Article 6(3) Appropriate Assessment Screening Report

Garryduff Bog, Co Galway
Decommissioning and Rehabilitation 2021

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1. INTRODUCTION

1.1 Background

McCarthy Keville O'Sullivan Ltd. (MKO) has been appointed to provide the information necessary to provide the information necessary to allow the undertaking of an Article 6(3) Screening for Appropriate Assessment for the decommissioning and rehabilitation of Garryduff Bog, Co Galway.

The current project is not directly connected with, or necessary for the management of any European Site, consequently the project has been subject to the Appropriate Assessment Screening process.

The assessment in this report is based on a desk study and field surveys between 2011 and 2020 by Bord na Móna and on a site visit on the 2nd of December 2020 by Inga Reich and Pat Roberts of MKO. It specifically assesses whether the proposed rehabilitation works will have any impact upon European Sites.

This report has been prepared in accordance with the European Commission guidance document 'Assessment of Plans and Projects Significantly affecting Natura 2000 Sites: Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC' (EC, 2001) and the Department of the Environment's Guidance on the Appropriate Assessment of Plans and Projects in Ireland (December 2009, amended February 2010).

In addition to the guidelines referenced above, the following relevant guidance was considered in preparation of this report:

1. *DoEHLG (2010) Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities. Department of the Environment, Heritage and Local Government,*
2. *European Communities (2018) Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission,*
3. *European Communities (2000) Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission,*
4. *Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission,*
5. *EC (2007) Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission. European Commission,*
6. *EC (2013) Interpretation Manual of European Union Habitats. Version EUR 28. European Commission.*

1.2 Appropriate Assessment

1.2.1 Screening for Appropriate Assessment

Screening is the process of determining whether an Appropriate Assessment is required for a plan or project. Consultants or project proponents may undertake a form of screening to establish if an Appropriate Assessment is required and provide advice or may submit the information necessary to allow the Screening to be undertaken. Where it cannot be excluded beyond reasonable scientific doubt, that a proposed plan or project, individually or in combination with other plans and projects, would have a significant effect on the conservation objectives of a European Site, an Appropriate Assessment (Natura Impact Statement) of the plan or project is required.

1.2.2 Appropriate Assessment (Natura Impact Statement)

The term Natura Impact Statement (NIS) is defined in legislation[1]. An NIS, where required, should present the data, information and analysis necessary to reach a definitive determination as to 1) the implications of the plan or project, alone or in combination with other plans and projects, for a European Site in view of its conservation objectives, and 2) whether there will be adverse effects on the integrity of a European Site. The NIS should be underpinned by best scientific knowledge, objective information and by the precautionary principle.

1.2.3 Statement of authority

The site visit was undertaken by Inga Reich (Honours degree in Biology, Ph.D. in Applied Ecology) and Pat Roberts (B.Sc. (Env.) MCIEEM) who has over 15 years post graduate experience in ecological consultancy and impact assessment. The report was written by Inga Reich and reviewed by Pat Roberts.

[1] *As defined in Section 177T of the Planning and Development Act, 2000 as amended, an NIS means a statement, for the purposes of Article 6 of the Habitats Directive, of the implications of a proposed development, on its own and in combination with other plans and projects, for a European site in view of its conservation objectives. It is required to include a report of a scientific examination of evidence and data, carried out by competent persons to identify and classify any implications for the European site in view of its conservation objectives*

2. DESCRIPTION OF THE PROJECT AND BASELINE ENVIRONMENT

2.1 Site details

2.1.1 Site location

Garryduff Bog is located approximately 2.5km north of Clonfert and 1km south of Shannonbridge in Co Galway (Grid Ref. E 199360 N 219997) on the western banks of the River Shannon. The L4305 runs about 1.6km to the south of the site and the bog can be accessed via a local road from the south-east. The site location is shown in Figure 2-1.

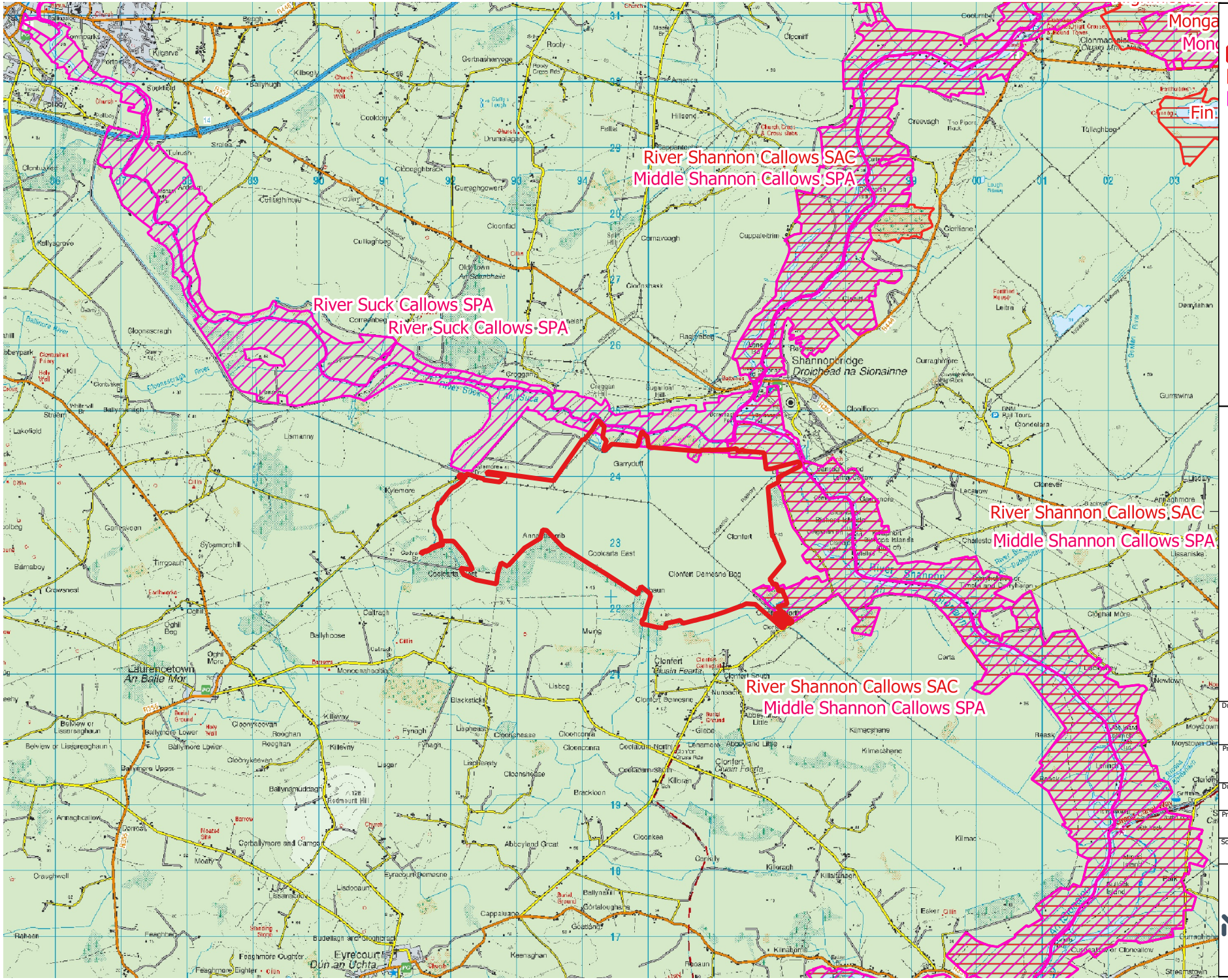
2.1.2 Site description

The site is located adjacent to the River Suck which flows along the northern boundary and meets the River Shannon which flows within close proximity of the eastern boundary. Parts of Garryduff form part of the floodplain of these rivers, resulting in regular inundation of the bog during the winter and other times when water levels are high. The surrounding landscape primarily consists of a mosaic 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.

Garryduff Bog comprises 973.73 Ha in total. Commercial peat extraction has been undertaken at the site for nearly 50 years and the peat on site was used as fuel peat supplying West Offaly Power in Shannon-bridge. As a result, most of the area is predominantly cutaway with frequently exposed marl and sub-soil and only small pockets of peat >2m depth remain. A small section in the western edge of Garryduff Bog has relatively larger deposits of peat *in situ*, with large parts of the peat in these areas more than 2.5m deep.

The majority of the underlying geology at Garryduff Bog is dark limestone and shale[2]. The underlying soils and sub-soils are classed as 'Raised Bog Cutover Peat'. Lacustrine deposits (lake deposits) are also present under the peat (lacustrine shell marl). The peat is underlain by glacial deposits interbedded with glacio-fluvial deposits over limestone bedrock in places. The glacial deposits generally consist of grey gravelly clay/silt.

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



Map Legend

- Site outline
- Special Area of Conservation
- Special Protection Area

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Drawing Title

Site Location

Project Title	Garryduff Bog, Co. Galway
	D & R 2021
Drawn By: IR	Checked By: PR
Project No.: 201008	Drawing No.: Figure 2-1
Scale: 1:75000	Date: 06.01.2021

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2.2 Characteristics of the Peatland Climate Action Scheme

2.2.1 Overview

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Blackwater bog group (Ref. P0502-01), of which Garryduff Bog is part of. As part of Conditions 10.1 and 10.2 of this license, respectively, decommissioning and rehabilitation (D & R) must be undertaken to ensure the permanent rehabilitation of the cutaway bog lands within the licensed area.

A document titled '*Garryduff Bog Cutaway Bog Decommissioning and Rehabilitation Plan 2021'* has been prepared specifically to describe the proposed D & R measures at Garryduff Bog and is appended to this document as Appendix 1.

It is proposed by Government that Bord na Móna (BnM) carry out a Peatland Climate Action Scheme (PCAS) on peatlands previously used for energy production. 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 – including Garryduff Bog. This proposed scheme will significantly go beyond what is required to meet rehabilitation obligations under existing EPA IPC licence conditions.

Decommissioning seeks to address condition 10.1 of license Ref. P0502-01, which 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.

Decommissioning must take place at each bog prior to or concurrent with rehabilitation – the scale of decommissioning per bog varies dependent on the items/ infrastructure previously in place to facilitate prior peat extraction.

Enhanced decommissioning as part of the PCAS will enhance the future after use of the bog for amenity value, security against access for illegal and unsocial activities and general State and community benefit.

Rehabilitation seeks to address the requirements of Condition 10.2 of IPC License Ref. P0502-01 and is based on a reference document prepared by BnM per Bog for which the IPC license is applicable. See the following extract from IPC License Ref. P0502-01:

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

Enhanced rehabilitation interventions supported by the above referenced 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.

2.2.2 Decommissioning and rehabilitation stage

The proposed **decommissioning** at Garryduff Bog includes:

- clean-up of bog,
- cleaning of existing silt ponds,
- peat stockpile management via levelling,
- decommissioning and de-gassing of mobile fuel tanks,
- de-sludgeing of septic tanks

If feasible, bog pump sites will be decommissioned and removed, and buildings and compounds will be decommissioned or removed.

Enhanced measures include:

- lifting of the existing rail line,
- decommissioning of existing level crossings,
- measures to restrict access to areas of the bog (where level crossings are to be removed and around silt ponds)

If feasible, high voltage power lines will be removed and bridges and underpasses will be decommissioned.

Of the 973.73 Ha, 777.45 Ha or 79.8% of the present landcover (2020) will be subject to **rehabilitation** measures. These are bespoke interventions designed to stabilise the existing baseline and meet compliance with the requirements of the existing EPA, IPC License and the proposed PCAS (Plate 2-1). Prescriptive measures are unique to the existing baseline habitats and comprise 4 no. broad categories, 1) those associated with deep peat cutover bog (Table 2-1), 2) measures associated with dry cutaway (Table 2-2) and 3) those associated with wetland cutaway (Table 2-3) and those associated with marginal lands (Table 2-4). The aim of rehabilitation is as much as possible to place existing peatlands on a trajectory towards a naturally functioning peatland system (Renou-Wilson 2012).

The proposed Garryduff rehabilitation will be undertaken using standard best practices in peatland restoration. These are based on published information in the Irish context, methodologies developed through rehabilitation trials, best practices employed elsewhere in Europe on peatland rehabilitation and restoration but also the experience of 40 years of research on the after-use development and rehabilitation of the BnM cutaway bogs (Clarke & Rieley 2010), including examples such as the BnM Raised Bog Restoration Project (Bord na Móna 2014).

Access during the D & R phase will be through the existing entrance close to Clonfert, where existing infrastructure is already in place via access tracks to facilitate the previous peat extraction.

In terms of rehabilitation, the ecological and site information collected during BnM ecological baseline surveys, additional site visits, stakeholder input, and monitoring and desktop analysis forms the basis for the planning of peatland rehabilitation at Garryduff Bog, along with:

- Significant international engagement during this period with other countries in relation to best-practise regarding peatland rehabilitation and after-use through the International Peatland 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;
- Hydrological modelling.

Methodology

Decommissioning

Decommissioning at Garryduff will involve the deployment of a work crew to collect and oversee the removal of any remaining plant or potentially contaminating waste left in situ in line with Condition 7 of License Ref. P0502-01. This condition specifically requires that BnM's procedures for the 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 the IPC license 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 EPA. Waste sent off-site for recovery or disposal shall only be conveyed to a waste contractor, as agreed by the EPA, and only transported from the site of the activity to the site of recovery/disposal in a manner which will not adversely affect the environment.

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

- The names of the agent and transporter of the waste;
- The name of the persons responsible for the ultimate disposal/recovery of the waste;
- The ultimate destination of the waste;
- Written confirmation of the acceptance and disposal/recovery of any hazardous waste consignments sent off-site;
- The tonnages and EWC Code for the waste materials listed in Schedule 2(i) Hazardous Wastes for Disposal/Recovery and Schedule 2(ii) Other Wastes for Disposal/Recovery sent off-site for disposal/recovery;
- Details of any rejected consignments.

A copy of this Waste Management record shall be submitted to the agency as part of the AER for Garryduff Bog. As required by the license, these waste items will be removed for recycling or disposal, using external contractors with the required waste collection permits, with waste records maintained as required. Where possible, BnM 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 license. Decommissioning may also include measures to restrict access to the bog or silt ponds.

Lifting of rail lines: this will be facilitated by a manual work crew either a) loading rail line components onto a trailer and removing a) direct to contractor, b) to a consolidation area via tractor, prior to disposal, or c) utilizing the rail line itself to remove the components in reverse order onto a locomotive trailer, with again, the parts being delivered up the rail line to be stored and/or disposed of, in line with IPC license conditions.

Bog area clean up: These bog areas include the parking spaces for production plant and equipment, locations for storing rail line, drainage pipes and stockpile covering. All remaining or unconsolidated old and unused polythene will be collected for recycling or disposal, depending on condition. Any remaining older and immobile plant will be brought in from bog and removed off site. Any remaining hazardous waste oils, fluids and batteries will be removed off site by qualified appropriate hazardous waste contractors. All remaining unused drainage pipes will be gathered up for reuse, recycling or disposal. All remaining, unconsolidated unused rail line sections will be collected from the bog and stored at the main access location for dismantling.

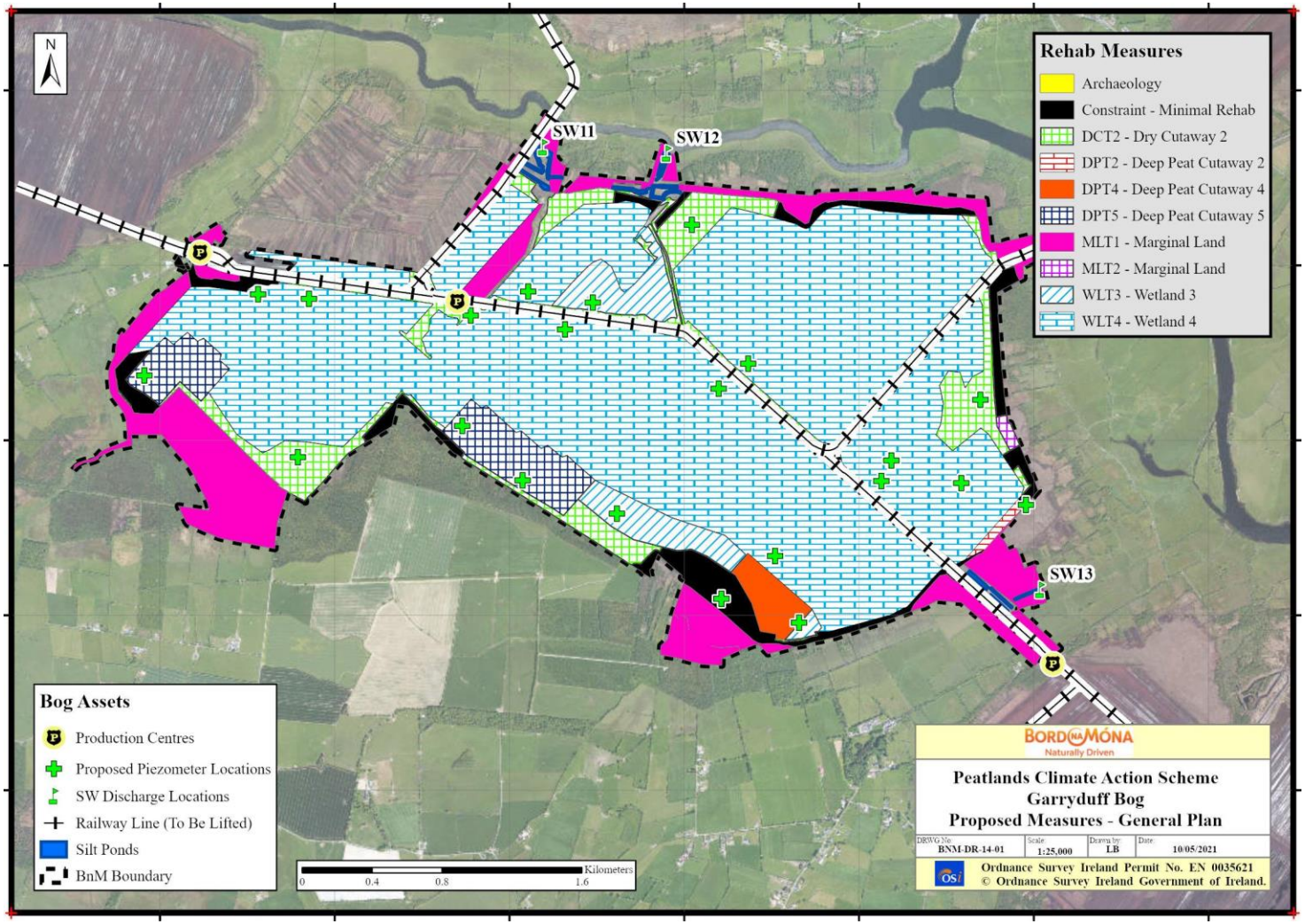

Plate 2-1 Indicative Enhanced Rehabilitation Plan for Garryduff Bog (extracted from Appendix 1)

Rehabilitation

Deep peat cutover bog rehabilitation packages

The key intervention to be applied to deep peat cutover bog is re-wetting of peat to encourage natural colonisation of typical vegetation and the development of *Sphagnum*-rich peat-forming vegetation communities. This requires managing water-levels close to the surface of the peat for most of the year (0.1m ± 0.05m). Several different approaches can be taken to this type of restoration/rehabilitation, and five rehabilitation packages with different intensities to managing suitable hydrological conditions are proposed (Table 2-1).

Table 2-1: Extent of deep peat cutover bog rehabilitation proposed at Garryduff.

Deep peat cutover bog		Extent (Ha)
DPT1	Regular drain blocking (3/100 m) + blocking outfalls and managing water levels with overflow pipes	
DPT2	More intensive drain blocking (max 7/100 m) + blocking outfalls and managing overflows	1.97
DPT3	More intensive drain blocking (max 7/100 m) + field reprofiling & blocking outfalls and managing overflows	
DPT4	Berms and field reprofiling (45m x 60m cell) + blocking outfalls and managing overflows + drainage channels for excess water + *Sphagnum* inoculation	10.57
DPT5	Cut and fill cell bunding (30m x 30m cell) + blocking outfalls and managing overflows + drainage channels for excess water + *Sphagnum* inoculation	37.65

The constituent prescriptions which combine to form the deep peat cutover bog rehabilitation packages DPT2, DPT4 and DPT5 at Garryduff Bog are further described below, namely:

1. More intensive drain blocking (max 7/100m)
2. Blocking outfalls
3. Managing water levels with overflow pipes
4. Berms and field reprofiling (45m x 60m cell)
5. Drainage channels for excess water
6. *Sphagnum* inoculation
7. Cut and fill cell bunding (30m x 30m cell)

1. More intensive drain blocking (max 7/100m) (Appendix 2, PCAS-0100-002)

This measure can be applied to cutover bog, cutaway bog and drained raised bog with different environmental characteristics. It can be applied to residual peat of various depths including deep cutover peat. The main objective is to block drains with peat barriers to raise water levels, re-wetting peat and slowing water movements through the site. Slowing water movement will have additional benefits of reducing fluvial carbon loss (via water) and also improving water quality leaving the site by reducing emissions of silt and ammonia.

The number of peat blockages per 100m is determined by the topography of the site, but an allowance has been estimated at a maximum of 7 blocks per 100m of field drain. The methodology follows NPWS guidelines published by the National Parks and Wildlife Service (Mackin *et al.,* 2017) and in line with methodologies originally developed by McDonagh (1997). The increased number of peat blockages (compared with the standard measures) will benefit re-wetting and trapping silt on cutaway with slightly greater slopes and will further slow the movement of water from these sites.

Peat blocks are constructed efficiently by excavator and bulldozer generally operating at a perpendicular direction to the field drains. The process involves clearing the drain by removing dry degraded peat/ vegetation and creating a 'key' (wider than the drain and approximately 0.5m deep) in the drain sides in order to ensure a tight seal is maintained. The drain is subsequently blocked with peat taken from a nearby 'borrow pit' (avoiding the top 0.1-0.2m) and involves placing layer after layer (about 0.3m each) of peat which are compacted in the drain using the bucket of the excavator. The blockage will be built up at

least 0.3-0.5m above the ground level of the bog to allow for subsequent shrinkage that occurs during peat drying. If vegetation was removed from the drain before clearing it, this should be placed on top of the blockage. The 'borrow pit' will be filled in with the peat that was extracted from the bottom of the drain and the sides of the pit should be pressed down and graded.

2. Blocking outfalls (Appendix 2, PCAS-0100-014).

The key objective from targeted blocking of outfalls within a bog is to re-wet peat but to manage water-levels at an appropriate level for the development of wetland and peatland vegetation. This measure optimises re-wetting of cutaway. This measure also has additional benefits of reducing fluvial carbon loss (via water) and also improving water quality leaving the site by reducing emissions of silt and ammonia.

Targeted blocking of outfalls is suitable for bogs or portions of bogs that have already had a period of natural colonisation, minimising disturbance to pioneer habitats that are already developing. It is also appropriate for locations where there is establishing habitats and where former drainage infrastructure is already starting to break down. Hydrological modelling and an understanding of site drainage is required to identify appropriate locations for targeted drain-blocking to maximise re-wetting. Drains are blocked at these locations using an excavator by lifting pipes and filling holes with peat or local sub-soils.

Again, the key objective is to manage water-levels at 0-0.01m above the peat surface for as much of the year as possible. Some deeper water is inevitable due to heterogenous topography of the cutaway. This measure can be particularly effective as outfall pipes generally run perpendicular to field drains to catch and transport water off the bog. The outfalls have been piped through high fields. Blocking pipes at the high fields means that the high fields can be converted to natural berms or embankments, creating a compartmented wetland.

An excavator is used to form a 'key' on either side of the drain which forms the outfall from the bog or field. A strip of peat is taken from the centre of the adjacent field, pushed into the drain and compacted by the bulldozer tracking over the drain block from the opposite side of the drain to the excavator. The approximate width of the block is 3-5 times the width of the drain. Blocks have to be wide enough to prevent water moving around the blockage and to prevent further leakage when the block subsides. Where possible and available, vegetation is used to cover the peat forming the outfall blockage.

3. Managing water levels with overflow pipes (Plate 2-2; Appendix 2, PCAS-0100-014).

This prescription is associated strongly with the blocking of outfalls. Following the blocking of outfalls, some high fields may require overflow pipes to be installed to manage water levels at the required height above peat surface and/or in instances where a series of high fields have been flooded using the cascade effect, the lowermost field may require the outfall to be piped and managed to facilitate access for example.

The first step is to block the existing drain where the pipe exits to stop flows. A new transverse field drain and pipe is then placed above the route of the previously blocked and now redundant pipe, to a specified invert level. The drain holding the new, raised pipe, is filled in using an excavator or bulldozer as appropriate.

Plate 2-2: Examples of installed overflow pipes

4. Berms and field reprofiling (45m x 60m cell) (Appendix 2, PCAS-0100-006)

This measure seeks to create large flat areas or cells of shallow water on bare peat, across multiple fields that are enclosed by shallow berms to retain shallow surface water. The creation of cells will help retain surface water, keeping peat wet and will further slow water movement through the cutaway.

The width of each cell will typically be four fields wide. The centre of former cambered peat production field will be used on side of the cell. Drains within the cell will be infilled. A bulldozer will be used to level and flatten the base of the cell and to infill the drains. The bulldozer will be used to remove the camber from the former peat production fields and to create a flat and level surface. Laser levels will be mounted on bulldozers to allow the machine drivers to move peat and create flat surfaces. Berms will be formed across or perpendicular to the fields using materials from the cell floor. These berms will be relatively shallow (0.3m high) and will be at least 4-5m wide. These berms will act to enclose the cell and to retain shallow surface water. Pipes will be used to manage overflows and prevent bund erosion.

The berms will be constructed using an excavator and the trench-bunding technique may be used. The trench bunding technique involves digging a new trench as a 'foundation' or key for the bund. Material is then repacked into the trench and then built up to create a bund. Additional material for the bund will be supplied by the surrounding area. The trench bunding technique improves the overall strength of the bund by creating a foundation and also reduces sub-surface flows through the bunded area.

The exact dimensions of the cells will be dependent upon the topography of the site and the heights of the various peat fields. For example, it may be appropriate to have cells that are only two fields wide where two low fields have higher fields on either side. It may not be appropriate to equalise the levels of two adjacent fields where there is a significant height difference. The length of the cells may be shorter if the fields are on a steeper gradient to that the base of the cells is flat to retain water. Such flexibility is essential to maximise water retention on site and minimise machinery and peat movements. This enhanced measure requires more intensive planning to adapt it towards varying topography.

5. Drainage channels for excess water (Appendix 2, PCAS-0100-014)

At some Bord na Móna sites, once drains and pipes are blocked, water can rise to inappropriate levels due to the localised topography (basins). Permanent deeper water can inhibit the development of wetland or peatland vegetation and large open bodies of water are not encouraged, where possible.

An excavator is used to create a V-shaped tap across a high field to allow water pass from a field with water to a field with little or none. The excavator approaches the proposed tap location along the surface of the high field. It then proceeds to excavate a V-shaped trench or drain to the desired depth to permit water to flow between the fields to either side.

This measure will allow greater management of water levels across the cutaway, the benefits of which are listed above and will help protect newly created infrastructure (cell bunds). Hydrological modelling will be key to design these new drainage channels.

6. *Sphagnum* inoculation

The main objective of this enhanced rehabilitation intervention is to accelerate the rate of natural colonisation of *Sphagnum* moss at suitable sites by introducing donor material. The presence of *Sphagnum*-rich vegetation on peatlands brings significant benefits as this is considered a potential carbon sink.

There is potential to use *Sphagnum* inoculation to establish and diversify selected small areas on target sites with *Sphagnum* species, which in turn, and in combination with natural colonisation, can then naturally colonise the remaining deep peat cutover bog area. *Sphagnum* inoculation should only be used in appropriate environmental conditions (water-logged, deep peat with stable water levels and with more acidic water chemistry).

It is proposed to use locally sourced *Sphagnum* and procured donor material, sourced from older established Bord na Móna cutover bog sites where possible, to inoculate Bord na Móna deep peat cutover bogs. Small amounts (handfuls) will be distributed into the newly created cells on deep peat cutover bog. This material can be planted into the soft peat or scattered into shallow water. The use of

significant volumes of *Sphagnum* donor material is constrained by the small amount of suitable donor material and donor sites. It is also proposed to use *Sphagnum* donor material developed in greenhouses (e.g., Beadaplugs), where suitable donor material can be made available, and where this is required.

There are significant benefits for climate action from establishing *Sphagnum*-rich peatland vegetation communities. These have been found to quickly develop as carbon sinks (> 10 years). This enhanced measure will be used in combination with some of the other enhanced re-wetting measures (cut and fill cell bunding) to accelerate and optimise the development of *Sphagnum*-rich vegetation on suitable deep peat cutaway sites.

7. Cut and fill cell bunding (30m x 30m cell) (Appendix 2, PCAS-0100-007)

This measure seeks to create large 30m x 30m flat areas ('cells') on bare peat across 3 fields per cell which are enclosed by shallow berms. The creation of the cells will help retain surface water, keeping peat wet and will further slow water movement through the bog.

As a first step, drain blocks are constructed as described under section 1 above. The centre of the cambered field is used as one side of the cell. To reprofile the field, a bulldozer is used to level and flatten the base of the cell and to infill the drains by removing the camber from the fields. Laser levels are mounted on bulldozers to allow the machine drivers to move peat and create flat surfaces to the appropriate levels.

Berms are formed 30m in length and 30m across 3 fields to create an enclosed cell. The berms are relatively shallow (0.3m high) and are 5m wide. An excavator is used to form a key (5m long) in the drain's edge where the berm crosses. A strip of peat (5m wide) is taken from the central camber of the field, pushed into the drain and compacted by the bulldozer tracking over the drain block.

The bulldozer is used to complete the central cross section of the berm by taking peat from the centre of the field and pushing it in line with the field to form a 5m wide x 0.3m high (approx.) cross berm. The peat material in the berm is compacted in layers by the dozer tracking over it. The berm edge profile is shaped by the bucket of the excavator.

Dry cutaway rehabilitation packages

The key intervention to be applied to dry cutaway is re-wetting of peat to encourage natural colonisation of typical vegetation and the development of *Sphagnum*-rich peat-forming vegetation communities. This requires managing water-levels close to the surface of the peat for most of the year (0.1m ± 0.05m). Several different approaches can be taken to this type of restoration/rehabilitation, and three rehabilitation packages with different intensities to managing suitable hydrological conditions are proposed (Table 2-2).

Table 2-2: Extent of dry cutaway rehabilitation proposed at Garryduff.

Dry cutaway		Extent (Ha)
DCT1	Blocking outfalls and managing water levels with overflow pipes	
DCT2	Regular drain blocking (3/100 m) + blocking outfalls and managing water levels with overflow pipes + targeted fertiliser treatment	88.5
DCT3	More intensive drain blocking (max 7/100 m) + blocking outfalls and managing overflows + targeted fertiliser treatment	

The constituent prescriptions which combine to form the dry cutaway rehabilitation package DCT2 at Garryduff Bog are further described, namely:

1. Regular drain blocking (3/100m)
2. Blocking outfalls (see *deep peat cutover bog rehabilitation* for details)
3. Managing water levels with overflow pipes (see *deep peat cutover bog rehabilitation* for details)
4. Targeted fertiliser treatment

1. Regular drain blocking (3/100m) (Appendix 2, PCAS-0100-008)

This measure can be applied to cutover bog, cutaway bog and drained raised bog with different environmental characteristics. It can be applied to residual peat of various depths including deep cutover peat. The main objective is to place peat blockages in drains to raise water levels, re-wetting peat and slowing water movements through the site. Slowing water movement will have additional benefits of reducing fluvial carbon loss (via water) and also improving water quality leaving the site by reducing emissions of silt and ammonia.

The number of peat blockages per 100m is determined by the topography of the site, but an allowance has been estimated at on average 3 blocks per 100m of field drain. The methodology follows NPWS guidelines published by the National Parks and Wildlife Service (Mackin *et al.,* 2017[3]) and in line with methodologies originally developed by McDonagh (1997).

Peat blocks are constructed efficiently by excavator and bulldozer generally operating at a perpendicular direction to the field drains. The process involves clearing the drain by removing dry degraded peat/ vegetation and creating a 'key' (wider than the drain and approximately 0.5m deep) in the drain sides to ensure a tight seal is maintained. The drain is subsequently blocked with peat taken from a nearby 'borrow pit' (avoiding the top 0.1-0.2m) and involves placing layer after layer (about 0.3m each) of peat which are compacted in the drain using the bucket of the excavator. The blockage will be built up at least 0.3-0.5m above the ground level of the bog to allow for subsequent shrinkage that occurs during peat drying. If vegetation was removed from the drain before clearing it, this should be placed on top of the blockage. The 'borrow pit' will be filled in with the peat that was extracted from the bottom of the drain and the sides of the pit should be pressed down and graded. A 'speed bump' peat block (approx. 5m wide) is created to allow for peat subsidence and to prevent water from flowing over the peat dam and eroding it before it becomes stabilised. This is done using a bulldozer, by taking a strip of peat from the central camber of the field, pushing it into the drain and compacting it by tracking over the drain block.

4. Targeted fertiliser treatment

Rock phosphate will be applied to headlands, high fields and other areas to accelerate establishment of vegetation either by hand or using a tractor. The application rate will be kept to a minimum.

Wetland cutaway rehabilitation packages

The key intervention to be applied to wetland cutaway is re-wetting of peat and maximisation of water retention to aid the development of wetland habitats comprising e.g., reed beds. This requires managing water-levels to reach depths of < 50cm during the summer so wetland vegetation can develop. Several different approaches can be taken to this type of restoration/rehabilitation, and five rehabilitation packages with different intensities to managing suitable hydrological conditions are proposed (Table 2-3).

Table 2-3: Extent of wetland cutaway rehabilitation proposed at Garrydulf.

Wetland cutaway		Extent (Ha)
WLT1	Turn off or reduce pumping to re-wet cutaway + blocking outfalls and managing water levels with overflow pipes	
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	
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	34.42
WLT4	More intensive drain blocking (max 7/100 m), + blocking outfalls and managing overflows + transplanting reeds and other rhizomes	603.01
WLT5	More intensive drain blocking (max 7/100 m), + field reprofiling + blocking outfalls and managing overflows + transplanting reeds and other rhizomes	

[3] *https://www.npws.ie/sites/default/files/publications/pdf/IWM99_RB_Restoration_Best%20Practice%20Guidance.pdf*

The constituent prescriptions which combine to form the wetland cutaway rehabilitation packages WLT3 and WLT4 at Garryduff Bog are further described, namely:

1. Turn off or reduce pumping (no explanation necessary)
2. Blocking outfalls (see *deep peat cutaway bog rehabilitation* for details)
3. Managing water levels with overflow pipes (see *deep peat cutaway bog rehabilitation* for details)
4. Blocking outfalls, targeted (methodology the same as in 'Blocking outfalls')
5. Constructing larger berms to re-wet cutaway
6. Transplanting reeds and other rhizomes

5. Constructing larger berms to re-wet cutaway (Appendix 2, PCAS-0100-010)

Typical existing production fields are cambered (higher) in the centre and lower towards the drains, helping drainage of the fields but limiting the re-wetting of the central area. The concept of cross berms is to slow the water movement through the bog and promote the creation of enclosed areas of wetland habitat with shallow water levels – in particular in areas where shallow peat depths remain.

First, an excavator is used to form a 'key' in the drain where the berm crosses. A strip of peat is taken from the central camber of the field, pushed into the drain and compacted by a bulldozer tracking over the drain block from the opposite side of the drain to the excavator. A 'key' is also formed similarly on the opposite side of the production field at the end of the proposed berm. Next the bulldozer is used to complete the central cross section of the berm by taking peat from the centre of the field and pushing it in line with the field to form an approximately 5m wide x 0.5m high cross berm.

6. Transplanting reeds and other rhizomes

Rhizomes will be collected from a donor area and transported to the site where they will be distributed throughout the respected area and replanted using an excavator. Through the other measures in this package, water levels will be kept high enough to encourage the development of reedbeds.

Marginal land rehabilitation packages

Depending on the habitat, marginal land might require drainage of different intensities to managing suitable hydrological conditions (Table 2-4).

Table 2-4: Extent of marginal land rehabilitation proposed at Garryduff.

Marginal land		Extent (Ha)
MLT1	No work required	113.05
MLT2	More intensive drain blocking (max 7/100 m)	1.33
MLT3	More intensive drain blocking (max 7/100 m), + blocking outfalls and managing overflows	

Most of the marginal land will require no work, while package MLT2, more intensive drain blocking (max 7/100m), is prescribed for small areas. This method has been described in the *wetland cutaway rehabilitation packages* section above.

Timescale

- Decommissioning activities will be completed within a period of 12 months but may be phased across 2 calendar years and are scheduled to be completed before the end of 2022.
- Rehabilitation activities will be completed within a period of approximately 7 months. In general, activities will be carried out between the months of April and October inclusive.
- The decommissioning stage may overlap rehabilitation activities.
- The duration of activities provided are approximate and may be slightly shorter or longer, depending on weather conditions and progress on rehabilitation prescriptions. Activities may

cease for the winter months due to rainfall and poor ground conditions. In any case, the rehabilitation period will not be longer than 1 year.
- Normal working times will be daylight hours between 08.00 and 17.30hrs Monday to Friday.

