

Bord na Móna

Knappoge Bog

**Cutaway Bog Decommissioning and
Rehabilitation Plan 2022**

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

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

This licence condition requires Bord na Móna agree with the EPA the measures that will provide for rehabilitation, i.e. stabilisation of Knappoge 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 Knappoge 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 Minister. 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 Knappoge 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 Knappoge 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 Knappoge 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.

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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 Knappogue Decommissioning and Rehabilitation Plan – Addendum 1 for more details.

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NON-TECHNICAL SUMMARY

- Industrial peat harvesting is now finished at Knappoge Bog, North-east of Lanesborough, Co. Longford.
- Bord na Móna is planning to rehabilitate Knappoge 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 the establishment of habitats and vegetation back onto the bare peat, and minimising impacts to downstream waterbodies. The bog was drained in the past to allow peat production. 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.
- 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 Reeds will thrive.
- Many Bord na Móna bogs cannot be restored to raised bog, as so much peat has been removed and the environmental conditions have been modified. However other natural habitats will develop like shallow wetlands with Reedbeds and Birch woodland, and in time a naturalised peatland can be restored.
- Re-wetting peat is also better for climate action. This reduces carbon emissions as re-wetting the remaining peat reduces carbon losses such as the production of Carbon Dioxide, the main Greenhouse Gas. The site is expected to still be a reduced carbon source for some time, but eventually the carbon sink function can re-establish as peat-forming conditions are restored. This will take some time.
- The development of a range of habitats in Knappoge 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 habitats.
- The drainage and development of Knappoge for industrial peat production began in 1963. Industrial peat production completely ceased in 2018.
- Much of the site is already establishing a range of pioneer wetland and peatland habitats.
- Measures proposed for Knappoge Bog include drain blocking, outfall management and other measures required to raise water levels to the surface of the peat (changing levels of pipes for example). Some fertiliser will be spread on headlands and other areas (a small part of the overall area) to encourage vegetation growth.
- Bord na Móna plan to carry out this work on part of the site in 2022-2024.
- These rehabilitation measures will be planned by a team consisting of ecologists, hydrologists and engineers. It is a principle of Bord na Móna rehabilitation planning that no actions will be taken that would negatively impact on adjacent land. No boundary drains will be blocked. Water will still leave the site via the existing outlets.
- It will take some time for vegetation and habitats to fully develop at Knappoge, and a peatland ecosystem to be restored. However, it is expected that most of the site will be developing pioneer habitats after 5-10 years.

- This is a peatland rehabilitation plan. Bord na Móna continually reviews its land-bank to consider future commercial or industrial developments. Any other proposed development will be planned in adherence to relevant planning guidelines and will consider the rehabilitation and the condition of the site.
- Longford County Council and Bord na Móna are developing a greenway through Knappoge Bog. This walking and cycling amenity will link Derryarogue Bog to the Royal Canal and Begnagh Bog to the east. This amenity can be integrated into the rehabilitation plan.
- Peatland rehabilitation of the Bord na Móna 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: Knappoge Bog

Area: 314 ha

Site description:

- Knappoge Bog is located to the NE of Lanesborough, adjacent to the River Shannon in Co. Longford.
- Peat Production at Knappoge Bog commenced in 1963, and ceased completely in 2018. The peat was formerly used as fuel peat in Lough Ree Power in Lanesborough. The bog comprises two main sections that are divided by a minor public road.
- Knappoge Bog had a pumped drainage regime. These pumps have now been turned off. There has already been significant natural re-wetting and development of pioneer wetland habitats at this site.
- The majority of the former peat production footprint is a mosaic of open water, wetland habitat, or pioneering bare peat and contains active drainage channels.
- Peat depths are shallow for the most part (<1m) apart from the NE corner of the northernmost section where extant peats are up to 2.5m in depth.
- Longford County Council and Bord na Móna are developing a greenway through Knappoge Bog. This walking and cycling amenity will link Derryrogue Bog to the Royal Canal and Begnagh Bog to the east. This amenity is partially constructed.
- Knappoge Bog partially overlaps the Royal Canal pNHA (NPWS Site Code: 002103).

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 in the former area recently in industrial peat production for the further development of wetland, Reed swamp, wet woodland and fen habitats on shallow cutaway peats, along with management of existing wetlands.
- Optimising hydrological conditions for the development of embryonic *Sphagnum*-rich vegetation communities in a small amount of suitable deep residual peat areas.
- The site has already developed a mosaic of pioneer cutaway habitats in places, notably wetland, Birch woodland and fen habitats. These areas will be assessed for potential for targeted actions to enhance existing wetland habitats and create small wetland features.
- Integrating rehabilitation measures with current infrastructure and land-uses.
- Optimising hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future.
- Rehabilitation will support the National Policies on Climate Action and GHG mitigation by maintaining and enhancing the current residual peat storage capacity of the bog (locking the carbon into the ground). It is expected that the bog will have reduced emissions (reduced source) as it develops naturally functioning wetland and peatland habitats. It will also support Ireland's commitments towards Water Framework Directive and the National River Basin Management Plan 2018-2021.

Scope of rehabilitation

The principal scope of this rehabilitation plan is defined by:

- The area of Knappoge Bog.
- EPA IPC Licence - Ref. P0504-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. The key objective of 'rehabilitation', as required by this licence, is achieved by the **environmental stabilisation** of the bog.
- **The 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 Knappoge Bog, in particular, optimising **climate action benefits**.
- The local environmental conditions of this bog. Knappoge Bog has variable environmental characteristics with a range of residual peat depths, hydrology and topography. Much of the site was dependent on pumped drainage during industrial peat extraction and is suited to wetland development.
- The key goals and outcomes of rehabilitation at this bog outlined above.
- To minimise potential impacts on neighbouring land, some boundary drains around Knappoge Bog will be left unblocked, as blocking boundary drains could affect adjacent land.
- Other constraints including archaeology and grazing rights.
- Current Land-use. The development of a greenway through Knappoge Bog.

Criteria for successful rehabilitation:

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

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

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

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 to have sufficient resources (staff and machinery) to deliver the planned rehabilitation.
- Weather conditions to be within normal limits over the rehabilitation plan timeframe.
- Rehabilitation measures to be effective.
- Natural colonisation of vegetation to develop semi-natural habitats at a rate within the normal limits.
- Monitoring to be robust and effective.

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 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.

Budget and Costing

- The rehabilitation plan outlined in this document is predicated on the understanding that it is the Minister's intention to support, via the Climate Action Fund 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.*
- In relation to the pre-existing Condition 10 IPC Licence requirement to carry out what can be termed the 'standard' decommissioning and rehabilitation, Bord na Móna maintains a Provision on its balance sheet to pay for these future costs when industrial peat extraction ceases. This is updated every year. For more information see the Bord na Móna Annual Report (Bord na Móna 2021). Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

Monitoring, after-care and maintenance

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

- Quarterly monitoring assessments of the site to determine the general status of the site, assess the condition of the rehabilitation work, assess the progress of natural colonisation, monitoring of any potential impacts on neighbouring land and general land security. The number of site visits will reduce after 2 years to bi-annually. These site visits will assess the need to additional rehabilitation, if needed.

- **Water quality monitoring** will be established. Monitoring of key water quality parameters for 2 years after rehabilitation will include: Ammonia, Phosphorous, Suspended solids (silt) and 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 appropriate 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 remote sensing 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.
- Monitoring as part of Climate Action Verification is dependent on support from the Climate Action Fund or other external funding.

Validation and IPC Licence surrender

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

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

1. INTRODUCTION

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Mount Dillon bog group (Ref. P0504-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. The bog is part of the Mount Dillon bog group (see Appendix II for details of the bog areas within the Mount Dillon Bog Group). Knappoge Bog is located in Co. Longford.

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.
- 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 identified a footprint of 33,000 ha (a subset of the BnM estate that has been used for energy production) as peatlands suitable for enhanced rehabilitation under 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. 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. 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 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 hydrological management, drain-blocking and cell bunding;
- re-profiling that will deliver suitable conditions for development of wetlands, fens and bog habitats;
- targeted fertiliser applications,
- seeding of targeted vegetation; and
- proactive inoculation of suitable peatland areas with *Sphagnum*.

These are collectively designed to optimise hydrological conditions (ideally and where possible water-levels <10 cm) for climate action benefits and to accelerate the trajectory of the site towards a naturally functioning ecosystem, and eventually a reduced carbon source/carbon sink again. (In some areas of dry cutaway this trajectory will be significantly longer and it is not feasible in the short-term to re-wet some areas. These 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.

Knappoge Bog is proposed to be part of this 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. P0504-01:

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

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

This document covers the area of **Knappoge bog**.

Longford County Council proposes to undertake a project comprising the construction of amenity trackway through part of Knappoge Bog. The development will consist of: the construction of a trackway approximately 2.3km in length through the townlands of Knappoge (Longford By), Cloonkeel and Ballynakill at Knappoge Bog. The works will consist of a walkway and a number of activity areas at various locations. This project is partially constructed.

Industrial peat extraction at Knappoge Bog permanently ceased in 2018. Currently the former peat production area comprises a mosaic of various different pioneering habitats, in addition to bare peat and exposed gravel sub-

soil. It is anticipated that the combination of active enhanced rehabilitation measures and natural colonisation will quickly accelerate environmental stabilisation. Nevertheless, it will take some time (30-50 years) for naturally functioning peatland ecosystems to fully re-establish.

Parts of Knappoge Bog (outside the areas owned and under the control of Bord na Móna) are currently 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 Knappoge 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 Knappoge which intersect the travel pass to Begnagh Bog, located due west.

There is recorded Archaeology present at Knappoge, primarily toghers; this is similarly treated as a constraint.

Additionally constraints are proximity to the Royal Canal and annual winter inundation from the adjacent Shannon.

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 enhanced rehabilitation plan considered **draft** 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) 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;
- 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 Knappoge 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):

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- 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.
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- Clark & Rieley (2010). Strategy for responsible peatland management.
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- Farrell & Doyle (2003). Rehabilitation of Industrial Cutaway Atlantic Blanket Bog, NW Mayo, Ireland.
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- 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.
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Additional on-line resources were also incorporated into the desk study, including:

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

- Historic Environment Viewer at <https://webgis.archaeology.ie/historicenvironment/>
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive catchments.ie/maps/ Map Viewer (www.catchments.ie);
- OPW Indicative Flood Maps (www.floodmaps.ie);
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie);
- River Basin Management Plan for Ireland 2018 – 2021;
- Bord na Móna Annual Report 2021.
- 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 its Biodiversity Action Plan programmes and are contacted during the rehabilitation planning process for their views. Bord na Móna can also facilitate site visits (where appropriate) to discuss the proposed plans. 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, Knappoge Bog was surveyed in March of 2011. Additional ecological walk-over surveys and visits have taken place at Knappoge Bog between 2012-2020 (visited during 2013, 2014, 2018, 2019, 2020 and a final confirmatory survey in September of 2021) to inform rehabilitation planning. 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 Knappoge in September 2021.

A detailed ecological survey report for Knappoge Bog is contained in Appendix III.

3. SITE DESCRIPTION

Knappoge Bog is located approximately 1km from Cloondara in Co Longford. The River Shannon forms a boundary to the west while the Royal Canal forms a boundary along the eastern edge of the bog. There are travel paths and drainage channels maintained around the bog for access. A rail line also runs through the bog.

Peat production at Knappoge bog commenced in 1963 and ceased in 2018. Over many years of peat extraction, many underlying glacial gravel ridges and hills have been exposed. The Haku method of industrial peat production was employed on this bog, this method allows for the deeper peat to be harvested between the emerging gravel hills, the peat was then stored in large piles on the site before being used to generate electricity in Lough Ree Power Station.

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

See Drawing number BNM-DR-23_08_01 titled **Knappoge Bog: Bog Site Location**, included in the accompanying Mapbook¹, which illustrates the location of Knappoge Bog in context to the surrounding area.

3.1 Status and Situation

3.1.1 Site history

Peat Production at Knappoge bog commenced in 1963, and finished in 2018. The peat was formerly used as fuel peat in Lough Ree Power in Lanesborough.

3.1.2 Current land-use

The site is developing naturally as a wetland.

Longford County Council and Bord na Móna are constructing a greenway amenity across this site as part of the Mid-Shannon Wilderness Park Greenway (Flynn, Furney Environmental Consultants, 2021²). This cycling and walking track will be situated on the former Bord na Móna railway. It is anticipated that this railway will be decommissioned shortly, when peat stocks are removed from neighbouring bogs.

There are licensed active turbary plots overlapping the bog boundary where there is active turf-cutting.

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

¹ Cutaway Bog Decommissioning and Rehabilitation Plan - Knappoge Bog Map Book

² Flynn, Furney Environmental Consultants, 2021, Ecological Impact Assessment, *Mid-Shannon Wilderness Park Greenway: Ecological Impact Assessment Report*, Document No: MSWP-RP-EN-0005-P02

mid 1980's, with a peak employment of 6,100 during the production season, which placed it among the country's largest commercial employers. The importance of such levels of employment were largely due to its regional concentration in the Midlands and the lack of alternative employment opportunities at the time.

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

In respect of Knappoge 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

The underlying geology at Knappoge Bog comprises Visean Limestones (undifferentiated)³. Subsoils at Knappoge comprise silty clays, silty clay loams overlain by deposits of organic mud or marl deposits.

The lowest lying areas of the site are underlain by marl (below c. 37.0mOD), while one several ridges of more elevated material (rising to >38.5mOD) trends into the bog for surrounding areas. This has been interpreted as glacial till (based on comparable features present in the surrounding area). 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.

3.2.2 Peat type and depths

Peat Production at Knappoge bog commenced in 1963, and finished in 2018. Peat depths are shallow for the most part (i.e. <1m) apart from the NE corner of the northernmost section where extant peats are up to 2.5m in depth.

3.3 Key Biodiversity Features of Interest

Knappoge bog is colonising with vegetation becoming established on most sections. As pumping of this bog has ceased large areas now correspond to a small lake and wetlands.

³ <https://www.gsi.ie/en-ie/data-and-maps/Pages/Bedrock.aspx>

3.3.1 Current habitats

The River Shannon forms a boundary to the west of Knappoge Bog while the Royal Canal forms a boundary along the eastern edge. The entire bog is colonised with pioneer vegetation becoming established on most sections. Revegetation appears to begin with Soft Rush (*Juncus effusus*) along the drains, followed by Birch (*Betula pubescens*) becoming established along with the Soft Rush (see **Error! Reference source not found.**). A network of railway lines exists which are elevated above the level of the surrounding (former) production bog- sections of which has effectively hedgerows to either side.

A large area of open water and wetland has now developed in the western part of the site. Surrounding this is a margin of cutover bog (PB4) now dominated by emergent Birch scrub and other vegetation. Other bodies of standing water (also FL) also exist to the east and northeast of the bog- and are subject to inundation from the Shannon during the winter period which increases their respective extent. Water levels reduce naturally in the summer.

The western extremity of Knappoge contains an area of intact raised bog (PB1) which forms part of a larger bog (a small portion of the raised bog is not in BnM ownership). A small section on the eastern edge of this habitat has been ditched but the majority of the raised bog has never been extensively drained.

The wet grassland adjacent the River Shannon is dominated by Purple Moor Grass (*Molinia caerulea*) on the higher ground that slopes towards the river while a band of Reed Canary-Grass (*Phalaris arundinacea*) dominated grassland occurred on the lower lying, flood prone ground. Reed beds dominated by Common Reed (*Phragmites australis*) bordered the river's edge. The wet grassland does not appear to have been grazed in recent years and as a consequence scrub is encroaching in this area.

The remainder of the bog which does not comprise open water is re-vegetating, mainly with Soft Rush and Birch. Due the undulating nature of the surface of the former production bog, small hills and ridges with gravel-based sub-soil have been exposed and many of these features are impeding the original drainage on the bog resulting in smaller areas of open water developing.

See Drawing number DR23_08_17 **Knappoge Bog: Current Habitat Map**, included in the accompanying Mapbook, which illustrates the habitats at Knappoge Bog.



Pioneering vegetation on cutaway including Scrub and Soft Rush dominated Poor fen (Oct 2021)



Bog vegetation with Sphagnum within raised bog remnant on north east of site (Oct 2021)



Mesotrophic lake and wetland habitats developing at Knappoge Bog west (Oct 2020)



Amenity Trackway at Knappoge Bog (Oct 2020)



Invasive Canadian Pitcher Plant on Knappoge bog

Table 1 Photos of Habitats at Knappoge Bog.

