Turraun Bog

Cutaway Bog Decommissioning and Rehabilitation Plan 2021

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0500-01:

> "*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 Turraun 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 permanently ceased at Turraun Bog. Bord na Móna have now announced the complete cessation of industrial peat production.

In addition, to preparing this document to comply with Condition 10 of IPC Licence Ref. P0500-01, due regard was also given to the proposed Peatlands Climate Action Scheme (PCAS) announced by the Minster. This Scheme will see the Minister support, via the Climate Action Fund, Bord na Móna in developing a package of measures, 'the proposed Scheme', for enhanced decommissioning, rehabilitation and restoration of cutaway peatlands referred to as, the Peatlands Climate Action Scheme'. However, only the additional costs associated with the additional and enhanced rehabilitation, i.e, measures which go beyond the existing standard mandatory decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support. The additional costs of the proposed Scheme will be supported by Government through the Climate Action Fund, administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) will act as the Scheme regulator.

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

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

Any consideration of any other future after-uses for Turraun 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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SUMMARY

Name of bog: Turraun **Area: 535** Ha

Site description:

- Turraun Bog has a long history of peat extraction. This bog was one of the first bogs to be brought under the management of the Turf Development Board, which developed into Bord na Móna. Consequently, it contains some of the oldest cutaway habitat within the BnM estate.
- Part of the bog was developed for wetlands and amenity as part of the Lough Boora Discovery Park in the 1990s. A walking trail is still present around Turraun. There is now a cycle track linking Lough Boora Discovery Park to the Grand Canal greenway.
- Turraun Bog was originally drained and developed for industrial peat production in the 1940s. Industrial peat production ceased in 2018.
- The former peat production footprint now comprises wetlands, bare peat, mosaics of pioneering vegetation, semi mature woodlands and emergent woodland/scrub habitats. Active drainage channels are present on site.
- Peat depths are limited on site with peat depths over most of the site are approximately 0.5-1m. Some areas in the southern section contain peat deposits of 1-2.5m. As a result, Turraun is considered a **shallow peat** cutaway bog.
- The Grand Canal pNHA is located adjacent to the northern site boundary of Turraun Bog.

Rehabilitation goals and outcomes

Bord na Móna is committed to discharging the obligations arising from Condition 10 of the IPC licence. The primary goals and outcomes of this plan are to (1) meet condition 10 requirements and (2) optimise climate action benefits from enhanced rehabilitation measures.

Being cognisant of the proposed Scheme for supporting enhanced decommissioning, rehabilitation and restoration measures (PCAS), the primary rehabilitation goal and outcome for Turraun Bog is **environmental stabilisation** of the site and **optimising climate action benefits**. This will be achieved via intensive **re-wetting**. This is defined as:

- Carrying out enhanced rehabilitation with the application of enhanced peat rehabilitation measures to re-wet peat and slow water movement across the site.
- Optimising hydrological conditions for the development of fen and Reedswamp on shallow cutaway peat, and eventually naturally functioning peatland habitats.
- Stabilisation or improvement in water quality parameters (e.g. suspended solids).
- Environmental stabilisation.
- Rehabilitation will support the National Policies on Climate Action and GHG mitigation by maintaining and enhancing the current condition peat storage capacity of the bog (locking the carbon into the ground). In time, it is expected that the bog will develop its carbon sink function, in part, as *Sphagnum*-rich communities develop across the bog. 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 Turraun Bog.

- EPA IPC Licence - Ref. P0500-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. The key objective of 'rehabilitation', as required by this licence, is achieved by the **environmental stabilisation** of the bog.
- **The proposed Scheme (PCAS)** includes enhanced measures which are designed to exceed/meet the standard stabilisation requirements as defined by the IPC Licence and to enhance the ecosystem services of Turraun Bog, in particular, optimising **climate action benefits**.
- The local environmental conditions of this bog.
- The key goals and outcomes of rehabilitation at this bog outlined above.
- Minimising potential impacts on neighbouring land. Some boundary drains around Turraun Bog will be left unblocked as blocking boundary drains could affect adjacent land.
- Bord na Móna have identified the main land-use at this site as biodiversity and ecosystem services. A significant part of the site is part of the Lough Boora Discovery Park.
- Some areas have been planted with conifer and broad-leaved woodland and are out of scope of this rehabilitation plan.

Criteria for successful rehabilitation:

The Criteria for successful rehabilitation for IPC Licence validation and for climate action verification have been defined as:

- Rewetting of peat in the former area of industrial peat production to slow water movement across the site to retain silt, accelerating the development of vegetation cover via natural colonisation, and reducing the area of bare exposed peat (IPC Licence validation) through the creation of compatible fen, Reed swamp and other wetland and peatland habitats.
- Stabilising or reducing key emissions to water (e.g. silt-run-off) (IPC Licence validation).
- Reducing pressure from peat production on the local river catchment (WFD).
- Optimising the extent of suitable hydrological conditions to optimise climate action (Climate action verification).
- Reduction in carbon emissions (Climate action verification).
- Setting the site on a trajectory towards establishment of a mosaic of compatible habitats including fen, Reed swamp, heath, scrub, Birch woodland and peatland communities, where conditions are suitable, and eventually towards a reduced carbon source/carbon sink (Climate action verification). These habitats will generally establish initially as pioneer vegetation. It will take some time for stable naturally functioning habitats to fully develop at Turraun Bog.
- Improvement in biodiversity and ecosystem services. (Climate action verification).

Meeting climate action verification criteria and monitoring of these criteria 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.
- Natural colonisation of vegetation to develop semi-natural habitats at a rate within the normal limits.

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 drainage management appraisal.
- Carry out an ecological assessment of the potential impacts of the planned rehabilitation.
- Carry out proposed measures, which will be a combination of targeted drain blocking, peat field re-profiling, blocking outfalls and water level management.
- Phase 2 measures may include fertiliser application targeting bare peat areas of headlands, high fields and other areas, and further water level management.
- Silt ponds will continue to be maintained during the rehabilitation and decommissioning schedule.
- Evaluate success of short-term rehabilitation measures outlined above and remediate, where necessary.
- Decommissioning of silt-ponds will be assessed and carried out, where required.

Timeframe:

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

Budget and Costing

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

Monitoring, after-care and maintenance

The monitoring, after-care and maintenance programme for Turraun Bog, as required to meet Condition 10 of the IPC Licence, 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, asses the progress of natural colonisation, monitoring of any potential impacts on neighbouring land and general land security.

The number of site visits will reduce after 2 years to bi-annually. These site visits will assess the need to any additional rehabilitation.

- **Water quality monitoring** will be established. Monitoring of key water quality parameters will include: Ammonia, Phosphorous, Suspended solids (silt), pH and conductivity.
- 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.
- Decommissioning of silt-ponds will be assessed and carried out, where needed.

Additional Monitoring:

- The monitoring and validation of re-vegetation via natural colonisation and changes in bog condition will be carried out using a remote sensing survey, after rehabilitation measures are implemented. This will be repeated after 5 years to map and validate changes.
- 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 of discharge is stabilising or 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 Boora bog group (Ref. P0500-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the cutaway boglands within the licensed area. Turraun Bog is part of the Boora bog group (see Appendix II for details of the bog areas within the Boora Bog Group). Turraun Bog is located in Co. Offaly.

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

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

It is proposed by Government that Bord na Móna carry out a Peatlands Enhanced Decommissioning, Rehabilitation and Restoration Scheme (PCAS) on peatlands previously used for energy production. Note this proposal is also known colloquially as the 'Peatlands Climate Action Scheme'. The additional costs of the proposed Scheme will be supported by Government through the Climate Action Fund. 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. This proposed Scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations (Appendix VII) under existing EPA IPC licence conditions. Improvements supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered. However, it is important for all stakeholders to understand that only the costs associated with the additional, enhanced and accelerated rehabilitation, i.e. those measures which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10, will be eligible for support under the proposed Scheme. Bord na Móna have now announced the complete cessation of industrial peat production across its estate (January 2021).

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

It is envisaged that the proposed Scheme will support a combination of activities, interventions, or measures which accelerate the original timelines including:

- more intensive management of water levels through drain-blocking and cell bunding;

- re-profiling that will deliver suitable conditions for development of wetlands, fens and bog habitats;
- targeted fertiliser applications,
- seeding of targeted vegetation; and
- proactive inoculation of suitable peatland areas with *Sphagnum.*

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

Turraun Bog is proposed to be part of this proposed Scheme and this rehabilitation plan outlines the approach to be taken. In the event that additional external funding is not secured, Bord na Móna will carry out a standard rehabilitation plan (outlined in Appendix I). This standard rehabilitation plan will also meet rehabilitation and decommissioning obligations under existing EPA IPC licence conditions.

1.1 Constraints and Limitations

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0500-01:

> "*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 only covers the area of Turraun Bog.

This rehabilitation plan takes account of the **future planned after-use** of Turraun Bog. Biodiversity and ecosystem services have been currently identified as the primary land-use at Turraun. Bord na Móna will continue to review the future after-use of its land-bank. Any consideration of any other future after-uses for Turraun Bog, will be conducted in adherence to the relevant planning legislation and consultation with relevant authorities and will be considered within the framework of this rehabilitation plan.

Peat production activities have the potential to impact the habitats and environment of a bog. The ecological processes involved in the creation and maintenance of functioning, active bog systems are complex, happen over very long time periods (>1,000 years) and not all are fully understood. Nevertheless, the basis for the proposed approaches and implementation outlined in the document is the experience gained in 40 years of research and implementation of the after-use development, rehabilitation and restoration of the Bord na Móna cutaway bogs as well as best practise internationally (see reference documents).

Industrial peat extraction at Turraun Bog ceased in permanently 2018. Currently the former peat production area comprises both bare peat and re-vegetated areas. The combination of active rehabilitation measures and natural

colonisation will quickly establish and/or increase the extent of pioneer vegetation and will be planned to accelerate environmental stabilisation. Nevertheless, it will take some time (30-50 years) for naturally functioning peatland ecosystems to fully re-establish.

Parts of Turraun 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 the margins of Turraun 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.

The former area of Turraun Bog that is now a private Native Woodland Scheme is not considered part of the scope of this rehabilitation plan.

Rehabilitation in other areas of the bog may also be constrained due to other property issues or issues such as rights of way.

2. METHODOLOGY

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

The ecological information and site information collected during the Bord na Móna ecological baseline survey, additional confirmatory site visits 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 proposed Scheme (PCAS)**. This rehabilitation includes enhanced measures defined in the Methodology Paper which are designed to exceed the standard stabilisation requirements as defined by the IPC Licence and to enhance the ecosystem services of Turraun Bog, in particular, optimising **climate action benefits**.

2.1 Desk Study

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

- Anderson *et al*. (2017). An overview of the progress and challenges of peatland restoration in Western Europe.
- Bonn *et al*. (2017). Peatland restoration and ecosystem services- science, policy and practice.
- Carroll *et al*. (2009). *Sphagnum* in the Peak District. Current Status and Potential for Restoration. Moors for the Future Report No 16.
- Clark & Rieley (2010). Strategy for responsible peatland management.
- Eades *et al*. (2003). The Wetland Restoration Manual.
- Farrell & Doyle (2003). Rehabilitation of Industrial Cutaway Atlantic Blanket Bog, NW Mayo, Ireland.
- Gann *et al*. (2019). International Principles and Standards for the practice of Ecological Restoration.
- Hinde *et al*. (2010). *Sphagnum* re-introduction project: A report on research into the re-introduction of *Sphagnum* mosses to degraded moorland. Moors for the Future Research Report 18.
- Joosten & Clarke (2002). Wise Use of mires and peatlands – Background and Principles including a framework for Decision-making.

- Lindsay (2010). Peatbogs and Carbon: a Critical Synthesis to Inform Policy Development in Oceanic Peat Bog Conservation and Restoration in the Context of Climate Change.
- Mackin *et al*. (2017). Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service,
- McBride *et al*. (2011). The Fen Management Handbook, (2011), Scottish Natural Heritage.
- McDonagh (1996). Drain blocking by machines on Raised Bogs. Unpublished report for National Parks and Wildlife Service.
- NPWS (2017a). National Raised Bog Special Areas of Conservation management plan. Department of Arts, Heritage and the Gaeltacht.
- Quinty & Rochefort (2003). Peatland Restoration Guide, second edition. Canadian *Sphagnum* Peat Moss Association and New Brunswick Department of Natural Resources and Energy.
- Regan*, et. al.* (2020). Ecohydrology, Greenhouse Gas Dynamics and Restoration Guidelines for Degraded Raised Bogs. EPA Research Report. Prepared for the Environmental Protection Agency by Trinity College Dublin.
- Renou-Wilson *et al*. (2011). BOGLAND - Sustainable Management of Peatlands in Ireland. STRIVE Report No 75 prepared for the Environmental Protection Agency.
- Schouten (2002). Conservation and Restoration of Raised Bogs: Geological, Hydrological and Ecological Studies. Dúchas - The Heritage Service of the Department of the Environment and Local Government, Ireland;
- Thom (2019). Conserving Bogs – Management Handbook.
- Wheeler & Shaw (1995). Restoration of Damaged Peatlands – with Particular Reference to Lowland Raised Bogs Affected by Peat Extraction.
- Wittram *et al*. (2015). A Practitioners Guide to Sphagnum Reintroduction. Moors for the Future Partnership.

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

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

2.2 Consultation

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

2.3 Field Surveys

Bord na Móna carried out a baseline ecological survey of all of its properties in 2009-2012 and developed habitat maps. As part of this exercise Turraun Bog was originally surveyed in December of 2009. Additional ecological walk-over surveys and visits have taken place at Turraun Bog between 2009-2020 to inform rehabilitation planning and habitat maps have been updated, where required. The most recent visit undertaken in November 2020. This rehabilitation plan is informed by the original baseline survey as well as subsequent 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 developed for classifying pioneer cutaway habitats as Fossitt categories were deemed not to be detailed enough for cutaway bog (much of cutaway bog could be classified as Cutover Bog - PB4). Much of the pioneer cutaway vegetation is still at an early stage of its development and cannot be assigned to Fossitt Level 3 categories yet.

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

3. SITE DESCRIPTION

Turraun Bog is located adjacent to the R357 in Co. Offaly, circa 5.5km to the south-east of Ferbane and 5km north west of Blueball (see Figure 3.1 & 3.2). The surrounding landscape is a mosaic primarily consists of low-lying agricultural land (pasture) interspersed with other raised bogs, many of which have also been managed by Bord na Móna for peat production with some areas utilised for domestic turf-cutting.

Turraun Bog is part of Lough Boora Discovery Park. There are several other BnM bogs nearby including the aforementioned; Pollagh/Cornalaur, The Derries and Oughter as well as Derrybrat, Boora, Drinagh, Clongawny More and Killaranny.

The Boora River (EPA Code: 25B08) flows northward along the western boundary of Turraun Bog. The Pollagh Stream (EPA Code: 25P05) also flows north adjacent to the site eastern boundary. Both water bodies join the River Brosna (EPA Code: 25B09) as it flows west toward the River Shannon less than 500m north of the site. The Grand Canal is situated directly north of and adjacent to Turraun Bog.

Turraun is linked to The Derries Bog to the west (also owned by Bord na Móna) by railway line and a machinery travel path. Railway lines and infrastructure also link Turraun to Pollagh Bog and Oughter Bog to the east.

Industrial peat production permanently ceased at Turraun Bog in 2018. A small portion of the original extent of the bog in the south west of the site has been taken up with a forestry plantation managed by Coillte.

The northern section is considered a biodiversity area and is part of the Lough Boora Discovery Park. The Turraun Lagoon is located in this area. There is a small area west of the track through the site containing two small lakes, commercial forestry and woodland. The ecology and amenity potential of Turraun has been studied in detail in the past as part of the development of and study of Lough Boora Discovery Park (Barron *et al*., 1994; Herry & Finney, 2009; Copland, 2010; Copland, 2015; Egan, 1998; Lally *et al*., 2012; Renou-Wilson *et al*., 2008; Rowlands & Feehan, 2000; Trodd 2003).