Use of natural resources

- There is no land requirement in respect of decommissioning. In total, rehabilitation activities will take place on 777.45 Ha of land. As rehabilitation through stabilisation and land cover change is the primary objective, no 'negative quality' land take is associated with rehabilitation. No land take is required for e.g., the storage of vehicles – vehicles are typically left in situ at points of work or on 'headlands'.
- No additional water is required for either decommissioning or rehabilitation.
- Regarding decommissioning, some peat or topsoil material which is contaminated may be removed in line with Schedule 2 of the IPC license. This is considered negligible in magnitude.
- During rehabilitation, minor quantities of existing peat will be excavated from drainage trenches and/or an immediately adjacent borrow pit at peat dam locations and immediately used to form peat dams. Borrow pits are re-instated, as the final step in dam creation, by the excavator driver profiling the surrounding peat/scraw into place over the excavated borrow pit. In each instance the magnitude of extracted peat is negligible. Similarly, the installation of overflow pipes may require excavation of minor quantities of peat, and/or subsoil dependent on location (Insertion of peat blockages/overflow pipes may interact with underlying subsoils where peat depths are shallow). All material used will be from the immediate vicinity and no transport of material will be required.
- Existing bare peat surfaces will be re-profiled in line with pre-defined levels where required to rewet areas of currently dry peat. This may be through use of a dozer or a screw leveller.
- Dozers will be used to create 'speed bumps' or dams across existing drainage channels adjacent to re-profiled areas, by dozing peat displaced in re-profiling into place at pre-defined blockage locations. Dozers may also be used to infill drains with peat displaced by screw levelling. For any prescriptions such as the creation of bunded cells, certain fields will be re-profiled into a succession of tiered cells with separating bunds or blockages; in some instances, these may be 'keyed', to avoid sub-surface water flow, and ensure cells retain the target depth of water.
- Reeds and other rhizomes will be transplanted into wetland cutaway.
- Deep peat cutover bog will be inoculated with *Sphagnum*.
- Hydrocarbons will be used on-site during rehabilitation activities and will be limited to the diesel or petrol fuel and mechanical oils used by any onsite site machinery and equipment.
- Fertilisers may be used to treat high fields and headlands to encourage natural colonisation.

Emissions and wastes

- Dust, noise and localised vibration along access routes arising from the arrival and departure of decommissioning vehicles or rehabilitation machinery will be localised to the access tracks or rail line, occur in low volumes and last for a negligible duration – it is common practice on BnM working bogs to leave vehicles in situ once on site, therefore daily trips into and out of the bog are not expected. Dust and noise limits are currently set on IPC licenses.
- Regarding rehabilitation, the extent of dust, noise and localised vibration from individual machines creating peat dams to block drains or blocking outfalls is momentary in duration and therefore considered negligible in magnitude. Reprofiling the surfaces of exposed peat using a 'dozer' or 'screw leveller' and creating 'speed bump' blockages or infilling drains produces a higher potential for the release of dust, however the duration of this is expected to be brief (i.e., with effects lasting less than a day). Enhanced measures where bunded cells are created may take longer duration.
- Fuel and some pipes may require to be delivered. No blasting or piling is required.
- General waste will arise from the presence of staff. Very small quantities of chemical waste will be generated, this waste is limited to solid waste oil, such as oily rags.
- A small works/tea hut is available at Garryduff Bog.

2.2.3 Operational stage

Operational activities

- Operational activities will mainly comprise non-intrusive environmental & ecological monitoring (including surface water monitoring, vegetation monitoring but also the use of drones to provide catalogues of aerial photography) and may also include minimal works such as repairs to existing peat blockages, adjustment of overflow pipes (where required) and fertilisation to increase successional rates.
- Maintenance of existing silt ponds to reduce emissions to local water bodies, as conditioned by the existing IPC license, will still be required.
- Access will be through the existing entrance close to Clonfert, where existing infrastructure is already in place via access tracks to facilitate the previous peat extraction.

Timing and duration of operational activities

- It is expected that scheduled inspection and maintenance activities will be carried out by a 2-4 person team, typically for 1 day per month, for the foreseeable future.
- Once constructed and commissioned, the proposed decommissioning and rehabilitation will remain permanently in place.

Use of natural resources

- There is limited requirement for the use of natural resources – negligible quantities of peat or subsoil may be used to repair existing or create additional drain blocks.

Emissions and wastes

- There will be negligible exhaust fumes, dust and noise emitted by maintenance vehicles and or other equipment such as drones during occasional maintenance works, such as to outflows.
- Collectively, re-wetting and re-vegetating will minimise any risk of emission to air from dust. During the operational stage of peatland rehabilitation, typical emission of dust from exposed peat to air is expected to cease.
- Following rehabilitation and into the early operational stage Garryduff Bog may continue to be a carbon source, however as habitats stabilise following intervention, the bog is expected to, over time, become a carbon sink in part.

2.3 Description of the baseline ecological environment

Assessing the impacts of any project and associated activities requires an understanding of the ecological baseline conditions prior to and at the time of the project proceeding. Ecological Baseline conditions are those existing in the absence of proposed activities (CIEEM, 2018).

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, Garryduff Bog was surveyed in February and June 2010 and resurveyed in 2014. Additional ecological monitoring and visits have taken place at Garryduff Bog between 2013-2020 to inform rehabilitation planning and habitat maps have been updated, where required. The latest visit by BnM took place in August 2019. The 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). 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 Atherton *et al.* (2010). A more detailed BnM classification system was previously developed for classifying pioneer cutaway habitats as Fossitt categories were deemed not to be detailed enough for cutaway bog (much of cutaway bog could be classified as Cutover Bog - PB4). Much of the pioneer cutaway vegetation is still at an early stage of its development and cannot be assigned to Fossitt Level 3 categories yet.
A detailed ecological survey report for Garryduff Bog is contained in Appendix III of Appendix 1.

A walkover survey was conducted on the 2nd of December 2020 by Inga Reich, Pat Roberts and Chris Cullen to confirm the ecological baseline as identified by Bord na Móna in the preceding surveys and as shown in the habitat map (Figure 2-2). During the survey, a number of whooper swans were flying over the site on several occasions and identified in parts of the bog and a merlin was observed perching on a tree on the site.

Garryduff Bog comprises extensive areas dominated by bare peat with emerging pioneer vegetation, parts of the cutaway have well developed wetland and scrub vegetation. These are classified by BnM as **bare peat (PB4)**, pioneer poor fen community, (emergent) birch **scrub (WS1)**, temporary open water or a mosaic of these habitats.

Garryduff includes several undeveloped or partially developed sections around the margin of the production bog that have been designated as part of River Shannon Callows SAC, Middle Shannon Callows SPA and Suck River Callows SPA and NHA. Some of the remnant **high bog (PB1)** is within the designated boundary, although it is quite degraded. These designated areas also include other typical marginal habitats such as **wet grassland (GS4)**, **scrub (WS1)** and **bog woodland (WN7)**. They also act as part of a buffer between the former production bog and the main channels of both rivers. Small undeveloped sections within the production bog include patches of **bog woodland (WN7)** dominated by birch (*Betula spp.*), **scrub (WS1)** and disturbed **raised bog (PB1)** in poor condition. Sections of birch-dominated **bog woodland (WN7)** and **wet grassland (GS4)** are located along the margins of the site. The areas of callows-type **wet grassland (GS4)** are managed as seasonal grazing are located along the banks of the River Suck, a **depositing/lowland river (FW2)**.

A stream flows into the River Suck at the eastern boundary of the site with the last 500m above ground. The above ground sections of the stream contain riparian habitats such as **bracken (HD1)**, **scrub (WS1)**, **wet grassland (GS4)** and **riparian woodland (WN5)** comprised of oak (*Quercus* spp.), ash (*Fraxinus excelsior*), alder (*Alnus glutionsa*), purging buckthorn (*Rhamnus cathartica*), willow (*Salix* spp.) and birch. To the south of the stream a band of **scrub (WS1)** is located between the production bog and the **wet grassland (GS4)** that runs parallel to the River Suck. This area is not dense scrub and contains tree species such as crab apple (*Malus sylvestris*), purging buckthorn and blackthorn (*Prunus spinosa*) with an under storey of bracken (*Pteridium aquilinum*) and bramble (*Rubus fruticosus*).

Plate 2-3 View of the typical lines of bare peat surface alternating with early pioneering vegetation communities and birch scrub across Garryduff Bog (April 2021).

2.3.1 Consequences of proposed rehabilitation for current habitats

Much of Garryduff Bog is expected to develop wetland habitats with a mosaic of fen, reed swamp, wet woodland and scrub. Birch woodland is expected to develop on the drier mounds and peripheral headlands. Parts of the bog with residual deeper peat have potential to develop *Sphagnum*-rich habitats. Habitats currently evaluated as not requiring rehabilitation (i.e., marginal land, railway line) will remain in line with existing baseline trends for these habitats.

Drawing Title
Current habitats

Project Title
Garryduff Bog, Co. Galway
D & R 2021

Drawn By	Checked By
IR	PR
Project No.	Drawing No.
201008	Figure 2-2
Scale	Date
1:25000	06.01.2021

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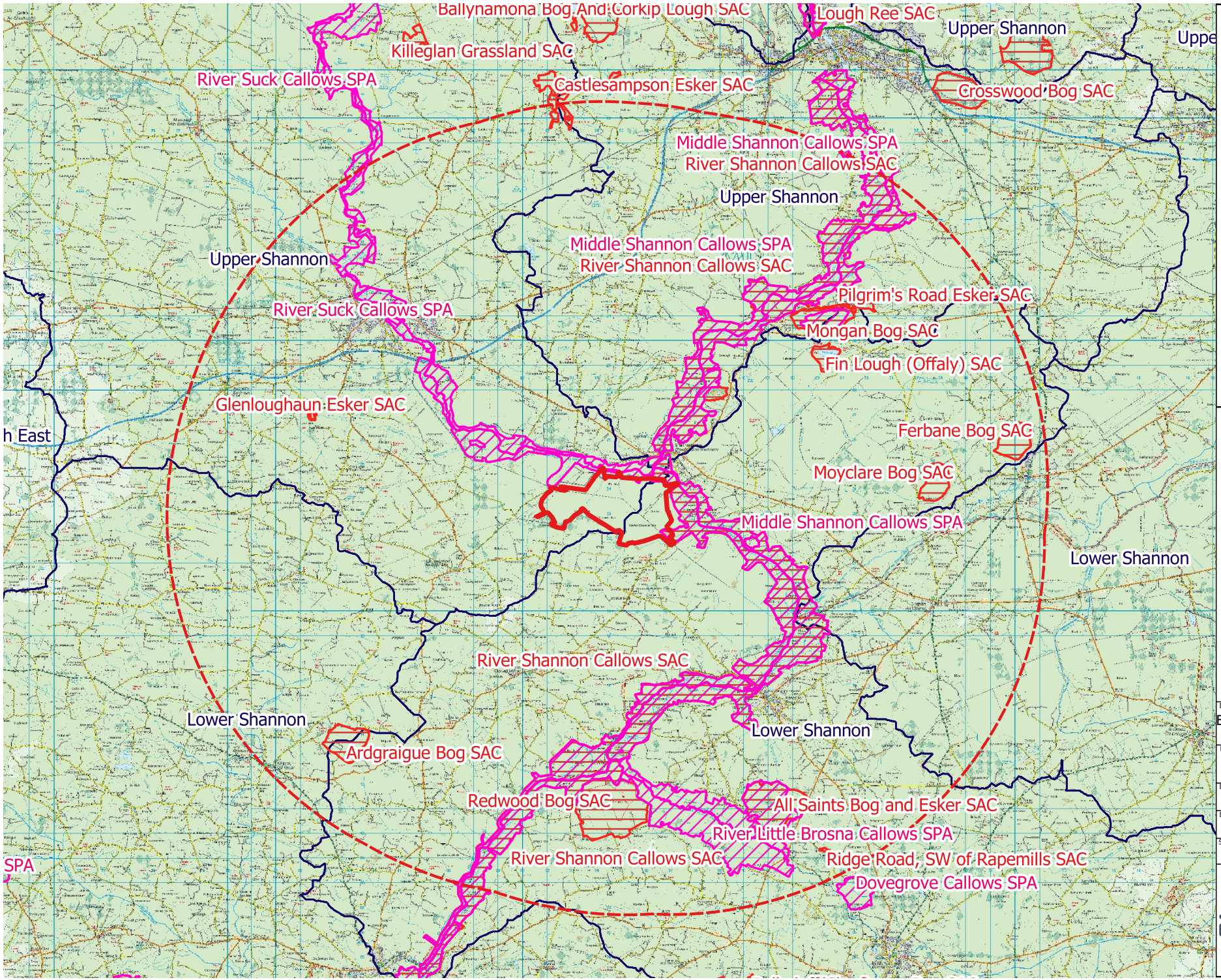
3. IDENTIFICATION OF RELEVANT EUROPEAN SITES

3.1 Identification of the European Sites within the Likely Zone of Impact

The following methodology was used to establish which European Sites are within the Likely Zone of Impact of the proposed development:

- Initially the most up to date GIS spatial datasets for European designated sites and water catchments were downloaded from the NPWS website (www.npws.ie) and the EPA website (www.epa.ie) on the 15/12/2020. The datasets were utilized to identify European Sites which could feasibly be affected by the proposed development.
- All European Sites within a distance of 15km surrounding Garryduff Bog were identified and are shown on Figure 3.1. In addition, the potential for connectivity with European Sites at distances of greater than 15km from the site was also considered in this initial assessment. In this case, no potential for the proposed works to result in significant effects on sites located at a distance of over 15km from Garryduff Bog was identified.
- The catchment mapping was used to establish or discount potential hydrological connectivity between Garryduff Bog and any European Sites. The hydrological catchments are also shown in Figure 3.1.
- In relation to Special Protection Areas, in the absence of any specific European or Irish guidance in relation to such sites, the Scottish Natural Heritage (SNH) Guidance, *'Assessing Connectivity with Special Protection Areas (SPA)'* (2016) was consulted. This document provides guidance in relation to the identification of connectivity between proposed development and Special Protection Areas. The guidance takes into consideration the distances species may travel beyond the boundary of their SPAs and provides information on dispersal and foraging ranges of bird species which are frequently encountered when considering plans and projects.
- Table 3-1 provides details of all relevant European Sites as identified in the preceding steps and assesses which are within the likely Zone of Impact. The assessment considers any likely direct or indirect impacts of the rehabilitation works, both alone and in combination with other plans and projects, on European Sites by virtue of the following criteria: size and scale, land-take, distance from the European Site or key features of the site, resource requirements, emissions, excavation requirements, transportation requirements and duration of the works were considered in this screening assessment.
- The site synopses and conservation objectives of these sites, as per the NPWS website (www.npws.ie), were consulted and reviewed at the time of preparing this report 15/12/2020.
- Where potential pathways for Significant Effect are identified, the site is included within the Likely Zone of Impact and considered in the Screening Assessment.



Map Legend

- Site outline
- Special Area of Conservation
- Special Protection Area
- Water Framework Directive Catchments

N

Drawing Title: European Sites within 15km of Garryduff Bog

Project Title: Garryduff Bog, Co. Galway
D & R 2021

Drawn By	Checked By
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Drawing No. 201008	Drawing No. Figure 3-1
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Table 3-1 Identification of European Sites within Likely Zone of Impact

European Sites and distance from Garryduff Bog	Qualifying Interests/Special Conservation Interests for which the European Site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 08/01/2021)	Conservation Objectives	Likely Zone of Impact Determination
Special Area of Conservation			
River Shannon Callows SAC [000216] **Distance:** 0km	› [1355] Otter (*Lutra lutra*) › [6410] *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) › [6510] Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) › [8240] Limestone pavements › [91E0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)	This site has the generic conservation objective: '*To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected.*' (NPWS (2020) Conservation objectives for River Shannon Callows SAC [000216] Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht.)	Pathways for direct effects to habitats were identified due to an overlap between this SAC and Garryduff Bog. Based on the site visit, desk study and habitat survey of Garryduff Bog carried out by BnM, none of the QI habitats are found within the site and it is considered that pathways for direct effects to these habitats from any proposed activities at Garryduff Bog can reasonably be excluded. The only activities within the areas overlapping with the SAC comprise the ongoing maintenance of the existing silt ponds (as part of the IPC license requirement), which will be accessed from existing cutaway bog or previously used tracks, and light works to maintain the hydraulic breaks on the margins of the bog or to manage existing outfalls. These works may involve the removal of debris or some re-grading or deepening of the existing drains without changing the footprint and will be carried out only as required, likely less than once a year. There will be no requirement to create new drains. In conclusion, direct effects on habitats within the SAC are evaluated as negligible in magnitude, reversible and unlikely to impact on conservation objectives. The is no complete source-impact-pathway for the following habitats due to their terrestrial nature and distance from the site:

European Sites and distance from Garryduff Bog	Qualifying Interests/Special Conservation Interests for which the European Site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 08/01/2021)	Conservation Objectives	Likely Zone of Impact Determination
			› [6410] *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) › [6510] Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) › [8240] Limestone pavements As such, there is no potential for indirect effects on these habitats. Following the precautionary principle, a potential pathway for effect on the following QI habitat and species was identified through surface water connectivity: › [91E0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) › [1355] Otter (*Lutra lutra*) However, the objective of the works involved in the D & R is to stabilise and restore the bog. These works are specifically designed to reverse the drainage of the bog and to minimise the run off of waters from it. The works will be similar in intensity to the active production that was undertaken until recently, but will be less invasive, short term and will involve an estimated six machines/crews working at any one time on the bog for an expected period of 2-3 years. There is no potential for these works to result in significant effects on downstream watercourses and

European Sites and distance from Garryduff Bog	Qualifying Interests/Special Conservation Interests for which the European Site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 08/01/2021)	Conservation Objectives	Likely Zone of Impact Determination
			ecological receptors as the works primarily involve the blocking of drainage pathways from the bog. Following the implementation of the PCAS, there will be no possibility of further effects. As such, in the absence of any mitigation, there is no potential for any significant effect on these QI receptors as a result of water pollution or change to the hydrological regime within the SAC. In addition to the above, it is noted that the silt ponds that are in place as part of the existing IPC licenced activity will continue to be maintained under the conditions of that licence and operated until the bog is fully stabilised. The potential for disturbance to otter, where it occurs outside the SAC was also assessed. Otter has been sighted on the production bog by BnM staff on occasion. However, the proposed D & R activities works will not result in any loss of otter habitat, are short term and will not be occurring over the entire bog at any one time, leaving much of the bog and potential otter habitat completely undisturbed. Hence. there is no potential for the works, in the absence of any mitigation, to result in significant disturbance to this QI species. **There is no potential for significant effects on this SAC and no further assessment is required.**
Fin Lough (Offaly) SAC [000576]	› [7230] Alkaline fens	Detailed conservation objectives for this site	There will be no direct effects on this SAC as the project footprint is located entirely outside the designated site.

European Sites and distance from Garryduff Bog	Qualifying Interests/Special Conservation Interests for which the European Site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 08/01/2021)	Conservation Objectives	Likely Zone of Impact Determination
Distance: 7.4km	› [1013] Geyer's whorl snail (*Vertigo geyeri*)	(Version 1, February 2019) were reviewed as part of the assessment and are available at www.npws.ie	Due to the absence of a hydrological connection and the distance from the site, no complete source-impact-pathway was identified for the QI habitat and species. As such, there is no potential for indirect effects to occur. **This site is not in the Likely Zone of Impact and no further assessment is required.**
Mongan Bog SAC [000580] **Distance:** 7.9km	› [7110] Active raised bogs › [7120] Degraded raised bogs still capable of natural regeneration › [7150] Depressions on peat substrates of the Rhynchosporion ›	Detailed conservation objectives for this site (Version 1, April 2016), were reviewed as part of the assessment and are available at www.npws.ie	There will be no direct effects on this SAC as the project footprint is located entirely outside the designated site. Due to the terrestrial nature of the QI habitats and the distance from the site, no complete source-impact-pathway was identified. As such, there is no potential for indirect effects to occur. **This site is not in the Likely Zone of Impact and no further assessment is required.**
Pilgrim's Road Esker SAC [001776] **Distance:** 8.3km	› [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites	Detailed conservation objectives for this site (Version 1, July 2018), were reviewed as part of the assessment and are available at www.npws.ie	There will be no direct effects on this SAC as the project footprint is located entirely outside the designated site. Due to the terrestrial nature of the QI habitat and the distance from the site, no complete source-impact-pathway was identified. As such, there is no potential for indirect effects to occur.

European Sites and distance from Garryduff Bog	Qualifying Interests/Special Conservation Interests for which the European Site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 08/01/2021)	Conservation Objectives	Likely Zone of Impact Determination
			This site is not in the Likely Zone of Impact and no further assessment is required.
Redwood Bog SAC [002353] **Distance:** 9.4km	› [7110] Active raised bogs › [7120] Degraded raised bogs still capable of natural regeneration › [7150] Depressions on peat substrates of the Rhynchosporion	Detailed conservation objectives for this site (Version 1, December 2015) were reviewed as part of the assessment and are available at www.npws.ie	There will be no direct effects on this SAC as the project footprint is located entirely outside the designated site. Due to the terrestrial nature of the QI habitats and distance from the site, no complete source-impact-pathway was identified. As such, there is no potential for indirect effects to occur. **This site is not in the Likely Zone of Impact and no further assessment is required.**
Glenloughaun Esker SAC [002213] **Distance:** 9.8km	› [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites	Detailed conservation objectives for this site (Version 1, June 2018), were reviewed as part of the assessment and are available at www.npws.ie	There will be no direct effects on this SAC as the project footprint is located entirely outside the designated site. Due to the terrestrial nature of the QI habitat and the distance from the site, no complete source-impact-pathway was identified. As such, there is no potential for indirect effects to occur. **This site is not in the Likely Zone of Impact and no further assessment is required.**
Moyclare Bog SAC [000581] **Distance:** 9.8km	› [7110] Active raised bogs	Detailed conservation objectives for this site	There will be no direct effects on this SAC as the project footprint is located entirely outside the designated site.

European Sites and distance from Garryduff Bog	Qualifying Interests/Special Conservation Interests for which the European Site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 08/01/2021)	Conservation Objectives	Likely Zone of Impact Determination
	› [7120] Degraded raised bogs still capable of natural regeneration › [7150] Depressions on peat substrates of the Rhynchosporion	(Version 1, November 2015) were reviewed as part of the assessment and are available at www.npws.ie	Due to the terrestrial nature of the QI habitats and the distance from the site, no complete source-impact-pathway was identified. As such, there is no potential for indirect effects to occur. **This site is not in the Likely Zone of Impact and no further assessment is required.**
All Saints Bog and Esker SAC [000566] **Distance:** 10.2km	› [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) › [7110] Active raised bogs › [7120] Degraded raised bogs still capable of natural regeneration › [7150] Depressions on peat substrates of the Rhynchosporion › [91D0] Bog woodland	Detailed conservation objectives for this site (Version 1, March 2016) were reviewed as part of the assessment and are available at www.npws.ie	There will be no direct effects on this SAC as the project footprint is located entirely outside the designated site. Due to the terrestrial nature of the QI habitats and distance from the site, no complete source-impact-pathway was identified. As such, there is no potential for indirect effects to occur. **This site is not in the Likely Zone of Impact and no further assessment is required.**
Ardgraigue Bog SAC [002356] **Distance:** 11km	› [7110] Active raised bogs › [7120] Degraded raised bogs still capable of natural regeneration › [7150] Depressions on peat substrates of the Rhynchosporion	Detailed conservation objectives for this site (Version 1, December 2015), were reviewed as part of the assessment and are available at www.npws.ie	There will be no direct effects on this SAC as the project footprint is located entirely outside the designated site. Due to the terrestrial nature of the QI habitats and the distance from the site, no complete source-impact-pathway was identified. As such, there is no potential for indirect effects to occur. **This site is not in the Likely Zone of Impact and no further assessment is required.**

European Sites and distance from Garryduff Bog	Qualifying Interests/Special Conservation Interests for which the European Site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 08/01/2021)	Conservation Objectives	Likely Zone of Impact Determination
Ferbane Bog SAC [000575] **Distance:** 12.9km	› [7110] Active raised bogs › [7120] Degraded raised bogs still capable of natural regeneration › [7150] Depressions on peat substrates of the Rhynchosporion	Detailed conservation objectives for this site (Version 1, November 2015), were reviewed as part of the assessment and are available at www.npws.ie	There will be no direct effects on this SAC as the project footprint is located entirely outside the designated site. Due to the terrestrial nature of the QI habitats and the distance from the site, no complete source-impact-pathway was identified. As such, there is no potential for indirect effects to occur. **This site is not in the Likely Zone of Impact and no further assessment is required.**
Ridge Road, SW of Rapemills SAC [000919] **Distance:** 13.7km	› [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	Detailed conservation objectives for this site (Version 1, June 2018), were reviewed as part of the assessment and are available at www.npws.ie	There will be no direct effects on this SAC as the project footprint is located entirely outside the designated site. Due to the terrestrial nature of the QI habitats and the distance from the site, no complete source-impact-pathway was identified. As such, there is no potential for indirect effects to occur. **This site is not in the Likely Zone of Impact and no further assessment is required.**
Castlesampson Esker SAC [001625] Distance: 13.9m	› [3180] Turloughs › [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	This site has the generic conservation objective: '*To maintain or restore the favourable*	There will be no direct effects on this SAC as the project footprint is located entirely outside the designated site. Due to the terrestrial nature of the QI habitats and the distance from the site, no complete source-impact-pathway

European Sites and distance from Garryduff Bog	Qualifying Interests/Special Conservation Interests for which the European Site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 08/01/2021)	Conservation Objectives	Likely Zone of Impact Determination
		conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected.' (NPWS (2020) Conservation objectives for Castlesampson Esker SAC [001625] Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht.)	was identified. As such, there is no potential for indirect effects to occur. **This site is not in the Likely Zone of Impact and no further assessment is required.**
Special Protection Area			
Middle Shannon Callows SPA [004096] **Distance:** 0km	› [A038] Whooper swan (*Cygnus cygnus*) › [A050] Wigeon (*Anas penelope*) › [A122] Corncrake (*Crex crex*) › [A140] Golden plover (*Pluvialis apricaria*) › [A142] Lapwing (*Vanellus vanellus*) › [A156] Black-tailed godwit (*Limosa limosa*) › [A179] Black-headed gull (*Chroicocephalus ridibundus*) › [A999] Wetland and waterbirds	This site has the generic conservation objective: '*To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA'* To acknowledge the importance of Ireland's wetlands to wintering	Pathways for direct effects to habitats were identified due to an overlap between this SPA and Garryduff Bog. However, the only activities within the areas overlapping with the SPA comprise the ongoing maintenance of the existing silt ponds (as part of the IPC license requirement), which will be accessed from existing cutaway bog or previously used tracks, and light works to maintain the hydraulic breaks on the margins of the bog or to manage existing outfalls. These works may involve the removal of debris or some re-grading or deepening of the existing drains without changing the footprint and will be carried out only as required, likely less than once a year. There will be no requirement to create new drains.

European Sites and distance from Garryduff Bog	Qualifying Interests/Special Conservation Interests for which the European Site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 08/01/2021)	Conservation Objectives	Likely Zone of Impact Determination
		waterbirds, this site has a second conservation objective: *'To maintain or restore the favourable conservation condition of the wetland habitat at Middle Shannon Callows SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.'* (NPWS (2020) Conservation objectives for Middle Shannon Callows SPA [004096] Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht.)	In conclusion, direct effects on habitats within the SPA are evaluated as negligible in magnitude, reversible and unlikely to impact on conservation objectives. Following the precautionary principle, a potential pathway for effect on all SCI species and their habitats was identified through surface water connectivity. However, the objective of the works involved in the D & R is to stabilise and restore the bog. These works are specifically designed to reverse the drainage of the bog and to minimise the run off of waters from it. The works will be similar in intensity to the active production that was undertaken until recently, but will be less invasive, short term and will involve an estimated six machines/crews working at any one time on the bog for an expected period of 2-3 years. There is no potential for these works to result in significant effects on downstream watercourses and ecological receptors as the works primarily involve the blocking of drainage pathways from the bog. Following the implementation of the PCAS, there will be no possibility of further effects. As such, in the absence of any mitigation, there is no potential for any significant effect on these SCI receptors as a result of water pollution or change to the hydrological regime within the SPA. In addition to the above, it is noted that the silt ponds that are in place as part of the existing IPC licenced activity will continue to be maintained under the conditions of that licence and operated until the bog is fully stabilised.

European Sites and distance from Garryduff Bog	Qualifying Interests/Special Conservation Interests for which the European Site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 08/01/2021)	Conservation Objectives	Likely Zone of Impact Determination
			The potential for disturbance to the SCI species, within and outside of the SPA was also assessed. The following species have been recorded at Garryduff bog: › [A038] Whooper swan (*Cygnus cygnus*) › [A050] Wigeon (*Anas penelope*) › [A142] Lapwing (*Vanellus vanellus*) (possibly breeding) › [A179] Black-headed gull (*Chroicocephalus ridibundus*) Suitable habitat is present at or adjacent to Garryduff Bog for the following species: › [A122] Corncrake (*Crex crex*) (this species has not been recorded from this SPA since 2015) › [A140] Golden plover (*Pluvialis apricaria*) › [A156] Black-tailed godwit (*Limosa limosa*) Many of the above wintering or passage wildfowl species are likely to occur in the site only, when there is deep enough water on areas of the bog. This may be limited dependant on pumping regimes, rainfall, flood levels in adjacent watercourse or floodplains. In addition, the works will not result in any loss of habitat, are short term and will not be occurring over the entire bog at any one time, leaving much of the bog completely undisturbed. Hence, there is no potential for the works, in

European Sites and distance from Garryduff Bog	Qualifying Interests/Special Conservation Interests for which the European Site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 08/01/2021)	Conservation Objectives	Likely Zone of Impact Determination
			the absence of any mitigation, to result in significant disturbance to these SCI species. **There is no potential for significant effects on this SPA and no further assessment is required.**
River Suck Callows SPA [004097] **Distance:** 0km	› [A038] Whooper swan (*Cygnus cygnus*) › [A050] Wigeon (*Anas penelope*) › [A140] Golden plover (*Pluvialis apricaria*) › [A142] Lapwing (*Vanellus vanellus*) › [A395] Greenland white-fronted goose (*Anser albifrons flavirostris*) › [A999] Wetland and waterbirds	This site has the generic conservation objective: *'To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA'* To acknowledge the importance of Ireland's wetlands to wintering waterbirds, this site has a second conservation objective: *'To maintain or restore the favourable conservation condition of the wetland habitat at River Suck Callows SPA as a resource for the*	Pathways for direct effects to habitats were identified due to an overlap between this SPA and Garryduff Bog. However, the only activities within the areas overlapping with the SPA comprise the ongoing maintenance of the existing silt ponds (as part of the IPC license requirement), which will be accessed from existing cutaway bog or previously used tracks, and light works to maintain the hydraulic breaks on the margins of the bog or to manage existing outfalls. These works may involve the removal of debris or some re-grading or deepening of the existing drains without changing the footprint and will be carried out only as required, likely less than once a year. There will be no requirement to create new drains. In conclusion, direct effects on habitats within the SPA are evaluated as negligible in magnitude, reversible and unlikely to impact on conservation objectives. Following the precautionary principle, a potential pathway for effect on all SCI species and their habitats was identified through surface water connectivity. However, the objective of the works involved in the D & R is to stabilise and restore the bog. These works are specifically designed to reverse the drainage of the bog and to minimise the run off of waters from it. The works will be similar in intensity to the active

European Sites and distance from Garryduff Bog	Qualifying Interests/Special Conservation Interests for which the European Site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 08/01/2021)	Conservation Objectives	Likely Zone of Impact Determination
		regularly-occurring migratory waterbirds that utilise it.' (NPWS (2020) Conservation objectives for River Suck Callows SPA [004097] Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht.)	production that was undertaken until recently, but will be less invasive, short term and will involve an estimated six machines/crews working at any one time on the bog for an expected period of 2-3 years. There is no potential for these works to result in significant effects on downstream watercourses and ecological receptors as the works primarily involve the blocking of drainage pathways from the bog. Following the implementation of the PCAS, there will be no possibility of further effects. As such, in the absence of any mitigation, there is no potential for any significant effect on these SCI receptors as a result of water pollution or change to the hydrological regime within the SPA. In addition to the above, it is noted that the silt ponds that are in place as part of the existing IPC licenced activity will continue to be maintained under the conditions of that licence and operated until the bog is fully stabilised. The following species have been recorded at Garryduff Bog: › [A038] Whooper swan (*Cygnus cygnus*) › [A050] Wigeon (*Anas penelope*) › [A142] Lapwing (*Vanellus vanellus*) (possibly breeding) Suitable habitat is present at or adjacent to Garyduff Bog for the following species: › [A140] Golden plover (*Pluvialis apricaria*)

European Sites and distance from Garryduff Bog	Qualifying Interests/Special Conservation Interests for which the European Site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 08/01/2021)	Conservation Objectives	Likely Zone of Impact Determination
			› [A395] Greenland white-fronted goose (*Anser albifrons flavirostris*) Many of the above wintering or passage wildfowl species are likely to occur in the site only, when there is deep enough water on areas of the bog. This may be limited dependant on pumping regimes, rainfall, flood levels in adjacent watercourse or floodplains. In addition, the works will not result in any loss of habitat, are short term and will not be occurring over the entire bog at any one time, leaving much of the bog completely undisturbed. Hence, there is no potential for the works, in the absence of any mitigation, to result in significant disturbance to these SCI species. **There is no potential for significant effects on this SPA and no further assessment is required.**
Mongan Bog SPA [004017] **Distance:** 8.1km	› [A395] Greenland white-fronted goose (*Anser albifrons flavirostris*)	This site has the generic conservation objective: '*To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA*'	There will be no direct effects on this SPA as the project footprint is located entirely outside the designated site. Due to the absence of a hydrological connection and the distance from the site, no complete source-impact-pathway was identified for the SCI species and its associated habitats. As such, there is no potential for indirect effects to occur. The potential for disturbance to the SCI species, where it occurs outside the SPA was also assessed.

European Sites and distance from Garryduff Bog	Qualifying Interests/Special Conservation Interests for which the European Site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 08/01/2021)	Conservation Objectives	Likely Zone of Impact Determination
		(NPWS (2020) Conservation objectives for Mongan Bog SPA [004017] Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht.)	Garryduff Bog is located outside the core foraging range of Greenland white-fronted goose (5-8km) and possible pathways for effects can therefore be excluded. **This site is not in the Likely Zone of Impact and no further assessment is required.**
River Little Brosna Callows SPA [004086] **Distance:** 8.6km	› [A038] Whooper swan (*Cygnus cygnus*) › [A050] Wigeon (*Anas penelope*) › [A052] Teal (*Anas crecca*) › [A054] Pintail (*Anas acuta*) › [A056] Shoveler (*Anas clypeata*) › [A140] Golden plover (*Pluvialis apricaria*) › [A142] Lapwing (*Vanellus vanellus*) › [A156] Black-tailed godwit *(Limosa limosa)* › [A179] Black-headed gull (*Chroicocephalus ridibundus*) › [A395] Greenland white-fronted goose (*Anser albifrons flavirostris*) › [A999] Wetland and waterbirds	This site has the generic conservation objective: '*To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA'* To acknowledge the importance of Ireland's wetlands to wintering waterbirds, this site has a second conservation objective: '*To maintain or restore the favourable conservation condition of the wetland habitat at*	There will be no direct effects on this SPA as no PCAS activities will be carried out in the sections of the European Site overlapping with Garryduff Bog. Due to the absence of a hydrological connection and the distance from the site, no complete source-impact-pathway was identified for the SCI species and their associated habitats. As such, there is no potential for indirect effects to occur. The following species have been recorded at Garryduff Bog: › [A038] Whooper swan (*Cygnus cygnus*) › [A050] Wigeon (*Anas penelope*) › [A142] Lapwing (*Vanellus vanellus*) Suitable habitat is present at or adjacent to Garryduff Bog for the following species: › [A140] Golden plover (*Pluvialis apricaria*)

European Sites and distance from Garryduff Bog	Qualifying Interests/Special Conservation Interests for which the European Site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 08/01/2021)	Conservation Objectives	Likely Zone of Impact Determination
		River Suck Callows SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.' (NPWS (2020) Conservation objectives for River Little Brosna Callows SPA [004086] Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht.)	› [A395] Greenland white-fronted goose (*Anser albifrons flavirostris*) Many of the above wintering or passage wildfowl species are likely to occur in the site only, when there is deep enough water on areas of the bog. This may be limited dependant on pumping regimes, rainfall, flood levels in adjacent watercourse or floodplains. In addition, the works will not result in any loss of habitat, are short term and will not be occurring over the entire bog at any one time, leaving much of the bog completely undisturbed. Hence, there is no potential for the works, in the absence of any mitigation, to result in significant disturbance to these SCI species. **This site is not in the Likely Zone of Impact and no further assessment is required.**
All Saints Bog SPA [004103] **Distance:** 10.2km	› [A395] Greenland white-fronted goose (*Anser albifrons flavirostris*)	This site has the generic conservation objective: '*To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA'*	There will be no direct effects on this SPA as the project footprint is located entirely outside the designated site. Due to the absence of a hydrological connection and the distance from the site, no complete source-impact-pathway was identified for the SCI species and its associated habitats. As such, there is no potential for indirect effects to occur. The potential for disturbance to the SCI species, where it occurs outside the SPA was also assessed.

