



Delichon Ecology

Cutaway Bog Decommissioning and Rehabilitation Plan

Natura Impact Statement

Esker Bog, Co. Offaly

Prepared For:



Contents

1	INTRODUCTION	1
1.1	Appropriate Assessment Process.....	2
1.1.1	Stages of the Appropriate Assessment Process	3
1.1.2	Statement of Authority	3
2	Stage 1: Screening	4
2.1	Screening Evaluation Process	4
2.1.1	Application of Protective Measures in the Screening Evaluation	4
2.2	Overview of Esker Bog Decommissioning and Rehabilitation	5
2.3	Screening Evaluation: Is the Project Directly Connected to or Necessary for Management of a European Site?	6
2.4	Description of the proposed Decommissioning and Rehabilitation.....	7
2.4.1	Location, Size, Scale, Landcover	7
2.5	Description of Receiving Environment	13
2.5.1	Desk Based Assessment	13
2.5.2	Field Assessments	30
2.5.3	Species of Conservation Interest	36
2.5.4	Invasive species	36
2.5.5	Certainty and Sufficiency of Data	36
2.6	Decommissioning and Rehabilitation Stage	37
2.6.2	Operational Stage	54
2.6.3	Other Projects and Plans with Potential to Cause In-Combination Effects	56
2.7	European Sites under consideration	61
2.7.1	Distance of the Project to European Sites	61
2.8	Sources of Information & Consultation.....	67
2.8.1	Consultation	67
2.8.2	Sources of Information	67
2.9	Potential Sources, Pathways and Timing of Impacts to European Sites (SACs & SPAs)	69

2.9.1	Potential Sources, Pathways and Timing of Impacts to SACs	69
2.9.2	Potential Sources, Pathways and Timing of Impacts SPAs	71
2.10	Screening Evaluation of the Potential for Effects on European Sites	72
2.11	Screening for Appropriate Assessment: Conclusion Statement	75
3	STAGE 2: APPROPRIATE ASSESSMENT	76
3.1	Introduction to Stage 2	76
3.1.1	Pressures and Threats of European Sites	76
3.1.2	Conservation Objectives for the relevant European Sites	78
3.2	Summary of Impact Pathways screened in for examination at Stage 2	99
3.3	Evaluation of potentially adverse impacts at Stage 2 (Alone & In Combination)	99
3.3.1	Indirect/ex-situ disturbance or displacement of species of Qualifying Interest (Otter)	99
3.3.2	Indirect/ex-situ mortality to species of Qualifying Interest (Otter) 101	
3.3.3	Indirect loss, reduction or degradation of aquatic habitats within the SAC and consequent effects to reliant aquatic species of Qualifying Interest 102	
3.4	Mitigation Measures	108
3.4.1	Description of the measures.....	108
3.4.2	Effectiveness of these measures.....	122
3.4.3	Implementation of Mitigation Measure.....	124
3.4.4	Degree of confidence in the likely success of the mitigation measure.....	124
3.4.5	Monitoring of the Implementation and Effectiveness of the Mitigation Measures.....	124
3.4.6	How any mitigation failure will be addressed.....	125
3.5	Evaluation of the impact of Esker Bog Decommissioning and Rehabilitation on the Integrity of the European Sites under consideration	127
3.6	Conclusion	128
4	REFERENCES	130

Table of Figures

Figure 1	Site Location of Esker Bog
Figure 2	Aerial photo of Esker Bog
Figure 3	Current Habitats at Esker Bog
Figure 4	Map of Esker Bog showing structures and designated emission points
Figure 5	Mammal Signs and Features within the Esker Bog Site
Figure 6	Completed Peat blockage
Figure 7	Examples of installed overflow pipes
Figure 8	Indicative methodology for field profiling DPT3B
Figure 9	Rehabilitation Method DPT4 45m x 60m Cell with Berms
Figure 10	Rehabilitation Method DPT5 30m x 30m cell with Berms
Figure 11	Drainage Management Measures for Esker Bog (derived from the Drainage Management Plan for Esker Bog)
Figure 12	Proposed Enhanced (PCAS) Rehabilitation Plan
Figure 13	Proposed Site Layout Plan for Esker Bog
Figure 14	Other projects and activities within 15km of the proposed Esker bog rehabilitation work
Figure 15	European Sites within 15km of Esker Bog
Figure 16	Proximal, adjacent or overlapping European Sites
Figure 17	BnM Emergency Response Clean Up Procedures
Figure 18	Esker Site Silt Control Measures
Figure 19	Key Drainage Features for Esker Bog
Figure 20	Flood Risk Analysis for Esker Bog

Table of Appendices

Appendix A	Finding of No Significant Effects (FONSE) Report
Appendix B	Esker Bog: Cutaway Bog Decommissioning and Rehabilitation Plan 2021
Appendix C	Site Synopses
Appendix D	Drawings of Proposed Rehabilitation Methodologies

Appendix E	Engineering and Rehabilitation Design Specification
Appendix F	Environmental Management Plan
Appendix G	Standard Operating Procedure for Otter

1 INTRODUCTION

Bord na Móna have in recent years permanently ceased industrial peat production on a significant area of bog. In line with Bord na Móna's accelerated decarbonization strategy, the company has also committed to ambitious enhanced peatland decommissioning and rehabilitation improvements.

This strategy has been developed to optimise benefits of peatland rehabilitation and restoration for climate action. In addition, it will also have benefits for biodiversity, water (catchment management) and other ecosystem services. These improvements are in line with the Government Climate Action agenda and will bring with it significant natural capital benefits. It will also create a stable natural landscape for the benefit of neighbours and local communities in former peat production areas.

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Allen bog group (Ref. P0503-01). 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 Allen bog group. Esker Bog is located 5.7km north-east of Daingean, Co. Offaly.

It is proposed by Government that Bord na Móna carry out a Peatlands Enhanced Decommissioning, Rehabilitation and Restoration Scheme (PCAS) on peatlands previously used for energy production. Note this proposal is also known colloquially as the 'Peatlands Climate Action Scheme'. The additional costs of the proposed Scheme will be supported by Government through the Climate Action Fund. Bord na Móna have identified a footprint of 33,000 ha (a subset of the BnM estate that has been used for energy production) as peatlands suitable for enhanced rehabilitation. This proposed Scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations (Appendix VII) under existing EPA IPC licence conditions. Improvements supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered.

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 PCAS will support activities, interventions, or measures across the Bord na Móna cutaway peatlands which accelerate the original timelines. Selected rehabilitation measures will take account of site environmental conditions, which can vary significantly. These measures potentially include:

- more intensive management of water levels through drain-blocking outfall blocking and use of overflow pipes;
- drain blocking on extant remnant bog;
- re-profiling that will deliver suitable conditions for development of wetlands, fens and bog habitats;
- targeted fertiliser applications,
- seeding of targeted vegetation; and
- proactive inoculation of suitable peatland areas with Sphagnum.

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

benefits is the restoration of suitable hydrological conditions and more intensive intervention means that the extent of suitable hydrological conditions can be optimised. These measures are designed to encourage the development of peat-forming habitats, where possible. 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.

This Screening for Appropriate Assessment Report / Natura Impact Statement Report has been prepared by Delichon Ecology on behalf of Bord na Móna and contains sufficient objective scientific information to facilitate the Public Authority to determine whether the decommissioning and rehabilitation outlined in the plan referenced above requires Appropriate Assessment, or whether the potential for significant effects on any designated European Site can be excluded.

The preparation of this Screening for Appropriate Assessment Report has had regard to;

- EU Habitats Directive (92/43/EEC),
- EU Birds Directive (Council Directive (2009/147/EC)
- European Communities (Birds and Natural Habitats) Regulations 2011,
- Assessment of Plans and Projects significantly affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC, European Commission 2001,
- Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities. Department of the Environment, Heritage and Local Government (2010).
- Managing Natura 2000 Sites: The Provisions of Article 6 of the 'Habitats Directive' 92/43/EEC, European Commission, 2018.
- *Esker Bog Cutaway Bog Decommissioning and Rehabilitation Plan 2021*(2021) as prepared by BnM – see **Appendix B** of this document.

For the avoidance of doubt, within this appraisal, no reliance is made on existing mitigation measures which form part of current or previous industrial peat production. The scope of this appraisal refers to the proposed decommissioning and rehabilitation only, as described in the Plan included as **Appendix B**.

1.1 Appropriate Assessment Process

Under Article 6(3) of the Habitats Directive, an Appropriate Assessment of the implications of any plan or project on a European Site is required before a project is approved/adopted. This must include all the aspects of the plan or project which can, either individually or in combination with other plans or projects, affect the conservation objectives of that European Site, in the light of the best scientific knowledge in the field. The competent national authorities are to authorise a plan, project or activity only if they have made certain that it will not adversely affect the integrity of any European Site.

This current document comprises a Screening for Appropriate Assessment and Natura Impact Statement. The Screening must identify whether the project, alone or in combination with other plans and projects, is likely to have significant effects on any European Site in view of the qualifying interests and conservation objectives of these sites; or whether the potential for such significant effects can be excluded. This test is completed with cognisance of emerging case law.

In the current context, where significant effects are considered likely, in view of the qualifying interests or special conservation interests and the respective conservation objectives of any European site, the Screening identifies that Appropriate Assessment is required. Therefore, this NIS report provides mitigation to avoid adverse effects on European site integrity. This report is conducted in line with the requirements of Article 6(3) of the EU Habitats Directive (92/43/EEC) and the National Parks and Wildlife Service (NPWS) Guidance

for Planning Authorities (2010), and it is intended that the information contained within this document will form the basis for the Article 6(3) Appropriate Assessment process completed by the Competent Authority.

1.1.1 Stages of the Appropriate Assessment Process

Appropriate Assessment involves a number of steps and tests that are applied using a stage-by-stage approach. Each step or stage in the assessment process precedes and provides a basis for other steps. The four stages in an Appropriate Assessment (AA), are further described below.

Guidance on the Appropriate Assessment (AA) process was produced by the European Commission in 2002, which was subsequently developed into guidance specifically for Ireland by the Department of Environment, Heritage and Local Government (DEHLG) (2009). These guidance documents identify a staged approach to conducting an AA, as shown in **Image 1**.



Image 1: The Appropriate Assessment Process (from: Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities, DEHLG, 2009).

Stage 1 - Screening for AA

This stage examines the likely effects of a project either alone or in combination with other projects upon a European site and considers whether it can be objectively concluded that these effects will not be significant.

Stage 2 – Appropriate Assessment

In this stage, the impact of the project on the integrity of the European site is considered with respect to the conservation objectives of the site and to its structure and function. Mitigation measures should be applied to the point where no adverse impacts on the site(s) remain.

Stage 3 - Alternative Solutions

Should the Appropriate Assessment determine that adverse impacts are likely upon a European site, this stage examines alternative ways of implementing the project that, where possible, avoid these adverse impacts. For the avoidance of doubt, no reliance is placed on Stage 3.

Stage 4 - IROPI

Assessment where no alternative solutions exist and where adverse impacts remain: Where imperative reasons of overriding public interest (IROPI) exist, an assessment to consider whether compensatory measures will or will not effectively offset the damage to the European site will be necessary. European case law highlights that consideration must be given to alternatives outside the project area in carrying out the IROPI test. It is a rigorous test which projects are generally considered unlikely to pass. In any event, the proponent does not purport to place any reliance on Stage 4.

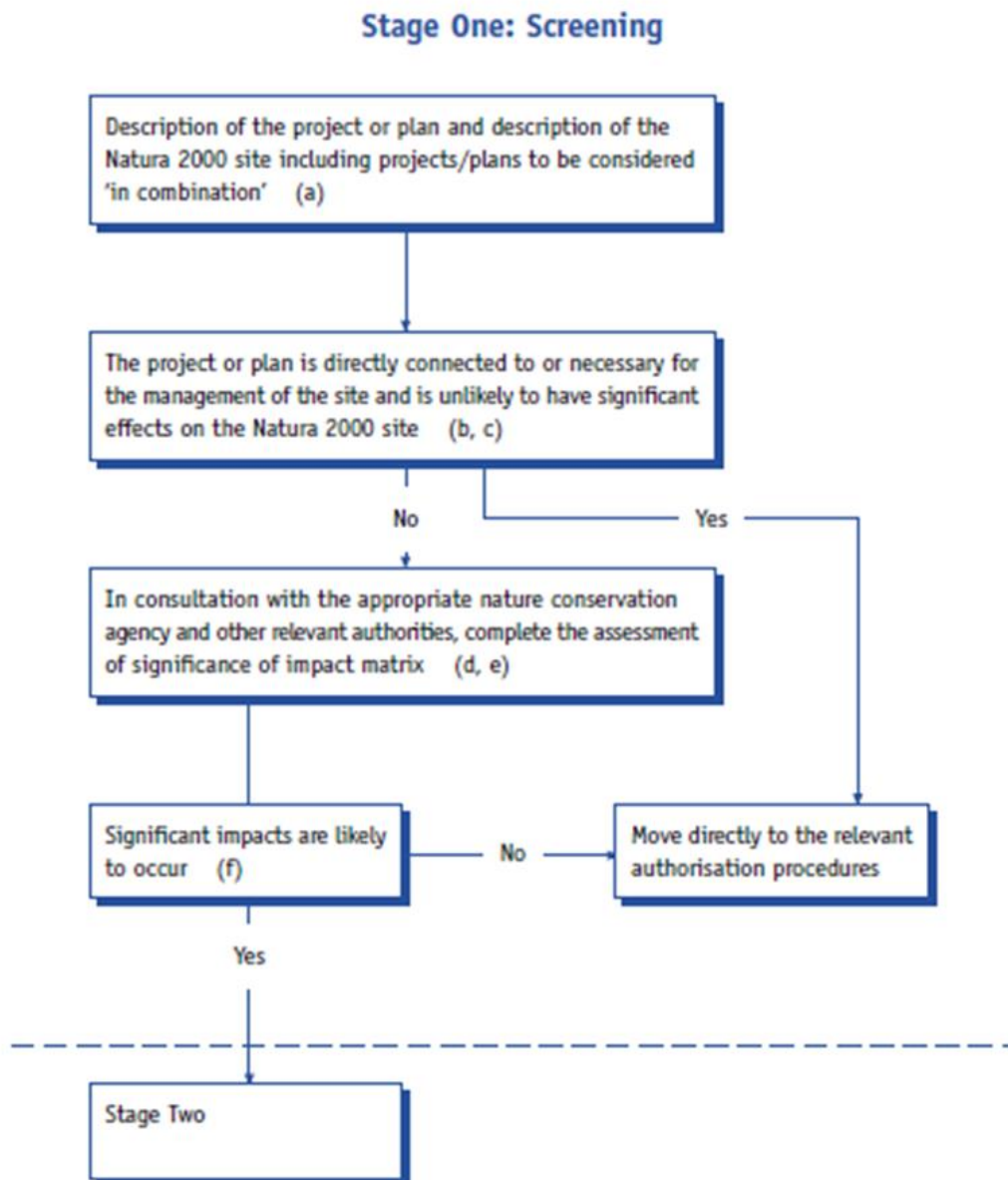
1.1.2 Statement of Authority

Eamonn Delaney BSc, MSc, MCIEEM, CECOL prepared this Natura Impact Statement. Eamonn has fourteen years consultancy experience and has prepared Screening for Appropriate Assessment and Natura Impact Statements for various projects, including residential, amenity, renewable energy and transport developments in addition to strategic policy and planning proposals. Eamonn conducted field visits to the Esker site in January 2020 and April 2021.

2 Stage 1: Screening

2.1 Screening Evaluation Process

The Screening process examines the likely effects of the described Esker Bog decommissioning and rehabilitation, as described in the appended 'plan' (**Appendix B**), either alone or in combination with other projects or plans, upon any European Site and considers whether it can be objectively concluded that these effects will not be significant. The Screening evaluation comprises four steps, as outlined in the diagram below:



2.1.1 Application of Protective Measures in the Screening Evaluation

The Screening evaluation to inform the AA process, presented in **Section 2.9** below, has been carried out in the absence of any best practice measures, protective measures or mitigation measures considered to avoid harmful effects on European Sites.

2.2 Overview of Esker Bog Decommissioning and Rehabilitation

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Allen bog group (Ref. PO503-01). As part of Conditions 10.1 and 10.2 of this license, respectively, decommissioning and rehabilitation must be undertaken to ensure the permanent rehabilitation of the cutaway bog lands within the licensed area. Esker bog is part of the Allen bog group. Esker Bog is located 5.6km north-east of Daingean, Co. Offaly.

A document titled '*Esker Bog Cutaway Bog Decommissioning and Rehabilitation 2021*' has been prepared specifically to describe the proposed decommissioning and rehabilitation measures at Esker Bog and is appended to this document as **Appendix B**.

It is proposed by Government that Bord na Móna carry out a Peatlands Enhanced Decommissioning, Rehabilitation and Restoration Scheme (PCAS) on peatlands previously used for energy production. 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 Esker 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. PO503-01, 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 dependant 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. PO503-01, 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. PO503-01:

"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."

Esker Bog has been in active peat production since the 1970s. Industrial peat production ceased in 2019. The primary rehabilitation goal and outcome for Esker Bog is **environmental stabilisation** of the bog.

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.

2.3 Screening Evaluation: Is the Project Directly Connected to or Necessary for Management of a European Site?

For a project or plan to be 'directly connected with or necessary to the management of the site', the 'management' component must refer to management measures that are for conservation purposes, and the 'directly' element refers to measures that are solely conceived for the conservation management of a site and not direct or indirect consequences of other activities.

Finding: No, the proposed Esker Bog Decommissioning and Rehabilitation is not directly connected to or necessary for the management of a European Site.

2.4 Description of the proposed Decommissioning and Rehabilitation

2.4.1 Location, Size, Scale, Landcover

2.4.1.1 Location

Esker Bog is located in north Co. Offaly border, 5.6km north-east of Daingean and 4 km south of Rhode. The bog is adjoined to Cavemount Bog to the west and Cloncreen Bog to the south-east. The landscape in this area is generally flat with Croghan Hill to the north-west. The Esker River flows along the southern side of the bog and forms a natural boundary. A tributary of the Esker Stream (the Dogen River), flows north to south and separates the eastern from the western side of Esker Bog. The majority of the bog is owned by Bord na Móna with a small section of high bog to the north-east being cut as turbary.

See **Figure 1: Site Location of Esker Bog** (over).

Figure 2: Aerial Imagery of Esker Bog (over).

Figure 3: Current habitats at Esker Bog (over).

2.4.1.2 Size, Scale, Landcover

Size and Scale: Esker Bog comprises 568.33Ha in total.

Esker bog is in production since the early 1970s. Production at the Esker Bog concentrated on milled peat to be used as fuel peat for the Edenderry Power Plant. A works area is located near the western boundary of the site and comprises localised areas of hardstanding with portacabins and of the main section. A permanent railway runs through the centre of the works area. Horticultural peat moss has been harvested from this site although in recent years there was a switch to harvesting of milled fuel peat. The peat is still red/brown in places (indicator of acidic *Sphagnum* peat) although it is noticeable that peat harvesting has lowered the surface of the bog significantly comparing to the surrounding intact high bog remnants. There was virtually no recolonisation on the recently active production bog.

Esker Bog (production area) is mainly composed of bare peat as the entire bog was in active peat production until 2019 (See **Appendix B**). There are some remnant, localised sections of high bog (corresponding with the marginal ecotype) still present to the south of the site, but these are generally small.

The majority of the large area in the west of Esker Bog within the Bord na Móna boundary is dominated by bare peat and the eastern section is largely cutaway. The Esker Stream flows along the southern side of the bog and forms a natural boundary. The Doden River, a tributary of the Esker River, flows north to south and separates the eastern from the western side of the site. A third watercourse flows along the western boundary of the site and is also a tributary of the Esker Stream. Field drains on both the western and eastern sections of Esker Bog run north-east to south west. Silt ponds are present at the edges of the bog where they drain in to the respective watercourses indicated above. There are seven outlets for water draining off Esker bog, all of which pass through silt ponds. One exception is the flow to the Doden River, the course of which has been modified and managed as a silt pond.

The underlying geology at Esker Bog comprises oolitic limestones¹. The underlying soils and sub-soils are classed as 'Raised Bog Cutover Peat'. The peat soils are likely to be underlain with limestone tills, as these sub-soils are exposed around the margins of the site. The sub-soils along the southern margin are limestone-based sands and gravels lain down by the river. Grey Marl was exposed in some of the spoil taken from the silt ponds at the southern end of the site. A significant portion of the residual peat on Esker Bog is mostly "red" or "*Sphagnum* peat". The western section of the bog contains the deepest peat reserves with over 2.6m of peat remaining in some areas. The eastern section has rather shallower peat depths remaining, with some fen peats exposed. Some of this area is also cutaway, with underlying sub-soils now exposed.

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

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). The bog is located in an area mapped by GSI as of low groundwater vulnerability (GSI Mapviewer).

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 blocked, 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.

Esker Bog was in industrial peat production since the early 1970s. The peat was formerly used as fuel peat in Edenderry Power. Industrial peat extraction completely ceased at Esker Bog in 2019.

In terms of size and scale, **decommissioning** at Esker includes the following:

- Clean-up of remaining or unconsolidated waste or materials located in Bogs, Yards, Buildings and Offices
- Cleaning Silt Ponds
- Decommissioning Peat Stockpiles
- Decommissioning Fuel Tanks and associated facilities; and
- Decommissioning or Removal of Septic Tanks.

Enhanced measures may also include the lifting of the existing rail line, decommissioning of existing level crossings and measures to restrict access to the bog.

Of the 568.33 ha within Esker Bog, 475.55ha or 83.67% will be subject to **rehabilitation** measures/activities.

Landcover

Existing:

There are some remnant habitats around the margins of Esker Bog. A narrow band of Birch woodland (WN7) and scrub (WS1) dominated by Birch are the most prominent habitats around the periphery of both the western and eastern sections. In some places, there are patches of remnant raised bog vegetation (PB1), generally dominated by Heather and being invaded by scrub, as they have largely dried out. Other parts of the margins are covered in a mosaic of Bracken and Birch scrub.

Although the western block of Esker bog is largely bare peat, the smaller eastern area is largely cutaway, and pioneer cutaway habitats have been developing here in recent years. On the higher and drier areas Birch woodland is developing, with a mosaic of rush-dominated poor fen and bare peat over much of the remainder of this area. The drainage system in this area has been maintained so it has remained relatively dry.

The small area of Esker Bog in the south-east of the area that has never been in production is dominated by mature Birch woodland (WN7) and also contains small patches of active and old cutover bog (PB4), wet grassland (GS4) that has developed on cutover peat and Bracken (HD1).

The Esker Stream, that flows along the southern boundary, is typical of a lowland depositing river and is infilled with emergent riparian vegetation such as Reed Canary grass and Bulrush.

A map showing existing habitats at Esker Bog is presented in **Figure 3**.

Extent of Landcover requiring Decommissioning: Decommissioning will be applicable across all of Esker Bog.

Extent of Landcover requiring Rehabilitation: Of the 568.33 ha within Esker Bog, 475.55ha or 83.67% will be subject to **rehabilitation** measures/activities.

Future Landcover: Following decommissioning and rehab, future landcover of habitats currently evaluated as not requiring Rehab (i.e. Access Tracks and rights of way, marginal lands such as agricultural land, and marginal areas (e.g. high bog) around the edges of Esker Bog) will remain in line with existing baseline trends for these habitats, albeit without any waste or materials which would have been left in situ in the absence of decommissioning.

For habitats where rehabilitation is undertaken, landcover is expected to eventually comprise Scrub, Bog Woodland (or various mosaics of Birch Woodland, such as with Willow, or Pine); Regenerating Degraded

Raised bog communities; Wetland habitats and communities of varying depths and extent; Poor fen, Oak-ash-hazel Woodland; Raised Bog; Riparian areas and also riparian woodland. The development of these habitats will reflect the varying underlying environmental conditions and in part will develop as a mosaic of habitats. Rehabilitation will also modify the local environmental conditions (e.g. hydrology and topography).

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. (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 Esker Bog will include:

- Re-wetting the deep peat areas of the bog using berms and field re-profiling. This enhanced measure seeks to create large (c. 45m x 60m) flat areas or cells of shallow (< 10 cm) water conditions on bare peat, across multiple fields that are enclosed by shallow berms to retain shallow surface water;
- Inoculation of *Sphagnum* on compatible residual deep peat areas;
- Re-wetting some deep peat areas of the bog through regular field drain blocking using a dozer to create three peat blockages every 100 m along each field drain;
- Re-wetting some deep peat areas of the bog through more intensive field drain blocking using a dozer to create seven peat blockages every 100 m along each field drain;
- Management of water levels with overflow pipes;
- Re-alignment of piped drainage;
- The construction of berms to create wetlands;
- Intensive drain blocking to create wetlands, and the introduction of Reeds and other Rhizomes;
- Optimising water retention in wetland areas, including placement of berms where required;
- Targeted fertiliser applications on bare peat areas to accelerate vegetation establishment on headlands and high fields. (It is noted that the application of fertiliser may need additional assessment and approval as per the IPC Licence),
- Regular drain blocking (3/100) on dry cutaway adjacent to wetland mosaics, along with the blocking of outfalls and management of water levels;
- 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).





Figure 2: Aerial photo of Esker Bog

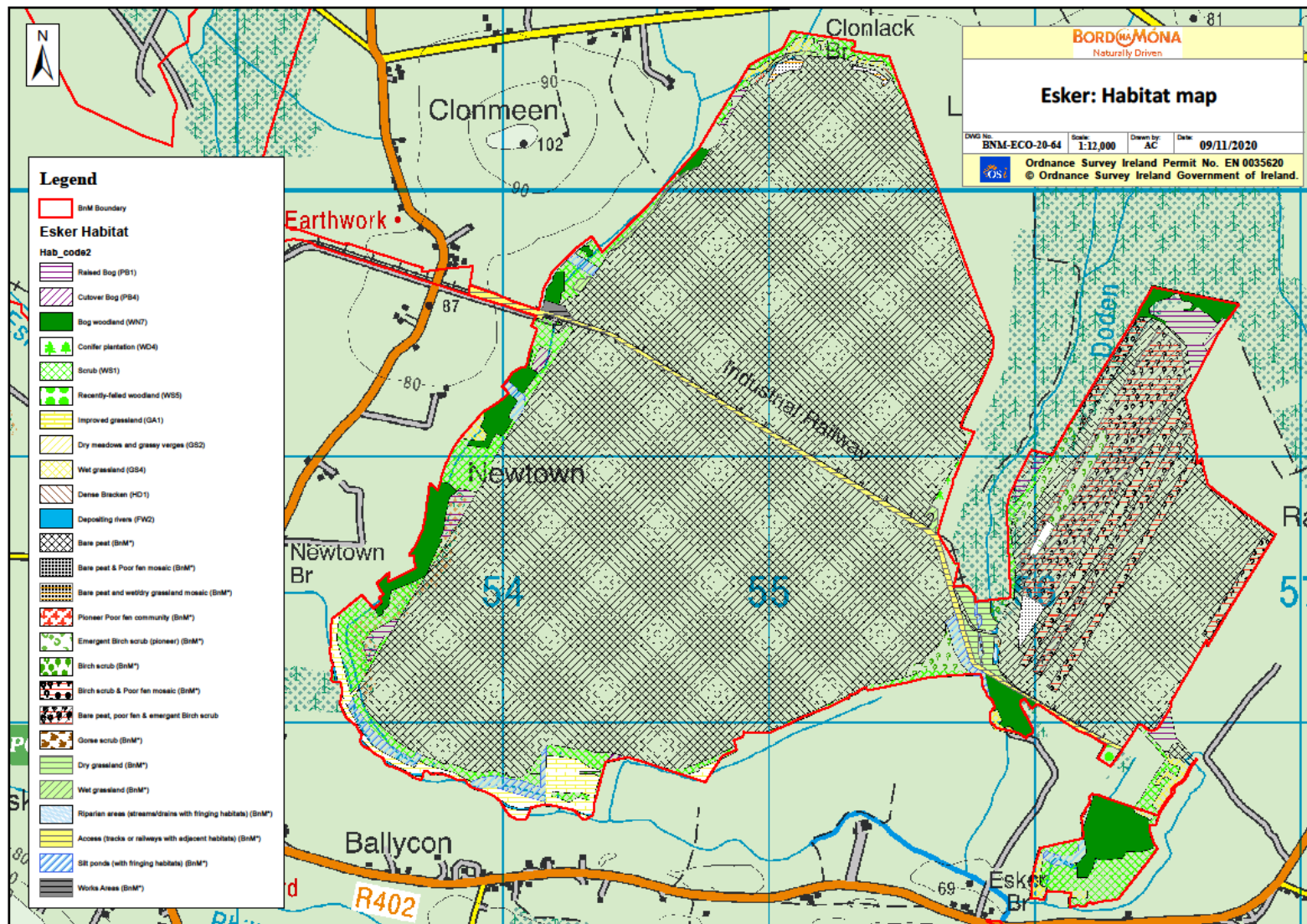


Figure 3: Current Habitats at Esker Bog

2.5 Description of Receiving Environment

The majority of Esker Bog within the Bord na Móna boundary is bare peat as this site was in production until 2019 (see Image 1 and Image 2). The site drains to the Figile catchment.

2.5.1 Desk Based Assessment

2.5.1.1 National Biodiversity Data Centre – Data Request

A search was undertaken on the National Biodiversity Data Centre² for Protected and Invasive Species presence in the vicinity of the proposed development. Esker Bog is located within hectad N52³. The protected and invasive species records available for these hectads are shown in **Table 1**.

Table 1: NBDC records of protected and invasive species in N52 10km grid square (hectad)

Common Name (Species Name)	Date of Record	Designation
Common Frog (<i>Rana temporaria</i>)	11/06/2018	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex V Protected Species: Wildlife Acts
Barn Owl (<i>Tyto alba</i>)	12/07/2017	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Barn Swallow (<i>Hirundo rustica</i>)	31/12/2011	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Black-headed Gull (<i>Larus ridibundus</i>)	31/12/2011	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Common Goldeneye (<i>Bucephala clangula</i>)	04/12/2017	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU Birds Directive >> Annex II, Section II Bird Species Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List

² Available at <https://www.biodiversityireland.ie/>. Accessed in March 2021

³ 10x10km Irish Grid Square

Common Name (Species Name)	Date of Record	Designation
Common Grasshopper Warbler (<i>Locustella naevia</i>)	31/12/2011	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Kestrel (<i>Falco tinnunculus</i>)	03/03/2016	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Kingfisher (<i>Alcedo atthis</i>)	31/12/2011	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU Birds Directive >> Annex I Bird Species Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Linnet (<i>Carduelis cannabina</i>)	31/12/2011	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Pheasant (<i>Phasianus colchicus</i>)	31/12/2011	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU Birds Directive >> Annex II, Section I Bird Species Protected Species: EU Birds Directive >> Annex III, Section I Bird Species
Common Redshank (<i>Tringa totanus</i>)	31/12/2011	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Common Snipe (<i>Gallinago gallinago</i>)	31/12/2011	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU Birds Directive >> Annex II, Section I Bird Species Protected Species: EU Birds Directive >> Annex III, Section III Bird Species Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Starling (<i>Sturnus vulgaris</i>)	31/12/2011	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List

Common Name (Species Name)	Date of Record	Designation
Common Swift (<i>Apus apus</i>)	31/12/2011	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Wood Pigeon (<i>Columba palumbus</i>)	31/12/2011	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU Birds Directive >> Annex II, Section I Bird Species Protected Species: EU Birds Directive >> Annex III, Section I Bird Species
Corn Crane (<i>Crex crex</i>)	31/07/1972	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU Birds Directive >> Annex I Bird Species Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Eurasian Curlew (<i>Numenius arquata</i>)	31/07/1991	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU Birds Directive >> Annex II, Section II Bird Species Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Eurasian Marsh Harrier (<i>Circus aeruginosus</i>)	01/05/2010	Protected Species: Wildlife Acts
Eurasian Teal (<i>Anas crecca</i>)	31/12/2011	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU Birds Directive >> Annex II, Section I Bird Species Protected Species: EU Birds Directive >> Annex III, Section II Bird Species Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Eurasian Wigeon (<i>Anas penelope</i>)	30/10/2017	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU Birds Directive >> Annex II, Section I Bird Species Protected Species: EU Birds Directive >> Annex III, Section II Bird Species Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List

Common Name (Species)	Date of Record	Designation
Eurasian Woodcock (<i>Scolopax rusticola</i>)	31/12/2011	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU Birds Directive >> Annex II, Section I Bird Species Protected Species: EU Birds Directive >> Annex III, Section III Bird Species Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
European Golden Plover (<i>Pluvialis apricaria</i>)	31/12/2011	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU Birds Directive >> Annex I Bird Species Protected Species: EU Birds Directive >> Annex II, Section II Bird Species Protected Species: EU Birds Directive >> Annex III, Section III Bird Species Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Grey Partridge (<i>Perdix perdix</i>)	29/02/1984	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU Birds Directive >> Annex II, Section I Bird Species Protected Species: EU Birds Directive >> Annex III, Section I Bird Species Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Hen Harrier (<i>Circus cyaneus</i>)	31/12/2011	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU Birds Directive >> Annex I Bird Species Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
House Martin (<i>Delichon urbicum</i>)	31/12/2011	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
House Sparrow (<i>Passer domesticus</i>)	31/12/2011	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Jack Snipe (<i>Lymnocyptes minimus</i>)	31/12/2011	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU

Common Name	Name (Species)	Date of Record	Designation
			Birds Directive >> Annex II, Section I Bird Species Protected Species: EU Birds Directive >> Annex III, Section III Bird Species
	Little Grebe (<i>Tachybaptus ruficollis</i>)	31/12/2011	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
	Mallard (<i>Anas platyrhynchos</i>)	31/12/2011	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU Birds Directive >> Annex II, Section I Bird Species Protected Species: EU Birds Directive >> Annex III, Section I Bird Species
	Merlin (<i>Falco columbarius</i>)	29/02/1984	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU Birds Directive >> Annex I Bird Species Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
	Mute Swan (<i>Cygnus olor</i>)	31/12/2011	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
	Northern Lapwing (<i>Vanellus vanellus</i>)	31/12/2011	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU Birds Directive >> Annex II, Section II Bird Species Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
	Northern Wheatear (<i>Oenanthe oenanthe</i>)	13/06/2010	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
	Peregrine Falcon (<i>Falco peregrinus</i>)	30/11/2017	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU Birds Directive >> Annex I Bird Species
	Ringed Plover (<i>Charadrius hiaticula</i>)	31/12/2011	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List

Common Name (Species Name)	Date of Record	Designation
Rock Pigeon (<i>Columba livia</i>)	31/12/2011	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU Birds Directive >> Annex II, Section I Bird Species
Sand Martin (<i>Riparia riparia</i>)	31/12/2011	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Sky Lark (<i>Alauda arvensis</i>)	15/06/2017	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Spotted Flycatcher (<i>Muscicapa striata</i>)	31/12/2011	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Stock Pigeon (<i>Columba oenas</i>)	29/02/1984	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Tufted Duck (<i>Aythya fuligula</i>)	31/12/2011	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU Birds Directive >> Annex II, Section I Bird Species Protected Species: EU Birds Directive >> Annex III, Section II Bird Species Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Water Rail (<i>Rallus aquaticus</i>)	31/12/2011	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Whinchat (<i>Saxicola rubetra</i>)	31/07/1972	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Whooper Swan (<i>Cygnus cygnus</i>)	30/11/2016	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU Birds Directive >> Annex I Bird Species Threatened Species: Birds of Conservation Concern

Common Name (Species Name)	Date of Record	Designation
		Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Yellowhammer (<i>Emberiza citrinella</i>)	31/12/2011	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Freshwater White-clawed Crayfish (<i>Austropotamobius pallipes</i>)	07/09/2015	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex II Protected Species: EU Habitats Directive >> Annex V Protected Species: Wildlife Acts
Alder Buckthorn (<i>Frangula alnus</i>)	02/09/2010	Threatened Species: Vulnerable
Basil Thyme (<i>Clinopodium acinos</i>)	19/06/2019	Threatened Species: Endangered
Blue Fleabane (<i>Erigeron acer</i>)	20/09/2019	Threatened Species: Endangered
Butterfly-bush (<i>Buddleja davidii</i>)	04/08/2019	Invasive Species: Invasive Species Invasive Species: Invasive Species >> Medium Impact Invasive Species
Sycamore (<i>Acer pseudoplatanus</i>)	30/09/2001	Invasive Species: Invasive Species Invasive Species: Invasive Species >> Medium Impact Invasive Species
Dingy Skipper (<i>Erynnis tages</i>)	09/05/2020	Threatened Species: Near threatened
Marsh Fritillary (<i>Euphydryas aurinia</i>)	14/09/2019	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex II Threatened Species: Vulnerable
Small Heath (<i>Coenonympha pamphilus</i>)	02/08/2019	Threatened Species: Near threatened
Wall (<i>Lasiommata megera</i>)	02/08/2019	Threatened Species: Endangered
Andrena (<i>Oreomelissa coitana</i>)	08/08/1998	Threatened Species: Vulnerable
Large Red Tailed Bumble Bee (<i>Bombus (Melanobombus) lapidarius</i>)	13/08/2020	Threatened Species: Near threatened
Common Garden Snail (<i>Cornu aspersum</i>)	16/09/1977	Invasive Species: Invasive Species Invasive Species: Invasive Species >> Medium Impact Invasive Species

Common Name (Species Name)	Date of Record	Designation
Common Whorl Snail (<i>Vertigo</i> (<i>Vertigo</i>) <i>pygmaea</i>)	16/09/1977	Threatened Species: Near threatened
Heath Snail (<i>Helicella itala</i>)	16/09/1977	Threatened Species: Vulnerable
Moss Chrysalis Snail (<i>Pupilla</i> (<i>Pupilla</i>) <i>muscorum</i>)	16/09/1977	Threatened Species: Endangered
Wrinkled Snail (<i>Candidula intersecta</i>)	16/09/1977	Invasive Species: Invasive Species Invasive Species: Invasive Species >> Medium Impact Invasive Species
Large White-moss (<i>Leucobryum glaucum</i>)	25/11/2012	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex IV Threatened Species: Least concern
American Mink (<i>Mustela vison</i>)	18/03/2015	Invasive Species: Invasive Species Invasive Species: Invasive Species >> High Impact Invasive Species Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Brown Rat (<i>Rattus norvegicus</i>)	15/05/2017	Invasive Species: Invasive Species Invasive Species: Invasive Species >> High Impact Invasive Species Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Eastern Grey Squirrel (<i>Sciurus carolinensis</i>)	31/12/2009	Invasive Species: Invasive Species Invasive Species: Invasive Species >> High Impact Invasive Species Invasive Species: Invasive Species >> EU Regulation No. 1143/2014 Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Eurasian Badger (<i>Meles meles</i>)	18/03/2015	Protected Species: Wildlife Acts
Eurasian Pygmy Shrew (<i>Sorex minutus</i>)	27/01/2015	Protected Species: Wildlife Acts
Eurasian Red Squirrel (<i>Sciurus vulgaris</i>)	30/09/2015	Protected Species: Wildlife Acts
European Otter (<i>Lutra lutra</i>)	13/02/2018	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex II Protected Species: EU Habitats Directive >> Annex IV Protected Species: Wildlife Acts
European Rabbit (<i>Oryctolagus cuniculus</i>)	08/03/1990	Invasive Species: Invasive Species Invasive Species: Invasive Species >> Medium Impact Invasive Species

Common Name	Name (Species)	Date of Record	Designation
Fallow Deer	<i>Dama dama</i>	13/03/2015	Invasive Species: Invasive Species Invasive Species: Invasive Species >> High Impact Invasive Species Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland) Protected Species: Wildlife Acts
Pine Marten	<i>Martes martes</i>	17/03/2015	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex V Protected Species: Wildlife Acts
West European Hedgehog	<i>Erinaceus europaeus</i>	17/06/2018	Protected Species: Wildlife Acts

2.5.1.2 National Parks and Wildlife Service Data Request

Table 2 presents protected species records held for hectad N52 & N53 by the National Parks and Wildlife Service.