3.3.2 *Species of conservation interest*

A review of available Biodiversity records from the National Biodiversity Data Centre (hereafter NBDC) of bird records from the recent 2007-2011 Bird Atlas, found 71 species of birds have been recorded at or near Knappoge Bog. In recent years' winter flooding at the bog has increased available habitat suitability for wintering wildfowl.

Species observed at Knappoge for which Bord na Móna has records includes (Amber listed) Whooper Swan (*Cygnus Cygnus*), up to 205 no. birds have been present on at least one occasion. Other wintering wildfowl include (Amber listed) Teal (*Anas crecca*), and Wigeon (*Anas Penelope*) and Tufted Duck (*Aythya fuligula*), both of which are Red listed in Ireland. Green listed Mallard (*Anas platyrhynchos*) and Mute Swan (*Cygnus olor*) also occur. Flocks of ducks including Teal, Mallard, Wigeon and Tufted duck numbering greater than 200 individuals combined have been recorded at Knappoge.

The Red listed Greenland white-fronted goose (*Anser albifrons flavirostris*) has been recorded when 4-6 individuals were present in the winter of 2017/18. Hen Harrier (*Circus cyaneus*) (Amber listed) has been recorded during the winter period at Knappoge.

Grey Heron (*Ardea cinerea*), Hooded Crow (*Corvus cornix*), European Robin (*Erithacus rubecula*), Common Blackbird (*Turdus merula*) have been recorded on surveys prior to 2020. In October of 2020, both Red listed Northern Lapwing (*Vanellus vanellus*) (n=13) and Amber listed Common Snipe (*Gallinago gallinago*) (n=6) were present at Knappoge. In an additional survey in October of 2021, Red listed Meadow pipit (n=2) and Amber listed Common Snipe (*Gallinago gallinago*) (n=5) were present. Others noted in the survey in 2021 include Jack Snipe (*Lymnocyptes minimus*), Grey Heron (*Ardea cinerea*), long-tailed tit (*Aegithalus caudatus*), swallows (*Hirundo rustica*) and wren (*Troglodytes troglodytes*) were present at Knappoge. Six swans were present onsite, but identification of the species was not possible.

Studies to inform the nearby Derryadd Wind Farm planning application⁴ recorded Red listed European Golden Plover (*Pluvialis apricaria*) at Knappoge during the winter period and breeding Northern Lapwing 'near to' Knappoge. The EIAR also describes wintering (Amber listed) Whooper Swan (*Cygnus cygnus*) at a number of wetlands in the hinterland of Knappoge, such as Fort William Turlough, Cordora Turlough and at Carrowmore⁵.

Signs of several mammal species have been noted by Bord na Móna ecologists during surveys of Knappoge including Red Fox (*Vulpes vulpes*), Badger (*Meles meles*) (numerous tracks around the bog), and Otter (*Lutra lutra*).

Irish Hare (*Lepus timidus subsp. hibernicus*), Pine marten (*Martes martes*) and American Mink (*Mustela vison*) are likely to occur in suitable habitat based on records from the NBDC website, as are bat species including Daubenton's Bat (*Myotis daubentonii*), Lesser Noctule (*Nyctalus leisleri*) and Soprano Pipistrelle (*Pipistrellus pygmaeus*).

Common Frog (*Rana temporaria*) occurs at Knappoge and was seen in October of 2020.

Marsh Fritillary (*Euphydryas aurinia*) have been recorded to the southwest of Knappoge at Derryrogue Bog, Co. Longford (NBDC data viewer) but there are no on-site records yet. NBDC records for the locality include Green Veined White (*Pieris napi*), Meadow Brown (*Maniola jurtina*) and Small Tortoiseshell (*Aglais uticae*) Butterflies at Knappoge. Red Admiral (*Vanessa Atalanta*) butterfly was present onsite in October 2020, along with Brown Hawker (*Aeshna grandis*) and Common Hawker (*Mosaic darners*).

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. Mammalian species such as Coypu are not expected to be subject to dispersal pathways from the PCAS, therefore there are no known IAS currently present whose range may be increased during PCAS activities. 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.

⁴McCarthy Keville O'Sullivan Ltd. (2017). Bord na Móna Breeding Surveys 2017 Derryadd Co. Longford Survey Report.

⁵ MWP (2017). Ornithology Report. Bord na Móna Winter Bird Survey 2016/17.

The invasive species Canadian Pitcher Plant (*Sarracenia purpurea*) was noted during a survey of Knappoge bog in October 2021 (see **Error! Reference source not found.**).

The invasive Coypu (*Myocastor coypus*) has previously been observed at Knappoge in 2017. However, there have been no recent records of this invasive, non-native mammal species.

3.4 Statutory Nature Conservation Designations

Knappoge Bog partially overlaps the Royal Canal pNHA (NPWS Site Code: 002103). In addition, the Lough Forbes Complex pNHA (Site code 001818) is ca.1km to the north east of Knappoge.

The Lough Forbes Complex SAC (Site Code 001818) and the overlapping Ballykenny-Fisherstown Bog SPA (Site Code 04101) are also both ca. 1km to the north east. Brown Bog NHA and SAC (Site Code 002346) is ca.3.5km north east of Knappoge.

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

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

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

Lough Ree SAC (and pNHA) is designated for the natural eutrophic lake as well as active raised bogs, degraded raised bogs capable of natural regeneration, bog woodland and Otter. Lough Ree SPA is designated for the assemblage of wintering wildfowl, many species of which occur in nationally important numbers, in addition to breeding Common Tern (*Sterna hirundo*) and Common Scoter (*Melanitta nigra*). No rehabilitation measures are proposed for the area of Knappoge that overlaps with any designations.

3.4.1 Other Nature Conservation Designations

The Ramsar Convention entered into force in Ireland on 15th March 1985. Ireland currently has 45 sites/wetlands designated as Wetlands of International Importance (Ramsar Sites). These cover a surface area of 66,994ha. There are no Ramsar Sites in the local vicinity of Knappoge Bog (i.e. within 3km). The closest Ramsar Site to Knappoge Bog is Lough Glen (Co. Westmeath), which is ca.20km east.

3.5 Hydrology and Hydrogeology

Knappoge forms part of the Upper Shannon Catchment (Catchment ID : 26C) as defined by the EPA under the Water Framework Directive (WFD) and is primarily situated within the Shannon[Upper]_SC_080 sub-catchment, with a small portion of the bog falling within the Shannon[Upper]_SC_060 sub-catchment. The bog is located 1.5km south of Termonbarry, with the River Shannon flowing in between. The bog contains several drainage pathways and discharge locations, with the majority of the bog discharging to the Ballynakill River to the South/South-west of the bog.

Knappoge Bog had a formerly pumped drainage regime, although pumps have now been turned off and decommissioned. Hydrological modelling (BNM-DR-23-08-01 titled **Knappoge Bog: Depression analysis**) indicates that a large part of the bog is a natural basin with significant potential for re-wetting, when drains have been blocked and pumping is reduced or stopped. Extensive wetlands have already developed across the site due to the cessation of pumping. Field drains run north-east to south west in both the eastern and western sections of Knappoge, although many of these have been flooded. The northernmost segment at Clogher and Rinn, has drains which flow north west to south east.

Regional hydrological data suggest that Knappoge receives average precipitation of 941mm/yr (1981-2010), with an estimated evapotranspiration rate of c. 501mm/yr, leaving an average effective precipitation of 440mm/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 440mm/yr, which equates to an annual runoff rate of c. 4,400m³/ha.

An aquifer is an underground body of water-bearing rock or unconsolidated materials (gravel or sand) from which groundwater can be extracted in useful amounts. GSIs Aquifer classes are divided into three main groups based on their resource potential, and further subdivided based on the type of openings through which groundwater flows. There are nine aquifer categories in total. Locally important aquifers are capable of supplying locally important abstractions (e.g. smaller public water supplies, group schemes), or good yields (100-400 m³/d). This data gives an indication of sub-surface deposits (bedrock and unconsolidated materials) in terms of their groundwater resource potential and dominant groundwater flow type.

Regionally important aquifers are those in which the network of fractures, fissures and joints, through which groundwater flows, is well connected and widely dispersed, resulting in a relatively even distribution of highly permeable zones. There is good aquifer storage and groundwater flow paths can be up to several kilometres in length. There is likely to be substantial groundwater discharge to surface waters ('baseflow') and large (>2,000 m³/d), dependable springs may be associated with these aquifers.

The bog is located in an area mapped by GSI as of low-moderate groundwater vulnerability (GSI Mapviewer). Groundwater Vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. Groundwater vulnerability maps are based on the type and thicknesses of subsoils (sands, gravels, glacial tills (or boulder clays), peat, lake and alluvial silts and clays) and the presence of karst features. Groundwater is most at risk where the subsoils are absent or thin and in areas of karstic limestone, where surface streams sink underground at swallow holes. 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 for Knappoge Bog is generally low-moderate in the surrounding area, although there are some high and extreme vulnerability areas in areas where bedrock is close to the ground surface.

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 peatlands in a licensed area is discharged via an appropriately designed silt pond treatment arrangement as required in Condition 6.6. of the licence.

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. There are four silt ponds around the margins of Knappoge Bog, two in the townland of Knappoge which outfall into field drains and eventually the Shannon, and two in Clogher and Rinn which outfall into field drains connected to the Camlin 26 blue line feature, which joins the Shannon at Cloondara.

Knappoge bog has three treated surface water outlets. One is to the north to the Camlin River (IE_SH_26C011000 CAMLIN_070). The remaining outlets are direct the River Shannon (IE_SH_26S021600 SHANNON (Upper)_100).

Peat extraction was identified as pressure in the second cycle of the River Basin Management Plan in the Shannon Upper (IE_SH_26S021600 SHANNON (Upper)_100), in the second cycle of the river basin management plan and is indicated as remaining so in the third cycle, currently under preparation.

Details of silt ponds, associated surface water emission points and those being monitored and sampled as part of the PCAS scheme are detailed on the accompanying structures map along with water quality map. See Drawing number BNM-DR-23-08-02 titled Knappoge Bog: Structures and Sampling, along with Drawing number BNM-DR-23-08-WQ01 titled Knappoge Bog: Water Quality Map included in the accompanying Mapbook, which illustrate the various drainage and water quality infrastructure present at Knappoge.

There is a robust monitoring program to track and verify any changes in baseline water quality conditions pre and post decommissioning and rehabilitation so that the success or otherwise can be tracked and verified for the National Parks & Wildlife Service, Environmental Protection Agency and Local Authority Water Program, amongst a range of stakeholders.

The main emission limit value associated with this bog is 35mg/l suspended solids, with trigger levels for ammonia of 1.42mg/l and COD 100mg/l.

Initial monthly results are included in Appendix XIII. These results cover the period from November 2020 to Dec 2021. During this period, the catchments supplying these two outlets were in flood and not discharging so there were some months where samples were not recovered over the Winter period. These indicate the baseline water quality from a minimum of 70% of the bog's catchment. Peat extraction ceased 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 locations, where samples could be obtained. All other parameters fluctuated slightly, most likely influenced by normal weather patterns, especially rainfall.

Monthly ammonia concentrations from November 2020 to August 2021 had a range of 0.018 to 0.8 mg/l with an average of 0.204 mg/l.

Results for suspended solids for the same period indicate a range of 2 to 6mg/l with an average of 2.4 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 trigger levels for ammonia and COD (see Table 3.1).

Bog	SW	Monitoring	pH	SS	TS	Ammonia	TP	COD	Colour
Knappoge	SW-49	Q1 21	7.4	2	351	0.796	0.05	30	83.3
Knappoge	SW-49A	Q1 21	5.8	3	23	0.309	0.05	15	180
Knappoge	SW-49	Q3 18	7.4	5	236	0.12	0.14	32	67
Knappoge	SW-50	Q3 18	7.7	5	376	0.19	0.05	35	78
Knappoge	SW-49	Q3 15	8.1	8	374	0.15	0.05	29	77
Knappoge	SW-50	Q3 15	7.8	5	318	0.51	0.05	35	99

Table 3.1. Decommissioning and Rehabilitation Programme Water Quality Monitoring.

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 aids 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. Additionally, the peatland vegetation can quickly stabilise this material within blocked drains on site (by acting like constructed wetlands).

Water quality of water discharged 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 rehabilitation and raised bog restoration is expected to have a positive impact on water quality and help the NRBMP deliver its objectives in relation to the WFD.

Water will still discharge from designated emission points when rehabilitation at Knappoge has been completed. This discharge will have improving water quality and there will be increased wetland attenuation, meaning slower release of water.

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). Collectively, ceasing industrial peat production, re-wetting and re-vegetating will minimise any risk of emission to air from dust.

3.8 Carbon emissions

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

The EPA-funded CarbonRestore Project (Renou-Wilson *et al.* 2012) found that rewetting of drained peatlands can lead to restoration of functional peatland, such as the return of typical plant and animal species, which in turn may lead to the restoration of peat-formation and the C-sink function. The EPA NEROS project carried out

GHG flux research at Moyarwood Bog and found that the bog was an overall Carbon sink (sink for CO₂ and a source for Methane) 6 years after bog restoration was carried out (Renou-Wilson et al. 2018).

It is expected that Knappoge Bog can become a reduced carbon source following rehabilitation. The potential of any cutaway site to develop as a reduced carbon source/carbon sink in the longer-term depends on land-use, the success of the rehabilitation measures, the extent of optimal re-wetting and hydrological conditions, the extent of development of *Sphagnum*-rich or other peat-forming habitats, the balance of carbon fluxes from different cutaway habitats and future climatic conditions. Much of the cutaway is expected to develop Reed Swamp and fen habitats with alkaline emission factors, and there is likely to be a proportion that will be permanent shallow open water (which is a likely source of Methane). This site is expected to develop a mosaic of wetlands with open water, fen, Reed swamp, wet woodland and scrub. Birch woodland is expected to develop on the drier mounds and peripheral headlands.

3.9 Current ecological rating

(Following NRA (2009) Evaluation Criteria)

Current ecological rating ranges from Local Importance (lower and higher value) to National Importance. The wetland habitats at this bog are deemed to be of **Local Importance (higher value)** due to its suitability for wintering wildfowl and breeding waders, whilst any bare peat is considered of **Local Importance (lower value)**. Pioneer and semi-natural habitats such as wet grassland, scrub and poor fen are rated higher and are deemed to be of **Local Importance (higher value)**.

There are records of Hen Harrier and Otter using the site and the presence of such features add to the ecological value of the site. In addition, the bog remnant located at the western section of the bog is rated as **County Importance** due to this habitat undergoing a decline in quality and extent at the national level (NRA, 2009).

A nationally important population of Whooper Swan use the bog during winter months. The population of Whooper Swan are deemed to be of **National Importance**.

4. CONSULTATION

4.1 Consultation to date

Consultation seeks to engage an audience of relevant stakeholders at both a national and local level. National stakeholders have been identified from varied bog restoration and rehabilitation efforts undertaken by Bord na Móna over the past 40 years, with particular emphasis on engagement with stakeholders during their Biodiversity Action Plan programme, since 2010. National Stakeholders include 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 Knappogue 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 Knappogue Bog with various stakeholders in relation to:

- Longford Wetland Wilderness (general proposal led by Longford County Council and other stakeholders. This has had several iterations. See Lough Ree and Mid Shannon, Spirit Level 2017. A feasibility study for Longford County Council).
- Feehan, J. (2004) A Long-Lived Wilderness; the future of the north midlands peatland network UCD/NWWPC.
- Lauder, A. & O'Toole L. (2017). Concept development for a landscape-scale Wetland Wilderness Park in the Mid Shannon Region. A report funded by the Heritage Council's Heritage Grant Scheme.
- Foss, P.J., Crushell, P. & Gallagher, M.C. (2017). Counties Longford & Roscommon Wetland Study. Report prepared for Longford and Roscommon County Councils.
- Midlands & East Regional WFD Operational Committee (River Basin Management Plans).
- Sub-committee on Shannon Flooding Work Programme and Measures (OPW, Waterways Ireland, ESB, LA's, Fisheries Ireland, NPWs etc).
- Archaeological Liaison Committee (National Museum of Ireland & Dept of Culture Heritage and the Gaeltacht).
- Midlands & East Regional WFD Operational Committee (River Basin Management Plans).
- Sub-committee on Shannon Flooding Work Programme and Measures (OPW, Waterways Ireland, ESB, LA's, Fisheries Ireland, NPWs etc).
- Archaeological Liaison Committee (National Museum of Ireland & Dept of Culture Heritage and the Gaeltacht).
- Proposed Mid-Shannon Wilderness Park Greenway development at Knappogue (Longford County Council).