European Sites and distance from Garryduff Bog	Qualifying Interests/Special Conservation Interests for which the European Site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 08/01/2021)	Conservation Objectives	Likely Zone of Impact Determination
		(NPWS (2020) Conservation objectives for All Saints Bog SPA [004103] Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht.)	Garryduff Bog is located outside the core foraging range of Greenland white-fronted goose (5-8km) and possible pathways for effects can therefore be excluded. **This site is not in the Likely Zone of Impact and no further assessment is required.**

3.2 European Sites with the potential to be significantly affected by the PCAS activities

No European Site has the potential to be significantly impacted by the proposed works.

3.3 Likely cumulative impact of the PCAS activities on European Sites, in-combination with other plans and projects

3.3.1 Review of other plans and projects

The potential for the rehabilitation works to contribute to a cumulative impact on European Sites was considered. The following plans and projects were considered for their potential to result in in-combination effects:

- The National Planning Application Database was consulted on the 16.12.2020 and a number of mostly small-scale proposed or consented developments were found within 5km of Garryduff Bog. Larger projects that were considered include a planned solar farm and a subsequent application for an amendment to include a battery storage facility that have recently been consented at Rooaun, Ballinasloe, Co. Galway.
- Bord na Móna provided a list of bogs where D & R activities are scheduled to occur within the same timeframe as in Garryduff Bog. Five bogs within the larger Blackwater bog group, that share downstream connectivity to European Sites, were identified, namely Kilmacshane, Kellysgrove, Clooniff, Belmount and Castlegar.
- Private turbary exists at Garryduff Bog and licensed and unauthorised turbary also occurs at various locations within 15km of Garryduff Bog, including several locations where the pathways for downstream in combination effects on European Sites may exist, primarily via drainage to EPA blue line watercourses to facilitate turbary.
- There is a current ongoing NPWS Raised Bog Restoration Project, and All Saints Bog and Esker SAC is the only raised bog within 15 km of Garryduff Bog, where restoration might overlap with the D & R activities.
- Galway County Development Plan 2015-2021, Galway County Biodiversity and Heritage Plan 2017-2022, Offaly County Development Plan 2014-2020, Roscommon County Development Plan 2014-2020, County Roscommon Heritage Plan 2017-2021, Westmeath County Development Plan 2014-2020 and Westmeath Biodiversity Action Pan 2014-2020 were also consulted and considered as part of this assessment.

3.3.2 Conclusion of in-combination/cumulative assessment

Due to the nature, small scale and short-term duration of the PCAS activities, no pathway or mechanism for the proposed works to result in any significant effect on any European Site was identified when considered on its own during the assessment process and therefore there is no potential for it to contribute to any such effects when considered in-combination with any other development or works.

The review of plans and projects that is described above did not reveal any additional potential pathways for effect on European Sites that may have arisen as a result of those plans or projects.

4. ARTICLE 6(3) APPROPRIATE ASSESSMENT SCREENING STATEMENT AND CONCLUSIONS

The findings of this Screening Assessment are presented following the European Commission's Assessment of Plans and Projects Significantly affecting Natura 2000 Sites: Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC (EC, 2001) and Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (EC, 2018) as well as the Department of the Environment's Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (DoEHLG, 2010).

4.1 Data collected to carry out assessment

In preparation of the assessment, the following sources were used to gather information:

- Review of NPWS Site Synopses, mapping and Conservation Objectives for the various European Sites within the Likely Zone of Impact.
- Review of 2019 EU Habitats Directive (Article 17) Report.
- Review of OS maps and aerial photographs of the site of the proposed development.
- Review of online web-mappers: National Parks and Wildlife Service (NPWS), Environmental Protection Agency (EPA), Water Framework Directive (WFD).
- Review of location and layout mapping for proposed rehabilitation
- Review of the detailed description of proposed rehabilitation measures, including methodologies specific to the main categories of land types under consideration.
- Review of the results of previous ecological surveys of Garryduff Bog.
- Review of relevant databases including National Biodiversity Ireland Database (NBDC).
- Review of other plans and projects within the area.
- Liaison with Chris Cullen from Bord na Móna.
- Site visit conducted by Inga Reich, Pat Roberts and Chris Cullen on 02/12/2020.

4.2 Concluding statement

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

It is acknowledged that, following D & R, the presence of an undisturbed wetland habitat the size of Garryduff Bog, may provide foraging opportunities, attract wildfowl species as a refugium, and/or act as a disturbance buffer to birds utilising the River Suck and Shannon corridors. These positive quality effects may ultimately positively impact the SCIs and benefit the Conservation Objectives of the adjacent SPAs. For the avoidance of doubt however, this is not considered in the evaluation above, nor is any reliance placed on this in the consideration of effects.

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Appendix 1

GARRYDUFF BOG CUTAWAY BOG DECOMMISSIONING AND REHABILITATION PLAN 2021

Garryduff Bog

Cutaway Bog Decommissioning and Rehabilitation Plan 2021

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

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

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

In addition, to preparing this document to comply with Condition 10 of IPC Licence Ref. P0502-01, due regard was also given to the 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 Garryduff Bog, which goes beyond that required by Condition 10 in the Licence, the list of actions necessary to comply with the 'standard' requirement of Condition 10 (in the absence of the proposed Scheme) is also included. The inclusion of the 'standard' measures together with the enhanced measures in this document allows the Scheme Regulator to distinguish and objectively determine the specific interventions (and their associated costs) eligible for support under the proposed Scheme.

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

Any consideration of any other future after-uses for Garryduff 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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Name(s):	SD	MMC	MMC
Date:	23/04/2021	24/04/2021	24/04/2021

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SUMMARY

Name of bog: Garryduff **Area:** 970 ha

Site description:

- Garryduff Bog was drained and developed for industrial peat production in the 1960s and has been in active peat production since 1968. Industrial peat production ceased in 2019. Industrial peat extraction has now completely ceased at Garryduff.
- Garryduff has a pumped drainage regime. There are currently large areas of surface water and emerging wetland vegetation across the site as pumping has been reduced. The majority of the former peat production footprint is bare peat (c.50%) and contains active drainage channels.
- The majority of Garryduff Bog is classed as cutaway, although there are small pockets with remnant peat >2.5m deep.
- The site is located adjacent to the River Shannon and several designated conservation sites.

Rehabilitation goals and outcomes

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

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

Scope of rehabilitation

The principal scope of this rehabilitation plan is defined by:

- The area of Garryduff Bog.
- EPA IPC Licence - Ref. P0502-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. The key objective of 'rehabilitation', as required by this licence, is achieved by the **environmental stabilisation** of the bog.
- **The 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 Garryduff Bog, in particular, optimising **climate action benefits**.
- The local environmental conditions of this bog. Garryduff has pumped drainage and a significant part of the site is suited to wetland development.
- The key goals and outcomes of rehabilitation at this bog outlined above.
- To minimise potential impacts on neighbouring land, some boundary drains around Garryduff Bog will be left unblocked as blocking boundary drains could affect adjacent land.

Criteria for successful rehabilitation:

The Criteria for successful rehabilitation to meet Condition 10 of the IPC Licence 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 further wetland/peatland habitat. (IPC Licence validation).
- Stabilising or reducing potential emissions to water (e.g. suspended solids) (IPC Licence validation).
- Reducing pressure from peat production on the local river catchment (WFD) (IPC Licence validation).
- 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 wetland, fen, Reed swamp, wet woodland, heath, embryonic *Sphagnum*-rich peat forming communities, scrub and Birch woodland communities, where conditions are suitable, and eventually towards a reduced Carbon source (Climate action verification). Some areas will naturally be dry and develop Birch woodland and other drier habitats. It will take some time for stable naturally functioning habitats to fully develop at Garryduff 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.

Summary of measures:

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

- Planning actions, including developing a detailed site plan and carrying out a hydrology and drainage assessment.
- Carry out an ecological appraisal of the potential impacts of the planned rehabilitation.
- Carry out proposed ground measures, which will be a combination of pump management, drain blocking, peat field re-profiling, cell-bunding and fertiliser applications targeting bare peat areas of headlands, high fields and other areas (where required).
- Phase 2 measures may include inoculation of *Sphagnum* in suitable areas.
- Silt ponds will continue to be maintained during rehabilitation and decommissioning.
- Evaluate success of short-term rehabilitation measures outlined above and remediate, where necessary.
- Decommissioning of silt-ponds will be assessed and carried out, where required.

Timeframe:

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

Budget and Costing

- The rehabilitation plan outlined in this document is predicated on the understanding that it is the Minister's intention to support, via the Climate Action Fund, Bord na Móna in developing a package of measures, 'the proposed Scheme', for enhanced decommissioning, rehabilitation and restoration of cutaway peatlands referred to as, the Peatlands Climate Action Scheme'. *However, only the additional costs associated with the additional and enhanced rehabilitation, i.e, measures which go beyond the*

existing standard mandatory decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support.

- In relation to the pre-existing Condition 10 IPC Licence requirement to carry out what can be termed the 'standard' decommissioning and rehabilitation, Bord na Móna maintains a Provision on its balance sheet to pay for these future costs when industrial peat extraction ceases. This is updated every year. For more information see the Bord na Móna Annual Report (Bord na Móna 2020). Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

Monitoring, after-care and maintenance

The monitoring, after-care and maintenance programme for Garryduff 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 additional rehabilitation.
- **Water quality monitoring** will be established. Monitoring of key water quality parameters for 2 years after rehabilitation will include: Ammonia, Phosphorous, Suspended solids (silt) & pH.
- Where other uses are proposed for the site, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the appropriate assessment and planning procedures.

Additional Monitoring:

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

Validation and IPC Licence surrender

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

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

1. INTRODUCTION

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Blackwater bog group (Ref. P0502-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. The bog is part of the Blackwater bog group (see Appendix II for details of the bog areas within the Blackwater Bog Group). Garryduff Bog is located in Co. Galway.

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

- Description of site management and status;
- Main issues and approaches to rehabilitation;
- Consultation to date with interested parties;
- Interaction with other policy and legislative frameworks (Appendix VI);
- The planned rehabilitation goals and outcomes:
- The scope of the rehabilitation plan;
- Criteria which define the successful rehabilitation and key targets to validate rehabilitation;
- Proposed rehabilitation actions;
- Proposed timeframe to implement these 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 on its peatlands. Note this proposal is also known colloquially as the 'Peatlands Climate Action Scheme' (PCAS). The additional costs of the proposed Scheme will be supported by Government through the Climate Action Fund, administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) will act as the Scheme regulator. Bord na Móna have identified a footprint of 33,000 ha as peatlands suitable for this scheme. This proposed Scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations (Appendix VII & IX) under existing EPA IPC licence conditions. Improvements supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered.

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

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

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

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

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

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

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

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

1.1 Constraints and Limitations

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

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

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

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

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

Industrial peat extraction at Garryduff Bog permanently ceased in 2019. Currently a significant portion of the former peat production area is bare peat with emerging wetland vegetation. The combination of active enhanced rehabilitation measures and natural colonisation will quickly establish pioneer vegetation. Nevertheless, it will take some time (30-50 years) for naturally functioning peatland ecosystems to fully re-establish

Parts of Garryduff 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 Garryduff Bog that are outside of the control of Bord na Móna. Nevertheless, Bord na Móna are aware of such issues which may constrain the proposed rehabilitation actions, and this rehabilitation plan considered potential impacts of these on the delivery of the stated objectives.

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

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 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 Garryduff Bog, in particular, optimising **climate action benefits**.

2.1 Desk Study

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

- Anderson *et al*. (2017). An overview of the progress and challenges of peatland restoration in Western Europe.
- Barry, T.A. et al (1973). A survey of cutover peats and underlying mineral soils. Soil Survey Bulletin No. 30. Dublin, Bord na Móna and An Foras Taluntais.
- Bonn *et al*. (2017). Peatland restoration and ecosystem services- science, policy and practice.
- Carroll *et al*. (2009). *Sphagnum* in the Peak District. Current Status and Potential for Restoration. Moors for the Future Report No 16.
- Clark & Rieley (2010). Strategy for responsible peatland management.
- Eades *et al*. (2003). The Wetland Restoration Manual.
- Farrell & Doyle (2003). Rehabilitation of Industrial Cutaway Atlantic Blanket Bog, NW Mayo, Ireland.
- Feehan, J. (2004). A long-lived wilderness. The future of the north midlands peatland network. Department of Environmental Resource Management, UCD.

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

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

- Moundillion Integrated Pollution Control Licence;
- Mountdillion Annual Environmental Reports;
- Review of the National Biodiversity Data Centre (NBDC) webmapper;
- Inland Fisheries Ireland (IFI) Reports;
- Environmental Protection Agency database (www.epa.ie);
- EPA Guidance on Requests for Alterations to a Licensed Industrial or Waste Activity;
- BirdWatch Ireland online data (including I-WeBS and CBS datasets; www.birdwatchireland.ie);
- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Historic Environment Viewer at https://webgis.archaeology.ie/historicenvironment/
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);

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

2.2 Consultation

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

2.3 Field Surveys

Bord na Móna carried out a baseline ecological survey of all of its properties in 2009-2012 and developed habitat maps. As part of this exercise, Garryduff Bog was surveyed in February and June 2010. It was re-surveyed in 2014. Additional ecological monitoring and visits have taken place at Garryduff Bog between 2013-2020 to inform rehabilitation planning and habitat maps have been updated, where required. The latest visit took place in August 2019. 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 survey report for Garryduff Bog is contained in Appendix III.

3. SITE DESCRIPTION

Garryduff Bog is located approximately 1 km south of Shannonbridge in Co. Galway. The River Suck flows along the northern boundary and meets the River Shannon, which flows along the eastern boundary (see Figure 3.1). The surrounding landscape is a mosaic primarily consist 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 (See Figure 3.2). Garryduff Bog is a pumped bog with a water table significantly lower than the surrounding area. The River Shannon and River Suck are immediately adjacent to the northern and eastern sides and parts of Garryduff Bog form part of the flood plain of these rivers. The bog is regularly inundated during winter and occasionally at other times when the water levels on the river are high.

A rail line connects Garryduff bog with Kilmacshane Bog to the south-east and Lismanny Bog to the north-west. There is also a railway connection to the north-east, where the railway line bridges over the River Shannon to connect Garryduff Bog with the power station in Shannonbridge and other bogs around Blackwater, and a bridge over the River Suck to the north, connecting Garryduff Bog to other bogs in the Blackwater Bog Group on the Roscommon side of the River Shannon. There is also road access to the site alongside the railway line in the north and from a public road in the south-west. The only infrastructure on-site, apart from the rail links and associated machinery access roads and tracks, is a tea centre located at the northern end of the site next Garryduff.

The site is bisected by one main railway line running roughly North-west to south-east and this is situated on the old route of the Ballnasloe section of the Grand Canal, which has been infilled.

3.1 Status and Situation

3.1.1 Site history

Garryduff Bog was drained and developed for industrial peat production in the 1960s and has been in active peat production since 1968. Industrial peat production ceased in 2019. The peat was harvested from this site was used for fuel peat West Offaly Power in Shannonbridge.

3.1.2 Current land-use

Industrial peat production has now completely ceased at Garryduff Bog. Biodiversity and ecosystem services has been identified as the main future as its primary land-use by Bord na Móna. The entire bog is not within the ownership of Bord na Móna and domestic turf cutting is having an impact on the bog, both within and outside the BnM boundary. A bog railway crosses through the site (Figure 3.5).

Several different research projects are currently using Garryduff Bog as a study area (SmartBog, WaterPeat).

The River Shannon flows within close proximity to the eastern boundary of the site and some grassland (under BnM ownership) extend from the site to the River Shannon.

This bog is a pumped bog with the water table significantly lower than the surrounding area.

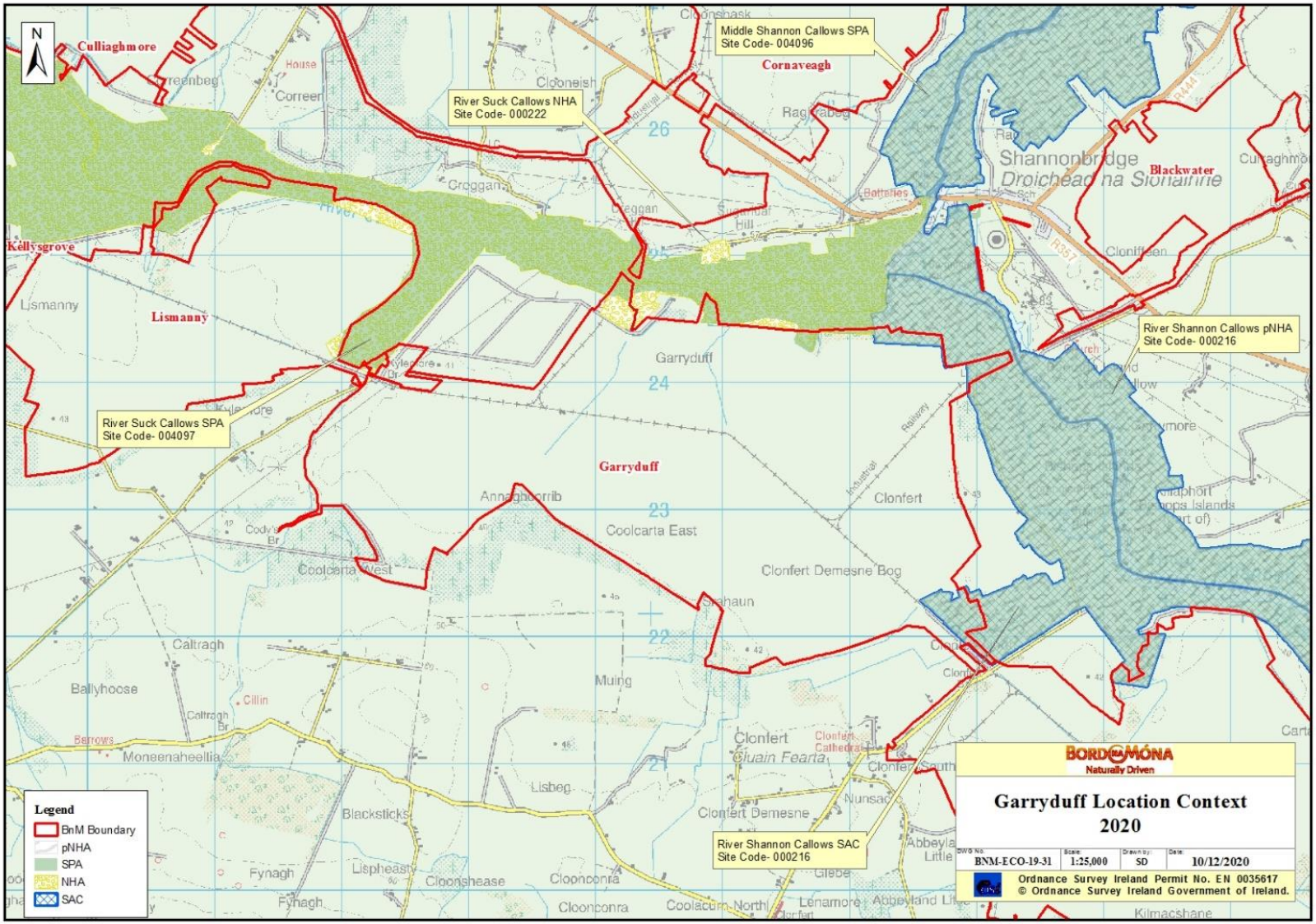

Figure 3.1 Location of Garryduff Bog in context to other Bord na Móna bogs and surrounding area

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 Garryduff 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 majority of the underlying geology at Garryduff Bog is dark limestone and shale,[1]. The underlying soils and sub-soils are classed as 'Raised Bog Cutover Peat'.

Lacustrine deposits (lake deposits) are also present under the peat (lacustrine shell marl). The peat is underlain by glacial deposits interbedded with glacio-fluvial deposits over limestone bedrock in places. The glacial deposits generally consist of grey gravelly clay/silt.

3.2.2 Peat type and depths

Garryduff Bog has been in commercial peat production for nearly 50 years and the majority of the area is predominantly cutaway (Figure 8.2). Marl and sub-soil is frequently exposed. Only small pockets have residual peat depth in excess of 2m.

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

By contrast, a small section in the western edge of Garryduff Bog has relatively larger deposits of peat in situ, with large parts of the peat in these areas in excess of 2.5m deep. The peat harvested on site was used as fuel peat supplying West Offaly Power.

3.3 Key Biodiversity Features of Interest

The majority of Garryduff Bog within the Bord na Móna boundary is developing pioneer cutaway vegetation now along areas still dominated by bare peat (Figure 3.3). The River Shannon flows within close proximity to the eastern boundary of Garryduff Bog, the River Suck flows along the northern edge and the former Ballinasloe Canal (now in-filled) runs along the line of the railway through the middle of the bog.

3.3.1 Current habitats

Much of the site comprises extensive areas dominated by bare peat but with emerging pioneer vegetation (see Figure 3.3). Parts of the cutaway now have well developed wetland and scrub vegetation. Garryduff includes several undeveloped or partially-developed sections around the margin of the production bog that have been designated as part of a nature conservation site (River Shannon Callows cSAC and SPA & Suck River Callows SPA and NHA). Some of the remnant high bog is within the designated boundary, although it is quite degraded. These designated areas also include other typical marginal habitats such as wet grassland, scrub and bog woodland. They also act as part of a buffer between the former production bog and the main channels of both rivers. Small undeveloped sections within the production bog include patches of Birch woodland (WN7), scrub (WS1) and disturbed raised bog (high bog PB1) in poor condition.

Sections of Birch woodland and wet grassland are located along the margins of the site. The areas of callows-type wet grassland are managed as seasonal grazing are located along the banks of the River Suck. A stream flows into the River Suck at the eastern boundary of the site and the last 500m are above ground. The above ground sections of the stream contain riparian habitats such as bracken (HD1), scrub (WS1), riparian woodland (WN5) and wet grassland (GS4). The riparian woodland was comprised of Oak, Ash, Alder, Purging Buckthorn, Willow and Birch.

To the south of the stream a band of scrub is located between the production bog and the wet grassland that runs parallel to the River Suck. This area is not dense scrub and contains tree species such as Crab Apple, Purging Buckthorn and Blackthorn with an under storey of Bracken and Bramble.

A habitat map of the site is shown in Figure 3.4.

Figure 3.2. View of the typical peat surface with existing drainage and early pioneering vegetation communities across Garryduff Bog

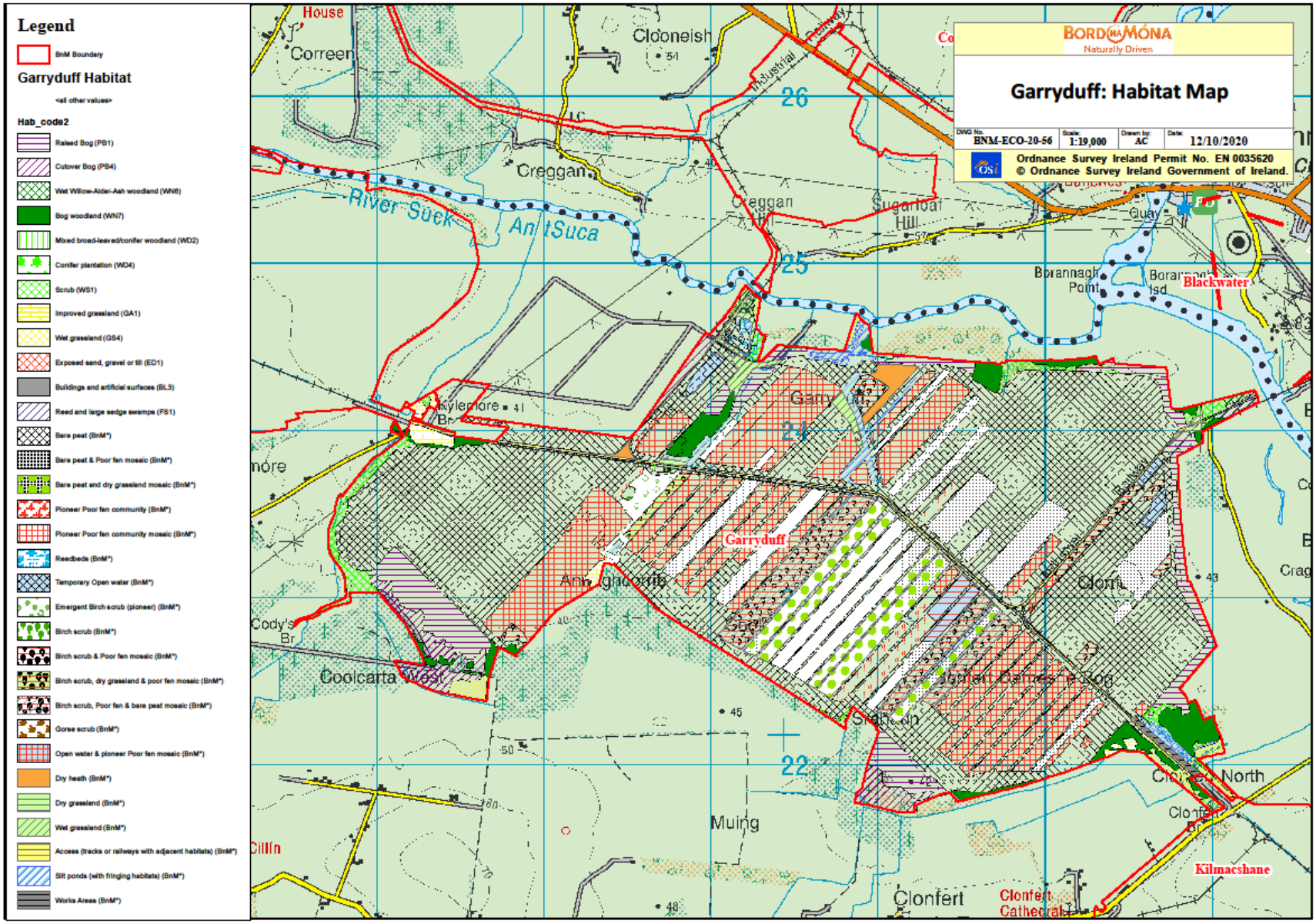

Figure 3.3 Habitat map of Garryduff Bog showing Bord na Móna habitat categorisation.

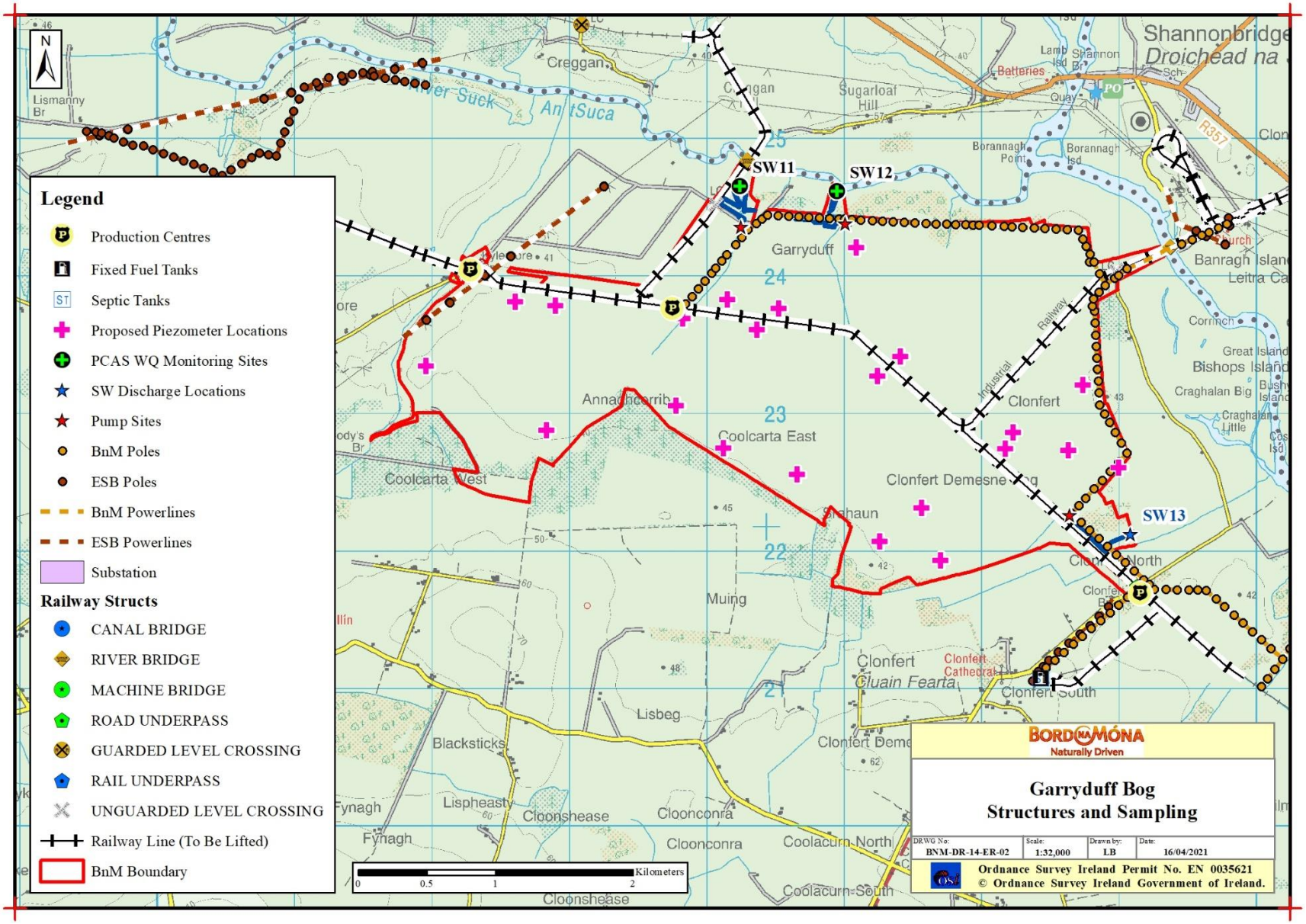

Figure 3.4. Map of Garryduff Bog showing structures and designated emission points.

3.3.2 Species of conservation interest

The main area of the bog is inundated annually with high winter water levels. These wet areas offer a refuge to significant flocks of Whooper Swans (listed on Annex I of the EU Birds Directive). Peak numbers for Garryduff Bog in February 2011 were 840 Whooper Swans (1% flyaway threshold is 270 individuals (Crowe & Holt, 2013; Wetlands International, 2015; Crowe *et al.*, 2015). Whooper Swan is a Special Conservation Interest (SCI) of the Middle Shannon Callows SPA and the River Suck Callows SPA (see Section 3.4). The temporary wetland also attracted significant numbers of wildfowl with mainly Mallard, Wigeon, Teal and Tufted Duck. Annual winter counts indicate that the site continues to attract large numbers of waterbirds.

The site attracts breeding waders such as Lapwing and Redshank (both BoCCI Red-listed) and Ringed Plover (BoCCI Amber-listed).

Large Heath Butterfly are present on two bog remnants along the southern margin; this species is on the Butterfly Red list.

Other species of conservation interest that have been recorded using the site include Otter (Annex II Habitats Directive species) and Badger (protected under the Irish Wildlife Act).

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. No invasive species, as listed under Regulation (EU) 1143/2014 on the prevention and management of the introduction and spread of invasive alien species, have been recorded at Garryduff Bog. A broad range of common garden escapes are occasionally present around the margins of Bord na Móna bogs, and although spatial overlap with the PCAS is expected to be limited, these are, where necessary, to be treated in line with Best Practice during PCAS activities.

3.4 Statutory Nature Conservation Designations

Garryduff Bog partially overlaps with the River Shannon Callows SAC and pNHA (NPWS Site Code: 000216), the Middle Shannon Callows SPA (NPWS Site Code: 004096) and the Suck River Callows NHA (NPWS site code 000222) and SPA (NPWS site code 0004097).

The northern boundary of the production bog adjoins this River Such SPA and NHA. These sites have been designated for their importance for wintering wildfowl and species of conservation importance such as Greenland White-fronted Geese and Whooper Swan. Some undeveloped and partially fringe habitats within the northern Bord na Móna boundary are designated as part of this NHA and SPA. Two sections contain a series of silt ponds and associated habitats. Other habitats include small amounts of remnant high bog, scrub and Birch woodland. Part of the Bord na Móna boundary extends out to the River Suck and this section takes in some wet grassland and fringing Reedbed and scrub along the edge of the river.

The designated areas on the River Shannon SAC and pNHA and the Middle Shannon Callows SPA partially includes several small areas along the eastern margin of Garryduff Bog. These small areas generally contain sections of remnant high bog (PB1) and other typical fringing habitats such as scrub (WS1) and patches of Birch woodland (WN7). One section was also partially developed as part of the production bog while another section is part of the access route to Shannonbridge. The River Shannon Callows SAC (and pNHA) is designated for grasslands (Molinia and Lowland Hay Meadows) as well as alluvial woodland and Otter. The Middle Shannon Callows SPA is

designated for the assemblage of wintering wildfowl, many species of which occur in internationally and nationally important numbers as well, in addition to breeding Corncrake. It is also noted as being important for breeding waders and a range of other nationally scarce species such as breeding Shoveler, Quail and Whinchat.

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 Garryduff Bog (i.e. within 3km) The closest Ramsar Sites to Garryduff Bog include Mongan Bog and Clara Bog.

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

3.5 Hydrology and Hydrogeology

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

Garyduff Bog is located in the Upper River Shannon catchment. The Bord na Móna bog is directly drained by the River Suck, two small watercourses that flow in a largely northerly direction from the bog and drain into the River Suck and one small watercourse that drains in a north-easterly direction into the River Shannon.

In the north-west corner of Garryduff Bog, water has been diverted away from the course of the Annaghcorrib stream through a series of silt ponds and into the River Suck. To the east of this is another series of silt ponds which drain into the Garryduff stream and subsequently into the River Suck c.10m downstream of the last (lowest) silt pond. The north-east corner of the bog drains through into an un-named stream that flows into the River Suck c.450m downstream from Garryduff Bog. The south-east corner of the Bog drains through into an unnamed stream that drains north-east into the River Shannon, c.1.3km downstream from Garryduff Bog. Although there are a number of small watercourses present along the southern edge of Garryduff Bog and the Laurencetown Stream that flows along its western side, none appear to be linked to the Bord na Móna production bog.

Silt ponds are present at the edges of the bog where they drain in to the respective watercourses indicated above.

The bog is located in an area with a locally important bedrock aquifer (Li) with Bedrock that is moderately productive only in local zones (EPA map-viewer). An aquifer is an underground body of water-bearing rock or unconsolidated materials (gravel or sand) from which groundwater can be extracted in useful amounts. GSIs Aquifer classes are divided into three main groups based on their resource potential, and further subdivided based on the type of openings through which groundwater flows. There are nine aquifer categories in total. 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 largely located in an area mapped by GSI as of low groundwater vulnerability (GSI Mapviewer). Groundwater Vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. Groundwater vulnerability maps are based on the type and thicknesses of subsoils (sands, gravels, glacial tills (or boulder clays), peat, lake and alluvial silts and clays), and the presence of karst features. Groundwater is most at risk where the subsoils are absent or thin and, in areas of karstic limestone, where surface streams sink underground at swallow holes. These data indicate there is generally low risk of any groundwater contamination occurring at this site, although care must be taken if working at the site periphery.

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 (present on an adjacent cutaway site). 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 restoration to interact or impact on underlying groundwater is very low.

3.6 Emissions to surface-water and water-courses

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

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

Garryduff bog has 3 treated surface water outlets, one to the Shannon Lower IE_SH_25SO12060, and two to the to the River Suck IE_SH_26S071500 catchment. This Suck water body is classified as Moderate Status in the 2013 – 2018 classification, but at risk and was listed as being under pressure from peat extraction in the second cycle of the river basin management plan and is indicated as remaining so in the third cycle, currently under preparation. Peat extraction was not identified as a pressure in the Shannon Lower under the second cycle of the river basin management plan and is indicated as remaining so in the third cycle, currently under preparation.

Details of silt ponds, associated surface water emission points and those being monitored and sampled as part of the PCAS scheme are detailed on the attached water quality map.

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

The main emission limit value associated with this bog is 35mg/l suspended solids, with trigger levels for ammonia of 4.27mg/l and COD 100mg/l. Initial monthly ammonia concentrations from August to January 2021 have a range of 0.033 to 0.573mg/l with an average of 0.227mg/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 mg/l	TS mg/l	Ammonia mg/l	TP mg/l	COD mg/l	Colour
Garryduff	SW-11	Q3 20	8.3	3	388	0.501	<0.05	59	151
Garryduff	SW-12	Q3 20	7.8	3	415	0.779	<0.05	55	144
Garryduff	SW-13	Q3 20	8	3	487	0.196	<0.05	55	138
Garryduff	SW-11	Q3 17	7.9	5	388	1.3	0.05	47	84
Garryduff	SW-12	Q3 17	7.9	5	500	1.2	0.05	44	54
Garryduff	SW-13	Q3 17	7.9	5	436	0.32	0.05	46	100

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

Water quality of water discharges from restored peatlands normally improves as a result of bog restoration measures and the restoration of natural peatland processes (Bonn *et al*., 20017). Bog restoration is also expected to improve water attenuation of the site as the drains are blocked, slowing water movement and water release from the site. Restored peatlands help slow the release of water and aid the natural regulation of floods downstream (Minayeva *et al*., 2017). The National River Basin Management Plan (NRBMP) 2018-2021 (DHPCLG, 2017) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). The NRBMP outlines how key actions such as the Bord na Móna 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 Garryduff has been completed. This discharge will have improving water quality and there will be increased wetland attenuation, meaning slower release of water. This is expected to have a positive impact on status of the key water body receptors.