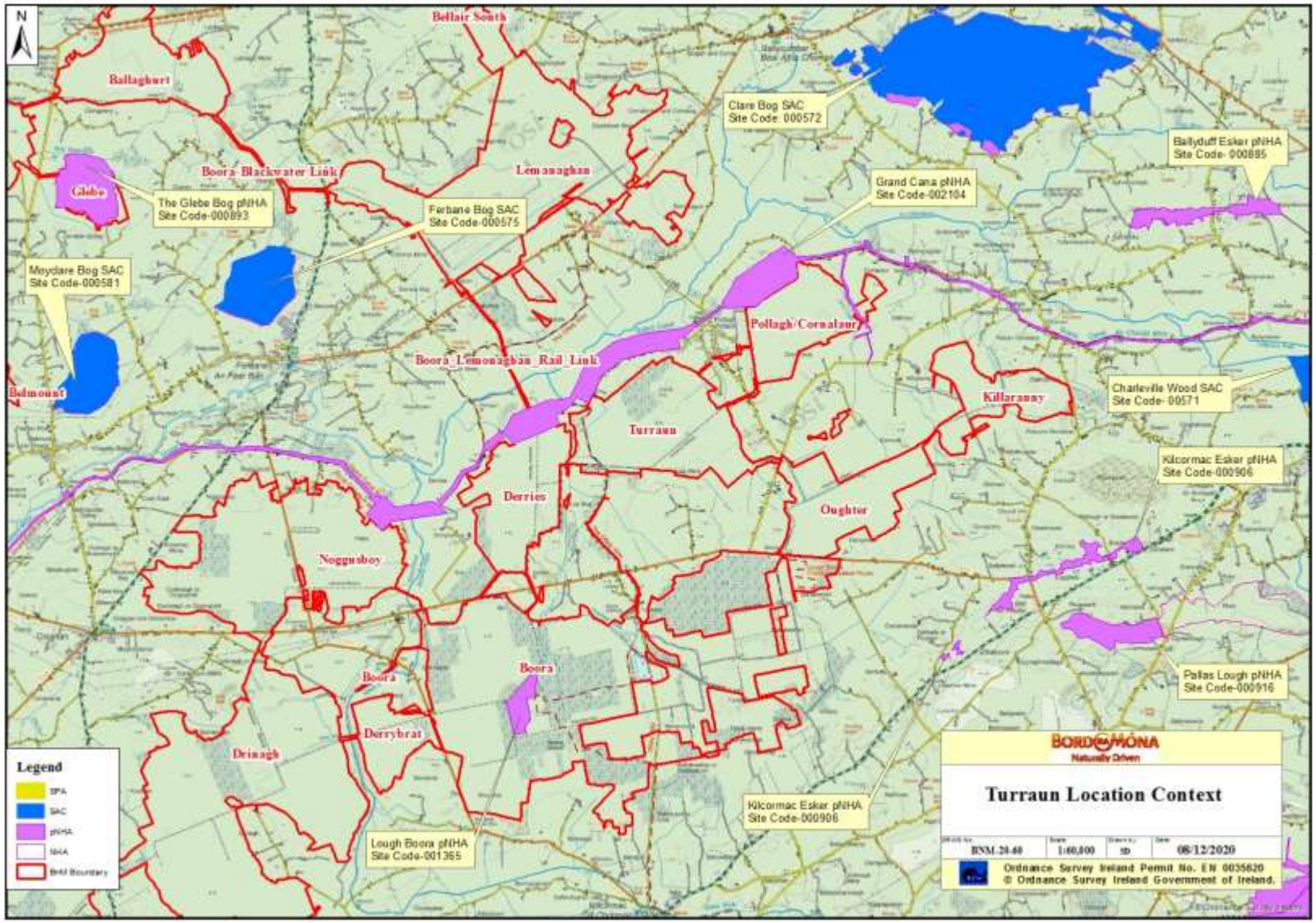


Figure 3.1 Location of Turraun in context to the surrounding area (designated lands included)

3.1 Status and Situation

3.1.1 Site history

Turraun Bog has a long history of peat extraction pre-dating the development of Bord na Móna (Clarke, 2010). This bog was one of the first bogs to be brought under the management of the Turf Development Board, which developed into Bord na Móna. Consequently, it contains some of the oldest cutaway habitat within the BnM estate. This older cutaway was one of the sites developed as part of the Lough Boora Discovery Park (https://www.loughboora.com/). Some rehabilitation and amenity measures, i.e. drain blocking and bunding to create lakes and wetlands, were carried out in the northern section of the site in the 1990s.

Peat production at Turraun Bog ceased in 2018. However, some stockpiles of peat remain on the site following harvesting and these are being transported to Derrinlough Briquette Factory. The site also formerly provided fuel peat for Ferbane Power Station, Ferbane, Co. Offaly and, in latter years, fuel peat was provided to West Offaly Power, Shannonbridge, Co. Offaly. The existing rail line through Turraun is still maintained. It is used to transport stock-peat from Turraun and adjacent sites.

3.1.2 Current land-use

Industrial peat production has now permanently ceased at Turraun Bog. Biodiversity and ecosystem services have been identified as the current primary land use at Turraun Bog by Bord na Móna.

A large area in the north of site has been developed as part of the Lough Boora Discovery Park (https://www.loughboora.com/). This wetland has hosted nationally important numbers of wintering wildfowl. An amenity walk exits within the woodland habitat to the east of the lake and wetlands extending to the east to encompass Cocta Hill.

The fishing lake is used as a Carp fishery by a local fishing club.

The Offaly Way way-marked National walking trail bisects the site and follows the newly upgraded track on the western side of the site.

A block of Conifer Plantation is situated at the south west of the site. This area is managed by Coillte and was planted in the 1980s. The most common crop species is Sitka Spruce *Picea sitchensis*. A smaller amount of Lodgepole Pine *Pinus contorta* also exists within the plantation.

A small area in the north-east of the site is a former Native Woodland plantation, developed by BnM. This consists of Scots pine *Pinus sylvestris* with Birch *Betula pubescens*.

The area to the south-east of the site is a private Native Woodland plantation. This area is beyond the scope of this rehabilitation plan.

There are no known rights of way, grazing licences or archaeological features on this bog.

3.1.3. Socio-Economic conditions

Bord na Móna has historically been a vital employer for the rural community of the Midlands of Ireland. Bord na Móna compiled a report on the role of peat extraction in the midlands historically in which they report that in 1986, by the end of Bord na Móna's Third Development Programme, a total of twenty-three work locations had been established around the country. The company had an average employment of approximately 4,688 in the

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

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

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

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

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

3.2 Geology and Peat Depths

3.2.1 Sub-soil geology

The underlying geology at Turraun Bog is mainly composed of Waulsortian Limestones [1]. There is a small area of Fossiliferous dark-grey muddy limestone situated in the north of the site. The underlying soils and sub-soils are classed as 'Cutover/Cutaway Peat'.

3.2.2 Peat type and depths

Commercial peat extraction was undertaken at Turraun Bog up until 2018. As a result of the harvesting programme in place at Turraun, peat depths are varied across the site. Most of the site contains shallow peat reserves (Figure 8.2). Peat depths of <1m occur over approximately 75% of the site. Some deeper peat deposits persist in the southern section of the site. Approximately 60% of the peat reserves in the southern section are 1.1-2.5m in depth. The remaining 30% of this area contains peat depths of 0.1-1m.

3.3 Key Biodiversity Features of Interest

The bog is currently developing pioneer cutaway habitats (production-related cutaway) and can be divided into a number of sections based on current physical characteristics and land-use. Some rehabilitation measures have previously been carried out on the northern section. The remainder of the site is slowly developing pioneering bare peat habitats. Much more is known about the ecology of Turraun than most Bord na Móna cutaway sites,

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

for example Egan (1998), Heery (1999), Rowlands (2001), Copland (2008, 2009), BOGFOR Research (Renou-Wilson *et al*., 2008).

3.3.1 Current habitats

Northern section

This area has been managed for biodiversity and amenity for a number of years. Turraun lake and wetlands was created by blocking drains and the construction of a berm around a natural basin in the early 1990's. The lake and wetlands provides a large open water habitat for wetland birds. It also provides extensive reedbed area and pioneer fen habitat. An area of developing birch woodland dominates the area to the immediate east of the wetland. Much of this woodland has been in development for over 20 years, now has many areas of closed canopy and is one of the best developed cutaway woodlands within the BnM estate. The understory of this woodland remains less developed and is still dominated by bramble scrub in many places, where it is dry. Small patches are re-wetting, have high *Sphagnum* cover and have the potential to develop into habitat that is analogous with Annex I bog woodland in the future.

Cocta Hill is situated further east across the northern section of the site. This hill is actually a north-south oriented ridge that was originally covered with raised bog. The peat has been cutaway and areas of exposed glacial subsoil and shallow peat have resulted in development of habitats not usually seen on cutaway bogs, e.g. calcareous dry grassland. This grassland is a feature of high biodiversity value due to its flora. It is orchid-rich and contains scarce and rare species such as Blue Fleabane and Field Gentian. Dry heath, dense bracken and dry grassland can also be found on Cocta Hill. To the east of the ridge, a native woodland scheme plantation of Scots Pine and Pedunculate Oak was established by BnM.

The Central section

This area was harvested until recently (2018). This area is dominated by bare peat and the associated pioneer habitats. Dry cutaway habitats dominated by Heather and birch scrub are developing on high fields while pioneer poor fen habitat dominated by *Eriophorum* species is developing in wetter or low lying areas.

Southern Section

The southern section has been out of production for many years and is developing into a mosaic of habitats through natural regeneration. Pioneer wetland habitats dominated by *Phragmites australis* and *Typha latifolia are* developing in some areas. *Eriophorum* dominated pioneer fen habitats containing *Juncus* species are also developing in parts of this section. Bare peat cutaway habitat is also present over much of this area. In Winter, large bodies of open water can be found in the low lying areas in this section, which attract wintering waterbirds.

Part of the bog south of the railway is also developing in a similar fashion and re-wetting with a mosaic of small open water bodies, pioneer fen and bare peat habitats. Part of this cutaway area was transferred to a third party as part of a privately developed Native Woodland Scheme.

Western Section

The western section comprises of a small Coilte commercial forestry plantation, a small band of improved grassland, calcareous grassland developing on the gravel used to support the former railway, two small artificial lakes and some areas of bare peat. The conifer forestry plantation contains some old forestry trials. The former railway track has been developed as an amenity trackway and for local access. There is an amenity car-parking facility positioned at the south-west corner of the site. The smaller of the two lakes has very steep banks and has not developed any riparian habitat. The second and larger lake, was developed for angling and was maintained by a local Carp angling group. An area of maturing Bog Woodland has developed on a low-lying section of cutaway bog.

A habitat map of Turraun Bog is shown in Figure 3.5, illustrative figures are shown overleaf in respect of a sample of habitats present at Turraun.

Figure 3.2. View of the revegetating milled peat surface (2020) across Turraun bog. Note some Whooper Swans in the background using the developing wetlands.

Figure 3.3 View of wetland habitat and emergent vegetation at Turraun Bog (2020)

Figure 3.4 Birch woodland and heathland habitats developing at Turraun.

3.3.2 Species of conservation interest

A number of species of conservation concern utilize the habitats available at Turraun Bog. The following is a summary of the records of these species available within both BnM records and those of the National Biodiversity Centre.

Multiple mammal species have been recorded at Turraun Bog. Evidence of badger *Meles meles*, European Otter *Lutra lutra,* Fox *Vulpes vulpes*, Hare *Lepus timidus hibernicus*, Pine Marten *Martes martes*, Fallow Deer *Dama dama* and Rabbit *Oryctologus cuniculus* were observed on site during BnM walkover surveys. NBDC data contains records of Eurasian Pygmy Shrew *Sorex minutus* and Irish stoat *Mustela erminea Hibernica* within 1km of site.

Regarding bats, no records within BnM files or on NDBC can be found for any bat species on the Turraun Bog site. However, the lack of bat records is likely due to lack of survey rather than absence of bats. The mosaic of habitats within and surrounding Turraun Bog provide potential foraging, roosting and commuting corridors to multiple species. Records exist in the surrounding area for at least seven species of bat including; Soprano Pipistrelle *Pipistrellus pygmaeus*, Nathusius' Pipistrelle *Pipistrellus nathusii*, Natter's Bat *Myotis nattereri*, Leisler's Bat N*yctalus leisleri*, Brown Long-eared Bat *Plecotus auritus*, Daubenton's Bat *Myotis daubentoniid* and Whiskered Bat *Myotis mystacinus.*

Insect records for the area from NDBC and BnM data include four butterfly species of conservation concern, namely; Marsh Fritillary *Euphydryas aurinia*, Small Heath *Coenonympha pamphilus*, Dingy Skipper *Erynnis tages* and Silver Washed Fritillary *Argynnis paphia*. Turraun is part of the NBDC Butterfly Monitoring Scheme. Butterfly diversity has remained relatively stable during the period of monitoring 2012-2018. Species that appeared during the latter part of this monitoring included Dark Green Fritillary and Marsh Fritillary. Species such as Dingy Skipper are supported by the developing calcareous grassland.

Records for 104 Beetle species, of which only *Nebrioporus depressus* and *Paracymus scutellaris* are considered near threatened have also been recorded on or within 1km of the site. Regarding *Hymenopteran* species, 13 have been recorded within 1km of site, of which, Large Red-Tailed Bumblebee *Bombus lapidaries* is designated as "Near Threatened" by the IUCN. Records of six species of mayfly, of which *Procloeon bifidum* is catagorised as "Vulnerable" also exist. Further entomological records include; 116 Moth species, 30 true bug species, 16 butterfly species separate to those mentioned already, 15 Odonata species, 11 true fly species, five Caddisfly species, two grasshopper species and one *Thysanoptera* species, none of which are of immediate conservation concern. There are also records for five species of spider, none of which are of immediate conservation concern.

There are 233 flowering plant species recorded on or near (within 1km) the site. Of that number only blue fleabane *Erigeron acer* is of direct conservation concern.

Cutaway bog habitat is useful to numerous bird species at different times of year. Birds have been well-recorded at Turraun for over 20 years (Breen, 2000) and over 100 bird species have been recorded. However, habitat succession and land management changes during this period has resulted in changes to the bird populations using the site. Nevertheless, the site continues to host county, if not nationally, important numbers of certain species. Below is a description of the records of bird species of immediate conservation concern.

The following wintering wildfowl have been recorded using the site; Mute Swan *Cygnus olor*, Greylag Goose *Anser anser*, Mallard *Anas platyrhynchos,* Eurasian Wigeon *Anas penelope* and Tufted Duck *Aythya fuligula.*

Other wetland species recorded on site include Grey Heron *Ardea cinerea*, breeding Great Crested Grebe *Podiceps cristatus* and Little Grebe *Tachybaptus ruficollis*. Waders such as European Golden Plover *Pluvialis apricaria* have been recorded on site during Winter.

Raptors such as Merlin *Falco* columbarius, Common Kestrel *Falco tinnunculus*, Buzzard *Buteo buteo* and Sparrowhawk *Accipiter nisus* have been recorded on site. No confirmed breeding records exist but breeding attempts are considered probable particularly for Kestrel and Sparrowhawk. Barn Owl *Tyto alba* and Long-easred Owl *Asio otus* have been recorded attempting to breed on or close to site also. Hen harrier *Circus cyaneus* have been recorded on site during winter months and Hen Harrier are known to roost on the site.

Breeding wader species recorded on site during summer months include Northern Lapwing *Vanellus vanellus,* Common Sandpiper *Actitis hypoleucos*, Common Snipe *Gallinago gallinago*, Ringed Plover *Charadrius hiaticula* and Eurasian Woodcock *Scolopax rusticola*.

Other avian species of conservation concern recorded using the site include; Meadow Pipit *Anthus pratensis*, Skylark *ALauda arvensis,* Barn Swallow *Hirundo rustica* and Common Kingfisher *Alcedo atthis*. Black-Headed Gull *Larus ridibundus* formerly bred at Turraun and may continue to do so irregularly. Passage waders, such as Greenshank, Little Stint and Oystercatcher have also been recorded stopping in at the wetlands.