To inform the current Plan, both national and local stakeholders, including neighbours whose land adjoins Knappogue 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) were contacted. Any identified local interest groups were also 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 Knappogue 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 Knappoge Bog, contact details and the PCAS website address was delivered to each house within a 1Km 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 Knappoge Bog – these are summarised below.

4.2.1 Assessments of rehabilitation

To date a number of consultees including: the IFA, the IMSCA and Trinity College Dublin have raised concerns regarding the duration and scope of consultation period. Stakeholders suggested that the consultation period should be extended to allow all potential stakeholders to make submissions where required.

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.

4.2.2 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.

4.2.3 Monitoring

Further details on monitoring of ecological metrics, and how and where reporting on this monitoring would take place, was raised the IPCC, University College Dublin and Trinity College researchers in their respective submissions relating to the finalisation of several bog rehab plans in 2021. Irish Water reiterated the requirement of a strong monitoring program with respect to water quality during and post rehabilitation.

4.2.4 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 Knappoge 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.

4.2.5 Future management

The IFA expressed concern about possible impact of peatland rehabilitation on surrounding farmlands, specifically around flooding/waterlogging of surrounding areas and development of new flood plains, as well as potential to have a negative impact on property values due to the accumulation of risks outlined above.

4.2.6 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 bogs (outside of the area owned by Bord na Móna).

The OPW acknowledged that Knappoge Bog does not overlap with any OPW Arterial Drainage Scheme.

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

One local resident suggested that the bog could be used to develop a community base wind or solar farm or energy storage 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 are carrying out ongoing consultation as part of the process of developing the rehabilitation plan for Knappoge 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

Appropriate Assessment screening will be undertaken on all the bogs as part of PCAS and this is currently being undertaken by external consultants for Knappoge 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 EIA 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 fauna monitoring is proposed as part of the monitoring and verification at Knappoge 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 Knappoge Bog.

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 Knappoge 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. However, PCAS will enable and support any future amenity development. Amenity development is proposed for this site as part of the Mid Shannon Wilderness Park. One section is already constructed. Any future amenity can be positively aligned and integrated to after-use plans following the completion of the proposed rehabilitation at Knappoge Bog. Rehabilitation measures proposed for Knappoge 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

It is the expectation of BnM that rehabilitation measures should 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. Biological monitoring of associated water courses is outside the scope of the PCAS scheme.

4.3.8 Future management

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

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 Knappoge 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.

The development of a community base wind or solar farm or energy storage unit is outside the scope of PCAS.

4.3.10 Concluding statement.

- Some parts of Knappoge bog includes areas of bare peat following the cessation of peat production, with some areas that were out of peat production earlier beginning to develop 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 etc. 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.
- Environmental stabilisation.
- 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 wetland habitats such as reed swamp, fen and wet woodland on shallow cutaway peat, and eventually naturally functioning wetland and peatland habitats.
- Optimising hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future, where possible.
- Supporting any current and future amenity land-use planning. Integrating rehabilitation measures with any future amenity. Peatland rehabilitation can be integrated positively with future amenity land-use.
- The main goal and outcome of this plan is the successful rehabilitation (environmental stabilisation) of peatlands used for industrial peat production at the bog in a manner that is acceptable to both external stakeholders and to Bord na Móna and which optimise climate action and other ecosystem service benefits.

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

- It will take some time for stable naturally functioning habitats to fully develop at Knappoge Bog. This will happen over a longer time-frame than the implementation of this rehabilitation plan.
- Re-wetting residual peat will initially maintain and enhance the carbon storage capacity of the bog. There is scientific consensus that restoration of hydrology in damaged bog can improve carbon storage, water storage and attenuation and help support biodiversity both on the site and in the catchment (see Section 3.8). This will reduce carbon emissions from the site from a larger carbon source to a smaller carbon source. 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). The majority of the site has been largely cutaway with shallow peat. In addition, areas of shell marl and fen peat remain and will develop fen and wetland habitats in the future.
- However, small areas of deep *Sphagnum* peat are present and do have 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, making the overall bog wetter. Other wetland and peatland habitats will develop in a wider mosaic that reflects underlying conditions.
- Rehabilitating former industrial peat production bog will also in the longer-term support other ecosystem services such as the development of new habitat to support biodiversity and local attenuation of water flows from the bog.

- WFD status in receiving water bodies can be affected by peatlands and peat extraction but is also affected by other sources such as agriculture. In addition, receiving water bodies that are assessed as At Risk from peatlands and from peat extraction are likely to have several contributory sources of impacts (private peat extraction and Bord na Móna).
- Re-wetting in general will benefit the future preservation of most known and unknown archaeological features.
- Bord na Móna are also planning rehabilitation measures, in 2021, in Begnagh Bog and Clooneeny Bog located to the east of the site. There are expected to be cumulative water quality and other ecosystem service benefits to receiving water bodies such as the associated tributaries and downstream to the River Shannon, from rehabilitation more than one bog in the same catchment.
- In relation to the proposed Mid-Shannon Wilderness Park Greenway, it is not proposed to carry out any intensive rehabilitation actions to change or negatively affect any amenity infrastructure or existing land-uses. It is intended that the proposed greenway will utilise the existing railway infrastructure that bisects the site. This future land use will not have a significant effect on rehabilitation planning, which will be focused on the former peat production areas.

6. SCOPE OF REHABILITATION

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

- The area of Knappoge Bog.
- EPA IPC Licence - Ref. P0504-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Knappoge bog is part of the Mount Dillon 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 Knappoge Bog, in particular, optimising **climate action benefits**. The proposed interventions will mean that environmental stabilization is achieved (meaning IPC obligations are met) and, in addition, significant other ecosystem service benefits particularly for climate action will be accrued.
- The local environmental conditions of Knappoge Bog identify wetland creation and the development of fen, Reed swamp and wet woodland as the most suitable rehabilitation approach for this site. Knappoge Bog had a pumped drainage regime and a significant area is likely to develop as wetland habitats, particularly Reed swamp. There is only a small portion of residual deep peat.
- The key objective of rehabilitation, as defined by this licence, is **environmental stabilisation** of the bog. Bord na Móna have defined the key goal and outcome of rehabilitation at Knappoge Bog as **environmental stabilisation** and **optimising residual peat re-wetting, and setting the site on a trajectory towards the development of wetlands/Reed Swamp and fen on shallow more alkaline peat and other subsoils**.
- Integrating rehabilitation measures with future potential amenity projects i.e. the Mid-Shannon Wilderness Park Greenway. It is not proposed to change any conditions around the area proposed for this project.
- Rehabilitation of Knappoge Bog will support multiple national strategies of climate action, biodiversity action and other key environmental strategies such as the Water Framework Directive.
- The time frame for the delivery of the planned rehabilitation will be undertaken according to available resources and appropriate constraints.
- Some rehabilitation measures are proposed on the marginal cutover bog zone at the peripheries of the bog.

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). Industrial peat extraction at Knappoge bog commenced in 1963, and finished in 2018. As a result, peat depths are shallow for the most part (i.e. <1m). In addition, this bog was formerly pumped to facilitate peat extraction – however pumps are now switched off resulting in increased levels of standing water. These are local factors that will influence the future trajectory of this bog, which need to be considered as part of the wider rehabilitation work.

- **Surrounding landscape and neighbours.** Another key constraint is the interaction between the Bord na Móna sites and the surrounding landscape. Care has to be taken that no active rehabilitation management is carried out that could negatively and knowingly impact on surrounding land. This includes any hydrological management on neighbouring farmland, as well as potential changes to the hydrology of surrounding designated sites. 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. If this occurs, rehabilitation measures will be reviewed and adapted. An archaeological impact assessment of the proposed rehabilitation at Knappoge has been carried out (Appendix XII). This assessment indicated there were some known archaeological features recorded in past but that these do not remain on the site, and there were no recommendations for further mitigation.
- **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.
- **Current/future land-use.** The key land-uses for the site are amenity. As described above, there are proposals for part of the Mid-Shannon Wilderness Park Greenway to utilise the existing railway corridor through the site. Any proposed enhancement measures (ie. targeted drain-blocking) will be positively aligned with current land-uses and will look to facilitate amenity, where possible. There are proposals to extend amenity infrastructure and rehabilitation will be positively aligned to enable any future amenity development. Re-wetting will be planned as to not to rule out potential future amenity.

6.2 Key Assumptions

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

6.3 Key Exclusions

The scope of this rehabilitation plan does not cover:

- The longer-term raised bog restoration trajectory of the site. The plan covers the short-term rehabilitation **actions** and **an additional monitoring and after-care programme** to monitor the rehabilitation during the Scheme and to respond to any needs (failure of environmental stabilisation for example). It is expected that this rehabilitation plan will set the site on an enhanced and accelerated trajectory towards environmental stabilisation and wetland creation. The plan does not set any goals or outcomes, for example, the extent (specific area) of active raised bog habitat (ARB) that may develop at this site in the long-term. This is beyond the scope of this rehabilitation plan.
- This plan is not intended to be an after-use or future land-use plan for Knappoge Bog.
- The longer-term management of this site, potentially as a nature conservation site, or for amenity, or for other uses in the future. This will require further engagement with stakeholders.

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.

Similarly monitoring of surface water ammonia emissions from a Corlea bog in Mountdillon over the past 4 yrs. post cessation of peat extraction with ongoing rehabilitation, indicate downward trends.

As the monthly monitoring program at Knappoge Bog continues in 2021/2022 during the rehabilitation works planned for 2022, and data from the 2021/22 monitoring program is compiled, further trending will be produced to verify any ongoing trends, post the completion of the rehabilitation.

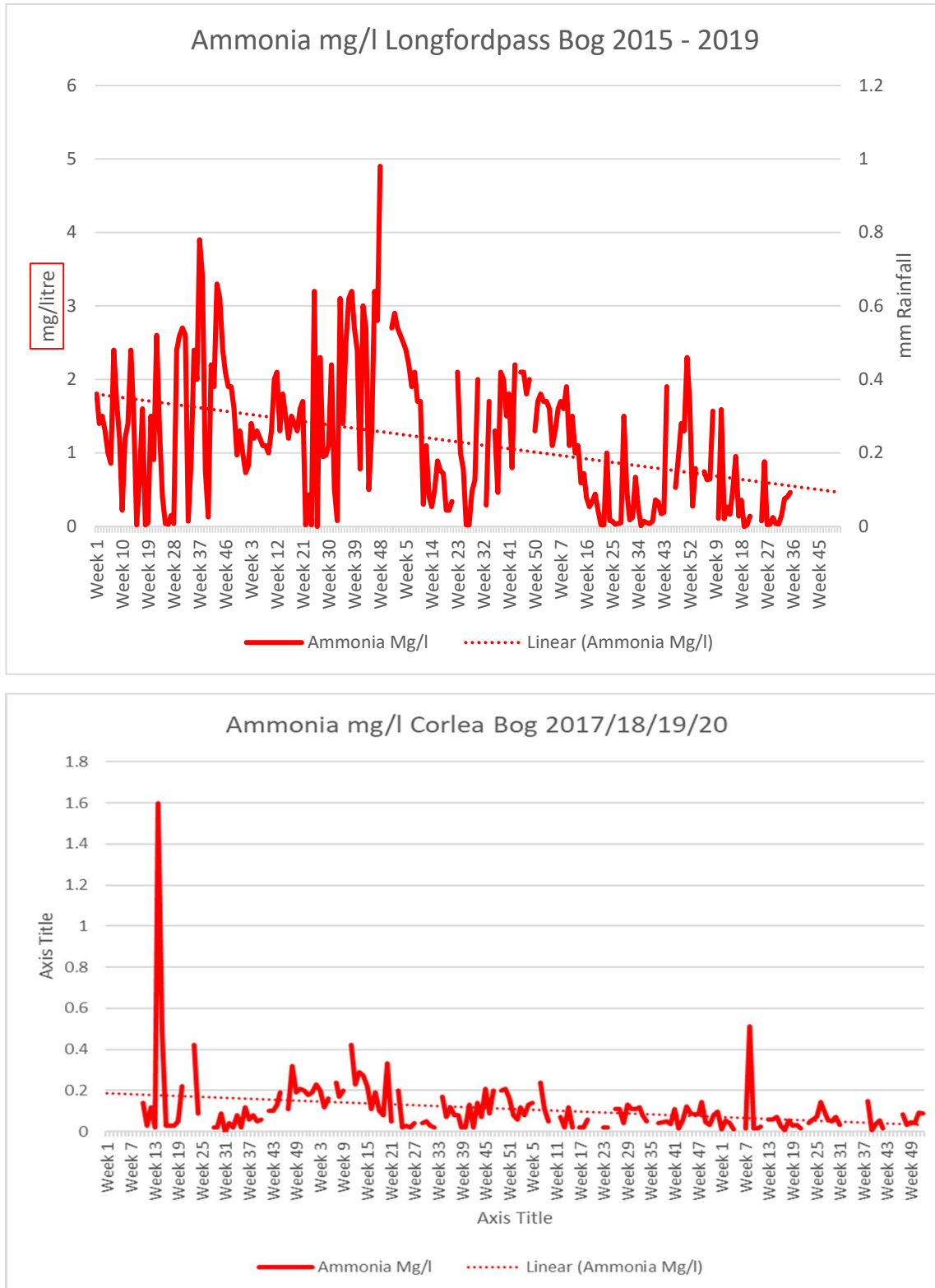


Figure 1 Ammonia levels over the period 2015-2019/2020 at Longfordpass and Corlea.

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, Reed Swamp, poor fen, wet woodland, heath, scrub and embryonic *Sphagnum*-rich raised bog peatland communities, where conditions are suitable. These habitats have already in part established as pioneer vegetation/wetlands. It will take some time for stable naturally functioning habitats to fully develop at Knappoge Bog. This will be demonstrated and measured via aerial photography, habitat mapping and cutaway/habitat condition assessment. Baseline monitoring will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Improvement in biodiversity and ecosystem services. This will be demonstrated by metrics outlined in Section 9.1 that can be used to measure changes in ecosystem services (e.g. water quality parameters, development of pioneer habitats, breeding bird monitoring). This will be measured by collecting a range of scientific data that can then quickly be adapted and into metrics that can be used to measure changes in various ecosystem services. Baseline monitoring will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future. These metrics will be defined in the context of the overall Scheme resources and after consultation with stakeholders.