Decommissioning and Rehabilitation Programme Water Quality Monitoring.

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

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

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

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

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

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

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

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

3.7 Fugitive Emissions to air

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

3.8 Carbon emissions

The bog is likely to be a carbon source as it is a drained (degraded) peatland with some active drainage, which facilitates the oxidation of peat. Peat extraction generally transforms a natural peatland which acts as a modest carbon sink into a cutaway ecosystem which is a large source of carbon dioxide (2–5 t C/ha/year) (Waddington & McNeil, 2002; Alm *et al*., 2007; Wilson *et al*., 2007, Wilson *et al*., 2015). Furthermore, they are also a significant

source of methane (Huttunen *et al*., 2003; Laine *et al*., 2007a) as a consequence of the conditions within the peat body that provide a suitable environment for the microbial breakdown of plant litter and root exudates. Degraded peatlands also release carbon/GHG emissions via the fluvial/aquatic pathway (Dissolved Organic Carbon – DOC, Suspended Solids/Particulate Matter, degassing of GHGs from water).

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

It is expected that Garryduff Bog can become a reduced carbon source with small sections having potential to develop as a carbon sink (albeit in the longer term) 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 cutaway habitats (some of the cutaway is expected to develop Reed Swamp and fen habitats with alkaline emission factors) and future climatic conditions. The majority of this site is expected to develop wetland with a mosaic of fen, Reed swamp, wet woodland and scrub. Birch woodland is expected to develop on the drier mounds and peripheral headlands. Parts of the bog with residual deeper peat have potential to develop *Sphagnum*-rich habitats.

3.9 Current ecological rating

(Following NRA (2009) Evaluation Criteria)

Current ecological rating ranges from **International** to **Local Importance (lower value).** The site partially overlaps with the River Shannon Callows SAC & pNHA (NPWS site code: 000216), the Middle Shannon Callows SPA (NPWS site code: 004096) and the Suck River Callows NHA (NPWS site code 000222) and SPA (NPWS site code 0004097). As such, Garryduff Bog is deemed to be of **International Importance**. Additionally, the assemblage of wintering Whooper Swans recorded on the site appears to regularly exceed the threshold for international importance (>270 individuals).

The majority of the site is rated as **Local importance (lower value)** due to the dominance of bare peat associated with peat extraction operations. Cutaway habitats are generally poorly developed, as are marginal remnant habitats, which have a somewhat higher value and assigned a rating **Local importance (higher value)**. However some areas, where cutaway habitats have established, would be rated as being of **county importance** due to the wetland habitats that have developed there and the species that have been recorded, including breeding waders.

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 active raised bog.

3.10 Garryduff Bog Characterisation Summary

Garryduff Bog is located approximately 1 km south of Shannonbridge in Co. Galway. It is part of the Blackwater bog group. Peat production began at Garryduff in the 1960's and permanently ceased in 2019. Garryduff Bog is situated in the floodplains of the Rivers Shannon and Suck. In order to develop this bog for peat harvesting a pumped drainage system was installed.

Most of the former production area has been cutaway and active field drains running in a northeast to southwest direction remain in place. Pioneer cutaway habitats have started to develop on the site in recent years, including Birch woodland and scrub on the higher (and drier) areas with a mosaic of rush-dominated poor fen and bare

peat over much of the remainder of this area. Some smaller areas of wetland habitats and open water are also present in some areas of the site. Small areas of heavily degraded raised bog remnant persist at the margins of the site.

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

1) Shallow Cutaway Bog modelled as wetland; These areas are predicted to develop wetland habitats such as reedbeds. This habitat is predicted to form in the areas of shallow topographical depressions. Rehabilitation will facilitate the development and establishment of wetland vegetation.
2) Shallow Cutaway bog modelled as deeper water; These areas are predicted to develop deep open water habitats. This habitat is predicted for the deep topographical basins in the central areas of the site. An open water body (2-3m depth) will develop in these areas.
3) Shallow Cutaway Bog modelled as dry; These areas are modelled as dry and are predicted to develop dry cutaway vegetation communities such as birch and heath scrub.
4) Deep peat area modelled as wet; In this area to the east of the site deep peat rehabilitation techniques will be used to promote the development of sphagnum rich vegetation communities.
5) Marginal areas, including headlands and high fields are likely to remain relatively dry. Drain-blocking and some fertiliser application is proposed on these areas where there is still bare peat, where Birch woodland and other drier habitats are expected to develop.

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 ongoing rehabilitation and their Biodiversity Action Plan programme, in operation 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 Garryduff Bog.

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

- Wintering wader and wildfowl usage through surveys of the site by Birdwatch Ireland (commissioned by BnM).
- Hydrological research on site with TCD
- Research on site as part of the EPA-funded SmartBog and WaterPeat Projects
- General consultation with range of stakeholders at annual Bord na Móna 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).
- The old Ballinasloe Canal is also being considered as one of the route options of the proposed Galway-Athlone greenway and Bord na Móna has been in high-level consultation with the relevant bodies regarding the potential development of a greenway on the existing track adjacent to the canal.
- Archaeological Liaison Committee (National Museum of Ireland & Dept of Culture Heritage and the Gaeltacht).
- Water mains supply to local houses that crosses the site.

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

In addition, advertisements about PCAS were also printed in the Connaught Tribune and Galway Advertiser in January 2021 (both area local newspapers that covers the Garryduff Bog area).

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

4.2 Issues raised by Consultees

To date, a number of issues have been raised by consultees during the consultation process for the current draft of the rehabilitation plan for Garryduff Bog – these are summarised below.

4.2.1 Assessments of rehabilitation

Queries on rehabilitation assessments were raised by NPWS and the National Museum of Ireland in relation to Appropriate Assessment, Environmental Impact Assessment and Strategic Environmental Assessment. Councillors from the Ballinasloe Municipal District of Co. Galway were keen to see these documents were made available for public view.

4.2.2 Restoration scope

IPCC were keen to see the rehabilitation plan aligned with amenity and after-use of the Garryduff Bog. Restoration/rehabilitation of marginal habitats was raised by BCI as worthy of consideration within the rehabilitation measures to support biodiversity objectives.

4.2.3 Monitoring

Further details on monitoring of ecological metrics, and how and where reporting on this monitoring would take place, was raised in the IPCC submission, Trinity College and University College Dublin. Butterfly Conservation Ireland also suggested that monitoring of Large Heath butterfly be considered to assess the success of the proposed rehabilitation actions.

4.2.4 Flooding

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

4.2.5 Turf cutting

Butterfly Conservation Ireland commented that ongoing turf cutting on the margins of the bog (within and outside of the area owned by Bord na Móna) needed to be addressed to maximise the benefits of the rehabilitation work being proposed.

4.2.6 Other issues

Amenity interests and opportunities associated with Garryduff Bog was raised by IPCC.

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

A member of The Aughrim Community Development Company requested information on behalf of the aforementioned organisation, regarding the extent of the PCAS based rehabilitation plans for Garryduff. The Aughrim Community Development Company proposes to create a climate action park in a small area of the bog.

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

4.3 Bord na Móna response to issues raised during consultation

4.3.1 Assessments of rehabilitation

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

An Archaeological Impact Assessment (AIA) is also being undertaken on all the bogs in PCAS. The aim for known archaeology on these bogs is to accomplish preservation in situ and we are taking steps to identify and avoid all known archaeology. Bord na Móna will accomplish this by including all known archaeology on the available GIS data from the AIA process, and either excluding or defining a buffer zone around these features, which will then be excluded from any ground works in these areas in the final plan. It is anticipated that any archaeology will benefit from the ultimate remit of the rehabilitation, in that water tables will be raised thereby preserving objects of archaeological significance in-situ. There is also an identified procedure for managing reports of stray finds that may arise during rehabilitation works.

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

All assessments undertaken as part of PCAS, including any future revisions to this plan or the Appropriate Assessment, will be available for public scrutiny once drafted.

4.3.2 Restoration scope

As part of the PCAS, all restoration/rehabilitation options have been developed to support climate action and biodiversity objectives. The restoration at Garryduff will enable and support any further amenity development by improving overall environmental and ecological conditions.

4.3.3 Monitoring

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

ecological interest has not been recorded on site, there is a strong likelihood that this species is still present as it has been recorded on other Bord na Móna bogs in similar condition in the recent past.

4.3.4 Flooding

It is the intention of Bord na Móna that the re-wetting of the bogs will be carried out in such a manner that does not impact on third party lands. Where it is deemed that blocking of a shared drain would cause any adjoining lands to flood, this will be avoided and alterations made to the rehabilitation plan. In general, drains around the margins of the bog will not be blocked.

External consultants have been appointed to carry a hydrological assessment to identify any potential impacts to neighbouring lands and to mitigate against any such impacts.

The rehabilitation measures proposed at Garryduff Bog will generally result in reduced runoff and drainage from the existing drains through drain blocking. It is intended that these measures will not significantly alter the existing topographical catchments and that the spine of the drainage networks, those which the upstream catchments drain through, will be retained by Bord na Móna. Based on evidence from other bogs, rehabilitation measures will reduce the run-off from the bog by returning the peatlands towards its natural water retention function.

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

4.3.5 Turf cutting

Those with existing, private turbary rights to cut turf for domestic fuel will be allowed to continue to cut turf as before. As noted above in relation to flooding, any re-wetting of Garryduff Bog will be designed to not impact on existing turf cutting.

4.3.6 Other issues (including amenity)

Creating amenity such as walking tracks is not part of the direct scope of PCAS. However, PCAS will enable and support future amenity development.

Given the proximity of our peatlands to the Shannon basin, Bord na Móna are positioned to make significant contributions to future amenity and associated green infrastructure initiatives.

The Aughrim Community Development Company were assured that PCAS would not interfere with the proposed climate action park.

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

4.3.7 Concluding statement.

- No specific issues were raised during consultation that required significant changes to the substance of the rehabilitation plan.

- Issues raised by several consultees in relation to potential impacts on adjacent land had already been accounted for during the hydrological analysis.
- Several marginal drains will not be blocked to avoid impacts on adjacent lands, rights of way, or turf-banks.
- Water supply to local houses that crosses the site will not be affected.
- No changes were required to the rehabilitation plan to enable any potential future amenity.

5. REHABILITATION GOALS AND OUTCOMES

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

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

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

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

general. Ultimately, improving the WFD status of the receiving water-body will depend on reducing pressure from a range of different sources., including peatlands in general (private and Bord na Móna).

6. SCOPE OF REHABILITATION

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

- The area of Garryduff Bog (Figure 3.1).
- EPA IPC Licence - Ref. P0502-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Garryduff Bog is part of the Blackwater 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 Garryduff Bog, in particular, optimising **climate action benefits**. The proposed interventions will mean that environmental stabilization is achieved (meaning IPC obligations are met) and, in addition, significant other ecosystem service benefits particularly for climate action will be accrued.
- The local environmental conditions of Garryduff Bog identify wetland creation and deep peat re-wetting as the most suitable rehabilitation approach for different part of this site. Garryduff Bog has a pumped drainage regime and a significant area is likely to develop as wetland habitats, particularly Reed swamp.
- 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 Garryduff Bog as **environmental stabilisation** and **optimising suitable hydrological conditions, and setting the site on a trajectory towards the development of naturally functioning peatland and wetland habitats (fen, Reed Swamp, wet woodland, embryonic *Sphagnum*-rich peat-forming habitats, and other associated wetland and peatland habitats).**
- Enhanced Rehabilitation of Garryduff 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.

6.1 Key constraints

- **Bog conditions.** Rehabilitation outcomes of sites are constrained by the environmental characteristics of these particular areas. For example, there is potential for raised bog restoration at some sites where there has not been significant industrial peat extraction and the peat body is largely intact (deep peat sites that are drained). At other sites, most of the peat mass has been removed, the environmental characteristics of these areas have therefore changed radically (peat depths, hydrology, water chemistry, substrate type, nutrient status, etc.) and there will therefore be different habitat outcomes (wetlands, fen, heathland, grassland and Birch woodland). On parts of Garryduff Bog, only a certain proportion of peat has been removed leaving a largely un-vegetated surface over deep peat deposits whilst on other areas almost all the peat layer has been removed, revealing subsoil visible. There are local factors that will influence the future trajectory of this site (underlying alkaline sub-soil) which need to be considered as part of the wider rehabilitation work. Hydrological factors – Garryduff Bog is a pumped bog – mean that a significant portion of the site is likely to develop as wetland.
- **Surrounding landscape and neighbours.** Another key constraint is the interaction between the Bord na Móna sites and the surrounding landscape. Care has to be taken that no active rehabilitation management is carried out that could negatively and knowingly impact on surrounding land. This includes any hydrological management on neighbouring farmland, as well as potential changes to the hydrology

of surrounding designed sites. In general, marginal drains will not be blocked. It is anticipated that the work proposed here (blocking drains and re-wetting cutaway peatlands) will not have any flooding impacts on adjacent land.

- **There is some drainage through Garryduff Bog (from north to south).** This drains adjacent farmland to the south of the bog. This drainage will not be impeded and rehabilitation will take account of the need to allow continued drainage while re-wetting adjacent cutaway.
- **Public Rights of Way**. Where a public right of way or similar burden exists on Bord na Móna property, consideration will be given to ensuring that this remain intact where possible. In some instances, depending upon previous land uses and management, alternative solutions may be required. These will be explored in consultation with local communities and statutory bodies during the consultation work associated with the decommissioning and rehabilitation work described here.
- **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 Garryduff Bog has been carried out (Appendix XII). There are several archaeological features known from this bog including the former canal. 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.

6.2 Key Assumptions

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

6.3 Key Exclusions

The scope of this rehabilitation plan does not cover:

- The longer-term raised bog restoration trajectory of the site. The plan covers the short-term rehabilitation **actions** and **an additional monitoring and after-care programme** to monitor the rehabilitation 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 restoration naturally functioning wetland and peatland habitats. 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 Garryduff Bog.
- The longer-term management of this site, potentially as a nature conservation site, or for amenity, or for other uses in the future. This will require further engagement with stakeholders.

7. CRITERIA FOR SUCCESSFUL REHABILITATION

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

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

Rehabilitation is generally defined by Bord na Móna as

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

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

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

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

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

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

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

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

- Optimising the extent of suitable hydrological conditions to optimise climate action and other ecosystem service benefits (optimising and maximising deep peat re-wetting). This will be measured by an aerial survey after rehabilitation has been completed.
- Accelerating the trajectory of the site towards becoming a reduced carbon source/carbon sink. This will be measured through habitat mapping and the development of cutaway bog condition assessment. This cutaway bog condition assessment will include assessment of environmental and ecological indicators such as vegetation cover, vegetation communities, presence of key species, *Sphagnum* cover, bare peat cover and water levels (similar to ecotope mapping). Baseline monitoring will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Reduction in carbon emissions. This will be estimated via a combination of habitat condition assessment and application of appropriate carbon emission factors derived from other sites. Baseline monitoring (habitat condition) will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future. Some carbon flux monitoring (chamber measurements) is being carried out at Garryduff Bog as part of the EPA-funded SmartBog project.
- Setting the site on a trajectory towards establishment of a mosaic of compatible habitats including Reed swamp and wetland, fen, wet woodland, 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 Garryduff Bog. This will be demonstrated and measured via aerial photography, habitat mapping and cutaway/habitat condition assessment. Baseline monitoring will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Improvement in biodiversity and ecosystem services. This will be demonstrated by metrics outlined in Section 9.1 that can be used to measure changes in ecosystem services (e.g. water quality parameters, development of pioneer habitats, breeding bird monitoring). This will be measured by collecting a range of scientific data that can then quickly be adapted and into metrics that can be used to measure changes in various ecosystem services. Baseline monitoring will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future. These metrics will be defined in the context of the overall Scheme resources and after consultation with stakeholders.

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

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

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

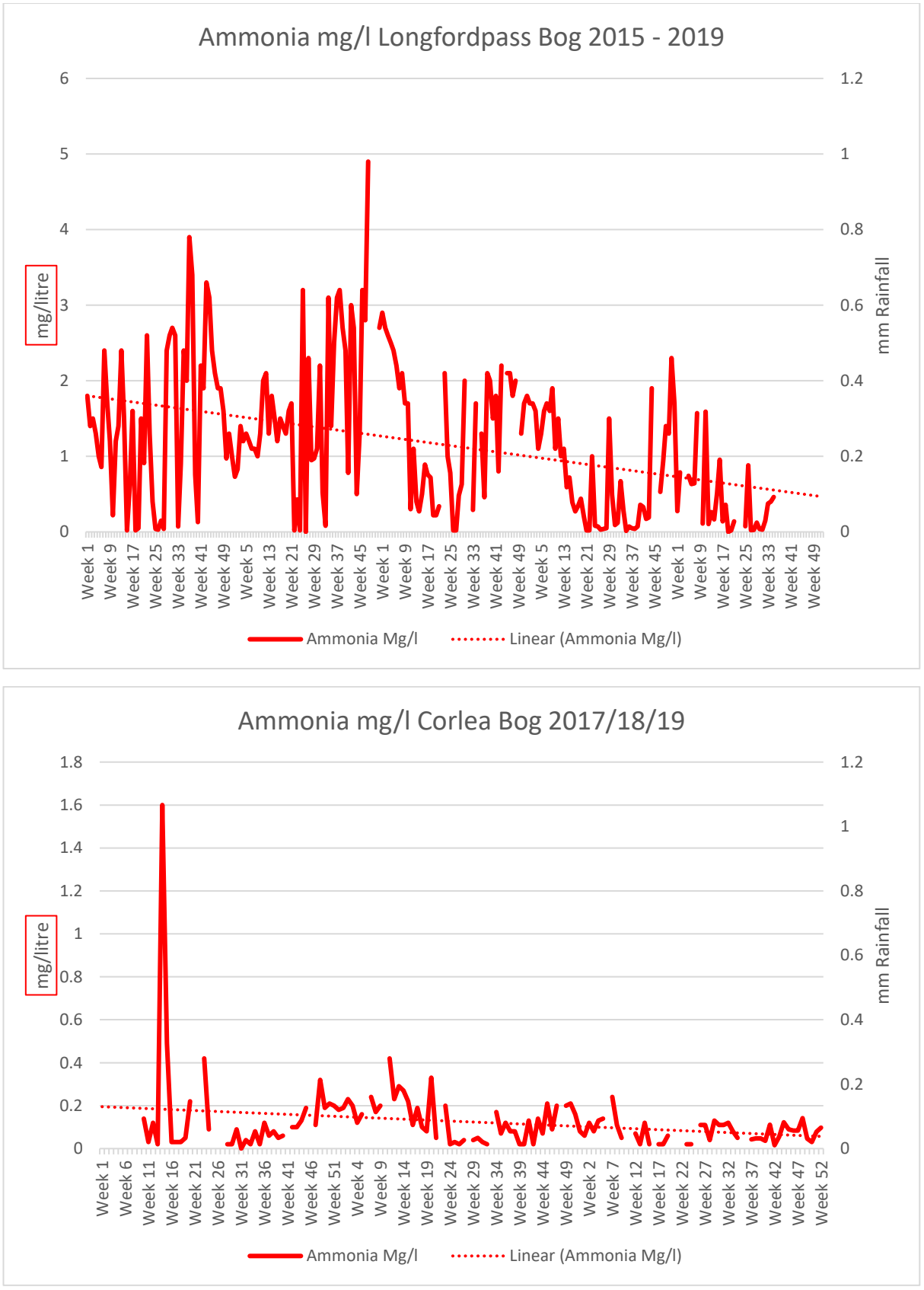

Figure 7.1. Ammonia levels at Longfordpass and Corlea Bogs.

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

Criteria type	Criteria	Target	Measured by	Expected Time-frame
IPC validation	Rewetting in the former area of industrial peat production	Delivery of rehabilitation measures Reduction in bare peat.	Aerial photography after rehabilitation has been completed – to demonstrate measures (drain-blocking) Establishment of a baseline for future monitoring of bare peat, vegetation establishment and habitat condition.	2021-2025
IPC validation	Key water quality parameters Ammonia, Phosphorous, Suspended solids, pH and conductivity	Reduction or stabilisation of key water quality parameters associated with this bog	Water quality monitoring. Started in advance of the proposed rehabilitation.	2021-2023
IPC validation	Reducing pressure from peat production on the local water body catchment (WFD)	Where sections of the water body that this bog drains to, have 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 can be attributable to the rehabilitation works undertaken	EPA WFD monitoring programme	WFD schedule

		on this bog, based the monitoring results of these inputs. Where they not been identified as under pressure from peat extraction, that the intervening EPA monitoring programme associated with its Programme of Measures for this water body, confirms that its classification remains at not being at risk from peat extraction associated with activities at this bog.		
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
Climate action verification	Setting the site on a trajectory towards establishment of a mosaic of	Establishment of compatible cutaway habitats	Habitat map, Cutaway bog condition map Baseline monitoring to be carried out during the scheme when rehabilitation is complete. Sites	2021-2025

	compatible habitats		can be re-monitored in the future and compared against this baseline.	
Climate action verification	Biodiversity and ecosystem services. Habitat establishment Presence of key species – Sphagnum Breeding birds	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	2021-2025

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

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

- **Funding to pay for resources required to deliver the planned rehabilitation (Bord na Móna and external).** Bord na Móna maintains a Provision on its balance sheet to pay for these future costs when industrial peat extraction ceases. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence. It is expected that additional costs of enhanced rehabilitation will be supported by Government through the Climate Action Fund.
- **Bord na Móna to have sufficient resources (staff and training) to deliver the planned rehabilitation with required associated skills and competencies.**
- **Bord na Móna to have sufficient resources (suitable machinery) and staff to maintain this machinery.**
- **Weather conditions to be within normal limits over the rehabilitation plan timeframe.** Long periods of wet weather have the capacity to significantly affect ground conditions and constrain the delivery of rehabilitation. The potential impact of wet weather on ground conditions can be reduced by appropriate planning and management. Bord na Móna have significant experience of managing these issues through 70 years of working in these peatland environments.
- **Rehabilitation measures to be effective.** The rehabilitation measures proposed in this plan are based on 40 years of Bord na Móna experience of peatland management and best practise applied internationally in peatland management. Measures proposed in this plan have already been shown to be affective at other sites. Bord na Móna will apply a flexible and adaptable approach to the more innovative rehabilitation measures proposed in this plan**.** If measures are not initially effective, Bord na Móna will review any requirement for additional practical rehabilitation.

- **Natural colonisation of vegetation to develop semi-natural habitats at a rate within the normal limits.** The development of naturally functioning semi-natural habitats on cutaway peatland takes time. Pioneer vegetation can develop relatively quickly (3-10 years) and wetland habitats can develop relatively quickly. Birch woodland make take 20-30 years to develop. However, it may take 50 years for active raised bog vegetation to re-develop on ground that was previously cutaway. Different environmental conditions will have a significant impact on the rate of natural colonisation, and as a result of the combination of different environmental conditions and the application of different rehabilitation measures, there will be a variety of habitat outcomes.
- Rehabilitation measures have been designed to accelerate and work with natural colonisation and other natural processes. Bord na Móna experience of rehabilitation has shown that re-wetting improves conditions for natural colonisation and that natural colonisation is accelerated where the environmental conditions are most suitable. Rehabilitation measures have been designed to modify the conditions of areas within sites where conditions are less suitable for natural colonisation (modifying hydrology, topography, nutrient status or availability of potential seed sources).
- **Monitoring to be robust and effective.** Rehabilitation Monitoring will be established to validate the success of rehabilitation as required by Condition 10 of the IPC Licence and to verify the benefits of the proposed enhanced measures to optimise climate action. This will focus on a collecting a range of scientific data that can then quickly be adapted and into metrics that can be used to measure changes in various ecosystem services.

8. REHABILITATION ACTIONS AND TIME FRAME

Peatland rehabilitation requires detailed planning and the use of data from desktop surveys and field surveys. This data in association with 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 Garryduff Bog will include**:**

- Re-assessment of the pumping regime and turning off pumps if this desired and has no significant external impact. Initial hydrological modelling indicates that a significant part of the site will develop a mosaic of wetland habitats with 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 in the adjacent River Shannon and Callows.
- Re-wetting the deep peat and some shallow peat areas of the bog using berms and field re-profiling. This enhanced measure seeks to create large (c. 45m x 60m) flat areas or cells of shallow (< 10 cm) water conditions on bare peat, across multiple fields that are enclosed by shallow berms to retain shallow surface water;
- Re-wetting some deep peat areas of the bog through field drain blocking using a dozer to create peat barriers (up to seven every 100 m along each field drain);
- Re-profiling of some fields within the deep peat and shallow peat areas to improve water retention capacity;
- Re-alignment of piped drainage;
- Maximise water retention in wetland areas, including placement of berms where required;
- Blocking drains in targeted marginal (degraded) high bog area and re-wetting, where possible, using an excavator to install peat barriers. Some bog remnants are too small to benefit from this approach.
- Targeted fertiliser applications to accelerate vegetation establishment on bare peat areas of headlands and high fields,
- Seeding of vegetation such as Reeds in targeted areas;
- Seeding of vegetation in much of the site is not required as this bog has already undergone significant natural colonisation and the development of pioneer habitats is already significantly progressed in particular sections.
- 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).

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 (PCAS) will be applied to Garryduff 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 hydrology and drainage management appraisal of the proposed enhanced rehabilitation measures;
- Carry out a review of known archaeology and an archaeological impact appraisal of the proposed rehabilitation. Incorporate the results of this assessment 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. Several known rights of way are present along the Bord na Móna margins.
- Carry out a review of remaining milled peat stocks. It is expected that all peat stocks will eventually be removed or decommissioned.
- Carry out an ecological appraisal of the potential impacts of the planned rehabilitation, such as the presence of sensitive ground-nesting bird breeding species (e.g. Curlew) or larval webs of Marsh Fritillary butterfly, etc. The scheduling of rehabilitation operations will be adapted as appropriate; and
- Ensure all activities comply with the environmental protection requirements of the IPC Licence.
- Carry out Appropriate Assessment of the Rehabilitation Plan. Incorporate any required mitigation measures from the AA in the plan for the delivery of rehabilitation and decommissioning across the site.
- Track delivery of mitigation measures (AA) and other environmental control measures during the implantation of the rehabilitation plan.

Table 8.1. Enhanced rehabilitation measures and target area. Note that the types of rehab and areas of rehab may change in response to stakeholder consultation and refinement of the enhanced rehabilitation measures.

Type	Code	Description	Area (Ha)
Deep peat cutover bog	DPT1	Regular drain blocking (3/100 m) + blocking outfalls and managing water levels with overflow pipes	
	DPT2	More intensive drain blocking (max 7/100 m) + blocking outfalls and managing overflows	1.97
	DPT3	More intensive drain blocking (max 7/100 m), + field reprofiling + blocking outfalls and managing overflows	
	DPT4	Berms and field re-profiling (45m x 60m cell) + blocking outfalls and managing overflows + drainage channels for excess water + *Sphagnum* inoculation	10.57
	DPT5	Cut and Fill cell bunding (30m x 30m cell) + blocking outfalls and managing overflows + drainage channels for excess water + *Sphagnum* inoculation	37.65
Dry cutaway	DCT1	Blocking outfalls and managing water levels with overflow pipes	
	DCT2	Regular drain blocking (3/100 m) + blocking outfalls and managing water levels with overflow pipes + targeted fertiliser treatment	88.5
	DCT3	More intensive drain blocking (max 7/100 m) + blocking outfalls and managing overflows + targeted fertiliser treatment	
Wetland cutaway	WLT1	Turn off or reduce pumping to re-wet cutaway + blocking outfalls and managing water levels with overflow pipes	
	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	
	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	34.42
	WLT4	More intensive drain blocking (max 7/100 m), + blocking outfalls and managing overflows + transplanting Reeds and other rhizomes	603.01
	WLT5	More intensive drain blocking (max 7/100 m), + field reprofiling + blocking outfalls and managing overflows + transplanting Reeds and other rhizomes	
Marginal land	MLT1	No work required	113.05
	MLT2	More intensive drain blocking (max 7/100 m)	1.33
	MLT3	More intensive drain blocking (max 7/100 m) + blocking outfalls and managing overflows with + boundary berm	
Other		Silt-ponds	8.96
		Archaeology	20.77
		Riparian	3.54
Total			973.73

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 pump management, drain blocking, peat field re-profiling, cell-bunding and fertiliser applications targeting headlands, high fields and other areas (where required). All rehabilitation actions will be carried out with regard to environmental control measures (Appendix IV);

- Monitor the success of rehabilitation measures in relation to developing suitable hydrological conditions;
- Carry out the proposed monitoring, as outlined.
- While natural colonisation is expected to commence almost immediately once peat production ceases, Phase 2 actions will be carried out in targeted areas to accelerate re-vegetation and colonisation of target species. Phase 2 actions may include seeding of targeted vegetation and inoculation of *Sphagnum*;
- Silt ponds will be monitored during this period and there will be continued maintenance and cleaning to prevent potential silt run-off from the site during the rehabilitation phase; and
- Submit an *ex post* report to the Scheme regulator to verify the eligible measures to be carried out in year 1 of the Scheme, and an *ex ante* estimate for year 2 of the Scheme; and so on for each year of the proposed Scheme.

8.3 Long-term (>3 years)

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

8.4 Timeframe

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

8.5 Budget and costing

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

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

Bord na Móna maintains a provision on its balance sheet to pay for the future costs of **standard** rehabilitation and decommissioning when industrial peat extraction ceases. This is updated every year - for more information

see the Bord na Móna Annual Report (Bord na Móna 2020). Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

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

Figure 8.1 Aerial photo of Garryduff Bog. The whiteness present in the aerial photo north of the railway is exposed calcareous marls.

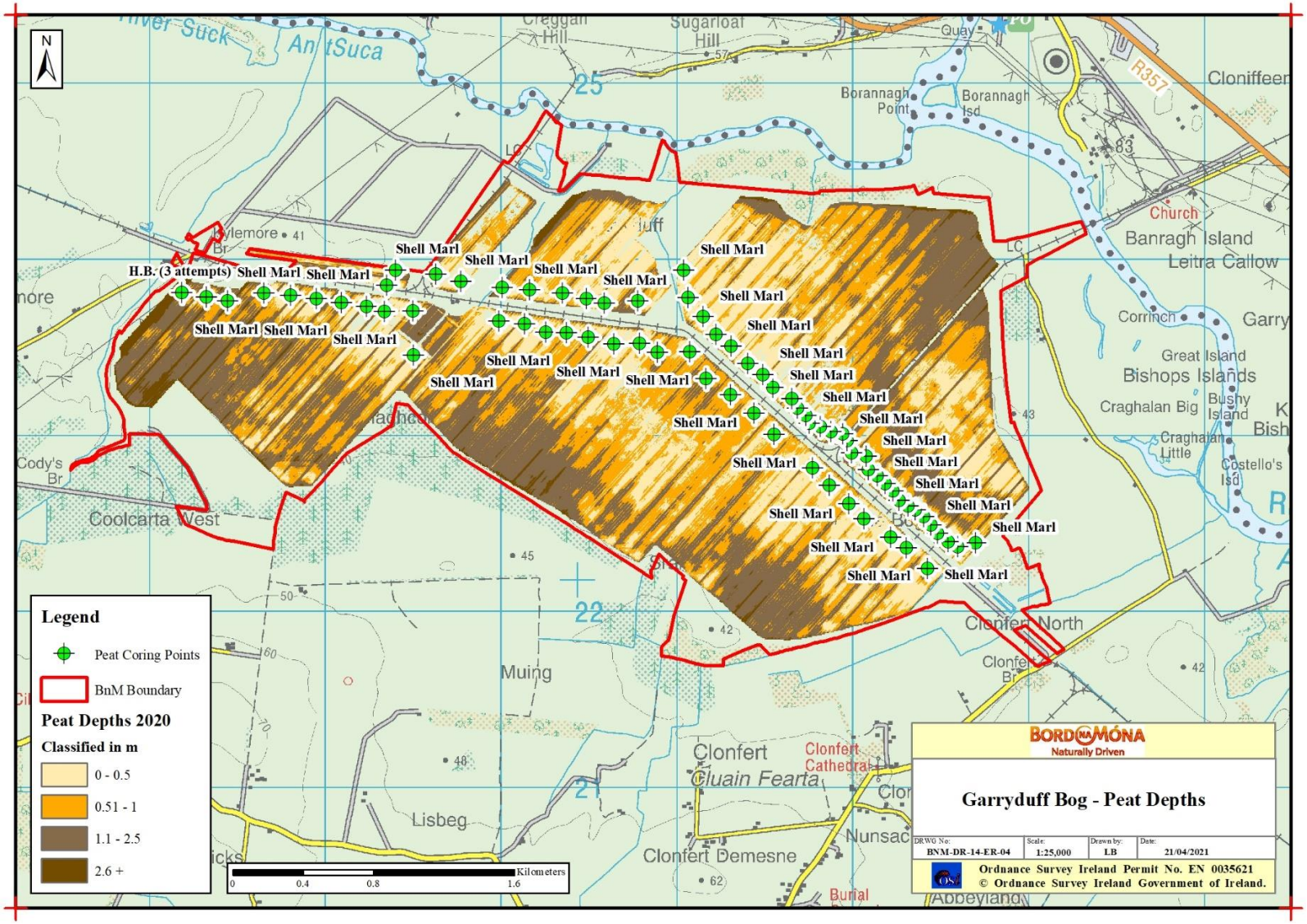

Figure 8.2. Peat Depth Map for Garryduff Bog. Deep peat reserves remain in the west of the bog areas, the peat over the remainder of the site has been harvested resulting in shallower peat reserves.

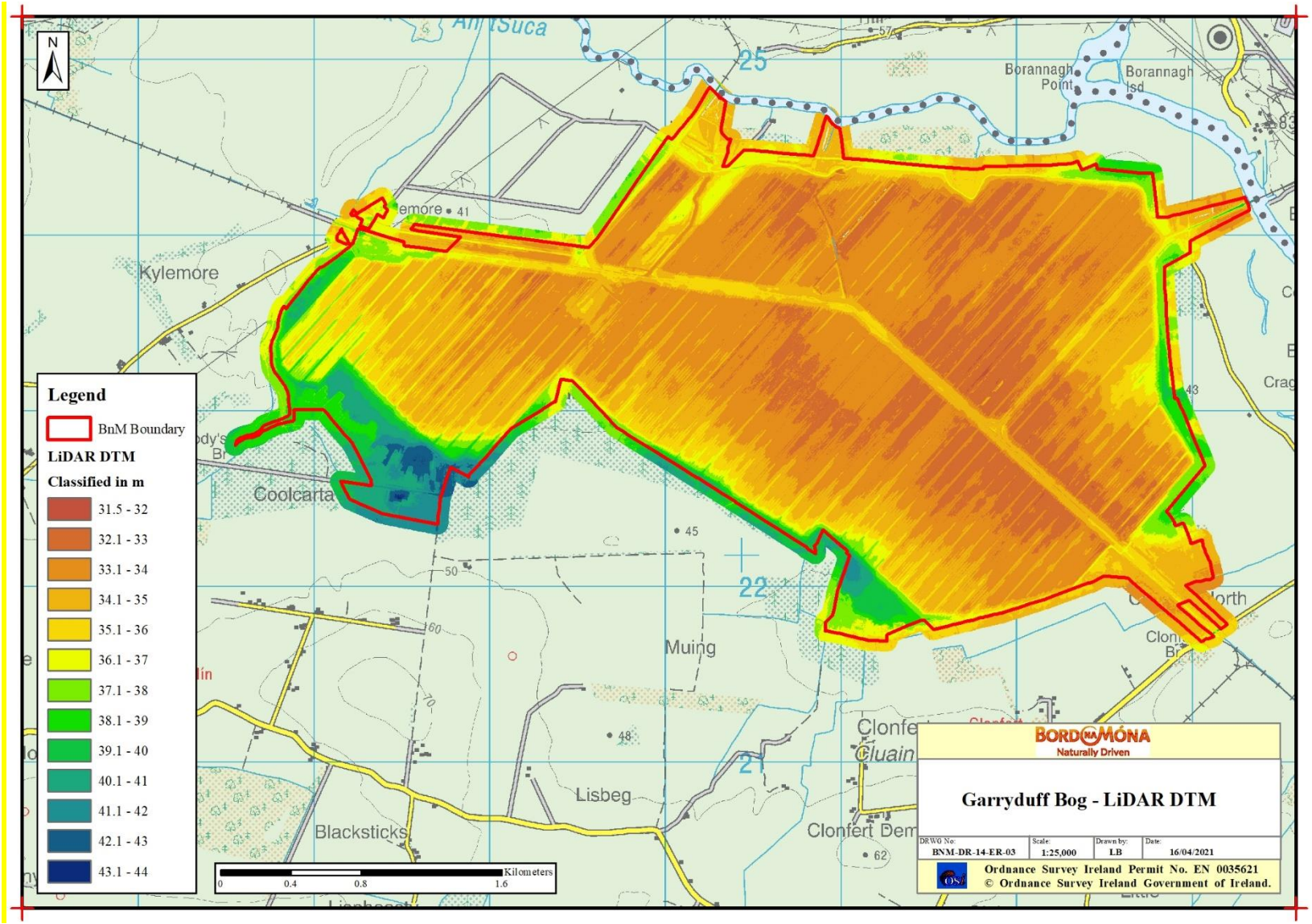

Figure 8.3. LIDAR topography map of Garryduff Bog. Low areas and basins are orange-yellow, more elevated areas are blue-green.