3.3.3 Invasive species

Invasive alien species known to occur at the subject bog (or desktop review suggests presence is likely), and for which reasonably foreseeable source impact pathways for dispersal may result from the proposed PCAS are described here.

A broad range of common garden escapees/Invasive Alien Species are occasionally detected on or close to former peat production sites. All invasive alien species detected will be treated in line with Best Practice during PCAS activities, where necessary. Records exist for American Mink *Mustela vison*, and Sycamore *Acer pseudoplatanus* at Turraun but are unlikely to be further dispersed during or as a result of PCAS activities. Records for Butterfly Bush Buddleja davidii, an invasive terrestrial flowering plant species, Nuttal's Waterweed Elodea nuttallii, an invasive aquatic plant species and Zebra Mussel Dreissena polymorpha, an invasive aquatic invertebrate species, exist within the NDBC data bank for this 1 km square but are associated with the near-by canal. No other invasive alien species, as listed under Regulation (EU) 1143/2014 on the prevention and management of the introduction and spread of invasive alien species, likely to be further dispersed during or as a result of PCAS activities has been recorded at Turraun Bog.

3.4 Statutory Nature Conservation Designations

There are no European Sites (SAC or SPA) located within 5km of Turraun Bog. Due to its location within the Lower River Shannon catchment, Turraun is hydrologically connected to at least two downstream European Sites namely the Middle Shannon Callows SPA (Site Code 004096 -17km due west), and the River Little Brosna Callows SPA (Site Code 004086 - ca.22km south west).

The nearest SAC is Ferbane Bog SAC (Site Code 000575) which is approximately 6Km to the north-west. Clara Bog SAC (Site Code 000572) is approximately 6.5Km to the north-east of Turraun. Moyclare Bog SAC (Site Code 000581) is situated circa. 8.5Km west of the site.

The Grand Canal pNHA (Site Code 002104) is situated directly to the North of Turraun Bog. Lough Boora pNHA (Site Code: 001365) is approximately 3.5Km to the south of site (Figure 3.1).

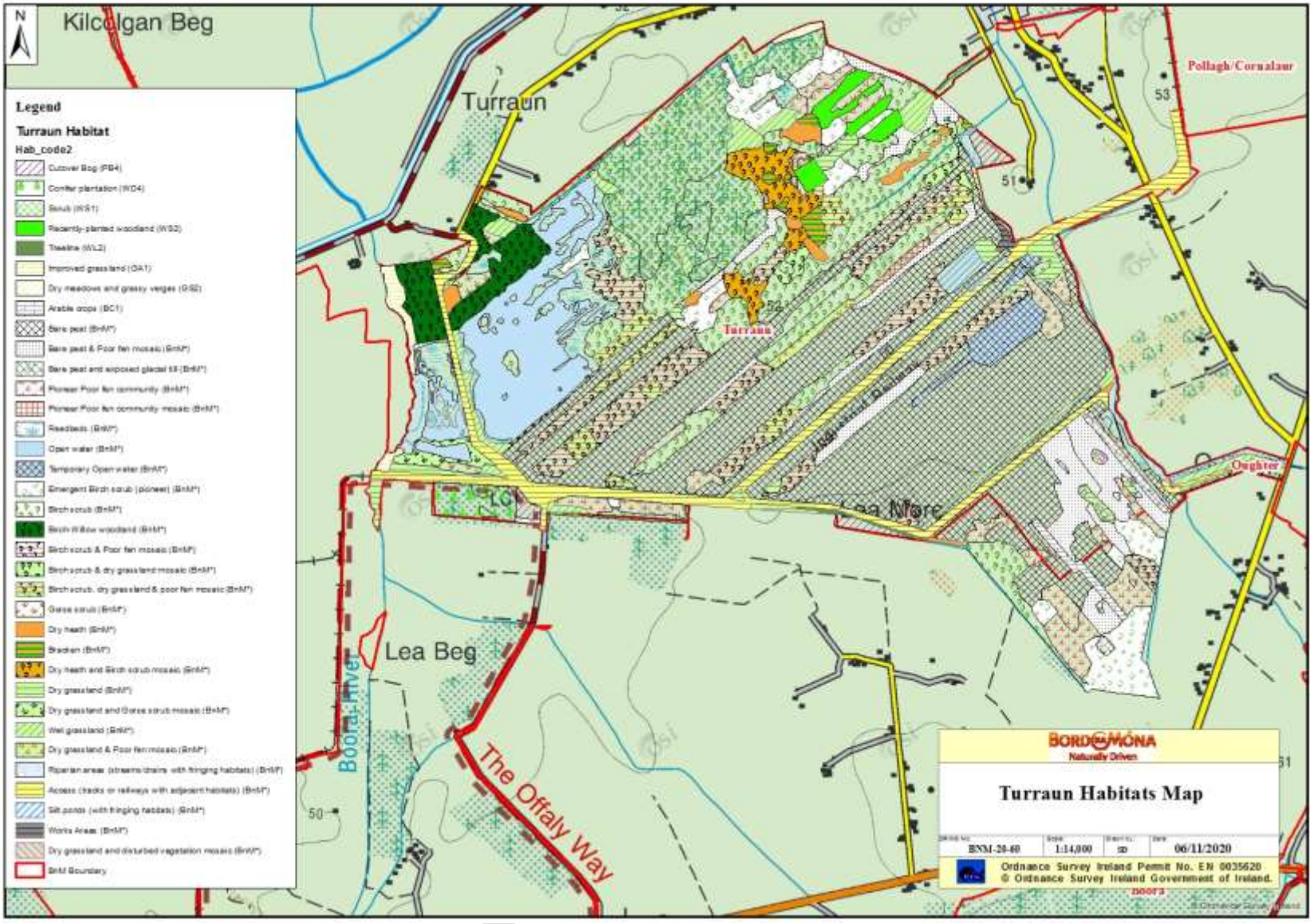


Figure 3.4. *Habitat map of Turraun Bog showing Bord na Móna habitat categorisation (November 2018).*

Figure 3.5. Map of Turraun Bog showing structures and designated emission points

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 Turraun Bog (i.e. within 3km) The closest Ramsar Sites to Turraun Bog include Pollardstown Fen (Kildare), Clara Bog and Raheenmore Bog (Offaly).

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

3.5 Hydrology and Hydrogeology

Turraun Bog has a gravity drainage regime. Part of the bog was rehabilitated as part of the Lough Boora Discovery Park. A lake was developed in a basin by developing a bund that closed one part of this natural basin. This created the lake and associated wetlands. Part of the bog (south-east section, recently in peat extraction) is a mosaic of relatively dry areas with active functioning drains. One section is already developing cutaway wetlands as it is a topographical basin and drainage has been impeded. Initial hydrological modelling indicates the bog has topographical basins that are expected to develop a mosaic of wetland habitats when rehabilitation is carried out and drains are blocked. A significant part of the site is also modelled as being relatively dry (Figure 8.4).

Turraun Bog is located in the Lower River Shannon Catchment (Shannon_Lwr). It is mainly drained to the west, by the Boora River (EPA Code: 25B08). The Pollagh Stream (EPA Code: 25P05) drains Turraun Bog to the east. Both water bodies flow north along the site boundaries (west and east) before converging with the River Brosna (EPA Code: 25B09) south of Ferbane, Co. Offaly.

There are three active silt ponds present on the Turraun site. Two silt ponds are situated in the west of the site. These western silt ponds manage discharges into the Boora River and in turn the Brosna. The remaining silt pond is located in the east of the bog to manage discharges into the Pollagh Stream and Brosna. The bog has field drains running in a general north to south orientation. Turraun is a gravity drained bog.

The bog is located in an area with a locally important bedrock aquifer. 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.

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

The peat is underlain by glacial deposits interbedded with glacio-fluvial deposits over limestone bedrock. The glacial deposits generally consist of grey gravelly clay/silt. Lacustrine deposits in the site generally consist of shell marl. The bog water table across the site is expected to be high when bog drains are locked, and perched above the underlying regional groundwater table. The ability of the shallow peat water to interact with the underlying

regional groundwater flows is limited by the permeability of the underlying glacial deposits. As such the potential for bog rehabilitation to interact or impact on underlying groundwater is very low.

3.6 Emissions to surface-water and water-courses

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

Silt ponds are the key silt control infrastructure to control potential emissions from industrial peat production sites. As require 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 period. Silt pond decommissioning will be considered when sites are deemed to be on a trajectory of environmental stability and peatland rehabilitation has been completed.

Turraun bog has 2 treated surface water outlets to the Pollagh Stream (Brosna) 010 IE_SH_25P050300. Peat extraction was not identified as a pressure in the second cycle of the river basin management plan and is indicated as remaining so in the third cycle, currently under preparation, with the downstream receiving Brosna River remaining as not under pressure from peat extraction.

There are no exceedances in the IPC Licence limits for Suspended solids and Ammonia resulting from ongoing surface water monitoring. As part of the rehabilitation plan and validation, surface water quality will be monitored to establish an expected stabilisation or improvement in water quality parameters. The main emission limit value associated with this bog is 35mg/l suspended solids, with trigger levels for ammonia of 3.7mg/l and COD 100mg/l. From an analysis of any monitoring over the past 3 yrs. of 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 (Table 3.1).

Table 3.1.

Bog	SW	Monitoring	pH	SS	TS	Ammonia	TP	COD	Colour
Turraun	SW-15	Q3 19	7.7	6	437	0.19	0.05	48	103
Turraun	SW-16	Q3 19	7.5	2	467	0.069	0.05	45	127
Turraun	SW-15	Q4 17	7.3	6	440	0.14	0.05	82	192
Turraun	SW-16	Q4 17	7.4	7	258	0.82	0.05	70	212
Turraun	SW-15	Q2 16	7.8	5	407	0.04	0.11	41	83
Turraun	SW-16	Q2 14	7.2	5	392	2.1	0.05	29	111

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. Re-wetted peat also aid the primary objective of stabilizing peat, as when peat is re-wetted it minimises risk to wind erosion. Re-wetted peat and the development of wet peatland habitats can

also act as sinks for silt and mobile peat, and increases additional retention time for solids, and the peatland vegetation can quickly stabilise this material within blocked drains on site (by acting like constructed wetlands).

Water quality of water discharges from restored/rehabilitated peatlands normally improves as a result of bog rehabilitation and restoration measures and the restoration of natural peatland processes (Bonn *et al*., 20017). Peatland rehabilitation 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 Raised Bog Restoration Project and ongoing Bord na Móna rehabilitation is expected to have a positive impact on water quality and help the NWBMP deliver its objectives in relation to the WFD.

Water will still discharge from designated emission points when rehabilitation at Turraun Bog has been completed. Existing silt ponds will continue to be maintained and operated as long as required or such point as they can be decommissioned, with no change in outfall type. This discharge will have improving water quality and there will be increased wetland attenuation, meaning slower release of water. This is expected to have a positive impact on status of the key downstream water body receptors.

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

The EPA-funded CarbonRestore Project (Renou-Wilson et. al. 2012) found that rewetting of drained peatlands can lead to restoration of functional peatland, such as the return of typical plant and animal species, which in turn may lead to the restoration of peat-formation and the C-sink function. The EPA NEROS project carried out GHG flux research at Moyarwood Bog and found that Moyarwood Bog was overall a Carbon sink (sink for CO_2 and a source for Methane) 6 years after bog restoration was carried out (Renou-Wilson et al. 2018).

It is expected that Turraun 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 the success of the rehabilitation measures, the extent of development of *Sphagnum*-rich or other peat-forming habitats, the balance of carbon fluxes from different cutaway habitats and future climatic conditions. This site is expected to

develop a mosaic of fen, Reed swamp, wet woodland, scrub. Birch woodland is expected to develop on the drier mounds and peripheral headlands.

3.9 Current ecological rating

(Following NRA (2009) Evaluation Criteria)

The majority of this site can be rated as having a County level ecological value (C-) as it is dominated by a significant area of naturalising cutaway habitats in good condition and contains sites, habitats and species of potentially a national interest such as the wetlands and lakes. The breeding and wintering wader and water bird usage of this site has transitioned over the years as the site has naturalised and matured. Water birds now utilise the SE section of the site that has been in peat production until recently.

Some sections of cutaway have developed areas of poor fen and scrub and can be rated as having **Moderate value, locally important (D).**

It is expected that the overall ecological value of this site will increase in the future as the site re-vegetates, matures and forms semi-natural habitats, such as more extensive areas of fen and Reed swamp.

4. CONSULTATION

4.1 Consultation to date

Consultation will seek to engage an audience of relevant stakeholders at both a national and local level. National stakeholders have been identified from varied bog restoration and rehabilitation efforts undertaken by Bord na Móna over the past 40 years, with particular emphasis on engagement with stakeholders during their Biodiversity Action Plan programme since 2010. National Stakeholders includes relevant government departments and agencies, relevant semi-state bodies, NGOs and other environmentally-focused groups with a national remit. Stakeholders can be emailed a copy of this draft plan when it has been finalised internally by Bord na Móna, and invited to make submissions on the objectives and content of this plan in relation to Turraun Bog.

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

- General consultation with range of stakeholders at annual Bord na Mona Biodiversity Action Plan review days 2010-2018.
- Midlands & East Regional WFD Operational Committee (River Basin Management Plans).
- Sub-committee on Shannon Flooding Work Programme and Measures (OPW, Waterways Ireland, ESB, LA's, Fisheries Ireland, NPWs etc).
- Archaeological Liaison Committee (National Museum of Ireland & Dept of Culture Heritage and the Gaeltacht).
- The development of Lough Boora Discovery Park (Offaly County Council);
- Bird surveys carried out by Birdwatch Ireland for Bord na Móna,
- the development of the cycle track (Offaly Leader and Offaly County Council);
- development of a management plan for Lough Boora with local stakeholders from Pollagh (Birdwatch Ireland 2018)
- interaction with the Grand Canal with Waterways Ireland.

The ecology and amenity potential of Turraun has been studied in detail in the past as part of the development of and study of Lough Boora Discovery Park (Barron et al. 1994, Heery and Finney 2009, Copland 2010, Copland 2015, Egan 1998, Lally et al. 2012, Renou-Wilson et al. 2008), Rowlands and Feehan 2000, Trodd 2003).

Local stakeholders will also be identified through ongoing engagement with neighbours whose land adjoins Turraun Bog. Additionally, local representatives of national bodies (such as Regional National Parks and Wildlife staff) and relevant offices in County Councils (such as the Heritage or Environmental Offices) will be contacted. Any identified local interest groups will also be sought and informed of the opportunity to engage with this rehabilitation plan, and when identified will be invited to submit their comments or observations in relation to the proposed rehabilitation at Turraun Bog.

All correspondence received will be acknowledged and evaluated against the rehabilitation work proposed here, and the final draft of the Turraun Bog Rehabilitation Plan will contain a review of the consultation.

4.2 Issues raised by Consultees

N/A. Not issued to consultees yet.

4.3 Bord na Móna response to issues raised during consultation

N/A

5. REHABILITATION GOALS AND OUTCOMES

The key rehabilitation goal and outcomes for Turraun Bog are **environmental stabilisation** of the site via **optimising climate action benefits**. This is defined as:

- Carrying out intensive rehabilitation with the application of a combination of enhanced rehabilitation measures (including drain-blocking, re-profiling, cell-bunding, fertiliser application).
- Optimising hydrological conditions for the development of Reed Swamp and fen on shallow more alkaline peat and other subsoils.
- Stabilisation or reduction in water quality parameters (e.g. suspended solids).
- Environmental stabilisation.
- Setting the site on an appropriate trajectory to develop naturally functioning peatland habitats over time. 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). Nevertheless, re-wetting across the entire bog, as part of the proposed Scheme, will improve habitat conditions of the whole bog, making the overall bog wetter. Other peatland habitats such as fen and associated Reed swamp will develop in a wider mosaic that reflects underlying conditions. It will take some time for stable naturally functioning habitats to fully develop at Turraun Bog.