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	of Aerial photography after rehabilitation has been completed – to demonstrate measures (drain-blocking)	2021-2024

		Reduction in bare peat.	Establishment of a baseline for future monitoring of bare peat, vegetation establishment and habitat condition.	
IPC validation	Key water quality parameters Ammonia, Phosphorous, Suspended solids, pH and conductivity	Reduction or stabilisation of key water quality parameters	Water quality monitoring. Started in advance of the proposed rehabilitation.	2022-2024
IPC validation	Reducing pressure from peat production on the local water body catchment (WFD)	No decline in the WFD status of the local river catchment	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	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 Water quality – Water quality monitoring Baseline monitoring to be carried out during the scheme when	2022-2025

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

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

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

- **Funding to pay for resources required to deliver the planned rehabilitation (Bord na Móna and external).** Bord na Móna maintains a Provision on its balance sheet to pay for these future costs when industrial peat extraction ceases. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence. It is expected that additional costs of enhanced rehabilitation will be supported by Government through the Climate Action Fund.
- **Bord na Móna to have sufficient resources (staff and training) to deliver the planned rehabilitation with required associated skills and competencies.**
- **Bord na Móna to have sufficient resources (suitable machinery) and staff to maintain this machinery.**
- **Weather conditions to be within normal limits over the rehabilitation plan timeframe.** Long periods of wet weather have the capacity to significantly affect ground conditions and constrain the delivery of rehabilitation. The potential impact of wet weather on ground conditions can be reduced by appropriate planning and management. Bord na Móna have significant experience of managing these issues through 70 years of working in these peatland environments.
- **Rehabilitation measures to be effective.** The rehabilitation measures proposed in this plan are based on 40 years of Bord na Móna experience of peatland management and best practise applied internationally in peatland management. Measures proposed in this plan have already been shown to be 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 cutaway peatland takes time. Pioneer vegetation can develop relatively quickly (3-10 years) and wetland habitats can develop relatively quickly. Birch woodland make take 20-30 years to develop. However, it may take 50 years for active raised bog vegetation to re-develop on ground that was previously cutaway. Different environmental conditions will have a significant impact on the rate of natural colonisation, and as a result of the combination of different environmental conditions and the application of different rehabilitation measures, there will be a variety of habitat outcomes.
- 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 remaining peat depths, topographical and hydrological modelling (depression analysis) will be important in planning the future peatland landscapes and planning the use of the most appropriate rehabilitation methodologies to maximise climate action benefits. Depression analysis 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 as the drawings referenced below:

BNM-DR-23-08-22 titled Knappoge Bog: Aerial Imagery2020

BNM-DR-23-08-04 titled Knappoge Bog: Peat Depths

BNM-DR-23-08_03 titled Knappoge Bog: LiDAR Map

BNM-DR-23-08_09 titled Knappoge 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-23-08-05 “Rehabilitation Measures” in the accompanying Mapbook (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 measures for Knappoge bog will include (see Table 8.1):

- Re-assessment of the pumping regime and removing pumps if this desired and has no significant external impact. A significant part of the site has already developed a mosaic of wetland habitats with permanent deeper water. Hydrological modelling will look to optimise water levels. Hydrological management will look to optimise summer water levels to maximise the development of wetland vegetation (by looking to set water depths at < 0.5 m, where possible. It is inevitable that some sections will naturally have deeper water due to the topography at this site). Water-levels will be adjusted at outfalls and by adjusting piped drainage. More sustainable permanent gravity drainage solutions will be examined. Some targeted bunding may be required. It is expected that a natural seasonal flooding regime will develop, with water-levels fluctuating in association with levels in the adjacent River Shannon.
- Intensive drain blocking around existing wetlands or standing water to create/promote the spread of wetland habitats.
- Optimising water retention in wetland areas, including placement of berms where required.
- Modifying water levels at outfalls, as it may be desirable to change and control water levels at the site over time, e.g. to increase water levels as the site becomes increasingly vegetated. This will further slow the movement of water through and out of the site.
- Regular drain blocking (3/100) on dry cutaway adjacent to wetland mosaics, along with the blocking of outfalls and management of water levels.
- Re-wetting the small amount of residual peat areas of the bog using berms and field re-profiling. This enhanced measure seeks to create large (c. 45m x 60m) flat areas or cells of shallow (< 10 cm) water

conditions on bare peat, across multiple fields that are enclosed by shallow berms to retain shallow surface water;

- Inoculation of *Sphagnum* on compatible residual deep peat areas;
- Intensive blocking of drains in targeted marginal (degraded) high bog area located at western side of the site and re-wetting, where possible, using an excavator to install peat blockages. Some other bog remnants are too small to benefit from this approach.
- Targeted fertiliser applications to accelerate vegetation establishment on areas of bare peat on headlands and high fields as required, see Drawing no. DR-23-08-28 “Fertiliser Application Map”.
- It is not expected that inoculation of Reeds and rhizomes will be required at this site as there has already been significant natural colonisation.
- The existing silt ponds will be retained and maintained during the rehabilitation phase. During the monitoring and verification phase the silt ponds will be continually inspected and maintained, where appropriate. When it is deemed that the silt ponds are not required, as the bog has been successfully stabilised and there is no run-off of suspended solids, the condition of the silt ponds will be reviewed. The silt ponds will either be de-watered (water levels lowered to a level where the silt pond will naturally develop as a small wetland feature), left in situ, or infilled (where discharges do not require silt control).

Table 8.1: Types of and areas for enhanced rehabilitation measures at Knappoge Bog

Type		Enhanced Rehabilitation Measure	Extent (Ha)
Deep peat	DPT2	More intensive drain blocking (7/100 m) + modifying outfalls and managing overflows	
Deep peat	DPT3	Regular drain blocking (3/100 m) + Field reprofiling + modifying outfalls	
Wetland	WLT2	Turn off or reduce pumping to re-wet cutaway + modifying outfalls and managing water levels with overflow pipes + Targeted blocking of outfalls within a site	99.26
Wetland	WLT3	Modifying outfalls and managing water levels with overflow pipes. Targeted blocking of outfalls within a site, constructing larger berms to re-wet cutaway and transplanting reeds and other rhizomes.	7.54
Wetland	WLT4	More intensive drain blocking (7/100 m), + modifying outfalls and managing overflows + transplanting Reeds and other rhizomes	85
Wetland	WL5	More intensive drain blocking (7/100 m), + modifying outfalls and managing overflows + transplanting Reeds and other rhizomes	
Marginal land	MLT1	No work required	25.42
Marginal Land	MLT2	More Intensive Drain Blocking (7/100m)	13.74
Silt ponds	Silt pond	Silt ponds*	0.45
Dry cutaway	DCT1	Modifying outfalls and managing water levels with overflow pipes	
Dry Cutaway	DCT2	Regular drain blocking (3/100m) + modifying outfalls and managing water levels with overflow pipes+ targeted fertiliser treatment	64.01
Constraint	Constraint	Other Constraints (ROW/pNHA)	18.78
Total			314.19

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 detailed site drawings outlining how the various rehabilitation methodologies (the Scheme PCAS) will be applied to Knappoge Bog. This will take account of peat depths, topography, drainage and hydrological modelling (depression analysis) (see map for an indicative view of the application of different rehabilitation methodologies).
- A drainage management assessment of the proposed rehabilitation measures has been carried out and any issues addressed via adaptations to the rehabilitation plan.
- An assessment of pumping requirements to complete decommissioning has been carried out.

- 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 possible.
- 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 any remaining milled peat stocks has been carried out. No milled peat stocks remain on this bog.
- An ecological appraisal of the potential impacts of the planned rehabilitation, if needed, such as the presence of sensitive ground-nesting bird breeding species (e.g. Lapwing) or larval webs of Marsh Fritillary butterfly, etc has been carried out. The scheduling of rehabilitation operations has been adapted to reduce disturbance to wetland bird species.
- 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 the rehabilitation plan for Knappogue screened out at the Stage I.)
- See Knappogue 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 (0-2 years)

- Carry out proposed measures as per the detailed site plan. This will include a combination of hydrological management, drain blocking, peat field re-profiling, high bog restoration and fertiliser applications targeting bare peat areas of headlands, high fields and other areas. in addition to wetland creation and management prescriptions. All rehabilitation will be carried out with regard to best practice environmental control measures (Appendix IV).
- Monitor the success of rehabilitation measures in relation to developing suitable hydrological conditions.
- Carry out the proposed monitoring, as outlined.
- While natural colonisation is expected to commence almost immediately once peat production ceases, Phase 2 actions will be carried out in targeted areas to accelerate re-vegetation and colonisation of target species.
- Silt ponds will be monitored during this period and there will be continued maintenance and cleaning to prevent 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.
- Reporting to the EPA will continue until the IPC License is surrendered.

8.4 Timeframe

- **2021-2022:** Short-term planning actions.
- **2022:** Short-term practical actions.
- **2022-2025:** 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) understand that it is the Minister's intention to impose an obligation on Bord na Móna to develop a package of measures, 'the Scheme', for the 'Peatlands Climate Action Scheme' (PCAS). It is understood that additional costs of the Scheme will be supported by the Government through the Climate Action Fund. However, only the additional costs associated with the additional and enhanced rehabilitation, i.e, measures which go beyond the existing 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 2021). Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

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

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.
- **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 bog's drainage catchments.
- Monitoring results will be maintained, trended and reported on each year as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, which will be available in April each year at www.epa.ie.
- The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Flow, SS, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD.
- This monthly sampling regime on a selected number of silt ponds will be carried out over a two-year cycle. The original (licence) requirement was for a quarterly sampling regime, but this has been increased to a monthly regime to appropriately track the changing water chemistry that will occur as part of this enhanced rehabilitation. In addition, DOC will be included as a parameter to try and identify any changes in carbon in the surface water.
- If, after two years, key criteria for successful rehabilitation are being achieved and key targets are being met, then the water quality monitoring will be reviewed, with consideration of potential ongoing research on site. The water quality data, the aerial surveys and the habitat mapping will be collated and will be submitted to the EPA as part of the final validation report.
- If, after two years, key criteria for successful rehabilitation have **not** been achieved and key targets have **not** been met, then the rehabilitation measures and status of the site will be evaluated and enhanced, where required. This evaluation may indicate no requirement for additional enhancement of rehabilitation measures but may demonstrate that more time is required before key criteria for

rehabilitation has been achieved. Monitoring of water quality will then also continue for another period to be defined.

- Where other uses are proposed for the site, 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.

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 Scheme or additional other funding. Monitoring of climate action and other ecosystem service benefits will be designed to take account of the requirements of monitoring benefits of the overall Scheme and will be stratified; that is not all monitoring will be carried out in each site. These are defined as:

- Vegetation and habitat monitoring will be carried out using a 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.
- The condition of the bog can be assessed using the condition assessment and suitable Greenhouse Gas (GHG) emission factors can be assigned to different habitats. GHG emission factors have been determined for various peatland habitats in Ireland (Wilson *et al.*, 2015) and are constantly being refined with more and more research. BnM is actively supporting research into GHG fluxes in different rehabilitated peatland habitats. This means that potential GHG emissions can be estimated from the site, as the site continues along its trajectory towards a naturally functioning peatland ecosystem.
- It is proposed to monitor the improvement of some biodiversity ecosystem services. To be defined in relation to monitoring of the overall Scheme and after consultation with stakeholders.

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

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

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

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

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ADDENDUM 1

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Mount Dillon bog group (Ref. P0504-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Knappoge Bog is located in Co. Longford.

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

Appropriate Assessment Reporting findings

An Appropriate Assessment Report⁶ was commissioned by Bord na Móna to inform whether the proposed PCAS activities at Knappoge Bog have the potential to result in Likely Significant Effects on European Sites. The concluding statement of this report reads as follows:

“It is concluded beyond reasonable scientific doubt, in view of best scientific knowledge, on the basis of objective information and in light of the conservation objectives of the relevant European Sites, that the proposed works, individually or in combination with other plans and projects, will not have a significant effect on any European Site”.

Therefore following screening, Appropriate Assessment is not required for the project as it is not directly connected with or necessary to the management of any European Site(s) and as it can be concluded, on the basis of objective information, that the project, individually or in combination with other plans or projects is not likely to have a significant effect on any European Site(s).

⁶ MKO (2022). Article 6(3) Appropriate Assessment Screening Report Knappoge Bog, Co Longford Decommissioning and Rehabilitation 2022

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.

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 Knappoge Bog (See Drawing number BNM- DR23_08_22_Aerial Imagery 2020 titled **Knappoge Bog: Aerial Imagery 2020**, included in the accompanying Mapbook, which illustrates the habitats at Knappoge Bog).
- EPA IPC Licence - Ref. P0504-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Knappoge bog is part of the Mount Dillon Bog group.
- The current condition of Knappoge Bog. This site had pumped drainage previously, however the pumps are now turned off. Pioneer wetland habitats are already developing across a significant part of the site.
- The key objective of rehabilitation, as defined by this licence, is **environmental stabilisation** of the bog.
- To minimise potential impacts on neighbouring land. Some boundary drains around Knappoge Bog will be left unblocked as blocking boundary drains could affect adjacent land.
- Land-use: It is proposed to develop a greenway through Knappoge Bog.

Rehabilitation goals and outcomes

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

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

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

Criteria for successful rehabilitation:

- Rewetting of residual peat 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:

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

Timeframe:

- 2022. 1st phase of rehabilitation. Field drain blocking and water-level management.
- 2022. 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)
Deep peat	DPT1	Regular drain blocking (3/100 m) + modifying outfalls and managing water levels with overflow pipes	
Dry cutaway	DCT1	Modifying outfalls and managing water levels with overflow pipes	64.01
Wetland	WLT1	Turn off or reduce pumping to re-wet cutaway + modifying outfalls and managing water levels with overflow pipes	191.8
Marginal Land	MLT1	No work required	39.16
Other	Silt Pond	Silt ponds*	0.45
Other	Constraint	Rights of Ways and constrained areas/buffers/Archaeology	18.78
Total			314.19

*3no. silt ponds which occur within the Knappoge boundary.

See Drawing number BNM-DR-23-08-20 titled **Knappoge Bog: Standard Rehab Measures** included in the accompanying Mapbook which illustrates 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, assess the progress of natural colonisation, monitoring of any potential impacts on neighbouring land and general land security. The number of site visits will reduce after 2 years to bi-annually. These site visits will assess the need to additional rehabilitation.
- Water quality monitoring will be established.
- Monitoring results will be maintained, trended and reported on each year as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, which will be available in April each year at www.epa.ie.
- The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD.
- This sampling regime on a selected number of silt ponds will be carried out over a two-year cycle. The original (licence) requirement was for a quarterly sampling regime.
- Where other uses are proposed for the site, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the required assessment and planning procedures.

Validation and IPC Licence surrender

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

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

APPENDIX II: BOG GROUP CONTEXT

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

Industrial peat extraction in the Mount Dillon Bog Group ceased in 2019. It is planned to supply remaining milled peat stocks to Lanesborough (LRP) during 2020. Both power stations will cease using peat by the end of 2020. Intensive decommissioning and rehabilitation for the Mount Dillon Bog Group is expected to start in 2020/2021. All remaining peat stocks will also be removed during 2020-2024.

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

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

A breakdown of the component bog areas for the Mount Dillon Bog Group IPC License Ref. PO-504-01 is outlined in Table Ap-2.

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

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

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Begnagh	265	Cutover Bog Industrial peat production commenced at Begnagh Bog in 1977 and ceased in 2020. Deep peat reserves remain on much of the former production area. Begnagh is considered a deep peat cutover bog.	Begnagh Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power Some areas of cutaway on site are developing pioneer cutaway vegetation communities.	2020	Draft 2021

Clooneeny	358	Cutover Bog Industrial peat production commenced at Clooneeny Bog in 1985 and ceased in 2020. Deep peat reserves remain on much of the former production area. Clooneeny is considered a deep peat cutover bog.	Clooneeny Bog formerly supplied a range of commercial functions including; horticultural peat and fuel peat for Lough Ree Power Most of the former production area on site is bare peat. Some areas of cutaway on site are developing pioneer cutaway vegetation communities.	2020	Draft 2021
Cloonmore	102	N/A	Never developed for industrial peat production; scattered plots.	N/A	N/A
Cloonshannagh	494	Cutover Bog Industrial peat production commenced at Cloonshannagh Bog in 1985 and ceased in 2020. Deep peat reserves remain across the former production area. Cloonshannagh is considered a deep peat cutover bog.	Cloonshannagh Bog formerly supplied a range of commercial functions including; horticultural peat and fuel peat for Lough Ree Power Restoration work has been carried out on a 38ha section of high bog within Cloonshannagh Bog. Some of the former production area on site is developing pioneer cutaway vegetation communities, the remainder of the site is bare peat.	2020	Draft 2017
Cloonshannagh Rail Link	28	Cloonshannagh rail link is a link between sites.	N/A	N/A	N/A
Corlea	163	Cutaway Bog Industrial peat production commenced at Corlea Bog in 1960 and ceased in 2018. Long-term peat extraction has reduced peat reserves on this bog. Corlea is considered a shallow peat cutaway bog.	The former production area at Corlea has already extensively colonised. Pioneer wetland and scrub development has occurred over much of the site. Some wetland and rehabilitation management was undertaken between 2016-2018. Part of site leased to local community development group to develop amenity walkway in association with Longford County Council.	2018	Draft 2019
Derraghan	289	Cutover Bog Industrial peat production commenced at Derraghan Bog in the 1940's and ceased in 2020. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derraghan is considered a shallow peat cutover bog.	Derraghan Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power Much of the former production area at Derraghan has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities.	2020	Draft 2021
Derryadd	653	Cutover Bog Industrial peat production commenced at Derryadd Bog in 1960 and ceased in 2020. Long-term peat extraction has reduced peat reserves on this bog. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derryadd is considered a shallow peat cutover bog.	Much of the former production area at Derryadd has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities Derryadd Bog will form part of the footprint of Derryadd Windfarm for which planning permissions were granted in 2020.	2020	Draft 2017
Derryadd2	328	Cutover Bog Industrial peat production commenced at Derryadd 2 Bog in 1960 and ceased in 2020. Long-term peat extraction has reduced peat reserves on this bog. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derryadd 2 is considered a shallow peat cutover bog.	Much of the former production area at Derryadd 2 has been out of peat production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities Derryadd 2 Bog will form part of the footprint of Derryadd Windfarm for which planning permissions were granted in 2020.	2020	Draft 2017
Derryarogue	895	Cutover Bog	Much of the former production area at Derryarogue has been out of production for	2020	Draft 2019