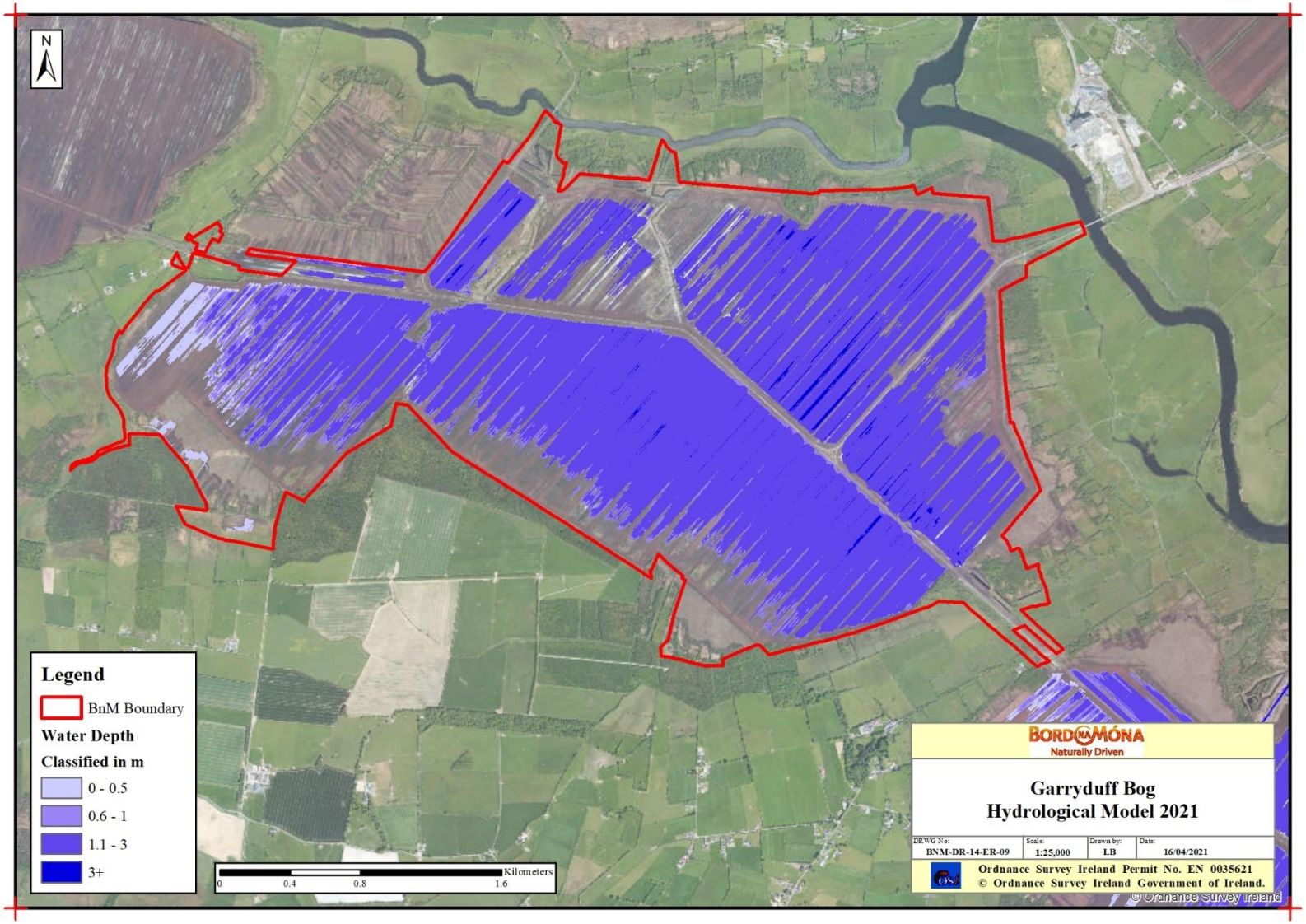

Figure 8.4. Hydrological model of Garryduff Bog. This shows expected water depths showing range of expected water depths based on current topography in the winter if pumps are turned off.

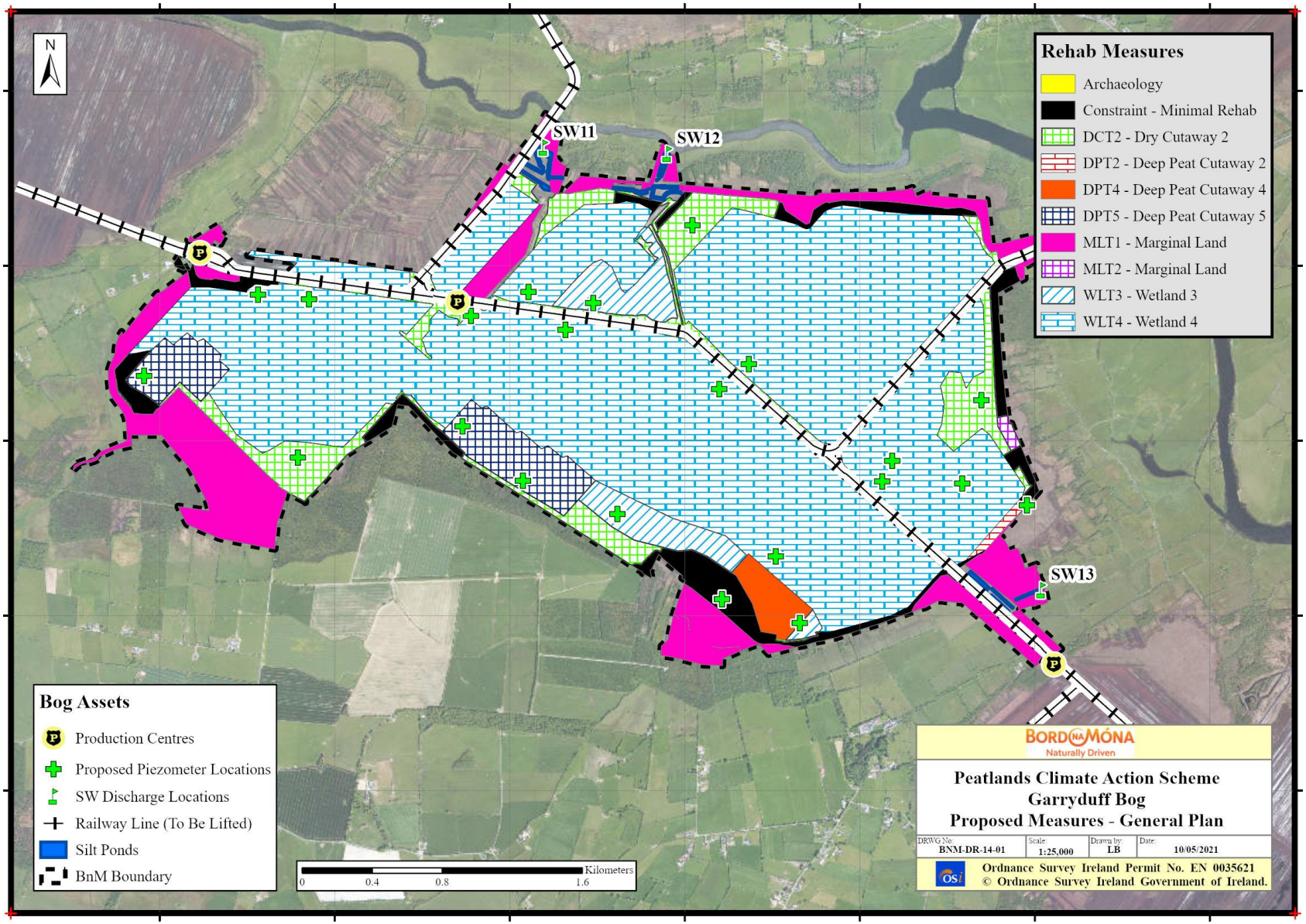

Figure 8.5. Indicative Enhanced Rehabilitation Plan for Garryduff Bog. *Note that the types of rehab and areas of rehab may change in response to stakeholder consultation and* refinement of the enhanced rehabilitation measures.

9. AFTERCARE AND MAINTENANCE

9.1 Programme for monitoring, aftercare and maintenance

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

- There will be **initial quarterly monitoring assessments** of the site to determine the general status of the site, the condition of the silt ponds, assess the condition of the rehabilitation work, monitoring of any potential impacts on neighbours land, general land security, boundary management, dumping and littering.
- The number of these site visits will reduce after 2 years to bi-annually and then after 5 years to annual visits.
- These monitoring visits will also consider any requirements for further practical rehabilitation measures.
- The **baseline condition of the site will be established** post-rehabilitation implementation by using an aerial survey to take an up to date aerial photo, when rehabilitation is completed. The extent of bare peat will be assessed using this baseline data, and habitat maps will be updated. It is proposed that sites can be monitored against this baseline in the future.
- **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 two years. post rehabilitation, depending on the period required to confirm that the main two parameters, suspended solids and ammonia are remaining compliant with the licence emission and trigger limit values and there is an improving trajectory in these two parameters i.e. reduction in concentration.
- 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, 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 criteria for successful rehabilitation are being achieved and key targets are being met, then water quality monitoring will be reviewed, with consideration of potential ongoing research on site. The water quality data, the aerial surveys and the habitat mapping will be collated and will be submitted to the EPA as part of the final validation report.
- If, after two years, key criteria for successful rehabilitation have **not** been achieved and key targets have **not** been met, then the rehabilitation measures and status of the site will be evaluated and enhanced, where required. This evaluation may indicate no requirement for additional enhancement of

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

- Where other uses are proposed for the site, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the required assessment process and planning procedures.

Additional monitoring measures are also proposed to monitor ecosystem service benefits that have been derived by the enhanced rehabilitation. These proposed monitoring measures will be funded by the proposed scheme or additional other funding. These are defined as:

- Vegetation and habitat monitoring after rehabilitation is completed using a cutaway bog condition assessment (Similar to ecotope mapping). This assessment will include assessment of on environmental and ecological indicators such as vegetation cover, vegetation communities, presence of key species, *Sphagnum* cover, bare peat cover and water levels. It is proposed that sites can be monitored against this baseline in the future.
- The condition of the bog can be assessed using the condition assessment and suitable Greenhouse Gas (GHG) emission factors can be assigned to different habitats. GHG emission factors have been determined for various peatland habitats in Ireland (Wilson *et al*., 2015) and are constantly being refined with more and more research. Bord na Móna 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 proposed Scheme and after consultation with stakeholders.

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

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

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

- The planned rehabilitation has been completed;
- The key criteria for successful rehabilitation has been achieved and critical success factors have been met;
- The water quality monitoring demonstrates that water quality indicators are moving towards what would be typical of a re-wetted cutaway bog; and
- The site has been environmentally stabilised.

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

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

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

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

Scope of rehabilitation

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

- The area of Garryduff Bog (Figure 3.1).
- EPA IPC Licence - Ref. P0502-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Garryduff Bog is part of the Blackwater Bog group.
- The current condition of Garryduff Bog. This site has pumped drainage. Pioneer wetland vegetation is developing across a significant part of the site.
- The key objective of rehabilitation, as defined by this licence, is **environmental stabilisation** of the bog.
- To minimise potential impacts on neighbouring land. some boundary drains around Garryduff Bog will be left unblocked as blocking boundary drains could affect adjacent land.
- Biodiversity and ecosystem services have been identified as the primary land-use by Bord na Móna.

Rehabilitation goals and outcomes

The key rehabilitation goal and outcome for Garryduff Bog is environmental stabilisation of the site via wetland creation and deep peat 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 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 and re-wetting). This will be demonstrated by a post rehab survey.
- Stabilising potential emissions from the site (e.g. silt run-off). The key target will be developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia). This will be demonstrated by water quality monitoring results.

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 to manage water levels across the site.
- Realignment of gravity outfalls.
- Pump management – reducing or ceasing pumping.
- Fertiliser treatment of bare peat areas of high fields and headlands (typically slow to naturally re-colonise) to encourage natural colonisation, if needed.
- No measures are planned for the surrounding marginal peatland habitats.
- Silt ponds will continue to be maintained during 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.

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

Table AP-1. Rehabilitation measures and target areas.

Type	Code	Description	Area (Ha)
Deep Peat	DPT1	Regular drain blocking (3/100 m) + blocking outfalls and managing water levels with overflow pipes	50.19
Dry Cutaway	DCT1	Blocking outfalls and managing water levels with overflow pipes	88.5
Wetland cutaway	WLT1	Turn off or reduce pumping to re-wet cutaway + blocking outfalls and managing water levels with overflow pipes	637.43
Marginal land	MLT1	No work required	117.92
Other		Silt-ponds	8.96
		Archaeology	20.77
		Constraint	49.96
Total			973.73

Monitoring, after-care and maintenance

- There will be initial quarterly monitoring assessments of the site to determine the general status of the site, the condition of the silt-ponds, assess the condition of the rehabilitation work, asses the progress of natural colonisation, monitoring of any potential impacts on neighbouring land and general land security. The number of site visits will reduce after 2 years to bi-annually. These site visits will assess the need to additional rehabilitation,
- Water quality monitoring will be established.
- Monitoring results will be maintained, trended and reported on each year as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, which will be available in April each year at www.epa.ie.
- The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD.
- This sampling regime on a selected number of silt ponds will be carried out over a two-year cycle. The original (licence) requirement was for a quarterly sampling regime.
- Where other uses are proposed for the site, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the 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;
- Water quality monitoring demonstrates that water quality of discharge is stabilising or improving; and
- The site has been environmentally stabilised.

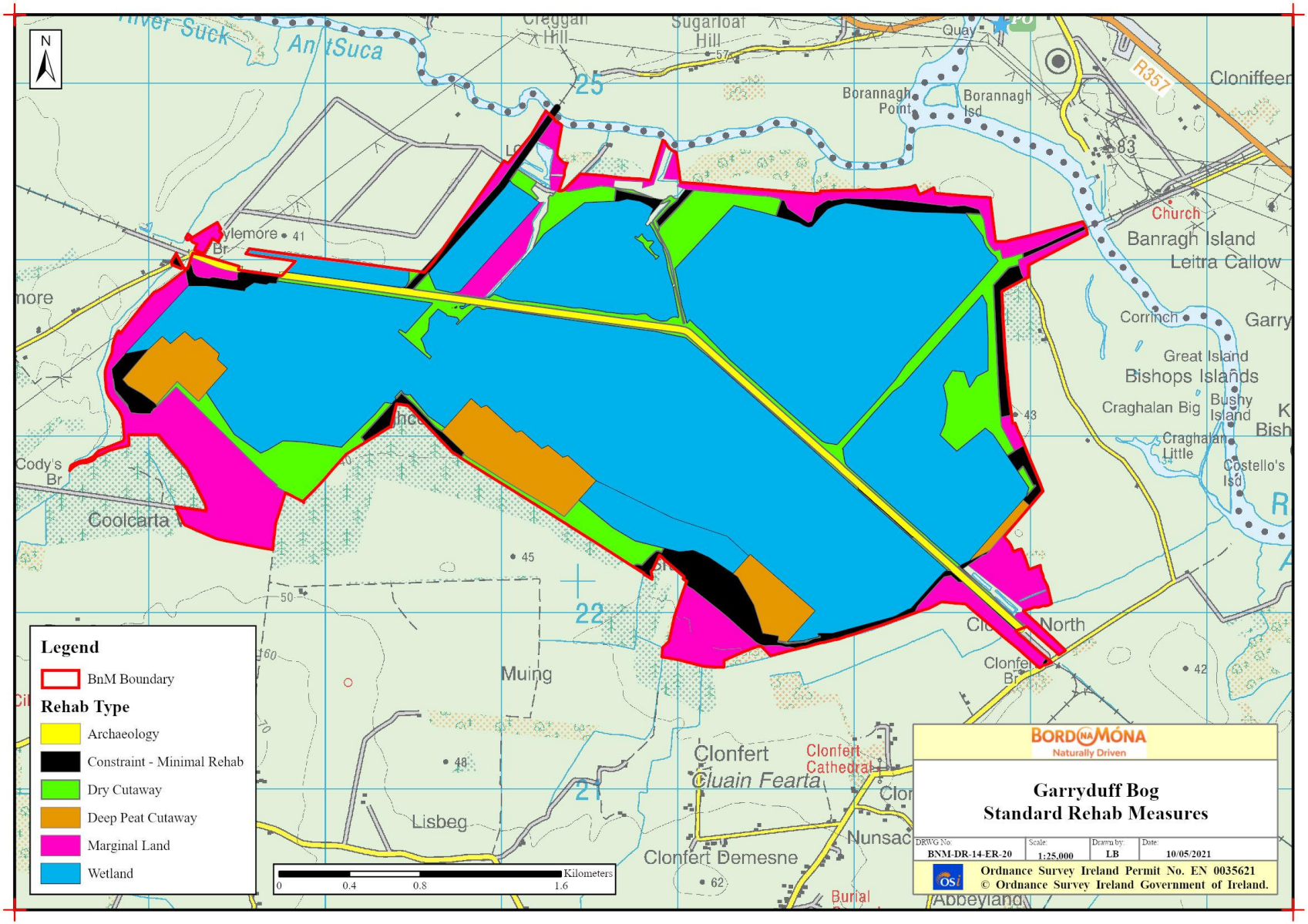

Figure Ap-1. Indicative adapted standard rehabilitation plan for Garryduff Bog.

APPENDIX II: BOG GROUP CONTEXT

The Blackwater Bog Group IPC Licensed area is made up of three sub-groups (Attymon, Blackwater and Derryfadda) and have been in industrial peat production for several decades. The majority of sites are situated alongside the Shannon and Suck Rivers within counties Roscommon, Galway, Westmeath and Offaly and cover an overall area of 15,515 ha. Each bog area further comprises a range of habitats from bare milled peat production areas to re-colonising cutaway to workshops areas and transport infrastructure. Industrial peat extraction from these sites mainly supplied ESB power stations at Shannonbridge (WOP) and Lanesborough (LRP).

Industrial peat extraction in the Blackwater Bog Group has permanently ceased on the majority of sites. It is planned to supply remaining milled peat stocks to Shannonbridge (WOP) and Lanesborough (LRP) during 2020. Both power stations will cease using peat by the end of 2020. Decommissioning and rehabilitation for the Blackwater Bog Group is expected to start in 2020/2021.

A number (6) of bogs were initially drained but have never been used for industrial peat production (three former development bogs (Kellysgrove, Tirrur-Derrymore and Newtown-Loughgore), Clonboley, Killeglan and Derrydoo-Woodlough). The latter three bogs are classed as restored raised bogs, still contain active bog habitat (that qualifies as the Annex I EU Habitats Directive habitat) and now form the core of the Bord na Móna Raised Bog Restoration Project due to their high biodiversity value and bog restoration potential. NPWS have identified the Clonboley bog cluster as having high ecological value within the recent assessment of raised bog SACs, NHAs and non-designated sites (NPWS 2014[2]).

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

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

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

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

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

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Attymon	336	Cutover Bog Industrial peat production commenced at Attymon Bog in 1941 and ceased in 2019. Attymon is a deep peat cutover bog.	Attymon Bog formerly supplied fuel sod peat. Coillte have developed a portion of the former production area for conifer forestry. Some rehabilitation was carried out in 2019/2020.	2109	Finalised 2018
Cloonkeen	252	Cutover Bog Industrial peat production commenced at Cloonkeen Bog in 1953 and ceased in 2019. Cloonkeen Bog is a deep peat cutover bog.	Cloonkeen Bog formerly supplied fuel sod peat. Coillte have developed a portion of the former production area for conifer forestry. Some rehabilitation was carried out in 2019/2020.	2019	Finalised 2018
Derrydoo-Woodlough	452	Development Bog Derrydoo-Woodlough Bog was drained in the 1980s in anticipation of industrial peat production. No industrial peat harvesting ever took place.	Bog restoration was carried out in 2013-2014 Rehabilitation (bog restoration) now complete.	N/A	Finalised 2012
Tirrur-Derrymore	422	Development Bog This bog was drained in the 1980s in anticipation of industrial peat production. No industrial peat harvesting ever took place.	This bog has significant raised bog restoration potential. Section leased to NPWS as a SAC turf-cutting relocation site.	N/A	Updated 2020
Newtown-Loughgore	448	Development Bog This bog was drained in the 1980s in anticipation of industrial peat production. No industrial peat harvesting ever took place.	Some sod turf production Bog restoration was carried out in 2019-2020 Rehabilitation (bog restoration) nearly complete.	2020	Finalised 2012
Killeglan	581	Development Bog This bog was drained in the 1980s in anticipation of industrial peat production. No industrial peat harvesting ever took place.	Bog restoration was carried out in 2013-2014 Rehabilitation (raised bog restoration) complete	N/A	Finalised 2016
Cloonboley 1	675	Development Bog This bog was drained in the 1980s in anticipation of industrial peat production. No industrial peat harvesting ever took place on the main section.	A small sub-section has been used for sod turf production. Bog restoration was carried out in 2013-2014 Rehabilitation (raised bog restoration) complete	2020	Finalised 2014
Cloonboley2	203	Development Bog This bog was drained in the 1980s in anticipation of industrial peat production. No industrial peat harvesting ever took place.	Bog restoration was carried out in 2013-2014 Rehabilitation (raised bog restoration) complete	N/A	Finalised 2016

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

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Ballaghhurt	597	Cutaway Bog Industrial peat production commenced at Ballaghhurt Bog in 1981. The majority of the site is cutaway with some residual deeper peat	Ballaghhurt Bog formerly supplied a range of commercial functions including horticultural peat and fuel peat. Pioneer cutaway vegetation communities are naturally developing on some cutaway areas.	2020	Draft 2017
Belmont	316	Cutaway Bog Industrial peat production commenced at Belmont Bog during the 1950's. The majority of the site is cutaway.	There are some areas of pioneer cutaway vegetation communities naturally colonising cutaway sections. Coilte have developed a portion of the bog for forestry.	2020	Draft 2021
Blackwater	2,303	Cutaway Bog Industrial peat production commenced at Blackwater Bog during the 1950's. The majority of the site is cutaway.	Bloomhill Bog formerly supplied milled horticultural peat and fuel peat. There is extensive development of emergent cutaway vegetation communities across the former production area. The site has been used for experimental forestry (BOGFOR) and other conifer plantations. Part of the site was rehabilitated with lake and wetland creation. An ash facility took ash from Shannonbridge Power station	2020	Draft 2017
Bloomhill	883	Cutover Bog Industrial peat production commenced at Bloomhill Bog during 1981. The majority of the site still has relatively deep residual peat.	Bloomhill Bog formerly supplied milled horticultural peat and fuel peat. Much of the former peat production area is bare peat.	2020	Draft 2017
Bunahinly-Kilgarvan	389	Cutover Bog Industrial peat production commenced at Bunahinly-Kilgarvan Bog during the 1990's. Residual Deep peat remains on these bogs.	Bunahinly-Kilgarvan formerly supplied milled horticultural peat and fuel peat. Much of the former production area is bare peat. Part of Bunihinly has been re-wetted.	2020	Draft 2017
Glebe	132	Cutover Bog Industrial peat production commenced at Glebe Bog during the 1990's. Residual deep peat remains on these bogs.	Glebe Bog formerly supplied milled; horticultural peat and fuel peat. Glebe bog is still listed as a pNHA. Much of the former production area is bare peat.	2020	Draft 2017
Clooniff	523	Cutover & cutaway Bog Industrial peat production commenced at Clooniff Bog during the 1970's. A mosaic of variable peat depths remains on this bog.	Clooniff Bog formerly milled fuel peat. Much of the former production area is bare peat or wetland. Some emergent vegetation communities are naturally colonising cutaway areas. Reduced pumping has created a large wetland in one area.	2020	Draft 2021

Cornafulla	460	Cutover Bog Industrial peat production commenced at Cornafulla Bog in 1987. This bog still retains relatively deep residual peat.	Cornafulla Bog formerly supplied milled horticultural peat and fuel peat. Much of the former production area or cutaway is bare peat.	2020	Draft 2017
Cornaveagh	492	Cutover Bog Industrial peat production commenced at Cornaveagh Bog in 1970's and ceased in 2020. This bog still retains relatively deep residual peat.	Cornaveagh Bog formerly supplied milled horticultural peat and fuel peat. Much of the former production area footprint or cutaway is bare peat.	2020	Draft 2017
Culliaghmore	442	Cutover Bog Industrial peat production commenced at Culliaghmore Bog in 1960's and ceased in 2020. Much of this bog is cutaway, with some pockets of deeper residual peat.	Culliaghmore Bog formerly supplied milled horticultural peat and fuel peat. Much of the former production area footprint or cutaway is bare peat. Some pioneer cutaway vegetation communities are naturally colonising cutaway areas.	2020	Draft 2017
Garryduff	970	Cutaway Bog Industrial peat production commenced at Garryduff Bog in 1960's. The majority of this bog is cutaway.	Much of the former production area footprint or cutaway is bare peat. Extensive natural development of pioneer cutaway vegetation communities is present on cutaway areas.	2020	Draft 2021
Kellysgrove	201	Development Bog Kellysgrove Bog was drained in the 1980s in anticipation of industrial peat production. No peat harvesting ever took place.	The site retains degraded raised bog vegetation. Kellysgrove Bog retains significant raised bog restoration potential. A way-marked walking trail is positioned along the old Ballinasloe Canal.	2020	Draft 2021
Kilmacshane	1,294	Cutaway Bog Industrial peat production commenced at Kilmacshane Bog in 1960's. The majority of this bog is cutaway with some pockets of deeper peat remaining.	Kilmacshane Bog formerly supplied milled horticultural peat and fuel peat. Some pioneer cutaway vegetation communities are naturally colonising cutaway areas and water levels have risen as pumping reduced, creating wetlands.	2014	Draft 2021
Lismanny	449	Cutaway Bog Industrial peat production commenced at Lismanny Bog in 1960's. The majority of this bog is cutaway with some pockets of deeper peat remaining.	Lismanny Bog formerly supplied milled horticultural peat and fuel peat. Much of the former production area footprint is bare peat. Some pioneer cutaway vegetation communities are naturally colonising cutaway areas.	2020	Draft 2021

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

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Derryfadda	610	Cutover bog Industrial peat production commenced at Derryfadda Bog in 1980's. This bog still retains residual deep peat.	Derryfadda Bog formerly supplied milled horticultural peat and fuel peat. Much of the former production area is bare peat. Some pioneer cutaway vegetation communities are naturally colonising cutaway areas.	2020	Draft 2017
Boughill	415	Cutover bog Industrial peat production commenced at Boughill Bog in 2008. This bog still retains residual deep peat.	Boughill Bog formerly supplied milled horticultural peat and fuel peat. Much of the former production area footprint or cutaway is bare peat.	2020	Draft 2017
Castlegar	517	Cutover bog Industrial peat production commenced at Castlegar Bog in 2001. This bog still retains residual deep peat.	Castlegar Bog formerly supplied milled horticultural peat and fuel peat. Much of the former production area is bare peat. The adjacent Annaghbeg Bog NHA is an intact undrained raised bog	2019	Draft 2021
Gowla	650	Cutover bog Industrial peat production by BnM commenced at Gowla Bog in 1970's. Development for sugar production was in place at Gowla since the 1950's. This bog still retains residual deep peat.	Gowla Bog formerly supplied milled horticultural peat and fuel peat. Much of the former production area footprint is bare peat.	2020	Draft 2017

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. The report outlines potential options for biodiversity management after industrial peat production has ceased, (if this is the proposed main land-use for the site).

Bog Name:	**Garryduff**	**Area (ha):**	972.1 ha (2401 .1 acres)
Works Name:	Blackwater	**County:**	Galway
Recorder(s):	MMC & DF	**Survey Date(s):**	22/02/2010 & 04/06/2010 16 & 18/06/2014

Habitats present (in order of dominance)

The most common habitats present at this site include:

- Bare peat (BP). The majority of the site is active production and there is little or no natural re-colonisation, even along the drains, the active production area (although this may be related to work practises on the site). Production is also exposing bare marl along portions of many fields. Some of this marl is being vegetated.
- Some typical poor fen habitats (pJeff, pTrig, pRos and pEang) and Birch scrub (eBir) are developing in production-related sections. (Codes refer BnM classification of pioneer habitats of production bog and cutaway. See Appendix II). A small area of dry heath (dHeath) has also developed in the northern part of the site.
- There are minor amounts of Reedbeds (pPhrag and pTyph) appearing in some fields with the majority appearing along the drains and being too small to map.
- Minor areas of other habitats associated with higher ground around silt ponds such as dry calcareous grassland (gCal), Molinia-dominated grassland (gMol) and Gorse scrub (eGor) are present in the silt pond complex.
- Several small patches of bog woodland (WN7) are present.
- A very minor area of Reedbeds (FS1) has developed in old drainage channels related to the old Grand Canal (SE corner).
- Fringe habitats around the margins of the production bog include raised bog remnants (PB1, PB4) scrub developing on high bog (WS1), Bracken (HP1) and bog woodland (WN7). (Codes refer to Heritage Council habitat classification, Fossitt 2000),

Description of site

Garryduff is located in east Galway, 1 km south of Shannonbridge. The River Suck flows along the northern boundary and meets the River Shannon, which flows along the eastern boundary. Garryduff is a relatively large industrial peat production site. This bog is a pumped bog with the water table significantly lower than the surrounding area. The site experienced rapid rising water levels in November 2009, and significant areas of open water was present at the time of the survey. The site is bisected by one main railway line running roughly NW-SE and this is situated on the old route of the Ballinasloe section of the Grand Canal, which has been infilled.

The majority of the site is not vegetated and was either bare peat or temporarily inundated with surface water at the time of the survey (when the site was revisited, most of the temporary open water sections were now exposed

and some pioneer poor fen vegetation was present, particularly where there was exposed marl). The site is divided into two main north and south sections by the main railway. The eastern side of the site contains a relatively narrow strip of land with access to the site.

Northern Section

This side of the site can be further divided by another railway that runs north and connects the main line with a bridge over the Shannon and also by several large drainage channels. A second branch of the railway is located further west along the western boundary and connects the main line with an adjacent site in Roscommon called Cornaveagh, across a bridge over the River Suck.

The eastern part of this section was dominated in the main by bare peat (east of the railway branch). A large part of this area (between the two railways) was also inundated with surface water at the time of the survey. This section was notably clear of vegetation and there was even very little vegetation developing along the edges of drains or within the drains. Small patches of Marsh Arrowgrass and Bog Cotton were most commonly seen along some of the drains. Bulrush was present in some of the drains but was rare. A small area has been out of production for several years and this was the only section that had developed any pioneer vegetation. The most common pioneer habitats were Birch scrub (eBir) and poor fen communities (pJeff and pEang). Some Bulrush was present within the drains. Several drier fields were being colonised by mainly tussocks of grass (Creeping Bent and Cocksfoot).

The area west of the railway branch was even less diverse. This area almost entirely comprised large areas of open water with several individual underwater fields separated by bare high stock-piles. The fields were surrounded by bare peat headlands. Further west (west of the bog woodland) there is a drain leading to a series of silt ponds. Towards the east side of these silt ponds there is a regenerating area with dry heath (dHeath) where production has not reduced the depth of the bog to the same extent as the majority of the site. The silt ponds also contain Reedbeds (pPhrag) with extensive Common Reed.

A small undeveloped block along the northern boundary contains some maturing bog woodland. This woodland was dominated by Birch and also contained some Scot's Pine and several Oak and Ash in the canopy. The shrub and understorey layers were poorly developed and dominated by dense Holly and Brambles. Some open patches contained thickets of Bracken and Bramble. The ground cover was also poorly developed and low in diversity. This was dominated by Ivy, mosses and leaf litter. Some bare peat was evident. Broad Buckler Fern was frequent. There were signs of Deer and Badger using this habitat.

The section of production bog between the large drain and an undeveloped area to the west was a complex mosaic of rewetted and dry sections with some pioneer vegetation. This area contained a series of pioneer poor fen communities (pJeff, pEang) including some areas dominated by Marsh Arrowgrass (pTyph). Both Common Reed and Bulrush were naturally colonising some of the drainage channels in this section. Birch was scattered through this section but overall the development of scrub was poor.

A narrow strip of undeveloped high bog is located near the western boundary. This section mainly contains bog woodland and scrub dominated by Birch. This area was not surveyed in detail due to access difficulties. Electric powerlines pass through this strip of land. Much of the intact raised bog has been disturbed or degraded and much of this area at the northern and southern margins is now grassland dominated by Purple Moor-grass.

The north-west corner contains a series of silt-ponds and associated habitats. These silt-ponds also contain extensive Reedbeds (pPhrag), although have been cleaned out to some extent in the recent past. Associated habitats around the silt-ponds include banks of peat that are developing scrub (eGor) Bracken (and Purple Moor-grass dominated grassland (gMol). Much of the grassland around the silt ponds in calcareous in nature (gCal). Other communities include some poorly developed pioneer grassland (mainly gMol and pJeff) developing on bare peat. Further north there is a small area close to the main River Suck channel and the railway bridge that is developing wet Willow dominated woodland. This habitat is poorly developed.

The eastern and northern margins of the production bog mainly contained a fringe of disturbed dry raised bog (PB1, high bog) that was being colonising by scrub and by conifers. Both Gorse and Birch were quite frequent

along the high bog margin and Pine saplings and small trees were frequently scattered over the high bog. There was occasional development of scrub on the high bog. The raised bog was dominated by Heather.

04/06/2010

When the site was surveyed a second time in June 2010, the majority of the rewetted section now comprised exposed bare peat. Exposed marl was present in many of the fields to some extent and this was being vegetated by mainly pioneer Arrowgrass-dominated vegetation and other poor fen communities (pEang and pJeff). The development of these communities was generally quite poor as they are quite young and at an early pioneer stage with significant proportion of bare peat. Greater Tussock Sedge (*Carex paniculata*) was one species of note that was recorded in the poor fen vegetation. Arrowgrass was spread over the area mapped as bare peat but was mainly at low densities. Further west of the silt pond complex in the northern section, several fields mainly vegetated with poor fen communities contained small amounts of Common Reed (pPhrag).

Southern Section

The southern section of the site can be further divided into a western side and an eastern side, with a works area and a tall stand of Birch trees acting as a divider for the two sub-sections.

The eastern side of the site was for the most part comprises with temporary surface water, long stretches of higher fields and stockpiles converged on surface waters. There were signs that water levels had indeed been higher in the weeks previous to the ecological survey. A section of bog woodland (WN7) is located within the BnM property in the far east of the site; however this area is actively managed by a party other than BnM. A section of degraded raised bog (PB1) is located along the southern boundary of the site. This area was dry and was dominated by Heather; some small sections of old cutover (PB4) were located to the south of the high bog. This area seems to have been used for domestic turf cutting but this appears to have been some time ago and bog woodland (WN7) was developing here.

As previously mentioned the majority of this section was inundated with areas of open water at the time of the ecological survey due to heavy rainfall. Large numbers of Whooper Swan were recorded along with high numbers of water fowl including Teal, Mallard and Tufted Duck. The areas along the southern boundary that were not inundated with rising water levels mostly comprised bare peat with the development of wetland and scrub habitats in places. Species that had developed here included Birch, Sitka Spruce, Pine (Scot's and Lodgepole), Cotton Grass, Soft Rush, Reedmace and Marsh Arrow Grass. The latter species was relatively abundant in places and had provided a food source for Whooper Swans.

To the far west of this site habitats such as a silt pond and Birch woodland were located. The Birch woodland was located on an area that had been used to store machinery in the past and the Birch had developed around this, further development of young Birch scrub was occurring to the east of this woodland. Immediately to the north, before the railway line a works area was located, it contained dining facilities, machinery and sheds. A small area immediately surrounding this facility had been planted with Leylandii Cypress trees while some Alder and Birch were also located here.

The western section was for the most part bare peat with only two small areas of temporary open water; the south eastern corner of the site was becoming revegetated with Birch and Marsh Arrow Grass. This section is in active production and many of the drainage ditches had been recently cleared out. Some of the stockpiles were also being taken off the site for use in the nearby West Offaly Power Plant. Sections of remnant raised bog (PB1) were located along the margins of this section. These habitats were dry and degraded, the largest area of raised bog to the south had been burned and active domestic turf cutting was evident.

A small section of Coillte managed conifer plantation (WD4) was located in the north eastern corner of the site within the BnM boundary. Small areas of bog woodland (WN7) that were dominated by Birch were located along the edges of the site. Two small fields of wet grassland (GS4) were located in the south of the site; these fields are actively managed by someone other than BnM. A field that is classified as improved grassland (GA1) is located

in the north west corner of the site, again this field is managed by a party other than BnM. A small area of bog woodland (WN7) containing Birch, Sycamore, Hawthorn, Rowan, Ash and Holly adjoins this field, while an un-maintained hedgerow forms the boundary between the field and the bog.

04/06/2010

The southern side was similar to the northern section in that hen the site was surveyed a second time in June 2010, the majority of the open water section now comprised exposed bare peat. However, this side was vegetated to a much greater extent with the exposed marl being colonised by mainly poor fen communities and some emergent scrub (eBr). Exposed marl was much more prevalent the southern side of the railway. Pioneer Marsh Arrowgrass-dominated vegetation was prominent in places as was mosaic of vegetation dominated by Bog Cotton, Rushes and emerging Birch. Bottle Sedge and Horsetail-dominated patches were also present, but to a lesser extent. Several patches of Common Reed were developing on this side of the railway.