Re-wetting residual peat will initially maintain and enhance the carbon storage capacity of the bog. There is a 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 (Grand-Clement *et al*., 2015; Anderson *et al*., 2017; Minayeva *et al*., 2017). This will reduce carbon emissions from the site from a larger carbon source to a smaller carbon source.

The site has the capacity to develop in part as a reduced carbon source. Sections of the site will improve in condition after re-wetting and also have the capacity to develop as a reduced Carbon source as Reed Swamp, fen, scrub and bog woodland habitats develop. 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 Carbon sink function.

The main deliverable 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.

6. SCOPE OF REHABILITATION

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

- EPA IPC Licence - Ref. P0500-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the cutaway boglands within the licensed area. Turraun bog is part of the Boora Bog group.
- The proposed Scheme is designed to exceed the stabilisation requirements as defined by the IPC Licence. This Scheme is designed to enhance the ecosystem services of Turraun Bog, in particular, optimising **climate action benefits**. The proposed interventions will mean that environmental stabilisation is achieved (meaning IPC obligations are met) and, in addition, significant other ecosystem service benefits particularly for climate action will be accrued.
- The area of Turraun Bog is defined by Figure 3.1
- The local environmental conditions of Turraun Bog identify cutaway re-wetting as the most suitable rehabilitation approach for this site. There is a strong alkaline influence on the ground-water at this site. This means that re-wetting will lead to the development of fen, Reed Swamp and other associated wetland/peatland habitats.
- 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 Turraun Bog as **environmental stabilisation** and **optimising suitable hydrological conditions, and setting the site on a trajectory towards the development of naturally functioning peatland habitats (fen, Reed swamp and other associated wetland habitats).**
- Rehabilitation of Turraun Bog will support multiple National strategies of climate action, biodiversity action and other key environmental strategies such was the Water Framework Directive.
- The time frame for the delivery of the planned rehabilitation will be undertaken according to available resources and appropriate constraints.
- It is not proposed to carry out any rehabilitation in the marginal **cutover** bog zone as this is quite fragmented by private turbary.

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 bogs where there has not been significant industrial peat extraction and the peat body is largely intact (deep peat sites that are drained). At other bogs, 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), and there will therefore be different habitat outcomes (wetlands, fen, heathland, grassland and Birch woodland).
- At Turraun Bog, commercial peat extraction was undertaken up until 2018. As a result, peat depths are limited on site with residual peat being quite shallow. In addition, due to the cessation of peat extraction activities combined with previous rehabilitation efforts portions of the bog have since naturally colonised with pioneering vegetation. There are local factors that will influence the future trajectory of this site (such as it was always a relatively 'wet' bog which was never pumped nor potentially fully drained) 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 must be taken that no active rehabilitation management is carried out that could negatively and knowingly impact on surrounding land. This includes any hydrological management on neighbouring farmland. It is anticipated that the work proposed here (blocking drains and re-wetting cutaway peatlands) will not have any flooding impacts on adjacent land.
- **Archaeology**. The discovery of monuments or archaeological objects during peatland rehabilitation may potentially constrain the rehabilitation measures proposed for a particular area. If this occurs, rehabilitation measures will be reviewed and adapted. An archaeological impact assessment of the proposed rehabilitation at Turraun Bog is being carried out (Appendix IX). There are several known archaeological features. These are generally located towards the margins of the site and will not be directly affected by the proposed rehabilitation. Rehabilitation in these zones will be avoided or minimised (peat barriers located to avoid damage to any archaeological features) (Figure 8.5). Rehabilitation methodologies in these areas will be amended or the areas excluded, depending on the AIA, to minimise or remove any impact.
- **Other Constrained areas**. None.

6.2 Key Assumptions

- It is assumed that Bord na Móna will have all resources required to deliver this project. For the avoidance of doubt, should the proposed 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 only the 'standard' decommissioning and rehabilitation measures required under Condition 10, and for which financial provisions have been made, to comply with that element of the Licence.
- 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 practical rehabilitation.

6.3 Key Exclusions

The scope of this rehabilitation plan does not cover:

- The longer-term restoration trajectory of the site. The plan covers the short-term rehabilitation **actions** (see the Methodology Paper and Table AP-3) and **an additional monitoring and after-care programme** to monitor the rehabilitation 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 the development of naturally functioning peatland habitats (fen and Reed swamp). 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. 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 Turraun Bog.
- The longer-term management of this site, potentially as a nature conservation site, or for amenity, or for other uses in the future.
- The former area of Turraun Bog site, which is now a private Native Woodland Scheme and outside the BnM red line property boundary.
- The former area of Turraun Bog site that is now a Coilte forestry plantation.

7. CRITERIA FOR SUCCESSFUL REHABILITATION

This section outlines what criteria will be used to indicate successful rehabilitation and what key criteria/targets will be used to mark the achievement of the rehabilitation goals and outcomes and validate the completion of the rehabilitation.

A key objective of this 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. silt run-off).

In addition, Bord na Móna wish to optimise climate action and other ecosystem service benefits via enhanced rehabilitation measures. Enhanced rehabilitation will significantly go beyond what is required to meet rehabilitation and decommissioning obligations under existing EPA IPC licence conditions. The proposed interventions will mean that environmental stabilisation is achieved (meaning IPC obligations are met) and, in addition, significant other benefits particularly for climate action will be accrued.

In general, the key objective will be to optimise the area of suitable hydrological conditions for climate action benefits (re-wetting peat and keeping water levels close to the peat surface) across this heterogeneous cutaway landscape to accelerate the trajectory of peat re-wetting towards the establishment of naturally functioning peatland habitats (fen and Reed swamp).

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

- Rewetting of residual peat in the former area of industrial peat production to offset potential silt run off and to encourage 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 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) for at least 2 years after the rehabilitation has been completed.
- Where the section of the water body, that this bog drains to, has been identified as under pressure from peat extraction, that the intervening EPA monitoring programme associated with its Programme of Measures for this water body, confirms that there is an improving trajectory in water quality from the peat extraction associated with activities at this bog. This will be measured by the EPA WFD monitoring programme.

7.1.1 Additional criteria for successful rehabilitation for the optimisation of climate action and other ecosystem service benefits:

- Optimising the extent of suitable hydrological conditions to optimise climate action and other ecosystem service benefits (optimising residual peat re-wetting). This will be measured and demonstrated by site monitoring (updated aerial photography) to measure the extent of suitable hydrological conditions.
- Accelerating the trajectory of the site towards becoming reduced carbon source.. 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).
- 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, fen, Reed swamp, heath, scrub, Birch woodland, and embryonic *Sphagnum*-rich peatland communities, where conditions are suitable. These habitats will generally establish initially as pioneer vegetation. It will take some time for stable naturally functioning habitats to fully develop at Turraun Bog. This will be demonstrated by the reduction in bare peat and the establishment of further pioneering habitats. This will be measured via aerial photography, habitat mapping and cutaway/habitat condition assessment.
- 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	Aerial photography after rehabilitation has been completed – to demonstrate measures (drain-blocking) Establishment of a baseline for future monitoring of bare peat, vegetation establishment and habitat condition.	2021-2025
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.	2020-2023
IPC validation	Reducing pressure from peat production on the local river catchment (WFD)	No decline in the WFD status of the local river catchment from this bog	EPA WFD monitoring programme	WFD schedule
Climate action verification	Optimising the extent of suitable hydrological conditions to optimise climate action	Optimal extent of suitable hydrological conditions	Aerial photography and Habitat mapping to map extent of suitable hydrological conditions. Baseline monitoring to be carried out during the Scheme when rehabilitation is complete. Sites can be re-monitored in the future and compared against this baseline.	2021-2025
Climate action verification	Reduction in carbon emissions.	Reduction in carbon emissions	Carbon emissions – estimated using a high bog condition assessment and appropriate carbon emission factors.	2021-2025

Criteria type	Criteria	Target	Measured by	Expected Time-frame
Climate action verification	Setting the site on a trajectory towards establishment of a mosaic of compatible habitats	Establishment of compatible cutaway habitats	Habitat map, Cutaway bog condition map, permanent vegetation monitoring quadrats	2021-2025
Climate action verification	Biodiversity and ecosystem services. Habitat establishment Presence of key species – Sphagnum Breeding and wintering birds Pollinators	Improvement in biodiversity and ecosystem services.	Metrics that relate to selected biodiversity and ecosystem services (to be defined). Presence of key species – Sphagnum – Walkover survey Breeding birds – Breeding bird survey Pollinators – Pollinator walk	2021-2025

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

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

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

- **Funding to pay for resources required to deliver the planned rehabilitation (Bord na Móna and external).** Bord na Móna maintains a Provision on its balance sheet to pay for these future costs when industrial peat extraction ceases. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence. It is expected that additional costs of enhanced rehabilitation will be supported by Government through the Climate Action Fund.
- **Bord na Móna to have sufficient resources (staff and training) to deliver the planned rehabilitation with required associated skills and competencies.**
- **Bord na Móna to have sufficient resources (suitable machinery) and staff to maintain this machinery.**

- **Weather conditions to be within normal limits over the rehabilitation plan timeframe.** Long periods of wet weather have the capacity to significantly affect ground conditions and constrain the delivery of rehabilitation. The potential impact of wet weather on ground conditions can be reduced by appropriate planning and management. Bord na Móna have significant experience of managing these issues through 70 years of working in these peatland environments.
- **Rehabilitation measures to be effective.** The rehabilitation measures proposed in this plan are based on 40 years of Bord na Móna experience of peatland management and best practise applied internationally in peatland management. Measures proposed in this plan have already been shown to be 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 measures to optimise climate action. This will focus on a collecting a range of scientific data that can then quickly be adapted and into metrics that can be used to measure changes in various ecosystem services.

8. REHABILITATION ACTIONS AND TIME FRAME

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

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

These enhanced measures for Turraun Bog will include:

- Re-wetting residual peat areas on the bog using berms and field re-profiling. This 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.
- In some areas, a cut-and-fill cell bunding technique is proposed. The cut and fill cell bunding approach aims to create 'saucers' or flat bunded areas (cells) on peat with berms to hold shallow water at appropriate levels.
- Re-wetting some areas of the bog through regular field drain blocking using a dozer/excavator to create three peat barriers every 100 m along each field drain.
- Re-alignment of piped drainage.
- Initial hydrological modelling indicates that a part of the site will develop a mosaic of wetland habitats with deeper water, when pumping is reduced or stopped. 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 variable topography). Water-levels will be adjusted at outfalls and by adjusting piped drainage. More sustainable permanent gravity drainage solutions will be examined. It is expected that a natural seasonal flooding regime will develop, with water-levels fluctuating in association with levels.
- Blocking drains in targeted existing pioneering vegetation mosaics, to accelerate re-wetting, and/or manage water levels to the correct height to accelerate the current trajectory towards Reed swamp and fen, using a dozer/excavator.
- Targeted fertiliser applications to accelerate vegetation establishment on bare peat on headlands and high fields. (It is noted that the application of fertiliser may need additional assessment and approval as per the IPC Licence).
- Silt ponds will be retained and maintained during the rehabilitation phase. During the monitoring and verification phase silt ponds will be continually inspected and maintained, where appropriate. When it is deemed that silt ponds are not required, as the bog has been successfully stabilised and there is no silt run-off, the condition of the silt ponds will be reviewed. 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).

- Seedling of vegetation is not required at this site as natural colonisation and the development of pioneer habitats is already significantly progressed.

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

Type	**Code**	**Enhanced Rehabilitation Measure**	**Extent (Ha)**
Dry cutaway	DCT2	Regular drain blocking (3/100 m) + blocking outfalls and managing water levels with overflow pipes + targeted fertiliser treatment	166.1
Wetland Cutaway	WLT1	Turn off or reduce pumping to re-wet cutaway + blocking outfalls and managing water levels with overflow pipes	12.5
Wetland Cutaway	WLT2	Turn off or reduce pumping to re-wet cutaway + blocking outfalls and managing water levels with overflow pipes + Targeted blocking of outfalls within a site	30.3
Wetland Cutaway	WLT3	Turn off or reduce pumping to re-wet cutaway + blocking outfalls and managing water levels with overflow pipes + Targeted blocking of outfalls within a site + constructing larger berms to re-wet cutaway + transplanting Reeds and other rhizomes	14.6
Wetland Cutaway	WLT4	More intensive drain blocking (max 7/100 m), + blocking outfalls and managing overflows + transplanting Reeds and other rhizomes	101.4
Marginal land	MLT1	No work required (Marginal land)	194.5
Constrained areas		Rehabilitation aligned to constraints	0
Silt ponds		Silt ponds	0.7
Total			536.0

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

- Seek formal approval of the enhanced plan, noting the alternative adapted standard plan should funding from the proposed Scheme not materialise, from the EPA.
- Agree an *ex ante* budget of eligible costs (based on the approved enhanced plan) with the Scheme regulator.
- Develop a detailed site plan with detailed site drawings outlining how the various rehabilitation methodologies (The proposed Scheme PCAS) will be applied to Turraun Bog. This will take account of peat depths, topography, drainage and hydrological modelling. (See map for an indicative view of the application of different rehabilitation methodologies).
- Carry out a drainage management appraisal of the proposed rehabilitation measures.
- Carry out a review of known archaeology and an archaeological impact appraisal of the proposed rehabilitation. Incorporate the results of this appraisal into the rehabilitation plan to minimise known archaeological disturbance, where possible;
- Carry out a review of issues that may constrain rehabilitation such as known rights of way, turbary and existing land agreements. A known right of way exists along across one of the Bord na Móna margins.

- Carry out an ecological assessment of the potential impacts of the planned rehabilitation, such as the presence of sensitive ground-nesting bird breeding species (e.g. Curlew or Lapwing) or larval webs of Marsh Fritillary butterfly, etc. The scheduling of rehabilitation operations will be adapted, if needed. Surreys will be scoped and carried out based on the baseline ecological survey and previous knowledge of sites.
- Ensure all activities comply with the environmental protection requirements of the IPC Licence.

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

- Carry out proposed measures as per the detailed site plan. This will include a combination of drain blocking, peat field re-profiling and cell-bunding. All rehabilitation will be carried out with regard to best practice environmental control measures (Appendix IV);
- Monitor the success of rehabilitation measures in relation to developing suitable hydrological conditions.
- Carry out the proposed monitoring, as outlined.
- While natural colonisation is expected to commence almost immediately once peat production ceases, Phase 2 actions will be carried out in targeted areas to accelerate re-vegetation and colonisation of target species. Phase 2 actions will include fertiliser application on high fields and headlands (where there is bare peat).
- Silt-ponds will be monitored during this period and there will be continued maintenance and cleaning to prevent silt run-off 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 proposed Scheme.

8.3 Long-term (>3 years)

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

8.4 Timeframe

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

Figure 8.1. Aerial photo of Turraun Bog. Note the western lakes and wetlands and amenity trails. The former peat production area is situated towards the south-east.