Table 2: NPWS records of protected and invasive species in N52 & N53 10km grid squares (hectads)

Common Name	Species Name	Record Date	Location(s)	Hectad
White-clawed Crayfish	<i>Autopotamobius pallipes</i>	Various dates	Esker Stream, Esker / Newtown Bridge, Yellow (Castlejordan watercourse, Dunrally watercourse)	N52 & N53
Mute Swan	<i>Cynus olor</i>	2006	Not provided	N53
Blue Fleabane	<i>Erigeron acer</i>	1991 & 1998	Rochefortbridge Co. Westmeath & Esker Bridge, Edenderry	N52 & N53
Hedgehog	<i>Erinaceus europaeus</i>	1980 & 1981	Moutlucas, Co Offaly, Fahy, Co. Offaly & Castlejordan Co. Meath	N52 & N53
Irish Hare	<i>Lepus timidus subsp. hibernicus</i>	1980, 1981 & 2010	Several locations within the 10km square	N52 & N53
Otter	<i>Lutra lutra</i>	1980, 1981, 1985, 1990, 2010	Mountlucas, Cavemount, Clonlack & Coolcor Co. Offaly	N52 & N53

Common Name	Species Name	Record Date	Location(s)	Hectad
Pine Marten	<i>Martes martes</i>	2005, 2010 & 2011	Cloonlast, Esker, Mountlucas and Derrycricket Co. Offaly	N52
Eurasian Badger	<i>Meles meles</i>	1980, 1981 and 1991	Greenhills, Rhode, Newtown, Mountlucas, Clonmore, Stonehouse, Mountwilson	N52 & N53
Stoat	<i>Mustela erminea</i>	1980, 1981	Castlejordan, Coolcor, Mountwilson, Greenhills, Rhode, Clonlack	N53
Green-winged Orchid	<i>Anacamptis morio</i>	1991	Esker Bridge, Edenderry	N52
Common Frog	<i>Rana temporaria</i>	1997 & 2004	Ballybrittan / Rogerstown & Aghameelick / Clonbulloge	N52 & N53
Eurasian Red Squirrel	<i>Sciurus vulgaris</i>	2010	Clonlast	N52 & N53
Pygmy shrew	<i>Sorex minutus</i>	1980	Greenhills, Co. Offaly	N53
Smooth Newt	<i>Lissotriton vulgaris</i>	2010	Derrycricket, Co. Offaly	N52

2.5.1.3 Baseline Water Quality Data for Esker Bog

Table 3 below provides baseline water quality data captured by Bord na Mona following sampling and monitoring efforts between November 2020 and May 2021. The results of these sampling events displays that suspended solids and ammonia levels are in compliance with IPC licence targets. Target water quality parameters and constraints for ammonia and phosphorus are not identified for water dependent or nutrient sensitive features of Qualifying Interest in the accompanying Site Specific Conservation Objectives for the River Barrow and River Nore SAC.

Table 3: Baseline water quality information for Esker Bog

Emission Point	IPC Licence ELV	River Barrow and River Nore SAC Target SSCO parameter ⁴	01/11/2020	01/12/2020	01/01/2021	01/02/2021	01/03/2021	01/04/2021	01/04/2021
Suspended solids (mg/l)									
SW24	35	n/a	2	2	12	5	2	4	6
SW26	35	n/a	2	2	2	6	2	13	15
SW27	35	n/a	2	5	2	3	14	5	21
Ammonia (mg/l)									
SW24	4.530	n/a	0.067	0.62	0.1	0.358	0.435	0.167	0.036
SW26	4.530	n/a	1.13	1.96	0.372	0.676	0.298	0.214	0.158
SW27	4.530	n/a	0.341	0.349	1.71	1.58	1.95	0.789	1.43
Total Phosphorous (mg/l)									
SW24	n/a	n/a	0.05	0.05	0.05	0.05	0.05	0.05	0.05
SW26	n/a	n/a	0.05	0.05	0.05	0.08	0.05	0.08	0.05

⁴ Target water quality parameters for nutrients such as ammonia and phosphorus are not provided for water dependent or nutrient sensitive features of Qualifying Interest in the accompanying Site Specific Conservation Objectives for the River Barrow and River Nore SAC.

Emission Point	IPC Licence ELV	River Barrow and River Nore SAC Target SSCO parameter ⁴	01/11/2020	01/12/2020	01/01/2021	01/02/2021	01/03/2021	01/04/2021	01/04/2021
SW27	n/a	n/a	0.05	0.05	0.05	0.05	0.05	0.05	0.05
pH									
SW24	n/a	n/a	7.5	7.6	7.5	7.3	7.5	8.1	8.3
SW26	n/a	n/a	7.5	7.4	7.9	7.9	8	8.2	8.3
SW27	n/a	n/a	7.8	8	7.3	7.5	7.6	8.1	8.2

Esker Bog Water Quality Management

In accordance with the existing Integrated Pollution Control licence for Esker Bog, drainage water is discharged via an appropriately designed silt pond treatment arrangement as required in Condition 6.6. of the licence.

Esker bog has silt ponds that discharge surface water to the Esker_020 watercourse. The third cycle of the River Basin Management plan indicates that the Esker Stream_020 will no longer be under pressure from peat extraction given its location within and adjacent to the proposed Esker Bog rehabilitation site. However the Figile river is indicated as remaining under pressure from peat extraction.

Details of silt ponds, associated surface water emission points and those being monitored and sampled as part of the PCAS scheme are detailed in the below water quality map (**Figure 4**).

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

The main emission limit value associated with this bog is 35mg/l suspended solids, with trigger levels for ammonia of 3.0mg/l and COD 100mg/l.

From an analysis of any monitoring over the past 5 yrs. of the IPC licence environmental monitoring programme, indicate that results were over the ELV for SS at least once (n=1 from a sample of 21), and over the trigger level for Ammonia (n=4 occasions from a sample of 21) (See below table⁵ replicated from the accompanying rehabilitation plan).

⁵ Replicated Table 3.1 from Esker Bog Rehabilitation Plan

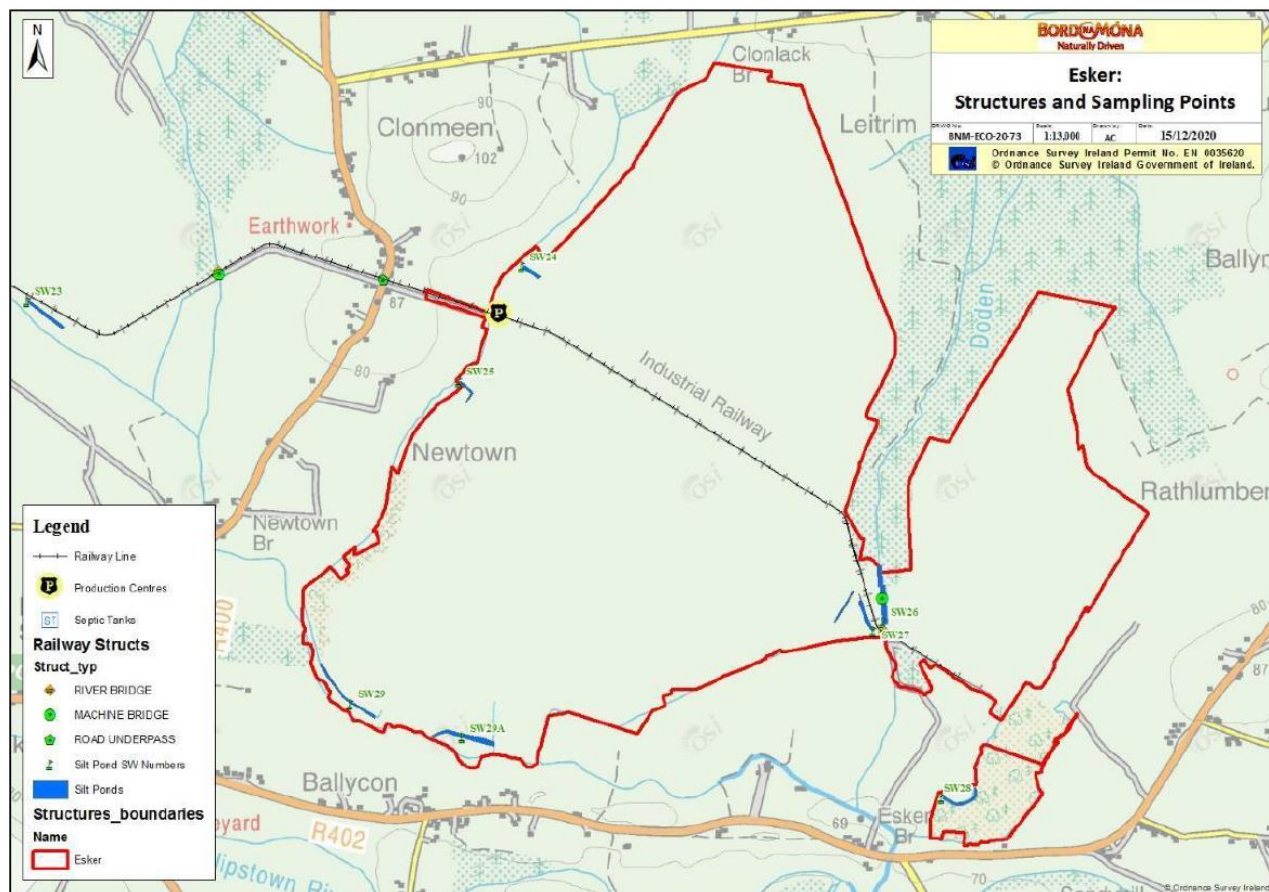


Figure 4 – Map of Esker Bog showing structures and designated emission points.

Bog	SW	Monitoring	Sample Date	pH	SS	TS	Ammonia	TP	COD	Colour
Esker	SW-24	Q2 2020	09/06/2020	8.3	3	257	0.013	0.05	45	113
Esker	SW-25	Q2 2020	09/06/2020	8	21	412	0.026	0.31	88	202
Esker	SW-26	Q2 2020	09/06/2020	8.4	9	364	0.141	0.05	16	82.7
Esker	SW-27	Q2 2020	09/06/2020	8.6	10	212	1.44	0.05	41	177
Esker	SW-28	Q2 2020	09/06/2020	7.9	3	410	0.032	0.05	41	107
Esker	SW-29	Q2 2020	09/06/2020	8.5	5	569	0.06	0.05	66	109
Esker	SW29-A	Q2 2020	09/06/2020	7.9	9	651	0.396	0.05	60	124
Esker	SW-24	Q3 18	12/09/2018	7.6	52	276	0.02	0.05	49	86
Esker	SW-25	Q3 18	12/09/2018	7.1	5	222	0.83	0.11	87	164
Esker	SW-26	Q3 18	12/09/2018	7.3	5	166	4.6	0.06	86	351
Esker	SW-27	Q3 18	12/09/2018	7.5	6	296	0.53	0.06	37	76
Esker	SW-28	Q3 18	12/09/2018	7.6	5	316	0.1	0.05	39	100
Esker	SW-29	Q3 18	12/09/2018	6.2	5	231	5.6	0.05	159	446
Esker	SW29-A	Q3 18	12/09/2018	7.6	5	242	5	0.1	116	355
Esker	SW-24	Q1 17	02/03/2017	7.4	6	130	0.47	0.05	79	242
Esker	SW-25	Q1 17	02/03/2017	6.6	8	84	0.49	0.05	81	244
Esker	SW-26	Q2 17	28/06/2017	7.2	5	172	4.3	0.05	112	325
Esker	SW-27	Q2 17	28/06/2017	7.6	5	298	0.9	0.05	59	131
Esker	SW-28	Q2 17	28/06/2017	7.5	5	306	1.6	0.05	81	160
Esker	SW-29	Q2 17	28/06/2017	7.2	15	230	2.3	0.05	126	338
Esker	SW29-A	Q2 17	28/06/2017	7.1	10	135	3.1	0.05	113	367

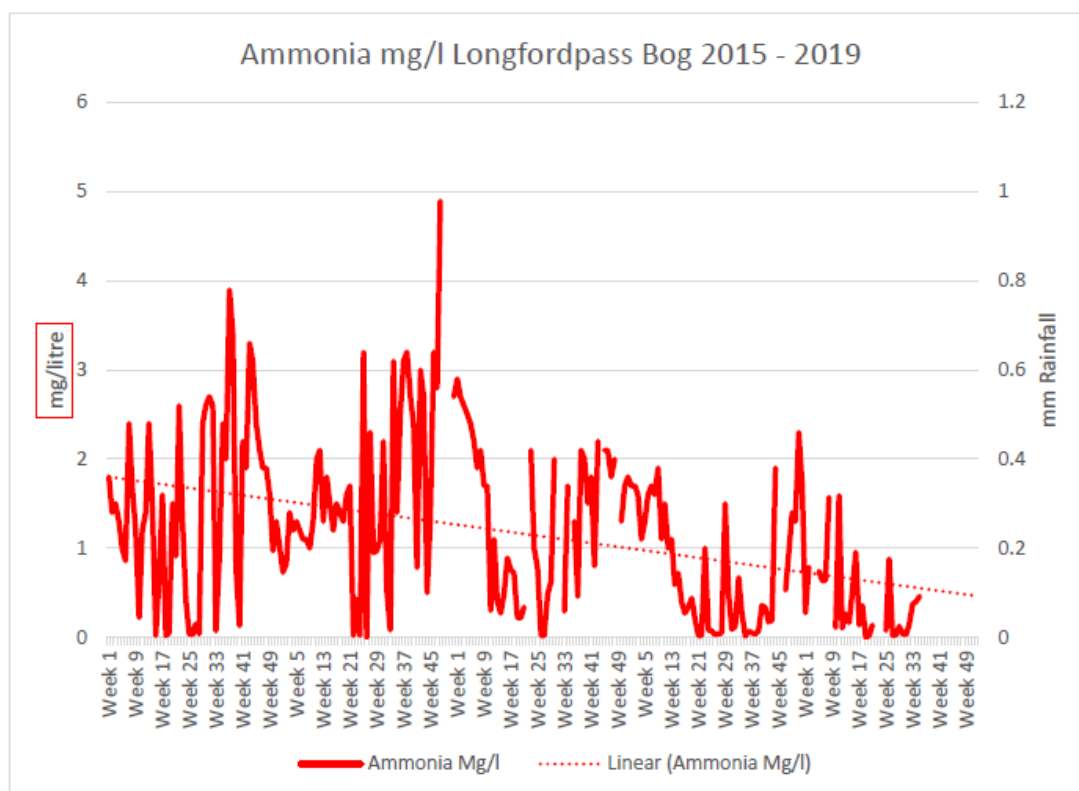
It is expected that following the implementation of the PCAS at Esker Bog the concentration of TP, ammonia, as well as Suspended Solids (SS) will follow a downward trend and will within the short-term (i.e. within a 3-year period) reduce concentrations of these parameters to below the NPWS limits.

This projection is supported by water quality monitoring of 2 other similar raised bogs (Longfordpass Bog and Corlea Bog) that were previously subject to industrial peat extraction and that have since been subject to

peatland rehabilitation. Graph 1 and Graph 2 below shows the downward trend for ammonia at Longfordpass Bog and Corlea Bog respectively.

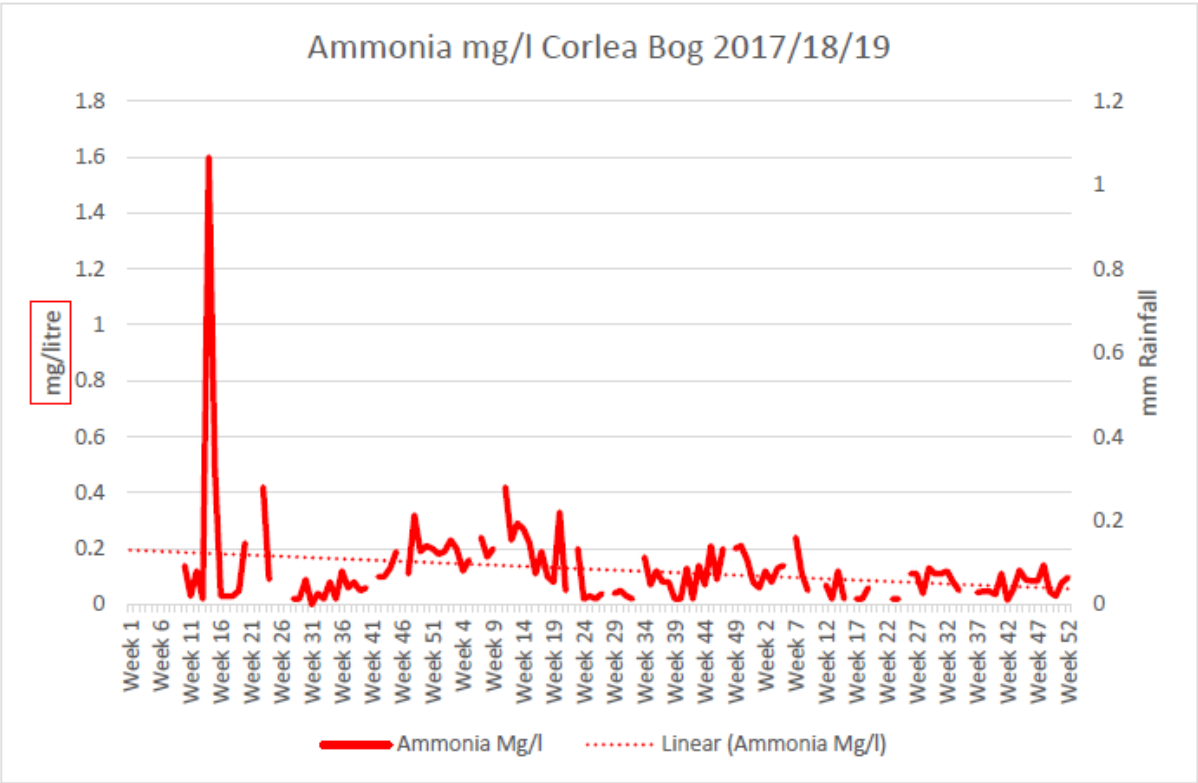
Graph 3 shows a consistent low level of TP recorded for Corlea Bog. The laboratory detection limit for TP is 0.05mg/l and Graph 2 shows that concentrations for TP are below the laboratory limits of detection, indicating very low levels. Similarly, the laboratory detection limits for SS was 5ml/l up until July 2019. The laboratory was changed in July 2019 and a new detection limit for SS of 2mg/l was applied. The SS concentrations were consistently below the 5mg/l and the 2mg/l at both laboratories, indicating very low SS concentrations in silt pond outfalls. Rehabilitation measures continue to establish at Corlea Bog and it has yet to stabilise, but the downward trend for ammonia found during the stabilisation of rehabilitation measures shows that once stabilised, the re-wetted bog will reduce ammonia emissions to the receiving and downstream environment. It is also reasonable to predict a downward trend for SS and TP as the rehabilitation measures become established.

It is further noted that the concentrations of TP, SS and ammonia reported in the above table are from onsite silt ponds. The silt pond network at Esker Bog discharges to the Esker_020 watercourse. River waterbody risk status in the receiving Esker_020 watercourse is classified as unassigned on the EPA mapviewer⁶ while the downstream areas of the Figile_040 are classified as At Risk. Q values for the Esker_020 watercourse at the nearest downstream sampling point (Esker Bridge) is evaluated as Q3-4, indicating Moderate Water Quality Status. Nonetheless, the waters discharging from silt ponds at Esker are diluted within the receiving watercourses and their downstream sections.

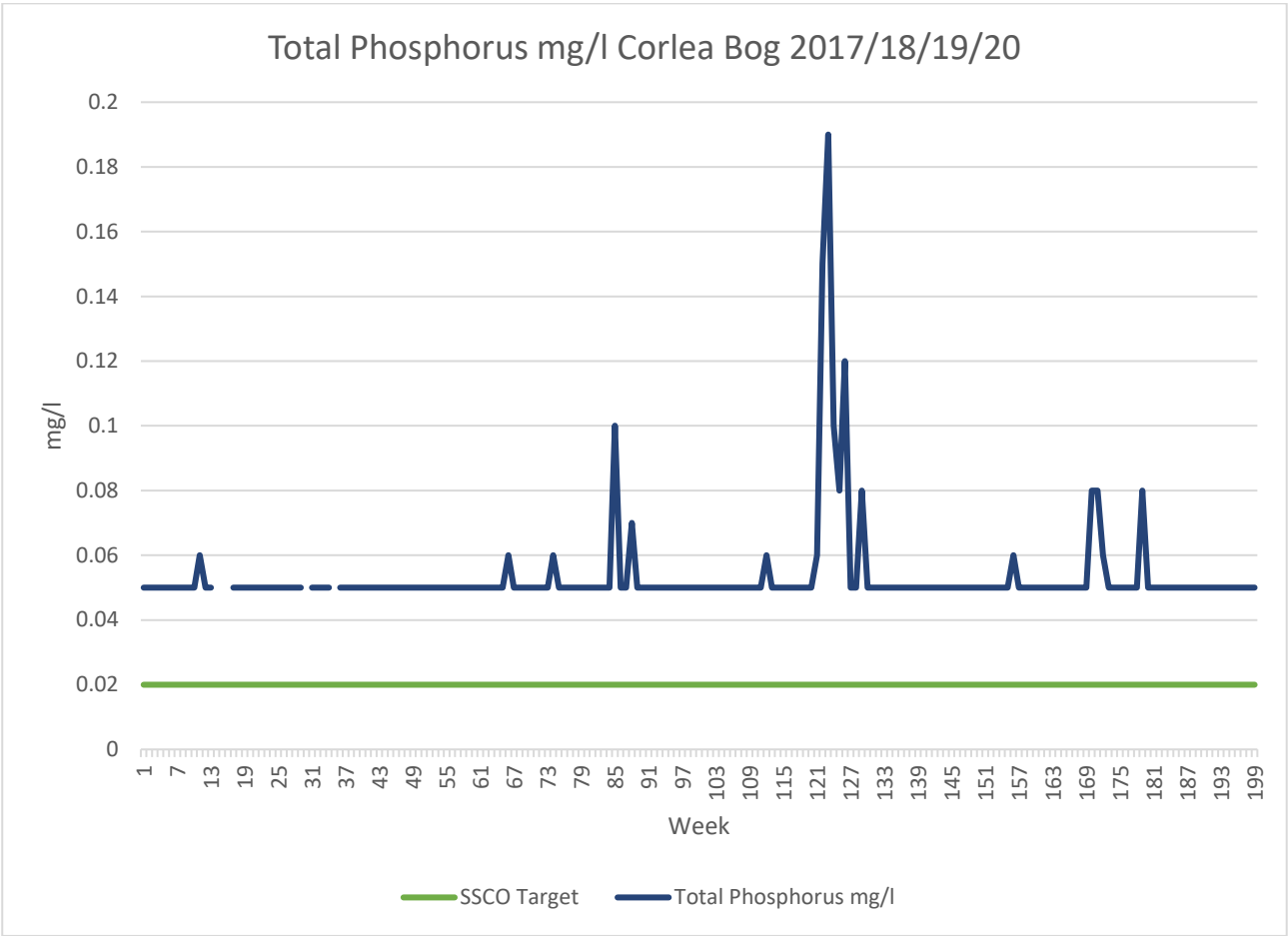


Graph 1: Ammonia Concentrations and Trend at Longfordpass Bog 2015-2019

⁶ <https://gis.epa.ie/EPAMaps/>



Graph 2: Ammonia Levels at Corlea Bog 2017-2019



Graph 3: TP Concentrations at Corlea Bog, showing the limit of detection at 0.05mg/l

2.5.2 Field Assessments

2.5.2.1 Current Habitats

There are some remnant habitats around the margins of Esker Bog. A narrow band of Birch woodland (WN7) and scrub (WS1) dominated by Birch are the most prominent habitats around the periphery of both the western and eastern sections. In some places, there are patches of remnant raised bog vegetation (PB1), generally dominated by Heather and being invaded by scrub, as they have largely dried out. Other parts of the margins are covered in a mosaic of Bracken and Birch scrub.

Although the western block of Esker bog is largely bare peat, the smaller eastern area is largely cutaway, and pioneer cutaway habitats have been developing here in recent years. On the higher and drier areas Birch woodland is developing, with a mosaic of rush-dominated poor fen and bare peat over much of the remainder of this area. The drainage system in this area has been maintained so it has remained relatively dry.

The small area of Esker Bog in the south-east of the area that has never been in production is dominated by mature Birch woodland (WN7) and also contains small patches of active and old cutover bog (PB4), wet grassland (GS4) that has developed on cutover peat and Bracken (HD1).

The Esker Stream, that flows along the southern boundary, is typical of a lowland depositing river and is infilled with emergent riparian vegetation such as Reed Canary grass and Bulrush.

A habitat map of the site is shown in **Figure 3**.



Image 1 – Section of the Esker_020 watercourse located to the west of the site.



Image 2 – Extensive cutover bog and railway line located within the centre of Esker Bog site.



Image 3 – Pond no. 4_43 located toward the centre of the Esker site.



Image 4 – Pond no. 340 incorporated into the Esker_020 watercourse located within the centre of the site.





Image 5 – Eastern cutover bog section of the Esker Bog site.



Image 6 – Railway line serving the eastern section of the Esker site.



Image 7 – Hardstanding area located near the western boundary of the site	Image 8 – Silt pond located near the north of the existing hardstanding area
	
Image 9 – Esker_020 watercourse to the south of the site	Image 10 – Silt pond located near the southern boundary of the site

2.5.2.2 Bird Surveys

The Esker Bog site was visited on two occasions; i.e. January 28th 2021 and April 01st, 2021.

The site walkover surveys completed in Esker Bog during the winter and spring of 2021 did not identify large numbers of waterbirds or wildfowl using this area for roosting or foraging purposes. Bird species identified during the 2021 site walkover surveys are presented in **Table 4**.

Table 4: Bird Species Identified during the site walkover surveys in 2020/2021

Common Name	Species Name	Activity within site
Blackbird	<i>Turdus merula</i>	Foraging along scrub and woodland at the site margins.
Buzzard	<i>Buteo buteo</i>	Soaring above woodland near the western boundary of the site.
Chaffinch	<i>Fringilla coelebs</i>	Foraging and calling within scrub and woodland at the site margins.
Chiffchaff	<i>Phylloscopus collybita</i>	Singing within woodland near the western boundary of the site.
Coal Tit	<i>Parus ater</i>	Foraging and calling within woodland at the site margins.
Dunnock	<i>Prunella modularis</i>	Foraging along scrub and woodland at the site margins.
Goldfinch	<i>Carduelis carduelis</i>	Foraging along Esker_020 watercourse near the southern boundary of the site.

Common Name	Species Name	Activity within site
Great Tit	<i>Parus major</i>	Foraging along scrub and woodland at the site margins.
Hooded Crow	<i>Corvus cornix</i>	Foraging and flying through the site.
Mallard	<i>Anas platyrhynchos</i>	Two Mallard flushed from Esker_020 watercourse.
Meadow Pipit	<i>Anthus pratensis</i>	Foraging over and near marginal bog areas.
Mistle Thrush	<i>Turdus viscivorus</i>	Foraging and calling from woodland adjoining the expansive cutover bog areas.
Robin	<i>Erithacus rubecula</i>	Foraging and singing along scrub and woodland at the site margins.
Rook	<i>Corvus frugilegus</i>	Foraging and flying through the site.
Skylark	<i>Alauda arvensis</i>	Singing / displaying on marginal bog habitat near the site's south-eastern boundary.
Snipe	<i>Gallinago gallinago</i>	Flushed from marginal bog habitat near the site's south-eastern boundary.
Willow Warbler	<i>Phylloscopus trochilus</i>	Singing within woodland near the western boundary of the site.
Wood Pigeon	<i>Columba palumbus</i>	Flushed from woodland habitats adjoining the site.
Wren	<i>Troglodytes troglodytes</i>	Foraging along scrub and woodland at the site margins.

2.5.2.3 Mammal Surveys

A mammal survey of the Esker bog site was undertaken on April 01st, 2021. This provided further information to the baseline walkover surveys completed in January 2021. An otter survey was completed along silt ponds and drainage channels within and adjoining the Esker site. In addition, the Esker Bog site and its environs were also surveyed for the presence and usage of non-volant mammal species including badger, fox, Irish Hare, mink etc.

The otter survey methodology followed those methods employed in the 'Otter Survey of Ireland 2004/2005' (Bailey & Rochford, 2006) comprising a modification of the Standard Otter Survey Method developed by Jefferies (1980).

In addition, the mammal survey incorporated badger surveys that were completed in accordance with the Guidelines for the treatment of badgers prior to the construction of National Road Schemes (TII, 2006) and The Badger and Habitat Survey of Ireland (Smal, 1995).

The findings of the survey are presented in **Table 5** below and illustrated in **Figure 5**.

Table 5: Findings of the April 2021 mammal survey

Common Name	Species Name	Grid Co-ordinates (in ITM)		Description
		X	Y	
Otter	<i>Lutra lutra</i>	653610	727822	Otter spraint on stone outcrop within the Esker_020 watercourse
Otter	<i>Lutra lutra</i>	653818	727788	Otter spraint on stone outcrop within the Esker_020 watercourse

The section of the Esker_020 watercourse supported two otter spraints on exposed / outcropping rock within the watercourse. This section of the watercourse provides suitable foraging and commuting habitat for otter. The river banks provide poor suitability to support otter holt habitat due to absence of semi-mature and mature trees and scrub that would provide adequate cover and refuge.

The section of the Esker_020 watercourse along the site's western boundary and the Dogen Stream located near the centre of the site provide low / poor suitability for otter. Both of these watercourses are shallow, sinuous and narrow and provide little to no foraging potential for otter. Nonetheless otter may use these watercourses on rare occasions as refugia or commuting purposes.

All silt ponds within the Esker Bog site were surveyed for signs of otter usage. There were no signs of ongoing or recent usage of these silt pond features during the January and April walkover surveys.

No evidence of other mammals such as fox, badger or pine marten were identified during the site walkover surveys. These mammals are highly unlikely to utilise the expansive cutover bog areas. However, there is suitable habitat for these mammals outside of the proposed works footprint on the marginal bog areas, woodland and scrub areas located along the site bounds and outside of the proposed works footprint.

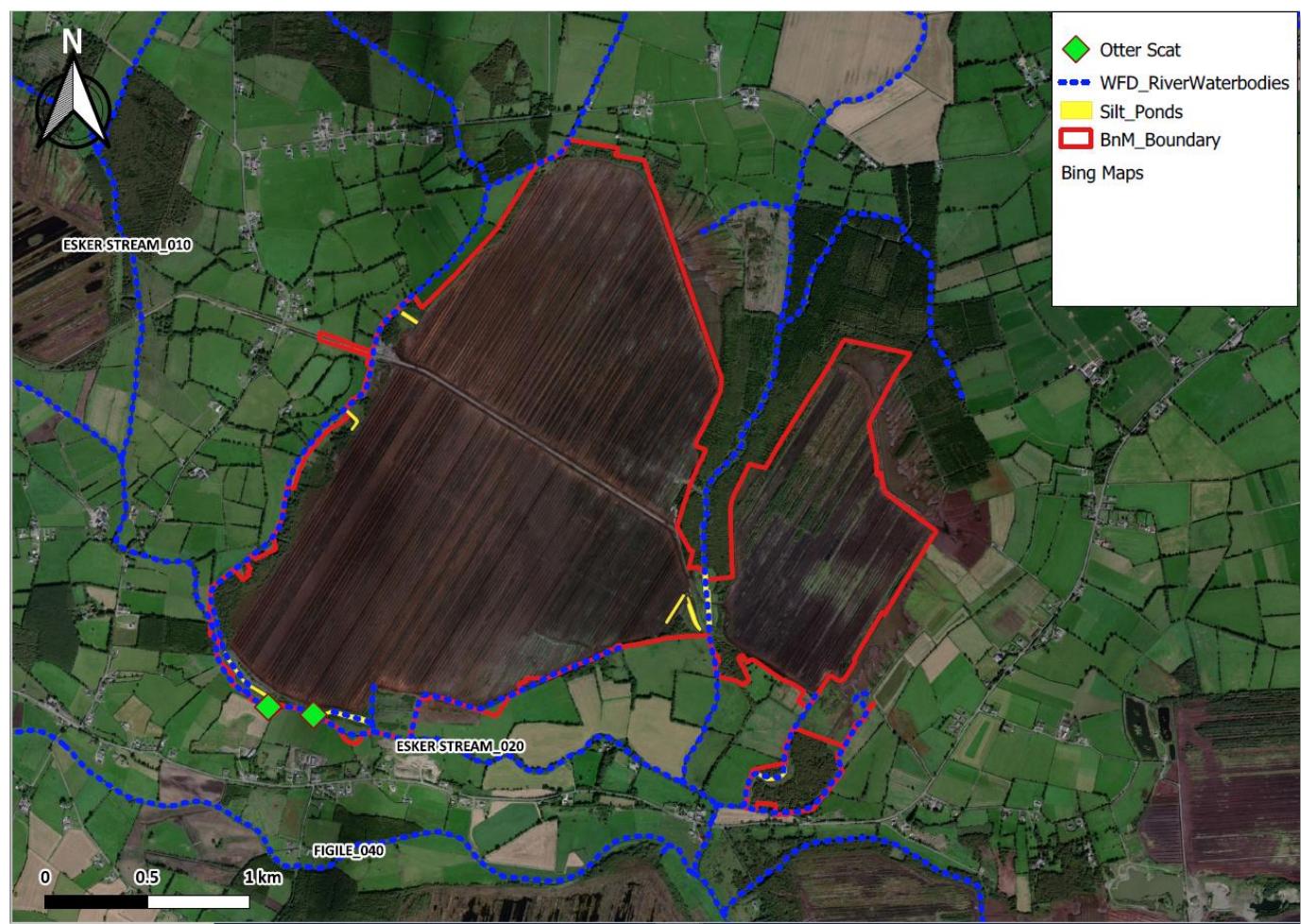


Figure 5: Mammal Signs and Features within the Esker Bog Site

2.5.3 Species of Conservation Interest

Esker Bog is used occasionally by several species of conservation interest including Peregrine, Merlin, Snipe and small flocks of wintering Golden Plover.

The Esker Stream along the southern boundary and the Dodan River (Esker Stream_020) that runs between the western and eastern areas of Esker Bog have the potential for Otter and Kingfisher.

The site walkover survey completed by Delichon Ecology in January 2021 identified the following avifaunal species: Blue Tit (*Cyanistes caeruleus*), Robin (*Erithacus rubecula*), Wren (*Troglodytes troglodytes*), Raven (*Corvus corax*), Reed Bunting (*Emberiza schoeniclus*), Wood Pigeon (*Columba palumbus*), Mistle Thrush (*Turdus viscivorus*), Blackbird (*Turdus merula*) and Song Thrush (*Turdus philomelos*). The expansive cutover bog areas did not support waders or wildfowl species during the site walkover survey.

The extensive silt ponds located near the centre of the site provide suitable habitats for avifaunal species such as Teal (*Anas crecca*), Moorhen (*Gallinula chloropus*) and Little Grebe (*Tachybaptus ruficollis*). The Esker_020 watercourse, particularly the section located within the centre of the site supports suitable commuting and foraging and resting habitat for otter (*Lutra lutra*).

2.5.4 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. There are no IAS in this context recorded from Esker Bog. Invasive plant species were not identified within the Esker bog site or its environs during the January 2021 site visit.