		Industrial peat production commenced at Derryarogue Bog in 1941 and ceased in 2020. Long-term peat extraction has reduced peat reserves on this bog. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derryarogue is considered a shallow peat cutover bog.	some time. These areas have already extensively colonised with pioneer wetland, cutaway and scrub vegetation communities. Derryarogue Bog will form part of the footprint of Derryard Windfarm for which planning permissions were granted in 2020. An amenity walkway through part of Derryarogue is proposed for the Derryard Windfarm project		
Derrycashel	388	Cutover Bog Industrial peat production commenced at Derrycashel Bog in 1951 and ceased in 2018. Long-term peat extraction has reduced peat reserves on this bog. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derrycashel is considered a shallow peat cutover bog.	Derrycashel Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power Much of the former production area at Derryarogue has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities. Some wetland and rehabilitation management was undertaken (c.60ha) between 2014-2015.	2018	Finalised 2021
Derrycolumb	454	Cutover Bog Industrial peat production commenced at Derrycolumb Bog in the 1980's and ceased in 2019. Most of the former production area still has deep peat reserves. Derrycolumb is considered a deep peat cutover bog.	Derrycolumb Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power Much of the former production area at Derrycolumb has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities.	2018	Finalised 2021
Derrymoylin	356	Cutover Bog Industrial peat production commenced at Derrymoylin Bog in 1985 and ceased in 2020. Long-term peat extraction has reduced peat reserves on this bog. Derrymoylin is considered a shallow peat cutover bog.	Derrymoylin Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power. Most of the former production area on site is bare peat.	2020	Draft 2021
Derryshannoge	452	Cutover Bog Industrial peat production commenced at Derryshannoge Bog in 1985 and ceased in 2020. Deep peat reserves remain across most of the site. Derryshannoge is considered a deep peat cutover bog.	Derryshannoge Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power. Much of the former production area at Derryshannoge has been out of production for some time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities.	2020	Draft 2017
Edera	281	Cutover Bog Development for industrial peat production commenced at Edera Bog in 1990's. Active extraction from Edera began in 2003 and ceased in 2018. Edera is considered a deep peat cutover bog.	Edera Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power. The majority of Edera Bog former production area is bare peat.	2020	Finalised 2021
Erenagh	93	Cutover Bog Development for industrial peat production commenced at Erenagh Bog in 1970's. Erenagh is considered a deep peat cutover bog.	Erenagh Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power. Much of the former production area at Erenagh has been out of production for some time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities.	2020	Draft 2017
Granaghan	212	Cutover Bog Development for industrial peat production commenced at Granaghan Bog in 1980's. Long-term peat extraction has reduced	Granaghan Bog formerly supplied a range of commercial functions including; horticultural peat and fuel peat for Lough Ree Power.	2020	Draft 2017

		peat reserves on this bog but deep peat reserves remain on site. Granaghan is considered a deep peat cutover bog.	The majority of Granaghan Bog former production area is bare peat.		
Killashee	110	Cutover Bog Development for industrial peat production commenced at Killashee Bog in 1985. Killashee is considered a deep peat cutover bog.	Killashee Bog formerly supplied a range of commercial functions including; horticultural peat and fuel peat for Lough Ree Power. The majority of Killashee Bog former production area is bare peat. Some areas have colonised with pioneer cutaway and scrub vegetation communities.	2020	Draft 2017
Knappoge	313	Cutaway Bog Peat Production at Knappoge bog commenced in 1963, and finished in 2018. Peat depths on the former production area are generally shallow. There are some pockets of deeper peat. Knappoge is considered a shallow peat cutaway bog.	Knappoge Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power. The majority of Knappoge Bog former production area is bare peat. Some areas have colonised with pioneer cutaway and scrub vegetation communities.	2018	Draft 2021
Lough Bannow	739	Cutaway Bog Peat Production at Lough Bannow bog commenced in the 1960'S, and finished in 2020. Peat depths on the former production area are generally shallow. There are some pockets of deeper peat. Lough Bannow is considered a shallow peat cutaway bog.	Much of the former production area at Lough Bannow has been out of production for some time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities. A small (35ha) conifer plantation was established in 1980's. Lough Bannow will form part of the footprint of Derryadd Windfarm for which planning permissions were granted in 2020.	2020	Draft 2017
Moher	483	Cutover Bog Peat Production at Moher bog commenced in the 1960'S, and finished in 2020. Peat depths on the former production area remain relatively deep. Moher is considered a deep peat cutover bog.	Moher Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power. Much of the former production area at Moher has been out of production for some time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities.	2020	Draft 2021
Mount Dillon	592	Cutaway Bog Peat Production at Mount Dillon bog commenced in the 1940'S, and finished in 2020. Peat depths on the former production largely shallow and the peat is considered cutaway. Some deep peat remains on the west of the site. Mount Dillon is considered a shallow peat cutaway bog.	Mount Dillon Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power. Much of the former production area at Mount Dillon has been out of production for some time. These areas have already extensively colonised with pioneer cutaway, wetland and scrub vegetation communities.	2020	Draft 2017

See Drawing number BNM-DR-23-08-24 titled **Mount Dillon Bog Group**, included in the accompanying Mapbook which illustrates the location of Knappoge Bog and the Mount Dillon Bog Group in context to the surrounding area

APPENDIX III: ECOLOGICAL SURVEY REPORT

Ecological Survey Report			
<i>Note: This report outlines an ecological survey of the bog. This report should not be taken as a management plan for the site as other land-uses may still be considered. Information within this report may inform the development of other land-uses and identify areas with particular biodiversity value.</i>			
Bog Name:	Knappoge	Area (ha):	314 ha
Works Name:	Mount Dillon	County:	Longford
Recorder(s):	BnM Ecology Section	Survey/ monitoring Date(s):	3 rd March 2011 Numerous site visits
<p>Habitats present (in order of dominance)</p> <p>The most common habitats present at this site include: (Codes refer BnM classification of pioneer habitats of production bog).</p> <ul style="list-style-type: none"> • Bare peat (BP) • pJeff • Scrub – eBir and oBir • Bp and exposed gravel • Open water • gMol • Access • Silt • Works <p>(Codes refer to Heritage Council habitat classification, Fossitt 2000),</p> <ul style="list-style-type: none"> • Raised bog (PB1) • Lowland depositing river (River Shannon) (FW2) • Royal Canal (FW3) • Drains (FW4) • Wet grassland (GS4) • Birch woodland (WN7) • Conifer plantation (WD4) 			
<p>Description of site</p> <p>Knappoge Bog is located approximately 1km from Cloondara in Co Longford. The River Shannon forms a boundary to the west of the site while the Royal Canal forms a boundary along the eastern edge of the site.</p> <p>This bog has been in industrial peat production from 1963 to 2018, since 2018 industrial peat production has ceased completely. Over many years of peat extraction, many underlying gravel ridges and hills have been exposed. The Haku</p>			

method of industrial peat production was employed on this bog, this method allowed for the deeper peat to be harvested between the emerging gravel hills, the peat was then stored in large piles on the site.

The entire site is undulating with vegetation becoming established on most sections of the site. Revegetation on this site appears to begin with Soft Rush along the drains, followed by Birch becoming established along with the Soft Rush. This vegetation spreads outwards from the drains towards the centre of the high fields.

This site is a pumped bog with two pumps present on the bog.

Raised bog section

The western edge of this site contains an area of intact raised bog. A small portion of the raised bog is not in BnM ownership. A small section on the eastern edge of the raised bog has been ditched but the majority of the site has never been extensively ditched. However some old drainage ditches are still visible, especially the site's main drain that runs in an east-west orientation across the site and serves as a boundary between the BnM owned property and the privately owned area to the north. The raised bog is dominated by Heather and Bog Myrtle along with Cross Leaved Heath, Bog rosemary, bog asphodel, Deer sedge with approximately 20% Sphagnum cover, mainly *Sphagnum magellanicum*, *S. capillifolium* and *S. cuspidatum*. The bog appeared to have been burned over in the past as no *Cladonia* was present. A band of Gorse marks the end of the raised bog where wet grassland forms a buffer between the River Shannon to the west and the raised bog.

The wet grassland was dominated by Purple Moor Grass on the higher ground that slopes towards the river while a band of Reed Canary-Grass dominated grassland occurred on the lower lying, flood prone ground. Reed beds dominated by Common Reed bordered the river's edge.

The section of wet grassland does not appear to have been grazed in recent years, as a consequence scrub is encroaching in this area. Low intensity grazing could be introduced into this area to control the spread of scrub into this area.

A section of wet-Willow Alder-Ash woodland is located to the south west of the raised bog. This woodland was prone to flooding from the Shannon and composed almost entirely of Willow and Alder. A Hen Harrier was observed perched in a large alder tree in this woodland.

Production bog

The majority of Knappoge Bog has been in production since approximately 1963, as a result large amounts of peat has been removed revealing ridges and small hills of exposed gravel. A network of railway lines exist on the site and these railway lines are now elevated above the level of the surrounding production bog. These railway lines connect Knappoge to neighbouring bogs such as Derryarogue and Beggagh.

The majority of the site is re-vegetating to some extent, mainly with Soft Rush and Birch spreading outwards from the drains. Due the undulating nature of the surface of the production bog, small hills and ridges have been exposed and many of these features are impeding the original drainage on the bog resulting in small areas of open water developing. These small areas of open water generally had plant species such as Soft Rush and Marsh Arrow Grass.

The Haku method of industrial peat production is employed on this site which involves using tractors with specially adapted trailers gathering peat and forming large peat piles. Two large piles of covered peat were located along the eastern and western edges of the production bog.

A section of production bog is separated from the main section of the bog by a public road (a cul-de-sac). This section of bog is the most northern point of the site and is younger in production terms being mostly bare peat, although some areas within this area had begun to revegetate.

Habitats on the boundaries of the site (not Bord na Móna) include Birch scrub, Birch woodland, wet grassland and remnant sections of bare peat. These are local value habitats.

Royal Canal

The Royal Canal flows along sections of the eastern boundary of the site with a specially constructed BnM railway bridge across the canal located on the site. This bridge allows boats to raise and lower the bridge in order to allow boats to travel along the canal. The canal at this location did not have any bank side vegetation and production bog runs right to the edge of the canal. Coarse fish were visible from the bridge and Otter spraint was located on the bank side footpath. It is also likely that Kingfisher may use this section of the canal.

<p>A walking trail (the Royal Canal Way) is located along the course of the canal. The Royal Canal Way extends from nearby Richmond Harbour to Dublin (145km).</p>
<p>Designated areas on site (cSAC, NHA, pNHA, SPA other)</p> <p>The Royal Canal pNHA (site code : 002103) is located along the eastern boundary of the site.</p> <p>The Ballykenny-Fishertown Bog SPA (SPA site code: 004101) is located 2 km to the north east of the site (Red Grouse have been recorded on this bog).</p>
<p>Adjacent habitats and land-use</p> <p>Adjacent habitats and land-uses include canal (FW3), lowland depositing river-River Shannon (FW2), wet grassland (GS4), improved grassland (GA1), conifer plantation (WD4), recently planted woodland (WS2), Birch woodland (WN7), raised bog (PB1) and cutaway bog (PB4).</p>
<p>Watercourses (major water features on/off site)</p> <ul style="list-style-type: none"> • The Royal Canal flows along parts of the eastern boundary of the site • The River Shannon forms a boundary with the western edge of the site • A tributary of the Shannon flows along a section of the south western boundary of the site. This drain is regularly cleaned out by BnM.
<p>Peat type and sub-soils</p> <p>The section of raised bog to the west of the site has never been harvested for peat industrially.</p> <p>The majority of the site has been harvested for peat since 1963 and much of the remaining peat is woody fen peat.</p>
<p>Fauna biodiversity</p> <p>Several bird species were noted on the site during the survey.</p> <ul style="list-style-type: none"> • Gold Finch (14) • Reed Bunting • Hen Harrier • Teal (30) • Mallard (15) • Water Rail • Heron • Long Tailed Tit • Whooper Swan (60 in February 2011) (34 December 2013) (64 February 2014) (123 -December 2017) (205 February 2018). • Greenland White-fronted Geese (4-6 individuals in the winter of 2017/18) • Other more common species include Meadow Pipit (11), Mute Swan, Blue Tit, Blackbird, Robin, Magpie, Rook, Grey Crow

- Teal, Mallard, Widgeon and Tufted Duck – combined flocks of greater than 200.

Mammals

- Otter (spraint alongside the canal, it is also highly likely that Otter are using the sections of the site that are located adjoining the river Shannon, although no signs of Otter were observed in these areas during the ecological survey).
- Fox
- Badger (numerous tracks around the site)
- Mink
- Sightings of Coypu by ecologists from Malachy Walsh consultants (2017)

Other

- Frog spawn in the drains.

Activities on the site

- Walking (Royal Canal Way along the eastern edge of the site)

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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 invasive species Canadian Pitcher Plant *Sarracenia purpurea* was recorded during a survey of Knappoge bog in October 2021 (see Table 1). Additionally, the invasive Coypu (*Myocastor coypus*) has previously been observed at Knappoge in 2017. Mammalian species such as Coypu are not expected to be subject to dispersal pathways from the PCAS, therefore there are no known IAS currently present whose range may be increased during PCAS activities. 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 other 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:

- 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 plague⁷ will be adhered with throughout all rehabilitation measures and activities.

⁷ <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 Mount Dillon bog group (Ref. PO-504-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. The bog is part of the Mount Dillon Bog group. This regulatory requirement is the main driver of the development of this rehabilitation plan.

2 The Peatlands Climate Action Scheme (PCAS)

Bord na Móna (BnM) 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. 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 by 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. The company aims to further develop renewable energy and resource recovery markets with a key objective of reducing the carbon intensity of all products. In addition, the carbon emission mitigation benefits associated with the post-peat extraction rehabilitated peatland following re-wetting, revegetation and colonisation of significant areas with native woodland will make a significant contribution to achieving the State’s carbon emission reduction targets.

4 National Peatlands Strategy

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

The strategy recognises that Ireland’s peatlands will continue to contribute to a wide variety of human needs and to be put to many uses. It aims to ensure that Ireland’s peatlands are sustainably managed so that their benefits can be enjoyed responsibly. It aims to inform appropriate regulatory systems to facilitate good decision making

in support of responsible use. It also aims to inform the provision of appropriate incentives, financial supports and disincentives where required. The strategy attempts to strike an appropriate balance between different needs, including local stakeholders like turf-cutters and semi-state bodies such as Bord na Móna.

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

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

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

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

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.

Knappoge Bog partially overlaps the Royal Canal pNHA (NPWS Site Code: 002103). In addition, the Lough Forbes Complex pNHA (Site code 001818) is ca.1km to the north east of Knappoge. The Lough Forbes Complex SAC (Site Code 001818) and the overlapping Ballykenny-Fisherstown Bog SPA (Site Code 04101) are also both ca. 1km to the north east. Brown Bog NHA and SAC (Site Code 002346) is ca.3.5km north east of Knappoge.

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

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. There are several Bord na Móna specific actions in this plan including the adoption of pollinator-friendly management within the Bord na Móna network of sites. One action to help achieve this objective is habitat rehabilitation and restoration, where possible, of pollinator-friendly habitats, including peatland habitats.

10 Land-use planning policies

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

No zoning information is available on the online resource myplan.ie in respect of the location of Knappoge Bog.⁸

11 National Archaeology Code of Practise

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

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

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

12 Bord na Móna Biodiversity Action Plan 2016-2021

Rehabilitation of industrial peatlands is a key objective of the Bord na Móna Biodiversity Action Plan 2016-2021. This action plan outlines the main objectives and actions around biodiversity on Bord na Móna lands. The Bord na Móna Biodiversity Action Plan also outlines key International and European policy in relation to biodiversity. This includes the **United Nations Convention on Biodiversity 2011-2020 (CBD)** and **European Biodiversity Strategy to 2020**. Further details of these policies and Bord na Mónas responses can be found in the Bord na Móna Biodiversity Action Plan (Bord na Móna 2016). Both policy documents highlight targets such as reducing pressure on biodiversity, promoting sustainability, habitat restoration and benefits of ecosystem services.