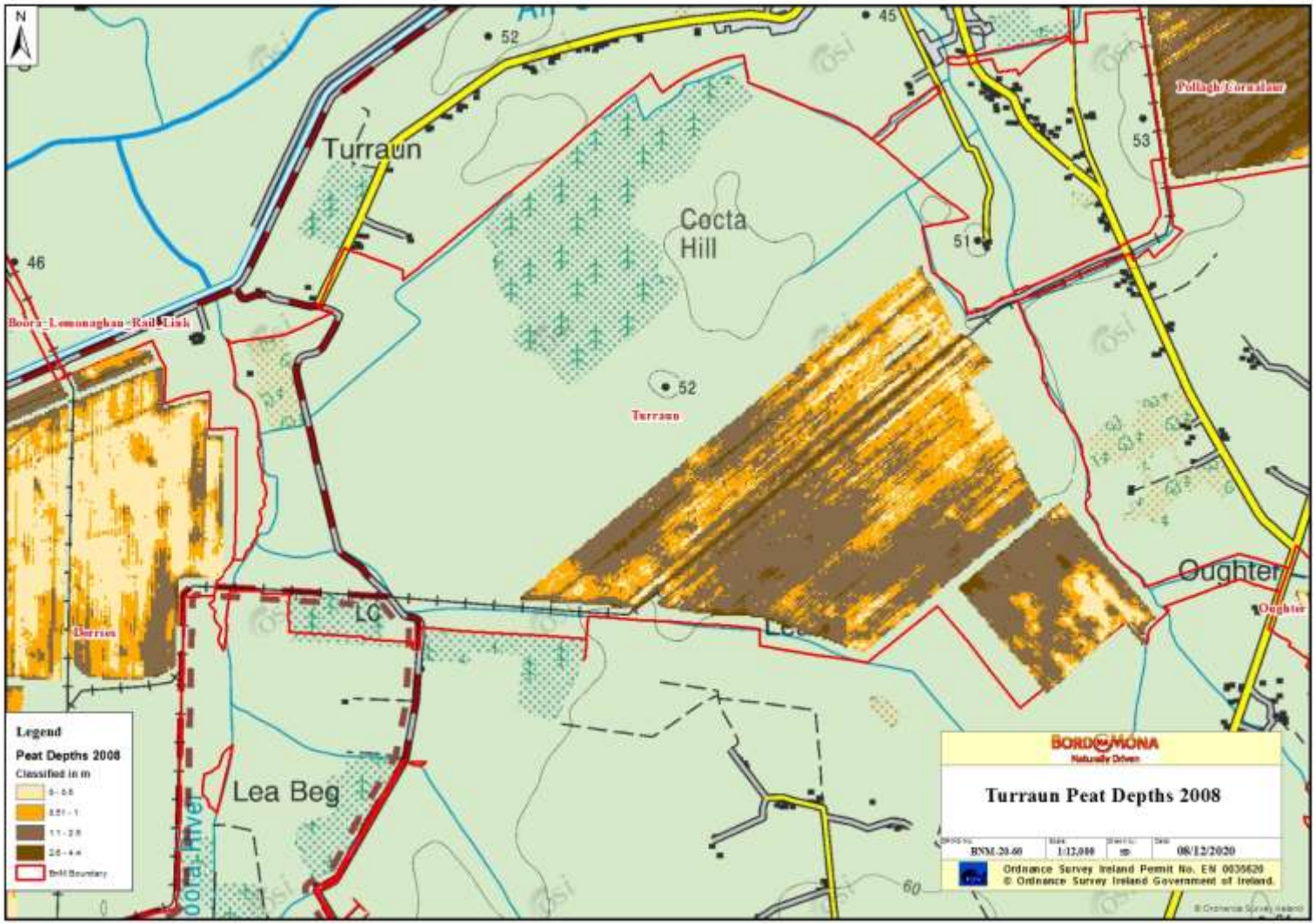


Figure 8.2. Peat depth (2008) map for Turraun Bog. Data is not available for the western side as it was cutaway

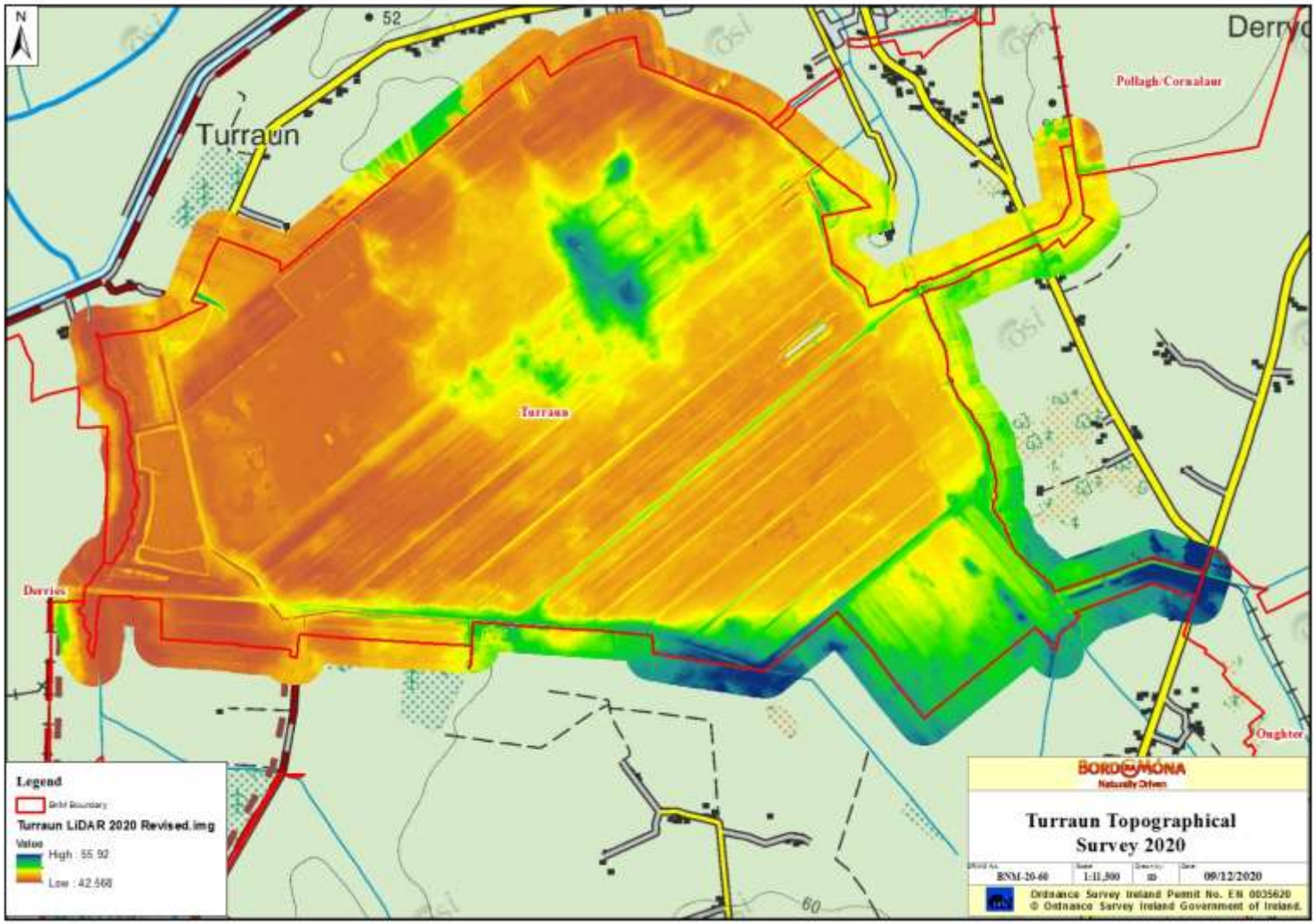


Figure 8.3. LIDAR topography map of Turraun Bog. Low areas and basins are orange-yellow, more elevated areas are blue-green. Note Cocta Hill towards the centre of the site as the elevated area in blue and green.

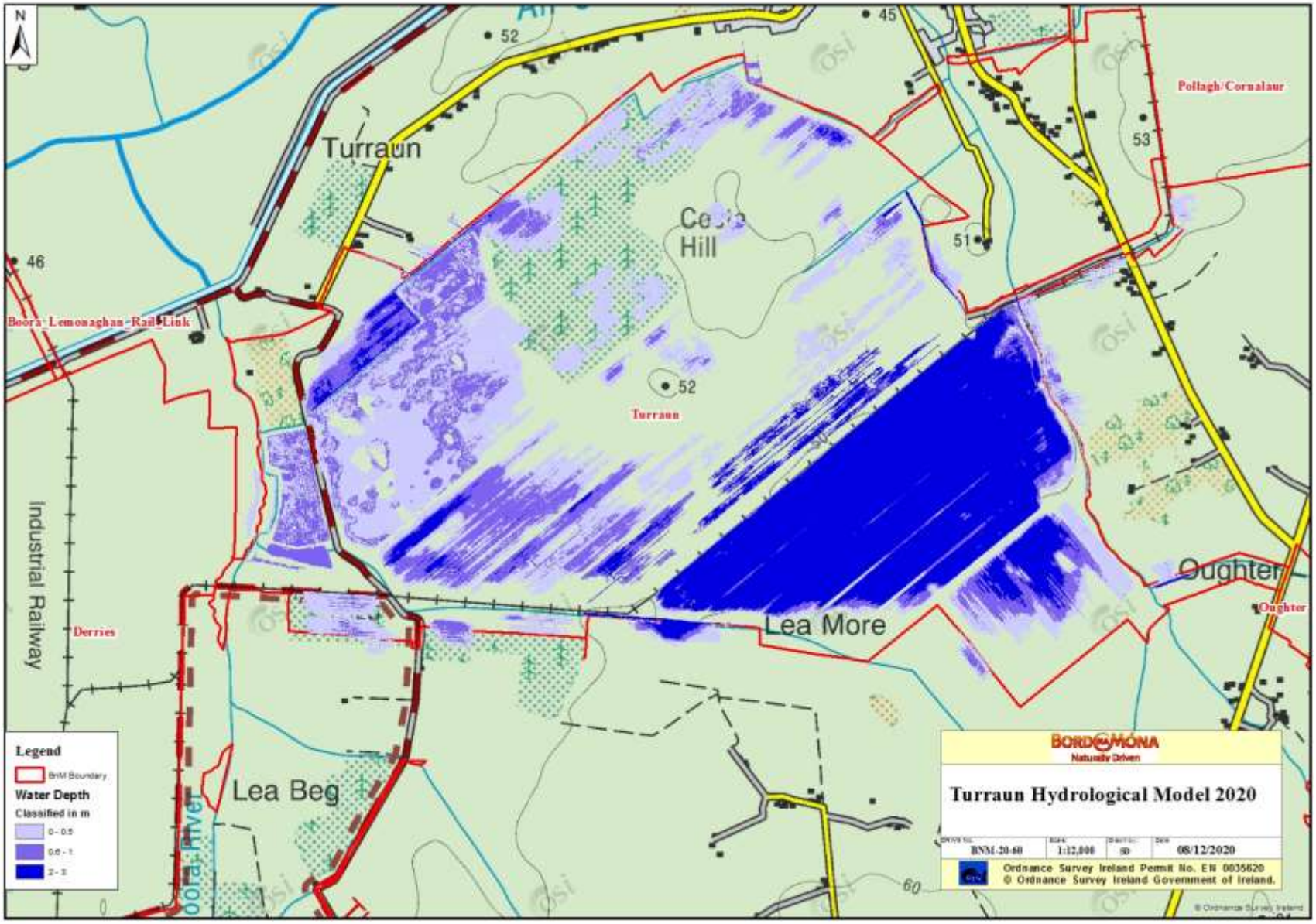


Figure 8.4. Hydrological modelling for Turraun Bog showing range of expected water depths based on current topography.

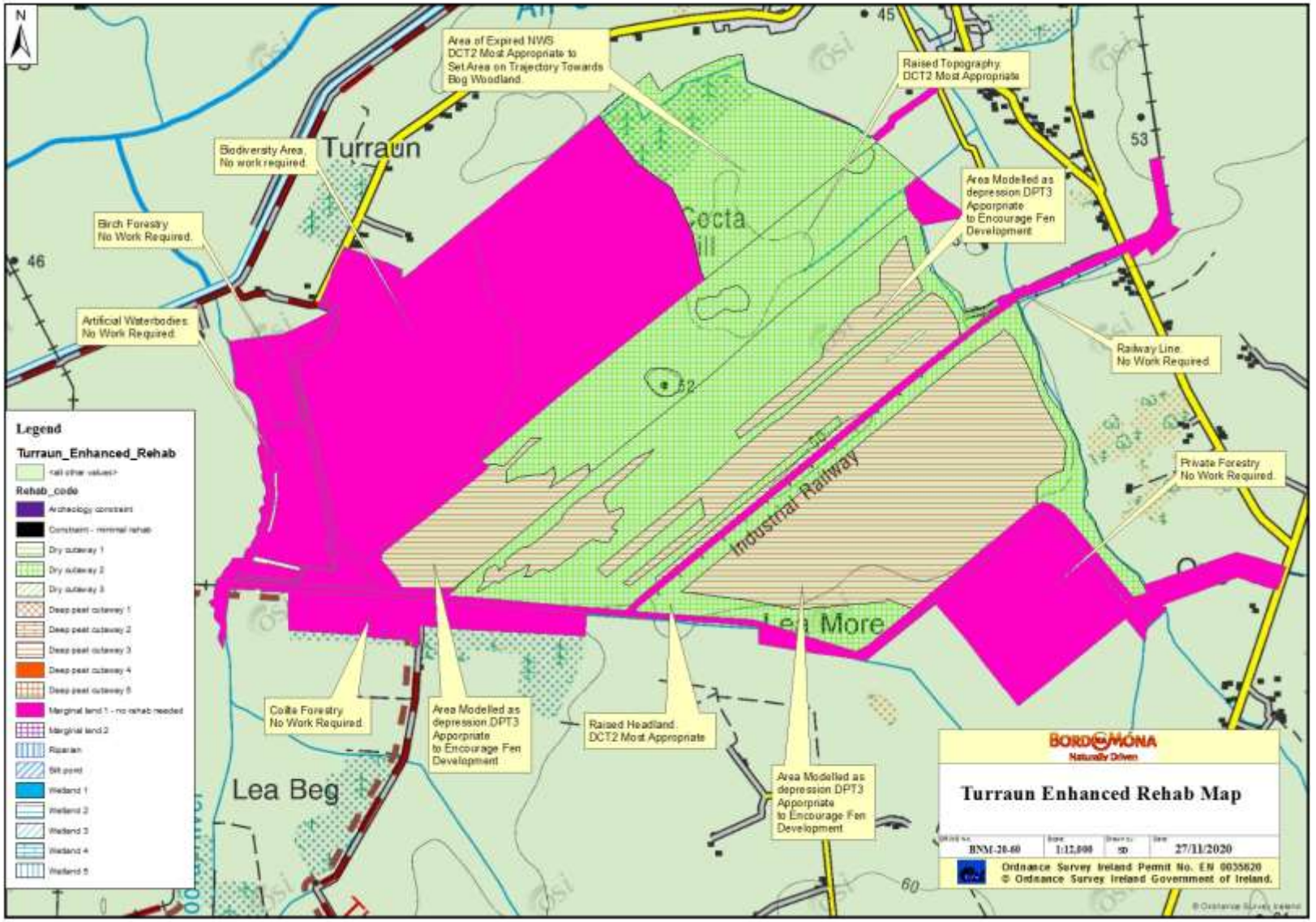


Figure 8.5. Turraun Bog Enhanced Rehabilitation Plan. Note that the actual distribution of these measures may be subject to change in response to stakeholder consultation and refinement of the enhanced rehabilitation measures.

8.5 Budget and costing

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

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

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

At this time, a 'standard' rehabilitation provision (sufficient to discharge the requirement of Condition 10 in the licence) has been be allocated to the site based on the area of deep peat habitats, wetland habitats, shallow cutaway areas, drier areas, and regenerating bog communities across the bog (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 further requirements for 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. The extent of bare peat will be assessed using this baseline data, and habitat maps will be updated.
- **Water quality monitoring** at the bog will be established. This will start in advance of the proposed rehabilitation. 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 three 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.
- Water quality monitoring will aim to include up to 70% of a bogs drainage catchments. With regard to this bog.
- Monitoring results will be maintained, trended and reported on each year as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, which will be available in April each year at www.epa.ie.
- The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD.
- This monthly sampling regime on a selected number of silt ponds will be carried out over a two-year cycle. The original (licence) requirement was for a quarterly sampling regime but this has been increased to a monthly regime to appropriately track the changing water chemistry that will occur as part of this 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 targets for successful rehabilitation are being achieved, then the water quality monitoring programme will be reviewed, with consideration of potential ongoing scientific 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 targets for successful rehabilitation have **not** been achieved, then the rehabilitation measures and status of the site will be evaluated and enhanced, where needed. This evaluation may indicate no requirement for additional enhancement of rehabilitation measures, but may

demonstrate that more time is required before key targets for successful 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 required assessment process and planning procedures.