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

A habitat map of the site is shown in **Figure 3**.

2.5.5 Certainty and Sufficiency of Data

The Biodiversity baseline information presented in this Appropriate Assessment reporting was collated from site investigations and field surveys, along with publicly available online resources including from the National Biodiversity Data Centre (NBDC) and the National Parks and Wildlife Service (NPWS) online webpage, which are regularly updated.

All field survey work was carried out by qualified and experienced ecologists.

In addition, where required, or possible, specific data requests have been made to NPWS via the online data request facility, specifically with regards to records of sensitive species; and, to BirdWatch Ireland in respect of the results of IWeBS surveys, which are available upon request.

Further sources of data used to supplement the current appraisal, included current, up to date, Bord na Móna held habitat mapping datasets, as well as previously commissioned baseline reporting of Bord na Móna Bog Groups, reporting to inform Bord na Móna wind farm proposals, and any available Bord na Móna wind farm monitoring reports where it was deemed there was overlap with the current scope of PCAS activities. Citations are provided at the end of this report for any reports which have been referenced.

For the avoidance of doubt although some of this supplementary baseline data was 3+ years old, due regard has been given to the passage of time & any changes to the baseline environment at Esker in the interim period were considered by a suitably qualified ecologist; visits to inform the current appraisal were used as ground-truthing exercises to confirm the relevance or not of any previously defined baseline information.

In the most part, due the continuation of industrial Peat Extraction by Bord na Móna up to and including the year 2019 at Esker, it was considered that habitats at the bog remained relatively unchanged from the point at which many prior baseline surveys were undertaken, and therefore, it is considered that data presented in prior baseline reporting was of relevance, with exceptions noted. Nonetheless reliance is focussed primarily on the most recently available or collected data.

2.6 Decommissioning and Rehabilitation Stage

The proposed **decommissioning** at Esker Bog includes the following:

- Clean-up of remaining or unconsolidated waste or materials located in Bogs, Yards, Buildings and Offices;
- Cleaning Silt Ponds;
- Decommissioning Peat Stockpiles;
- Decommissioning Fuel Tanks and associated facilities and De-Gassing Mobile Fuel Tanks; and
- Desludging of Septic Tanks.

Further measures include the lifting of the existing rail line, decommissioning of existing level crossings and measures to restrict access to the bog.

Rail line lifting may occur concurrently or after rehabilitation activities. In some instances, outer spurs are to be left in place to facilitate rehabilitation access, meaning these lines won't be lifted until rehabilitation is complete.

The proposed Esker Bog **rehabilitation** comprises a series of bespoke (to Esker Bog) interventions designed to stabilise the existing baseline and meet compliance with the requirements of the existing EPA, IPC License and the proposed PCAS. Prescriptive measures are unique to the existing baseline habitats and comprise 3 no. broad categories,

- 1) those associated with (exposed) Deep Peat; drain blocking (different intensities), berms and field reprofiling and cut and fill cell bunding;
- 2) those associated with Dry cutaway; i.e. drain blocking, managing water levels and overflows; and
- 3) measures associated with Wetland Cutaway, including restricting and reducing pumping regimes and associated drain blocking, along with outfall blocking and management of overflows.
- 4) those associated with remnant high bog namely drain blocking

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).

2.6.1.1 Decommissioning and Rehabilitation Access

Access will be through the existing local road networks and railway line at the Newtown and Rathlumber townlands, in addition to existing internal access tracks which facilitated the previous peat extraction. No change to baseline conditions to facilitate access for either decommissioning or rehabilitation is required.

2.6.1.2 Standard Methodology for Decommissioning

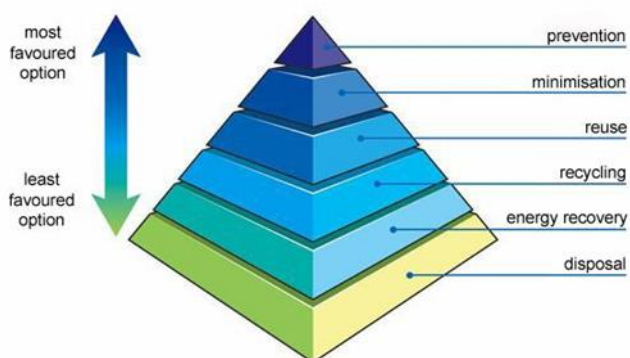
Decommissioning at Esker Bog will involve the deployment of a work crew to collect and oversee the removal of any remaining plant or potentially contaminating waste left *in situ* in line with Condition 7 of License Ref. P0503-01. This condition specifically requires that BnM's procedures for the Disposal 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 Esker Bog. 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 Esker 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, 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 license.

Decommissioning may also include measures to restrict access to the bog or silt ponds.

Regarding the 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.

Peat stockpiles: Any existing and unsalable peat stockpiles which are required to be 'decommissioned' will have protective polythene removed. This will involve the stripping of the polythene cover as per standard procedure where the polythene is rolled/baled by a polywrapper for transport to the area hardstand for removal off-site. Any peat stockpiles that are unsalable will be required to be decommissioned and rehabilitated into the adjoining fields ('levelling'), from where it was originally harvested. This process first

involves the associated silt pond being cleaned if necessary, the stockpile field drains blocked to capture any run-off, with blockages every 100m. The peat is then deposited by dozer onto the adjoining field and blocked drain, where it is cambered and compacted.

Silt Ponds: Silt ponds will continue to be maintained during rehabilitation and decommissioning. Where required, decommissioning of silt-ponds will be assessed and carried out as necessary.

Decommissioning and De-Gassing Mobile Fuel Tanks: These tanks are first emptied of any usable fuel and then degassed using a suitable hazardous waste contractor, with appropriate certification provided. The tank is then either removed for reuse or recycling or retained within the bund as a site asset. In addition, the concrete bund is cleaned, and any hazardous wastes generated are removed by hazardous waste contractor. Any remaining concrete bunds, once cleaned and deemed as an infrastructural asset to the site will be retained.

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.

2.6.1.3 Standard Methodology for Rehabilitation Activities

The proposed Esker **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 Bord na Móna cutaway bogs (Clarke, 2010; Bord na Móna, 2016), including examples such as the BnM Raised Bog Restoration Project⁷ - see also **Section 2.8.2** Sources of Information.

In terms of rehabilitation the ecological and site information collected during Bord na Móna ecological baseline surveys, additional site visits, stakeholder input, and monitoring and desktop analysis forms the basis for the planning of peatland rehabilitation at Esker 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); and
- Consultation and engagement with internal and external stakeholders.
- GIS Mapping
- BnM drainage surveys
- Bog topography
- Hydrological modelling

Rehabilitation Packages Techniques or Methods

The key interventions to be applied to deep peat cutover bog restoration/rehabilitation is re-wetting peat to encourage natural colonisation of typical vegetation and the development of Sphagnum-rich peat-forming vegetation communities. The key interventions to be applied to areas of shallow residual peat prone to flooding, and areas of exposed marl or underlying substrate are effectively those to target the production of

⁷ Bord na Móna 2014. Blocking Drains in Irish raised bogs. The Bord na Móna Raised Bog Restoration Project. Cris, R. Buckmaster, S. Bain, C. Reed, M. (Eds) (2014) Global Peatland Restoration demonstrating SUCCESS. IUCN UK National Committee Peatland Programme, Edinburgh. <http://www.iucn-uk-peatlandprogramme.org/sites/www.iucn-uk-peatlandprogramme.org/files/IUCNGlobalSuccessApril2014.pdf>

wetlands, or fen forming habitats. Some areas of residual peat, due to modelled water levels will effectively only be subject to water level management. Areas of marginal and higher elevated ground within the former production area, such as headlands will also be subject to drain blocking and fertiliser application. Certain prescriptions will require management to ensure water-levels remain close to the surface of the peat for most of the year (100mm \pm 50mm).

Several different approaches can be taken to this type of restoration/rehabilitation, and the rehabilitation packages with different rehabilitation/restoration intensities to managing suitable hydrological conditions are proposed (see Table 6/7) with detailed drawings presented in **Appendix D**.

A breakdown of the extent of deep peat rehabilitation packages is provided in **Table 6**, below.

Deep Peat Cutover Bog		Extent (ha)
DPT3	More intensive drain blocking (max 7/100 m), + field reprofiling + blocking outfalls and managing overflows	161.23
DPT4	Berms and field re-profiling (45m x 60m cell) + blocking outfalls and managing overflows + drainage channels for excess water + <i>Sphagnum</i> inoculation	112.12
DPT5	Cut and Fill cell bunding (30m x 30m cell) + blocking outfalls and managing overflows + drainage channels for excess water + <i>Sphagnum</i> inoculation	44.96

Table 6: Extent of Deep Peat Rehabilitation proposed at Esker.

A breakdown of the extent of wetland, dry cutaway rehabilitation types and silt ponds is provided in **Table 7**, below. See **Appendix D** for the full suite of Methodology Drawings.

Dry Cutaway and Wetland		Extent (Ha)
DCT2	Regular drain blocking (3/100 m) + blocking outfalls and managing water levels with overflow pipes + targeted fertiliser treatment	70.43
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	35.09
WLT4	More intensive drain blocking (7/100 m), + blocking outfalls and managing overflows + transplanting Reeds and other rhizomes	51.72
MLT1	No work required	43.64
MLT2	More intensive drain blocking (max 7/100 m)	3.27
n/a	Silt ponds	2.42
n/a	Constraints ⁸	13.83
n/a	Other Constraints (Irish Water Pipeline)	29.62

Table 7: Extent of Dry Cutaway and Wetland proposed at Esker.

⁸ Areas identified as constraints will have no interventions. For areas where the proposed IW pipeline corridor overlaps proposed rehabilitation, PCAS activities will be fully undertaken post construction of the pipeline (should it be consented). In the meantime the pipeline corridor will be isolated from surrounding rehabilitation vis-à-vis a hydraulic break (drain) and berm. The creation of these features is considered to constitute 'minimal rehabilitation' for the purposes of the PCAS scheme, as natural vegetation colonisation is expected to occur in the short term following same.

The constituent prescriptions which combine to form each respective rehabilitation package are further described below, namely;

1. Regular Drain Blocking (3/100m) (Speed Bump - DCT2)
2. Intensive Drain Blocking (max 7/100m) (Excavator -DPT3, WLT4, MLT2)
3. Blocking Outfalls
4. Managing Water levels (Overflow pipes)
5. Field Reprofilling (Variant on DPT4)
6. Berms and field reprofiling (45m x 60m cell)
7. Drainage channels for excess water (DPT4 and DPT5)
8. Cut and fill cell bunding (30m x 30m cell) (DPT5)
9. Sphagnum Innoculation (DPT4 and DPT5)
10. Silt Pond Cleaning
11. Retention of Hydraulic Breaks (DMP measure)

The rehabilitation measures and layout plan are displayed in **Figure 12** and **Figure 13** below. A full set of Detailed Drawings for the Proposed Rehabilitation Works Methodologies are included in **Appendix D**.

1. Regular Drain Blocking (3/100m) (Speed Bump)

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. 'Speed Bumps' allow for peat subsidence and to prevent water from flowing over the drain block and eroding it before it becomes stabilised.

Phase 1 begins with the creation of a 'key' on either side of the drain. The dozer cuts down and pushes out peat 0.5-1m from the edge of the drain, with an equivalent section on the other side of the drain.

The next step comprises forming the 'Speed Bump' itself. A strip of peat is taken from the central camber of the field, pushed into the drain and keyed area and compacted by a bull-dozer tracking over the drain block, to form an approximately 5m Wide 'Speed Bump'.

Fields are then completed with Speed Bumps (at an approximate ratio of 3 Per 100m). Speed bumps are profiled to ensure that the overall field profile is lower in the centre and higher over the drain blocks.

See Methodology Drawing **PCAS-0100-001**.

2. Intensive Drain Blocking (max 7/100m)

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 a max of 7 blocks per 100m of field drain. The methodology follows NPWS guidelines published by the National Parks and Wildlife Service (Mackin *et al.*, 2017⁹) and in line with methodologies originally developed by McDonagh (1997).

⁹ https://www.npws.ie/sites/default/files/publications/pdf/IWM99_RB_Restoration_Best%20Practice%20Guidance.pdf

In all instances peat blockages will be installed using a specially adapted tracked machine. The process involves clearing the drain and creating a 'key' 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' and involves placing layer after layer of peat until it is built up to above the ground surface, after which it is covered with a 'scraw' of vegetation (where available). Each peat blockage takes approximately 5mins to complete.

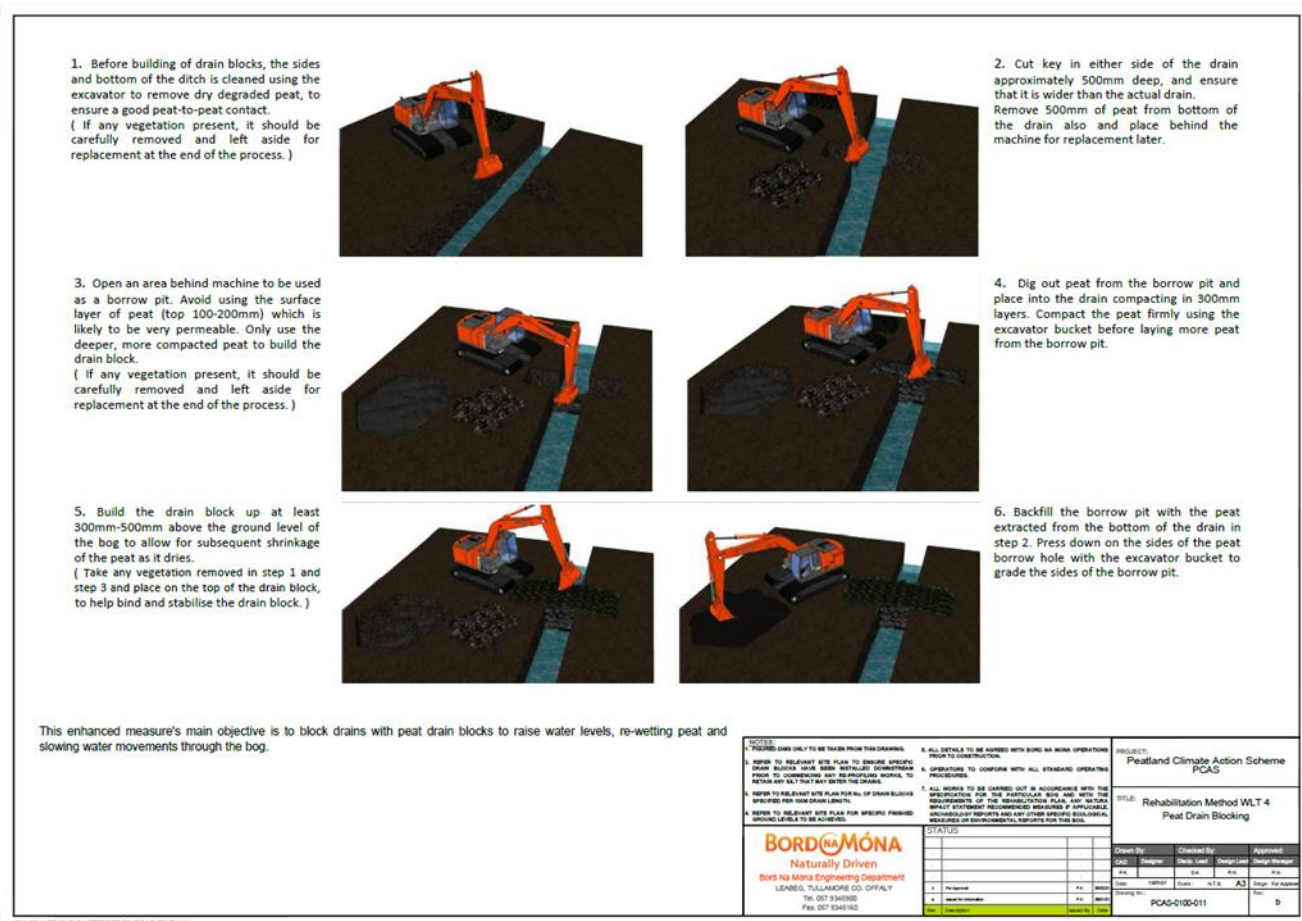


Figure 6: Completed Peat blockage (reproduced from Mackin *et al.*, 2017)

3. Blocking Outfalls

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 0-10 cm 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 bull-dozer 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. This measure is strongly linked with the next in respect of water level management.

See Methodology Drawing **PCAS-0100-014**.

4. Managing water levels

Overflow Pipes

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. Overflow pipes will typically be new, 100mm plastic pipes.

Overflow pipes are installed using an excavator.



Figure 7: Examples of installed overflow pipes

5. Field Reprofilng

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 field re-profiling is to level the surface of the individual peat production fields to retain surface water at the required depth. On peatlands with increased slopes it will be more advantageous to create shallow depressions.

This variation of the DPT4 process, which uses a screw-leveller and bulldozer, can be described as a number of distinct phases.

Phase 1: Re-Profiling of Field Surface

The first operation in the re-profiling process begins with using a Screw-Leveller to remove the high central camber from individual production fields and deposit the peat on the lower-lying edges of the same production field. The Screw-Leveller, with a level axis, will run up the first side of the production field and down the other side close to the edge of the drain, resulting in some of the peat being tipped into the drain.

Phase 2: Infilling of Drains

Next the Bull-dozer will run up the first side of the production field and down the other side with the front blade at an angle placing the peat in the drain.

Phase 3: Final Levelling of Drains & Field

Next the Bull-dozer will track over the first of the infilled drains and then back down the other drain compacting and levelling the peat. It will also make a pass down the middle of field flattening any peat mounds left between Screw Leveller and Bulldozer runs.

Phase 4: Drain Blocking

Drain blocks are constructed using an Excavator operating at a perpendicular direction to the field drains. A key is cut in the drain approximately 500mm deep ensuring that it is wider than the actual drain. A 500mm depth of peat is removed from bottom of drain also and placed behind the machine for replacement later.

An area behind the machine, within reach of the excavator arm, is selected to be used as a borrow pit. Turf and degraded peat is removed from the surface. This material is placed close by to be used as cover later. 'Clay' like peat is extracted from pit and compacted in 300mm layers using the excavator bucket, to form the drain block. 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 then back filled with the peat extracted from the bottom of the drain. The sides of the borrow pit are pressed down and graded with the excavator bucket. (If any vegetation present, it is 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.

Phase 5: Cross Berm

Next the Bull-dozer is used to form peat transverse (i.e. across the production field, and perpendicular to the drain on either side) Cross Berms approximately 5.0m wide x 300mm high at given centres along the length of the production field. This reduces sheet flow of water.

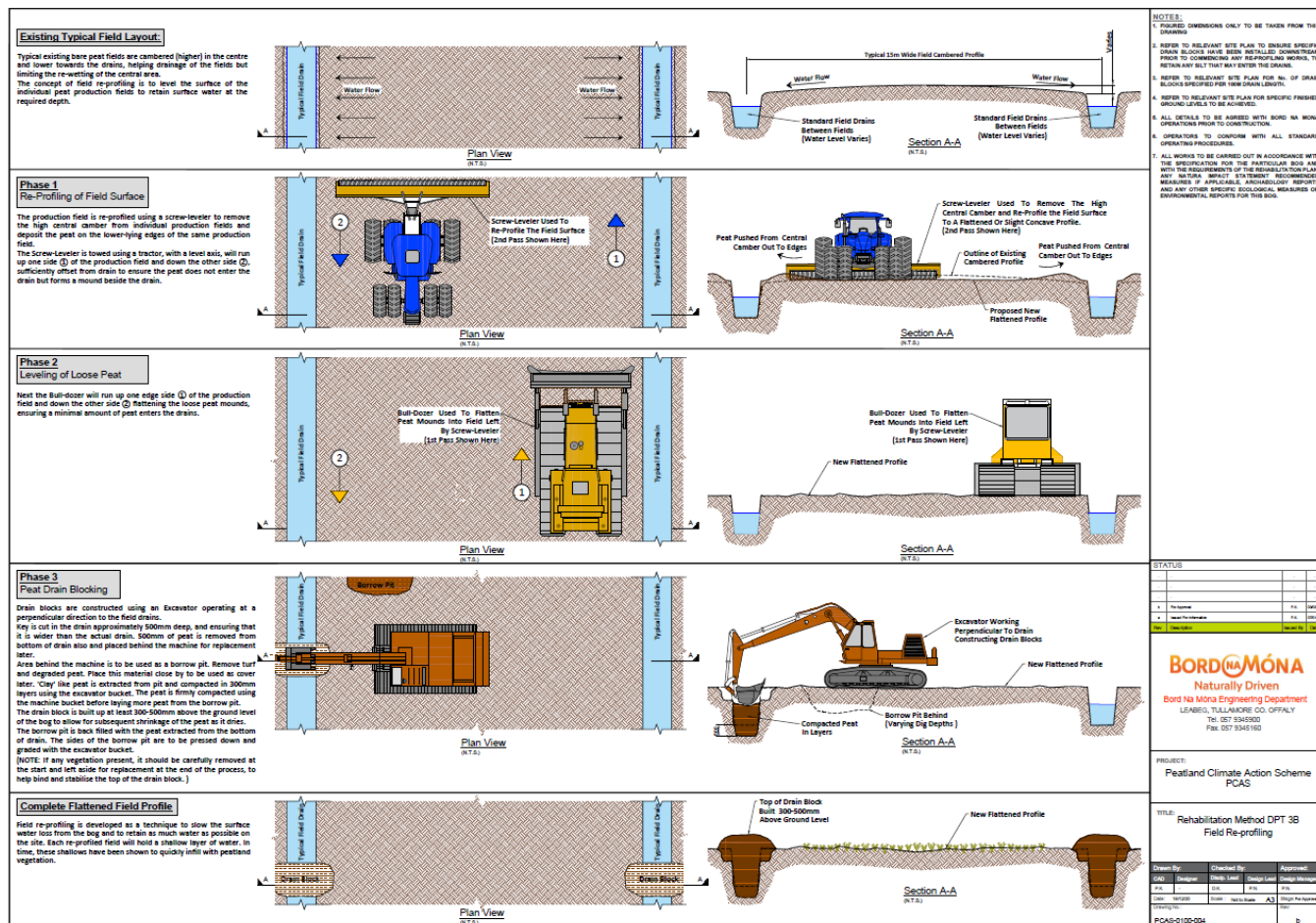


Figure 8: Indicative methodology for field profiling DPT3B

6. Berms and field reprofiling (45m x 60m cell)

This measure (DPT4 variation) 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.

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. A key is cut in the drain approximately 500mm deep ensuring that it is wider than the actual drain. A 500mm depth of peat is removed from bottom of drain also and placed behind the machine for replacement later.

An area behind the machine, within reach of the excavator arm, is selected to be used as a borrow pit. Turf and degraded peat is removed from the surface. This material is placed close by to be used as cover later. 'Clay' like peat is extracted from pit and compacted in 300mm layers using the excavator bucket, to form the drain block. 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 then back filled with the peat extracted from the bottom of the drain. The sides of the borrow pit are pressed down and graded with the excavator bucket. (If any vegetation present, it is 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 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 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.

The berms are constructed using a bull-dozer pushing the peat obtained from the original field camber to form mounds. The mounds of loose peat are then levelled and compacted using the machine's tracks to ensure that the berm retains shallow water in the cell. The top surface level of the berms is constructed with a high level of accuracy.

Phase 3 Final Profile

Drainage pipes are incorporated into the berm construction at specific locations to manage overflows and prevent berm erosion.

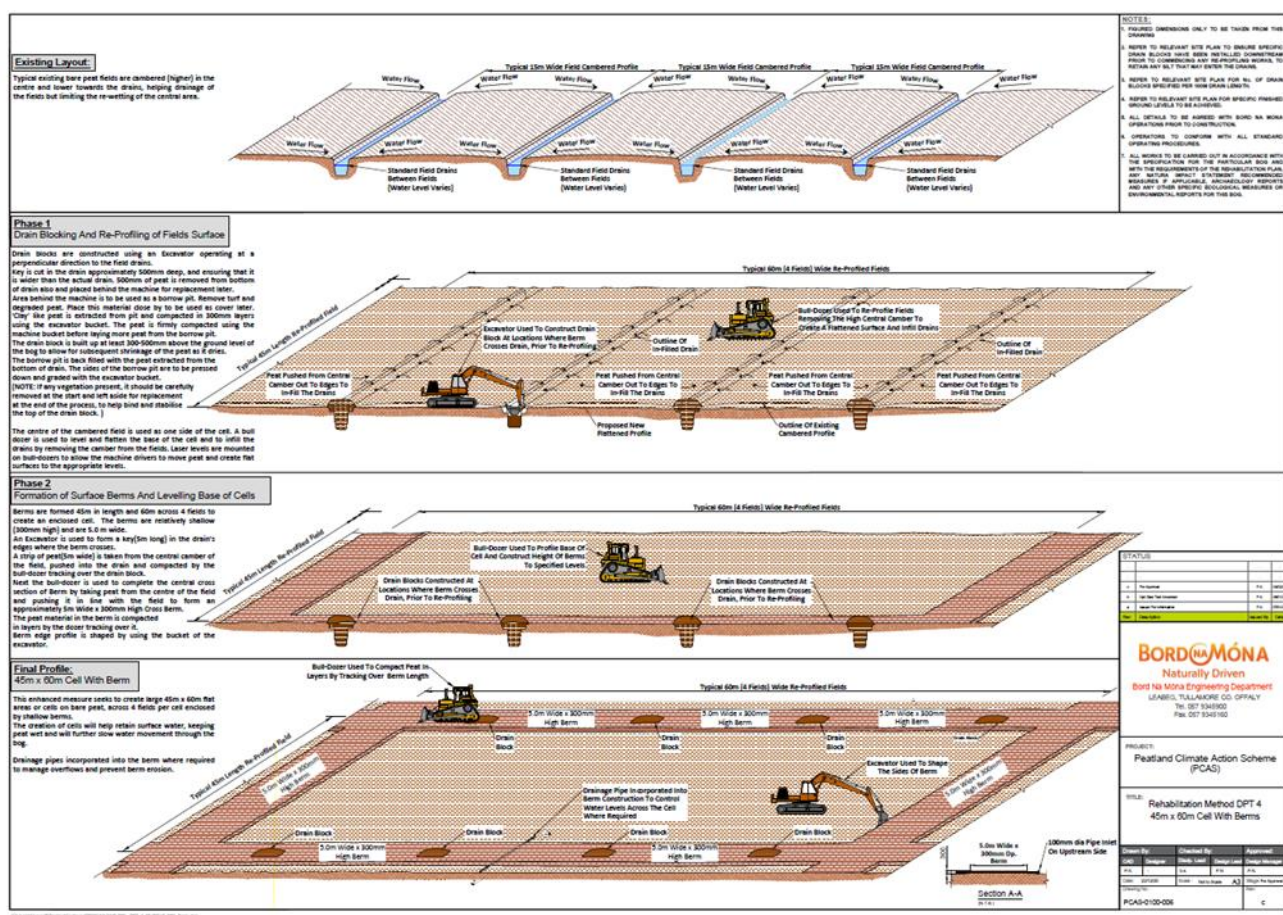


Figure 9: Rehabilitation Method DPT4 45m x 60m Cell with Berms

7. Drainage channels for excess water

New drainage channels (swales) are appropriate to help manage larger volumes of water at large sites during high rainfall events. The main objective is not to drain any residual peat but to manage excess water and prevent significant flooding. Swales (shallow wide drainage channels) are a common measure used in the design and construction of constructed wetlands. They may only get occasional use during the year during periods of high rainfall.

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.

In some instances, 'taps' can be cut between peat fields to allow water flow/reduce volumes of water from one part of the bog to another.

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).

8. Cut and fill cell bunding (30m x 30m cell)

This is an intensive engineering approach to peatland rehabilitation that looks to modify the topography substantially to optimise suitable hydrological conditions for the development of peat-forming communities. It will also 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 cut and fill cell bunding approach as DPT5 aims to create 'saucers' or flat bunded areas (cells) on peat with berms to hold shallow water at appropriate levels. Each cell is approximately 30 x 30 m and laser levels will be used on excavators and bulldozers to aid the construction of flat cells surrounded by slightly convex berms. As cells are constructed production field drains will be infilled with peat. Cells will be sized relatively small to prevent wave erosion affecting the development of moss growth.

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. A key is cut in the drain approximately 500mm deep ensuring that it is wider than the actual drain. A 500mm depth of peat is removed from bottom of drain also and placed behind the machine for replacement later.

An area behind the machine, within reach of the excavator arm, is selected to be used as a borrow pit. Turf and degraded peat is removed from the surface. This material is placed close by to be used as cover later. 'Clay' like peat is extracted from pit and compacted in 300mm layers using the excavator bucket, to form the drain block. 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 then back filled with the peat extracted from the bottom of the drain. The sides of the borrow pit are pressed down and graded with the excavator bucket. (If any vegetation present, it is 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 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.

Phase 2: Formation of Surface Berms and Levelling Base of Cells

Berms are formed 30m in length and 30m across 3 fields to create an enclosed cell. The berms are relatively shallow (300mm high) and are 5.0 m wide.

The berms are constructed using a bull-dozer pushing the peat obtained from the original field camber to form mounds. The mounds of loose peat are then levelled and compacted using the machine's tracks to ensure that the berm retains shallow water in the cell. The top surface level of the berms is constructed with a high level of accuracy.

Phase 3 Final Profile

DPT 5: Multiple Field Re-Profiling With Edge Berms To Create 30mx30m Cells

Existing Layout:
Typical existing bare peat fields are cambered (higher) in the center and lower towards the drains, helping drainage of the fields but limiting the re-wetting of the entire 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 100mm deep, and ensuring that it is wider than the actual drain. 100mm of peat is removed from bottom of drain stop 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 (or peat) is extracted from pit and compacted in 100mm 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 to at least 300-500mm above the ground level of the bog to allow for subsequent coverage of the peat at 5 drils.
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 grouted 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.)
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 30m in length and 30m across 3 fields to create an enclosed cell. The berms are maximum shallow (300mm high) and are 5.5m wide.
The berms are constructed using a bull-dozer moving the peat obtained from the original field camber to form mounds.
The mounds of loose peat are then leveled and compacted using the machine's tracks to ensure that the berm retains shallow water in the cell. The top surface level of the berms are constructed with a high-level of accuracy.

**Final Profile:
30m x 30m Cell With Berm**
This enhanced measure seeks to create large 30m x 30m cell 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.

Typical 30m Wide Field Cambered Profile
Water Flow
Standard Field Drains Between Fields

Typical 30m Wide Re-Profiled Cell
Excavator Used To Construct Drain Block At Locations Where Berms Crossed, Prior To Re-Profiling
Bull-Dozer Used To Re-profile Fields Removing The High Central Camber To Create A Flatter Surface And Infill Drains
Outline Of In-Filled Drain
Peat Pushed From Center Camber Out To Edges To In-Fill The Drains
Proposed New Flatter Profile

Typical 30m Length Re-Profiled Cell
Bull-Dozer Used To Profile Base-Of Cell And Construct Height Of Berms To Specified Levels
Drain Blocks Constructed At Locations Where Berms Crossed, Drain, Prior To Re-Profiling

Typical 30m Wide Re-Profiled Cell
5.0m Wide x 300mm Dp. Berms
1.0m Wide x 300mm Dp. Berms
Drain Block
Drain Pipe Incorporated Into Berms Construction To Control Water Levels Across The Cell Where Required
5.0m Wide x 300mm Dp. Berms
1.0m Wide x 300mm Dp. Berms
500mm dia Fly Ashed Co. upstream Side

9. *Sphagnum* Inoculation

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).

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 year). 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.

10. Silt Pond Cleaning

The cleaning procedure is as follows:

- If the silt pond system has a by-pass channel or a stand-by pond, then the drainage is diverted through these. If not, then the inlet to the pond is blocked or the supply pump switched off for the duration of the cleaning.
- If the outlet from the pond has a weir then the level is lowered to de-water the silt. If not, then the outlet pipe is blocked for the duration of the cleaning.
- The pond is cleaned from the inlet to the outlet either from one side, if the width allows or from both sides, if not.
- The silt is deposited as far back from the silt pond as possible with the excavator, or additionally with the aid of a dozer if space is limited.
- If necessary, a peat bund is left between the pond and the excavated silt to retain liquid sludge from flowing back into the pond.
- When the pond has been cleaned, the inlet is opened and the pond allowed to fill before lowering the outlet weir.
- If the drainage was diverted during the maintenance, then it is redirected back into the pond.
- Once cleaned, the date is entered on to the inspection log.

11. Hydraulic Breaks

To sustain hydrological continuity through the margins of the proposed rehabilitation and decommissioning site and to avoid flooding of adjacent lands, it is proposed to retain/create certain key hydraulic breaks (drains) along the margins of the bog site. These works will be completed to retain peripheral surface water drainage around the margins of the bog rehabilitation sites allowing hydrological flow from lands upstream of the site to areas downstream of the rehabilitation site. These works may require localised instream excavation, widening and regrading of existing drains with tracked excavators, and the removal of debris. These works may require localised instream excavation, widening and regrading of existing drains with tracked excavators. **Figure 11** below provides an image from the Esker Bog Drainage Management Plan which shows the locations and extent of proposed drainage management features. This mostly includes the retention of existing drainage features, maintenance of silt ponds, and the creation of a new channel near the southern boundary of the site.



Figure 11: Drainage Management Measures for Esker Bog (derived from the Drainage Management Plan for Esker Bog)

See **Appendix D** for the full suite of Methodology Drawings.

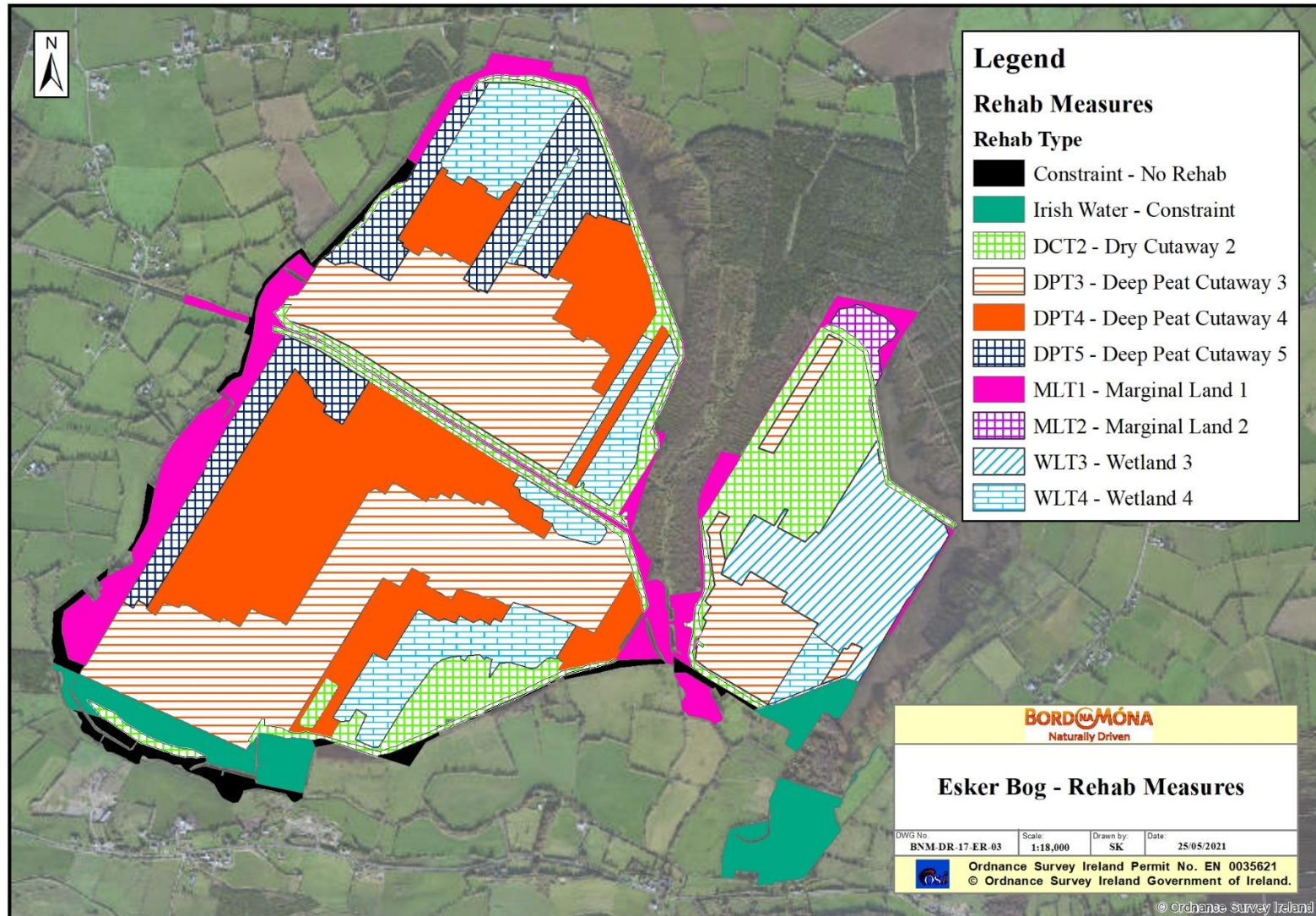


Figure 12: Proposed Enhanced (PCAS) Rehabilitation Plan¹⁰

¹⁰ The enhanced rehabilitation Map is sourced from Section 8 of the appended Decommissioning and Rehabilitation Plan (**Appendix B**).