⁸ <https://myplan.ie/zoning-map-viewer/>

One example of a key CBD target is:

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

The EUs headline target for progress by 2020 is to:

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

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

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

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

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

In general, Bord na Móna will seek to balance and optimise commercial, social, and environmental value of these sites, while taking account of the need for sustainability and their biodiversity value.

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

APPENDIX VII. DECOMMISSIONING

1. Condition 10 Decommissioning

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

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

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

The main success criteria pertaining to successfully complying with this condition is ensuring that no environmental liability remains from this infrastructure and material and that the bog can be deemed suitable for surrender of the license 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	Knappoge 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	Not applicable
4	Decommissioning or Removal of Buildings and Compounds	Not applicable
6	Decommissioning Fuel Tanks and associated facilities	Decommissioning and De-Gassing Mobile Fuel Tanks
7	Decommissioning and Removal of Bog Pump Sites	Where required
8	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.

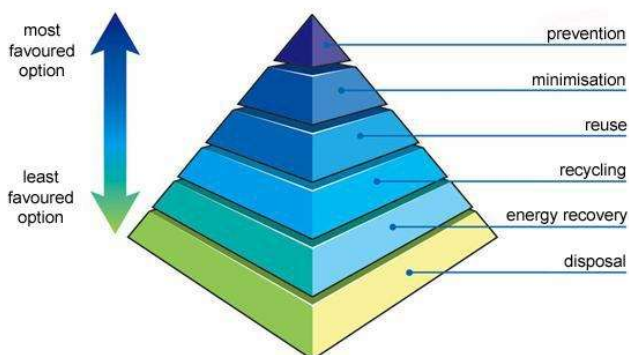
7.3.5 The tonnages and EWC Code for the waste materials listed in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* sent off-site for disposal/recovery.

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 be reused or recycled ahead of disposal.



The list of such items and the decommissioning methodologies are defined in the proposed **Methodology** paper.

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	Knappoge Decommissioning Plan
1	Removal of Railway Lines	Removal of Railway Lines
2	Decommissioning Bridges and Underpasses	Not Applicable
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	Not Applicable

APPENDIX IX. 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 cutover 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 cutover 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 Licence. 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 is defined as the process of re-establishing to the extent possible the structure, function and integrity of indigenous ecosystems and the sustaining habitats they provide” (SER 2004). Defined in this way, restoration encompasses the repair of ecosystems (Whisenant 1999) and the **improvement of ecological conditions in damaged wildlands** through the **reinstatement of ecological processes**. In general, Bord na Móna cutaway peatlands cannot be restored back to raised bog in a reasonable timeframe as their environmental conditions 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 is reduced or stopped. The water chemistry of wetland cutaway frequently is strongly influenced by the more alkaline sub-soils that have been exposed during peat production. This means that pioneer vegetation is more typical of fen and wetland, rather than raised bog. Wetland cutaway will have a broad range of hydrological conditions depending on the local topography. In some cases, these wetlands may form deep water (> 0.5 m) whilst other areas may have the water table at or just below the surface of the ground.

APPENDIX IX. EXTRACTIVE WASTE MANAGEMENT PLAN

(Minimisation, treatment, recovery and disposal)

Objective:

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

Scope:

This plan covers IPPC Licence's Ref P0504-01, Mountdillon Group of Bogs in County Longford.

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

1.2 Power Station screenings:

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

1.3 Bog Timbers:

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

2.0 P0504-01 IPPC Licence Extractive Waste Conditions

2.1 Condition 7.5 Extractive Waste Management

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

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

2.2 Condition 7.6 Waste Facility

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

2.3 Condition 7.7 Excavation Voids

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

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

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

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

3.0 Minimisation.

3.1 Silt pond excavation material and cleanings.

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

3.2 Power Station Screenings.

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

3.3 Bog Timbers.

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

4.0 Treatment

4.1 Silt pond excavation material and cleanings.

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

4.2 Power Station Screenings.

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

4.3 Bog Timbers

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

5.0 Recovery

5.1 Silt pond excavation material and cleanings.

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

5.2 Power Station Screenings.

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

5.3 Bog Timbers

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

6.0 Disposal

6.1 Silt pond excavation material and cleanings.

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

6.2 Power Station Screenings.

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

6.3 Bog Timbers

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

7.0 Extractive Waste Management Plan

5 (2a)(i)

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

5 (2a)(ii)

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

5 (2a)(iii)

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

5 (2a)(iv)

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

5 (2a)(v)

Peat mineral resources do not undergo any treatment.

5 (2b)

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

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

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

5 (3)

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

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

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

Classification in accordance Annex II.

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

Description of operations.

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

Closure plan. (Bog Rehabilitation Plan).

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

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

10.2 Cutaway Bog Rehabilitation Plan:

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

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

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

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

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

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

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

Review.

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

APPENDIX X. MITIGATION MEASURES FOR THE APPLICATION OF FERTILISER

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

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

APPENDIX XI. CONSULTATION SUMMARIES**Table APXI -1 Consultees contacted**

Bog Name	Contact Organisation	Contact Name	Date of Issue	Format	Date Response Received	Response Format
Knappoge	Department of Housing, Local Government and Heritage NPWS	Multiple Staff Members	02.02.2022	Email		
Knappoge	National Museum of Ireland	Multiple Staff Members	02.02.2022	Email		
Knappoge	Department of Housing, Local Government and Heritage	General Email Contact	02.02.2022	Email		
Knappoge	Dept of Agriculture Food & the Marine	General Email Contact	02.02.2022	Email		
Knappoge	Department of Environment, Climate and Communications	Multiple Staff Members	02.02.2022	Email		
Knappoge	Dept of Rural and Community Development	General Email Contact	02.02.2022	Email		
Knappoge	Department of the Housing Local Government and Heritage	General Email Contact	02.02.2022	Email		
Knappoge	Minister for Environment, Climate and Communications	Minister - Eamon Ryan	02.02.2022	Email		
Knappoge	Minister of state for Agriculture with responsibility for Land use and Biodiversity	Pippa Hackett Minister of State for Land Use and Biodiversity)	02.02.2022	Email		
Knappoge	Oireachtas	Danielle McDonnell (Minister Malcolm Noonan Secretary)	02.02.2022	Email	02.02.2022	Email

Knappoge	An Taisce	General Email Contact	02.02.2022	Email		
Knappoge	Environmental Protection Agency	Multiple Staff Members	02.02.2022	Email		
Knappoge	Inland Fisheries Ireland	General Email Contact	02.02.2022	Email		
Knappoge	Local Authority Waters Programme	Multiple Staff Members	02.02.2022	Email		
Knappoge	NWRA	General Email Contact	02.02.2022	Email		
Knappoge	Teagasc	General Email Contact	02.02.2022	Email		
Knappoge	The Heritage Council	General Email Contact	02.02.2022	Email		
Knappoge	Waterways Ireland	General Email Contact	02.02.2022	Email		
Knappoge	An Forum Uisce (The Water Forum)	General Email Contact	02.02.2022	Email		
Knappoge	Coillte	Multiple Staff Members	02.02.2022	Email		
Knappoge	Irish Water	General Email Contact	02.02.2022	Email		
Knappoge	Irish Water- Water Supply Project Eastern and Midlands Region	General Email Contact	02.02.2022	Email		
Knappoge	Office of Public Works (OPW)	Multiple Staff Members	02.02.2022	Email	16/02/2022	Email
Knappoge	CARO (Climate Action Regional Office) Eastern and Midlands	General Email Contact	02.02.2022	Email		
Knappoge	Bat Conservation Ireland	General Email Contact	02.02.2022	Email		
Knappoge	Birdwatch Ireland	General Email Contact	02.02.2022	Email		
Knappoge	Butterfly Conservation Ireland	General Email Contact	02.02.2022	Email		
Knappoge	Eastern and Midland Regional Assembly	General Email Contact	02.02.2022	Email		

Knappoge	Fisheries Ireland	General Email Contact	02.02.2022	Email		
Knappoge	Friends of the Earth	General Email Contact	02.02.2022	Email		
Knappoge	Friends of the Irish Environment	General Email Contact	02.02.2022	Email		
Knappoge	ICMSA (Irish Creamery Milk Suppliers Association)	General Email Contact	02.02.2022	Email		
Knappoge	ICSA (Irish Cattle and Sheep Farmers Association)	General Email Contact	02.02.2022	Email		
Knappoge	Irish Farmers Association	General Email Contact	02.02.2022	Email	02/02/2022	Email
Knappoge	Irish Peatlands Conservation Council	General Email Contact	02.02.2022	Email		
Knappoge	Irish Raptor Study Group	General Email Contact	02.02.2022	Email		
Knappoge	Irish Rural Link (Community Wetlands Forum)	General Email Contact	02.02.2022	Email		
Knappoge	Irish Rural Link	General Email Contact	02.02.2022	Email		
Knappoge	Irish Wildlife Trust	General Email Contact	02.02.2022	Email	10.02.2022	Email
Knappoge	Inland Waterways Association of Ireland (IWAI)	General Email Contact	02.02.2022	Email		
Knappoge	National Association of Regional Game Councils	General Email Contact	02.02.2022	Email		
Knappoge	NPWS Rangers North Midlands	General Email Contact	02.02.2022	Email		
Knappoge	NUIG Galway	General Email Contact	02.02.2022	Email		
Knappoge	PPN Longford Public Participation Network	General Email Contact	02.02.2022	Email		

Knappoge	Ranger Association Committee	General Email Contact	02.02.2022	Email		
Knappoge	Shannon Flood Risk State Agency Co-ordination Working Group	General Email Contact	02.02.2022	Email		
Knappoge	Sustainable Water Action Network (SWAN)	General Email Contact	02.02.2022	Email		
Knappoge	Trinity College Dublin	General Email Contact	02.02.2022	Email		
Knappoge	Turf Cutters and Contractors Association	General Email Contact	02.02.2022	Email		
Knappoge	UCD / Irish Rural Link	General Email Contact	02.02.2022	Email		
Knappoge	University College Dublin	General Email Contact	02.02.2022	Email		
Knappoge	Waterways Ireland	General Email Contact	02.02.2022	Email		
Knappoge	Woodlands of Ireland	General Email Contact	02.02.2022	Email		
Knappoge	Longford County Council	General Email Contact	02.02.2022	Email		
Knappoge	Chief Executive Longford County Council	General Email Contact	02.02.2022	Email		
Knappoge	Director of Services - Head of Finance and Regeneration	General Email Contact	02.02.2022	Email		
Knappoge	Director of Services - Strategic Infrastructure and Climate Change.	General email address	02.02.2022	Email		
Knappoge	Longford County Council - Director of Services (Strategic Infrastructure and Climate Change)	General Email Contact	02.02.2022	Email		

Knappoge	Longford County Council - Heritage Officer	General Email Contact	02.02.2022	Email		
Knappoge	Longford County Councillors - Ballymahon District	Colm Murray	02.02.2022	Email		
Knappoge	Longford County Councillors - Ballymahon District	Mick Cahill	02.02.2022	Email		
Knappoge	Longford County Councillors - Ballymahon District	Paul Ross	02.02.2022	Email		
Knappoge	Longford County Councillors - Ballymahon District	Mark Casey	02.02.2022	Email		
Knappoge	Longford County Councillors - Ballymahon District	Gerard Farrell	02.02.2022	Email		
Knappoge	Longford County Councillors - Ballymahon District	Pat O'Toole	02.02.2022	Email		
Knappoge	Longford County Councillors - Longford	Peggy Nolan	02.02.2022	Email		
Knappoge	Longford County Councillors - Longford	Uruemu Adejinmi	02.02.2022	Email		
Knappoge	Longford County Councillors - Longford	John Browne	02.02.2022	Email		
Knappoge	Longford County Councillors - Longford	Seamus Butler	02.02.2022	Email		
Knappoge	Longford County Councillors - Longford	Gerry Hagan	02.02.2022	Email		

Knappoge	Longford County Councillors - Longford	Martin Monaghan	02.02.2022	Email		
Knappoge	Longford County Councillors - Longford	Gerry Warnock	02.02.2022	Email		
Knappoge	TD/Longford	Peter Burke	02.02.2022	Email		
Knappoge	TD/Longford	Sorca Clarke	02.02.2022	Email		
Knappoge	TD/Longford	Joe Flaherty	02.02.2022	Email		
Knappoge	TD/Longford	Robert Troy	02.02.2022	Email		
Knappoge	Eastern and Midland Regional Assembly	General Email Contact	02.02.2022	Email		
Knappoge	All Land- owners in vicinity of bog	Leaflet Drop	29.03.2022	Leaflet		
Knappoge	All those with turbary rights	Leaflet Drop	29.03.2022	Leaflet		

Table APXI -2 Response summary from Consultees contacted

Organisation	Summary of Response by Stakeholder	BnM Response
Office of Public Works	<p>Submission received from OPW on 16/02/2022.</p> <p>The Knappoge Bog does not overlap with any OPW Arterial Drainage Scheme. In general, the OPW supports the BnM bog rehabilitation and rewetting as a Nature Based Catchment Management measure in managing flood flows in the River Shannon Catchment, in particular at any AFA downstream, identified in the Shannon CFRAM Study, and the many other environmental co-benefits from developing this project.</p>	BnM responded acknowledging the submission by OPW on the 18/02/2022 and responded to the queries raised within the same.
Irish Farmers Association	<p>The IFA made a submission on Knappoge Bog 02/02/2022 raising the following points:</p> <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> (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. <p>The IFA made a number of proposals to be considered as potential solutions to queries raised.</p>	BnM responded on 09/02/2022 to address the concerns of raised by the IFA. Dialogue is ongoing between BnM and the IFA.
Private Individual/Local resident A	Response received on the 10.02.2022 suggesting that the bog could be used to develop a community base wind or solar farm or energy storage unit.	BnM responded on the 24.02.2022 stating that such a proposal is outside the scope of the Peatlands Climate Action Scheme. However, this was sent to the Bord an Móna Renewable Energy section for their review.
Irish Wildlife Trust	Acknowledged receipt of Knappoge rehab plan and replied stating that they not have the staff capacity to respond to this consultation at the moment but will keep it on file.	Consultation 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

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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:

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			
2			



**Archaeological Impact Assessment of Proposed Bog
Decommissioning and Rehabilitation at Knappoge Bog, Co.
Longford**

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.314 hectares at Knappoge Bog, Co. Longford 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 Knappoge Bog will include:

- Re-assessment of the pumping regime and removing pumps if this desired and has no significant external impact. A significant part of the site has already developed a mosaic of wetland habitats with permanent deeper water. Hydrological modelling will look to optimise water levels. Hydrological management will look to optimise summer water levels to maximise the development of wetland vegetation (by looking to set water depths at < 0.5 m, where possible. It is inevitable that some sections will naturally have deeper water due to the topography at this site). Water-levels will be adjusted at outfalls and by adjusting piped drainage. More sustainable permanent gravity drainage solutions will be examined. Some targeted bunding may be required. It is expected that a natural seasonal flooding regime will develop, with water-levels fluctuating in association with levels in the adjacent River Shannon.
- Intensive drain blocking around existing wetlands or standing water to create/promote the spread of wetland habitats.
- Optimising water retention in wetland areas, including placement of berms where required.
- Modifying water levels at outfalls, as it may be desirable to change and control water levels at the site over time, e.g. to increase water levels as the site becomes increasingly vegetated. This will further slow the movement of water through and out of the site.
- Regular drain blocking (3/100) on dry cutaway adjacent to wetland mosaics, along with the blocking of outfalls and management of water levels.
- Re-wetting the small amount of residual peat areas of the bog using berms and field re-profiling. This enhanced measure seeks to create large (c. 45m x 60m) flat areas or cells of shallow (< 10 cm) water conditions on bare peat, across multiple fields that are enclosed by shallow berms to retain shallow surface water;
- Inoculation of Sphagnum on compatible residual deep peat areas;
- Intensive blocking of drains in targeted marginal (degraded) high bog area located at western side of the site and re-wetting, where possible, using an excavator to install peat blockages. Some other bog remnants are too small to benefit from this approach.
- Targeted fertiliser applications to accelerate vegetation establishment on areas of bare peat on headlands and high fields as required, see Drawing no. DR-23-21-28 "Fertiliser Application Map".
- It is not expected that inoculation of Reeds and rhizomes will be required at this site as there has already been significant natural colonisation.
- The existing silt ponds will be retained and maintained during the rehabilitation phase. During the monitoring and verification phase the silt ponds will be continually inspected and maintained, where appropriate. When it is deemed that the silt ponds are not required, as the bog has been successfully stabilised and there is no run-off of suspended solids, the condition of the silt ponds will be reviewed. The



silt ponds will either be de-watered (water levels lowered to a level where the silt pond will naturally develop as a small wetland feature), left in situ, or infilled (where discharges do not require silt control).