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

- Vegetation and habitat monitoring after rehabilitation is completed using a cutaway bog condition assessment (Similar to ecotope mapping). This assessment will include assessment of on environmental and ecological indicators such as vegetation cover, vegetation communities, presence of key species, *Sphagnum* cover, bare peat cover and water levels.
- 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.

9.2 Rehabilitation plan validation and licence surrender – report as required under condition 10/4

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

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

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

10. REFERENCES

Atherton, I, Bosanquet, SDS & Lawley, M (2010). Mosses and liverworts of Britain and Ireland - a field guide. British Bryological Society.

Anderson, R., Farrell, C., Graf, M., Muller, F., Calvar, E., Frankard, P., Caporn, S., Anderson, P. (2017). An overview of the progress and challenges of peatland restoration in Western Europe. Restoration Ecology, Issue 2 Pages 271-282.

Barron, S., Egan, T., Feighery, T., Fleming, E., Healy, K., O'Boyle, D., O'Hora, A. and O'Riordan, P. (1994). Lough Boora Parklands Pre-feasibility study by Boora Enterprise Group. Brosna Press, Ferbane, Ireland.

Bord na Móna 2014. Blocking Drains in Irish raised bogs. The Bord na Móna Raised Bog Restoration Project. Cris, R. Buckmaster, S. Bain, C. Reed, M. (Eds) (2014) Global Peatland Restoration demonstrating SUCCESS. IUCN UK National Committee Peatland Programme, Edinburgh. http://www.iucn-uk-peatlandprogramme.org/sites/www.iucn-uk-peatlandprogramme.org/files/IUCNGlobalSuccessApril2014.pdf

Bord na Móna. 2016. Bord na Móna Biodiversity Action Plan 2016-2021. Brosna Press, Ferbane. http://www.bordnamona.ie/wp-content/uploads/2016/04/Biodiversity-Action-Plan-2016-2021.pdf.

Bord na Móna (2020). Bord na Móna Annual Report 2020. https://www.bordnamona.ie/wp-content/uploads/2020/07/M12822-BORD-NA-MONA_Annual-Report-2020_WEB2.pdf

Bonn, A., Allott, T., Evans, M., Joosten, H. & Stoneman, R. (2017) Peatland restoration and ecosystem Services-science, policy and practice. Cambridge University Press.

Carroll, J., Anderson, P., Caporn, S., Eades, P., O'Reilly C. & Bonn, A. 2009. Sphagnum in the Peak District. Current Status and Potential for Restoration. Moors for the Future Report No 16. Moors for the Future Partnership.

Clarke, D. and Rieley, J. 2010. Strategy for responsible peatland management. International Peat Society, Finland.

Clarke, D. (2010). Brown Gold. A history of Bord na Móna and the Irish peat industry. Gill Books.

Copland, A. (2010). Birds on Cutaway Peatlands at Boora, Co. Offaly. Internal report, Bord na Móna.

Copland, A. 2015. Assessment of environmental and community opportunities for three cutaway peatland sites in the Lough Boora Discovery Park: Drinagh, The Derries and Turraun. Cutaways for Communities: Conservation, Recreation, Education. Unpublished report prepared for Offaly Local Development Company in association with Bord na Móna.

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

Department of Communications, Climate Action and Environment 2019. National Climate Action Plan 2019. https://www.dccae.gov.ie/en-ie/climate-action/publications/Pages/Climate-Action-Plan.aspx

Department of Housing, Planning, Community and Local Government 2017. Public consultation on the River Basin Management Plan for Ireland. Department of Housing, Planning, Community and Local Government. https://www.housing.gov.ie/sites/default/files/public-consultation/files/draft_river_basin_management_plan_1.pdf

Department of Arts, Heritage and the Gaeltaght 2015. National Peatland Strategy. Department of Arts, Heritage and the Gaeltacht.

http://www.npws.ie/sites/default/files/general/Final%20National%20Peatlands%20Strategy.pdf

Eades, P., Bardsley, L., Giles, N. & Crofts, A. (2003). The Wetland Restoration Manual. The Wildlife Trusts, Newark.

Egan, T. (1998). A pilot project for the utilisation of cutaway bogs in West Offaly. In: Towards a conservation strategy for the bogs of Ireland (eds G. O'Leary and F. Gormley), pp. 119-126. Irish Peatland Conservation Council, Dublin.

Environment Agency (2013). The Knotweed code of practise. Managing Japanese Knotweed on development sites. Environment Agency, Bristol, UK. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/536762/LIT_2695.pdf

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

EPA (2019). http://gis.epa.ie/Envision. EPA Envision Map Viewer. (Last Viewed: 31/12/2019).

EPA (2020). Guidance on the process of preparing and implementing a bog rehabilitation plan. http://www.epa.ie/pubs/reports/enforcement/guidanceontheprocessofpreparingandimplementingabogrehabilitationplan.html

Farrell, C. A. and Doyle, G. J. 2003. Rehabilitation of Industrial Cutaway Atlantic Blanket Bog, NW Mayo, Ireland. Wetlands Ecology and Management, 11, 21-35.

Fernandez, F., Connolly K., Crowley W., Denyer J., Duff K. & Smith G. (2014) Raised Bog Monitoring and Assessment Survey (2013). Irish Wildlife Manuals, No. 81. National Parks and Wildlife Service, Department of Arts, Heritage and Gaeltacht, Dublin, Ireland.

Gann, G.D., McDonald, T., Walder, B., Aronson, J., Nelson, C.R., Jonson, J., Hallett, ,J.G., Eisenberg, C., Guariguata, M.R., Liu, J., Hua,F., Echeverría, C., Gonzales, E., Shaw, N., Decleer, K. & Dixon, K.W. (2019). International Principles and Standards for the practice of Ecological Restoration. Restoration Ecology 27(S1): S1–S46.

Grand-Clement, E., Anderson, K., Smith D., Angus, M., Luscombe D.J., Gatis, N., Bray L.S., Brazier R.E. (2015). New approaches to the restoration of shallow marginal peatlands Journal of Environmental Management 161.

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

Heery, S. and Finney, K. (1999). Lough Boora Parklands. Habitat Survey and Conservation Evaluation. Unpublished Report to the Lough Boora Parklands Group. Heritage Council, Ireland.

Hinde, S., Rosenburgh, A., Wright, N., Buckler, M. and Caporn, S. 2010. Sphagnum re-introduction project: A report on research into the re-introduction of Sphagnum mosses to degraded moorland. Moors for the Future Research Report 18. Moors For The Future Partnership.

Holden, J., Walker, J., Evans, M.G., Worrall, F., Bonn, A., 2008. In: DEFRA (Ed.), A Compendium of Peat Restoration and Management Projects.

Joosten, H. and Clarke, D. 2002. Wise Use of mires and peatlands – Background and Principles including a framework for Decision-making. I.M.C.G. – I.P.S., Jyväskylä, Finland.

Lally, H., Gormally, M., Higgins, T. and Colleran, E. (2012). Evaluating Different Wetland Creation Approaches for Irish Cutaway Peatlands Using Water Chemical Analysis. Wetlands 32:129-136.

Lindsay, R., 2010. Peatbogs and Carbon: a Critical Synthesis to Inform Policy Development in Oceanic Peat Bog Conservation and Restoration in the Context of Climate Change (Report to RSPB Scotland, Edinburgh).

Mackin, F., Barr, A., Rath, P., Eakin, M., Ryan, J., Jeffrey, R. & Fernandez Valverde, F. (2017) Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.

McBride, A., Diack, I., Droy, N., Hamill, B., Jones, P., Schutten, J., Skinner, A. and Street, M. 2011. The Fen Management Handbook, (2011), Scottish Natural Heritage, Perth.

Minayeva, T. et al. (2017). Towards ecosystem-based restoration of peatland biodiversity. Mires and Peat, Volume 19 (2017), Article 01, 1–36, http://www.mires-and-peat.net

McDonagh, E. (1996). Drain blocking by machines on Raised Bogs. Unpublished report for National Parks and Wildlife Service. https://www.npws.ie/sites/default/files/publications/pdf/McDonagh_1996_Drain_Blocking_Raised_Bogs.pdf.

NPWS. (2014). Review of the raised bog Natural Heritage Area network. Department of Arts, Heritage and the Gaeltacht.

NPWS. (2017a). National Raised bog Special Areas of Conservation management plan. Department of Arts, Heritage and the Gaeltacht. https://www.npws.ie/sites/default/files/files/FOR%20UPLOAD%20Plan(WEB_English)_05_02_18%20(1).pdf

NPWS. (2017b). Actions for biodiversity 2017-2021. Ireland's 3rd national biodiversity plan. Department of Arts, Heritage and the Gaeltacht. https://www.npws.ie/sites/default/files/publications/pdf/National%20Biodiversity%20Action%20Plan%20English.pdf

NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill. https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2019_Vol2_Habitats_Article17.pdf

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

NRA (2010). Guidelines on The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads. National Roads Authority.https://www.tii.ie/technical-services/environment/construction/Management-of-Noxious-Weeds-and-Non-Native-Invasive-Plant-Species-on-National-Road-Schemes.pdf.

Quinty, F. and L. Rochefort, 2003. Peatland Restoration Guide, second edition. Canadian Sphagnum Peat Moss Association and New Brunswick Department of Natural Resources and Energy. Québec, Québec.

Regan, S., Swenson, M., O'Connor, M. & Gill, L. (2020). Ecohydrology, Greenhouse Gas Dynamics and Restoration Guidelines for Degraded Raised Bogs. EPA RESEARCH PROGRAMME 2014–2020. Report No.342. (2014-NC-MS-2). EPA Research Report. Prepared for the Environmental Protection Agency by Trinity College Dublin. www.epa.ie.

Renou-Wilson, F., Keane, M., McNally, G., O'Sullivan, J. and Farrell, E.P. (2008). Developing a forest resource on industrial cutaway peatland. The BOGFOR programme. COFORD, Dublin.

Renou-Wilson F., Bolger T., Bullock C., Convery F., Curry J. P., Ward S., Wilson D. & Müller C. (2011). BOGLAND - Sustainable Management of Peatlands in Ireland. STRIVE Report No 75 prepared for the Environmental Protection Agency. Johnstown Castle, Co. Wexford.

Renou-Wilson, F., Wilson, D., Rigney, D., Byrne, K., Farrell, C. and Müller C. (2018). Network Monitoring Rewetted and Restored Peatlands/Organic Soils for Climate and Biodiversity Benefits (NEROS). Report No. 238. Report prepared for the Environmental Protection Agency. Johnstown Castle, Co. Wexford.

Rowlands, R. and Feehan, J. (2000). The ecological future of industrially milled cutaway peatlands in Ireland. Aspects of Applied Biology, 58, 263-270.

Schouten, M.G.C. (2002). Conservation and Restoration of Raised Bogs: Geological, Hydrological and Ecological Studies. Dúchas - The Heritage Service of the Department of the Environment and Local Government, Ireland; Staatsbosbeheer, the Netherlands; Geological Survey of Ireland; Dublin.

Smith, G., O'Donoghue, P., O'Hora, K. & Delaney, E. (2011). Best Practice Guidance for Habitat Survey and Mapping. The Heritage Council.

Stace, C. A. (1997). New Flora of the British Isles. Cambridge: Cambridge University Press.

Thom, T., Hanlon, A., Lindsay, R., Richards, J., Stoneman R. & Brooks, S. (2019). Conserving Bogs – Management Handbook. https://www.iucn-uk-peatlandprogramme.org/sites/default/files/header-images/Conserving%20Bogs%20the%20management%20handbook.pdf

Trodd, W. (2003). Assessment of aquatic habitats in Turraun Nature Reserve for restoration management and use of Chironomidae (diptera: insecta) as indicators of water quality. Unpublished PhD thesis, University College Dublin.

Wilson, D., Renou-Wilson, F., Farrell, C., Bullock, C. and Muller, C. (2012). Carbon Restore – the potential of restored Irish peatlands for carbon uptake and storage; CCRP Report. EPA Wexford.

Wilson, D., Dixon, S.D., Artz, R.R., Smith, T.E.L., Evans, C.D., Owen, H.J.F., Archer, E., & Renou-Wilson, F. (2015). Derivation of greenhouse gas emission factors for peatlands managed for extraction in the Republic of Ireland and the UK. Biogeosciences Discuss., 12, 7491–7535.

Wheeler, B. D., & Shaw, S. C. (1995). Restoration of Damaged Peatlands – with Particular Reference to Lowland Raised Bogs Affected by Peat Extraction. London: HMSO.

Wittram, B. W., Roberts, G., Buckler, M., King, L., & Walker, J. S. (2015). A Practitioners Guide to Sphagnum Reintroduction. Edale: Moors for the Future Partnership.

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

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

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

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

Scope of rehabilitation

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

- EPA IPC Licence - Ref. P0500-01. 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. Turraun bog is part of the Boora Bog group.
- A key objective of rehabilitation, as defined by this licence, is **environmental stabilisation** of the bog.
- The area of former industrial peat production at Turraun Bog as defined by Figure 3.1. Industrial peat production has now permanently ceased at Turraun Bog.
- Minimising potential impacts on neighbouring land. Some boundary drains around Turraun Bog will be left unblocked as blocking boundary drains could affect adjacent land.
- Land-use. Biodiversity and ecosystem services have been identified as the current primary land-use by Bord na Móna.

Rehabilitation goals and outcomes

The key rehabilitation goal and outcome for Turraun Bog is environmental stabilisation of the site via re-wetting. 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 peatland habitats.

Criteria for successful rehabilitation:

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

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

Rehabilitation indicators

- Demonstrating the delivery of the rehabilitation through site visits and through updated aerial photography (indicating presence of peat barriers, elevated water levels and re-wetting).
- Stabilising potential emissions from the site (silt run-off). The target will be developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia).

Rehabilitation measures: (see Figure Ap-1)

- Blocking field drains in the former industrial production area using a dozer to create regular peat barriers (three barriers per 100 m) along each field drain.
- Re-alignment of piped drainage.
- Realignment of gravity outfalls (where needed).
- Fertiliser treatment of bare peat areas of high fields and headlands (typically slow to naturally re-colonise) to encourage natural colonisation, if needed. (It is noted that the application of fertiliser may need additional assessment and approval as per the IPC Licence).
- No measures are planned for the surrounding marginal peatland habitats.
- Silt ponds will continue to be maintained during the rehabilitation and decommissioning.
- Evaluate success of short-term rehabilitation measures and enhance where necessary.
- Decommissioning of silt-ponds will be assessed and carried out, where required.

Timeframe:

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

Budget and Costing

- Bord na Móna maintains a Provision on its balance sheet to pay for the future costs of 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 2019). 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 has been allocated to the site based on the area of different cutaway types across the bog.

Table AP-1. Rehabilitation measures and target area.

Type	Code	Description	Area (Ha)
Dry Cutaway	DCT1	Limited drain blocking, Blocking outfalls and managing water levels with overflow pipes	177.2
Deep Peat	DPT1	Regular drain blocking (3/100 m) + blocking outfalls and managing water levels with overflow pipes	127.9
Marginal land	MLT1	No work required	230.1
Silt ponds		Silt-ponds	0.7
Total			**535.9**

Monitoring, after-care and maintenance

- There will be initial quarterly monitoring assessments of the site to determine the general status of the site, the condition of the silt-ponds, assess the condition of the rehabilitation work, asses the progress of natural colonisation, monitoring of any potential impacts on neighbouring land and general land security. The number of site visits will reduce after 2 years to bi-annually. These site visits will assess the need to any 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 appropriate 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.
- The water quality monitoring demonstrates that water quality of discharge is stabilising or improving.
- The site has been environmentally stabilised.