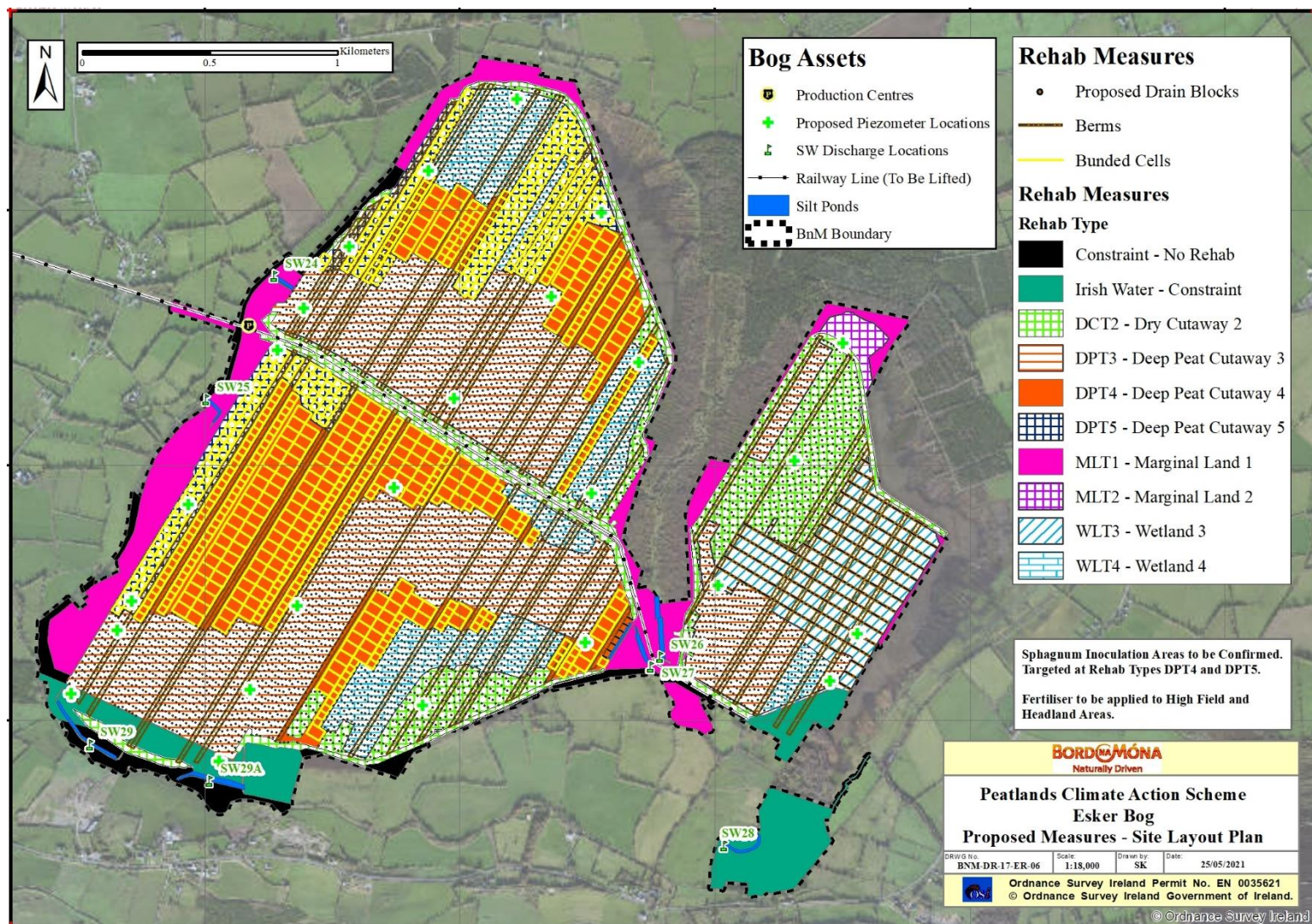


Figure 13: Proposed Site Layout Plan for Esker Bog

2.6.1.4 Decommissioning and Rehabilitation Timescale and Resource Requirements

Duration

Decommissioning activities will be completed within a period of 12 months and are scheduled to be completed before the end of April 2022.

Rehabilitation activities will be completed within a period of approximately 12 months. In general activities will be carried out between the months of April and October inclusive.

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 line with typical BnM work practice and H&S requirements. In any case, the rehabilitation period will not be longer than 1 year.

2.6.1.4.1 Hours of Work

Normal Decommissioning and Rehabilitation times will be daylight hours between 08.00 and 17.30hrs Monday to Friday.

2.6.1.5 Use of Natural Resources

Land Requirement: There is no land requirement in respect of **decommissioning**. In total **rehabilitation** activities will take place on 457.55 hectares 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'.

Water: No additional water is required for either decommissioning or rehabilitation.

Soils/Peat:

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 blocks. 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 dependant 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 dam locations. Dozers may also be used to infill drains with peat displaced by screw levelling. For any prescriptions such as the creation of banded 'cells', certain fields will be re-profiled into a succession of tiered cells with separating bunds or dams; in some instances, these may be 'keyed', to avoid sub-surface water flow, and ensure cells retain the target depth of water.

Peat will also be utilised to infill any blocked outfalls or raised drainage pipes.

Hydrocarbons will be used on-site during decommissioning and rehabilitation activities and will be limited to the diesel or petrol fuel and mechanical oils used by any onsite site machinery and equipment.

2.6.1.6 Emissions & Wastes during Rehabilitation

Dust, Noise, Vibration: 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. Reprofilling 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.

Durations overall are expected over a 12 month period at Esker Bog or until rehabilitation is complete.

Fuel and some pipes may require to be delivered. No blasting or piling is required.

Wastes: 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.

Welfare Facilities: Welfare facilities are available at Esker Bog. Where required, Portaloos and additional welfare facilities may be added to the Esker site. This may be required to accommodate guests or additional workers during the summer months and to assist with social distancing requirements during the ongoing Covid-19 pandemic.

2.6.2 Operational Stage

Duration: Once constructed and commissioned, the proposed Decommissioning and Rehabilitation will remain permanently in place.

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 operations such as repairs to existing peat blockages, adjustment of overflow pipes (where required) and or 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. Activities to retain the function of drainage channels operating as hydraulic breaks within the silt pond infrastructure will be retained to assist with decommissioning methods.

Operational Access: Operational access will be through the Newtown townlands western boundary of the site, where existing infrastructure is already in place via access tracks and railway lines to facilitate the previous peat extraction.

Timing of Operational Activities: It is expected that scheduled inspection and maintenance activities will be typically carried out by a 2-4 person team, typically for 1 day per month, for the foreseeable future.

Use of Natural Resources: During the Operational Stage, 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 & Wastes: During the Operation Stage of Rehabilitation 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.

Fugitive emissions to air

Collectively, ceasing industrial peat production, 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.

Carbon Emissions

Following rehabilitation and into the early operational stage Esker 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.

2.6.3 Other Projects and Plans with Potential to Cause In-Combination Effects

The location of the proposed Esker Bog decommissioning and rehabilitation does not overlap the footprint of any other existing projects or plans.

Other bogs within the larger Bog Group or within the River Barrow Catchment (including Cavemount Bog, Mountlucas Bog and Cloncreen Bog) will also be subject to both decommissioning and rehabilitation to meet IPC license conditions. This has the potential to result in in-combination effects from the release of hydrocarbons, emissions to air and water.

Peat extraction through turbary occurs around the north-eastern and south-eastern margins of Esker Bog and at other locations within 15km and the downstream catchment of the River Barrow and River Nore SAC. This has the potential to result in in-combination effects from the release of hydrocarbons, emissions to air and water, and through modification to drainage regimes.

The proposed Barrow Blueway (Planning Reference Number 17/81), a multi-use shared leisure route (Blueway), approximately 115 kilometres (km) in length, on the existing navigation towpath is located on the Grand Canal 15.8km south-west of Esker Bog. This was granted planning permission by local authorities but was objection were submitted to An Bord Pleanála and the grant of planning permission overturned.

Retention is being sought for continued use of an existing wind monitoring mast, with instruments, 100m in height on its lands at Blackriver Bog, Lullybeg, Co. Kildare for a further period of three years. This site is located 10.9km south-east of Esker Bog and drains to the Figile River catchment. The purpose of the mast is to assess the suitability of the company's adjacent lands for wind farm development. Previous planning application reference numbers: PL12/943 and PL17/840.

Mount Lucas windfarm (Planning Reference: 09453) is located 1.6km south-west of Esker Bog. This windfarm development supports connectivity to the upstream sections of the Daingean_030 and Figile watercourses. This development consists of thirty two turbines up to 100m hub height and up to 112m rotor diameter with a total height not exceeding 156m; a transformer and crane hardstanding area at each turbine, underground electrical and communication cables linking the turbines; internal site tracks; a permanent met lattice mast 100m high; a 110Kv substation and associated equipment and control building. Another windfarm project is currently in development at Cloncreen, south of the Esker Bog rehabilitation site.

In December 2020, Bord na Móna applied to Offaly County Council for the continued use of the previously permitted ash repository (Planning Ref No: 20621) (An Bord Pleanála PL 19.216998 / Offaly County Council 05/1267) for deposition of up to 20,000 tonnes of peat ash and biomass during 2023, with an amendment to the planning boundary to incorporate the site entrance. This application was accompanied by a Natura Impact Statement which considered potential impacts consequent significant adverse effects and requisite mitigation measures to European Sites within the project zone of influence, including the River Barrow and River Nore SAC.

A planning search of the National Planning Database found a number of proposed or consented developments within the vicinity of Esker Bog, including private dwellings or amendments to private dwellings and a number of agricultural led planning applications such as for slatted sheds/ amendments to existing farm infrastructure etc.

A planning application for the demolition and construction of pig houses (Planning Reference Number 152) was submitted to Offaly County Council in 2015. The planning application sought for the demolition of 10 no. existing pig houses and construction of 2 no. pig houses and extension to 2 no. existing structures to form pig house no. 3, together with all ancillary structures and all associated site works on the site of an existing pig house enterprise. This application related to a development which is for the purposes of an activity requiring an Integrated Pollution Prevention and Control (IPPC). An Environmental Impact Statement and

Natura Impact Statement has been submitted with this planning application. This planning application is located ca. 17km downstream of the site located on the western fringes of the Figile_060 River.

There are 4 no. local authority jurisdictions within 15km of Esker Bog (Offaly County Council, Laois County Council, Westmeath County Council and Kildare County Council). All local authorities have County Development Plans and/or plans relating to Heritage and Biodiversity.

There is a current ongoing NPWS Raised Bog Restoration Project which may include at some date some raised bogs within 15km of Esker Bog. Restoration activities at these bogs may have the potential for in combination effects with decommissioning and rehabilitation at Esker Bog, however there is no currently known temporal or spatial overlap between any planned restoration activities and the decommissioning and rehabilitation of Esker Bog.

A map showing the locations of in-combination projects within 15km of the proposed works is presented in **Figure 14** below.

2.6.3.1 Other BnM Bog Group Decommissioning and Rehabilitation

Other BnM bogs within the larger Allen Bog group will also be subject to decommissioning and rehabilitation to meet the various, pertinent, IPC license conditions, however, currently, the only known temporal overlap between these proposed activities elsewhere on Bord na Móna lands that support proximity and supporting potential connectivity is as follows:

- Mountlucas Bog – Located 1.6km southwest of Esker Bog and drains to the Daingean_030 watercourse which is part of the Figile River catchment. The downstream section of the Figile River catchment are designated as part of the River Barrow and River Nore SAC.
- Cloncreen Bog - Located 0.2km south-east of Esker Bog and drains to the Figile_040 watercourse. The Figile River is designated as part of the River Barrow and River Nore SAC 26.7km downstream of Esker Bog.
- Cavemount Bog - Located 1.0km west of Esker Bog and drains to the Esker_010 (upstream sections of the Esker_020 watercourse which drains the Esker Bog site). The Esker_010 watercourse is a tributary of the Figile River which is designated as part of the River Barrow and River Nore SAC 26.7km downstream of Esker Bog.
- Clonad Bog – Located 6.2km southwest of Esker Bog. This bog is drained by the Daingean_010 and Daingean_020, Daingean_030 and Figile watercourses. The Daingean River is a tributary of the Figile River. The Figile River is designated as part of the River Barrow and River Nore SAC 26.7km downstream of Esker Bog.
- Ummeras Bog – Location 12.1km south-east and ca. 18km downstream along the Figile catchment. The Figile River is designated as part of the River Barrow and River Nore SAC 26.7km downstream of Esker Bog and 8.5km downstream of Ummeras Bog.

All four bog sites within the Allen Bog group proposed for rehabilitation in 2021 are located in proximity to one another and all are located within the Figile River_020 Water Framework Directive subcatchment.

The construction phase of decommissioning and rehabilitation at these bogs may overlap those proposed for Esker Bog. Bogs sites within the Allen Bog Group are located within the Barrow catchment and support connectivity with the River Barrow and River Nore SAC. Should decommissioning or rehabilitation at these sites commence alongside or overlap those proposed for Esker, this could result in in-combination or cumulative effects to the River Barrow and River Nore SAC.

The Operational stage of Esker Bog Decommissioning and Rehabilitation will overlap the Rehabilitation stage of other bogs within the Allen Bog group however the expected magnitude of any effects from Esker Bog at

this lifecycle stage are evaluated as insufficient to result in in-combination effects. The possibility of likely significant in combination effects can reasonably be excluded on this basis.

As outlined, bog sites within the Allen Bog Group proposed for decommissioning and rehabilitation in 2021, support potential connectivity with the Figle River catchment and downstream areas of the River Barrow and River Nore SAC. The decommissioning and rehabilitation of any other bogs within the greater Allen Bog Group will be subject to Appropriate Assessment and it is considered the requisite mitigation will be in place should the potential for any adverse effects on European site integrity be identified as part of the Appropriate Assessment process. This should also identify the potential for any sequential in-combination pathways, in particular should temporal overlap exist.

2.6.3.2 Turbary

Analysis of aerial photography identified private turbary at the north-eastern fringe of Esker Bog and the eastern and south-eastern section of the bog. Analysis of aerial photography displays evidence of unauthorised turbary occurs at various locations within 15km of Esker Bog and in those bog sites fringing the Figle River catchment downstream of the Esker Bog site, such as Cloncreen Bog. Hydrological linkages between these turbary sites and the receiving environment at Esker Bog may exist, primarily via drainage to EPA blue line watercourses. These linkages provide potential to contribute to in-combination or cumulative effects to the River Barrow and River Nore SAC.

2.6.3.3 NPWS Raised Bog Restoration Raheenmore Bog SAC (000582), Knockacoller Bog SAC (002333) and Coolrain Bog SAC (002332)

Raheenmore Bog SAC (000582), located 9.5km north-west of Esker Bog is included as part of the Living Bog project sites. This is an EU LIFE 2014-2020 Programme funded project aimed at Restoring Active Raised Bogs in Ireland's SAC Network 2016-2020 (**LIFE14 NAT/IE/000032**) aims to restore active raised bog on 12 raised bog SACs in the network, including Raheenmore Bog SAC.

Knockacoller Bog SAC (002333) and Coolrain Bog SAC (002332) are located 43km and 45km south-east of the proposed Esker bog rehabilitation area respectively and may possibly be subject to restoration and rehabilitation practices in the short-term.

An Appropriate Assessment (of the National Raised Bog SAC Management Plan 2017-2022) has been carried out in accordance with Regulation 42(11) and 42(12) of the European Communities (Birds and Natural Habitat) Regulations 2011-2015 and has had regard to the findings of the Natura Impact Statement, the conservation and management measures set out in the National Raised Bog SAC Management Plan 2017-2022 and which constitute plan-level mitigation measures, and the submissions and observations received on the (draft) National Raised Bog SAC Management Plan¹¹. One of the primary mitigation elements proposed is that screening for appropriate assessment and if necessary appropriate assessment will be carried out in relation to any site specific/project level measures including restoration measures and turf-cutting. If AA of a project at site level determines that adverse effects are likely, or cannot be ruled out, the project will either not be pursued or, where considered appropriate, the derogation steps of Article 6(4) will apply, but only in a case in which there are imperative reasons of overriding public interest (IROPI) requiring a project to proceed, there are no less damaging alternative solutions, and compensatory measures have been identified that can be put in place.

¹¹ https://www.npws.ie/sites/default/files/general/AA%20Determination%20NRBMP%202017_2022_0.pdf

On this basis, it is assumed that the appropriate level of Appropriate Assessment has or will be carried out in respect of any future proposed restoration activities at the above bog, and that any required mitigation to avoid adverse effects on European Site integrity will be in place.

2.6.3.4 Agricultural Activity

Given the connectivity between Esker Bog and the River Barrow catchment, there is potential for agricultural activities and their respective emissions to air (noise as a source of disturbance) and water (sediment, runoff, deleterious materials) to combine with source effects from decommissioning and rehabilitation at Esker Bog. Most of these activities are not subject to Appropriate Assessment, and form part of the existing baseline environment.

2.6.3.5 IPPC Licencing

Two IPPC licences issued P0614-01 & P0614-02 to a pig farm in the downstream sections of the Figile watercourse upstream of Bracknagh, Co. Offaly. These pig farms are located within proximity to the Figile_080 watercourse. Activities within this facility are subject to the licencing conditions, controls and ongoing monitoring.

2.6.3.6 Mountlucas Windfarm

Bord na Mona Energy Ltd have constructed a 32 turbine windfarm, with turbines measuring up to 100m hub height and 112m rotor diameter. Additional and ancillary developments include a transformer and crane hardstanding, underground electrical cables, internal site tracks, met mast, 110Kv substation and control building with associated septic tank and treatment system, extension to existing borrow pit, drainage and all associated works. This windfarm is currently operational and will not contribute to in-combination or synergistic effects with the proposed decommissioning and rehabilitation works. There is no potential for in-combination effects due to construction or rehabilitation activities.

2.6.3.7 Local Authority Development Plans

The following development plans have been identified:

- Offaly County Development Plan 2021 – 2027
- Offaly Heritage Plan 2017-2021

It is assumed that the above, or any other plans including those currently at draft status, will be subject to the requirement for Appropriate Assessment which can reasonably be assumed to provide mitigation to avoid adverse effects on European Sites.

2.6.3.8 Other Projects or Activities

The likelihood of cumulative interaction with other plans or projects is considered low, due to limited temporal or spatial overlap; the absence of hydrological connectivity or shared hydrological catchment with many of the other plans or projects described, the separation distance or setback buffers between the described plans or projects and European Sites, and the requirement for Appropriate Assessment for other plans or projects, such as private dwellings, forestry entrances, slatted sheds, masts and amendments to existing planning consents, which can reasonably be assumed to provide mitigation to avoid adverse effects on European Sites. In addition, there may be plans to development amenity facilities for some Bord na Móna bog sites. Such developments will be subject to the planning process and will be screened for Appropriate Assessment as necessary. Nonetheless the possibility of secondary effects from activities forming part of decommissioning or rehabilitation at Esker Bog cannot be excluded – a precautionary approach is taken.

2.6.3.9 Local Authority Drainage Schemes

As part of the Barrow Drainage District Offaly County Council (and other local authorities located downstream on the Barrow catchment such as Laois and Kildare) may wish to commence drainage maintenance schemes within watercourses supporting connectivity with the proposed decommissioning and rehabilitation works at Esker Bog, including watercourses located upstream and downstream along the Figle catchment. There is the potential for in-combination effects should these drainage schemes be completed in the absence of best practice measures or considered mitigation. However, such drainage maintenance schemes are subject to their own Appropriate Assessment prior to commencement, which will consider potential impacts, consequent significant effects and requisite mitigation measures to offset potential adverse effects to European Sites within the project Zone of Influence.

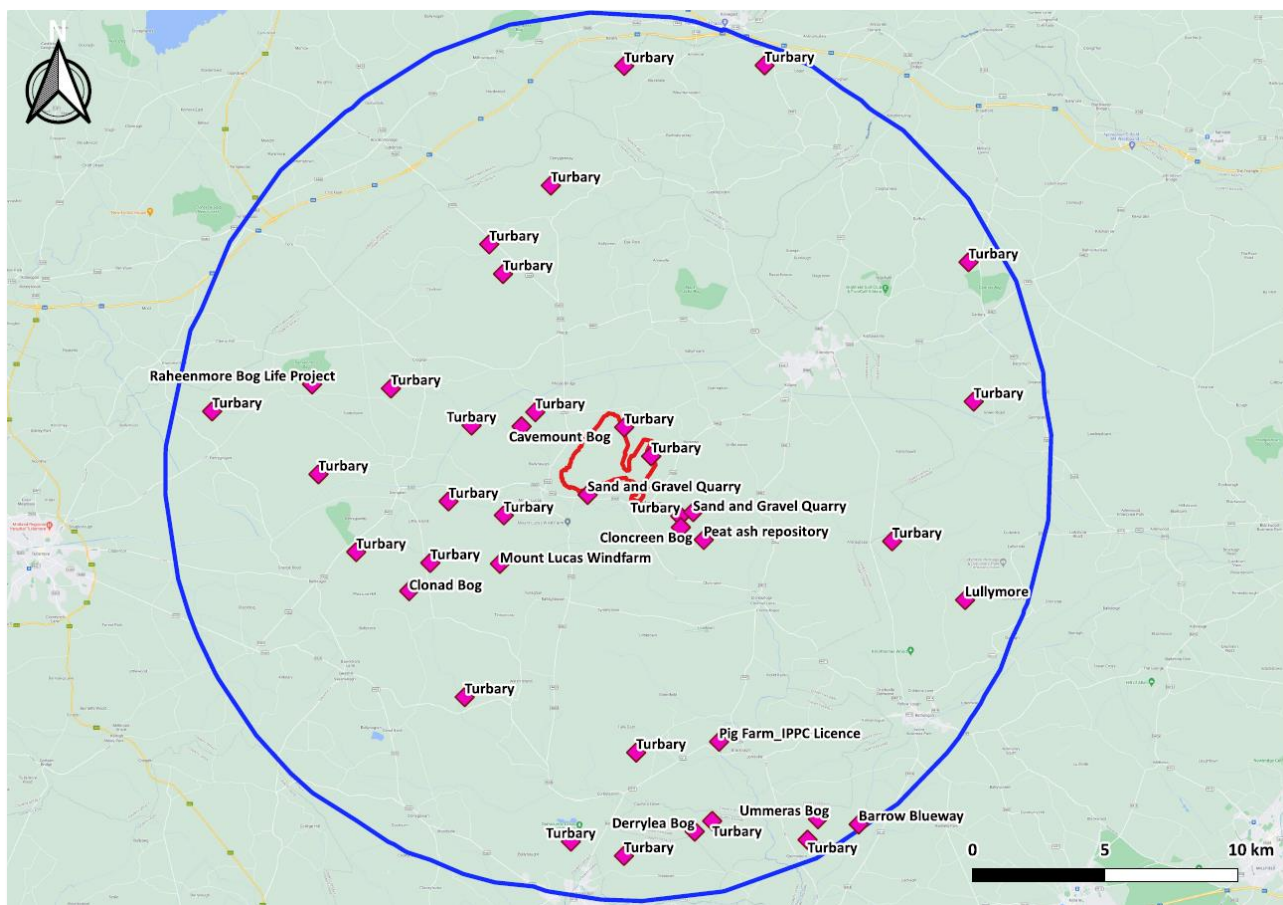


Figure 14: Other projects and activities within 15km of the proposed Esker bog rehabilitation work

2.7 European Sites under consideration

2.7.1 Distance of the Project to European Sites

For the proposed Esker Bog decommissioning and rehabilitation, a limited zone of potential impact is predicted, due to the relatively small scale, duration and localised nature of the activities proposed.

Nevertheless, a precautionary 15km distance was chosen to evaluate the potential for effects (alone and in combination) on European Sites.

There are **3 European Sites** - **3 Special Area's of Conservation (SAC)** **within 15km of Esker Bog**. There are no SPAs located within 15km of Esker Bog. The locations of these European Sites are illustrated in **Figure 15: European Sites within 15km of Esker Bog** and **Figure 16: Proximal, adjacent or overlapping European Sites**, with the distances from the bog rehabilitation site and comment on hydrological connectivity provided in **Table 8**.

Table 8: Proximity of the proposed Esker Bog to European Sites

European Site (SAC or SPA)	Site Code	Distance from the Proposed Bog Rehabilitation*	Hydrological Connectivity (Y/N: If Yes Downstream or Upstream connectivity relative to Esker Bog)
River Barrow and River Nore SAC	002162	14.5km south and 26.7km downstream	Y: Remote downstream connectivity via the Esker_020, Figile_040, Figile_050, Figile_060 and Figile_080 watercourses.
Raheenmore Bog SAC	000582	9.5km north-west	N: No, this European Site is located upstream of the proposed bog rehabilitation. No hydrological connectivity between the proposed bog rehabilitation site and this European Site.
The Long Derries, Edenderry SAC	000925	8.5km east	N: No, this European Site is located upstream of the proposed bog rehabilitation. No hydrological connectivity between the proposed bog rehabilitation site and this European Site.

*All distances cited are the closest straight line distance as measured using GIS.

The Qualifying Interests/Special Conservation Interests and locational context for each of the thirteen European Sites examined in this Screening Report are provided in **Table 9**.

The Site Synopsis and Conservation Objectives for each site are available in full on the National Parks & Wildlife Service website at <https://www.npws.ie/protected-sites> and references including date of access, are included in **Section 4**. Conservation Objectives were reviewed to inform the current appraisal – in particular to identify any possible sensitivities and resultant pathways for likely significant effects.

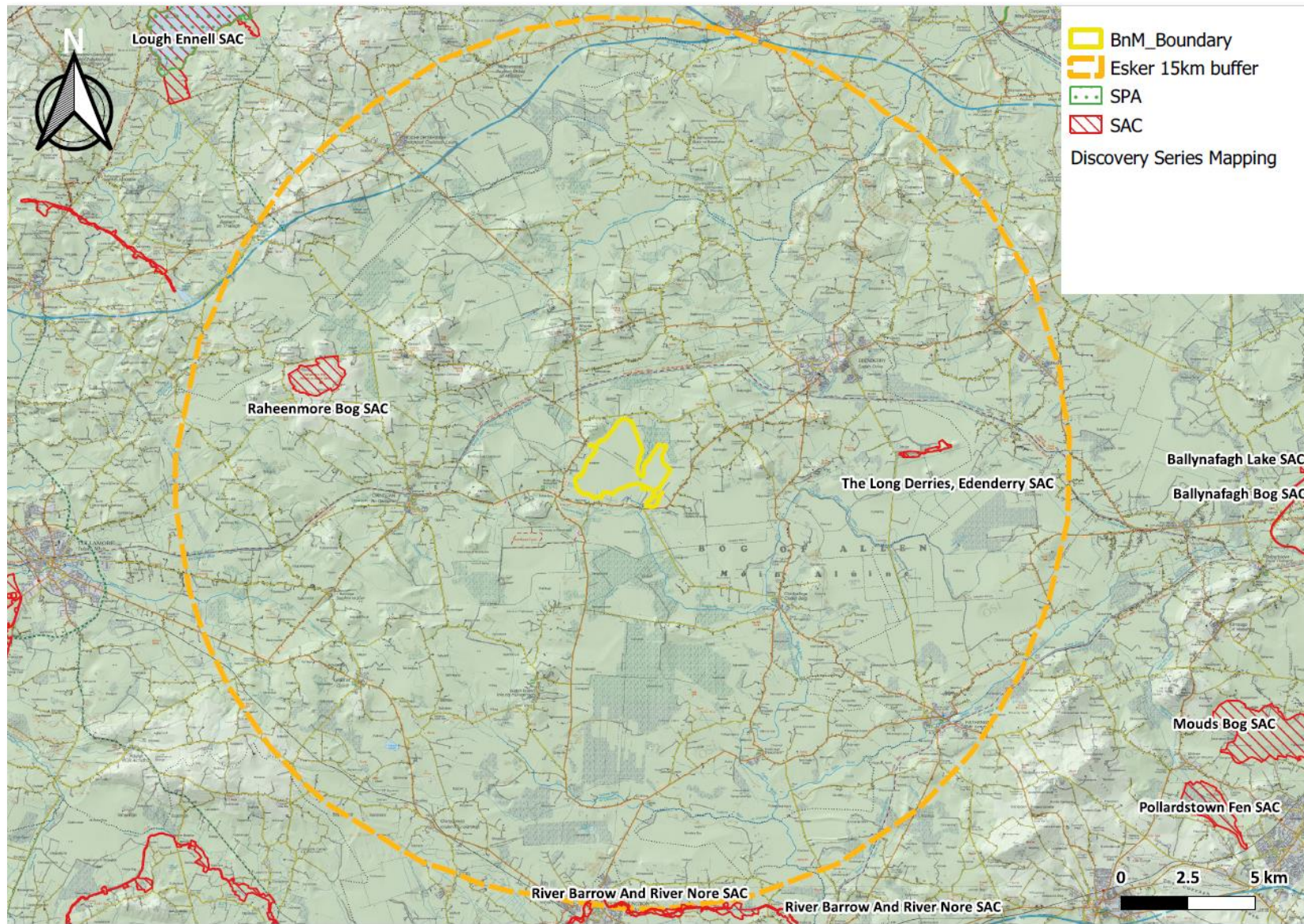


Figure 15: European Sites within 15km of Esker Bog

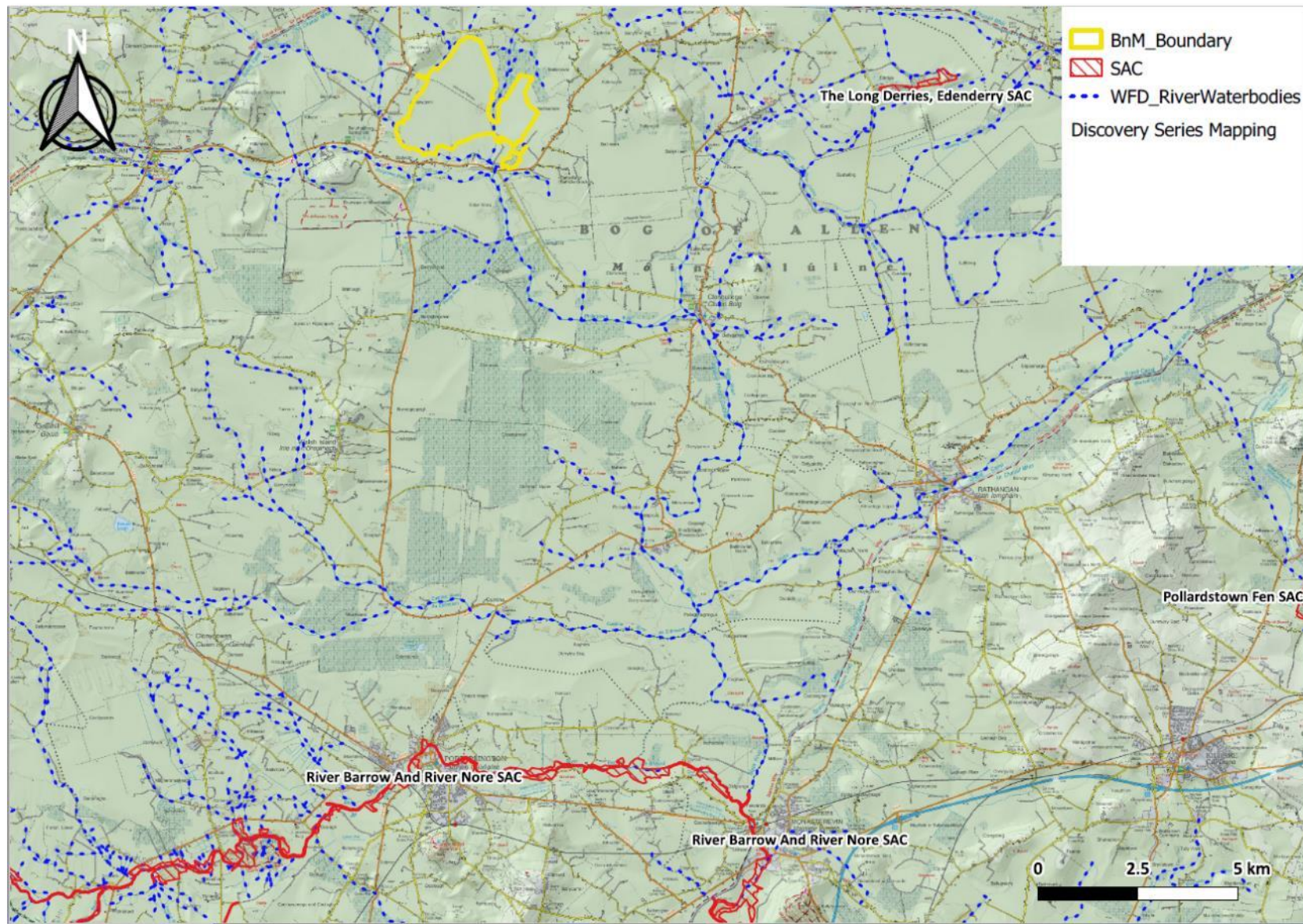


Figure 16: Proximal European Sites to Esker Bog

Table 9: Description of European Sites within a 15km radius of Esker Bog

European Site Name and Code	Qualifying Interest / Special Conservation Interest and Code *denotes a priority habitat	Summary Description (from Site Synopsis)	Data Source
1	River Barrow and River Nore SAC (002162)	<p>[1016] Desmoulin's whorl snail (<i>Vertigo moulinsiana</i>)</p> <p>[1029] Freshwater pearl mussel (<i>Margaritifera margaritifera</i>)</p> <p>[1092] White-clawed crayfish (<i>Austropotamobius pallipes</i>)</p> <p>[1095] Sea lamprey (<i>Petromyzon marinus</i>)</p> <p>[1096] Brook lamprey (<i>Lampetra planeri</i>)</p> <p>[1099] River lamprey (<i>Lampetra fluviatilis</i>)</p> <p>[1103] Twaite shad (<i>Alosa fallax</i>)</p> <p>[1106] Atlantic salmon (<i>Salmo salar</i>) (only in fresh water)</p> <p>[1130] Estuaries</p> <p>[1140] Mudflats and sandflats not covered by seawater at low tide</p> <p>[1310] <i>Salicornia</i> and other annuals colonizing mud and sand</p> <p>[1330] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>)</p> <p>[1355] Otter (<i>Lutra lutra</i>)</p> <p>[1410] Mediterranean salt meadows (<i>Juncetalia maritimi</i>)</p> <p>[1421] Killarney fern (<i>Trichomanes speciosum</i>)</p> <p>[1990] Nore freshwater pearl mussel (<i>Margaritifera durrovensis</i>)</p> <p>[3260] Water courses of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation</p> <p>[4030] European dry heaths</p>	<p>This site consists of the freshwater stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains, and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site passes through eight counties – Offaly, Kildare, Laois, Carlow, Kilkenny, Tipperary, Wexford and Waterford. Major towns along the edge of the site include Mountmellick, Portarlinton, Monasterevin, Stradbally, Athy, Carlow, Leighlinbridge, Graiguenamanagh, New Ross, Inistioge, Thomastown, Callan, Bennettsbridge, Kilkenny and Durrow. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow, and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore (NPWS, 2016).</p> <p>NPWS (2011) River Barrow and River Nore SAC 002162. Version date: 19.07.2011. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.</p> <p>Accessed online 24.01.2021</p>

European Name and Code	Site	Qualifying Interest / Special Conservation Interest and Code *denotes a priority habitat	Summary Description (from Site Synopsis)	Data Source
		<p>[6430] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels</p> <p>[7220] * Petrifying springs with tufa formation (Cratoneurion)</p> <p>[91A0] Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles</p> <p>[91E0] * Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae)</p>		
2	Raheenmore Bog SAC	<p>[7110] Active raised bogs</p> <p>[7120] Degraded raised bogs still capable of natural regeneration</p> <p>[7150] Depressions on peat substrates of the Rhynchosporion</p>	<p>This raised bog developed in a small basin in the catchment of two major river systems i.e. the Brosna and the Boyne. It is situated about 5 km from Daingean in Co. Offaly. The peat is very deep, up to 15 m in places. The bog has a well-developed hummock and hollow system. Raheenmore Bog is a classic example of a midland raised bog and the deepest remaining in Ireland. It is of high conservation importance as it contains good examples of the priority Annex I habitat active raised bog, and the non-priority habitats degraded raised bog and depressions on peat substrates (Rhynchosporion). Most of the site is owned by the NPWS and there has been considerable research and restoration work carried out on the site over the past 15 years. Of particular notes is that this is one of the few raised bogs where restoration of the lagg zone remains feasible (NPWS, 2013).</p>	<p>NPWS (2015) Conservation Objectives: Raheenmore Bog SAC 000582. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Accessed online 08.02.2021</p>
3	The Long Derries Edenderry SAC (000925)	<p>[6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco Brometalia</i>) (* important orchid sites)*</p>	<p>The Long Derries is located approximately 5 km south-east of Edenderry in Co. Offaly and is part of a low esker ridge running from Edenderry to Rathdangan. It consists primarily of glacial gravels interspersed with loam and peat soil. The Long Derries is of botanical importance due to the presence of good quality dry, calcareous grassland, an interesting gravel pit</p>	<p>NPWS (2020) Conservation objectives for The Long Derries, Edenderry SAC [000925]. Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht.</p>

European Name and Code	Site Code	Qualifying Interest / Special Conservation Interest and Code *denotes a priority habitat	Summary Description (from Site Synopsis)	Data Source
			flora and the presence of three rare plant species, two of which are legally protected. The presence of an interesting transition habitat from esker to peatland, and a varied bird population, including the rare Nightjar and Partridge, adds to the importance of the site (NPWS, 2013).	Accessed online 24.01.2021

2.8 Sources of Information & Consultation

2.8.1 Consultation

Consultation seeks to engage an audience of relevant stakeholders at both a national and local level.