Eastern access zone

This small area contains a gravel track, travel paths and a railway, with associated pioneer calcareous grassland (gCal). There is some wet grassland, bog woodland and scrub on both sides of this area. Some of the wet grassland and bog woodland along the southern boundary was fenced off and grazed by cattle. Part of the old canal drainage system is still intact and this wide drain was infilling with reedbeds (FS1) and contained other aquatic vegetation. The northern side was cut off by drainage channels and silt ponds.

2014.

The majority of the site is underlain by shell-marl and this is having a significant influence on the colonising vegetation. High fields are creating a pattern of 1-2 bare peat fields separated by 4-6 re-vegetating fields. This is generally dominated by Marsh Arrowgrass, Jointed Rush and Bog Cotton and can be quite open with significant amount of bare peat cover (25-50%). This vegetation type occurred on low fields between high fields and there is still surface water in places. This vegetation can mainly be seen south of the railway. The area north of the railway in the central section has similar pioneer vegetation, but it is less well developed. Small scrubby Birch and Willow can be scattered through this vegetation, but it tends to be light. There is also some Reed cover scattered through the site, forming stands that are slowly getting larger. There are occasional clumps of *Carex rostrata*, generally with Bog Cotton in wetter areas where there is some standing water. Overall, the pioneer vegetation tends to be quite diverse and is not dominated by one or two species, as is the case with other sites. The moss layer in the wetter areas is poorly developed. There was one small area towards the NW section that was dominated by Yellow Sedge and also had some colonising Black Bog-rush.

The NE section has a somewhat different topography in that there are several ridges of underlying gravel that are influencing the re-vegetation. Where the cutaway is dry, the vegetation tends to contain more Birch and Soft Rush. Wetter areas tend to have greater cover of Bog Cotton.

The two main bog remnants are generally relatively dry and dominated by marginal ecotope. There was a small area in the southern remnant that tended towards sub-central and had a spongy surface with good *Sphagnum* cover. Large Heath butterfly were flying on the bog remnants.

Key biodiversity features of interest

- Overall this site has relative few features of particular ecological interest from a botanical perspective. Wetland habitats are developing. .
- Garryduff includes several undeveloped or partially-developed sections around the margin of the production bog that have been designated as part of a nature conservation site (River Shannon Callows cSAC and SPA & Suck River Callows SPA and NHA). Some of the remnant high bog is within the designated boundary, although it is quite degraded. These designated areas also include other typical marginal habitats such as wet grassland, scrub and bog woodland. They also act as part of a buffer between the production bog and the main channels of both rivers.

- Small undeveloped sections within the production bog include patches of bog woodland (WN7), scrub (WS1) and disturbed raised bog (high bog PB1) in poor condition.
- The main area of the bog was temporarily inundated with surface water and rising water levels at the time of the survey. These areas of open water offer a refuge to a very significant flock of Whooper Swan (Annex I; EU Birds Directive). Peak numbers for this site were 840 (cut off point for classifying a site as internationally important for Whooper Swans is 1% of national population – 210 in 2006 (this figure has been updated to 270 in line with current population trends Crowe et al. 2015)). The temporary wetland also attracted significant numbers of wildfowl with mainly Mallard and Wigeon and some Teal and Tufted Duck.
- Other species of conservation interest that were noted using the site include Otter (Annex II Habitats Directive species) and Badger (protected under the Irish Wildlife Act).
- 2014 Area now out of production are re-vegetating with a range of pioneer wetland and poor fen communities, predominantly influenced by underlying shell-marl. There are several indicators of potential rich fen development in places.
- 2014. There have been several anecdotal records of Hen Harrier around the site in the past few years. Peak Whooper Swan numbers are still quite high (> 270 international importance) during winter months.
- 2014. Large Heath Butterfly was recorded on two bog remnants along the southern margin. This species is on the Butterfly Red list.

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

Suck River Callows NHA (NPWS site code 000222) and SPA (NPWS site code 0004097)

The northern boundary of the production bog adjoins this long designated area that follows the path of the River Suck. This site has been designated for its importance for wintering wildfowl and species of conservation importance such as Greenland White-fronted Geese and Whooper Swan.

Some undeveloped and partially fringe habitats within the northern BnM boundary are designated as part of this NHA and SPA. Two sections contain a series of silt ponds and associated habitats. Other habitats include small amounts of remnant high bog, scrub and bog woodland. Part of the BnM boundary extends out to the River Suck and this section takes in some wet grassland and fringing Reedbed and scrub along the edge of the river. There are 14 ha within the NHA boundary in the Garryduff property.

River Shannon Callows cSAC & pNHA (NPWS site code 000216) and SPA (Middle Shannon Callows, NPWS site code 004096)

This large designated area extends between Athlone and Portumna. The designated area partially includes several small areas along the eastern margin of the site. These small areas generally contain sections of remnant high bog (PB1) and other typical fringing habitats such as scrub (WS1) and patches of bog woodland (WN7). One section is also partially developed as part of the production bog while another section is part of the access route to Shannonbridge.

There are 22 ha in total within the cSAC designation in the Garryduff property.

There are 36 ha in total within SPA between the two designations.

Adjacent habitats and land-use

Habitats around the margins of the site include:

- The River Shannon and Suck Callows (low-lying wet grassland and Reedbeds that are prone to inundation during winter months) around the northern and eastern boundaries.
- Improved grassland (GA1) and wet grassland (GS4) that is grazed during the summer and fodder is also cut.

- Typical marginal peatland habitats such as remnant high bog (PB1), cutover bog (PB4), bog woodland (WN7) and scrub (WS1). There is intensive active cutting of domestic peat around the north-west side of the site, outside the BnM boundary.
- Conifer forestry that has also been planted in places (non-Coillte) adjacent to the southern boundary.

Watercourses (major water features on/off site)

- The main channel of the Shannon and the Suck passes close to the east and north sides of the site respectively. All the drainage on the site is linked to the river. Parts of the site are less than 250 m from the main channels of both rivers.
- An old branch of the Grand Canal extending between Ballinasloe and the Shannon passes through the mid-section of Garryduff. It was constructed in 1823. This canal was closed in 1961 and was infilled to create the main BnM railway line through the site. Some of the old drains along the base of the canal at still intact. These are located at the eastern end along the main access zone into the site.
- Garryduff formerly contained a small lough called Lough Kimmeen. This lough was drained and removed during production. The bog also formerly contained several flush/soak features that were mapped on the old OSI 2nd edition 6 inch map. There are no sign of these features now.
- Several small streams mapped on the old OSI 2nd edition 6 inch map flow north from the bog to the River Suck. Some of these streams have been canalised and piped and are now part of the main drainage of the production bog. One stream has also been channelised and flows though an undeveloped section on the western half of the site.

Peat type and sub-soils

The majority of the site in underlain by shell-marl, which is having a significant influence on pioneer vegetation development.

Fauna biodiversity

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

- A max number of 890 Whooper Swans was recorded from the site (23/02/2010). The previous day 356 Whooper Swans were counted but it was felt this was an incomplete count. Swans were likely to be collecting here prior to final migration back to Iceland. It was noticeable that there were far more Whooper Swans at Garryduff compared to Kilmacshane, where water levels had gone down significantly. High numbers of Whooper Swans were noted on this site at several other occasions in January including the surveys of Lismanny (25/01/2010) and Kilmacshane (19-21/01/2010) (where 350 swans were counted). A very significant number of Whooper Swans (internationally important > 270) seems to have been present on this site, especially since the bogs are probe to inundation during winter months, and on the adjacent Kilmacshane bog for several months in 2009/2010, according to these counts and to other accounts of swan usage for these sites.
- There was significant numbers of other wildfowl. Wigeon and Mallard seemed to be most numerous. Teal were also present and there were several Tufted Duck. A max count of 250 wildfowl was recorded. Several pairs of mallard were also flushed from some of the various silt ponds.
- A pair of Ravens were calling and displaying over the site for a relatively long period. Ravens are likely to nest in the adjacent woodland around the site.
- Common birds such as passerines and corvids were also noted on the site. These included Wren, (using adjacent high bog margin) Pied Wagtail along access routes), Blackbird (in bog woodland), Pheasant (in bog woodland), Blue Tits (bog woodland), Long-tailed Tit (Bog woodland), Wood Pigeon, (over-flying and using adjacent woodland), Grey Crow (over-flying and roosting), Reed Bunting (using scrub around silt ponds), Redwing (using silt pond area), and Rook (over-flying and roosting).

- Snipe (15 in total) were flushed from several sections of the site including some of the remnant high bog around the margins.
- Pair of Cormorants was observed flying over the site.

04/06/2010

- Two Lapwings were also flushed from the production bog.
- 2 Heron using TOW
- Other more common species included Meadow Pipit, Mallard (2) Skylark, Wren and Chaffinch.

Mammals

- Signs of Deer (most likely Fallow Deer) were noted at several locations around the margins of the site.
- Grazing by Rabbits/Hares was noted along some of the access routes through the site and Hare droppings were noted around the margins and on some of the high bog.
- Signs of Squirrel (probably Red Squirrel) were noted in the bog woodland along the north of the site.
- Signs of Fox noted around the margins of the site.
- Signs of Badger foraging and footprints were also frequently noted around the margins of the site.
- Otter and Mink have both been sighted at Garryduff by local BnM staff in recent years
- Signs of Pine Marten noted along the railway track (04/06/2010)

Other species

- 4-Spotted Chaser

June 2014

- Large Heath Butterfly (5), (on two remnants along the southern margin), Common Blue, Meadow Brown, Orange Tip,
- Meadow Pipit, Hen Harrier, Whooper Swan, Ringed Plover, Heron,

Forestry and potential forestry on site

There are several small areas of woodland on the site. Some of these are bog woodland that has naturally developed on mounds within the production area are in one case a small undeveloped section along the northern boundary. Bog woodland and scrub is also developing on undeveloped fringe high bog along the northern boundary of the site.

Garryduff is a pumped bog and it is likely that the water-table will rise significantly once the bog comes out of production and large sections may be permanently rewetted as a result of surface water inundation. This will render nearly the entire site unsuitable for the development of forestry. There is some cutover bog located on the south-west corner. This may be suitable for planting. There has been private planting of conifers on adjacent cutover bog outside the BnM boundary adjacent to this area.

Activities on the site

Activities on the site include:

- Industrial peat production. The majority of this site is in active production with only a small proportion considered production-related cutaway. There are no significant areas permanently out of production at this site.
- Use of rail links. The main railway line links adjoining sites Kilmacshane, Lismanny and others to West Offaly Power, across a bridge over the Shannon.
- There is a small Works/Tea Hut along the central railway in the western section of the site.
- Electric powerlines pass over some of the site.
- Domestic peat cutting. There is intensive active domestic peat cutting of an undeveloped section of high bog located in the south-west part of the site. This area is accessed by a bog track.
- Burning had occurred within the past five years in the previously mentioned area of raised bog.

There is some wet grassland and bog woodland along both sides of the eastern access zone that was fenced off and grazed by cattle. There may be boundary/ownership issues with some of the land on both sides of the eastern access zone. Other areas of lands that were actively managed by parties other than BnM were located along the margins of the southern section.

HABITAT DESCRIPTIONS

(See Habitats Description Document for detailed description of each vegetation community not described in this section.)

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

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

APPENDIX V. BIOSECURITY

No invasive plant species of the third schedule have been recorded at Garryduff Bog.

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[3] and Zebra Mussel will be adhered with throughout all rehabilitation activities.

[3] 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 announced the cessation of all industrial peat extraction in 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 Blackwater bog group (Ref. P0502-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. The bog is part of the Blackwater 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 scheme, (PCAS), across a footprint of 33,000 ha. This proposed scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations under existing EPA IPC licence conditions. Interventions and measures supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and

other ecosystem services, will also be delivered. However, only the costs associated with the additional and enhanced measures, i.e., those which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10, will be eligible for support under the proposed Scheme.

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

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 (PCAS)**.

The development of site rehabilitation plans and the delivery of peatland rehabilitation by Bord na Móna is expected to have a positive impact on water quality and will help the 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 2016-2021

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

7 National conservation designations

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

Garryduff Bog partially overlaps with the River Shannon Callows SAC and pNHA (NPWS Site Code: 000216) and Middle Shannon Callows SPA (NPWS Site Code: 004096) at three small location on the eastern and southern periphery of the site. The River Shannon Callows SAC (and pNHA) is designated for grasslands (Molinia and Lowland Hay Meadows) as well as alluvial woodland and Otter. The Middle Shannon Callows SPA is designated for the assemblage of wintering wildfowl, many species of which occur in internationally and nationally important numbers as well, in addition to breeding Corncrake. It is also noted as being important for breeding waders and a range of other nationally scarce species such as breeding Shoveler, Quail and Whinchat.

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.

Garryduff Bog is located in an area zoned by Galway 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 has been carried out for the proposed rehabilitation at this site (Appendix XII). The recommendations of this assessment will be incorporated into the rehabilitation plan to minimise impacts on known archaeology. In addition, Bord na Móna will adhere to the Archaeology Code of Practise relating to management of stray archaeological finds that may arise during cutaway peatland rehabilitation and decommissioning.

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

13 Bord na Móna commitments

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

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

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

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

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

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

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

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

APPENDIX VII. DECOMMISSIONING

1. Condition 10 Decommissioning

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

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

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

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

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

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

Item	Description	Garryduff Decommissioning Plan
1	Clean-up of remaining or unconsolidated waste or materials located in Bogs, Yards, Buildings and Offices	Clean-up of Bog
2	Cleaning Silt Ponds	Cleaning Silt Ponds
3	Decommissioning Peat Stockpiles	Peat Stockpile Management via Levelling
4	Decommissioning or Removal of Buildings and Compounds	If feasible
5	Decommissioning Fuel Tanks and associated facilities	Decommissioning and De-Gassing Mobile Fuel Tanks
6	Decommissioning and Removal of Bog Pump Sites	If feasible
7	Decommissioning or Removal of Septic Tanks	De-sludge Septic Tank

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

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

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

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

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

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

waste.

7.3.3 The ultimate destination of the waste.

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

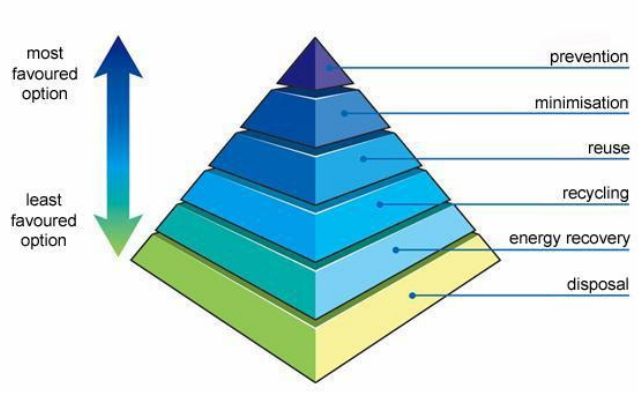
7.3.5 The tonnages and EWC Code for the waste materials listed in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* sent off-site for disposal/recovery.

7.3.6 Details of any rejected consignments.

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

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

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



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

2. Enhanced Decommissioning.

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

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

APPENDIX VIII. GLOSSARY

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

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

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

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

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

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

Rehabilitation: Rehabilitation is defined in general by Bord na Móna as environmental stabilisation of the former cutaway. This is generally achieved via re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention. It is not possible to restore raised bog habitats on BnM cutaway in general in the short-term. In general, most of the peat mass has been removed from many BnM cutaway sites and the environmental characteristics of these areas have therefore changed radically (peat depths, hydrology, water chemistry, substrate type, nutrient status. This means there will therefore be different habitat outcomes (wetlands, fen, heathland, grassland and Birch woodland). Other after-use development may also serve to act as rehabilitation.

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

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

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

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

APPENDIX IX. EXTRACTIVE WASTE MANAGEMENT PLAN

(Minimisation, treatment, recovery and disposal)

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

Scope:
This plan covers IPPC Licence's P0502-01, Blackwater Group of Bogs in Counties Roscommon, Galway, Offaly and Westmeath,

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

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

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

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

2.0 P0503-01 IPPC Licence Extractive Waste Conditions

2.1 Condition 7.5 Extractive Waste Management
The licensee shall draw up a Waste Management Plan (to be known as an Extractive Waste Management Plan) for the minimisation, treatment, recovery and disposal of extractive waste. This Plan shall meet the requirements of regulation 5 of the Waste Management (Management of Waste from the Extractive Industries) Regulations,2009. The Plan shall be submitted for agreement by the Agency by the 31' December2012. The Plan shall be reviewed at least once every five years thereafter in a manner agreeable to the Agency and amended in the event of substantial changes to the operation of a waste facility or to the waste deposited. Any amendments shall be notified to the Agency.
All extractive waste shall be managed in accordance with the Extractive Waste Management Plan. A report on the implementation of the Extractive Waste Management Plan shall be provided in the AER.

2.2 Condition 7.6 Waste Facility
(i) No new waste facility may be developed or an existing waste facility modified unless agreed by the Agency.
(ii) The licensee shall ensure that all existing waste facilities are managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iii) The licensee shall ensure that all new waste facilities are constructed, managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iv) Operational measures shall be continuously employed to prevent damage to waste facilities from personnel, plant or equipment.
(v) The licensee shall establish and maintain a system for regular monitoring and inspection of waste facilities.
(vi) All records of monitoring and inspection of waste facilities, as required under the licence, shall be maintained on-site in order to ensure the appropriate handover of information in the event of a change of operator or relevant personnel.

2.3 Condition 7.7 Excavation Voids
7.7.1 Unless otherwise agreed by the Agency, only extractive waste shall be placed in excavation voids.
7.7.2 When placing extractive waste into excavation voids for rehabilitation and construction purposes, the licensee shall, in accordance with regulation 10 of the Waste Management (Management of Waste from the Extractive Industries) Regulations, 2009, and the Extractive Waste Management Plan:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

7.0 Extractive Waste Management Plan

5 (2a)(i)
The vast majority of peat extraction bogs were all designed and drained for production prior to the 1960's and as such the production fields layout cannot' be altered. Under our Cleaner Reduction Procedures, various design changes have been implemented to the production machines and process to reduce lost peat which eventually is captured in the silt ponds and requires removal as waste peat silt. This along with training and ongoing research and development will continuously reduce waste peat and subsequently waste silt pond cleanings. Bog timbers are present naturally in various volumes and quantities in different bogs and as peat production involves stripping peat in layers, the exposure, generation and removal of these timbers is unavoidable. Work has been undertaken recently into project looking at grinding of these bog timbers in situ using a timber miller, and if this project becomes viable it will contribute to the reduction of bog timbers.

5 (2a)(ii)
Given the nature and expanse of peat bogs, the stockpiling and storage of these waste materials do not present a visual, storage or stability problem. As required under Condition 10 of the IPPC Licence, the silt pond excavations and screenings will be utilised to backfill the silt pond voids once the bogs have finished and stabilised in accordance with out Bog Rehabilitation Plan. Storage of these wastes in the interim, open to the elements does not present a change on the nature of these wastes that will threaten the environment or prevent their reuse during the bog rehabilitation process.

5 (2a)(iii)
Under Condition 10 of the IPPC Licence, all silt ponds will be decommissioned once the bog surface has stabilised, in agreement with the Agency. This will involve the removal of weirs and flow controls, returning the silt pond back to its original drain or removing the silt pond from the drainage system. Both of these activities will involve placing the silt pond extraction and cleaning material back into the excavation void.

5 (2a)(iv)
The peat bogs do not contain any topsoil, so this is not required.

5 (2a)(v)
Peat mineral resources do not undergo any treatment.

5 (2b)
These three extractive waste are all being reused and recovered back to their original extraction points and have not undergone any physical, chemical, or biological change.

5 (2c)(i, ii & iii)
These three extractive wastes, stored on the bog for reuse or recovery during the bog rehabilitation phase, do not require any management or monitoring during the operation of these bogs. Silt pond excavations and cleanings are stored adjacent to the silt pond and quickly revegetated and stabilise, the screenings are graded back into the bog at the agreed locations upon disposal and the bog timbers do not prevent any water or airborne danger to the environment.

5 (3)
The three extractive wastes arising from peat extraction operations at this site are classified wastes from mineral non-metalliferous excavation, with an EWC code of 0101 02. The materials are not classified as hazardous under Directive 91/689/EEC20, and do not contain substances or preparations classified as dangerous under Directives 67/548/EEC5 or 1999/45/EC6 above a certain threshold.
The peat excavations and cleanings are stored in locations and in a manner that they could not collapse, and are remote in their nature. The stockpiles are located adjacent to silt ponds that are cleaned regularly and as such these stockpiles are managed and levelled to facilitate further cleanings.
Therefore the material stored at these waste facilities would not be considered to be a Category A waste facility.

Classification in accordance Annex II.

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

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

Closure plan. (Bog Rehabilitation Plan).
Condition 10.1 – 10.3 of the IPPC Licence requires the following:

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

10.2 Cutaway Bog Rehabilitation Plan:

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

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

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

10.4 A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment. This plan including maps and ecological classifications are available on file at the Clonsast IPPC Licence Coordinators office.
The location in relation to the silt pond excavations and cleanings are adjacent to the silt ponds, which are considered under the Shannon River Basin Management Plan in accordance with the requirements of Directive 2000/60/EC.
Screenings and bog timbers are all naturally occurring elements of peatland and there placement back to the bog in smaller concentrated designated waste facilities does not constitute a risk to the prevention of water compliance.
The lands under where these materials are deposited are peatlands and are un-effected by the placing of this material.

Review.
This plan will be reviewed every five years, the first review to take place in September 2017. This review will entail an inspection of these waste facilities to ensure their placing, management, maintenance and stability comply with the requirements of the Extractive Waste Management requirements and condition 7.5, 7.6 and 7.7 of the Clonsast IPPC Licence P0503-01.

APPENDIX X. MITIGATION MEASURES FOR THE APPLICATION OF FERTILISER

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

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

APPENDIX XI. CONSULTATION SUMMARIES

Table APX -1 Consultees contacted

Bog Name	Contact Organisation	Contact Name	Date of Issue	Communication Format	Date Response Received	Response format
Garryduff	Galway County Council - Director of Services (Planning, Environment and Emergency Services)	Eileen Ruane	06/01/2021	E-mail		
Garryduff	Galway County Council - Diretor of service Housing/ community	Liam hanrahan	06/01/2021	E-mail		
Garryduff	Galway County Council - Heritage Officer	Marie Mannion	06/01/2021	E-mail		
Garryduff	Northern and Western Regional Assembly	info@nwra.ie	06/01/2021	E-mail		
Garryduff	*Galway County Councillors - Ballinasloe District*	*Cllr. Tim Broderick*	06/01/2021	E-mail		
Garryduff	*Galway County Councillors - Ballinasloe District*	*Cllr. Dermot Connolly*	06/01/2021	E-mail		
Garryduff	*Galway County Councillors - Ballinasloe District*	*Cllr. Michael Connolly*	06/01/2021	E-mail		
Garryduff	*Galway County Councillors - Ballinasloe District*	*Cllr. Declan Geraghty*	06/01/2021	E-mail		
Garryduff	*Galway County Councillors - Ballinasloe District*	*Cllr. Peter Keaveney*	06/01/2021	E-mail		
Garryduff	*Galway County Councillors - Ballinasloe District*	*Cllr. Dr. Evelyn Francis Parsons*	06/01/2021	E-mail	07/01/2021	E-mail
Garryduff	TD Roscommon - Galway	Michael Fitzmaurice	06/01/2021	E-mail	05/12/2020 (Response to earlier contact re. PCAS)	E-mail
Garryduff	TD Roscommon - Galway	Claire Kerrane	06/01/2021	E-mail		

Garryduff	TD Roscommon - Galway	Denis Naughten	06/01/2021	E-mail	09/12/2020 (Response to earlier contact re. PCAS)	E-mail
Garryduff	Senator Roscommon Mayo	Aisling Dolan	06/01/2021	E-mail	18/01/2021	E-mail
Garryduff	National Parks and Wildlife Service	General E-mail Contact	06/01/2021	E-mail		
Garryduff	NPWS Regional Network	District Conservation Officer (Galway East)	06/01/2021	E-mail	December /2020	E-mail
Garryduff	Dept. of the Housing Local Government and Heritage	Malcom Noonan (Minister of State at the Department of Housing, Local Government and Heritage)	06/01/2021	E-mail		
Garryduff	National Monuments Service	General E-mail Contact	06/01/2021	E-mail		
Garryduff	National Museum of Ireland (Irish Antiquities Division)	General E-mail Contact	06/01/2021	E-mail	28/12/2020	E-mail
Garryduff	Minister for Environment, Climate and Communications	Minister - Eamon Ryan	06/01/2021	E-mail		
Garryduff	EPA	General E-mail Contact	07/01/2021	E-mail		
Garryduff	Office of Public Works	General E-mail Contact	06/01/2021	E-mail		
Garryduff	Minister of state for Agriculture with responsibility for Land use and Biodiversity	Pippa Hackett Minister of State for Land Use and Biodiversity)	06/01/2021	E-mail		
Garryduff	Inland Fisheries Ireland	General E-mail Contact	06/01/2021	E-mail		
Garryduff	Waterways Ireland	General E-mail Contact	06/01/2021	E-mail		
Garryduff	The Heritage Council	General E-mail Contact	06/01/2021	E-mail	04/01/2021	E-mail
Garryduff	Western Development Commission	General E-mail Contact	06/01/2021	E-mail		
Garryduff	An Forum Uisce (The Water Forum)	General E-mail Contact	06/01/2021	E-mail		
Garryduff	Local Authority Waters Programme	Catchment Scientist Western Region	06/01/2021	E-mail		
Garryduff	An Taisce	General E-mail Contact	06/01/2021	E-mail		
Garryduff	Friends of the Earth	General E-mail Contact	06/01/2021	E-mail		

Garryduff	Friends of the Irish Environment	General E-mail Contact	06/01/2021	E-mail		
Garryduff	Birdwatch Ireland	General E-mail Contact	06/01/2021	E-mail		
Garryduff	Irish Peatlands Conservation Council	General E-mail Contact	06/01/2021	E-mail	21/01/2021	E-mail
Garryduff	Irish Wildlife Trust	General E-mail Contact	06/01/2021	E-mail	01/02/2021	E-mail
Garryduff	Bat Conservation Ireland	General E-mail Contact	06/01/2021	E-mail		
Garryduff	Woodlands of Ireland	General E-mail Contact	06/01/2021	E-mail		
Garryduff	Butterfly Conservation Ireland	General E-mail Contact	06/01/2021	E-mail		
Garryduff	Community Wetlands Forum (part of Irish Rurallink)	General E-mail Contact	06/01/2021	E-mail		
Garryduff	Turf Cutters and Contractors Association	Postal Address	15/01/2021	Post		
Garryduff	Galway Public Participation Network (PPN)	General E-mail Contact	06/01/2021	E-mail		
Garryduff	Sustainable Water Action Network (SWAN)	http://www.swanireland.ie/	06/01/2021	E-mail		
Garryduff	Irish Farmers Association (Head Office)	General E-mail Contact	06/01/2021	E-mail	Dialogue is on-going	E-mail
Garryduff	National Association of Regional Game Councils	General E-mail Contact	06/01/2021	E-mail		
Garryduff	ICMSA (Irish Creamery Milk Suppliers Association)	General E-mail Contact	06/01/2021	E-mail	Dialogue is on-going	
Garryduff	ICSA (Irish Cattle and Sheep Farmers Association	General E-mail Contact	06/01/2021	E-mail		
Garryduff	Midlands & East Regional WFD Operational Committee	Co-ordinator Local Authority Water Programme	06/01/2021	E-mail		
Garryduff	Shannon Flood Risk State Agency Co-ordination Working Group	Flood Risk Management Policy Officer	06/01/2021	E-mail		
Garryduff	Ballinasloe Tidy Towns Committee	General E-mail Contact	06/01/2021	E-mail		
Garryduff	Ballinasloe Walks and Trails	General E-mail Contact	06/01/2021	E-mail		
Garryduff	Ballydangan Red Grouse Project	General E-mail Contact	06/01/2021	E-mail		
Garryduff	BACD Ltd	General E-mail Contact	06/01/2021	E-mail		

Garryduff	Williamstown Tidy towns	General E-mail Contact				
Garryduff	Galway Athlone Cycleway Project team	info@galwaytoathlonecycleway.com	06/01/2021	E-mail		
Garryduff	University College Dublin	General E-mail Contact	15/01/2021	E-mail	18/01/2021	E-mail
	Trinity College Dublin	General E-mail Contact	24/01/2021	E-mail	24/01/2021	E-mail
Garryduff	Aughrim Community Development Company	General E-mail Contact			10/02/2021	E-mail

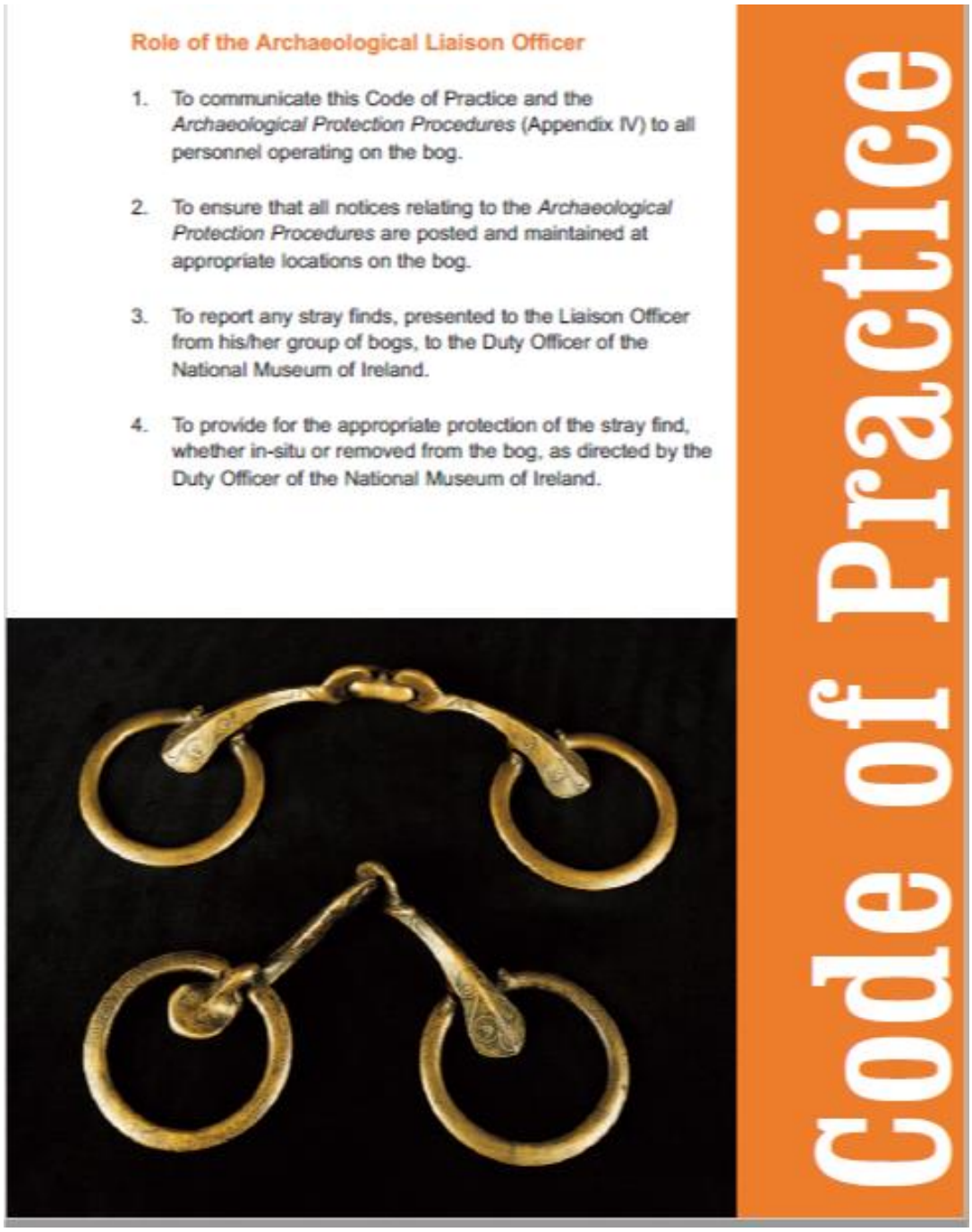
Table APX -2 Response summary from Consultees contacted

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

National Museum of Ireland (Irish Antiquities Division)	Responded through e-mail 28/12/2020 in relation to all PCAS bogs. Issues raised were; 1) The request that due diligence be taken during works to protect any archaeologically significant findings or areas 2) The NMI reiterated the importance of peatlands for the preservation of archaeology and requested they be consulted as part of any EIA undertaken	BnM acknowledged and responded via e-mail on 28/12/2020 to assure BnM will give due cognisance to all points within all rehabilitation plans for Garryduff Bog. A virtual meeting on PCAS between BnM and NMI was held on 18/01/2021
Irish Farmers Association	Responded to consultation regarding Garryduff and the PCAS project at large on multiple dates throughout ongoing discourse. Specific submission on Garryduff Bog received from IFA. Concerns raised were: 1) Potential for flooding on adjacent lands. 2) Health and Safety 3) Perceived potentially detrimental impact of PCAS on property value 4) Reiterated the desire of the IFA that people who have been cutting turf on bogs should retain this right.	A working group has been established at a high level between BnM and IFA on various issues including PCAS. A meeting was held between BnM and IFA representatives on 18/02/2021 to present details on PCAS. Dialogue is ongoing.
The Heritage Council	Responded to consultation via e-mail on 04/01/2021 asking for more information on PCAS in general and looking to be involved in any seminar or information events.	BnM responded via phone conversation on 11/01/2021. Dialogue is ongoing.
The Irish Wildlife Trust	Responded to consultation via e-mail on 01/02/2021 to acknowledge receipt of PCAS plans and indicate desire to make a submission. Submission received on 23/03/2021 supporting the PCAS scheme and specifically requesting: 1. Consideration of statutory protection for rehabilitated bogs; 2. Consideration for re-wilding in determining future habitats and species presence, including reintroductions; 3. Appropriate monitoring is established.	BnM responded via email and phone throughout February and March. A virtual meeting/PCAS presentation was held for IWT on 17/02/2021. Dialogue is ongoing.
Trinity College	A researcher at Trinity College, Dublin, made a submission by e-mail 24/01/2021. The following points were raised; 1) Advised that the consultation phase of the project should be given more time 2) Advised that there is little evidence of pre-project and post-project measurement 3) Advised that further community engagement with local stakeholders and research based stakeholders would benefit the project	BnM acknowledged and will give due cognisance to all points raised in the submission by Trinity College Researcher in the rehabilitation plan for Garryduff Bog. BnM raised responded via e-mail.

Dept. of Agriculture, Food & the Marine (DAFM)	Submission by e-mail to express support for PCAS in general. Submission recommended; 1) That local landowners and stakeholders be considered as part of the consultation process. 2) EIA assessment be carried out prior to PCAS works. 3) Hydrological assessments are carried out with a view to protecting adjoining lands from adverse impacts.	BnM acknowledged and responded via e-mail on 02/03/2021 to assure that all points raised within the submission will be considered. A virtual meeting/PCAS presentation was held for DAFM on 11/12/2020.
Butterfly Conservation Ireland	Responded to consultation via e-mail with submission on Garryduff. Concerns raised were: 1) Alterations to the text of the rehab plan. 2) Request for all turf cutting on BnM land to end. 4) Suggest monitoring for Large Heath Butterfly or food plant Hare's-tail Cottongrass. 5) Suggested alterations to habitat design in rehab plan to further connect regional high bog habitats and create further raised bog habitat on site. Also, BCI reiterated need to protect valuable habitat such as riparian habitat containing purging buckthorn. 6) Advised BnM to ensure that quality habitats already found on site are not damaged by PCAs activities.	BnM acknowledged via e-mail; Phone conversation with BCI on 19/01/2021.
ICMSA (Irish Creamery Milk Suppliers Association)	Virtual meeting/PCAS presentation organised for 03/03/2021.	A meeting was held by BnM on 03/03/2021 to present details on PCAS to the ICMSA and members. Dialogue is ongoing.
University College Dublin	A researcher from UCD contacted BnM with a submission on PCAS. The researcher suggested that the rehabilitations contain a good level of detail regarding rehab but could be improved by including more detail on water table level monitoring and measuring.	BnM acknowledged and responded via e-mail to assure that all points raised within the submission will be considered in final draft of Garryduff Bog rehabilitation plan.
Aughrim Community Development Company	Submission made to voice support for PCAS project in general but to request information on the extent of PCAS plans at Garryduff. The Aughrim Community Development Company intends to create a climate action park in the Margins of the Bog	BnM acknowledged and responded via e-mail to assure that all points raised within the submission will be considered in final draft of Garryduff Bog rehabilitation plan. Also, advised that the area intended for the climate action park will not be affected by rehabilitation plans

APPENDIX XII. ARCHAEOLOGY



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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	13/09/2020	First release	EMcD
2			

Archaeological Impact Assessment of Proposed Bog Rehabilitation at Garryduff Bog, Co. Galway. Dr. Charles Mount. April 2021.