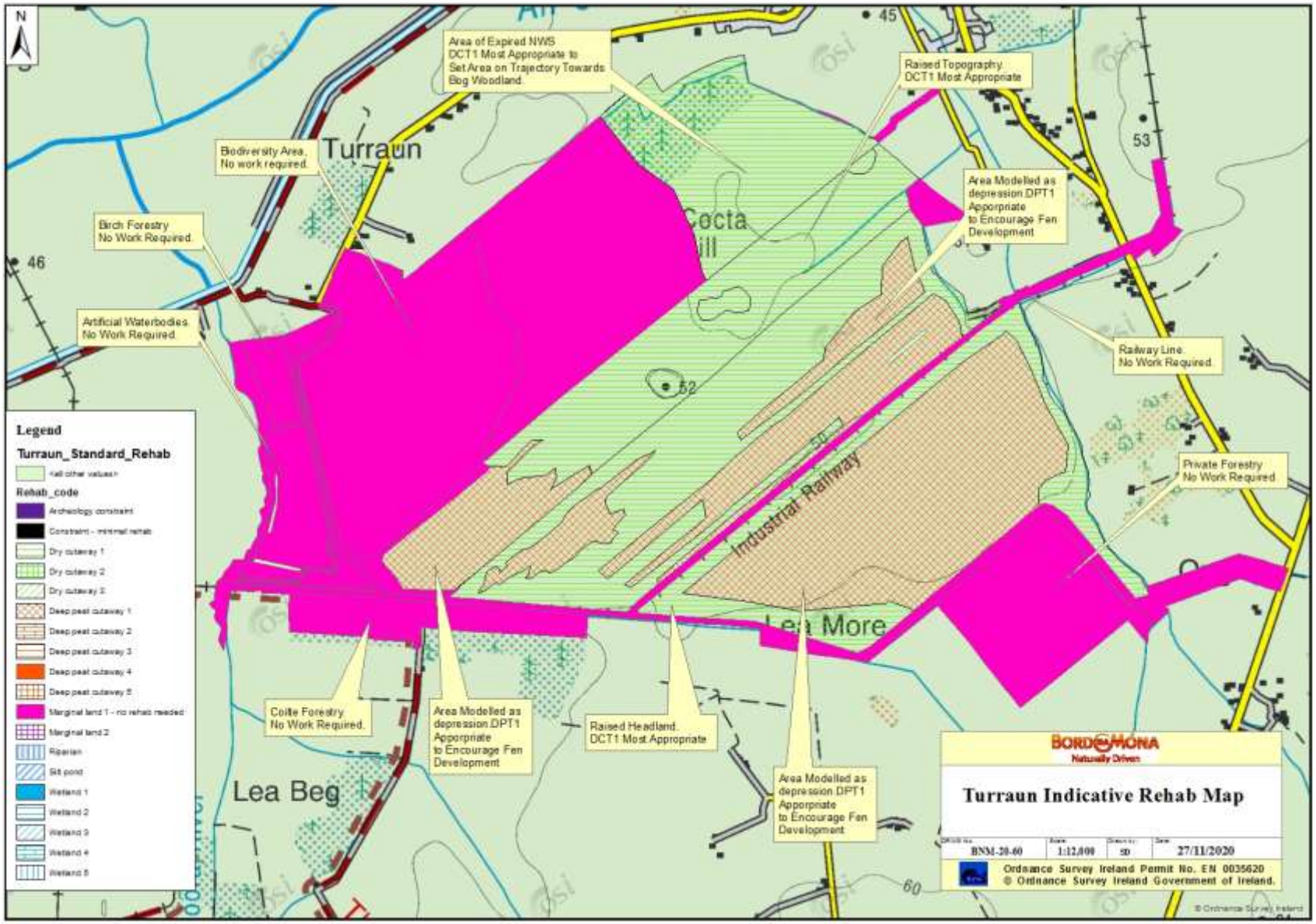


Figure Ap-1. Indicative standard rehabilitation plan for Turraun Bog.

APPENDIX II: BOG GROUP CONTEXT

The Boora group of bogs are sited between Killeigh (Offaly) in the East to Banagher (Offaly) in the West and between Kinnitty (Offaly) in the south and Clara (Offaly) in the North. The River Shannon is the major river catchment for the area with a smaller area lying within the Barrow catchment.

The Boora Group is one of the oldest bog groups in Ireland. Bord na Móna was set up in 1946 and it commenced the development of the Boora Bogs in 1946 with milled peat production commencing in 1955. Milled peat was produced in the Boora Bog for the supply of fuel peat to the power station in Ferbane which commenced power generation in 1957 and closed in 2001. The Boora bogs were also developed for the supply of milled peat to the Derrinlough Briquette factory, which commenced production in 1957.

Much of the Boora Bog complex became cutaway as it was in peat production at an early stage. A number of rehabilitation measures comprising naturalisation and development of alternative after-uses have been already explored at the Boora Bog Group, including coniferous forestry, biomass, agricultural grassland, amenity use, rare species conservation management (specifically Grey Partridge) and wetland creation. Some of this was carried out in the 1980s While agricultural fields and coniferous forestry have been developed successfully on the cutaway bogs at Boora, it was found that these require financial investment that at this time exceeds any potential commercial output value. The Lough Boora Discovery Park encompasses all areas relating to amenity and biodiversity. www.loughboora.com.

The bogs in The Boora Bog Group have been used in the past to supply milled peat for the horticultural market, local power stations (Ferbane, Shannonbridge and West Offaly Power) and Derrinlough Briquette factory.

A breakdown of the component bog areas for the Boora Bog Group IPC License Ref. PO500-01, and current, indicative Peat Production Status, is outlined in Table Ap-2. These areas are also outlined on Figure AI-2 (Map of the Boora Bog Group).

Table Ap-2: Boora Bog Group names, area and indicative status

Bog Name	Area (ha)	Indicative Peat Production Status and land-use
Killaun	359.5	Killaun is currently a horticultural peat bog and industrial peat production is expected to continue in the future, depending on future milled peat resource requirements (subject to current substitute consent applications and future planning applications for industrial peat production).
Boora	1,842.4	Milled peat production has ceased in Boora East. Milled peat production is anticipated to continue in part of Boora West for the foreseeable future, depending on future milled peat resource requirements (subject to current substitute consent applications and future planning applications for industrial peat production). The majority of Boora bog has already been rehabilitated. A significant area of cutaway bog has been re-wetted, developed as conifer forestry (Coillte) and developed as farmland (1980s). This site now forms the core of Lough Boora Discovery Park.
Pollagh/Cornalaur	280.8	Industrial peat production ceased at Pollagh Bog in 2019. There is some Emerging naturally colonising cutaway. Cornalaur was never developed or in peat extraction.
Noggusboy	917.4	Industrial peat production ceased at Noggusboy Bog West in 2019. Part of the site was developed for conifer forestry by Coillte. Part of the site was developed as Cloghan Lake, as part of Lough Boora Discovery Park, in 1999. Industrial peat production is expected to continue at Noggusboy East in the future, depending on future milled peat resource requirements (subject to

		current substitute consent applications and future planning applications for industrial peat production). There is some emerging naturally colonising cutaway.
Drinagh	1,339.1	Industrial peat production ceased at Drinagh Bog in 2019. Drinagh East is cutaway and has been extensively rehabilitated as wetland. This part of the site has extensive development of naturally functioning peatland habitats. Some Coillte conifer forestry is also present. There is some emerging naturally colonising cutaway in Drinagh West.
Killaranny	242.8	Milled peat production is anticipated to continue at Kilaranny into the future, depending on future peat resource requirements, (subject to current substitute consent applications and future planning applications for industrial peat production). A portion of the site is leased by NPWS since 2011 as a re-location area for turf cutters from nearby Clara Bog SAC.
Oughter	352.9	Oughter Bog has not been in peat production since 2012. Industrial peat extraction has now ceased at Oughter Bog. The site has naturally been re-wetting and there is already significant natural colonisation.
Galros	191.5	Milled peat production is anticipated to continue at Galros Bog for the foreseeable future, depending on future milled peat resource requirements, (subject to current substitute consent applications and future planning applications for industrial peat production). Some naturally emerging cutaway habitats are developing in part of the site.
Clongawny More	987.2	Industrial peat production ceased at Clongawny More Bog in 2019. Part of the site rehabilitated, as part of Lough Boora Discovery Park, in 1999. Some Coillte conifer forestry is also present. The site has naturally been re-wetting and there is already significant natural colonisation. Bord na Móna currently have submitted an application for renewable energy development on this bog.
Derrinboy	305.7	Milled peat production is anticipated to continue at Derrinboy Bog for the foreseeable future, depending on future milled peat resource requirements (subject to current substitute consent applications and future planning applications for industrial peat production). Derrinboy Bog supplies horticultural peat.
Moneitta	707.5	Milled peat production is anticipated to continue at Moneitta Bog for the foreseeable future, depending on future milled peat resource requirements (subject to current substitute consent applications and future planning applications for industrial peat production).
Boora_Lemanaghan_Rail_Link	6.9	Not applicable
Derries	368.2	Milled peat production has now ceased at the Derries Bog and the bog is considered cutaway. Wetland rehabilitation carried out over part of site in 1999. Amenity trackway development in 2015. Part of the Lough Boora Discovery Park. The site has now been extensively naturally colonised and is a mosaic of wetland and Birch woodland habitats.
Turraun	534.5	Milled peat production has now ceased at Turraun Bog and the bog is considered cutaway. Wetland rehabilitation carried out over part of area in 1999 as part of the Lough Boora Discovery Park. This section of the site has now been extensively naturally colonised and is a mosaic of wetland and Birch woodland habitats.
Derryclure	327.6	Milled peat production is anticipated to continue at Derryclure Bog for the foreseeable future, depending on future milled peat resource requirements (subject to current substitute consent applications and future planning

		applications for industrial peat production. Derryclure Bog supplies horticultural peat.
Lemanaghan	1,253.7	Milled peat production is anticipated to continue at Lemanaghan for the foreseeable future, depending on future milled peat resource requirements. (subject to current substitute consent applications and future planning applications for industrial peat production There is some naturally emerging cutaway habitats.
Belair North	565.7	Milled peat production is anticipated to continue at Bellair North for the foreseeable future, depending on future peat resource requirements (subject to current substitute consent applications and future planning applications for industrial peat production. There are relatively deep peat resources still present in Bellair North.
Derrybrat	171.6	Milled peat production has now ceased at Derrybrat and the bog is considered cutaway. The site has been partially rehabilitated and there is already significant natural colonisation. Some Coillte conifer forestry has been developed on the site.
Belair South	228.8	Milled peat production has now ceased at Bellair South Bog and the bog is considered cutaway.
Total	**10,983.7**	

APPENDIX III: ECOLOGICAL SURVEY REPORT

Ecological Survey Report

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

Bog Name:	**Turraun**	**Area (ha):**	581.3 ha (1436.4 acres)
Works Name:	Boora	**County:**	Offaly
Recorder(s):	MMC & DF	**Survey Date(s):**	03-04/12/2009, 07/2015

Habitats present (in order of dominance)

The most common habitats present on the industrial cutaway include:

- Open water and associated wetland habitats. A significant area is covered by the large lake in Turraun lagoon and the smaller lakes to the west of the road. These lakes have associated emergent and marginal wetland habitats such as Reedbeds (pPhrag, minor pThyp, pSch) and some Poor fen (pRos) and scrub (eBir dominated by Willow) vegetation. One of the smaller lakes is almost entirely infilled with Reedbeds (pPhrag). (Codes refer BnM classification of pioneer habitats of industrial cutaway. See Appendix II).
- Maturing Bog woodland (cBir/BirWD) and associated Birch-dominated scrub. The Biodiversity Area and the southern part of the site contain a significant amount of these habitats. There are pockets of Bog woodland developing in the most mature sections of the Biodiversity Area but the majority of it has been classified as scrub as the woodland layers are poorly defined at present.
- Pioneer Poor fen communities (pJeff, pEang) and dry grassland (gCo-An) are associated with the Birch scrub. There are small amounts of other communities such as other Poor Fen communities (pTrig), Dry Heath dominated by Heather (dHeath), grassland dominated by Purple Moorgrass (gMol) and small patches of Reeds (pPhrag, pThyp).
- The area around Cocta Hill is dominated by a mosaic of Dry Heath dominated by Heather (dHeath), Dense Bracken (pPter), dry grassland dominated by Purple Moorgrass, dry grassland dominated by Cocksfoot (gCo-An) and scrub dominated by Birch but with a significant amount of Pine (eBir/oBir). There is also some bare, exposed glacial till. There are also some bare un-colonised fields in this area.
- A significant area of the site is still bare peat with small amounts of pioneer Poor fen communities (pJeff, pEang) and Birch scrub (eBir).
- Other habitats around the site include some cutover bog (PB4), Scrub (WS1), Dense Bracken (HP1) and grassy verges (GS2), which are associated with the margins or the bog and are also found along the riparian zones and on embankments between the lakes. (Codes refer to Heritage Council habitat classification, Fossitt 2000),
- The NWS scheme is classified as immature woodland (WS2). There is also some biomass crops sown in the southern section (BC1).

Description of site

Turraun bog is part of the Lough Boora Parklands. It is located between the bogs of Oughter and The Derries. The Grand Canal flows within 0.4km of its northern boundary and the R357 Clochan to Tullamore road is situated approximately 0.7km to the south of the site. This site is notable for the large Biodiversity Area that contains some constructed wetlands on some of the oldest cutaway to have come out of production. Some sections of the cutaway were abandoned in the 1970's and Turraun Lagoon was developed in 1991-1992. The time elapsed since production has allowed the development of a rich mosaic of habitats in this area.

The site can be split up into four main sections, the southern section that is zoned on the Land-use Map as Other, the central section that is still in active production or considered production-related cutaway, the northern section that is zoned as a Biodiversity Area and contain Turraun Lagoon and the small area west of the main track through the site that contains two small lakes, some forestry and woodland.

Southern Section

This area is zoned as Other on the land-use map. The Pollagh stream flows along the north eastern edge of this section while an old railway line forms the northern boundary. The southern section has been out of production for a number of years and is developing into a mosaic of habitats through natural regeneration for the most part. The most obvious feature of this section of the site are the numerous areas of exposed gravel and glacial till. These areas are small and are the highest points in this section. They are slow to re-colonise but where vegetation exists on these mounds it is generally dry grassland (gCal) and disturbed/pioneer vegetation (DisCf) with some Birch scrub (eBir).

This section is for the most part a mosaic of habitats with bare peat, pioneer poor fen communities (pEang, pBulb, pCamp, pJeff), some temporary open water (tOW), pioneer Reedbeds (pPhrag), dry grassland (gCal gCo-An) and Birch scrub (eBir & oBir) all present. Many of the drains also contain Reedmace (pTyph). Maturing Birch scrub is most prominent along the western and southern part of this section. Part of this area along the western boundary has been fenced off as a Native Woodland Scheme and is planted with Oak and Birch. This area is not considered to be owned by BnM even though it is inside the boundary. An area of bare peat with some dHeath was located in the north western corner of this section. Several fields were also sown with a Reed Canary-grass biomass crop.

Central Section

The central section of the site is zoned as active production and production-related cutaway and is dominated by bare peat. A railway line on a tall embankment runs in an east-west direction linking the two sides of the site. The Pollagh Stream forms a boundary along part of the eastern edge of the section. At the time of the survey a large area of cutaway south of the railway line was temporarily wet (tOW) and this corresponds with some of the lowest land within this section (See LIDAR map) so water is pooling in a depression. There is some re-colonisation of the site with only several fields recently out of production and the development of pioneer Poor fen communities (pJeff, minor pEang), dry and wet pioneer grassland communities (gMol, gCal) and scattered emerging Birch scrub.