Knappoge Bog is located c.0.5km south-west of the village of Cloondara, Co. Longford, and just west of the Royal Canal. The overall rehabilitation area occupies the townlands of Ballycorn, Ballynakill, Begnagh, Clogher and Rinn, Cloonard, Cloondara, Cloonkeel, Knappoge and Middleton on OS 6 inch sheets Longford Nos. 12 and 13.

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

- The IAWU Peatland Survey 1991
- Bord na Mona Re-assessment survey 1999
- 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

Early Investigations

A gravel road in Knappoge townland (RMP LF012-003----) orientated NNE-SSW, was exposed during peat-milling, c. 1980, 1m below the field surface. A section of the road was excavated by Barry Raftery in 1988 (Raftery 1996, 194-5).

Peatland survey

In 1991 the Irish Archaeological Wetland Unit (IAWU) did a complete survey of the rehabilitation area as part of the Archaeological Survey of Ireland Peatland Survey (Unlicensed). 51 sightings of archaeological material were made (see Table 1). These archaeological sightings were notified to the Archaeological Survey of Ireland and 46 sightings were included in the Sites and Monuments Record.

IAWU Cat. No.	IAWU Class	Townland	Irish Grid E	Irish Grid N	SMR No.	Depth BS m
LF-KPE 1	GRAR	Knappoge	204340	273730	LF012-003----	
LF-CDA 1	TOGH	Cloondara	205062	275294	LF013-065001-	
LF-CDA 2	WWIS	Cloondara	205068	275281	LF013-065017-	
LF-CDA 3	WWIS	Cloondara	205075	275268	LF013-065018-	
LF-CD 1	TOGH	Cloonard & Cloondara	205031	275278	LF013-065002-	
LF-CD 2	TOGH	Cloonard	205004	275244	LF013-065012-	
LF-CD 3	TOGH	Cloonard	204996	275227	LF013-065015-	
LF-CD 4	WWIS	Cloonard	205007	275237	LF013-065003-	
LF-CD 5	WWIS	Cloonard	205018	275251	LF013-065004-	



LF-CD 6	TOGH	Cloonard	205006	275239	LF013-065005-	
LF-CD 7	WWIS	Cloonard	205002	275235	LF013-065006-	
LF-CD 8	TOGH	Cloonard	205006	275219	LF013-065007-	
LF-CD 9	TOGH	Cloonard	205014	275229	LF013-065008-	
LF-CD 10	FIND	Cloonard	205004	275201	-	
LF-CD 11	WWIS	Cloonard	205017	275210	LF013-065014-	
LF-CD 12	WWIS	Cloonard	205086	275127	LF013-065009-	
LF-CD 13	WWIS	Cloonard	205092	275100	LF013-065010-	
LF-CD 14	WWIS	Cloonard	205107	275099	LF013-065015-	
LF-CD 15	WWIS	Cloonard	205102	275088	LF013-065011-	
LF-CD 16	WWIS	Cloonard	0	0	LF013-065016-	
LF-CR 1	TOGH	Clogher & Rinn	205808	274886	LF013-066001-	
LF-CR 2	TOGH	Clogher & Rinn	205834	274900	LF013-066002-	
LF-CR 3	TOGH	Clogher & Rinn	205908	274905	LF013-066003-	
LF-CR 4	TOGH	Clogher & Rinn	205931	274898	LF013-066004-	
LF-CR 5	TOGH	Clogher & Rinn	205926	274877	LF013-066005-	
LF-CR 6	MISC	Clogher & Rinn	0	0	-	
LF-CR 7	MISC	Clogher & Rinn	0	0	-	
LF-CR 8	MISC	Clogher & Rinn	0	0	-	
LF-CR 9	MISC	Clogher & Rinn	0	0	-	
LF-MN 1	WWIS	Middleton	205226	273464	LF013-067022-	
LF-MN 2	TOGH	Middleton	205336	273461	LF013-067001-	
LF-MN 3	TOGH	Middleton	205394	273609	LF013-067002-	
LF-MN 4	TOGH	Middleton	205381	273601	LF013-067003-	
LF-MN 5	TOGH	Middleton	205327	273576	LF013-067004-	
LF-MN 6	TOGH	Middleton	205372	273606	LF013-067005-	
LF-MN 7	TOGH	Middleton	205331	273588	LF013-067006-	
LF-MN 8	TOGH	Middleton	205279	273550	LF013-067007-	
LF-MN 9	TOGH	Middleton	205299	273574	LF013-067008-	
LF-MN 10	TOGH	Middleton	205242	273538	LF013-067009-	
LF-MN 11	TOGH	Middleton	205170	273538	LF013-067010-	
LF-MN 12	TOGH	Middleton	205219	273478	LF013-067011-	
LF-MN 13	TOGH	Middleton	205299	273484	LF013-067012-	
LF-MN 14	TOGH	Middleton	205247	273482	LF013-067013-	
LF-MN 15	TOGH	Middleton	205249	273498	LF013-067014-	
LF-MN 16	TOGH	Middleton	205260	273503	LF013-067015-	
LF-MN 17	WWIS	Middleton	205279	273508	LF013-067016-	
LF-MN 18	TOGH	Middleton	205293	273507	LF013-067017-	
LF-MN 19	WWIS	Middleton	205340	273497	LF013-067018-	
LF-MN 20	WWIS	Middleton	205356	273521	LF013-067019-	
LF-MN 21	WWIS	Middleton	205353	273521	LF013-067020-	
LF-MN 22	WWIS	Middleton	205343	273519	LF013-067021-	

Table 1. List of sites recorded by the IAWU in the rehabilitation area in 1991.

Recorded Monuments

The Record of Monuments and Places (RMP) for Co. Longford which was established under Section 12 of the National Monuments (Amendment) Act, 1994 was examined as part of the assessment (DAHGI 1996). This record was published by the Minister in 1995 and includes sites and monuments that were known in Knappoge Bog before that date. This review established that there are 38 RMPs located in the proposed rehabilitation area (see Table 2 and Fig. 1). All the sightings were notified by the IAWU following the 1991 survey.

RMP No.	RMP Classification	Townland	ITM E	ITM N	Irish Grid E	Irish Grid N	IAWU Cat._No.
LF012-003----	Togher	Knappoge	604257	773748	204307	273730	LF-KPE 1
LF013-065001-	Togher	Cloondara	605038	775329	205088	275311	LF-CDA 1
LF013-065002-	Worked Wood	Cloonard (Rathcline By.)	604957	775255	205007	275237	LF-CD 1
LF013-065003-	Togher	Cloonard (Rathcline By.), Cloondara	605008	775313	205058	275295	LF-CD 4
LF013-065004-	Worked Wood	Cloonard (Rathcline By.)	604994	775286	205044	275268	LF-CD 5



LF013-065005-	Togher	Cloonard (Rathcline By.)	604982	775274	205032	275256	LF-CD 6
LF013-065006-	Worked Wood	Cloonard (Rathcline By.)	604978	775270	205028	275252	LF-CD 7
LF013-065007-	Togher	Cloonard (Rathcline By.)	604982	775254	205032	275236	LF-CD 8
LF013-065008-	Togher	Cloonard (Rathcline By.)	604990	775264	205040	275246	LF-CD 9
LF013-065009-	Worked Wood	Cloonard (Rathcline By.)	605057	775165	205107	275147	LF-CD 12
LF013-065010-	Worked Wood	Cloonard (Rathcline By.)	605063	775138	205113	275120	LF-CD 13
LF013-065011-	Worked Wood	Cloonard (Rathcline By.)	605073	775126	205123	275108	LF-CD 15
LF013-066001-	Togher	Clogher And Rinn	605758	774904	205808	274886	LF-CR 1
LF013-066002-	Togher	Clogher And Rinn	605784	774918	205834	274900	LF-CR 2
LF013-066003-	Togher	Clogher And Rinn	605858	774924	205908	274906	LF-CR 3
LF013-066004-	Togher	Clogher And Rinn	605881	774916	205931	274898	LF-CR 4
LF013-066005-	Togher	Clogher And Rinn	605876	774895	205926	274877	LF-CR 5
LF013-067001-	Togher	Middleton	605286	773479	205336	273461	LF-MN 2
LF013-067002-	Togher	Middleton	605344	773627	205394	273609	LF-MN 3
LF013-067003-	Togher	Middleton	605331	773619	205381	273601	LF-MN 4
LF013-067004-	Togher	Middleton	605277	773594	205327	273576	LF-MN 5
LF013-067005-	Togher	Middleton	605322	773624	205372	273606	LF-MN 6
LF013-067006-	Togher	Middleton	605281	773606	205331	273588	LF-MN 7
LF013-067007-	Togher	Middleton	605229	773568	205279	273550	LF-MN 8
LF013-067008-	Togher	Middleton	605249	773592	205299	273574	LF-MN 9
LF013-067009-	Togher	Middleton	605192	773556	205242	273538	LF-MN 10
LF013-067010-	Togher	Middleton	605120	773556	205170	273538	LF-MN 11
LF013-067011-	Togher	Middleton	605169	773496	205219	273478	LF-MN 12
LF013-067012-	Togher	Middleton	605249	773502	205299	273484	LF-MN 13
LF013-067013-	Togher	Middleton	605198	773501	205248	273483	LF-MN 14
LF013-067014-	Togher	Middleton	605199	773516	205249	273498	LF-MN 15
LF013-067015-	Togher	Middleton	605210	773521	205260	273503	LF-MN 16
LF013-067016-	Worked Wood	Middleton	605229	773526	205279	273508	LF-MN 17
LF013-067017-	Togher	Middleton	605243	773525	205293	273507	LF-MN 18
LF013-067018-	Worked Wood	Middleton	605290	773515	205340	273497	LF-MN 19
LF013-067019-	Worked Wood	Middleton	605306	773539	205356	273521	LF-MN 20
LF013-067020-	Worked Wood	Middleton	605303	773539	205353	273521	LF-MN 21
LF013-067021-	Worked Wood	Middleton	605293	773537	205343	273519	LF-MN 22

Table 2. List of sites included in the Record of Monuments and Places in the rehabilitation area.

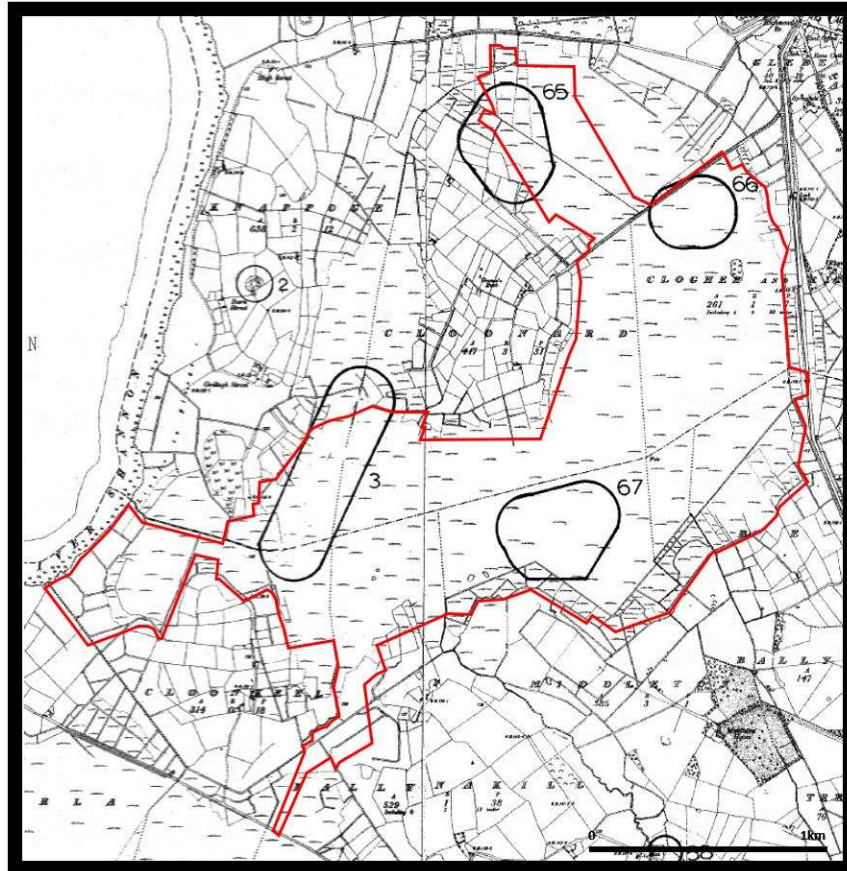


Fig. 1. Knappoge Bog, Co. Longford, detail of the Record of Monuments and Places map sheets Nos. 12 and 13. The proposed rehabilitation area is outlined with the red line. There are a several Recorded Monuments in the rehabilitation area.

1999 Bord na Móna Re-assessment Survey

Knappoge Bog was surveyed (unlicensed) by ADS Ltd in 1999 as part of the Bord na Móna re-assessment survey. The survey work noted that only 9 of the sightings made by the IAWU in 1991 remained on the field surface. Three of the sites noted in the 1999 survey were selected for excavation as part of the 2001 BnM Mitigation Project. However, a field inspection carried out by ADS Ltd in early 2001 showed that these sites were no longer extant (Whitaker 2018, 60-61).

Archaeological Excavations

Following the 1999 re-assessment survey of Knappoge Bog three sightings were chosen for excavation by the National Monuments Service and the National Museum as part of the 2001 BnM Mitigation Project. However, a field inspection carried out by ADS Ltd in early 2001 showed that these sites were no longer extant (Whitaker 2018, 61). Reports of archaeological excavations and licensed monitoring in the study area listed in the excavations database at excavations.ie were examined as part of the assessment. There are no additional reports of archaeological investigation carried out in the rehabilitation area.

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 12th of January 2022. 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 46 entries in the SMR in the proposed rehabilitation area (see Table 4). These sightings were all reported by the IAU following the 1991 Peatland are included.