Archaeological Impact Assessment of Proposed Bog Decommissioning and Rehabilitation at Garryduff Bog, Co. Galway

Report For

Bord Na Móna Energy Ltd.

Author

Dr. Charles Mount

Bord Na Móna Project Archaeologist

Introduction

The EPA (2002) *Guidance on the process of preparing and implementing a bog rehabilitation plan* notes that the licensee should characterise the bog prior to embarking on detailed planning and implementation. This characterisation should detail how the land is classified in terms of statutory protections, e.g. as European sites, world heritage sites, RAMSAR sites, National Heritage Areas, national monuments, archaeological heritage, etc. This archaeological impact assessment report was prepared by Dr. Charles Mount for Bord na Móna Energy Ltd to fulfil this characterisation in relation to archaeological heritage. It represents the results of a desk-based assessment of the impact of proposed bog rehabilitation on c.971 hectares at Garryduff Bog, Co. Galway on the known archaeological heritage of the bog. The proposed rehabilitation actions will be a combination of measures to create wetlands and re-wet deep peat as outlined in the draft Methodology Paper for the proposed Bord na Móna Decommissioning, Rehabilitation and Restoration Scheme. These enhanced measures for Garryduff Bog will include:

- 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 to manage water levels across the site.
- Realignment of gravity outfalls.
- Pump management – reducing or ceasing pumping.
- Fertiliser treatment 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 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.

Garryduff Bog is located close to the west bank of the River Shannon, c.600m north of Clonfert, c.1km south of Shannonbridge and north of the L4305 road. The Grand Canal runs through the length of the bog in a north-west to south-east direction. The bog occupies the townlands of Annaghcorrib, Clonfert (Butson), Clonfertdemesne Bog, Clonfert North, Coolcarta East and West, Garryduff, Kylemore and Srahaun, on OS 6 inch sheets Galway 100 and 101.

Methodology

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

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

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

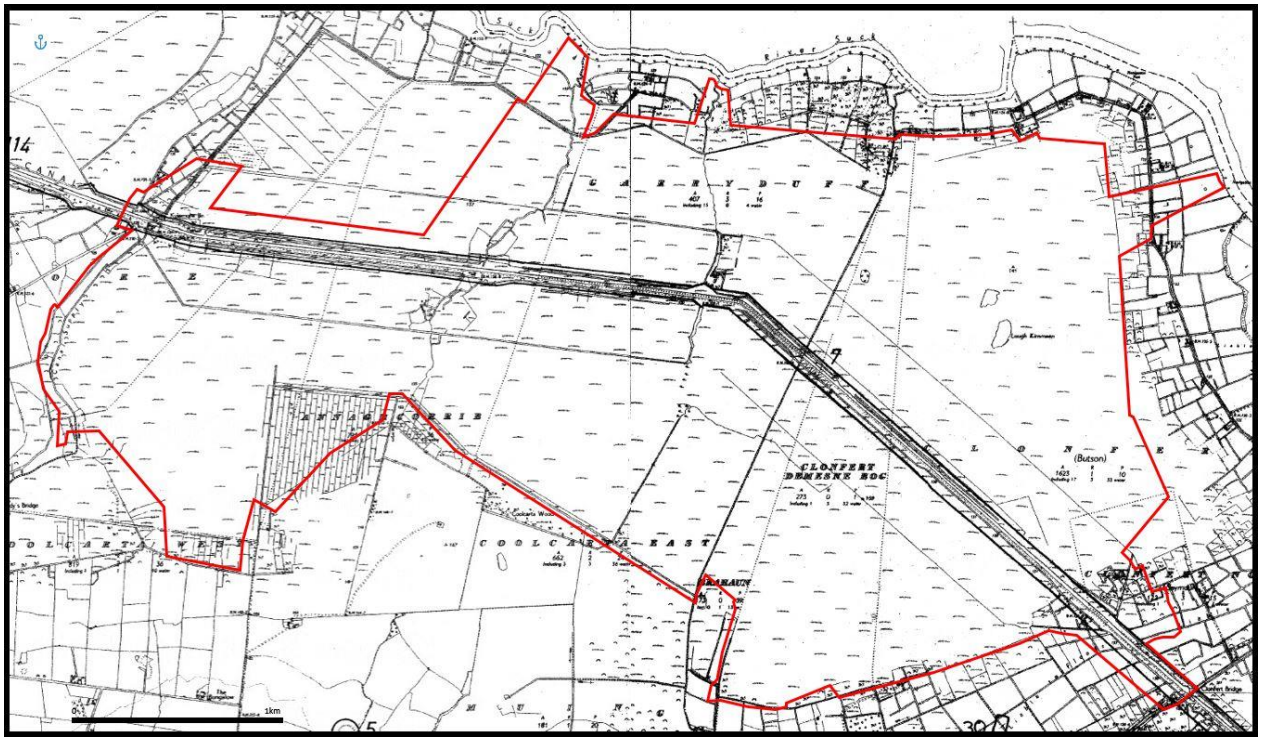


Fig. 1. Garryduff Bog, Co. Galway, detail of the Record of Monuments and Places map sheets Nos. 100 and 101. The proposed rehabilitation area is outlined with the red line. There is one Recorded Monument in the area.

Desktop assessment

Recorded Monuments

The Record of Monuments and Places (RMP) for Co. Galway which was established under Section 12 of the National Monuments (Amendment) Act, 1994 was examined as part of the assessment (DAHGI 1997). This record was published by the Minister in 1997 and includes sites and monuments that were known in Garryduff Bog before that date. This review established that there is one RMP situated in the proposed rehabilitation area the line of the Grand Canal included as RMP GA100-114--- and GA101-007--- (see Table 1 and Fig. 1).

RMP No.	Townland	Classification	N.G.R. E	N.G.R. N
GA100-114---	Lismany, Annaghcorribe, Coolcarta East, Coolcarta West, Garryduff, Kylemore	Canal	19189	22415
GA101-007---	Clonfert, Clonfert North, Garryduff, Reask	Canal	19787	22110

Table 1. List of RMPs in Garryduff Bog.

Peatland survey

Garryduff Bog was surveyed by the Irish Archaeological Wetland Unit (IAWU) in 1992 (unlicensed) as part of the Archaeological Survey of Ireland Peatland Survey. A total of 9 sightings were identified and recorded and subsequently lodged in the records of the Archaeological Survey of Ireland (see Table 2). A Road-Class

1 togher (GA100-172) was excavated in a single cutting in Annaghcorrib townland by Raftery in 1988 and then by the IAWU in 1992. These excavations were unlicensed.

SMR No.	SMR Class	IAWU Code	IAWU Class	Townland	Easting	Northing	DBS
GA100-114----	Canal	-	-	Lismany, Annaghcorribe, Coolcarta East, Coolcarta West, Garryduff, Kylemore	Various	Various	-
GA100-168	Road - class 1 togher	GA-ACB 0001	TOGH	Annaghcorrib & Coolcarta East	593910	723715	0.0
GA100-172	Road - class 1 togher	GA-ACB 0001	TOGH	Annaghcorrib	194292	224464	0.00
GA100-173	Road - gravel/stone	GA-ACB 0002	GRAR	Annaghcorrib & Coolcarta West	193010	222762	0.00
GA100-174	Road - gravel/stone	GA-ACB 0003	GRAR	Annaghcorrib & Coolcarta West	192980	222828	0.00
GA100-175	Road - class 3 togher	GA-ACB 0004	TOGH	Annaghcorrib	192921	222761	0.40
GA100-176	Structure - peatland	GA-ACB 0005	WWIS	Annaghcorrib	193480	223458	0.00
GA100-181	Structure - peatland	GA-ACB 0006	WWIS	Garryduff	193240	223939	0.20
GA101-066	Pitfall trap	GA-CCE 0001	FIND	Coolcarta east	194960	222835	0.00
GA101-067	Redundant record	GA-CCE 0002	FIND	Coolcarta east	194755	223140	0.00
-	-	GA-CCE 0003	FIND	Coolcarta east	-	-	-

Table 2. List of sightings recorded by the IAWU in with SMR concordance Garryduff Bog.

Sites and Monuments Record

The Sites and Monuments Record (SMR) which is maintained by the Department of Housing, Local Government and Heritage was examined as part of the assessment on the 12th of April 2021. The SMR consists of records included in the RMP and sites and monuments notified to the Dept. since the publication of the RMP. This review established that there are ten sites and monument entered in the SMR in the proposed rehabilitation area. The sightings are indicated in Table 2 and Fig. 2 below.

These are all sightings identified by the IAWU survey in 1992 that were notified to the Archaeological Survey of Ireland.

National Inventory of Architectural Heritage

The National Inventory of Architectural Heritage which is maintained by the Department of Housing, Local Government and Heritage was examined as part of the assessment on the 12th of April 2021. This review established that there are two structures listed I the Inventory located in the rehabilitation area (see Table 3 and Fig. 2). The canal is also a Recorded Monument include as GA100-114--- and GA101-007---.

NIAH No.	NIAH Class	Townland	Easting	Northing
30410003	Bridge	Kylemore	592295	724010
30410027	Canal	Kylemore, etc.	592377	7223984

Table 3. Structures listed in the National Inventory of Architectural Heritage in the study area.

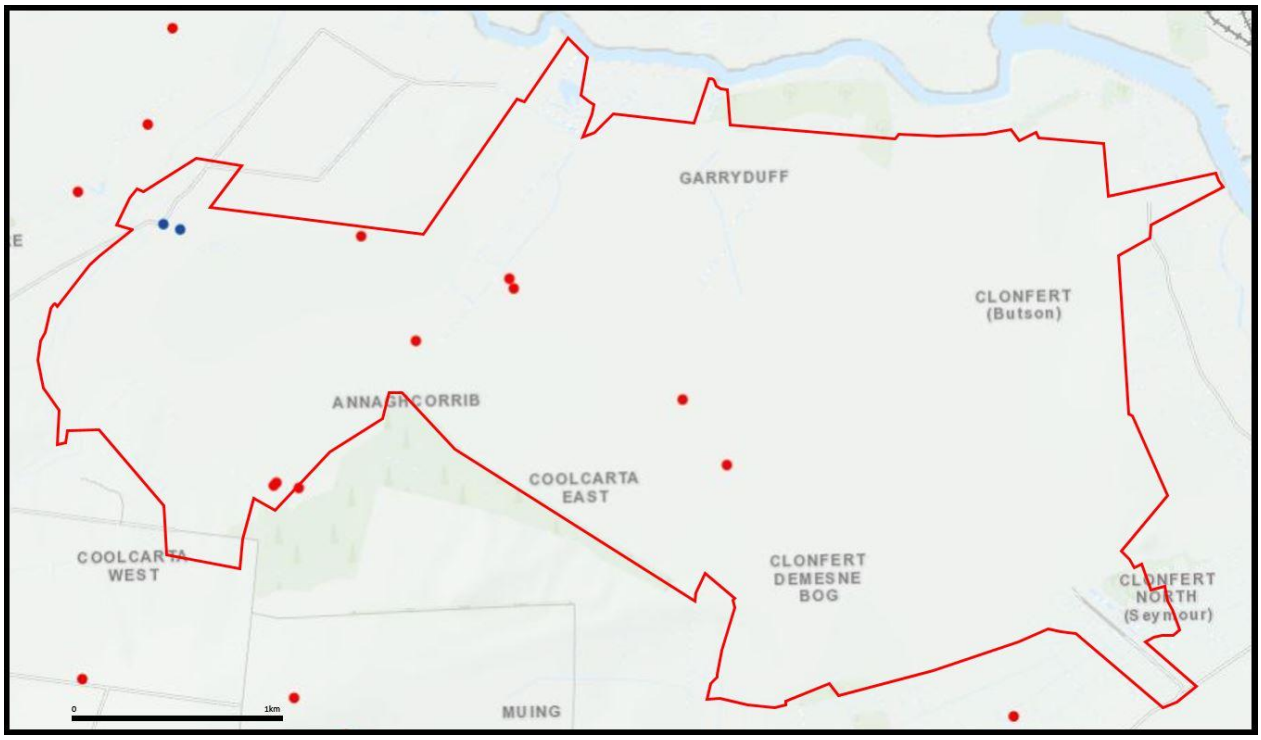


Fig. 2. Garryduff Bog, Co. Galway, detail of the Sites and Monuments Record. The proposed rehabilitation area is outlined with the red line. There are 10 SMRs in the area.

Re-assessment Peatland Survey 2009

Garryduff bog was also the subject of the Re-assessment Peatland Survey 2009 (excavation license 09E0406) which was commissioned by Bord na Móna and was carried out by Archaeological Development Services (Rohan 2009). At the time of the survey parts of the northeast side and parts of the southeast side of the bog remained in production. In the out of production areas the fields were grass-covered and numerous drains were silt-filled. A handheld GPS was used to locate find spots for the previously recorded sites; however, nothing remained of these sites. Additional fieldwalking took place in areas where field surface and drain faces were still visible but no new archaeological sites were identified within the bog during this round of fieldwalking survey.

Archaeological investigations

One of the monuments identified in the IAWU survey (GA100-172) was archaeologically excavated in 1988 and 1992 (unlicensed). Reports of archaeological excavations and licensed monitoring in the study area listed in the excavations database at excvations.ie were examined as part of the assessment. There are no additional reports of any archaeological investigations carried out in the rehabilitation area.

Reported finds

Several reports of archaeological finds from Garryduff Bog are recorded in the topographical files of the National Museum of Ireland. These include an iron brooch (1955:86) and a rounded ‘loaf-shaped’ piece of bog butter (2001:70) from Annaghcorrib townland; a late Bronze Age socketed bronze knife (1940:57); fragments of a wooden vessel (1943:225) from Kylemore townland and a clay crucible (2015C1:17.1-3). There is also a bronze palstave (2015C1:16) from Carta townland but the find place is not specified.

Previous assessments

Garryduff Bog has been the subject of an Environmental Impact Assessment Report caried out by Irish Archaeological Consultancy LTD in 2018 for Bord na Móna Energy Limited in relation to IPC Licence P0500-01. The assessment noted the monuments identified by IAWU in 1992 and noted that there was a moderate potential for archaeological features to be uncovered during the course of any future development works in Garryduff Bog.

Impact assessment

A total of 11 sightings of archaeological material and one additional architectural structure have been identified and recorded in the rehabilitation area. 10 of these sightings were made by the IAWU Peatland Survey and these were subsequently entered into the Sites and Monuments Record. The Re-assessment Peatland Survey 2009 found that none of the sightings made by the IAWU survived. The line of the Grand Canal (GA100-114--- and GA101-007---) does survive and a bridge (NIAH 30410003) survives in the rehabilitation area survive (see Table 4).

NIAH No.	RMP No.	Townland	Classification	N.G.R. E	N.G.R. N
30410027	GA100-114---	Lismany, Annaghcorribe, Coolcarta East, Coolcarta West, Garryduff, Kylemore	Canal	19189	22415
30410027	GA101-007---	Clonfert, Clonfert North, Garryduff, Reask	Canal	19787	22110
30410003	-	Kylemore	Bridge	592295	724010

Table 4. All surviving monuments and structures in the rehabilitation area.

Recommendations

The line of the Grand Canal (GA100-114--- and GA101-007---) and a bridge (NIAH 30410003) should be avoided by the rehabilitation works with a 20m buffer zone (see Table 4). Note the Grand Canal (GA100-114--- and GA101-007---) extends through the whole length of Garryduff Bog and its location is marked in Fig 1 with a thick black outline numbered 114 and 7. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it should also be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.

Conclusion

This is a desk-based archaeological assessment and includes a collation of existing written and graphic information to identify the likely archaeological potential of the proposed rehabilitation area. The line of the Grand Canal (GA100-114--- and GA101-007---) and a bridge (NIAH 30410003) should be avoided by the rehabilitation works with a 20m buffer zone (see Table 4). Should any previously unknown archaeological material be uncovered during the rehabilitation works, it should be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.

References

DAHGI 1997. Recorded Monuments Protected under Section 12 of the National Monuments (Amendment) Act, 1994. County Galway.

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

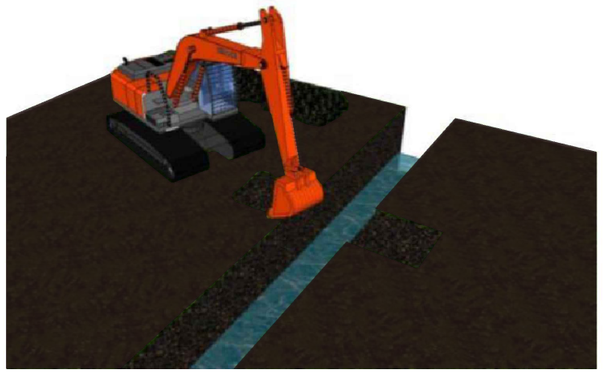
Rohan, N. 2009. Report on 2009 Re-assessment Field Survey Blackwater & Boora Group of Bogs. Unpublished report for Bord na Móna

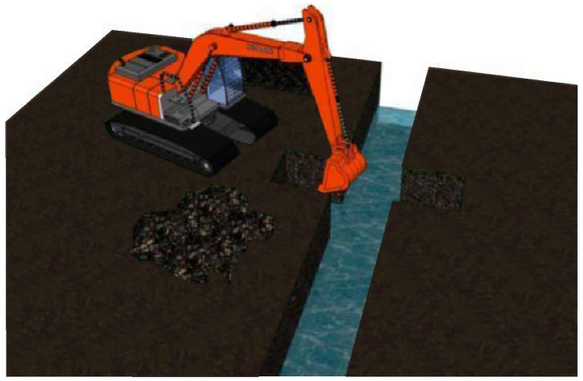
Dr. Charles Mount
12 April 2021

Appendix 2

REHABILITATION METHODS

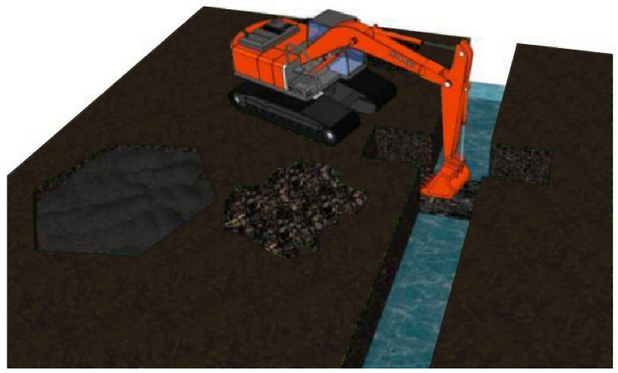
1. Before building drain block, the sides and bottom of the ditch is cleaned using the excavator to remove dry degraded peat, to ensure a good peat-to-peat contact.
(If any vegetation present, it should be carefully removed and left aside for replacement at the end of the process.)

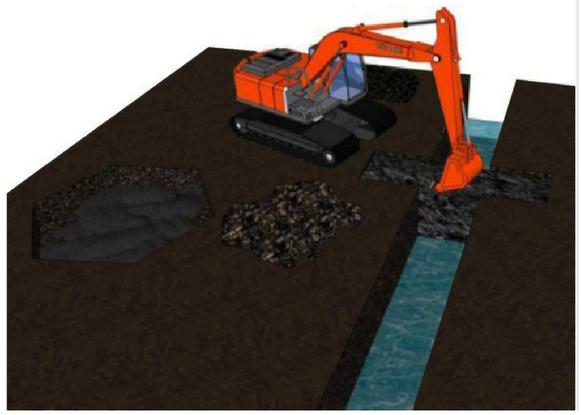




2. Cut key in either side of the drain approximately 500mm deep, and ensure that it is wider than the actual drain.
Remove 500mm of peat from bottom of the drain also and place behind the machine for replacement later.

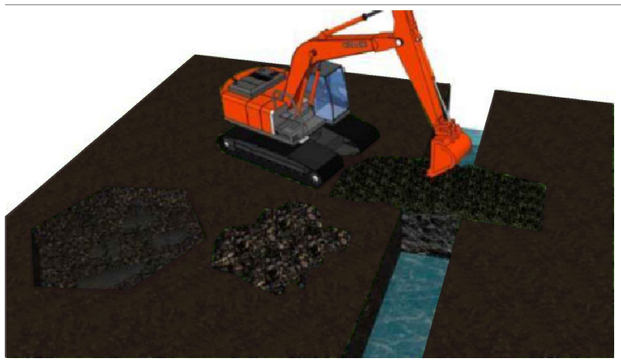
3. Open an area behind machine to be used as a borrow pit. Avoid using the surface layer of peat (top 100-200mm) which is likely to be very permeable. Only use the deeper, more compacted peat to build the drain block.
(If any vegetation present, it should be carefully removed and left aside for replacement at the end of the process.)

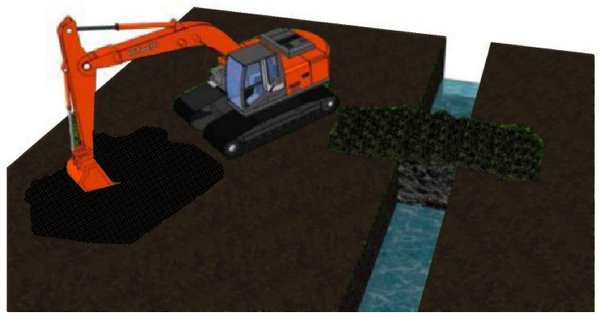




4. Dig out peat from the borrow pit and place into the drain compacting in 300mm layers. Compact the peat firmly using the excavator bucket before laying more peat from the borrow pit.

5. Build the drain block up at least 300mm-500mm above the ground level of the bog to allow for subsequent shrinkage of the peat as it dries.
(Take any vegetation removed in step 1 and step 3 and place on the top of the dam, to help bind and stabilise the drain block.)





6. Backfill the borrow pit with the peat extracted from the bottom of the drain in step 2. Press down on the sides of the peat borrow hole with the excavator bucket to grade the sides of the borrow pit.

This enhanced measure's main objective is to block drains with peat drain blocks to raise water levels, re-wetting peat and slowing water movements through the bog.

NOTES:

1. FIGURED DIMS ONLY TO BE TAKEN FROM THIS DRAWING.
2. REFER TO RELEVANT SITE PLAN TO ENSURE SPECIFIC DRAIN BLOCKS HAVE BEEN INSTALLED DOWNSTREAM PRIOR TO COMMENCING ANY RE-PROFILING WORKS, TO RETAIN ANY SILT THAT MAY ENTER THE DRAINS.
3. REFER TO RELEVANT SITE PLAN FOR No. OF DRAIN BLOCKS SPECIFIED PER 100M DRAIN LENGTH.
4. REFER TO RELEVANT SITE PLAN FOR SPECIFIC FINISHED GROUND LEVELS TO BE ACHIEVED.
5. ALL DETAILS TO BE AGREED WITH BORD NA MONA OPERATIONS PRIOR TO CONSTRUCTION.
6. OPERATORS TO CONFORM WITH ALL STANDARD OPERATING PROCEDURES.
7. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH THE SPECIFICATION FOR THE PARTICULAR BOG AND WITH THE REQUIREMENTS OF THE REHABILITATION PLAN, ANY NATURA IMPACT STATEMENT RECOMMENDED MEASURES IF APPLICABLE, ARCHAEOLOGY REPORTS AND ANY OTHER SPECIFIC ECOLOGICAL MEASURES OR ENVIRONMENTAL REPORTS FOR THIS BOG.

BORD NA MÓNA
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Tel. 057 9345900
Fax. 057 9345160

STATUS

Rev	Description	Issued By	Date
b	For Approval	P.K.	03/03/21
a	Issued for Information	P.K.	18/12/20

PROJECT:
Peatland Climate Action Scheme
PCAS

TITLE:
Rehabilitation Method DPT 2
Peat Drain Blocking

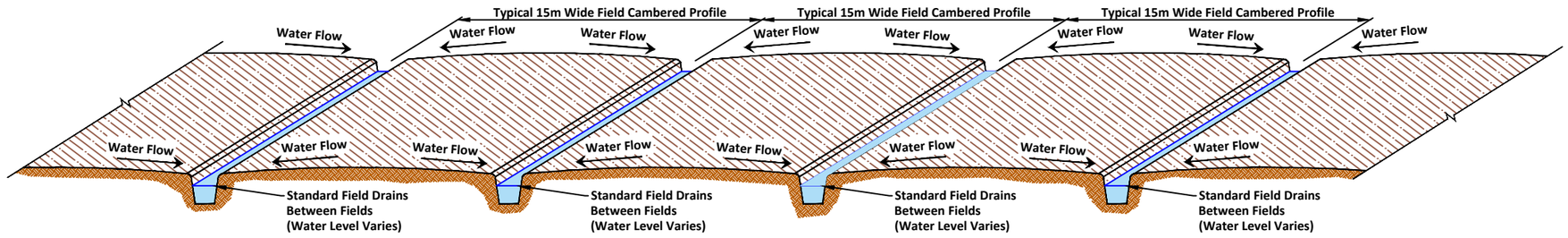
Drawn By:		Checked By:		Approved:
CAD	Designer	Discip. Lead	Design Lead	Design Manager
P.K.		D.K.	P.N.	P.N.

Date: 18/12/20 Scale : N.T.S. A3 Stage: For Approval

Drawing No.: PCAS-0100-002 Rev: b

Existing Layout:

Typical existing bare peat fields are cambered (higher) in the centre and lower towards the drains, helping drainage of the fields but limiting the re-wetting of the central area.



NOTES:

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2. REFER TO RELEVANT SITE PLAN TO ENSURE SPECIFIC DRAIN BLOCKS HAVE BEEN INSTALLED DOWNSTREAM PRIOR TO COMMENCING ANY RE-PROFILING WORKS, TO RETAIN ANY SILT THAT MAY ENTER THE DRAINS.
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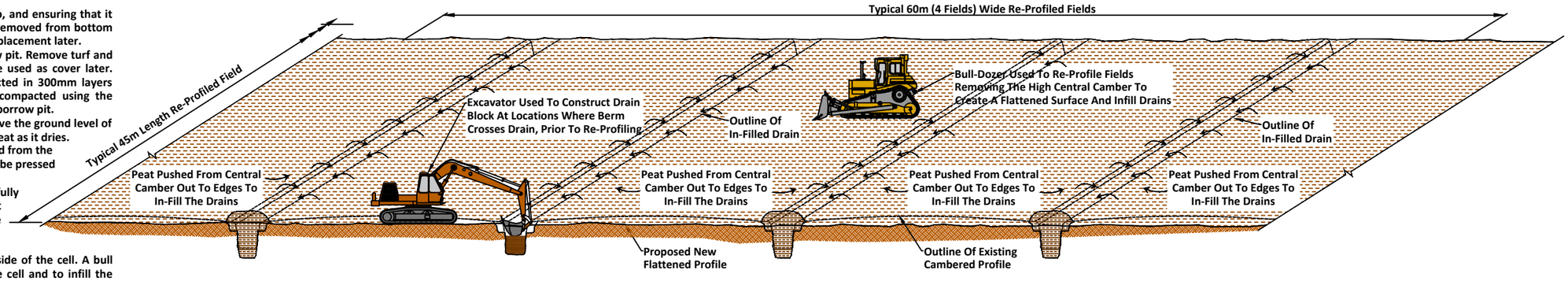
Phase 1
Drain Blocking And Re-Profiling of Fields Surface

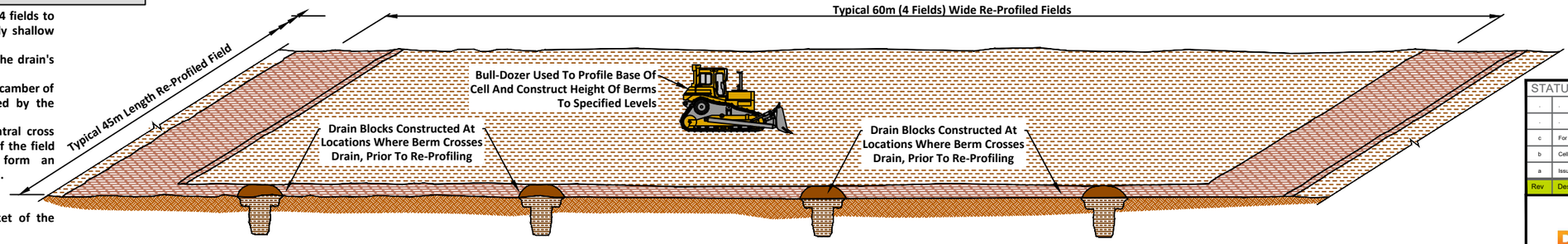
Drain blocks are constructed using an Excavator operating at a perpendicular direction to the field drains.
Key is cut in the drain approximately 500mm deep, and ensuring that it is wider than the actual drain. 500mm of peat is removed from bottom of drain also and placed behind the machine for replacement later.
Area behind the machine is to be used as a borrow pit. Remove turf and degraded peat. Place this material close by to be used as cover later. 'Clay' like peat is extracted from pit and compacted in 300mm layers using the excavator bucket. The peat is firmly compacted using the machine bucket before laying more peat from the borrow pit.
The drain block is built up at least 300-500mm above the ground level of the bog to allow for subsequent shrinkage of the peat as it dries.
The borrow pit is back filled with the peat extracted from the bottom of drain. The sides of the borrow pit are to be pressed down and graded with the excavator bucket.
(NOTE: If any vegetation present, it should be carefully removed at the start and left aside for replacement at the end of the process, to help bind and stabilise the top of the drain block.)

The centre of the cambered field is used as one side of the cell. A bull dozer is used to level and flatten the base of the cell and to infill the drains by removing the camber from the fields. Laser levels are mounted on bull-dozers to allow the machine drivers to move peat and create flat surfaces to the appropriate levels.



Phase 2
Formation of Surface Berms And Levelling Base of Cells

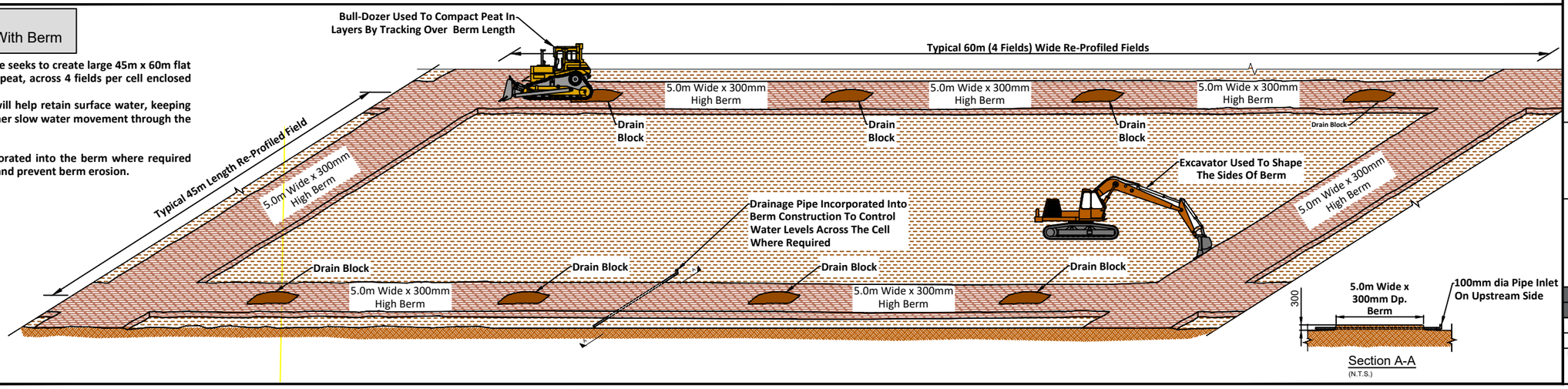
Berms are formed 45m in length and 60m across 4 fields to create an enclosed cell. The berms are relatively shallow (300mm high) and are 5.0 m wide.
An Excavator is used to form a key(5m long) in the drain's edges where the berm crosses.
A strip of peat(5m wide) is taken from the central camber of the field, pushed into the drain and compacted by the bull-dozer tracking over the drain block.
Next the bull-dozer is used to complete the central cross section of Berm by taking peat from the centre of the field and pushing it in line with the field to form an approximately 5m Wide x 300mm High Cross Berm.
The peat material in the berm is compacted in layers by the dozer tracking over it.
Berm edge profile is shaped by using the bucket of the excavator.



Final Profile:
45m x 60m Cell With Berm

This enhanced measure seeks to create large 45m x 60m flat areas or cells on bare peat, across 4 fields per cell enclosed by shallow berms.
The creation of cells will help retain surface water, keeping peat wet and will further slow water movement through the bog.

Drainage pipes incorporated into the berm where required to manage overflows and prevent berm erosion.



STATUS

Rev	Description	Issued By	Date
.	.	.	.
.	.	.	.
c	For Approval	P.K.	24/02/21
b	Cell Size Text Amended	P.K.	28/01/21
a	Issued For Information	P.K.	07/01/21

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Fax. 057 9345160

PROJECT:
Peatland Climate Action Scheme (PCAS)

TITLE:
Rehabilitation Method DPT 4
45m x 60m Cell With Berms

Drawn By:		Checked By:		Approved:
CAD	Designer	Discip. Lead	Design Lead	Design Manager
P.K.	-	D.K.	P.N.	P.N.

Date: 22/12/20 | Scale: Not to Scale A3 | Stage: For Approval
Drawing No.: PCAS-0100-006 | Rev: c

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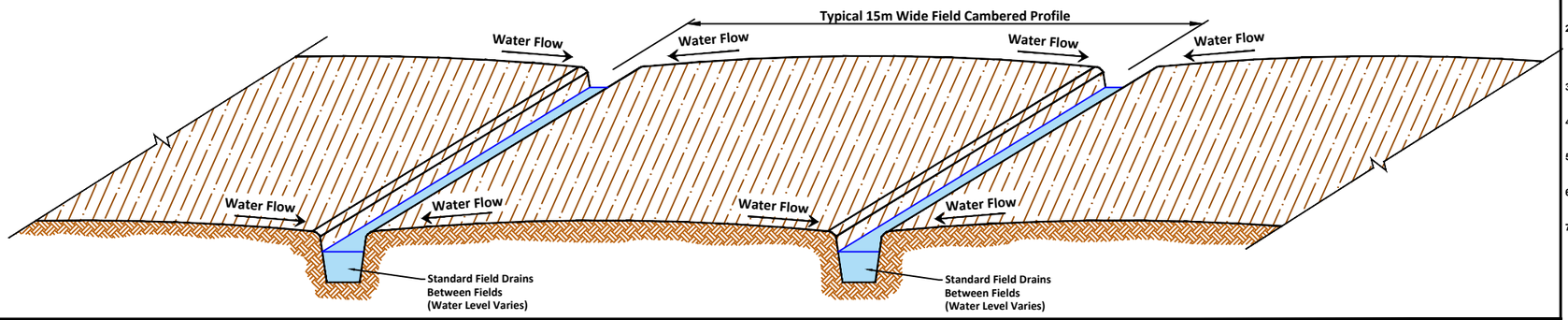
Existing Layout:

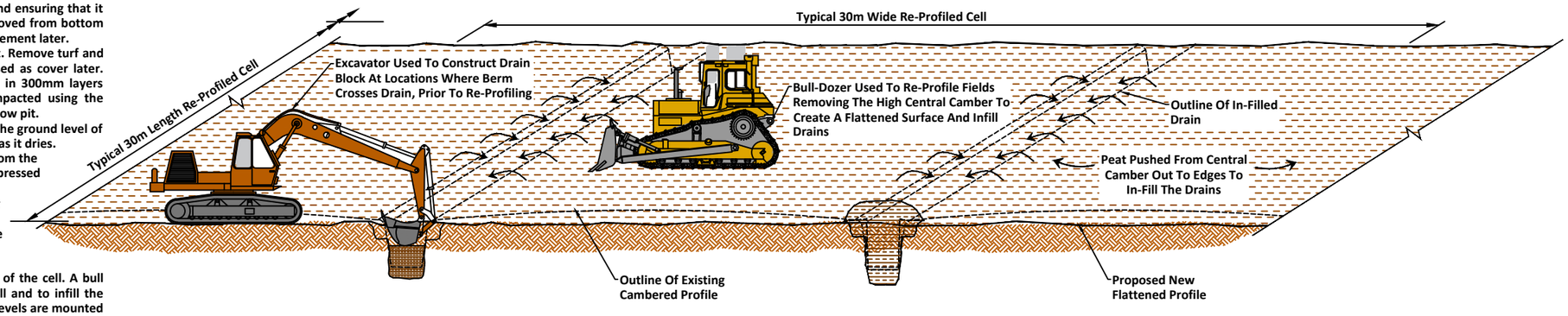
Typical existing bare peat fields are cambered (higher) in the centre and lower towards the drains, helping drainage of the fields but limiting the re-wetting of the central area.