To inform the current Rehabilitation Plan, both national and local stakeholders, including neighbours whose land adjoins Esker 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 Esker Bog (see **Appendix B**).

See Section 4 of the Rehabilitation Plan included as **Appendix B** for a full consultation report.

Formal consultation has been undertaken with NPWS regarding proposed Decommissioning and Rehabilitation Plans, including protected Sites. The findings and feedback from the consultation process have been fed into the final rehabilitation and decommissioning plans. Due cognisance was also given to information available on the NPWS website at:

<https://www.npws.ie/development-consultations#>.

In addition, two meetings were held with the EAU to discuss consultation with the Minister in accordance with Regulation 42(9) of the European Communities (Birds and Natural Habitats) Regulations, 2011.

2.8.2 Sources of Information

Other sources of Information, which were considered during this Screening evaluation, included both desktop studies and fieldwork:

- Review of the Conservation Objectives, Site Synopsis and Site boundary information for the European Sites within with study area;
- Review of OSI Discovery Mapping for the 15km study area around Esker Bog;
- Review of EPA online mapping for watercourse features (<https://gis.epa.ie/EPAMaps/>);
- Review of location and layout mapping for proposed Rehab;
- Review of the detailed description of proposed Decommissioning and Rehabilitation measures, including methodologies specific to the main categories of land types under consideration, which occur in cutaway bogs;
- Review of other plans and projects within 15km
- Review of the results of previous Ecological Surveys of Esker Bog, along with recent confirmatory site visits; and

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

- Review of the National Biodiversity Data Centre (NBDC) webmapper;
- Inland Fisheries Ireland (IFI) Reports;
- Environmental Protection Agency database (www.epa.ie);
- EPA Guidance on Requests for Alterations to a Licensed Industrial or Waste Activity;
- BirdWatch Ireland online data (including I-WeBS and CBS datasets; www.birdwatchireland.ie);
- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive catchments.ie/maps/ Map Viewer (www.catchments.ie);

- OPW Indicative Flood Maps (www.floodmaps.ie),
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie);
- River Basin Management Plan for Ireland 2018 – 2021;
- Bord na Móna Annual Report 2019;
- Spatial data in respect of Article 17 reporting, available online at <https://www.npws.ie/maps-and-data/habitat-and-species-data/article-17>.
- Spatial data in respect of Article 12 reporting, available online at <https://www.npws.ie/maps-and-data/habitat-and-species-data/article-12-data>.
- Available data on Greenland White-fronted Geese such as annual reporting by the Greenland White-fronted Goose Study and National Parks and Wildlife Service.

Planning peatland rehabilitation 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 4**):

- Bord na Móna Biodiversity Action Plan
- Anderson *et al.* (2017). An overview of the progress and challenges of peatland restoration in Western Europe.
- Bonn *et al.* (2017). Peatland restoration and ecosystem services- science, policy and practice.
- Carroll *et al.* (2009). Sphagnum in the Peak District. Current Status and Potential for Restoration. Moors for the Future Report No 16.
- Clark & Rieley (2010). Strategy for responsible peatland management.
- Eades *et al.* (2003). The Wetland Restoration Manual.
- Farrell & Doyle (2003). Rehabilitation of Industrial Cutaway Atlantic Blanket Bog, NW Mayo, Ireland.
- Gann *et al.* (2019). International Principles and Standards for the practice of Ecological Restoration.
- Hinde *et al.* (2010). Sphagnum re-introduction project: A report on research into the re-introduction of Sphagnum mosses to degraded moorland. Moors for the Future Research Report 18.
- Joosten & Clarke (2002). Wise Use of mires and peatlands – Background and Principles including a framework for Decision-making.
- Lindsay (2010). Peatbogs and Carbon: a Critical Synthesis to Inform Policy Development in Oceanic Peat Bog Conservation and Restoration in the Context of Climate Change.
- Mackin *et al.* (2017). Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service,
- McBride *et al.* (2011). The Fen Management Handbook, (2011), Scottish Natural Heritage.
- McDonagh (1996). Drain blocking by machines on Raised Bogs. Unpublished report for National Parks and Wildlife Service.
- NPWS (2017a). National Raised bog Special Areas of Conservation management plan 2017-2022. 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.
- 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.

2.9 Potential Sources, Pathways and Timing of Impacts to European Sites (SACs & SPAs)

2.9.1 Potential Sources, Pathways and Timing of Impacts to SACs

2.9.1.1 Direct Impact to Habitats within the SAC (no potential for this impact to occur)

There is no spatial overlap between Esker Bog and any of the SAC's under consideration. It can therefore reasonably be concluded that there is no potential for direct impact/effects (such as habitat loss, or loss of habitat connectivity) on any SAC's from the proposed decommissioning and rehabilitation of Esker Bog. Possible pathways can only exist for indirect effects on SAC's either secondary, cross-factor or 'ex-situ'. Therefore, there is **no possibility of direct impacts to SAC** habitats, and this impact pathway is screened out from further evaluation. No potential for likely significant effects identified.

2.9.1.2 Indirect loss or degradation of terrestrial or aquatic habitats within SAC boundaries

Sources (all outside SAC boundaries): Movement of soil or peat, machinery; earthworks, excavations, installation of pipes/ temporary overburden storage, cleaning of silt ponds, removal of waste and/or raw material, lifting of rail; use of fuels, chemicals or fertiliser.

Working within watercourses and drainage channels along the site boundary / periphery to retain the function of hydraulic barriers between the site and the surrounding environment and to sustain the flow of surface water around the margins of the site. Such works may require localised instream works, mobilisation of particulate matter, local excavations within drainage channels, machinery works within and adjacent to watercourses.

Pathway: Surfacewater runoff flow paths to receiving drainage systems, downstream watercourses.

Potential Esker Bog Decommissioning and Rehabilitation Impact/Pathway Connectivity:

The identified impact sources could possibly reduce water quality or aquatic habitat quality in the local context, where all proposed operations are located outside of and at a distance from any designated SAC. The Esker Bog supports remote connectivity with the River Barrow and River Nore SAC (26.7km downstream) via the Esker_020, Figile_040, Figile_050, Figile_060 and Figile_080 watercourses.

The current appraisal evaluates the possibility for any effects in downstream hydrologically connected SAC European Sites through sediment/contaminant/nutrient laden runoff, or the spread of invasive species, with regard to any indirect habitat loss, reduction in habitat extent, or degradation effects (i.e. to habitat quality) in respect of Qualifying Interests.

Timing of Impacts: The potential for impact sources arising from the project only relates to the stage (i.e. Decommissioning and Rehabilitation), when groundworks and use of machinery will take place for a limited duration - in this instance expected to be up to 12 months. Once decommissioning and rehabilitation are complete, the decommissioned and rehabilitated Esker Bog will require some monitoring, generally involving visual inspections of habitat succession, sometimes using drones, and any ongoing scheduled maintenance such as of silt ponds, or collection of water samples, plus activities to retain the function of hydraulic breaks, following inspection. Due to the negligible (both in terms of source magnitude but also duration) and non-intrusive nature of operational activities, there is no potential for the operational phase of the proposed decommissioning and rehabilitation to cause effects to European Sites.

2.9.1.3 Indirect or ex-situ disturbance or displacement of Qualifying Interests

Sources (all outside SAC boundaries): Decommissioning and Rehabilitation activities; movement of construction machinery and vehicles including rail; presence of personnel; noise and vibration and/or visual intrusion from construction works and construction machinery.

Working within watercourses and drainage channels along the site boundary / periphery to retain the function of hydraulic barriers between the site and the surrounding environment and to sustain the flow of surface water around the margins of the site. Such works may require localised instream works, mobilisation of particulate matter, local excavations within drainage channels, machinery works within and adjacent to watercourses.

Pathway: contact (direct contact with BnM personnel during site works), air (through its ability to transmit noise effects), visibility (on site presence of BnM personnel)

Potential Esker Bog Decommissioning and Rehabilitation Impact/Pathway Connectivity: The impact sources identified above may result in possible localised impacts occurring within the local context of the decommissioning and rehabilitation area during the construction phase. Any such impacts resulting in disturbance or displacement effects on Annex II species listed as Qualifying Interests of SACs (e.g. Otter) would be *ex situ*. The Esker Bog site is drained via the Esker and Figile watercourses, which may provide foraging or commuting habitat for otter associated with River Barrow and River Nore SAC. Otters utilising these watercourses may experience ex-situ disturbance effects as a result of the proposed rehabilitation practices.

Timing of Impacts: As outlined above, the potential for effects only relates to the construction stage of decommissioning and rehabilitation. The scale and duration of any operational phase sources of disturbance or displacement are considered insufficient to result in likely significant effects.

2.9.1.4 Indirect or ex-situ mortality of Qualifying Interests

Sources (all outside SAC boundaries): Decommissioning and Rehabilitation activities; movement of construction machinery and vehicles including rail; presence of personnel; noise and vibration and/or visual intrusion from construction works and construction machinery.

Working within watercourses and drainage channels along the site boundary / periphery to retain the function of hydraulic barriers between the site and the surrounding environment and to sustain the flow of surface water around the margins of the site. Such works may require localised instream works, mobilisation of particulate matter, local excavations within drainage channels, machinery works within and adjacent to watercourses.

Pathway: Contact (direct contact with BnM machinery during the proposed rehabilitation works)

Potential Esker Bog Decommissioning and Rehabilitation Impact/Pathway Connectivity: The impact sources identified above may result in possible localised impacts occurring within the local context of the decommissioning and rehabilitation area during the construction phase. Any such impacts resulting in disturbance or displacement effects on Annex II species listed as Qualifying Interests of SACs (e.g. Otter) would be *ex situ* and separated from any European Site. There are no impact sources identified which would extend outside of the local extent of the works area which could indirectly result in mortality of Qualifying Interests of any SAC.

Timing of Impacts: As outlined above, the potential for effects only relates to the construction stage of decommissioning and rehabilitation. The scale and duration of any operational phase sources of disturbance or displacement are considered insufficient to result in likely significant effects.

2.9.1.5 **Other Projects with Potential to Cause Cumulative Impacts to SAC sites**

Baseline Sources associated with the Proposed Decommissioning Rehabilitation Works upon with cumulative impacts could be based (all outside SAC boundaries):

Baseline effects associated with the proposed Decommissioning and Rehabilitation activities are as follows; movement of construction machinery and vehicles including rail; presence of personnel; noise and vibration and/or visual intrusion from construction works and construction machinery.

Working within watercourses and drainage channels along the site boundary / periphery to retain the function of hydraulic barriers between the site and the surrounding environment. Such works may require localised instream works, mobilisation of particulate matter, local excavations within drainage channels, machinery works within and adjacent to watercourses.

The potential projects and plans within the project Zone of Influence that could contribute towards cumulative effects with the proposed rehabilitation works are presented and considered in **Section 2.6.3**.

Pathway: Contact (direct contact with BnM personnel or machinery during site works), air (through its ability to transmit noise effects), visibility (on site presence of BnM personnel)

Potential Esker Bog Decommissioning and Rehabilitation Impact/Pathway Connectivity: The identified impact sources could possibly reduce water quality or aquatic habitat quality in the local context, where all works are located outside of and at a distance from any designated SAC.

The current appraisal evaluates the possibility for any effects in downstream hydrologically connected SAC European Sites through sediment/contaminant/nutrient laden runoff, or the spread of invasive species, with regard to any indirect habitat loss, reduction in habitat extent, or degradation effects (i.e. to habitat quality) in respect of Qualifying Interests.

The disturbance related impact sources identified above may result in possible localised impacts occurring within the local context of the decommissioning and rehabilitation area during the works phase.

Timing of Impacts: It is considered that during the decommissioning and rehabilitation stages at Esker Bog, the possibility exists for any inadvertent release of silt or other degrading materials to possibly combine with downstream effects from other projects. Although expected to be localised and limited in magnitude, disturbance effects on Otter may combine with other localised sources such as related to Turbary and agriculture to result in increased effects on ex-situ populations. Significant effects during operation can be screened out.

2.9.2 **Potential Sources, Pathways and Timing of Impacts SPAs**

2.9.2.1 **Direct Impacts to Habitats within SPAs**

There is no spatial overlap between Esker Bog and any of the SPA's under consideration. It can therefore reasonably be concluded that there is no potential for direct impact/effects (such as habitat loss, or loss of habitat connectivity) on any SPA's from the proposed decommissioning and rehabilitation of Esker Bog. Possible pathways can only exist for indirect effects on SPA's either secondary, cross-factor or 'ex-situ'. Therefore, there is **no possibility of direct impacts to SPA** species or their associated habitats, and this impact pathway is screened out from further evaluation. No potential for likely significant effects identified. Furthermore, the proposed bog rehabilitation site is not located within 15km of any SPA site and does not support immediate downstream connectivity with an SPA site.

2.9.2.2 **Indirect Impacts to Habitats and Species within SPAs (including ex-Situ effects)**

The proposed Esker bog rehabilitation site is not located within 15km of any SPA site and does not support immediate downstream connectivity with a SPA site. The nearest SPA to Esker Bog is Lough Ennell SPA, located

20km north-west (along the closest straight line distance). Due to the separation distance and lack of connectivity, there will be no indirect impacts (including ex-Situ effects) to SPAs or their associated SCI species and wetland habitats as a result of the proposed bog rehabilitation works. Therefore there will be no indirect impacts (including ex-Situ effects) to SPAs or their associated SCI species and wetland habitats as a result of the proposed bog rehabilitation works.

2.10 Screening Evaluation of the Potential for Effects on European Sites

The Screening evaluation is based on a conceptual site model which identifies potential impact source-pathways between the described Esker Bog decommissioning and rehabilitation and each European Site. This allows for an assessment of any potential for significant effects on the Qualifying Interests / Special Conservation Interests and their respective Conservation Objectives. The relevant stage of the Esker Bog decommissioning and rehabilitation is the construction stage, no impact source-pathways are identified during the operational stage.

The following impact source-pathways for the three SAC sites are evaluated in relation to any potential for significant effects (**Table 10** below):

- Indirect loss or degradation of terrestrial or aquatic habitats (through changes in existing hydraulic regime – flooding of adjacent lands, increased run-off to downstream sites etc.) within SAC sites, alone and in combination;
- Indirect or ex-situ disturbance or displacement of species of Qualifying Interest, alone and in combination;

The evaluation of potential for in-combination effects with regard to Other Plans or Projects includes the plans or projects described in **Section 2.6.3**.

The proposed bog rehabilitation site is not located within 15km of SPA sites and does not support downstream connectivity to SPA sites. There is no potential source-pathway-receptor dynamic between the proposed bog rehabilitation works at Esker and Special Protection Areas (SPAs). Therefore, potential significant effects to SPA sites as a result of the proposed bog rehabilitation works are not possible. Potential impacts and consequent likely significant effects to SPAs as a result of the proposed bog rehabilitation works will not be considered further in this Appropriate Assessment.

Table 10: Evaluation of Possibly Significant Effects to the three SAC sites

	European Site	Separation Distance from Esker Bog	Hydrological Connection – Yes/No	<p>Evaluation of the potential for Esker Bog decommissioning and rehabilitation, either alone or in combination with other plans or projects, to cause either of the following effects to the ten SAC Sites:</p> <p>1. Direct effects to Qualifying Interest habitats or species of an SAC Site (i.e. species mortality, habitat loss, fragmentation, degradation, loss/reduction in connectivity) within or ex-situ the SAC</p> <p>2. Indirect loss or degradation of terrestrial or aquatic habitats within the SAC site;</p> <p>3. Indirect/ex-situ disturbance or displacement of species of Qualifying Interest.</p> <p>4. Indirect or ex-situ mortality of Qualifying Interests</p>
1	River Barrow and River Nore SAC (002162)	14.5km south-west and 26.7km downstream	Y: Remote downstream connectivity via the Esker_020, Figile_040, Figile_050, Figile_060 and Figile_080 watercourses.	<p>1: Screened Out – No likelihood for direct effects to Qualifying Interest habitats of an SAC Site (i.e. habitat loss, fragmentation, degradation, loss/reduction in connectivity) within the SAC</p> <p>The proposed works are not located within or in immediate proximity to this European Site. Therefore there will be no direct impacts to this European Site.</p> <p>2: Screened In - Possibility for indirect loss, reduction or degradation of terrestrial or aquatic habitats within the SAC and consequent effects to reliant species of Qualifying Interest</p> <p>Due to the presence of hydrological connectivity between proposed activities and this European Site possible pathways for effects are identified.</p> <p>3: Screened In - Possibility for indirect or ex-situ disturbance or displacement of species of Qualifying Interests</p> <p>Due to the presence of hydrological connectivity between proposed activities and this European Site, possible pathways for localised effects on (ex-situ) Otter (a species of Qualifying Interest for this European Site) are identified, which cannot be screened out in the absence of measures to avoid harmful effects.</p> <p>4: Screened In – Possibility for indirect or ex-situ mortality to species of Qualifying Interests</p> <p>Due to the presence of hydrological connectivity between proposed activities and this European Site, possible pathways for localised effects on (ex-situ) Otter (a species of Qualifying Interest for this European Site) are identified, and cannot be screened out in the absence of measures to avoid harmful effects such as accidental or inadvertent mortality when undertaking certain works e.g. cleaning of silt ponds.</p>
2	Raheenmore Bog SAC (000582)	9.5km north-west	N: No, located upstream of the proposed works within a separate	<p>1: Screened Out – No likelihood for direct effects to Qualifying Interest habitats of an SAC Site (i.e. habitat loss, fragmentation, degradation, loss/reduction in connectivity) within or ex-situ the SAC</p> <p>The proposed works are not located within or in proximity to this European Site. Therefore there will be no direct impacts to this European Site.</p>

	European Site	Separation Distance from Esker Bog	Hydrological Connection – Yes/No	<p>Evaluation of the potential for Esker Bog decommissioning and rehabilitation, either alone or in combination with other plans or projects, to cause either of the following effects to the ten SAC Sites:</p> <p>1. Direct effects to Qualifying Interest habitats or species of an SAC Site (i.e. species mortality, habitat loss, fragmentation, degradation, loss/reduction in connectivity) within or ex-situ the SAC</p> <p>2. Indirect loss or degradation of terrestrial or aquatic habitats within the SAC site;</p> <p>3. Indirect/ex-situ disturbance or displacement of species of Qualifying Interest.</p> <p>4. Indirect or ex-situ mortality of Qualifying Interests</p>
			hydrological subcatchment. No hydrological connectivity between the proposed bog rehabilitation site and this European Site.	<p>2: Screened Out - Possibility for indirect loss, reduction or degradation of terrestrial or aquatic habitats within the SAC and consequent effects to reliant species of Qualifying Interest</p> <p>Due to the separation distance to this SAC and the lack of hydrological connectivity, possible pathways for indirect loss, reduction or degradation of terrestrial / aquatic habitats within or in close proximity to Esker Bog can be excluded.</p> <p>3: Screened Out - No potential for indirect or ex-situ disturbance or displacement of species of Qualifying Interests</p> <p>The proposed works located 9.5km from this European Site. There are no species of Qualifying Interest listed for this European Site. Therefore there will be no indirect or ex-situ disturbance effects in this regard.</p> <p>4: Screened Out - No potential for indirect or ex-situ mortality to species of Qualifying Interests</p> <p>The proposed works located 9.5km from this European Site. There are no species of Qualifying Interest listed for this European Site. Therefore there will be no indirect or ex-situ effects in this regard.</p>
3	The Long Derries, Edenderry SAC (000295)	8.5km east	N: No, located upstream of the proposed works within a separate hydrological subcatchment. No hydrological connectivity between the proposed bog rehabilitation site and this European Site.	<p>1: Screened Out – No likelihood for direct effects to Qualifying Interest habitats of an SAC Site (i.e. habitat loss, fragmentation, degradation, loss/reduction in connectivity) within or ex-situ the SAC</p> <p>The proposed works are not located within or in proximity to this European Site. Therefore there will be no direct impacts to this European Site.</p> <p>2: Screened Out - Possibility for indirect loss, reduction or degradation of terrestrial or aquatic habitats within the SAC and consequent effects to reliant species of Qualifying Interest</p> <p>Due to the separation distance to this SAC and the lack of hydrological connectivity, possible pathways for indirect loss, reduction or degradation of terrestrial / aquatic habitats within or in close proximity to Esker Bog can be excluded.</p> <p>3: Screened Out - No potential for indirect or ex-situ disturbance or displacement of species of Qualifying Interests</p> <p>The proposed works located 8.5km from this European Site. There are no species of Qualifying Interest listed for this European Site. Therefore there will be no indirect or ex-situ disturbance effects in this regard.</p> <p>4: Screened Out - No potential for indirect or ex-situ mortality to species of Qualifying Interests</p> <p>The proposed works located 8.5km from this European Site. There are no species of Qualifying Interest listed for this European Site. Therefore there will be no indirect or ex-situ effects in this regard.</p>

2.11 Screening for Appropriate Assessment: Conclusion Statement

The Screening Evaluation provided herein has examined the potential for any effects arising via source pathway linkages with regard to connectivity to designated European Sites (SACs) within the zone of influence of all predicted Project impacts. An extended buffer zone of 15km was further considered, in line with NPWS guidance (DoEHLG, 2009), for evaluation of effects on any European Site which may arise associated with the proposed decommissioning and rehabilitation of Esker Bog, as required. There is a total of three European sites located within the 15km zone of consideration:

1. River Barrow and River Nore SAC (002162)
2. Raheenmore Bog SAC (000582)
3. The Long Derries Edenderry SAC (000925)

Following screening it can reasonably be concluded **that there is no likelihood of significant effects to two of the above European Sites** (Raheenmore Bog and Long Derries Edenderry SAC) because of the proposed project, either alone or in-combination with other plans or projects. **Therefore, the potential for significant effects on three European Sites has been excluded, the Project has been 'Screened Out' from the Appropriate Assessment process, no Appropriate Assessment is required.**

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

- River Barrow and River Nore SAC (002162)

A Stage 2 Appropriate Assessment Report follows in respect of these European Sites.

3 STAGE 2: APPROPRIATE ASSESSMENT

3.1 Introduction to Stage 2

Following screening to inform the requirement for Appropriate Assessment, the potential for significant effects, could not be excluded, with regard to the following European Site:

- River Barrow and River Nore SAC (002162)

This section comprises a detailed appraisal of the impacts of the proposed Esker Bog Decommissioning and Rehabilitation (either directly or indirectly) or in-combination with other projects or plans, on the integrity of the above listed European Sites, and is considered with respect to their conservation objectives and to their structure and function.

An overview of Esker Bog proposed Decommissioning and Rehabilitation is provided in **Section 2.2**. See also the document included as **Appendix B** of this report.

3.1.1 Pressures and Threats of European Sites

Threats and pressures published for the River Barrow and River Nore SAC are presented in **Table 11** below.

Table 11 – Threats and Pressures for River Barrow and River Nore SAC

Rank ¹²	Threat Pressure ¹³	Inside (i) / Outside (o) / Both (b)
H	K01.01 - Abiotic (slow) natural processes - Erosion	i
M	B07 - Forestry activities not referred to above	b
M	C01.03 - Peat extraction	o
L	D03.01 - Port areas	i
H	H01 - Pollution to surface waters (limnic, terrestrial, marine & brackish)	b
H	J02.12.02 - Dykes and flooding defense in inland water systems	i
M	J03.02.01 - Reduction in migration/ migration barriers	i
L	A10.01 - Removal of hedges and copses or scrub	i
M	J02.02.01 - Dredging/ removal of limnic sediments	i
L	C01.01.01 - Sand and gravel quarries	b
M	J02 - Human induced changes in hydraulic conditions	b

¹² Threat, pressure and impact ranking provided on Natura 2000 data form: H – High, M - Medium, L - Low

¹³ Threat code sourced from Natura 2000 data form and follows reference list provided on threats, pressures and activities for European sites

Rank¹²	Threat Pressure¹³	Inside (i) / Outside (o) / Both (b)
H	A02.01 - Agricultural intensification	b
M	B02 - Forest and Plantation management & use	b
M	I01 - Invasive non-native species	i
L	F01.01 - Intensive fish farming, intensification	i
M	J02.06 - Water abstractions from surface waters	i
L	E02 - Industrial or commercial areas	o
M	A04.01.01 - Intensive cattle grazing	i
L	F02.01.02 - Netting	i
L	F02.03 - Leisure fishing	i
M	F02 - Fishing and harvesting aquatic resources	o
M	M01 - Changes in abiotic conditions	i
H	J02.05.02 - Modifying structures of inland water courses	i
M	B05 - Use of fertilizers (forestry)	b

3.1.2 Conservation Objectives for the relevant European Sites

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and;
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and;
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

3.1.2.1 River Barrow and River Nore SAC (Site Code 002162)

The site-specific conservation objectives of the River Barrow and River Nore SAC aim to define favourable conservation condition for the particular habitat or species at that site. These objectives and conditions are considered in **Table 12** below in respect of the Qualifying Interests of River Barrow and River Nore SAC which were screened in for further evaluation. Further consideration is provided in **Table 12** to each Qualifying Interest and the potential for the proposed project to support connectivity and potentially impact this feature of Qualifying Interest.

The conservation objectives of River Barrow and River Nore SAC are available in full on the National Parks & Wildlife Service website at <https://www.npws.ie/protected-sites>. The conservation objectives reproduced in the table below were sourced from NPWS Conservation Objectives: NPWS (2011) River Barrow and River Nore SAC 002162. Version date: 19.07.2011. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht and should be read in conjunction with any other supporting documentation on the referenced website as provided above.

Table 12: Conservation Objectives of the River Barrow and River Nore SAC (Site Code 002162)

Code and Qualifying Interest	Conservation Objective	Potential Connectivity Source-Pathway-Receptor Link	Requiring Further Consideration in this NIS
[1016] Desmoulin's whorl snail (<i>Vertigo moulinsiana</i>)	To maintain the favourable conservation condition of Desmoulin's whorl snail in the River Barrow and River Nore SAC.	No potential source-pathway-receptor link as the proposed bog decommissioning and rehabilitation are a significant distance upstream from suitable habitat and known locations of this species. The nature of the proposed bog decommissioning and rehabilitation the attenuation capacity of the watercourses between Esker Bog and the distribution of this species within the SAC means that there will be no potential impact of the proposed decommissioning and rehabilitation to this species.	No
[1029] Freshwater pearl mussel (<i>Margaritifera margaritifera</i>)	The status of the freshwater pearl mussel (<i>Margaritifera margaritifera</i>) as a qualifying Annex II species for the River Barrow and River Nore SAC is currently under review. The outcome of this review will determine whether a site-specific conservation objective is set for this species. Please note that the Nore freshwater pearl mussel (<i>Margaritifera</i>	Esker Bog and the downstream sections of the River Barrow and River Nore SAC are located within the Barrow FWPM catchment. This catchment is categorised as a <i>catchment with previous records of Margaritifera, but current status unknown</i> . The adjoining Nore catchment supports living Freshwater Pearl Mussel. There is no hydrological connectivity	No

Code and Qualifying Interest	Conservation Objective	Potential Connectivity Source-Pathway-Receptor Link	Requiring Further Consideration in this NIS
	<i>durrovensis</i>) remains a qualifying species for this SAC.	between the catchment draining the proposed decommissioning and rehabilitation works at Esker and the River Nore Freshwater Pearl Mussel population.	
[1092] White-clawed crayfish (<i>Austropotamobius pallipes</i>)	To maintain the favourable conservation condition of White-clawed crayfish in the River Barrow and River Nore SAC.	Yes – potentially located in downstream sections of the River Barrow and River Nore SAC.	Yes
[1095] Sea lamprey (<i>Petromyzon marinus</i>)	To restore the favourable conservation condition of Sea lamprey in the River Barrow and River Nore SAC.	No potential source-pathway-receptor link as the proposed bog decommissioning and rehabilitation are a significant distance upstream (>95km upstream) from this estuarine / coastal habitat. The nature and scale of the proposed decommissioning and rehabilitation and the attenuation capacity of the watercourses between Esker Bog and the distribution of this species within the SAC means that there will be no potential impact of the decommissioning and rehabilitation to this species.	No
[1096] Brook lamprey (<i>Lampetra planeri</i>)	To restore the favourable conservation condition of Brook lamprey in the River Barrow and River Nore SAC.	Yes – potentially located in downstream sections of the River Barrow and River Nore SAC.	Yes

Code and Qualifying Interest	Conservation Objective	Potential Connectivity Source-Pathway-Receptor Link	Requiring Further Consideration in this NIS
[1099] River lamprey (<i>Lampetra fluviatilis</i>)	To restore the favourable conservation condition of River lamprey in the River Barrow and River Nore SAC.	Yes – potentially located in downstream sections of the River Barrow and River Nore SAC.	Yes
[1103] Twaite shad (<i>Alosa fallax</i>)	To restore the favourable conservation condition of Twaite shad in the River Barrow and River Nore SAC.	No potential source-pathway-receptor link as the proposed bog decommissioning and rehabilitation are a significant distance upstream (>95km upstream) from this estuarine / coastal habitat. The nature and scale of the proposed decommissioning and rehabilitation and the attenuation capacity of the watercourses between Esker Bog and the distribution of this species within the SAC means that there will be no potential impact of the decommissioning and rehabilitation to this species. In addition, the distance between the proposed development site and the dilutional capacity of the watercourses, waterbodies and the large transitional waterbody are likely to remove the potential any of significant effects, direct or indirect to this species for the River Barrow and River Nore	No

Code and Qualifying Interest	Conservation Objective	Potential Connectivity Source-Pathway-Receptor Link	Requiring Further Consideration in this NIS
		SAC as a result of water borne pollutants.	
[1106] Atlantic salmon (<i>Salmo salar</i>) (only in fresh water)	To restore the favourable conservation condition of Salmon in the River Barrow and River Nore SAC.	Yes – potentially located in downstream sections of the River Barrow and River Nore SAC.	Yes
[1130] Estuaries	To maintain the favourable conservation condition of Estuaries in the River Barrow and River Nore SAC.	No potential source-pathway-receptor link as the proposed decommissioning and rehabilitation are a significant distance upstream (>95km upstream) from this estuarine / coastal habitat. The nature and scale of the proposed decommissioning and rehabilitation and the attenuation capacity of the watercourses between Esker Bog and this habitats means that there will be no potential impact of the decommissioning and rehabilitation to this habitat. In addition, the distance between the proposed development site and the dilutional capacity of the watercourses, waterbodies and the large transitional waterbody are likely to remove the potential any of significant effects, direct or indirect to this habitat for the River Barrow and River Nore	No

Code and Qualifying Interest	Conservation Objective	Potential Connectivity Source-Pathway-Receptor Link	Requiring Further Consideration in this NIS
		SAC as a result of water borne pollutants.	
[1140] Mudflats and sandflats not covered by seawater at low tide	To maintain the favourable conservation condition of the Mudflats and sandflats not covered by seawater at low tide in the River Barrow and River Nore SAC.	No potential source-pathway-receptor link as the proposed decommissioning and rehabilitation are a significant distance upstream (>95km upstream) from this estuarine / coastal habitat. The nature and scale of the proposed decommissioning and rehabilitation and the attenuation capacity of the watercourses between Esker Bog and this habitats means that there will be no potential impact of the decommissioning and rehabilitation to this habitat. In addition, the distance between the proposed development site and the dilutional capacity of the watercourses, waterbodies and the large transitional waterbody are likely to remove the potential any of significant effects, direct or indirect to this habitat for the River Barrow and River Nore SAC as a result of water borne pollutants.	No

Code and Qualifying Interest	Conservation Objective	Potential Connectivity Source-Pathway-Receptor Link	Requiring Further Consideration in this NIS
[1310] <i>Salicornia</i> and other annuals colonizing mud and sand	To maintain the favourable conservation condition of <i>Salicornia</i> and other annuals colonizing mud and sand in the River Barrow and River Nore SAC.	No potential source-pathway-receptor link as the proposed decommissioning and rehabilitation are a significant distance upstream (>95km upstream) from this estuarine / coastal habitat. The nature and scale of the proposed decommissioning and rehabilitation and the attenuation capacity of the watercourses between Esker Bog and this habitats means that there will be no potential impact of the decommissioning and rehabilitation to this habitat. In addition, the distance between the proposed development site and the dilutional capacity of the watercourses, waterbodies and the large transitional waterbody are likely to remove the potential any of significant effects, direct or indirect to this habitat for the River Barrow and River Nore SAC as a result of water borne pollutants.	
[1330] Atlantic salt meadows (<i>Glaucopuccinellietalia maritima</i>)	To restore the favourable conservation condition of Atlantic salt meadows in the River Barrow and River Nore SAC.	No potential source-pathway-receptor link as the proposed bog decommissioning and rehabilitation are a	

Code and Qualifying Interest	Conservation Objective	Potential Connectivity Source-Pathway-Receptor Link	Requiring Further Consideration in this NIS
		significant distance upstream (>95km upstream) from this estuarine / coastal habitat. The nature and scale of the proposed decommissioning and rehabilitation and the attenuation capacity of the watercourses between Esker Bog and this habitats means that there will be no potential impact of the decommissioning and rehabilitation to this habitat. In addition, the distance between the proposed development site and the dilutional capacity of the watercourses, waterbodies and the large transitional waterbody are likely to remove the potential any of significant effects, direct or indirect to this habitat for the River Barrow and River Nore SAC as a result of water borne pollutants.	
[1355] Otter (<i>Lutra lutra</i>)	To restore the favourable conservation condition of Otter in the River Barrow and River Nore SAC.	Yes – potentially located in downstream sections of the River Barrow and River Nore SAC. Also likely to use the sections of the Figile River and Slate River, upstream of the River Barrow and River Nore SAC designation.	Yes

Code and Qualifying Interest	Conservation Objective	Potential Connectivity Source-Pathway-Receptor Link	Requiring Further Consideration in this NIS
[1410] Mediterranean salt meadows (<i>Juncetalia maritimi</i>)	To restore the favourable conservation condition of Mediterranean salt meadows in the River Barrow and River Nore SAC.	No potential source-pathway-receptor link as the proposed bog decommissioning and rehabilitation are a significant distance upstream (>95km upstream) from this estuarine / coastal habitat. The nature and scale of the proposed decommissioning and rehabilitation and the attenuation capacity of the watercourses between Esker Bog and this habitats means that there will be no potential impact of the decommissioning and rehabilitation to this habitat. In addition, the distance between the proposed development site and the dilutional capacity of the watercourses, waterbodies and the large transitional waterbody are likely to remove the potential any of significant effects, direct or indirect to this habitat for the River Barrow and River Nore SAC as a result of water borne pollutants.	No
[1421] Killarney fern (<i>Trichomanes speciosum</i>)	To maintain the favourable conservation condition of Killarney Fern in the River Barrow and River Nore SAC.	No potential source-pathway-receptor link as the proposed bog decommissioning and rehabilitation are a	No

Code and Qualifying Interest	Conservation Objective	Potential Connectivity Source-Pathway-Receptor Link	Requiring Further Consideration in this NIS
		significant distance upstream (>70km upstream) from this species. The nature and scale of the proposed decommissioning and rehabilitation and the attenuation capacity of the watercourses between Esker Bog and the distribution of this species within the SAC means that there will be no potential impact of the proposed rehabilitation to this species.	
[1990] Nore freshwater pearl mussel (<i>Margaritifera durrovensis</i>)	To restore the favourable conservation condition of the Nore freshwater pearl mussel in the River Barrow and River Nore SAC.	No – there is no hydrological connectivity between Esker Bog, the downstream sections of the River Barrow and River Nore SAC and this species of Qualifying Interest. The Nore freshwater pearl mussel is located within a separate hydrological catchment to Esker Bog and is located within the main channel of the River Nore.	No
[3260] Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	To maintain the favourable conservation condition of Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation in	Yes – potentially located in downstream sections of the River Barrow and River Nore SAC.	Yes

Code and Qualifying Interest	Conservation Objective	Potential Connectivity Source-Pathway-Receptor Link	Requiring Further Consideration in this NIS
	the River Barrow and River Nore SAC.		
[4030] European dry heaths	To maintain the favourable conservation condition of European dry heaths in the River Barrow and River Nore SAC.	No potential for connectivity as this is a terrestrial habitat located on the steep valley sides of the Barrow Valley, tributaries and in the Blackstairs Mountains.	No
[6430] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	To maintain the favourable conservation condition of Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels in the River Barrow and River Nore SAC.	This Annex I habitat is potentially located in downstream sections of the River Barrow and River Nore SAC, especially in the various areas of alluvial forest and elsewhere within the SAC where the floodplain of the river is intact. However, the nature and scale of the proposed decommissioning and rehabilitation and the attenuation capacity of the watercourses between Esker Bog and the distribution of this habitat within the SAC means that there will be no potential impact of the proposed rehabilitation to this species.	Yes
[7220] * Petrifying springs with tufa formation (Cratoneurion)	To maintain the favourable conservation condition of Petrifying springs with tufa formation (Cratoneurion) in the	This Annex I habitat is potentially located in downstream sections of the River Barrow and River Nore SAC, especially in the various areas of alluvial forest	Yes

Code and Qualifying Interest	Conservation Objective	Potential Connectivity Source-Pathway-Receptor Link	Requiring Further Consideration in this NIS
	River Barrow and River Nore SAC.	and elsewhere within the SAC where the floodplain of the river is intact. However, the nature and scale of the proposed decommissioning and rehabilitation and the attenuation capacity of the watercourses between Esker Bog and the distribution of this habitat within the SAC means that there will be no potential impact of the proposed rehabilitation to this species.	
[91A0] Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	To restore the favourable conservation condition of Old oak woodland with <i>Ilex</i> and <i>Blechnum</i> in the River Barrow and River Nore SAC.	<p>The distribution of this habitat within the SAC are described in the SAC site synopsis as follows <i>'The best examples of old oak woodlands are seen in the ancient Park Hill woodland in the estate at Abbeyleix; at Kyleadohir, on the Delour, Forest Wood House, Kylecorragh and Brownstown Woods on the Nore; and at Cloghristic Wood, Drummond Wood and Borris Demesne on the Barrow, though other patches occur throughout the site'.</i></p> <p>No potential for connectivity as this is a terrestrial habitat located outside of the river floodplain.</p>	No

Code and Qualifying Interest	Conservation Objective	Potential Connectivity Source-Pathway-Receptor Link	Requiring Further Consideration in this NIS
[91E0] * Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae)	To restore the favourable conservation condition of Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae) in the River Barrow and River Nore SAC.	This habitat located in downstream sections of the River Barrow and River Nore SAC. The Conservation Objectives supporting document for the River Barrow and River Nore SAC identifies this Annex I habitat on the margins of the River Barrow main >20km downstream of the site. The nature and scale of the proposed decommissioning and rehabilitation and the attenuation capacity of the watercourses between Esker Bog and the distribution of this species within the SAC means that there will be no potential impact of the proposed rehabilitation to this species.	Yes

The findings of the assessment presented in **Table 12** indicates that the proposed works have the potential to impact freshwater dependent and nutrient sensitive aquatic habitats and species associated with the River Barrow and River Nore SAC potentially located downstream of the Esker Bog Rehabilitation site. The Qualifying Habitats and Species of the River Barrow and River Nore SAC potentially impacted by the proposed works are as follows:

- [1092] White-clawed crayfish (*Austropotamobius pallipes*)
- [1096] Brook lamprey (*Lampetra planeri*)
- [1099] River lamprey (*Lampetra fluviatilis*)
- [1106] Atlantic salmon (*Salmo salar*) (only in fresh water)
- [1355] Otter (*Lutra lutra*)
- [3260] Water courses of plain to montane levels with the *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation
- [6430] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
- [7220] *Petrifying springs with tufa formation (*Cratoneurion*)
- [91E0] *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)

The Site Specific Conservation Objectives for these features of Qualifying Interest are addressed in **Section 3.1.2.2** below.