SMR_NO	SMR Class	Townland	ITM E	ITM N	Survey Ref
LF012-003----	Road - gravel/stone trackway - peatland	Knappoge (Longford By.)	604257	773748	LF-KPE 1
LF013-065001-	Road - class 3 togther	Cloondara	605038	775329	LF-CDA 1
LF013-065002-	Redundant record	Cloonard (Rathcline By.)	604957	775255	LF-CD 1
LF013-065003-	Road - class 2 togther	Cloonard (Rathcline By.), Cloondara	605008	775313	LF-CD 4
LF013-065004-	Redundant record	Cloonard (Rathcline By.)	604994	775286	LF-CD 5
LF013-065005-	Road - class 3 togther	Cloonard (Rathcline By.)	604982	775274	LF-CD 6
LF013-065006-	Redundant record	Cloonard (Rathcline By.)	604978	775270	LF-CD 7
LF013-065007-	Road - class 3 togther	Cloonard (Rathcline By.)	604982	775254	LF-CD 8
LF013-065008-	Road - class 3 togther	Cloonard (Rathcline By.)	604990	775264	LF-CD 9
LF013-065009-	Redundant record	Cloonard (Rathcline By.)	605057	775165	LF-CD 12
LF013-065010-	Structure - peatland	Cloonard (Rathcline By.)	605063	775138	LF-CD 13
LF013-065011-	Structure - peatland	Cloonard (Rathcline By.)	605073	775126	LF-CD 15
LF013-065012-	Road - class 1 togther	Cloonard (Rathcline By.)	604980	775279	LF-CD 2
LF013-065013-	Road - class 2 togther	Cloonard (Rathcline By.)	604973	775263	LF-CD 3
LF013-065014-	Redundant record	Cloonard (Rathcline By.)	604993	775245	LF-CD 11
LF013-065015-	Redundant record	Cloonard (Rathcline By.)	605078	775137	LF-CD 14
LF013-065016-	Redundant record	Cloonard (Rathcline By.)	-	-	LF-CD 16
LF013-065017-	Redundant record	Cloondara	605044	775316	LF-CDA 2
LF013-065018-	Redundant record	Cloondara	605051	775303	LF-CDA 3
LF013-066001-	Road - class 3 togther	Clogher And Rinn	605758	774904	LF-CR 1
LF013-066002-	Road - class 3 togther	Clogher And Rinn	605784	774918	LF-CR 2
LF013-066003-	Road - class 2 togther	Clogher And Rinn	605858	774924	LF-CR 3
LF013-066004-	Road - class 3 togther	Clogher And Rinn	605881	774916	LF-CR 4
LF013-066005-	Road - class 3 togther	Clogher And Rinn	605876	774895	LF-CR 5
LF013-067001-	Road - class 3 togther	Middleton	605286	773479	LF-MN 2
LF013-067002-	Redundant record	Middleton	605344	773627	LF-MN 3
LF013-067003-	Road - class 3 togther	Middleton	605331	773619	LF-MN 4
LF013-067004-	Road - class 3 togther	Middleton	605277	773594	LF-MN 5
LF013-067005-	Road - class 3 togther	Middleton	605322	773624	LF-MN 6
LF013-067006-	Road - class 3 togther	Middleton	605281	773606	LF-MN 7
LF013-067007-	Redundant record	Middleton	605229	773568	LF-MN 8
LF013-067008-	Road - class 3 togther	Middleton	605249	773592	LF-MN 9
LF013-067009-	Road - class 3 togther	Middleton	605192	773556	LF-MN 10
LF013-067010-	Road - class 3 togther	Middleton	605120	773556	LF-MN 11
LF013-067011-	Road - class 3 togther	Middleton	605169	773496	LF-MN 12
LF013-067012-	Road - class 3 togther	Middleton	605249	773502	LF-MN 13
LF013-067013-	Road - class 2 togther	Middleton	605198	773501	LF-MN 14
LF013-067014-	Road - class 3 togther	Middleton	605199	773516	LF-MN 15
LF013-067015-	Road - class 3 togther	Middleton	605210	773521	LF-MN 16
LF013-067016-	Redundant record	Middleton	605229	773526	LF-MN 17
LF013-067017-	Road - class 3 togther	Middleton	605243	773525	LF-MN 18
LF013-067018-	Redundant record	Middleton	605290	773515	LF-MN 19
LF013-067019-	Redundant record	Middleton	605306	773539	LF-MN 20
LF013-067020-	Redundant record	Middleton	605303	773539	LF-MN 21
LF013-067021-	Redundant record	Middleton	605293	773537	LF-MN 22
LF013-067022-	Redundant record	Middleton	605176	773482	LF-MN 1

Table 3. Sightings in Knappoge Bog listed in the SMR in 2021. Coordinates are ITM.

Previous assessments

Knappoge Bog has been the subject of an Environmental Impact Assessment Report carried out by Irish Archaeological Consultancy LTD in 2018 for Bord na Móna Energy Limited in relation to IPC Licence P0500-01 (Whitaker 2018). This assessment included a review of the topographical files and finds registers of the



National Museum of Ireland intended to identify all finds from the bog reported to the Museum by that date and these finds are included below (Pers Comm. Jane Whitaker). The assessment noted that there was a high potential for archaeological features to be uncovered during the course of any future development works in Knappoge Bog.

Reported finds

As noted above the Environmental Impact Assessment Report carried out by Irish Archaeological Consultancy LTD in 2018 for Bord na Móna Energy Limited in relation to IPC Licence P0500-01 contains a complete list of known finds from Knappoge Bog reported to the National Museum of Ireland up to 2018. There are no reported finds known from the bog.

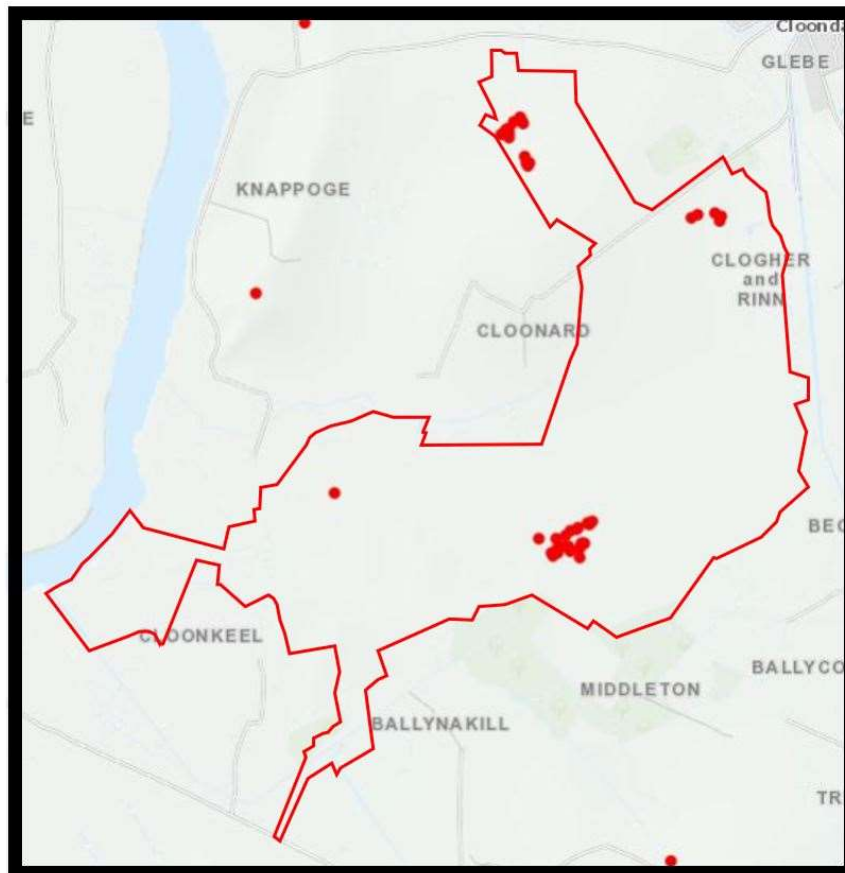


Fig. 2. Knappoge Bog, Co. Longford, detail of the Sites and Monuments Record. The proposed rehabilitation area is outlined with the red line. There are a large number of SMRs in the rehabilitation area.

Impact assessment

Fifty-one sightings of archaeological material were identified and recorded in Knappoge Bog in 1991 by the IAWU. The Bord na Móna Re-assessment Survey 1999 identified no new sightings and found that all but nine of the sightings made by the IAWU had been removed by 1999. The remaining sightings were found to have been removed by 2001 when an attempt was made to excavate them. Therefore none of the sightings made in the 1991 IAWU survey survive in the bog.



Recommendations

There is no known surviving archaeological material in Knappoge Bog. The bog has not been surveyed for more than twenty years and there is a high potential for additional material to have been exposed on the bog surfaces and in the drain faces. 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 Knappoge Bog. The bog has not been surveyed for more than twenty years and there is a high potential for additional material to have been exposed on the bog surfaces and in the drain faces. 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.

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DAHGI 1996. Recorded Monuments Protected under Section 12 of the National Monuments (Amendment) Act, 1994. County Longford.

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Dr. Charles Mount
14 January 2022

APPENDIX XIII. WATER QUALITY MONITORING RESULTS FOR KNAPPOGE BOG

Table AP13.1. Water quality data for 12 months from November 2020 to August 2021 at Knappoge bog.

PCAS SW Sampling Scheme					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
					1/11/20	1/2/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21
Mountdillon	P0504-01	Knappoge	290	SW49	2	2	2	2	2	2	6
Mountdillon	P0504-01	Knappoge	291	SW50	2	NF	NF	NF	NF	2	2
				ELV	35	35	35	35	35	35	35
PCAS SW Sampling Scheme					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
					1/11/20	1/2/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21
Mountdillon	P0504-01	Knappoge	290	SW49	125	83.3	81.6	95.5	101	104	163
Mountdillon	P0504-01	Knappoge	291	SW50	137	NF	NF	NF	NF	125	83.6
PCAS SW Sampling Scheme					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
					1/11/20	1/2/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21
Mountdillon	P0504-01	Knappoge	290	SW49	38	30	28	59	35	42	70
Mountdillon	P0504-01	Knappoge	291	SW50	37	NF	NF	NF	NF	37	36
PCAS SW Sampling Scheme					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
					1/11/20	1/2/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21
Mountdillon	P0504-01	Knappoge	290	SW49	7.4	7.4	7.8	7.8	7.8	7.7	7.5
Mountdillon	P0504-01	Knappoge	291	SW50	7.3	NF	NF	NF	NF	7.6	7.7
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
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
					1/11/20	1/2/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21
Mountdillon	P0504-01	Knappoge	290	SW49	0.05	0.05	0.05	0.14	0.05	0.05	0.07
Mountdillon	P0504-01	Knappoge	291	SW50	0.05	NF	NF	NF	NF	0.05	0.05
PCAS SW Sampling Scheme					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
					1/11/20	1/2/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21
Mountdillon	P0504-01	Knappoge	290	SW49	149	351	159	256	174	177	253
Mountdillon	P0504-01	Knappoge	291	SW50	304	NF	NF	NF	NF	198	242
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
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
					1/11/20	1/2/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21
Mountdillon	P0504-01	Knappoge	290	SW49	0.051	0.796	0.035	0.098	0.018	0.039	0.089
Mountdillon	P0504-01	Knappoge	291	SW50	0.8	NF	NF	NF	NF	0.019	0.096
PCAS SW Sampling Scheme					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
					1/11/20	1/2/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21
Mountdillon	P0504-01	Knappoge	290	SW49	15.8	12.7	11.6	16.8	14.7	15.1	50.8
Mountdillon	P0504-01	Knappoge	291	SW50	16.7	NF	NF	NF	NF	17.4	40.9

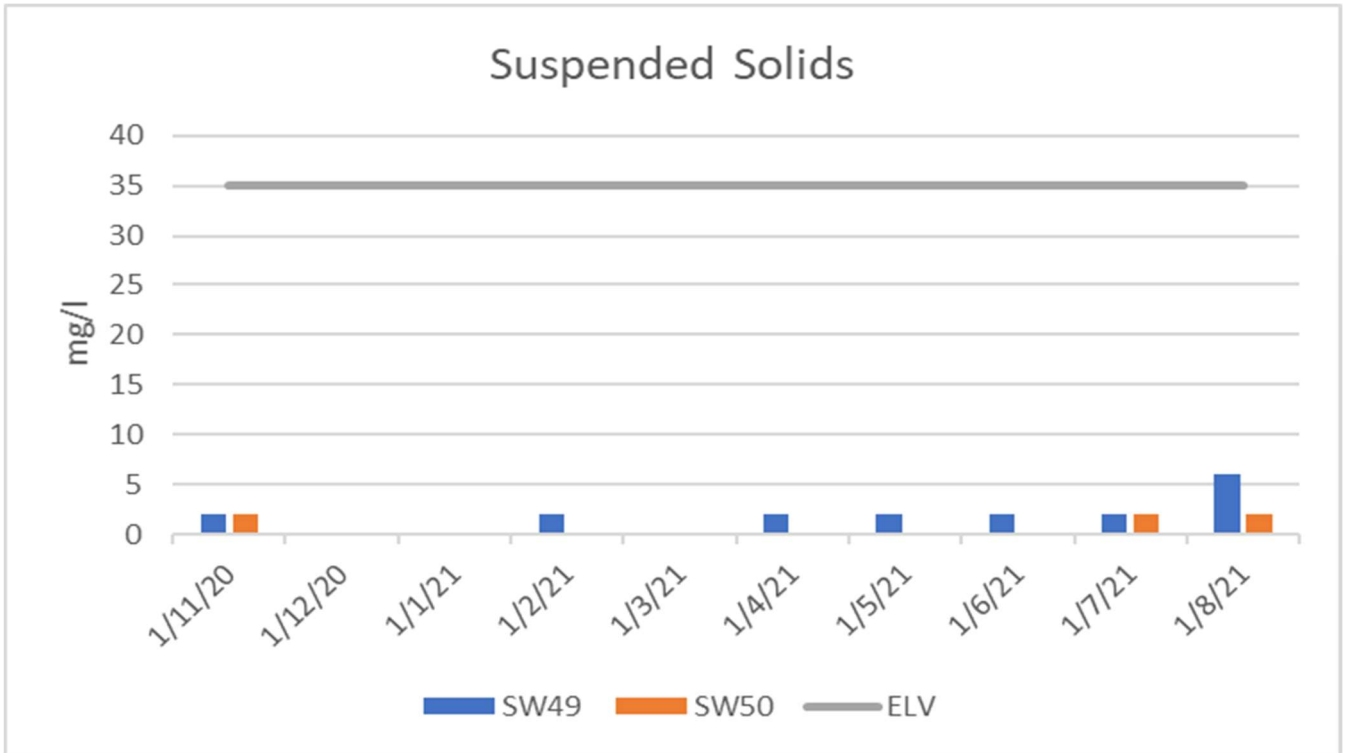


Figure AP13.1. Suspended solids in water sampling at Knappoge from different discharge points. 35 mg/l is the emission limit value.

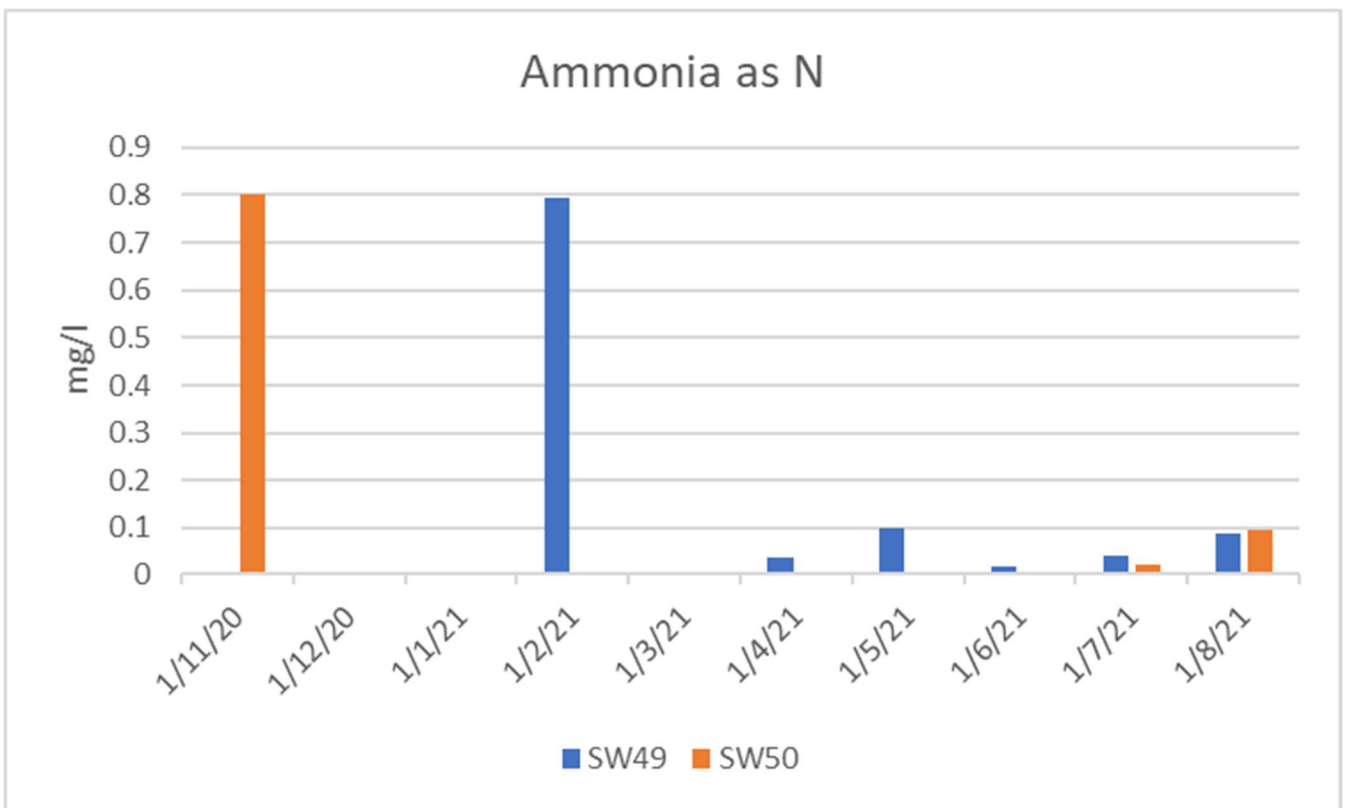


Figure AP13.2. Ammonia concentrations in water sampling from Knappoge from different discharge points. The main trigger level for ammonia is 4.53mg/l for reporting to EPA.