Phase 1
Drain Blocking And Re-Profiling of Fields Surface

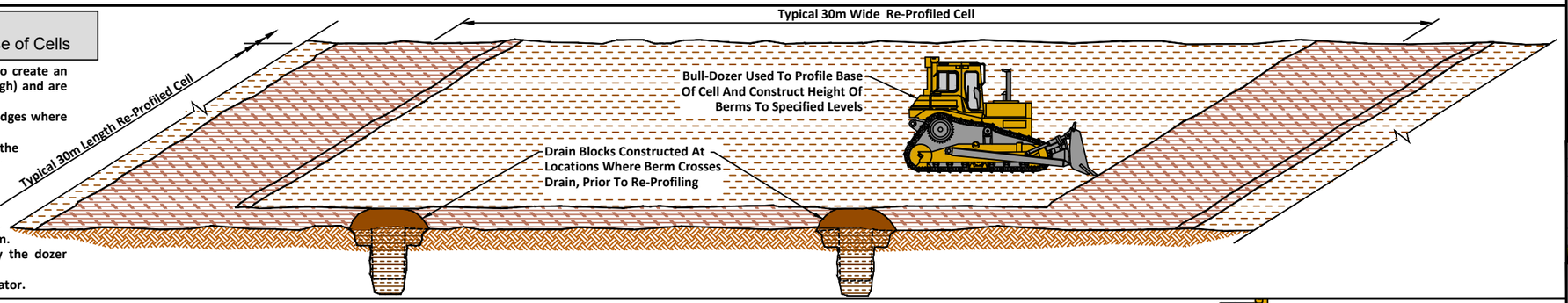
Drain blocks are constructed using an Excavator operating at a perpendicular direction to the field drains.
Key is cut in the drain approximately 500mm deep, and ensuring that it is wider than the actual drain. 500mm of peat is removed from bottom of drain also and placed behind the machine for replacement later.
Area behind the machine is to be used as a borrow pit. Remove turf and degraded peat. Place this material close by to be used as cover later. 'Clay' like peat is extracted from pit and compacted in 300mm layers using the excavator bucket. The peat is firmly compacted using the machine bucket before laying more peat from the borrow pit.
The drain block is built up at least 300-500mm above the ground level of the bog to allow for subsequent shrinkage of the peat as it dries.
The borrow pit is back filled with the peat extracted from the bottom of drain. The sides of the borrow pit are to be pressed down and graded with the excavator bucket.
(NOTE: If any vegetation present, it should be carefully removed at the start and left aside for replacement at the end of the process, to help bind and stabilise the top of the drain block.)

The centre of the cambered field is used as one side of the cell. A bull dozer is used to level and flatten the base of the cell and to infill the drains by removing the camber from the fields. Laser levels are mounted on bull-dozers to allow the machine drivers to move peat and create flat surfaces to the appropriate levels.



Phase 2
Formation of Surface Berms And Levelling Base of Cells

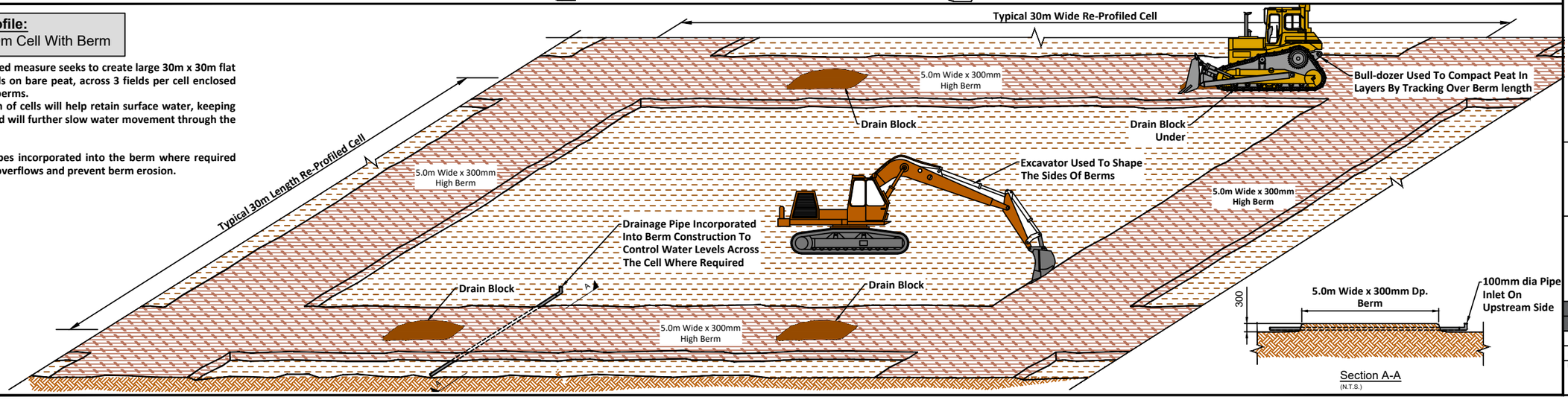
Berms are formed 45m in length and 60m across 4 fields to create an enclosed cell. The berms are relatively shallow (300mm high) and are 5.0 m wide.
An Excavator is used to form a key(5m long) in the drain's edges where the berm crosses.
A strip of peat(5m wide) is taken from the central camber of the field, pushed into the drain and compacted by the bull-dozer tracking over the drain block.
Next the bull-dozer is used to complete the central cross section of Berm by taking peat from the centre of the field and pushing it in line with the field to form an approximately 5m Wide x 300mm High Cross Berm.
The peat material in the berm is compacted in layers by the dozer tracking over it.
Berm edge profile is shaped by using the bucket of the excavator.



Final Profile:
30m x 30m Cell With Berm

This enhanced measure seeks to create large 30m x 30m flat areas or cells on bare peat, across 3 fields per cell enclosed by shallow berms.
The creation of cells will help retain surface water, keeping peat wet and will further slow water movement through the bog.

Drainage pipes incorporated into the berm where required to manage overflows and prevent berm erosion.



NOTES:

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
2. REFER TO RELEVANT SITE PLAN TO ENSURE SPECIFIC DRAIN BLOCKS HAVE BEEN INSTALLED DOWNSTREAM PRIOR TO COMMENCING ANY RE-PROFILING WORKS, TO RETAIN ANY SILT THAT MAY ENTER THE DRAINS.
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4. REFER TO RELEVANT SITE PLAN FOR SPECIFIC FINISHED GROUND LEVELS TO BE ACHIEVED.
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STATUS

Rev	Description	Issued By	Date
.	.	.	.
.	.	.	.
.	.	.	.
b	For Approval	P.K.	25/02/21
a	Issued For Information	P.K.	28/01/21

BORD NA MÓNA
Naturally Driven
Bord Na Móna Engineering Department
LEABEG, TULLAMORE CO. OFFALY
Tel. 057 9345900
Fax. 057 9345160

PROJECT:
Peatland Climate Action Scheme
PCAS

TITLE:
Rehabilitation Method DPT 5
30m x 30m Cell With Berms

Drawn By:		Checked By:		Approved:
CAD	Designer	Discip. Lead	Design Lead	Design Manager
P.K.	-	D.K.	P.N.	P.N.

Date: 18/12/20 | Scale : Not to Scale A3 | Stage: For Approval
Drawing No.: PCAS-0100-007 | Rev: b

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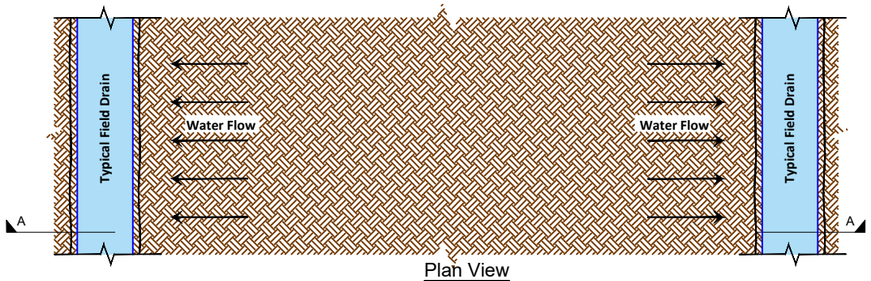
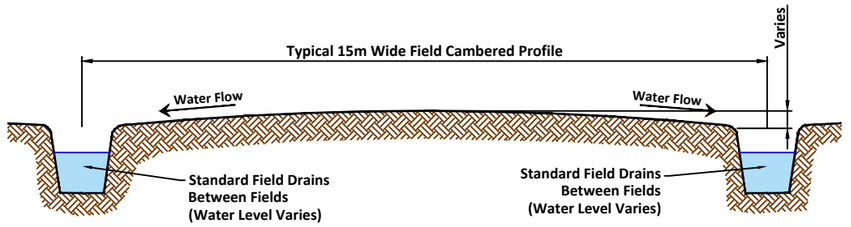
Existing Layout:

Typical existing bare peat fields are cambered (higher) in the centre and lower towards the drains, helping drainage of the fields but limiting the re-wetting of the central area.
The concept of drain blocking is to raise the water levels in the drains to re-wet the cutaway and slow the water movement through the bog.



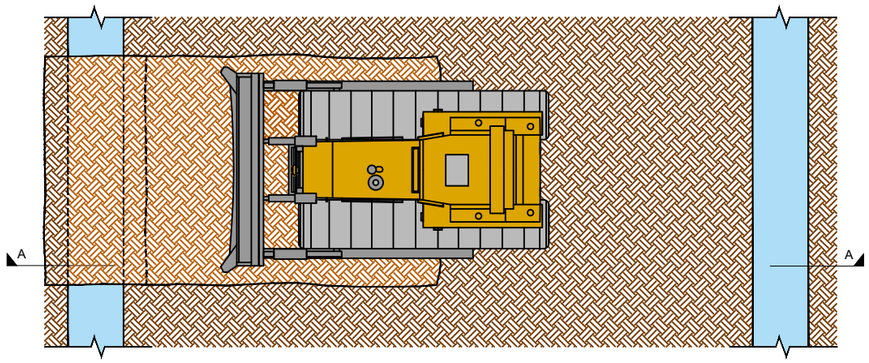
Plan View
(N.T.S.)



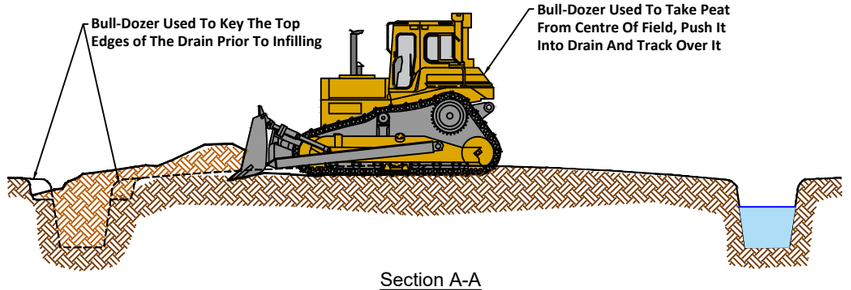
Section A-A
(N.T.S.)

Phase 1
Forming 'Speed Bump'

The Bull-dozer is used to create a 5m Length key along both edges of the drain, approximately 500mm Wide x 500mm Deep.
Next a strip of peat is taken from the central camber of the field, pushed into the drain and compacted by the bull-dozer tracking over the drain block, to form an approximately 5m Wide 'Speed Bump'.



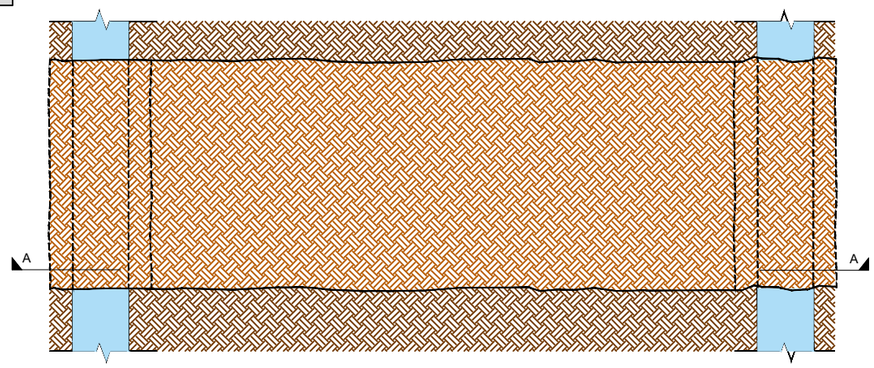
Plan View
(N.T.S.)



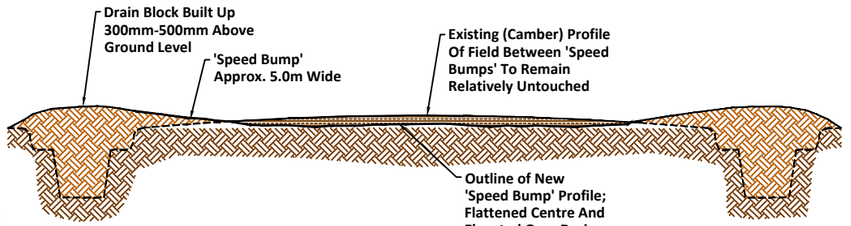
Section A-A
(N.T.S.)

Complete Fields With Speed Bump (3 Per 100m)

Drain Blocks are built up at least 300mm-500mm above the existing ground level to allow for peat subsidence and to prevent water from flowing over the drain block and eroding it before it becomes stabilised.



Plan View
(N.T.S.)



Section A-A
(N.T.S.)

Section B-B
(N.T.S.)

NOTES:

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
2. REFER TO RELEVANT SITE PLAN TO ENSURE SPECIFIC DRAIN BLOCKS HAVE BEEN INSTALLED DOWNSTREAM PRIOR TO COMMENCING ANY RE-PROFILING WORKS, TO RETAIN ANY SILT THAT MAY ENTER THE DRAINS.
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4. REFER TO RELEVANT SITE PLAN FOR SPECIFIC FINISHED GROUND LEVELS TO BE ACHIEVED.
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STATUS

Rev	Description	Issued By	Date
.	.	.	.
.	.	.	.
c	For Approval	P.K.	03/03/21
b	'Key' Added To Top Edges Of Drain at Drain Block Locations	P.K.	09/02/21
a	Issued For Information	P.K.	29/01/21

BORD NA MÓNA
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Bord Na Móna Engineering Department
LEABEG, TULLAMORE CO. OFFALY
Tel. 057 9345900
Fax. 057 9345160

PROJECT:
Peatland Climate Action Scheme
PCAS

TITLE:
Rehabilitation Method DCT 2
'Speed Bump' Peat Drain Block

Drawn By:		Checked By:		Approved:
CAD	Designer	Discip. Lead	Design Lead	Design Manager
P.K.	-	D.K.	P.N.	P.N.

Date: 13/01/21 | Scale : Not to Scale A3 | Stage: For Approval

Drawing No.: PCAS-0100-008 | Rev: c

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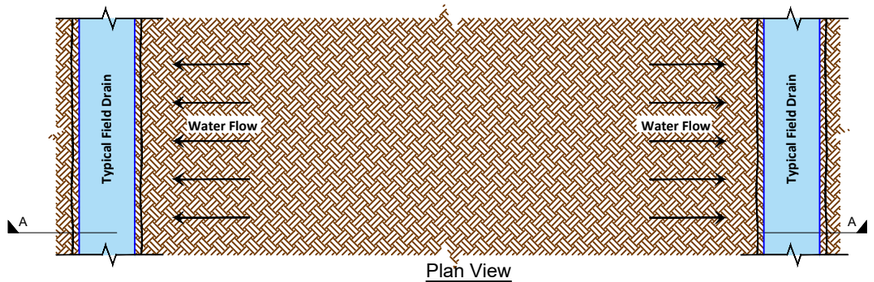
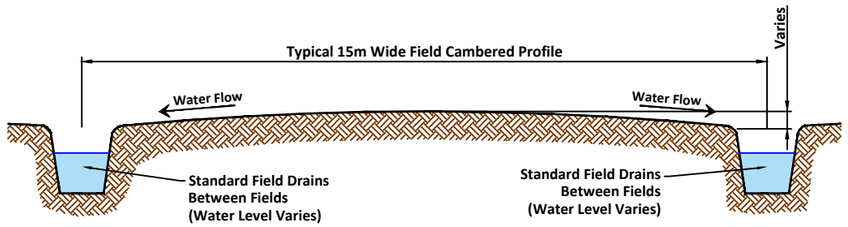
Existing Layout:

Typical existing bare peat fields are cambered (higher) in the centre and lower towards the drains, helping drainage of the fields but limiting the re-wetting of the central area.
The concept of Cross berms is to slow the water movement through the bog.



Plan View



Section A-A
(N.T.S.)

NOTES:

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2. REFER TO RELEVANT SITE PLAN TO ENSURE SPECIFIC DRAIN BLOCKS HAVE BEEN INSTALLED DOWNSTREAM PRIOR TO COMMENCING ANY RE-PROFILING WORKS, TO RETAIN ANY SILT THAT MAY ENTER THE DRAINS.
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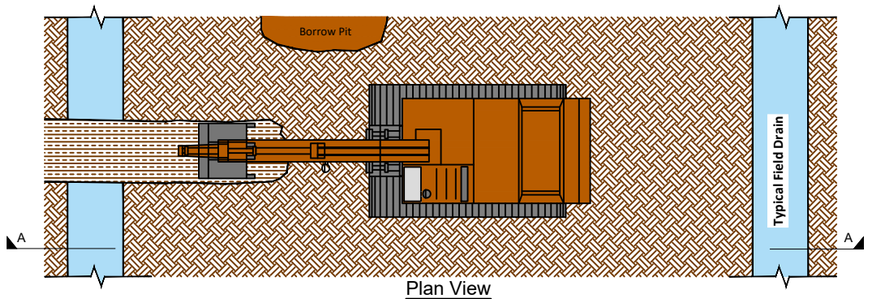
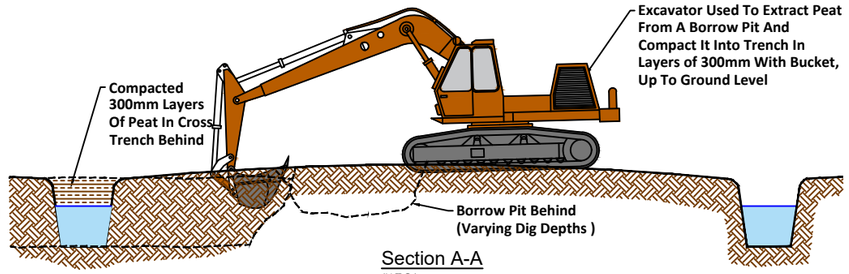
Phase 1
Forming Peat Trench

An Excavator is used to dig a trench approx. 1.2m Wide (4ft. wide excavator bucket) and up to 1.5m Deep where ground conditions allow, along the proposed location of the Berm.
If good 'clay like' ombrotrophic peat exists in trench the peat is turned over and compressed back into trench.
Area behind the machine is used as a borrow pit. Remove degraded peat and place this material close by to be used as cover later. 'Clay' like peat is extracted from pit and compacted in 300mm layers using the excavator bucket. The peat is firmly compacted using the machine bucket before laying more peat from the borrow pit, until ground level is reached.
Backfill the borrow pit with the degraded peat extracted from the trench and surface of borrow pit.



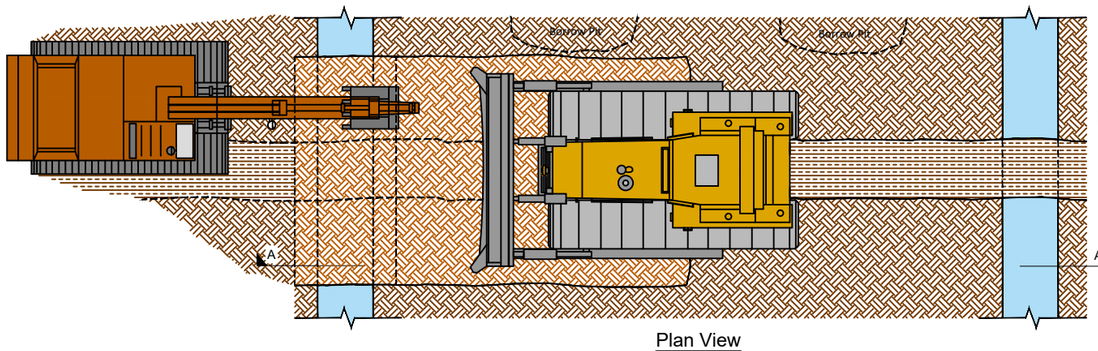
Plan View



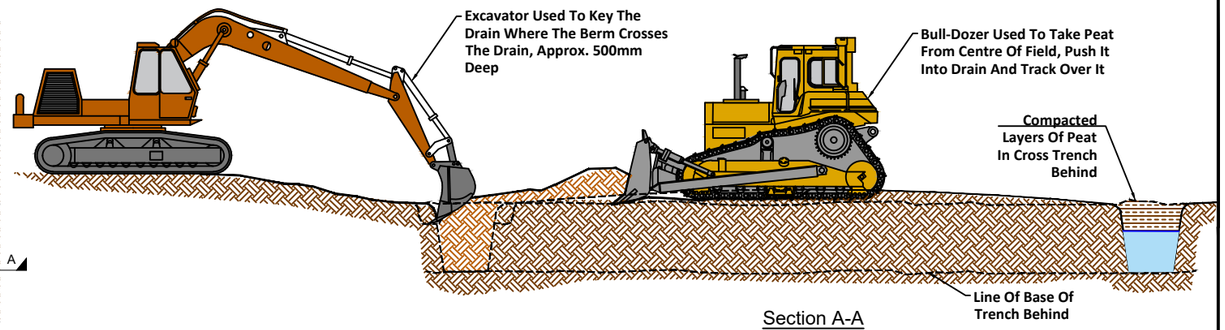
Section A-A
(N.T.S.)

Phase 2
Forming Peat Berm

An Excavator is used to form a key(5m long) in the drain's edges where the berm crosses.
A strip of peat(5m wide) is taken from the central camber of the field, pushed into the drain and compacted by the bull-dozer tracking over the drain block.



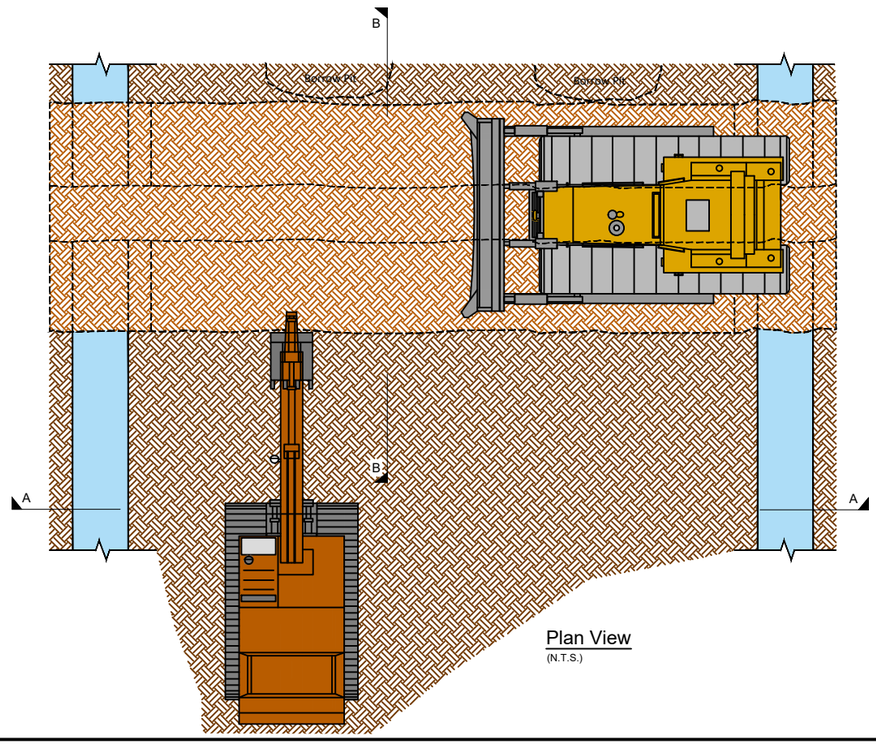
Plan View



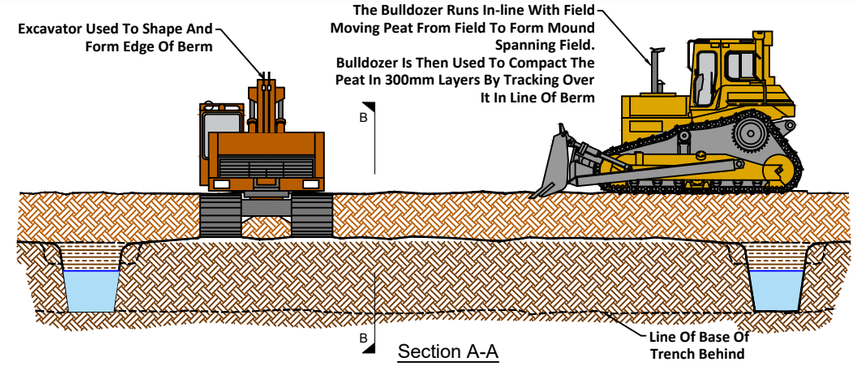
Section A-A

Phase 3
Forming Peat Berm

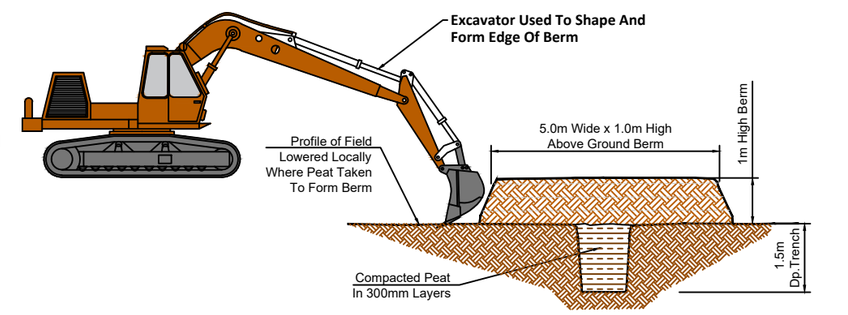
Next the bull-dozer is used to complete the central cross section of Berm by taking peat from the centre of the field and pushing it in line with the field to form an approximately 5m Wide x 1m High Cross Berm.
The peat material in the berm is compacted in layers of 300mm by the dozer tracking over it.
The excavator bucket is used to form and shape the edges of the compacted berm.



Plan View
(N.T.S.)



Section A-A



Section B-B

STATUS

Rev	Description	Issued By	Date
.	.	.	.
.	.	.	.
.	.	.	.
b	Berm Height Increased And Trench Detail Added	P.K.	25/02/21
a	Issued For Information	P.K.	29/01/21

BORD NA MÓNA
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Bord Na Móna Engineering Department
LEABEG, TULLAMORE CO. OFFALY
Tel. 057 9345900
Fax. 057 9345160

PROJECT:
Peatland Climate Action Scheme
PCAS

TITLE:
Rehabilitation Method WLT 3
Peat Berm

Drawn By:		Checked By:		Approved:
CAD	Designer	Discip. Lead	Design Lead	Design Manager
P.K.	-	D.K.	P.N.	P.N.

Date: 28/01/21 | Scale : Not to Scale A3 | Stage: For Approval
Drawing No.: PCAS-0100-010 | Rev: b

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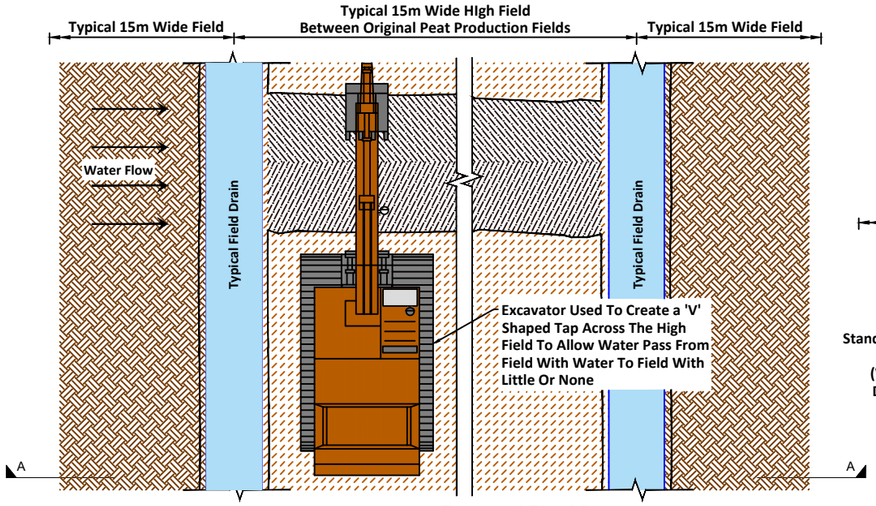
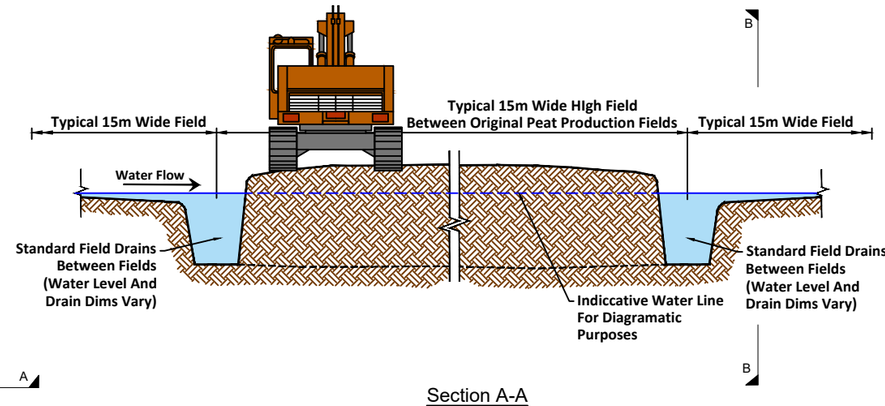
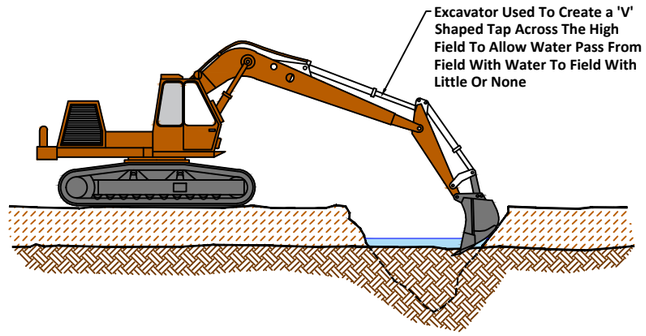
'V' Tap Across High Field To Control Water Levels



Proposed Plan View
(N.T.S.)



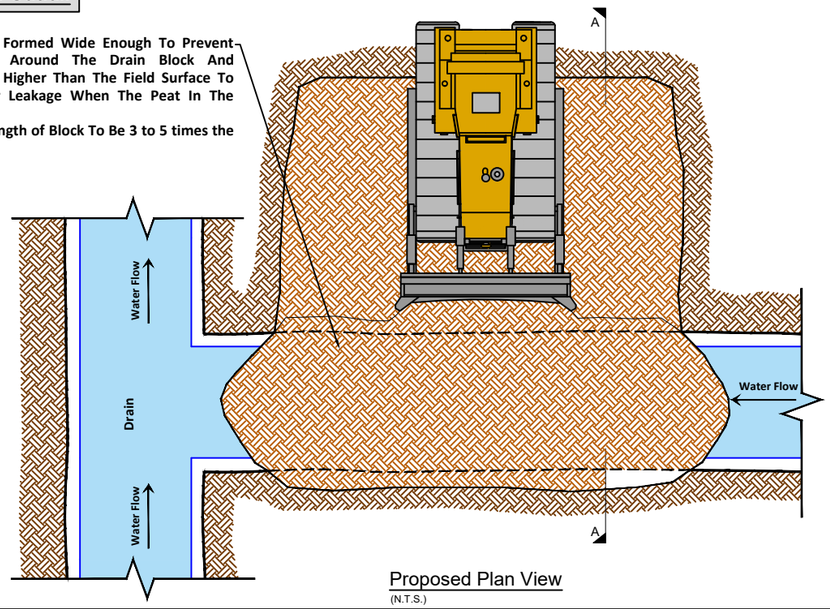
Section A-A
(N.T.S.)



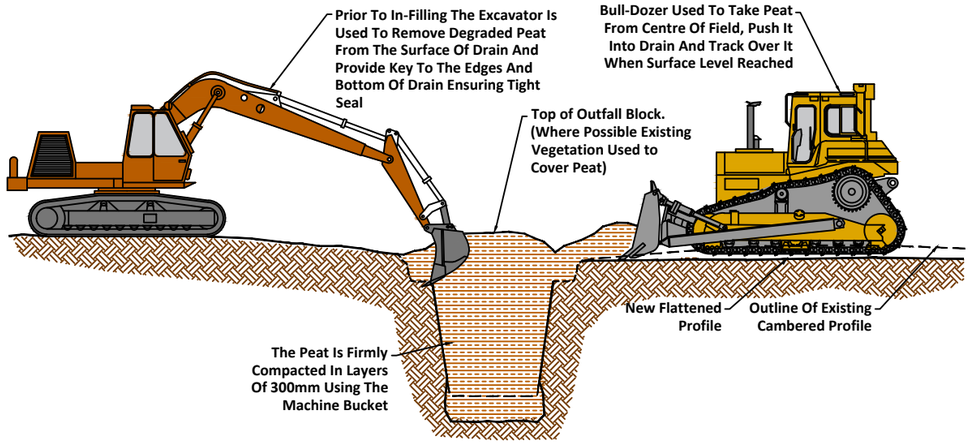
Section B-B
(N.T.S.)

Blocking Of Outfall

The Blocks Are Formed Wide Enough To Prevent Water Moving Around The Drain Block And 300mm-500mm Higher Than The Field Surface To Prevent Further Leakage When The Peat In The Blocks Subsides.
Approximate Length of Block To Be 3 to 5 times the Width Of Drain

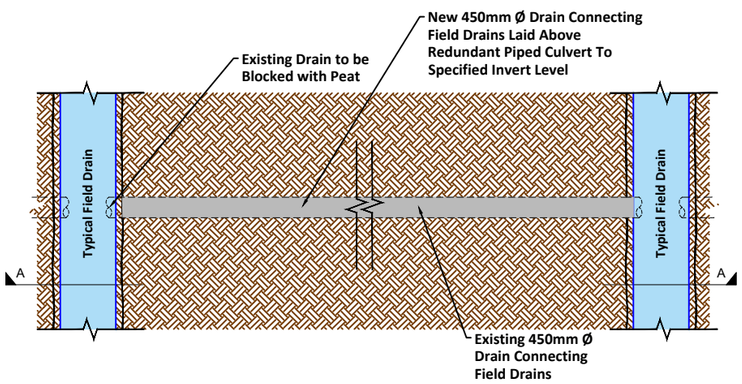


Proposed Plan View
(N.T.S.)

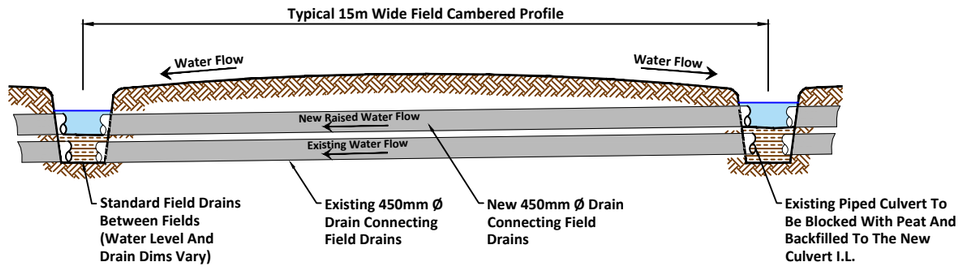


Section A-A
(N.T.S.)

Raise Piped Culverts To Control Water Levels



Proposed Plan View
(N.T.S.)



Section A-A
(N.T.S.)

NOTES:

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
2. REFER TO RELEVANT SITE PLAN TO ENSURE SPECIFIC DRAIN BLOCKS HAVE BEEN INSTALLED DOWNSTREAM PRIOR TO COMMENCING ANY RE-PROFILING WORKS, TO RETAIN ANY SILT THAT MAY ENTER THE DRAINS.
3. REFER TO RELEVANT SITE PLAN FOR No. OF DRAIN BLOCKS SPECIFIED PER 100M DRAIN LENGTH.
4. REFER TO RELEVANT SITE PLAN FOR SPECIFIC FINISHED GROUND LEVELS TO BE ACHIEVED.
5. ALL DETAILS TO BE AGREED WITH BORD NA MONA OPERATIONS PRIOR TO CONSTRUCTION.
6. OPERATORS TO CONFORM WITH ALL STANDARD OPERATING PROCEDURES.
7. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH THE SPECIFICATION FOR THE PARTICULAR BOG AND WITH THE REQUIREMENTS OF THE REHABILITATION PLAN, ANY NATURA IMPACT STATEMENT RECOMMENDED MEASURES IF APPLICABLE, ARCHAEOLOGY REPORTS AND ANY OTHER SPECIFIC ECOLOGICAL MEASURES OR ENVIRONMENTAL REPORTS FOR THIS BOG.

STATUS

Rev	Description	Issued By	Date
.		.	.
.		.	.
c	'Key' Added to Base Of Drain For Blocking Of Outfall Control Measure	P.K.	03/03/21
b	For Approval	P.K.	25/02/21
a	Issued For Information	P.K.	29/01/21

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PROJECT:
Peatland Climate Action Scheme
PCAS

TITLE:
Modifying of Outfalls
& Managing Water Levels

Drawn By:		Checked By:		Approved:
CAD	Designer	Discip. Lead	Design Lead	Design Manager
P.K.	-	D.K.	P.N.	P.N.

Date: 20/01/21 | Scale : Not to Scale A3 | Stage: For Approval
Drawing No.: PCAS-0100-014 | Rev: c

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