3.1.2.2 Site Specific Conservation Objectives of the River Barrow and River Nore SAC

Table 13: Site specific conservation objectives for White-clawed crayfish (*Austropotamobius pallipes*) (1092)

Attribute	Measure	Target	Potential Impact
Distribution	Occurrence	No reduction from baseline.	The proposed decommissioning and rehabilitation works may have the potential to impact these attributes (particularly water quality) in the event of major siltation events (resulting from the impact sources referenced in Section 2.9.1).
Population structure: recruitment	Percentage occurrence of juveniles and females with eggs	Juveniles and/or females with eggs in at least 50% of positive samples	
Negative indicator species	Occurrence	No alien crayfish species	
Disease	Occurrence	No instances of disease	
Water quality	EPA Q value	At least Q3-4 at all sites sampled by EPA	
Habitat quality: heterogeneity	Occurrence of positive habitat features	No decline in heterogeneity or habitat quality	

Table 14: Site specific conservation objectives for Brook Lamprey (*Lampetra planeri*) (1096)

Attribute	Measure	Target	Potential Impact
Distribution	% of river accessible	Access to all watercourses down to first order streams	The proposed works will not contribute barrier effects to lamprey or directly effect spawning or distribution dynamics in the downstream catchment. There is the potential for indirect secondary effects as a result of water quality impacts during the proposed rehabilitation works.
Population structure of juveniles	Number of age/size groups	At least three age/size groups of brook/river lamprey present	
Juvenile density in fine sediment	Juveniles/m ²	Mean catchment juvenile density of brook/river lamprey at least 2/m ²	
Extent and distribution of spawning	m ² and occurrence	No decline in extent and distribution of spawning beds	
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater),	More than 50% of sample sites positive	

Attribute	Measure	Target	Potential Impact
	downstream of spawning areas		

Table 15: Site specific conservation objectives for River Lamprey (*Lampetra fluviatilis*) (1099)

Attribute	Measure	Target	Potential Impact
Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem and major tributaries down to second order accessible from estuary	The proposed works will not contribute barrier effects to lamprey or directly effect spawning or distribution dynamics in the downstream catchment. There is the potential for indirect secondary effects as a result of water quality impacts during the proposed rehabilitation works.
Population structure of juveniles	Number of age/size groups	At least three age/size groups of river/brook lamprey present	
Juvenile density in fine sediment	Juveniles/m ²	Mean catchment juvenile density of brook/river lamprey at least 2/m ²	
Extent and distribution of spawning habitat	m ² and occurrence	No decline in extent and distribution of spawning beds	
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	

Table 16: Site specific conservation objectives for Atlantic Salmon (*Salmo salar*) (1106)

Attribute	Measure	Target	Potential Impact
Distribution: extent of anadromy	% of river accessible	100% of river channels down to second order accessible from estuary	The proposed works will not contribute barrier effects to Atlantic Salmon or directly effect spawning or distribution dynamics in the downstream catchment. There is the potential for indirect secondary effects as a result of
Adult spawning fish	Number	Conservation Limit (CL) for each system consistently exceeded	
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold	

Attribute	Measure	Target	Potential Impact
		value. Currently set at 17 salmon fry/5 min sampling	water quality impacts and deterioration of spawning habitat during the proposed rehabilitation works (resulting from the impact sources referenced in Section 2.9.1).
Out-migrating smolt abundance	smolt abundance Number	No significant decline	
Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	
Water quality	EPA Q value by EPA	At least Q4 at all sites sampled by EPA	

Table 17: Site specific conservation objectives for Water courses of plain to montane levels with the Ranunculus fluitantis and Callitriche-Batrachion vegetation (3260)

Attribute	Measure	Target	Potential Impact
Habitat distribution	Occurrence	No decline, subject to natural processes	The proposed decommissioning and rehabilitation works have the potential to impact these attributes (particularly water quality) in the event of major siltation events (resulting from the impact sources referenced in Section 2.9.1).
Habitat area	Kilometres	Area stable or increasing, subject to natural processes	
Hydrological regime: river flow	Metres per second	Maintain appropriate hydrological regimes	
Hydrological regime: groundwater discharge	Metres per second	The groundwater flow to the habitat should be permanent and sufficient to maintain tufa formation	
Substratum composition: particle size range	Millimetres	The substratum should be dominated by large particles and free from fine sediments	
Water chemistry: minerals	Milligrammes per litre	The groundwater and surface water should have sufficient concentrations of minerals to allow deposition and	

Attribute	Measure	Target	Potential Impact
		persistence of tufa deposits	
Water quality: suspended sediment	Milligrammes per litre	The concentration of suspended solids in the water column should be sufficiently low to prevent excessive deposition of fine sediments	
Water quality: nutrients	Milligrammes per litre	The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition	
Vegetation composition: typical species	Occurrence	Typical species of the relevant habitat sub-type should be present and in good condition	
Floodplain connectivity	Area	The area of active floodplain at and upstream of the habitat should be maintained	

Table 18: Site specific conservation objectives for Otter (*Lutra lutra*) (1355)

Attribute	Measure	Target	Potential Impact
Distribution	Percentage positive sites	No significant decline.	The proposed works will not contribute barrier effects to otter or directly effect breeding dynamics within the SAC boundary. There is the potential for indirect secondary effects as a result of water quality impacts, ex-situ disturbance and mortality during the
Extent of terrestrial habitat Hectares	No significant decline.	No significant decline. Area mapped and calculated as 122.8ha above high water mark (HWM); 1136.0ha along river banks / around ponds	
Extent of marine habitat Hectares	Hectares	No significant decline. Area mapped and calculated as 857.7ha	

Attribute	Measure	Target	Potential Impact
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 616.6km	proposed rehabilitation works (resulting from the impact sources referenced in Section 2.9.1).
Extent of freshwater (lake) habitat	Hectares	No significant decline. Area mapped and calculated as 2.6ha	
Couching sites and holts	Number	No significant decline	
Fish biomass available	Kilograms	No significant decline	

Table 19: Site specific conservation objectives for Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430)

Attribute	Measure	Target	Potential Impact
Habitat distribution	Occurrence	No decline, subject to natural	The proposed decommissioning and rehabilitation works will not impact the attributes outlined for this Annex I habitat; i.e. habitat distribution and area, hydrological regime and vegetation structure & composition.
Habitat area	Area stable or increasing,	Area stable or increasing,	
Hydrological regime: Flooding depth/height of water table	Metres	Maintain appropriate hydrological regimes	
Vegetation structure: sward height	Centimetres	30-70% of sward is between 40 and 150cm in height	
Vegetation composition: broadleaf herb: grass ratio	Percentage	Broadleaf herb component of vegetation between 40 and 90%	
Vegetation composition: typical species	Number	At least 5 positive indicator species present	
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control- NB Indian balsam (<i>Impatiens glandulifera</i>), monkeyflower (<i>Mimulus guttatus</i>), Japanese knotweed (<i>Fallopia japonica</i>) and giant	

Attribute	Measure	Target	Potential Impact
		hogweed (Heracleum mantegazzianum)	

Table 20: Site specific conservation objectives for *Petrifying springs with tufa formation (Cratoneurion) (7220)

Attribute	Measure	Target	Potential Impact
Habitat area	Square metres	Area stable or increasing, subject to natural processes	The proposed decommissioning and rehabilitation works have the potential to impact these attributes (particularly water quality) in the event of major siltation events (resulting from the impact sources referenced in Section 2.9.1).
Habitat distribution	Occurrence	No decline. See map 6 for recorded location	
Hydrological regime: height of water table; water flow	Metres; metres per second	Maintain appropriate hydrological regimes	
Water quality	Water chemistry measures	Maintain oligotrophic and calcareous conditions	
Vegetation composition: typical species	Occurrence	Maintain typical species	

Table 21: Site specific conservation objectives for *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae (91E0))

Attribute	Measure	Target	Potential Impact
Habitat area	Hectares	Area stable or increasing, subject to natural processes, at least 181.54ha for sites surveyed: see map 6	The proposed decommissioning and rehabilitation works will not impact the attributes outlined for this Annex I habitat; i.e. habitat distribution, woodland size and structure, hydrological regime and vegetation composition.
Habitat distribution	Occurrence	No decline. Surveyed locations shown on map 6	
Woodland size	Hectares	Area stable or increasing.	
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with	

Attribute	Measure	Target	Potential Impact
		semi- mature trees and shrubs; and well-developed herb layer	
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	
Woodland structure: natural regeneration	Seedling:sapling:pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	
Hydrological regime: Flooding depth/height of water table	Metres	Appropriate hydrological regime necessary for maintenance of alluvial vegetation	
Woodland structure: dead wood m ³ per hectare;	number per hectare	At least 30m ³ /ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder)	
Woodland structure: veteran trees	Number per hectare	No decline	
Woodland structure: indicators of local distinctiveness	Occurrence	No decline	
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including ash (<i>Fraxinus excelsior</i>) alder (<i>Alnus glutinosa</i>), willows (<i>Salix</i> spp) and locally, oak (<i>Quercus robur</i>)	

Attribute	Measure	Target	Potential Impact
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non- native invasive species, absent or under control	

3.2 Summary of Impact Pathways screened in for examination at Stage 2

The impact pathways presented in **Table 22** to Qualifying Interests/Special Conservation Interests are examined in relation to each of the three European Sites under consideration, in order to evaluate the effect of Esker Bog Decommissioning and Rehabilitation, if any, on the integrity of the River Barrow and River Nore SAC.

Table 22: Qualifying Interests/Special Conservation Interests and Impact Pathways examined at Stage 2

European Site	Qualifying Interest/Special Conservation Interest for evaluation at Stage 2	Impact examined at Stage 2
River Barrow and River Nore SAC (Site Code 002162)	[1092] White-clawed crayfish (<i>Austropotamobius pallipes</i>) [1096] Brook lamprey (<i>Lampetra planeri</i>) [1099] River lamprey (<i>Lampetra fluviatilis</i>) [1106] Atlantic salmon (<i>Salmo salar</i>) (only in fresh water) [1355] Otter (<i>Lutra lutra</i>) [3260] Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation [6430] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [7220] * Petrifying springs with tufa formation (Cratoneurion) (7220)*Petrifying springs with tufa formation (Cratoneurion) [91E0] * Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnus incanae, Salicion albae)	a) Indirect/ex-situ disturbance or displacement of species of Qualifying Interest. b) Indirect loss, reduction or degradation of aquatic habitats within the SAC and consequent effects to reliant aquatic species of Qualifying Interest c) Indirect/ex-situ mortality to species of Qualifying Interest.

3.3 Evaluation of potentially adverse impacts at Stage 2 (Alone & In Combination)

Evaluations are generally grouped between those which impact habitats (direct or indirect based on where secondary habitat degradation potentially occurs, i.e. within a European Site boundary or outside) and then species (Indirect/ex-situ disturbance/displacement of species of Qualifying Interest). Potentially adverse impacts on aquatic habitats and water dependent species of Qualifying Interest are addressed under the treatment of Indirect loss, reduction or degradation of terrestrial or aquatic habitats within the SAC and consequent effects to reliant species of Qualifying Interest. Indirect/ex-situ mortality is only considered relevant in respect of Otter, as this is a volant species capable of entering the Esker Bog site and utilising the attenuation ponds and adjacent watercourses.

In combination evaluations are based on the other plans or projects described in **Section 2.6.3**.

3.3.1 Indirect/ex-situ disturbance or displacement of species of Qualifying Interest (Otter)

3.3.1.1 Alone

Otter are rated as a very high sensitivity receptor (based on International importance ratings) and do not tolerate disturbance at or near holts (breeding dens) that are in active use (breeding may occur at any time of the year, but most likely during the Summer/early Autumn period). When Otters are not breeding, records suggest that Otters are less sensitive to human disturbance (Chanin, 2013). This could include the disturbance of animals at resting places (couches) but also at natal holts.

There are no known Otter holts at Esker Bog or its environs, and the general unsuitability of areas subject to decommissioning and rehabilitation no doubt constrains usage, however Otter may utilise existing silt ponds or open areas of watercourses located upstream and downstream of the site and between the peatland basins.

The likelihood of otter disturbance and displacement during the proposed works are considered to be low and highly unlikely. Should otter utilise the watercourses at the margins of the site (such as the Esker_020 Stream and its tributaries) on an occasional or temporary basis, then disturbance effects as a result of the proposed works would be most likely to occur during daylight hours. Such disturbance effects are highly unlikely, however should they occur, they would be considered to be temporary and indirect. Such disturbance and displacement effects, should they occur, will not be adverse.

Disturbance effects are more likely in respect of foraging or resting animals, ex-situ from the SAC, primarily within aquatic habitats but also within adjacent riparian corridors and /or whilst crossing the bog/ utilising drains in close proximity to proposed works. Many of the drainage features present whilst not within an SAC boundary, are ultimately hydrologically connected to a downstream SAC which includes Otter as a Qualifying Interest.

Were the impacts described above to occur within an SAC watercourse it may result in direct adverse effects on QI Species and Conservation objectives such as a decline in range and/or distribution and numbers of individuals within the SAC catchment.

Although there are no known otter were holts identified within Esker Bog site, otter spraints were identified along the Esker_020 watercourse located on the site's southern boundary. This section of the Esker_020 watercourse provides suitable foraging and commuting habitat for otter and it is possible that otter may utilise the silt pond features located near the southern boundary of Esker Bog. Therefore, there is the likelihood of otter disturbance during the proposed rehabilitation works, especially where these works are concentrated on or near silt ponds and the Esker_020 watercourse near the site's southern boundary.

In instances where this impact occurs outside or ex-situ the SAC it may, dependant on source magnitude, degree of hydrological connectivity and presence or absence of mitigating measures in line with tried and tested methods, have secondary adverse effects on connected or supporting populations for downstream but ecologically connected Otter.

3.3.1.2 In Combination

There is potential for cumulative effects from other plans or projects which may result in similar source-impact-pathways to Otter within other tributaries or within the connected areas of the Figile and Barrow subcatchments.

The decommissioning and rehabilitation of Esker Bog by BnM, which is within the River Barrow catchment, may result in likely significant/ potentially adverse effects on Otter.

In the absence of mitigation measures to avoid/reduce harmful effects, the order of cumulative effects is that of both projects combined, notwithstanding that it is assumed that Appropriate Assessment and mitigation measures, if required, will be undertaken and put in place.

Additional sources of disturbance such as baseline agricultural activities or existing turbary are considered unlikely to result in in combination adverse effects, due to habituation, described tolerance and occurrence during primarily daylight hours.

All other plans or projects identified are subject to Appropriate Assessment and it is assumed that in-combination effects are therefore unlikely, due to the requirement for mitigation if potentially adverse effects are identified.

3.3.1.3 Stage 2 Evaluation

In the absence of measures to avoid/reduce harmful effects, the magnitude of effects (alone, in combination and synergistic) is evaluated as low, with a moderate to high possibility of adverse effects on European Sites/Conservation Objectives evaluated.

3.3.2 Indirect/ex-situ mortality to species of Qualifying Interest (Otter)

3.3.2.1 Alone

Otter are rated as a very high sensitivity receptor (based on International importance ratings) and may be sensitive to mortality through inadvertent collision with moving vehicles or machinery, in particular during hours of darkness. However, such an occurrence is highly unlikely as the rehabilitation works will be completed during daylight hours only. Some travel to and from and within the site may be undertaken after daylight hours.

There are no known Otter holts at Esker Bog or its environs, and the general unsuitability of areas subject to decommissioning and rehabilitation no doubt constrains usage, however Otter may utilise existing silt ponds or open areas of watercourses located upstream and downstream of the site and between the peatland basins.

Indirect and ex-situ mortality of otter are more likely in respect of foraging or resting animals, primarily within aquatic habitats but also within adjacent riparian corridors and /or whilst crossing the bog/ utilising drains in close proximity to proposed works. Many of the watercourses (including drainage for historic peat extraction) present whilst not within an SAC boundary, are ultimately hydrologically connected to a downstream SAC which includes Otter as a Qualifying Interest.

Were the impacts described above to occur within an SAC watercourse it may result in direct adverse effects on QI Species and Conservation objectives such as a decline in range and/or distribution and numbers of individuals within an SAC - however this is not applicable in respect of Esker Bog Decommissioning and Rehabilitation.

Although there are no known otter were holts identified within Esker Bog site, otter spraints were identified along the Esker_020 watercourse located on the site's southern boundary. This section of the Esker_020 watercourse provides suitable foraging and commuting habitat for otter and it is possible that otter may utilise the silt pond features located near the southern boundary of Esker Bog. Therefore, there is the likelihood of otter mortality during proposed rehabilitation works, especially where these works are concentrated on or near silt ponds and the Esker_020 watercourse near the site's southern boundary.

In instances where this impact occurs outside or *ex-situ* an SAC it may, dependant on source magnitude, degree of hydrological connectivity and presence or absence of mitigating measures in line with tried and tested methods, have secondary adverse effects on connected or supporting populations for downstream but ecologically connected Qualifying Interest (QI) species, thus affecting Site Integrity/Conservation Objectives similarly.

3.3.2.2 In combination

There is potential for cumulative effects from other plans or projects which may result in similar source-impact-pathways to Otter within other tributaries or within the downstream areas of River Barrow and River Nore SAC.

The decommissioning and rehabilitation of Esker Bog by BnM, which is also within the River Barrow catchment, may result in likely significant/ potentially adverse effects on Otter.

In the absence of mitigation measures to avoid/reduce harmful effects, the order of cumulative effects is that of both projects combined, notwithstanding that it is assumed that Appropriate Assessment and mitigation measures, if required, will be undertaken and put in place.

Additional sources of disturbance such as baseline agricultural activities are considered unlikely to result in combination adverse effects.

All other plans or projects identified are subject to Appropriate Assessment and it is assumed that in-combination effects are therefore unlikely, due to the requirement for mitigation if potentially adverse effects are identified.

3.3.2.3 Stage 2 Evaluation

In the absence of measures to avoid/reduce harmful effects, the magnitude of effects (alone, in combination and synergistic) is evaluated as low, with moderate to high possibility of adverse effects on European Sites/Conservation Objectives evaluated.

3.3.3 Indirect loss, reduction or degradation of aquatic habitats within the SAC and consequent effects to reliant aquatic species of Qualifying Interest

Aquatic habitats and species in this instance refers to the habitats and species of Qualifying Interest for the River Barrow and River Nore SAC located in the downstream sections of the River Barrow SAC that support indirect and remote hydrological connectivity (See **Table 12**). Deterioration in water quality within Esker Bog and the downstream watercourses as a result of the proposed works, could result following the release of sediment or silt laden water from the site to the receiving watercourses; i.e. the Esker River and further downstream to the Figile River. Siltation of the receiving watercourses could effect the in-situ and / or reliant QI species for the River Barrow and River Nore SAC such as Otter, Atlantic Salmon, River Lamprey, Brook Lamprey, White-clawed Crayfish and the following aquatic / water dependent habitats for the River Barrow and River Nore SAC; Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation (3260) Petrifying springs with tufa formation (Cratoneurion)* (7220) and Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae* (91E0). However, the nature of the proposed decommissioning and rehabilitation and the attenuation capacity of the watercourses between Esker Bog and the distribution of this species within the SAC means that there will be no potential impact of the proposed rehabilitation to this species.

Decommissioning and Rehabilitation (D&R) at Esker Bog will require direct excavation of the banks and bed of the existing internal drainage channels (peat production drains) to facilitate drain blocking, levelling of existing stock piles, reprofiling areas of cutover peat to remove preferential flowpaths to drainage channels, movement of peat to create various dams/speedbumps and cell bunds, regulate pumping to facilitate creation of wetlands. It will require the use of machinery and involve the removal of waste, including raw material, potentially contaminated soils or peat, railway infrastructure, and fuel.

Esker Bog is hydrologically connected to the Esker_020 and Figile_040 watercourse. The contributing catchment area where Esker discharges into the Esker Stream _020 waterbody is c. 55km² which is estimated to have a QMED¹⁴ of 9.64m³/s. This is 26.7km upstream of the River Barrow and River Nore SAC.

Given the substantial dilution rates that are achievable between Esker Bog and the River Barrow and River Nore SAC, it is not anticipated that the proposed rehabilitation measures will give rise to any perceptible impacts on

¹⁴ QMED can be defined as the median of the Annual Maximum (Amax) series of a watercourse at a gauged location. The QMED is the flood with a return period of 2 years and is approximately equivalent to bankfull flow

water quality either alone or in-combination. Furthermore, the discharge from the bogs will be managed through silt traps which will substantially reduce the quantity of peat silt export from the bog. During low flow conditions when dilution potential will be lowest the silt traps will be most effective, in contrast during large events when silt traps are least effective very substantial dilution will be achievable within the Esker_020 and Figile_040 watercourses.

3.3.3.1 Water quality effects due to sedimentation or the release of deleterious materials

Alone

Erosion and deposition are natural process in watercourses varying naturally throughout the year. However, additional sediment contributions entering the watercourse, such as from D&R in, adjacent to or upstream of individual watercourses, could have negative implications for fish and invertebrates due to physical damage and reduced feeding/foraging, as well as negative impacts due to compaction of spawning gravels by sediment causing mortality impacts for salmonid eggs (affecting recruitment) and interfering with invertebrate life stages within gravel substrates (interstitial spaces). These impacts may be mobilised downstream and affect river reaches at a distance from the physical works. Effects on these receptors may in turn affect downstream aquatic QI habitats and species for the River Barrow and River Nore SAC. In addition, water quality effects due to contamination by fuels, oils or cementitious material has the potential to lead to direct toxicity events to QI species, or sub-lethal degradation and loss of aquatic habitat quality.

The release of large volumes of sediment and /or deleterious materials to aquatic habitats upstream of an SAC may reduce the quality of aquatic habitat resource for QI species, and/or result in effective habitat loss should QI species cease to utilise degraded habitats.

Overall effects may reduce the suitability of the receiving waters as a resource for QI species and the degrade water dependent and nutrient sensitive QI habitats, thus affecting Site Integrity and/or Conservation Objectives – particularly those which seek to maintain or restore the favourable conservation condition of the QI habitat / species at the River Barrow and River Nore SAC.

Given the substantial dilution rates that are achievable within the Esker_020 waterbody, it is not anticipated that the proposed rehabilitation measures will give rise to any perceptible impacts on water quality either alone or in-combination. Furthermore, the discharge from the bogs will be managed through silt traps which will substantially reduce the quantity of peat silt export from the bog. During low flow conditions when dilution potential will be lowest the silt traps will be most effective, in contrast during large events when silt traps are least effective very substantial dilution will be achievable within the Esker_020 waterbody.

In combination

There is potential for cumulative effects from other plans or projects which may result in similar source-impact-pathways to waterbodies upstream of or within the SAC's under consideration.

The decommissioning and rehabilitation of Esker Bog by BnM, may result in likely significant/potentially adverse effects on water quality.

In the absence of mitigation measures to avoid/reduce harmful effects, the order of cumulative effects is that of both projects combined, notwithstanding that it is assumed that Appropriate Assessment and mitigation measures, if required, will be undertaken and put in place.

Various sources of water-quality related effects - with linkage to activities such as Agriculture or Turbary - within the SAC constitute activities requiring consent (ARC) of the minister and therefore are unlikely to result in combination adverse effects.

All other plans or projects identified are subject to Appropriate Assessment/and or consented mitigation measures and it is assumed that in-combination effects are therefore unlikely, due to the requirement for mitigation if potentially adverse effects are identified.

Stage 2 Evaluation

In the absence of measures to avoid/reduce harmful effects, the magnitude of effects (alone, in combination and synergistic) is evaluated as moderate, with adverse effects on European Sites/Conservation Objectives evaluated as likely.

3.3.3.2 Alteration of flow regimes or changes to watercourse morphology

Alone

Watercourse morphology relates to the shape of a watercourse channel, its bed and banks and how erosion, transportation of water, sedimentation and the composition of riparian vegetation changes this shape over time. In the absence of mitigation there is potential for sediment deposition at a scale which may alter tributary channel morphology within or ex-situ an SAC (including silt ponds where they occur thus reducing the suitability of receiving (downstream) aquatic habitats and species of Qualifying Interest. Such occurrences could affect Site Integrity and/or Conservation Objectives for a European Site – particularly those which seek to maintain or restore the favourable conservation condition of aquatic habitats and species at the designated SAC.

The following Hydrological effects may occur to the local environment as a result of the proposed works and may influence flow regimes to the receiving environment and receiving watercourses. These include:

- Increases in groundwater levels which may affect neighbouring lands across hydraulic gradients;
- Reductions in conveyance capacity around or through the Esker Bog, or;
- Marginal alteration of topographical catchments, also resulting in flooding as a result of increased run-off.

Increased flooding and consequent run-off to lands adjacent to and surrounding Esker Bog could result in increased run-off of potential pollutants to the receiving watercourses; i.e. the Esker River and the Figile River, both of which provide remote connectivity between the site and the River Barrow and River Nore SAC. Changes to the hydrological regime (reductions or increases in run-off) could result in consequent effects to ex-situ water dependent species using the downstream areas of the Figile River. Increased flow volumes / regimes to receiving watercourses may change localised watercourse morphology (as a result of localised erosion / scouring) which could contribute ex-situ effects to QI species using the downstream areas of the Figile River catchment, particularly otter.

In combination

There is potential for cumulative effects from other plans or projects which may result in similar source-impact-pathways to waterbodies upstream of or within the SAC under consideration.

The decommissioning and rehabilitation of Esker Bog by BnM, which is also within the River Figile catchment and supports connectivity to the River Barrow main channel, may result in likely significant/potentially adverse effects on water quality.

In the absence of mitigation measures to avoid/reduce harmful effects, the order of cumulative effects is that of both projects combined, notwithstanding that it is assumed that Appropriate Assessment and mitigation measures, if required, will be undertaken and put in place.

Various sources of flow regime or water morphology related effects, with linkage to activities such as Agriculture or Turbary, within the SAC constitute activities requiring consent (ARC) of the minister and therefore are unlikely to result in in combination adverse effects, and notably are a substantial distance downstream. Where other projects with water morphology related effects fall under the planning code, they will be considered by the relevant local authority to determine if Appropriate Assessment/and or consented mitigation measures are required to offset potential adverse effects to European Sites. Therefore such projects are unlikely to result in in combination adverse effects.

All other plans or projects identified are subject to Appropriate Assessment/and or consented mitigation measures and it is assumed that in-combination effects are therefore unlikely, due to the requirement for mitigation if potentially adverse effects are identified.

Stage 2 Evaluation

In the absence of measures to avoid/reduce harmful effects, the magnitude of effects (alone, in combination and synergistic) is evaluated as low, with adverse effects on European Sites/Conservation Objectives evaluated as likely.

3.3.3.3 Spread of invasive species

Alone

Invasive aquatic species include non-native, terrestrial invasive species such as Rhododendron, Japanese knotweed or Himalayan balsam, invasive riparian vegetation (such as Japanese knotweed) and also fish and mobile invertebrate fauna (such as Asian clam, Signal crayfish, or non-native shrimp species). Aquatic invasive species may be introduced to unaffected catchments or spread within infected watercourses to hydrologically connected SAC during the course of instream works or transported via excavated material by site machinery.

Aquatic invasive species have the potential for significant ecosystem disturbance, disrupting the predator/prey balance or causing habitat disruption within aquatic systems. The spread of aquatic invasive species is not restricted in extent to the footprint of rehabilitation / decommissioning works but can be transported both upstream (mobile species and 3rd party transport) and downstream (hydrological transport) within a watercourse, potentially extending throughout the catchment.

No non-native invasive species have been recorded at Esker Bog.

Non-native, invasive species potentially affecting the aquatic environment can also include terrestrial species which compromise bank integrity, riparian structural diversity and riparian invertebrate production contributing to habitat diversity and feeding inputs within the aquatic system.

Were the impacts described above to occur within, in close proximity to, or upstream of an SAC watercourse it may result in adverse effects on QI's and Conservation objectives such as the resource status and favourable condition of QI habitat, by virtue of effects to structure and composition of QI habitat, an altered hydrological regime and through secondary effects on prey item species, affecting the supporting habitat quality for SCI Species.

In combination

There is potential for cumulative effects from other plans or projects which may result in similar source-impact-pathways to the European Site under consideration.

The decommissioning and rehabilitation of Esker Bog by BnM, which is also within the River Barrow catchment, may result in likely significant/potentially adverse effects on water quality. In the absence of mitigation measures to avoid/reduce harmful effects, the order of cumulative effects is that of both projects combined, notwithstanding that it is assumed that Appropriate Assessment and mitigation measures, if required, will be undertaken and put in place.

Various sources of vectors for the introduction of invasive species, with linkage to activities such as Agriculture or Turbary, within the SAC constitute activities requiring consent (ARC) of the minister and therefore are unlikely to result in in combination adverse effects - additionally these are a substantial distance downstream. Where projects with invasive species related effects fall under the planning code, they will be considered by the relevant local authority to determine if Appropriate Assessment/and or consented mitigation measures are required to offset potential adverse effects to European Sites. Therefore such projects are unlikely to result in in-combination adverse effects.

All other plans or projects identified are subject to Appropriate Assessment/and or consented mitigation measures and it is assumed that in-combination effects are therefore unlikely, due to the requirement for mitigation if potentially adverse effects are identified.

Stage 2 Evaluation

In the absence of measures to avoid/reduce harmful effects, the magnitude of effects (alone, in combination and synergistic) is evaluated as low, with adverse effects on European Sites/Conservation Objectives evaluated as likely.

3.4 Mitigation Measures

3.4.1 Description of the measures

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

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

- Bog restoration/rehabilitation works will be restricted to within the footprint of the proposed rehabilitation works area.
- The proposed rehabilitation works will have due regard to noise limits and hours of operation (i.e. dusk and dawn) to minimise any potential disturbance on resident and local fauna that utilise the site and immediate environs.
- A standard operating procedure overseen by the Project Ecologist will be in place for all PCAS activities to avoid any significant effects on breeding birds. This will include ground nesting birds and will apply to silt pond cleaning, and cutaway activities. Restriction zones will be in place to avoid effects on any identified ground nesting birds/waterfowl as appropriate.
- All plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (SI 359/1996).
- The proposed works will be restricted to daylight hours and there will be no requirement for artificial lighting.
- Silt ponds will be inspected and maintained as per the IPC Licence.
- During periods of heavy precipitation and run-off, works will be halted.
- Works will be carried out using a suitably sized machine and, in all circumstances, excavation depths and volumes will be minimised where possible.
- All machines will be regularly checked and maintained prior to arrival at the site to prevent hydrocarbon leakage.
- Hoses and valves will be checked regularly for signs of wear and will be closed and securely locked when not in use.
- Fuelling and lubrication of equipment shall only be carried out in designated areas away from surface water drainage features and ecologically sensitive areas.
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling.
- All waste will be sorted by the works crews, managed within the site in designated waste disposal facilities, and removed to a licenced waste facility, in line with BnM Standard operating practice.
- Vehicles will never be left unattended during refuelling.
- No direct discharges to waters will be made. No washings from vehicles, plant or equipment will be carried out on site.
- All plant refuelling will take place using mobile fuel bowsers. Only dedicated trained and competent personnel will carry out refuelling operations.

- All fuels required for machinery and equipment will be stored in a designated location, away from main traffic activity, at the nearest BnM Compound. All fuel will be stored in bunded, locked storage containers. Diesel or petrol fuel and mechanical oils will also be used by site vehicles.
- Mobile storage such as fuel bowsers will be bunded to 110% capacity to prevent spills. Tanks for bowsers and generators shall be double skinned. When not in use, all valves and fuel trigger guns from fuel storage containers will be locked. All pumps using fuel or containing oil will be locally and securely bunded where there is the possibility of discharge to waters.
- Potential impacts caused by spillages etc. during rehabilitation works will be reduced by keeping spill kits and other appropriate equipment on-site.
- Site works will be carried out in accordance with 'best practice'. In order to ensure compliance and implementation of 'best practice', these measures will be communicated to relevant Bord na Móna staff and updated as required.
- All waste water will be removed by a licenced waste contractor to a licenced waste water treatment facility.
- Any fertiliser used will be Rock Phosphate and will not be applied in the following conditions:
 1. The land is waterlogged;
 2. The land is flooded, or it is likely to flood;
 3. The land is frozen, or covered with snow;
 4. Heavy rain is forecast within 48 hours (forecasts will be checked from Met Éireann).
 5. The ground slopes steeply and there is a risk of water pollution, when factors such as surface run-off pathways, the presence of land drains, the absence of hedgerows to mitigate surface flow, soil condition and ground cover are taken into account.
- 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.

The below image / flow chart (**Figure 17**) provides Bord na Móna's proposed clean up procedures for fuel/oil and peat.

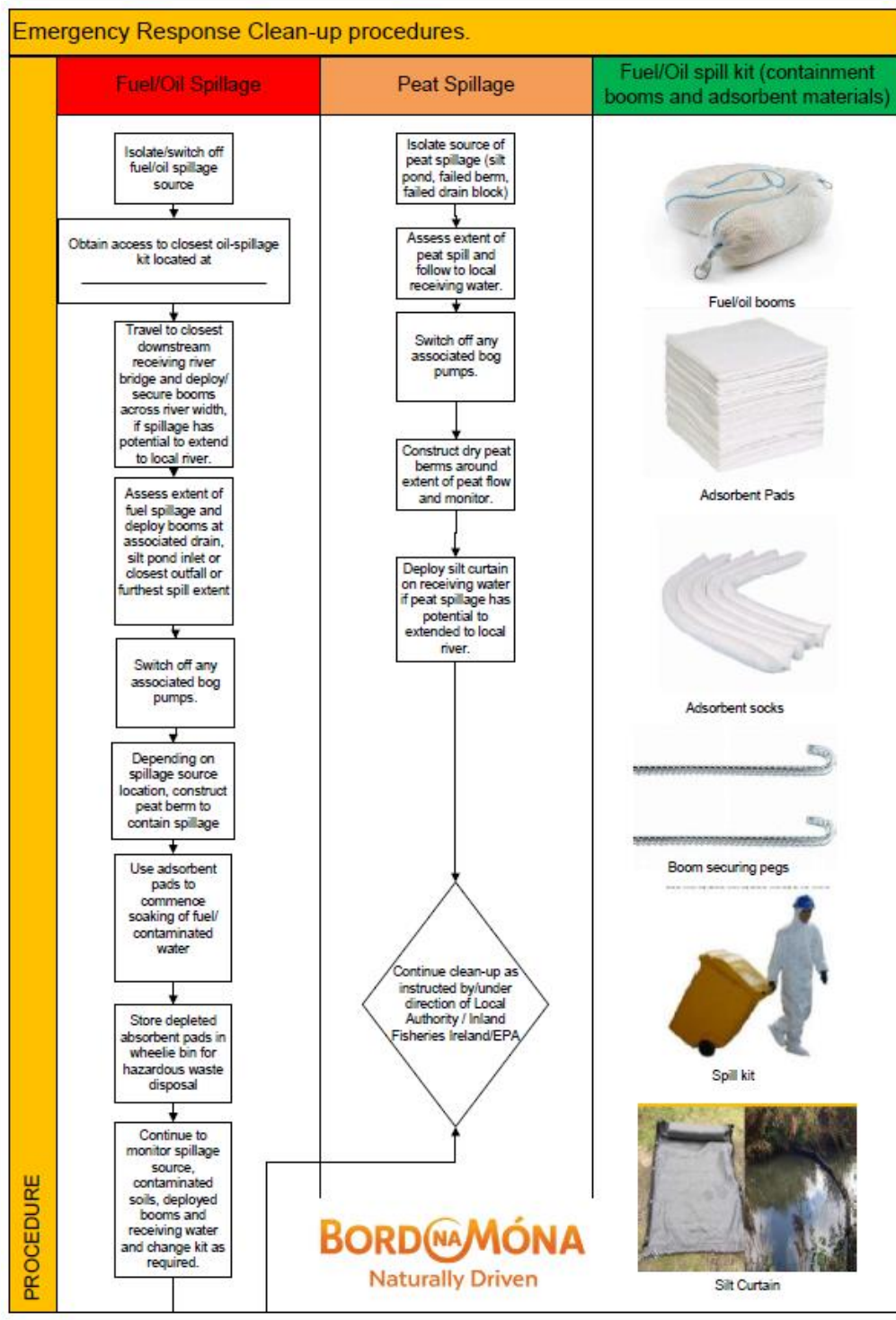


Figure 17: BnM Emergency Response Clean Up Procedures

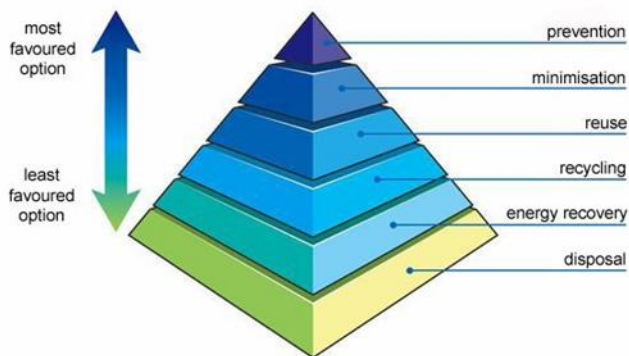
3.4.1.2 Best Practice Measures around the treatment of Waste

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

- Disposal or recovery of waste shall take place only as specified in Schedule 2(i) Hazardous Wastes for Disposal/Recovery and Schedule 2(ii) Other Wastes for Disposal/Recovery of this licence and in accordance with the appropriate National and European legislation and protocols. No other waste shall

be disposed of/recovered either on-site or off-site without prior notice to, and prior written agreement of, the Agency.