The northern part (north of the railway contains much more development of pioneer habitats including several fields that have been out of production for some time (production-related cutaway) and have therefore much more extensive development of Birch scrub. A works area along with silt traps, is located along the eastern boundary. The Silt Pond area contains a series of silt ponds, connecting drains and associated tall embankments of re-vegetating spoil (with pioneer Poor fen communities, pioneer/disturbed vegetation, dry grassland and emerging Birch scrub. A series of adjacent fields to the north are still in production and dominated by bare peat and these are divided by a band of vegetated fields. These fields for the most part contain mosaics of pioneer Poor fen communities (pJeff & pEang) and Birch scrub (eBir & oBir). However, some zonation of communities is evident along these fields that can be related to the underlying topography. Some Dry heath with frequent Heather appears in association with the other habitats to the west while the central zone is characterised by more frequent wetland communities with pioneer Bog Cotton (pEang) and pioneer Reedbed (pPhrag) prominent in association with the Birch scrub. There is also minor development of pioneer Arrowgrass-dominated vegetation (pTrig) on some of the drier areas and on some of the bare fields. Dry grassland also appears in some pockets towards each end of these fields.

Biodiversity Area (Northern section)

The northern section is zoned entirely as biodiversity and has not had any peat harvested from it for 20+ years. Some sections may have come out of production in the 1970's (Rowlands 2001). Part of this area was re-wetted in the 1990's (mainly by blocking the drainage outflows and creating an embankment along the northern boundary) to form a lake in a natural depression in the cutaway. Higgins (2007) describes this lake as an alkaline, largely clear water, mesotrophic-eutrophic lake, with a moderately diverse phytoplankton assemblage comprising a mixture of chlorophytes, cyanophytes and diatoms. The lake is situated in the western part of this section and a small road runs close to its western shore. Around this lake there is extensive and diverse development of marginal wetland communities. These communities are dominated by Reedbeds (mainly pPhrag, some pTyph and pSch), pioneer Poor Fen communities and Birch and Willow scrub. The eastern shore is particularly wet and inaccessible with significant areas of Reedbeds. One large island and many smaller islands have developed within the lake and these islands are dominated by Reedbeds with some Birch and Willow. Some of the banks around the lake

(particularly the southern bank are quite steep with no development of typical bankside/riparian vegetation and a Facebank of exposed peat has developed.

There is a natural transition along a topographical/hydrological gradient from the open water further east towards marginal wetland/scrub communities and onto maturing Bog Woodland where the cutaway becomes drier (is more elevated). It should be noted that not all the maturing bog woodland is found on higher ground. The transitional zone between the lake and the maturing Bog woodland is characterised by pioneer Poor fen communities (pEang, pRos, pJeff) along with some Reedbeds (pPhrag) and emerging and more developed Birch scrub. At the time of the survey some of this cutaway had standing water. Other drier sections contain other Poor Fen communities dominated by Soft Rush and dry grassland also appears (gC0-An) in association with the Birch scrub.

The maturing Bog Woodland is still quite immature to be described as actual woodland habitat. Pockets of this scrub/woodland are better developed than others. Much of it has a closed canopy. However, there are only small areas where a mature canopy has formed and there are distinct woodland layers such as understorey, and scrub under the canopy. The ground vegetation is also poorly formed and dominated in parts by Bramble in the drier sections.

The Bog woodland extends towards higher ground around Cocta Hill. This hill is actually a ridge that runs in a north-south direction. Some glacial sub-soil and bedrock is exposed along this ridge and other sections are covered with a much shallower layer of peat. Consequently other habitats such as Dry Heath dominated by heather (dHeath), Dense Bracken (dPter), dry grassland dominated by Purple Moorgrass and more typical dry calcareous grassland (gCal & gCo-An) communities appear on and around this ridge in association with pockets of emerging and more developed Birch scrub. Of note is the appearance of Common Reed on some of this higher ground. This higher ground is a very complex mosaic of the above habitats. There is also minor development of pioneer Arrowgrass-dominated vegetation (pTrig) on some of the drier areas and on some of the bare fields.

A NWS has been recently established by Bord na Mona to the east of the ridge. Scots Pine and Pedunculate Oak were planted. The Oak has been fenced off while the Scot Pine has been planted outside the area of the fence. Willow, Birch and Rowan are also present in this area along with naturally colonised Scot's Pine and Lodgepole Pine. Pioneer poor fen communities again become prominent along the eastern edge of this section along with maturing Birch scrub where the ground falls to lower ground towards the edge of the site.

Notable indicator species such as Black Bog-rush and ombrotrophic *Sphagnum* species have been recorded at Turraun in the past (Heery 1999, Rowlands 2001) but were not recorded during the recent survey. Black Bog rush may be an indicator of development of rich fen conditions in parts of the Biodiversity area while Rowlands (2001) recorded both *Sphagnum recurvum* and *S. cuspidatum* in some small hollows within the maturing bog woodland. C. Farrell (pers. comm 2010) also recorded these species in the emerging scrub (2006).

Western section (west of road)

This section is the smallest section on the site. Only a small band of improved grassland separates it from the adjacent Derries bog. A minor road along a high ridge forms the eastern boundary and separates the site from the main Turraun lagoon. A small area of conifer plantation has been planted in the south-west corner. Moving north, a railway line crosses the site with calcareous grassland on either side along with some bare peat and developing Gorse scrub. Two distinct small lakes have been created further north. The first is a smaller body of water that has not developed any distinctive riparian vegetation and has quite steep banks. This lake was designed for fishing and is stocked with Carp by the local anglers group. The more northerly lake is quite shallow and the majority of it has infilled with dense Reedbeds. The lakes are surrounded by tall embankments that contain developing scrub (WS1), patches of Dense Bracken (HD1), calcareous grassland (GS1 and ranker tussocky grassland (GS2). A small channel connects these two lakes. Further north a stand of maturing Bog woodland has developed in a low section of cutaway.

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

None

The Grand Canal pNHA (NPWS site code 2104) is located to the north of this site and part of the designated area along the canal is adjacent to part of the northern Turraun boundary.

Watercourses (major water features on/off site)

There are several significant water features on and around the site.

- The Boora River flows along the west side of the site and forms part of the boundary of the site. This river is part of the Brosna catchment. The riparian development along the majority of this river is poor with a deep main channel surrounded by tall embankments that are vegetated by Birch/Willow scrub, Bramble patches, rank grassland (GS2) and Dense Bracken (HP1). Two small streams flow off parts of Taurraun bog (canalised) and link to the Boora River.
- Another small tributary of the Brosna (Pollagh Stream) flows along the west side of the site and forms part of the boundary.

Peat type and sub-soils

The site is dominated by *Phragmites* peat that overlays shell marl for the most part. In some sections the peat is underlain with more gravely glacial till and other parts are under-lain with fine-grained silty clays. The Cocta Hill area is underlain with gravel with sand and clay (glacial drift material composed of calcareous limestone).

Fauna biodiversity

Several bird species were noted on the site during the survey. Copland (2008, 2009) outlines in detail breeding bird and wintering water-bird usage of this site.

- A pair of Kestrels was noted over the site.
- Whooper Swans were using the site. A max count estimated that up to 50 birds were using temporary Open Water in a wet section of the site still in active production. Whooper Swans were also using the large lake. There was continual traffic to and from The Derries on both days of the survey.
- Wildfowl were using the wetland including Moorhen, Mallard, Teal, Little Grebe and Tufted Duck.
- Snipe were routinely flushed from most sections of the site with 36 in total recorded.
- Other more common birds were noted on the site. These included Blackbird, Robin, Pheasant, Grey Crow, Rook, Meadow Pipit, Linnet, Field Fare, Blue Tit, Chaffinch and Reed Bunting. Bird activity in the Birch scrub/woodland within the Biodiversity Area was noticeably high compared to other sites surveyed during this period. Copland (2009) also notes that counts of Robin and Blackbird were almost double that of any other site and relates this to the longer development period for scrub/woodland on the site. A Jay was observed along the boundary of this section.
- A Sparrowhawk was noted on the site to the north west of the large lake on the 22nd July 2011

Mammals

- Signs of Deer (most likely Fallow Deer) were noted at several locations around the site including within the Birch scrub/woodland of the Biodiversity Area.
- Rabbit were also quite common on some of the drier sections of cutaway and several Hares were also observed during fieldwork. Grazing by Rabbits/Hares was widespread throughout the site.
- Signs of Badger foraging and footprints were quite regularly noted in the Birch scrub/woodland of the Biodiversity Area. Badger activity in this area was high, although no setts were recorded.
- Otter has been noted using the small fishing lake in 2009 and are likely to be using the large lake in the Biodiversity Area, although no signs were recorded during the survey.
- Pine Martin scats were observed in the woodland areas.

Fish

- One of the small lakes is stocked with Carp and is managed as a fishery by the local fishing club.

Fungal biodiversity

Hygrocybe cantharellus (Goblet Waxcap), *Laccaria proxima* (Scurfy Deceiver), *Clavaria argillacea* (Moor Club) and *Mycena sp*.

Activities on the site

Activities on the site include:

- Turraun is part of the Lough Boora Parklands and is promoted by Bord na Mona (www.loughbooraparklands.com) as a site for bird watching and other amenity activities such as walking. It is listed in many guide books as a visitor attraction within Co. Offaly and has been the subject of many articles in various publications. A rough track around the large lake and wetland (Turraun Lagoon) is maintained for walking. It is less accessible and less well used than other sites such as Boora Lakes and Boora Sculpture Park. A bird hide has also been erected in the NW corner of the Turraun Lagoon.
- The *Offaly Way* passes though Turraun and follows the road to the west of the site.
- The smallest lake was designed and maintained as a fishing lake. It is stocked with Carp at present by the local fishing club.

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 measures 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, work will be halted.
- Rehabilitation 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.
- Rehabilitation and decommissioning will be carried out in accordance with 'best practice' (Currently being updated). In order to ensure compliance and implementation of 'best practice', these measures will be communicated to relevant Bord na Móna staff and updated as required.

APPENDIX V: BIOSECURITY

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

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

- 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 inspecting and washing vehicles prior to entering sites.

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

In addition to the above, Best Practise measures around the prevention and spread of Crayfish plague[2] and Zebra Mussel will be adhered with throughout all rehabilitation measures and activities.

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

APPENDIX VI: POLICY AND REGULATORY FRAMEWORK

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

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

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

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

1 EPA IPC Licence

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Boora bog group (Ref. PO-500 SB). 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 Boora Bog group. This regulatory requirement is the main driver of the development of this rehabilitation plan.

2 The Peatlands Climate Action Scheme (PCAS)

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

It is envisaged that Bord na Móna carry out an enhanced decommissioning, rehabilitation and restoration, under the proposed Scheme, and supported by the Climate Action Fund across a footprint of 33,000 ha (a subset of the BnM estate that has been used for energy production). This proposed scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations under existing EPA IPC licence conditions. Interventions and measures supported by the Scheme will ensure that environmental stabilisation is achieved

(meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered. However, only the 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 proposed Scheme.

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

For the avoidance of doubt, should the proposed 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.

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

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

The NRBMP outlines how peat extraction can be a potentially significant pressure on various water quality parameters. Peatland rehabilitation of Bord na Móna cutaway (in addition to other measures) is part of the WFD

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

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

6 National Biodiversity Action Plan-2021

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

7 National conservation designations

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

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

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

Bord na Móna has played a key role in the development of the National Raised Bog Special Area of Conservation Management Plan 2017-2022 and the Review of the Raised Bog Natural Heritage Area Network. Several Bord na

Móna sites were assessed by the National Parks and Wildlife Service as part of the above Plan and Review and there is an expectation that several Bord na Móna sites will be designated as SACs and NHAs in the future. This will reinforce the network of protected raised bog sites and replace in part sites that will be de-designated as they have been deemed to be significantly damaged and are deemed to have no raised bog restoration prospects.

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

9 All-Ireland Pollinator Plan 2015-2020

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

10 Land-use planning policies

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

Turraun Bog is located in an area zoned by Offaly County Council as open countryside.

11 National Archaeology Code of Practise

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

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

- BNM must ensure that any monuments or archaeological objects discovered during peat extraction are protected in an appropriate manner by following the Archaeological Protection Procedures.
- BNM must ensure that any newly discovered monuments on Bord na Móna lands are reported in a timely manner to the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht.
- BNM must ensure that any archaeological objects discovered on Bord na Móna lands are reported immediately to the Duty Officer of the National Museum of Ireland.

- Bord na Móna will endeavour to adhere to this code of practise during the peatland rehabilitation phase and appropriate archaeology mitigation is carried out before and during cutaway peatland rehabilitation. An Archaeological Impact Assessment is being carried out for the proposed rehabilitation at this site (Appendix IX). The recommendations of this assessment will be incorporated into the rehabilitation plan to minimise impacts on known archaeology. In addition, Bord na Móna will adhere to the Archaeology Code of Practise relating to management of stray archaeological finds that may arise during cutaway peatland rehabilitation and decommissioning.

12 Bord na Móna Biodiversity Action Plan 2016-2021

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

One example of a key CBD target is:

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

The EUs headline target for progress by 2020 is to:

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

The Pollagh 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. Bord na Móna have now announced the complete cessation of industrial peat production across its estate (January 2021). Rehabilitation measures will continue to be carried out with the focus on re-wetting and rehabilitation of cutover and cutaway areas in line with national policies (such as the National Peatland Strategy, the National Biodiversity Action Plan, the Climate Action Plan 2019, the Water Framework Directive, etc.) and rehabilitation guidelines set down by the Environmental Protection Agency. To date, 15,000 hectares of cutaway and cutover bog have been rehabilitated using this approach with 5,000 hectares in active rehabilitation.

In line with Bord na Móna's accelerated decarbonisation programme, the company has also committed to a significantly larger rehabilitation target. This is reflected in our plans to rehabilitate a further 20,000 hectares of cutaway and cutover bog to wetland and woodland mosaics by 2025. In addition, we plan to restore a further

1,000 hectares of raised bog habitat by 2025. These targets are significant in both timing and scale and are indicative of Bord na Móna's increased new ambition in this area.

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

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

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

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

APPENDIX VII. DECOMMISSIONING

1. Condition 10 Decommissioning

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

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

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

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

Typically, these items/infrastructures would be 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	Turraun Decommissioning Plan
1	Clean-up of Bogs, Yards, Buildings and Offices	Clean-up of Bog
2	Cleaning Silt Ponds	Cleaning Silt Ponds
3	Decommissioning Peat Stockpiles	Peat Stockpile Management via Levelling
4	Decommissioning or Removal of Buildings and Compounds	Decommission and Removal of Porto-cabin tea centre and materials store
5	Decommissioning Fuel Tanks and associated facilities	Decommissioning and De-Gassing Mobile Fuel Tanks
6	Decommissioning and Removal of Bog Pump Sites	Not Applicable
7	Decommissioning or Removal of Septic Tanks	De-sludge Septic Tank

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

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

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

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

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

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

waste.

7.3.3 The ultimate destination of the waste.

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

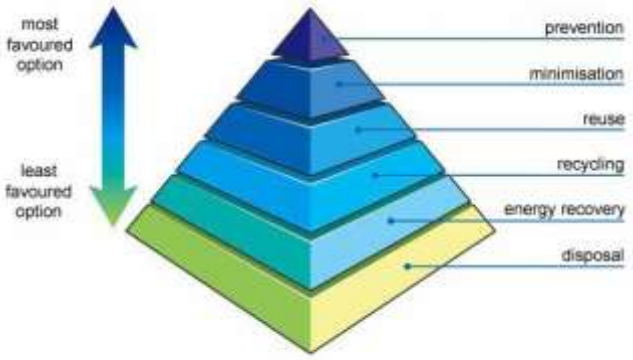
7.3.5 The tonnages and EWC Code for the waste materials listed in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* sent off-site for disposal/recovery.

7.3.6 Details of any rejected consignments.

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

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

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



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

2. Enhanced Decommissioning.

The remaining infrastructure does not constitute a risk to the environment and would not be a requirement of condition 10 of the license. 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	Turraun 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 VIII. GLOSSARY

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

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

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

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

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

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

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

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

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

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

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

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

APPENDIX IX. ARCHAEOLOGY

Archaeological Impact Assessment of Proposed Bog Rehabilitation at Turraun Bog, Co. Offaly. Dr. Charles Mount. Nov 2020.

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

1) Purpose

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

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

2) Procedure

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

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

Your Archaeological Liaison Officer is ……

3) Records

Revision Index			
Revision	Date	Description of change	Approved
1	13/19/2020	First release	EMcD
2			