- Waste sent off-site for recovery or disposal shall only be conveyed to a waste contractor, as agreed by the Agency, and only transported from the site of the activity to the site of recovery/disposal in a manner which will not adversely affect the environment.
- A full record, which shall be open to inspection by authorized persons of the Agency at all times, shall be kept by the licensee on matters relating to the waste management operations and practices at this site. This record shall as a minimum contain details of the following:
 - The names of the agent and transporter of the waste.
 - The name of the persons responsible for the ultimate disposal/recovery of the waste.
 - The ultimate destination of the waste.
 - Written confirmation of the acceptance and disposal/recovery of any hazardous waste consignments sent off-site.
 - The tonnages and EWC Code for the waste materials listed in Schedule 2(i) Hazardous Wastes for Disposal/Recovery and Schedule 2(ii) Other Wastes for Disposal/Recovery sent off-site for disposal/recovery.
 - Details of any rejected consignments.
- A copy of this Waste Management record shall be submitted to the Agency as part of the AER for the site.
- As required by the licence, these waste items will be removed for recycling or disposal, using external contractors with the required waste collection permits, as agreed by the EPA, with waste records maintained as required for inspection by authorized persons of the EPA at all times.
- Where possible, Bord na Móna will utilize the appropriate waste hierarchy to identify waste that can be 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.

3.4.1.3 Best Practice & Biosecurity

The potential for importation or introduction of non-native plant species (such as Japanese Knotweed, Himalayan Balsam, etc.) has been identified. Section 49 of the European Communities (Birds and Natural Habitats) Regulations 2011 prohibits the introduction and dispersal of invasive alien species (particularly plant species) listed on Part 1 (third column) of the 'Third Schedule'.

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

- Records of problematic invasive species within the various bog units will be marked out with signs to highlight areas of infestation to personnel.
- All plant machinery will be restricted from disturbing known colonies of invasive species.
- All plant machinery will avoid unnecessary crossings to adjoining lands.
- For any material entering the site, the supplier must provide an assurance that it is free of invasive species.
- All plant and equipment employed on the proposed works (e.g. diggers, tracked machines, footwear etc.) must be thoroughly cleaned down using a power washer unit, and washed into a dedicated and contained area prior to arrival on site and on leaving site to prevent the spread of invasive aquatic / riparian species such as (but not limited to) Japanese knotweed (*Fallopia japonica*) and Himalayan Balsam (*Impatiens glandulifera*). A sign off sheet must be maintained by the contractor to confirm cleaning;
- Good site hygiene will be employed to prevent the introduction and spread of problematic invasive alien plant species (i.e. Japanese Knotweed (*Fallopia japonica*), Himalayan Balsam (*Impatiens glandulifera*), Himalayan Knotweed (*Persicaria wallichii*), etc.) by thoroughly inspecting and washing vehicles prior to entering the works area.

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

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

- All water quality monitoring equipment which has been used in water will be treated with a disinfectant or a strong saline solution and then thoroughly dried (ideally over 24 hours) BEFORE being used in water again.
- Check, Clean, Dry protocol will be adhered with before and after visiting a river or lake for monitoring, in line with Best Practice¹⁵ or for activities such as Sphagnum inoculation.
- Virkon Aquatic will be available as required.

3.4.1.4 Silt Ponds

Silt Ponds – 9 no. Silt ponds with a total volume of 33,359.03 m³ and area of 2.01ha are in place at Esker Bog and connected to the existing drainage network.

These silt ponds, already stipulated and in use as mitigation measures in respect of Peat Extraction under IPC license, will continue to function as the primary intervention in terms of sediment release to receiving waterbodies. It should be noted, that the silt pond network at Esker Bog will not be the sole mitigation measure to attenuate silt laden waters emanating from the site during the project construction and operational phases. The design of the PCAS scheme requires the creation of internal drain blocking measures (including terminal dams), which will in itself reduce the possibility of surface run-off to the receiving environment during the

¹⁵ <https://www.biodiversityireland.ie/projects/invasive-species/crayfish-plague/>

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

Regular cleaning and reporting on same already forms part of annual (AER) reporting submitted to EPA. All Silt Ponds at Esker Bog are currently compliant with EPA requirements. **Table 13** below, and **Figure 18** overleaf summarise and illustrate the onsite Silt Pond locations, the latter also illustrates the current flow regime within the main drainage network (into which any other drains also feed). Continued maintenance and reporting on same will be reported on annually until IPC license Surrender.

Table 13 Silt Ponds in use at Esker Bog

Bog Name	IPC License Reference	Pond No.	Volume (m ³)
Esker	503_01	1_38	1643.26
Esker	503_01	2_39	1858.15
Esker	503_01	3_40	2873.73
Esker	503_01	3_4142	5451.25
Esker	503_01	3_47	2847.23
Esker	503_01	4_43	4397.08
Esker	503_01	6_45	4978.81
Esker	503_01	7_45	6752.19
Esker	503_01	New Pond	2557.33
		Total	33,359.03

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

The attenuation of silt and particulate matter generated as a result of the proposed works is a key mitigation measure for the proposed rehabilitation and decommissioning works. The main source of potential impact to influence significant adverse effects to the downstream areas of the River Barrow and River Nore SAC relate to particulate matter run-off from the site, during the rehabilitation works. A key consideration in this regard will be drain blocking as described in **Section 3.4.1.5** below. This methodology relies on the placement of terminal dams at the extremity of the drain; i.e. that closest to watercourse within the receiving environment. The securing of strategic peat dams will allow the hydraulic separation between the proposed rehabilitation works and the receiving and downstream aquatic environment, and in so doing isolating these works from sensitive ecological and environmental receptors within the project zone of influence and in the case of Esker Bog the River Barrow and River Nore SAC.

Further detail is provided in this section on the proposed rehabilitation measures at Esker Bog, particularly the provision of measures Deep Peat 3 (DPT3), Deep Peat 4 (DPT4) and Deep Peat 5 (DPT5).

It is proposed to develop these measures across 318.31ha of the Esker Bog site (See **Figure 12**, **Figure 13** and the accompanying Bog Rehabilitation Plan in **Appendix B**). The development of these measures will involve the construction of berms and field re-profiling, blocking outfalls, managing overflows and drainage channels for excess water and *Sphagnum* inoculation.

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

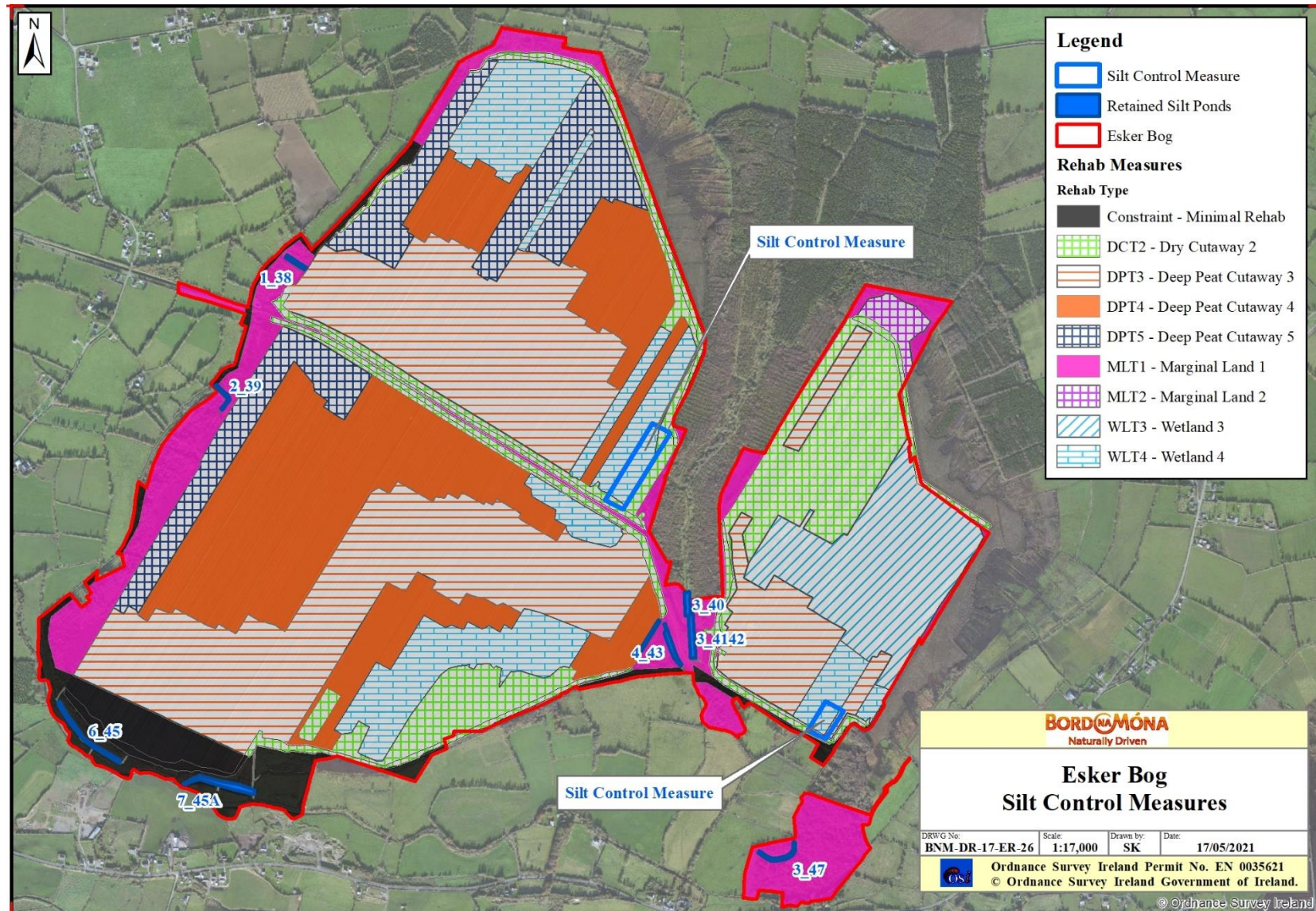


Figure 18: Esker Site Silt Control Measures

3.4.1.5 Measures to avoid runoff when carrying out drain blocking

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

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

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

3.4.1.6 Measures for cleaning Silt Ponds within EPA Blue line features

Cleaning of silt ponds integrated into or adjoining EPA Blue line features, will follow the below best practice measures.

- Cleaning of silt ponds will align with best practice measures, including BnM Standard Operating Procedures (SOPs) for works within and near watercourses, works with hydrocarbons, biosecurity measures when working at and different watercourses and waterbodies.
- Prior to cleaning of silt ponds on streams/rivers in any particular year, Inland Fisheries Ireland will be notified in advance.
- Cleaning of silt ponds will be completed under licence (following consultation with IFI) and in accordance with strict biosecurity measures. Cognisance of capture of non-target aquatic species (Crayfish, lamprey, small fish etc.) within the dredged material and the secure rescue and translocation of these species downstream of the pond cleaning works in line with IFI guidance. Silt ponds will be cleaned from the inlet point to the outlet point allowing fish and aquatic life to migrate downstream as the works progress. The silt pond cleaning works and species translocation efforts will be overseen by

a suitably qualified Ecologist/Ecological Clerk of Works/Environmental Supervisor and ongoing monitoring undertaken by the project ecologist.

- Prior to the commencement of the works, the excavator shall be inspected for invasive species. Should any be observed they should be removed and disposed off site to a licenced waste facility. The machine bucket and arm shall be treated with 1% Virkon Aquatic.
- Excavated silt material will be placed at least 20m away from the blue line feature and will be deposited into corralled berms and thereafter secured into the nearby ground with the back of the machine excavator bucket, to ensure particulate matter is not mobilised during or following rainfall events.
- Retain vegetation on un-worked banks and avoid unnecessary scraping of silt pond margins and banks.
- The above will be overseen by a suitably qualified Ecologist/Ecological Clerk of Works.

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

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

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

3.4.1.7 Rehabilitation Design at Esker Bog

Further detail is provided in this section on the proposed rehabilitation measures at Esker Bog, particularly the provision of measures Deep Peat 3 (DPT3), Deep Peat 4 (DPT4) and Deep Peat 5 (DPT5).

It is proposed to develop these measures across 316.50ha of the Esker Bog site (See **Figure 12**, **Figure 13** and the accompanying Bog Rehabilitation Plan in **Appendix B**). The development of these measures will involve the construction of berms and field re-profiling, blocking outfalls, managing overflows and drainage channels for excess water and *Sphagnum* inoculation.

Once constructed and fully operational, these rehabilitation features will act in the same way as a series individual silt ponds. The functioning of these features will act as an source of surface water retention and attenuation on site, further mitigating the risk of silt release from this area to the receiving environment. The location of the silt control measures and silt ponds for Esker Bog are presented in **Figure 18**.

In addition to the above design principles and their inherent attenuation capacities, it is considered that the Esker_020 watercourse and downstream Figile_040 afford substantial dilution rates. The contributing catchment area where Esker discharges into the Esker_020 waterbody is c. 55km² and is estimated to have a QMED of 9.64m³/s. This is 26.7km upstream of the River Barrow and River Nore SAC.

Given the substantial dilution rates achievable within the Esker and Figile watercourses, it is not anticipated that the proposed rehabilitation measures will give rise to any perceptible impacts on water quality either alone or in-combination. Furthermore, the discharge from the bogs will be managed through silt traps (**Section**

3.4.1.5) which will substantially reduce the quantity of peat silt export from the bog. During low flow conditions when dilution potential will be lowest the silt traps will be most effective, in contrast during large events when silt traps are least effective very substantial dilution will be achievable within the Esker and Figle watercourses.

3.4.1.8 Mortality or disturbance to Otter

- Confirmatory surveys for active Otter holts and breeding activity will be carried out 150m upstream and downstream of suitable habitat prior to the commencement of works in close proximity.
- Should it be confirmed all works within 150m of an active otter holt, will be carried out during daylight hours and outside of 2 hours after sunrise or before sunset during summer and outside of 1 hours after sunrise or before sunset during winter.
- Silt pond cleaning (See **Section 3.4.1.6**) will be monitored by a suitably qualified Ecologist/Ecological Clerk of Works to ensure that there is no disturbance or mortality to otter. This will involve an initial walkover survey / check of the silt pond feature prior to commencement of the cleaning works.
- No wheeled or tracked vehicles (of any kind) will be used within 20m of active, but non-breeding otter holts, and light work will not take place within 15m of such holts, except under license.
- The prohibited area associated with otter holts, should they be located in confirmatory surveys, will, where appropriate, be protected from any inadvertent disturbance from any works or personnel occurring nearby such as at a silt pond and declared as 'Ecology Restriction Zone' with no mention of otters to any onsite staff.
- Appropriate awareness of the purpose of the excluded area will be conveyed through toolbox talks with site staff and sufficient signage will be placed on each possible access point. All contractors or operators on site will be made fully aware of the procedures pertaining to Ecology Restriction Zones and subject to audits and non-conformance records in the event of non-compliance, to be included in reports submitted to Local Authorities and relevant Statutory Consultees.
- All construction works will be carried out during daylight hours.
- All works will be carried out and completed in compliance with Bord na Mona's Standard Operating Procedure for otter (**Appendix G**).

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

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

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

This mitigation measure has been included first and foremost to avoid flooding of adjacent lands where hydraulic gradients may exist, but secondarily mitigates negative quality effects on watercourses in the receiving environment (from addition nutrient run-off along flooding pathways), and hence downstream connected European Sites (River Barrow and River Nore SAC) and their nutrient sensitive and water dependent habitats and species of Qualifying Interest.

Key drainage features at Esker Bog are presented in **Figure 19**.

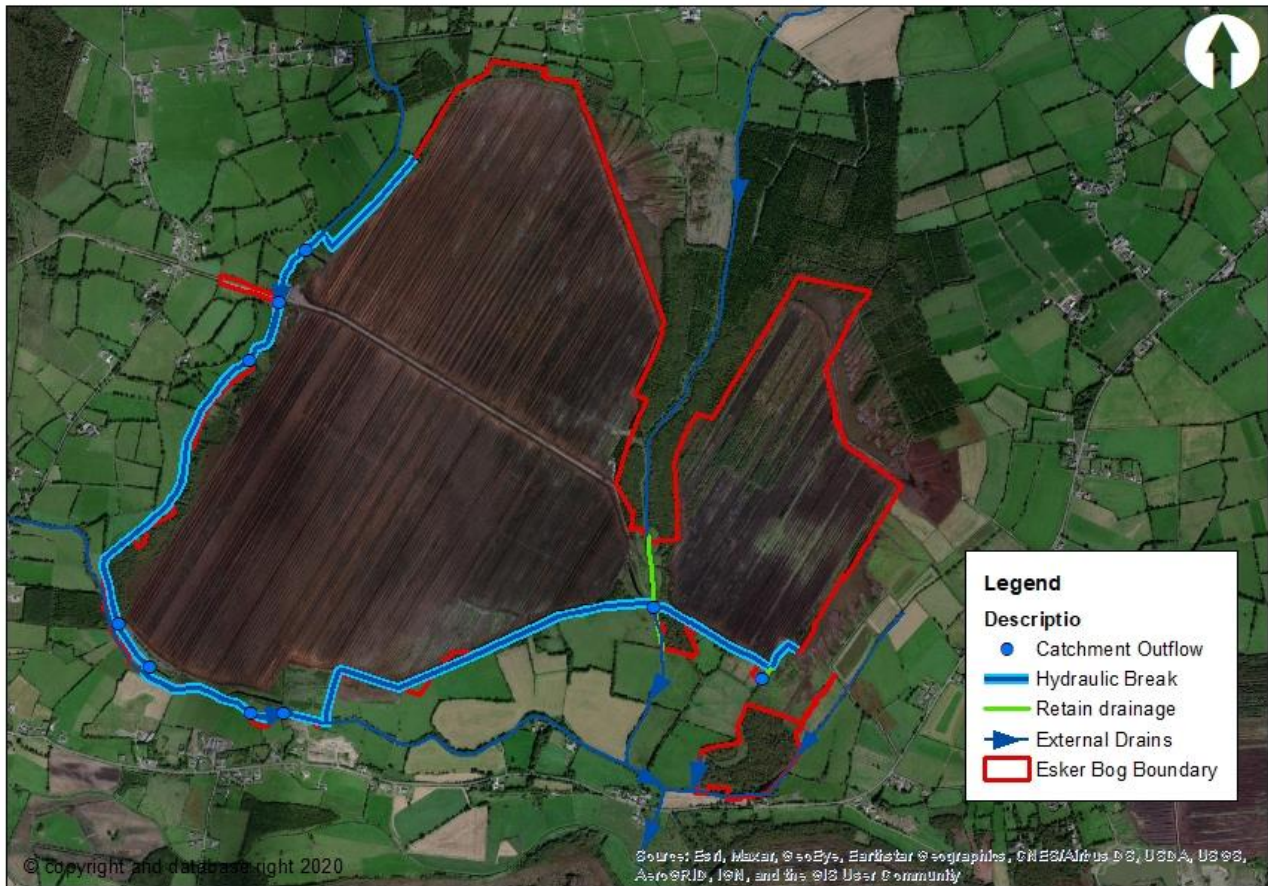


Figure 19: Key drainage features for Esker Bog

3.4.1.10 Upgrade of boundary or peripheral drains outside of the proposed rehabilitation footprint

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

- Prior to commencement of channel works, at least 2 no. check dams will be placed at the downstream end of the drainage channel to control the flow of suspended sediment downstream to receiving watercourses.
- The most downstream check dam will comprise locally sourced turves and double bagged sand bags to initially secure and check downstream flow within the channel. At least 10m upstream of this check dam, a peat dam will be created and keyed into the adjoining drainage channel banks following the methodologies presented in **Section 2.6.1.3**.
- The build-up of silt material upstream of the constructed check dams will be monitored during upgrade works and the silt material will be removed from the drainage channel during works as it builds up. The material will be removed from the channel, spread and levelled into the adjacent field, a minimum of 10m from the nearest drain.
- The constructed check dams will be inspected during periods of dry weather to ensure no 'cracking' of peat has occurred which might allow for discharge.
- Upon completion of the upgrade works, all silt will be removed from the drainage channel immediately upstream of the 2 standard drain blocks prior to their removal. The 2 standard drain blocks will only be

removed once all upgrade works are completed and once all water within the channel is suitably settled with no evidence of suspended solids within the water column.

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

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

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

3.4.1.11 Mitigation to Prevent Berm Failure

The below mitigation measures will be put in place when constructing and working with berm features as part of the bog rewetting and rehabilitation process. The berm design adopts an empirical design approach. It is proposed to apply proven sizes, proportions, materials, and assemblies from existing successful rehabilitation measures and flood defence berm features carried out in the past by Bord na Mona. This represents mitigation for the proposed rehabilitation works through design; i.e. integrating key design principles into the rehabilitation efforts to restrict potential berm failure and consequent run-off to the receiving environment. Further details on berm design and mitigation incorporated into berm design is provided in **Appendix E - Engineering and Rehabilitation Design Specification**.

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

Mitigation through maintenance and avoidance:

- Ongoing monitoring of completed peat drain blocks in the weeks after formation will ensure they have consolidated.
- The risk associated with peat drain block failure from an environmental and rehabilitation measures impact is generally categorised as low as a peat drain block failure will result in an impact that is

localised and silt control measures are provided upstream of all discharge points. There is an allowance for a reactive approach to remediation measures where required.

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

Further to the above, **Figure 17** above presents an Emergency Response procedures to address peat spillage in the unlikely event of berm failure.

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

3.4.1.12 Flood Risk at Esker Bog

The CFRAM maps show that there is an area to the south of the study area that is at risk of flooding from the Figile_040 although the bog itself is not. **Figure 20** replicates the flood risk map from the accompanying Drainage Management Plan for Esker Bog.

It should be noted this analysis did not consider the fluvial flood risk from the smaller watercourses which drain to the Figile_040 River through Esker Bog. Historical anecdotal evidence was reviewed to ascertain if there are any known flooding or drainage issues from these smaller watercourses to the bog or adjacent land. No drainage issues have been identified along the Esker Bog boundary drains. Data from the 2015/16 flood event and observations from Bord na Móna do not indicate significant flooding within the bog but some partial flooding south of the bog boundary field which is consistent with what has been observed by Bord na Móna.

There is no predicted groundwater flooding to the bog indicated on the GSI datasets. A smaller area north-west of the bog boundary has a low probability of groundwater flooding.

Furthermore, regarding the potential for flooding of silt ponds along the Dogen stream, it is noted that it is a relatively small catchment area feeding into this area, therefore the risk of significant fluvial flooding is relatively low. It is considered that even if this area were to flood that the water would be ponded and levels slowly subside, meaning limited resuspension of deposited peat silt.

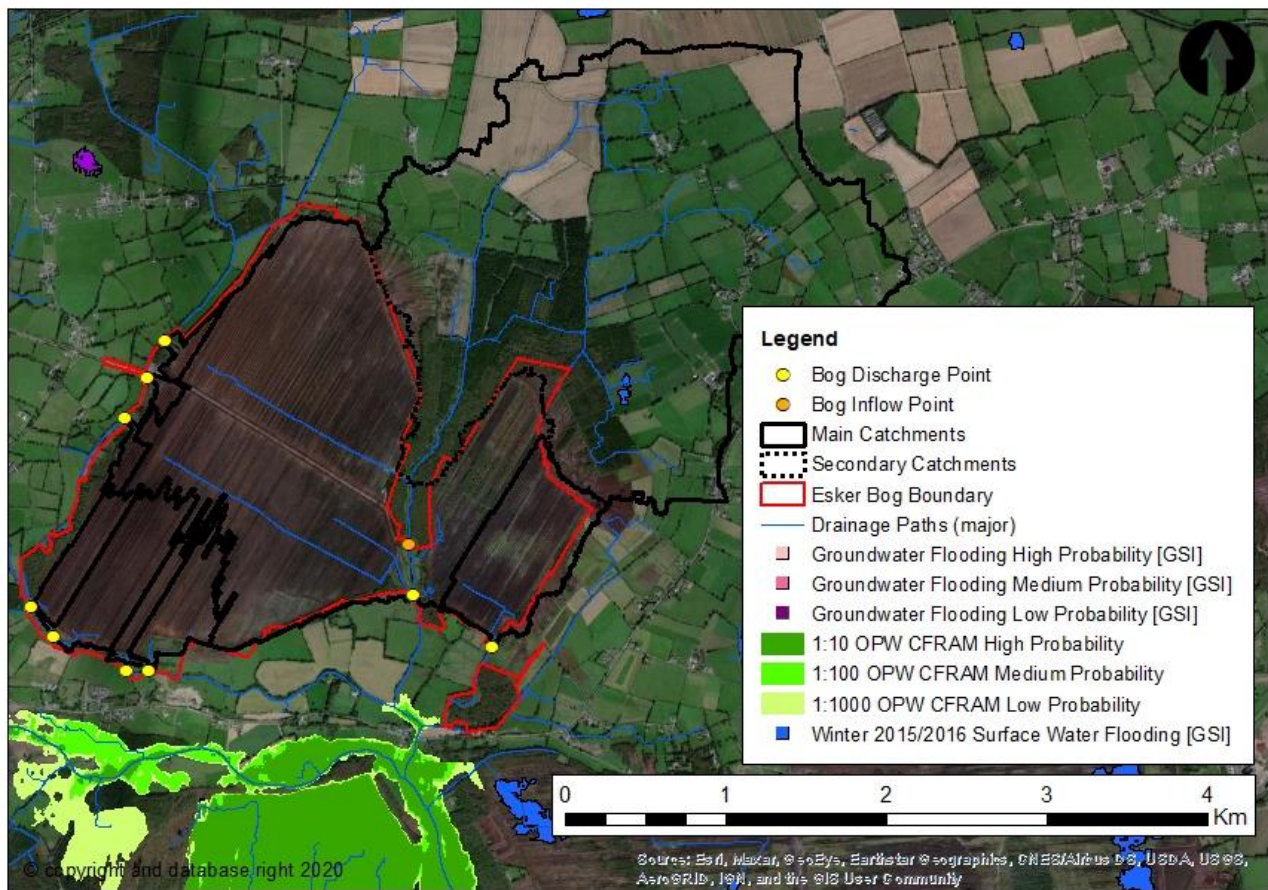


Figure 20: Flood Risk Analysis for Esker Bog

3.4.2 Effectiveness of these measures

The Mitigation Measures (Project Design Measures, Management Plans, Environmental Emergency Response Measures and Best Practice Measures), listed in **Section 3.4.1** above, have been developed by the hydrological/drainage and ecological expert members of the Decommissioning and Rehabilitation project team in Bord na Móna and use best practice water quality protection techniques which are tried and tested regularly across the country. Furthermore, a suitably qualified Environmental Supervisor will be employed during the construction stage to monitor the effectiveness of these measures on a daily basis. The Environmental Supervisor will be supported and assisted by members of the BnM Ecology Team as required. An Environmental Management Plan (EMP) has also been prepared for the proposed works (See **Appendix F**).

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

3.4.2.1 Watercourse crossing works and aquatic habitat protection guidance

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

3.4.2.2 Pollution Prevention Guidance Notes (PPGs) & Guidance for Pollution Prevention (GPP)¹⁶

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

¹⁶<https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/>

3.4.2.3 Construction Industry Research and Information Association (CIRIA)¹⁷

- CIRIA Report C502 Environmental Good Practice on Site;
- CIRIA Report C532 Control of Water Pollution from Construction Sites: Guidance for consultants and contractors;
- CIRIA Report C648 Control of Pollution from Linear Construction Project; Technical Guidance;
- CIRIA Handbook C650 Environmental good practice on site;
- CIRIA Handbook C651 Environmental good practice on site checklist;
- CIRIA Report C609 - SuDS – hydraulic, structural & water quality advice; and,
- CIRIA Report C697 – The SuDS Manual.

3.4.2.4 Invasive Species Guidance

- Managing Japanese knotweed on development sites - The Knotweed Code of Practice produced by the Environmental Agency (2013)¹⁸;
- NRA Guidelines on The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (2010)¹⁹;
- Managing Invasive Non-native Plants in or near Freshwater, Environment Agency (2010)²⁰;
- Best Practice Management Guidelines Japanese knotweed *Fallopia japonica*, Invasive Species Ireland (2015);
- IFI Biosecurity Protocol for Field Survey Work, Inland Fisheries Ireland (2010²¹).

3.4.2.5 Guidance relating to Bird Disturbance

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

¹⁷ Available from <https://www.ciria.org/>

¹⁸ <http://cfinns.scrt.co.uk/wp-content/uploads/2014/06/2013-code-of-practice.pdf>

¹⁹ <https://www.tii.ie/technical-services/environment/construction/Management-of-Noxious-Weeds-and-Non-Native-Invasive-Plant-Species-on-National-Road-Schemes.pdf>

²⁰ <https://www.midsussex.gov.uk/media/1725/managing-invasive-non-native-plants.pdf>

²¹ <https://www.fisheriesireland.ie/Biosecurity/biosecurity-protocol-for-field-survey-work.html>

3.4.2.6 Guidance relating to Mammal Disturbance

- OPW (2013) Construction, Replacement or Alteration of Bridges and Culverts²².
- National Roads Authority. Guidelines for the treatment of Otters prior to the construction of National Road Schemes. <https://www.tii.ie/tii-library/environment/construction-guidelines/Guidelines-for-the-Treatment-of-Otters-prior-to-the-Construction-of-National-Road-Schemes.pdf>

3.4.3 Implementation of Mitigation Measures

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

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

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

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

3.4.4 Degree of confidence in the likely success of the mitigation measure

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

3.4.5 Monitoring of the Implementation and Effectiveness of the Mitigation Measures

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

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

- 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

²²<https://www.gov.ie/en/publication/957aa7-consent-requirements-constructionalteration-of-watercourse-infrastru/>

any potential impacts on neighbour's land, general land security, boundary management, dumping and littering.

- The number of these site visits will reduce after 2 years to bi-annually and then after 5 years to annual visits.
- These monitoring visits will also consider any requirements, if required, for further practical rehabilitation measures.
- The **baseline condition of the site will be established** post-rehabilitation implementation by using an aerial drone survey to take an up to date aerial photo, when rehabilitation is completed. The extent of bare peat will be assessed using this baseline data, and habitat maps will be updated, if required.
- A **water quality monitoring programme** at the bog will be established. The main objective of this water quality monitoring programme will be to establish a baseline and then monitor the impact of peatland rehabilitation on water quality from the bog. Monitoring of key environmental variables will include: Ammonia, Phosphorous, Suspended solids (silt), pH and conductivity. Water quality samples will be collected from the main drainage system from the bog at a designated point, before water leaves the site. Water quality samples will be collected at monthly intervals. Where required, additional composite samplers may be place, with an intensive additional monitoring regime required as part of IPC license surrender.
- If, after three years, key criteria for successful rehabilitation are being achieved and critical success factors are being met, then the water quality monitoring programme will be reviewed, with consideration of potential ongoing research on site. The water quality data, the drone surveys and the habitat mapping will be collated and will be submitted to the EPA as part of the final validation report.
- If, after three years, key criteria for successful rehabilitation have **not** been achieved and critical success factors have **not** been met, then the rehabilitation measures and status of the site will be evaluated and enhanced, where required. This evaluation may indicate no requirement for additional enhancement of rehabilitation measures but may demonstrate that more time is required before key criteria for rehabilitation has been achieved. Monitoring of water quality will then also continue for another period to be defined.
- Where other uses are proposed for the site, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the appropriate assessment process and planning procedures.

3.4.6 How any mitigation failure will be addressed

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

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

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

Commitments or an unforeseen environmental event. Works will not be allowed to re-commence until the issue is resolved.

3.5 Evaluation of the impact of Esker Bog Decommissioning and Rehabilitation on the Integrity of the European Sites under consideration

Using the checklist in the **Table 24** below, the proposed Esker Bog Decommissioning and Rehabilitation Plan, as described in **Appendix B**, both alone and in-combination with other projects, for adverse impacts on the integrity of the European Sites under consideration is examined, following the implementation of the measures described herein.

Table 24: Integrity of European Site checklist

<i>Does the project or plan have the potential to: Yes/No</i>	River Barrow and River Nore SAC (Site Code 002162)
- cause delays in progress towards achieving the conservation objectives of the site?	No
- interrupt progress towards achieving the conservation objectives of the site?	No
- disrupt those factors that help to maintain the favourable conditions of the site?	No
- interfere with the balance, distribution and density of key species that are the indicators of the favourable condition of the site?	No
- change the dynamics of the relationships (between, for example, soil and water or plants and animals) that define the structure and/or function of the site?	No
- interfere with predicted or expected natural changes to the site (such as water dynamics or chemical composition)?	No
- reduce the area of key habitats?	No
- reduce the population of key species?	No
- change the balance between key species?	No
- reduce diversity of the site?	No
- result in disturbance that could affect population size or density or the balance between key species?	No

3.6 Conclusion

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

Appropriate Assessment Stage One Screening of all European sites identified within a 15km radius of the proposed rehabilitation works evaluated that the potential for significant effects on the Qualifying Interests of one European Site could not be excluded; i.e. River Barrow and River Nore SAC. In particular, the potential for indirect effects to downstream aquatic QI habitats and species via a deterioration in water quality and ex-situ disturbance and mortality to otter, a volant QI species of this SAC.

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

Following examination and analysis, there is the potential for:

- Impacts through the release of silt laden surface water to downstream water dependent and nutrient sensitive habitats and species of Qualifying Interest of the River Barrow and River Nore SAC.
- Mortality, disturbance and / or displacement of the ex-situ otter populations associated with the River Barrow and River Nore SAC.

To restrict the above impact pathways, the key protective measure relates to the retention of silt laden water and potentially deleterious materials associated with the decommissioning and rehabilitation works to the project footprint. A key consideration in this regard will be drain blocking as described in **Section 3.4.1.5**. This methodology relies on the placement of terminal dams at the extremity of the drain; i.e. that closest to watercourse within the receiving environment. The securing of strategic peat dams will allow for hydraulic separation between the proposed rehabilitation works and the receiving and downstream aquatic environment, and in so doing isolating these works from sensitive ecological and environmental receptors within the project zone of influence and in the case of Esker Bog, the River Barrow and River Nore SAC. Other key mitigation measures include the standard best practice environmental control measures, bespoke mitigation measures to avoid berm failure, the utilisation of existing surface water management infrastructure and the provision of further bespoke surface water management, mitigation measures and rehabilitation measures. Finally, It is proposed to develop these measures across 318.31ha of the Esker Bog site (See **Figure 12**, **Figure 13** and the accompanying Bog Rehabilitation Plan in **Appendix B**). The development of these measures will involve the construction of berms and field re-profiling, blocking outfalls, managing overflows and drainage channels for excess water and *Sphagnum* inoculation.

Once constructed and fully operational, the rehabilitation features will act as a source of surface water retention and attenuation on site, further mitigating the risk of run-off from the bog rehabilitation site to the receiving environment. The development of the proposed decommissioning and rehabilitation measures, coupled with best practice design measures and bespoke mitigation measures will ensure that potential impact magnitude will be low and not significant and will not provide baseline impacts upon which synergistic effects from downstream projects and plans may result. In addition to the above design principles and their inherent attenuation capacities, it is considered that the receiving hydrological catchment and its associated watercourses (Esker_020 and Figile_040) afford substantial dilution rates. It is not anticipated that the proposed rehabilitation measures will give rise to any perceptible impacts on water quality either alone or in-combination. Furthermore, the discharge from the bogs will be managed through silt traps (**Section 3.4.1.5**)

which will substantially reduce the quantity of peat silt export from the bog. During low flow conditions when dilution potential will be lowest the silt traps will be most effective, in contrast during large events when silt traps are least effective very substantial dilution will be achievable within the Esker_020 and Figile_040 watercourses.

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

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

4 REFERENCES

- Anderson, R., Farrell, C., Graf, M., Muller, F., Calvar, E., Frankard, P., Caporn, S., Anderson, P. (2017). An overview of the progress and challenges of peatland restoration in Western Europe. *Restoration Ecology*, Issue 2 Pages 271-282.
- Bonn, A., Allott, T., Evans, M., Joosten, H. & Stoneman, R. (2017) *Peatland restoration and ecosystem Services-science, policy and practice*. Cambridge University Press.
- Bord na Móna 2014. Blocking Drains in Irish raised bogs. The Bord na Móna Raised Bog Restoration Project. Cris, R. Buckmaster, S. Bain, C. Reed, M. (Eds) (2014) *Global Peatland Restoration demonstrating SUCCESS*. IUCN UK National Committee Peatland Programme, Edinburgh. <http://www.iucn-uk-peatlandprogramme.org/sites/www.iucn-uk-peatlandprogramme.org/files/IUCNGlobalSuccessApril2014.pdf>
- Carroll, J., Anderson, P., Caporn, S., Eades, P., O'Reilly C. & Bonn, A. 2009. Sphagnum in the Peak District. Current Status and Potential for Restoration. *Moors for the Future Report No 16*. Moors for the Future Partnership.
- Chanin P (2003). *Ecology of the European Otter*. Conserving Natura 2000 Rivers Ecology Series No. 10. English Nature, Peterborough.
- Chanin, P., (2013) *Otters (The British Natural History Collection)*. Whittet Books Ltd.
- Charles, P, Edwards, P (eds) (2015). *Environmental Good Practice on Site*. CIRIA.
- Clark, D. and Rieley, J. 2010. Strategy for responsible peatland management. International Peat Society, Finland.
- Cramp, S. (1977-1993). *Handbook of the birds of Europe, the Middle East and North Africa: the birds of the Western Palearctic* (7 Vols). Oxford University Press, Oxford.
- Crowe, O. (2005). *Ireland's Wetlands and their Waterbirds: Status and Distribution*. Birdwatch Ireland, Newcastle, Co. Wicklow.
- Department of Environment, Heritage and Local Government (2009) *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities*, DoEHLG, Dublin.
- Duffy, M. (2018) The Corncrake Conservation Project Annual Report. 2018. Available online at: <https://www.npws.ie/sites/default/files/general/corncrake-report-2018.pdf>
- Eades, P., Bardsley, L., Giles, N. & Crofts, A. (2003). *The Wetland Restoration Manual*. The Wildlife Trusts, Newark.
- Farrell, C. A. and Doyle, G. J. 2003. Rehabilitation of Industrial Cutaway Atlantic Blanket Bog, NW Mayo, Ireland. *Wetlands Ecology and Management*, 11, 21-35.
- Fox, T. & Stroud, D.A. (2002). The Greenland White-fronted Goose *Anser albifrons flavoristris*. *BWP Update* 4: 65-68.
- Gann, G.D., McDonald, T., Walder, B., Aronson, J., Nelson, C.R., Jonson, J., Hallett, J.G., Eisenberg, C., Guariguata, M.R., Liu, J., Hua, F., Echeverría, C., Gonzales, E., Shaw, N., Decler, K. & Dixon, K.W. (2019). International Principles and Standards for the practice of Ecological Restoration. *Restoration Ecology* 27(S1): S1–S46.

Hayhow, D.B. (2009). *Consequences of winter habitat use in a migratory shorebird. Thesis submitted for the degree of Doctor of Philosophy at the University of East Anglia, Norwich, 2009.* Available at: https://ueaeprints.uea.ac.uk/id/eprint/10607/1/Thesis_hayhow_d_2009.pdf

Heery, S. (2018) Birds in Central Ireland. 6th mid Shannon Bird Report. 2012-2016. BirdWatch Ireland, Kilcoole, County Wicklow.

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

EU Birds Directive (2009) Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (codified version) Official Journal of the European Union 26.1.2010 L20/7 – L20/25

EU Habitats Directive (1992) Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora Official Journal of the European Communities 22/07/1992 L206/07 – L206/50

Environment and Heritage Service (2002) The Habitats Regulations: A guide for competent authorities. Environment and Heritage Service, Belfast.

European Commission (2018) Managing Natura 2000 Sites: The Provisions of Article 6 of the 'Habitats Directive' 92/43/EEC.

https://ec.europa.eu/environment/nature/natura2000/management/docs/art6/EN_art_6_guide_jun_2019.pdf

Fox, A.D, I. Francis, D. Norriss & Alyn Walsh. 2019. Report of the 2018/2019 International Census of Greenland White-fronted Geese. Greenland White-fronted Goose Study / National Parks & Wildlife Service report, Kalo

Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters. Available online at: <https://www.fisheriesireland.ie/documents/624-guidelines-on-protection-of-fisheries-during-construction-works-in-and-adjacent-to-waters/file.html>

Irish Statute Book (Various) European Communities (Natural Habitats) Regulations 1997 (S.I. 94/97) as amended in 1998 (S.I. No. 233/1998), 2005 (S.I. No. 378/2005) and 2011 (SI No. 477/2011). Dublin, Ireland

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

Lewis, L.J., Burke, B., Fitzgerald, N., Tierney, T.D. & Kelly, S. (2019). Irish Wetland Bird Survey: Waterbird Status and Distribution 2009/10-2015/16. Irish Wildlife Manuals, No. 106. National Parks and Wildlife Service, Department of culture, Heritage and the Gaeltacht, Ireland.

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

Livezey KB, Ferná'ndez-Juricic E, Blumstein DT. Database of bird flight initiation distances to assist in estimating effects from human disturbance and delineating buffer areas. Journal of Fish and Wildlife Management 7(1):181-191; e1944-687X. doi: 10.3996/082015-JFWM-078

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

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

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

NPWS (2011) River Barrow and River Nore SAC 002162. Version date: 19.07.2011. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Accessed online 24.01.2021

NPWS (2016) Site Synopsis: River Barrow and River Nore SAC 002162. Version date: 9.2.2016. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Accessed online 24.01.2021.

NPWS (2015) Conservation Objectives: Raheenmore Bog SAC 000582. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2013) Site Synopsis: Raheenmore Bog SAC 000582. Version date: 02.09.2013. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Accessed online 08.02.2021.

NPWS (2020) Conservation objectives for The Long Derries, Edenderry SAC [000925]. Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht. Accessed online 24.01.2021.

NPWS (2013) Site Synopsis: Long Derries, Edenderry SAC 000925. Version date: 24.09.2013. Department of Culture, Heritage and the Gaeltacht. Accessed online 24.01.2021.

NPWS (2015) A framework for Corncrake Conservation to 2022. National Parks and Wildlife Service, Department of Arts, Heritage & the Gaeltacht. Available online at:

<https://www.npws.ie/sites/default/files/publications/pdf/A%20Framework%20for%20Corncrake%20Conservation%20to%202022%20%28Nov2015%29.pdf>

NPWS (2015). Article 12 Reporting: Annex 2: Bird Species status and trends reporting format for the period 2008-2012. Available online at

http://cdr.eionet.europa.eu/Converters/run_conversion?file=/ie/eu/art12/envuvesya/IE_birds_reports-14328-144944.xml&conv=343&source=remote#A082_B

NRA (2008) Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes; Available online at: <https://www.tii.ie/tii-library/environment/construction-guidelines/Guidelines-for-the-Crossing-of-Watercourses-during-the-Construction-of-National-Road-Schemes.pdf>

Office for Official Publications of the 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.

Office for Official Publications of the European Communities (2001) Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC. Office for Official Publications of the European Communities.

OPW (2013) Construction, Replacement or Alteration of Bridges and Culverts. Available online at: <https://www.gov.ie/en/publication/957aa7-consent-requirements-constructionalteration-of-watercourse-infrastru/>

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

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

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

Scottish Natural Heritage. (2017) '*Survey Methods for use in assessing the impacts of onshore windfarms on bird communities*' Version 2. SNH, Battleby, Scotland.

Scottish Natural Heritage. (2017) '*Assessing Connectivity with Special Protection Areas (SPA's)*'. SNH, Battleby, Scotland. Available online at: <https://www.nature.scot/sites/default/files/2018-08/Assessing%20connectivity%20with%20special%20protection%20areas.pdf>

Scottish National Heritage (2016) *Dealing with Construction and birds. Guidance Version 3*. SNH, Battleby, Scotland.

Scottish National Heritage (2009) *Monitoring the impact of onshore wind farms on birds - January 2009. Guidance Note*. SNH, Battleby, Scotland.

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

Wernham, C.V., Toms, M.P., Marchant, J.H., Clark, J.A. Sitiwardens, G.M.&Baillie, S.R. (eds). 2002. *The Migration Atlas; movements of the birds of Britain and Ireland*. T. & A.D.Poyser, London.

Wetlands International. (2018). *Waterbird Population Estimates*. wpe.wetlands.org.

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

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

Appendix A FONSE

Finding of No Significant Effects Report (FONSE)

In accordance with the EC (2001) guidance document, *Assessment of plans and projects significantly affecting Natura 2000 sites – Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*, A Finding of No Significant Effects Report has been completed for the proposed Decommissioning and Rehabilitation Plan for Esker Bog. The standard matrix for this report provided in Annex 2 of the guidance document was followed. Line items in italics are taken directly from the guidance document.

Finding of No Significance Effects Report	
<i>Name and location of the Natura 2000 sites</i>	<p>The Evaluation provided herein has examined the potential for any effects arising via source pathway linkages with regard to connectivity to designated European Sites (SACs and SPAs) within the zone of influence of all predicted Project impacts. An extended buffer zone of 15km was further considered, in line with NPWS guidance (DoEHLG, 2009), for evaluation of effects on any European Site which may arise associated with the proposed decommissioning and rehabilitation of Esker Bog, as required. There is a total of 3 European sites located within the 15km zone of consideration:</p> <ul style="list-style-type: none"> - River Barrow and River Nore SAC (002162) -14.5km south and 26.7km downstream; - Raheenmore Bog SAC (000582) - 9.5km north-west; and - The Long Derries, Edenderry SAC (000925) - 8.5km east.
<i>Description of the project or plan</i>	<p>Overview: Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Allen bog group (Ref. P0503-01). 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 Allen bog group. Esker Bog is located 5.7km north-east of Daingean, Co. Offaly.</p> <p>A document titled 'Esker Bog Cutaway Bog Decommissioning and Rehabilitation Plan 2021' has been prepared specifically to describe the proposed decommissioning and rehabilitation measures at Esker Bog as appended to this document as Appendix B.</p> <p>Purpose: The decommissioning and Rehabilitation of Esker Bog as required under IPC license.</p>
<i>Is the Project or Plan directly connected with or necessary to the management of the site (provide details)?</i>	No

Finding of No Significance Effects Report	
Are there other projects or plans that together with the project of plan being assessed could affect the site (provide details)?	<p>Yes: In addition to the proposed decommissioning and rehabilitation plan the following projects were considered:</p> <ol style="list-style-type: none"> 1 Other BnM Bog Group Decommissioning and Rehabilitation 2 NPWS Raised Bog Restoration at Mouds Bog and Coolrain Bog 3 Agricultural Activity 4 Turbary 5 Agriculture 6 Local Authority Development Plans 7 Local small residential and agricultural developments, extensions, alterations 8 Local and Regional Amenity Developments 9 Development Plans
The Assessment of Significant Effects	
Describe how the project or plan (alone or in combination) is likely to affect the Natura 2000 site	<ul style="list-style-type: none"> - Disturbance of QI species (ex-situ from the SAC bounds) using adjacent, nearby and downstream sections of the Esker and Figile watercourses and consequently downstream sections of the River Barrow and River Nore SAC. - Indirect effects to downstream sections of the Esker and Figile watercourses (and their associated aquatic habitats and species) as a result of run-off to receiving watercourses (such as siltation, hydrocarbons etc.) and further downstream to River Barrow and River Nore SAC.
Explain why these effects are not considered significant	<p>Following examination and analysis, and taking account of the protective measures proposed, the proposed rehabilitation works were found not to result in adverse effects due to the standard and targeted protective measures, in particular the attenuation and control of surface water run-off from the bog site to the surrounding and receiving environment.</p> <p>The key protective measure being retention of silt laden water and potentially deleterious materials associated with the decommissioning and rehabilitation works to the project footprint. The attenuation of silt and particulate matter generated as a result of the proposed works is a key mitigation measure for the proposed rehabilitation and decommissioning works. The main source of potential impact to influence significant adverse effects to the downstream areas of the River Barrow and River Nore SAC relate to particulate matter run-off from the site, during the rehabilitation works. A key consideration in this regard will be drain blocking. This methodology relies on the placement of terminal dams at the extremity of the drain; i.e. that closest to watercourse within the receiving environment. The securing of strategic peat dams will allow the hydraulic separation between the proposed rehabilitation works and the receiving and downstream aquatic environment, and in so doing isolating</p>

Finding of No Significance Effects Report			
	these works from sensitive ecological and environmental receptors within the project zone of influence and in the case of Esker Bog and the River Barrow and River Nore SAC.		
Name of Agency or Body Consulted	Summary of Response		
NPWS	Formal consultation has been undertaken with NPWS regarding proposed Decommissioning and Rehabilitation Plans, including protected Sites. The findings and feedback from the consultation process have been fed into the final rehabilitation and decommissioning plans. Due cognisance was also given to information available on the NPWS website at: https://www.npws.ie/development-consultations# .		
Data Collected to Carry out the Assessment			
Who carried out the assessment	Sources of Data	Level of assessment completed	Where can the full results of the assessment be accessed and viewed
Delichon Ecology	A combination of consultation, desktop studies and field surveys.	Screening for Appropriate Assessment Appropriate Assessment – Natura Impact Statement	Bord na Móna, Leabeg, Blueball, Tullamore, Co. Offaly, R35 P304.

Appendix B Esker Bog: Cutaway Bog Decommissioning and Rehabilitation Plan 2021



Esker Bog

Cutaway Bog Decommissioning and Rehabilitation Plan 2021

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0503-01:

“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 Esker Bog upon cessation of peat production and compliments the licence requirement to decommission the site.

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

Industrial peat production has now fully ceased at Esker Bog. Bord na Móna have now announced the complete cessation of industrial peat production.

In addition, to preparing this document to comply with Condition 10 of IPC Licence Ref. P0503-01, due regard was also given to the proposed ‘Peatlands Climate Action Scheme’ (PCAS) announced by the Minister. This Scheme will see the Minister support, via the Climate Action Fund, Bord na Móna in developing a package of measures, ‘the proposed Scheme’, for enhanced decommissioning, rehabilitation and restoration of cutaway peatlands referred to as, the Peatlands Climate Action Scheme’. However, only the additional costs associated with the additional and enhanced rehabilitation, i.e., measures which go beyond the existing standard mandatory decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support. The additional costs of the proposed Scheme will be supported by Government through the Climate Action Fund, administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) will act as the Scheme regulator.

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

Bord na Móna have defined the key rehabilitation outcome at Esker 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 Esker Bog, such as amenity, will be conducted in adherence to the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this rehabilitation plan.

Document Control Sheet

Document Name:	Esker Bog Decommissioning and Rehabilitation Plan 2021					
Document File Path:						
Document Status:	Final					

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

Rev.	1.0	Author(s):	Checked By:	Approved By:
		AC	MMC	MMC
		04/11/2020	22/12/2020	16/02/2021

Rev.	8.0	Author(s):	Checked By:	Approved By:
		AC	MMC	MMC
		22/03/2021	21/05/2021	24/05/2021

Table of Contents

Summary.....	7
1. Introduction.....	11
1.1 Constraints and Limitations.....	12
2. Methodology	14
2.1 Desk Study	14
2.2 Consultation	16
2.3 Field Surveys	16
3. Site Description.....	17
3.1 Status and Situation.....	17
3.1.1 Site history	17
3.1.2 Current land-use	17
3.1.3. Socio-Economic conditions.....	17
3.2 Geology and Peat Depths	19
3.2.1 Sub-soil geology.....	19
3.2.2 Peat type and depths.....	19
3.3 Key Biodiversity Features of Interest.....	19
3.3.1 Current habitats.....	20
3.3.2 Species of conservation interest	21
3.3.3 Invasive species	23
3.4 Statutory Nature Conservation Designations.....	23
3.4.1 Other Nature Conservation Designations	23
3.5 Hydrology and Hydrogeology	23
3.6 Emissions to surface-water and water-courses.....	24
3.5.1 Decommissioning and Rehabilitation Programme Water Quality Monitoring.	27
3.7 Fugitive Emissions to air	29
3.8 Carbon emissions.....	29
3.9 Current ecological rating	29
3.10 Esker Bog Characterisation Summary.....	30
4. Consultation	31
4.1 Consultation to date	31
4.2 Issues raised by Consultees	31
4.2.1 Assessments of rehabilitation	31

4.2.2	Restoration scope	32
4.2.3	Monitoring	32
4.2.4	Flooding of adjacent land	32
4.2.5	Land Management.....	32
4.2.6	Other issues (including amenity)	32
4.3	Bord na Móna response to issues raised during consultation	33
4.3.1	Assessments of rehabilitation	33
4.3.2	Restoration scope	33
4.3.3	Monitoring.....	33
4.3.4	Flooding of adjacent land	33
4.3.5	Land Management.....	34
4.3.6	Other issues (including amenity)	34
4.3.7	Concluding statement.	35
5.	Rehabilitation Goals and Outcomes	36
6.	Scope of Rehabilitation.....	38
6.1	Key constraints	38
6.2	Key Assumptions	39
6.3	Key Exclusions.....	39
7.	Criteria for successful rehabilitation	40
7.1.	Criteria for successful rehabilitation to meet EPA IPC licence conditions:	40
7.2.	Critical success factors needed to achieve successful rehabilitation as outlined in the plan.....	44
8.	Rehabilitation Actions and Time Frame	46
8.1	Short-term planning actions (0-1 years).....	52
8.2	Short-term practical actions (0-2 years).....	53
8.3	Long-term (>3 years)	53
8.5	Budget and costing	55
9.	Aftercare and Maintenance.....	56
9.1	Programme for monitoring, aftercare and maintenance.....	56
9.2	Rehabilitation plan validation and licence surrender – report as required under condition 10/4	57
10.	References.....	58
	APPENDIX I: A standard peatland rehabilitation Plan to meet conditions of the IPC Licence	62
	APPENDIX II: Bog Group Context.....	66
	APPENDIX III: Ecological Survey Report.....	70
	APPENDIX IV: Environmental Control Measures to be applied to bog rehabilitation.....	73

APPENDIX V: Biosecurity.....	74
Appendix VI: Policy and Regulatory Framework	75
APPENDIX VII: Decommissioning	82
APPENDIX VIII: Glossary.....	85
APPENDIX IX. Extractive Waste Management Plan.....	87
APPENDIX X. Mitigation Measures for the Application of Fertiliser.....	91
APPENDIX XI. Consultation Summaries	92
APPENDIX XII. Archaeology	97

SUMMARY

Name of bog: Esker **Area:** 568 ha

Site description:

- Esker Bog is located in Co. Offaly, approximately 3.5km south-southeast of Rhode and c.6km east of Daingean.
- Esker Bog was in industrial peat production since the early 1970s until 2019. The peat was formerly used as fuel peat to supply Edenderry Power.
- Esker Bog has a gravity drainage regime.
- The majority of the former peat production footprint is bare peat and contains active drainage channels.
- A part of the site has been developing a mosaic of cutaway habitats.
- The western section of the bog contains the deepest residual peat with over 2.6m of peat remaining. The eastern area has shallower remaining peat and is now considered to be cutaway.
- The Esker Stream flows along the southern boundary of the western part, and the Dogen River, a tributary of the Esker Stream, flows north to south and separates the eastern from the western side of the site.

Rehabilitation goals and outcomes

Bord na Moña is committed to discharging the obligations arising from Condition 10 of the IPC licence. The primary goals and outcomes of this plan are:

- Meeting conditions of the IPC License;
- Stabilisation or improvement in water quality parameters (e.g. suspended solids);
- Environmental stabilisation.
- Optimising hydrological conditions for **climate action benefits as part of PCAS**. This will be achieved via **deep peat re-wetting** and the **development of wetlands, fen, Reed Swamp and wet woodland on shallow cutaway peat**, and eventually naturally functioning wetland/peatland habitats.
- Optimising hydrological conditions for the development of embryonic *Sphagnum*-rich vegetation communities in suitable deep residual peat areas.
- Rehabilitation will support the National Policies on Climate Action and GHG mitigation by maintaining and enhancing the current condition peat storage capacity of the bog (locking the carbon into the ground). In time, it is expected that the bog will develop its carbon sink function, in part, as *Sphagnum* communities develop across the bog. It will also support Ireland's commitments towards Water Framework Directive and the National River Basin Management Plan 2018-2021 and future National River Basin Management Plans.
- Optimising hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future.

Scope of rehabilitation

The principal scope of this rehabilitation plan is defined by:

- The area of Esker Bog.
- EPA IPC Licence - Ref. P0503-01. 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 and optimising **climate action benefits**.

- The local environmental conditions of this bog; Esker Bog has variable environmental characteristics with a range of residual peat depths, hydrology and topography.
- The key goals and outcomes of rehabilitation at this bog outlined above.
- To minimise potential impacts on neighbouring land, some boundary drains around Esker Bog will be left unblocked, as blocking boundary drains could affect adjacent land.
- Other constraints including the proposed Water Supply Project- Eastern and Midlands Region route.

Criteria for successful rehabilitation:

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

- Rewetting of residual deep peat in the former area of industrial peat production to slow water movement across the site to retain silt, encouraging development of vegetation cover via natural colonisation, and reducing the area of bare exposed peat (IPC Licence validation). The target will be the delivery of measures and this will be measured by an aerial survey after rehabilitation is completed. (IPC Licence validation).
- Stabilising or reducing key emissions to water (e.g. silt-run-off) (IPC Licence validation).
- Reducing pressure from peat production on the local river catchment (WFD) (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/partial carbon sink (Climate action verification). Some areas will naturally be dry and develop Birch woodland and other drier habitats. It will take some time for stable naturally functioning habitats to fully develop at Esker Bog.
- Improvement in biodiversity and ecosystem services. (Climate action verification).

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

Summary of measures:

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

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

Timeframe:

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

- 2024. Decommission silt-ponds, if necessary.

Budget and Costing

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

Monitoring, after-care and maintenance

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

- Quarterly monitoring assessments of the site to determine the general status of the site, assess the condition of the rehabilitation work, assess the progress of natural colonisation, monitoring of any potential impacts on neighbouring land and general land security. The number of site visits will reduce after 2 years to bi-annually. These site visits will assess the need to additional rehabilitation, if needed.
- **Water quality monitoring** will be established. Monitoring of key water quality parameters for 2 years after rehabilitation will include: Ammonia, Phosphorous, Suspended solids, pH and conductivity.
- Where other uses are proposed for the site, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the appropriate assessment and planning procedures.

Additional Monitoring:

- The monitoring and validation of re-vegetation via natural colonisation and changes in bog condition will be carried out using an aerial remote sensing survey, after rehabilitation measures are implemented. It is proposed that sites can be monitored against this baseline in the future.
- Biodiversity Ecosystem services will be monitored using specific indicators.
- Carbon emissions monitoring can 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. Baseline monitoring (habitat condition) will be carried after rehabilitation is completed (during the Scheme). It is proposed that Esker Bog 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 Allen bog group (Ref. P0503-01). 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 Allen bog group (see Appendix II for details of the bog areas within the Allen-Clonsast Bog Group). Esker Bog is located in Co. Offaly.

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0503-01:

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

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

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

It is expected that the proposed Scheme (PCAS) will have benefits accruing from biodiversity provision, water quality and storage attenuation as well as increased carbon storage, reduced carbon emissions and acceleration towards carbon sequestration. The Scheme will also facilitate monitoring of carbon fluxes (Greenhouse Gases

and fluvial carbon) in selected areas (in addition to other established Research programmes), to monitor changes in where the interventions will accelerate the trajectory towards a naturally functioning peatland ecosystem.

It is envisaged that the PCAS 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 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 embryonic bog 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.

1.1 Constraints and Limitations

This document covers the area of **Esker 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 Esker 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 Esker Bog ceased completely in 2019. Currently the former peat production area is bare peat although a mosaic of pioneer habitats has been developing towards the eastern side of the site where production ceased a number of years ago. The combination of active enhanced rehabilitation measures and natural colonisation will quickly establish further pioneer vegetation and more mature habitats and will be planned to accelerate environmental stabilisation. Nevertheless, it will take some time (30-50 years) for naturally functioning wetland and peatland ecosystems to fully re-establish.

Parts of Esker 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 Esker 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. The proposed Water Supply Project- Eastern and Midlands Region route is indicated to run along the southern side of the site; this development is at pre-planning stage.

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 enhanced rehabilitation plan also considered **recently published** guidance issued by the EPA in 2020 – **Guidance on the process of preparing and implementing a bog rehabilitation plan**.

The ecological information and site information collected during the Bord na Móna ecological baseline survey, additional confirmatory site visits and monitoring and desktop analysis forms the basis for the development of the rehabilitation plan for the bog, along with:

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

2.1 Desk Study

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

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

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

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

- Allen Integrated Pollution Control Licence;
- Allen 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, Esker Bog was surveyed in August 2010. Additional ecological walk-over surveys and visits have taken place at Esker Bog between 2012-2020 to inform rehabilitation planning and habitat maps have been updated, where required- the latest site visit took place in November 2020. This rehabilitation plan is informed by the original baseline survey as well as subsequent confirmatory site walk-over surveys and visits, and updates to baseline data.

Habitat mapping followed best-practise guidance from Smith *et al.* (2011). Map outputs including all habitat maps and target notes were produced using GIS software application packages (ArcGIS). General marginal habitats and other habitats that had not been modified significantly by industrial peat extraction were classified using Fossitt *et al.* (2000). Plant nomenclature for vascular plants follows Stace (2010), while mosses and liverworts nomenclature follows identification keys published by the British Bryological Society (2010). A more detailed Bord na Móna classification system was 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 Esker Bog is contained in Appendix III.

3. SITE DESCRIPTION

Esker Bog is located in Co. Offaly, approximately 3.5km south-southeast of Rhode and c.6km east of Daingean. Esker Bog comprises two main sections, a larger area in the west and a smaller section in the east, that are divided by a stream (the Dogen River). A third, small, separate area is also included as part of Esker Bog. This is located to the south-west of the other two bog areas (See Figure 3.1). The surrounding landscape is dominated by a mosaic of farmland, largely consisting of improved grassland, and other bogs, many owned and managed by Bord na Móna (See Figure 8.1). The Esker Stream flows along the southern boundary of the western side, with the Dogen River, a tributary of the Esker Stream, flowing north to south and separating the eastern from the western side of Esker Bog.

Esker Bog is connected via a Bord na Móna rail link to Cavemount Bog, which lies 1.3km to the west-northwest. Ballycon Bog is 700m south of Esker Bog, although the two bogs are not connected, being separated by farmland, the R402 road and the Esker Stream. Cloncreen Bog is located c.200m immediately south of the small section of Esker Bog. Again, these two bogs are separated by some farmland and the R402 road with no direct links (road or rail) between the two Bord na Móna properties.

3.1 Status and Situation

3.1.1 Site history

Esker Bog was in industrial peat production since the early 1970s. The peat was formerly used as fuel peat in Edenderry Power. Industrial peat extraction completely ceased at Esker Bog in 2019.

The small, discrete bog section in the south-east of Esker Bog has never been in production.

3.1.2 Current land-use

Industrial peat production has now completely ceased at Esker Bog. However, some stockpiles of peat remain on the site following harvesting; these are being transported to Edenderry Power Station and Derrinlough Briquette Factory. There is a small length of bog railway and some other infrastructure on this site (Figure 3.6).

The proposed Water Supply Project- Eastern and Midlands Region, will connect Parteen basin Co. Tipperary to a Termination Point Reservoir at Peamount, Co. Dublin. The pipeline corridor for the proposed project intersects Esker Bog. This project is in its pre-planning stage.

There are some turbary plots overlapping the bog boundary.

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 Esker 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

According to GSI, the underlying geology at Esker Bog comprises oolitic limestones ¹. The underlying soils and sub-soils are classed as ‘Raised Bog Cutover Peat’ The peat soils are likely to be underlain with limestone tills, as these sub-soils are exposed around the margins of the site. The sub-soils along the southern margin are limestone-based sands and gravels lain down by the river. Grey Marl was exposed in some of the spoil taken from the silt ponds at the southern end of the site.

3.2.2 Peat type and depths

A significant portion of the residual peat on Esker Bog is mostly “red” or “*Sphagnum* peat” (Figure 8.2). The western section of the bog contains the deepest peat reserves with over 2.6m of peat remaining in some areas. The eastern section has rather shallower peat depths remaining, with some fen peats exposed. Some of this area is also cutaway, with underlying sub-soils now exposed.

3.3 Key Biodiversity Features of Interest

The majority of the large area in the west of Esker Bog within the Bord na Móna boundary is dominated by bare peat (Figure 3.2) and the eastern section is largely cutaway (Figure 3.3). The Esker Stream flows along the southern side of the bog and forms a natural boundary. The Dogen River, a tributary of the Esker River, flows north to south and separates the eastern from the western side of the site. A third watercourse flows along the western boundary of the site and is also a tributary of the Esker Stream.

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



Figure 3.2 Bare peat of former production area at Esker Bog (western end)



Figure 3.3 Area of cutaway peatlands at Esker Bog (eastern end).

3.3.1 Current habitats

There are some remnant habitats around the margins of Esker Bog. A narrow band of Birch woodland (WN7) and scrub (WS1) dominated by Birch are the most prominent habitats around the periphery of both the western and eastern sections. In some places, there are patches of remnant raised bog vegetation (PB1), generally dominated by Heather and being invaded by scrub, as they have largely dried out. Other parts of the margins are covered in a mosaic of Bracken and Birch scrub.

Although the western block of Esker bog is largely bare peat, the smaller eastern area is largely cutaway, and pioneer cutaway habitats have been developing here in recent years. On the higher and drier areas Birch

woodland is developing, with a mosaic of rush-dominated poor fen and bare peat over much of the remainder of this area (see Figure 3.4). The drainage system in this area has been maintained so it has remained relatively dry. The small area of Esker Bog in the south-east of the area (Figure 3.4) that has never been in production is dominated by mature Birch woodland (WN7) and also contains small patches of active and old cutover bog (PB4), wet grassland (GS4) that has developed on cutover peat and Bracken (HD1).



Figure 3.4 Area of bog woodland in the south east of the site.

The Esker Stream, that flows along the southern boundary, is typical of a lowland depositing river and is infilled with emergent riparian vegetation such as Reed Canarygrass and Bulrush.

A habitat map of Esker Bog is shown in Figure 3.5.

3.3.2 Species of conservation interest

Esker Bog is used occasionally by several species of conservation interest including Peregrine, Merlin, Snipe and small flocks of wintering Golden Plover.

The Esker Stream along the southern boundary and the Dogen River that runs between the western and eastern areas of Esker Bog have the potential for Otter and Kingfisher.

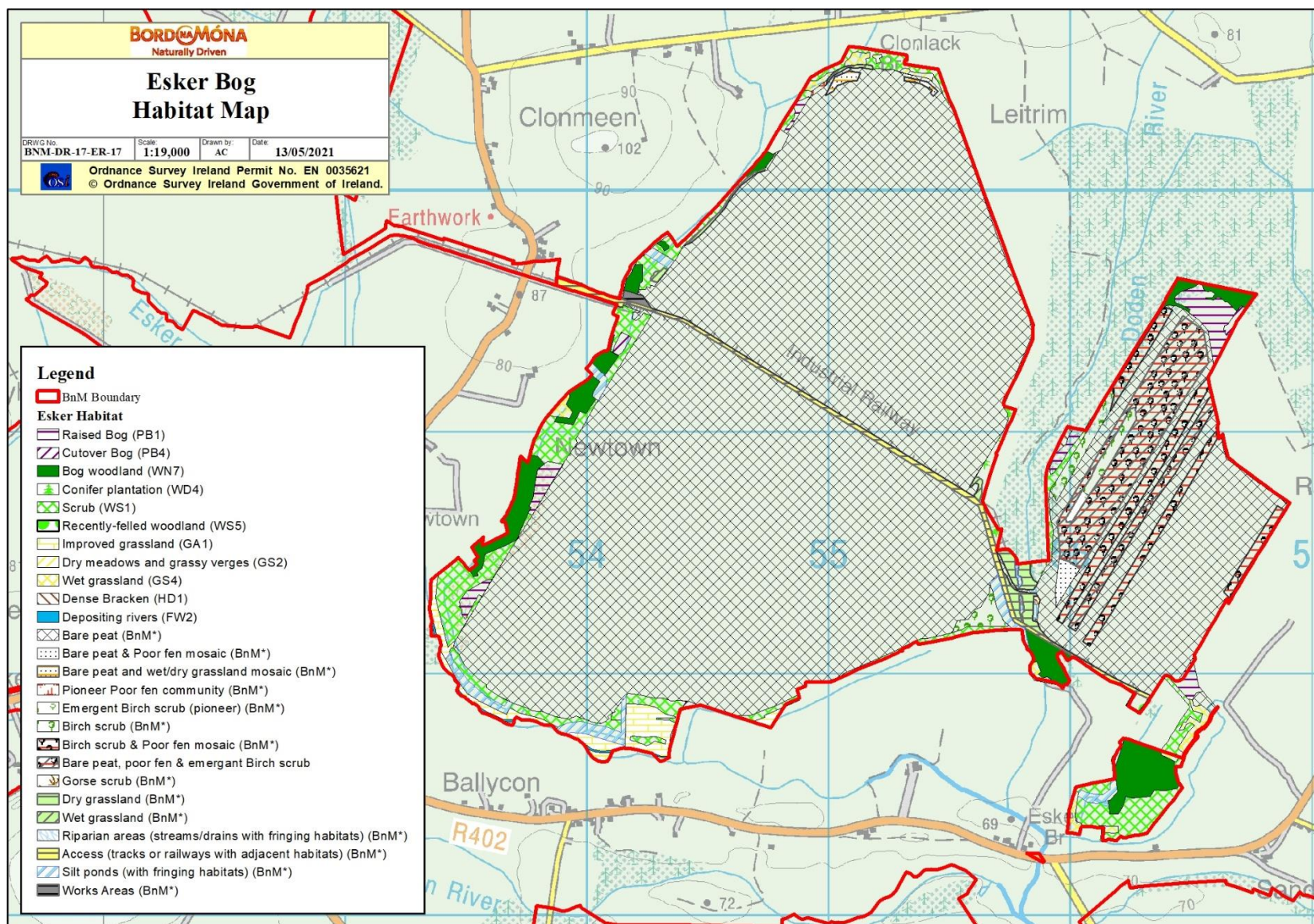


Figure 3.5 Habitat map of Esker Bog showing Bord na Móna habitat categorisation

3.3.3 *Invasive species*

A broad range of common garden escapees/Invasive Alien Species are occasionally detected on or close to former peat production sites. All invasive alien species detected will be treated in line with Best Practice during PCAS activities, where necessary.

No other invasive alien species, as listed under Regulation (EU) 1143/2014 on the prevention and management of the introduction and spread of invasive alien species, likely to be further dispersed during or as a result of PCAS activities has been recorded at Esker Bog.

3.4 **Statutory Nature Conservation Designations**

There are no sites designated for nature conservation objectives on or immediately adjacent to Esker Bog. The Grand Canal pNHA (NPWS site code 002104) lies c.2km north of Esker Bog (Figure 3.1).

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

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

3.5 **Hydrology and Hydrogeology**

Esker Bog has a gravity drainage regime. The majority of the bog is currently relatively dry with active functioning drains. Initial hydrological modelling indicates the bog has topographical basins with high potential for re-wetting and developing a mosaic of re-wetted peatland habitats when rehabilitation is carried out and drains are blocked. A significant part of the site is also modelled as being relatively dry (Figure 8.4).

Esker Bog is located in the Barrow catchment and is drained by three watercourses that all meet just south of the Bord na Móna property. The main watercourse draining Esker Bog is the Esker Stream which flows along the southern boundary of the property. To the east, the bog is drained by the Rathcobican stream (a tributary of the Esker Stream). The Dogen River, also a tributary of the Esker Stream flows through the centre of Esker Bog, separating the large western and eastern sections. The small, separate section of Esker Bog in the south-east corner is drained by the Rathlumber stream.

Field drains on both the western and eastern sections of Esker Bog run north-east to south west. There are seven outlets for water draining off Esker bog, all of which pass through silt ponds. One exception is the flow to the Dogen River, the course of which has been modified and managed as a silt pond.

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). These data give an indication of sub-surface deposits

(bedrock and unconsolidated materials) in terms of their groundwater resource potential and dominant groundwater flow type.

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

The peat is underlain by glacial deposits interbedded with glacio-fluvial deposits over limestone bedrock. The glacial deposits generally consist of grey gravelly clay/silt (present on an adjacent cutaway site). The bog water table across the site is expected to be high when bog drains are blocked, 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.

3.6 Emissions to surface-water and water-courses

Esker bog has 7 treated surface water outlets to the Esker Stream IE_SE_14E010200 and eventually the Figile River IE_SE_14F010300. Peat extraction was identified as a pressure in both rivers in the second cycle of the river basin management plan and is indicated as remaining so in the Figile in the third cycle, currently under preparation. However the Figile river is indicated as remaining under pressure from peat extraction.

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 in Figure 3.7.

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

The main emission limit value associated with this bog is 35mg/l suspended solids, with trigger levels for ammonia of 3.0mg/l and COD 100mg/l.

Initial monthly ammonia concentrations from August to January 2021 have a range of 0.036 to 1.96mg/l with an average of 0.700mg/l.

From an analysis of any monitoring over the past 5 yrs. of the IPC licence environmental monitoring programme, indicate that results were under the ELV for SS and the trigger level for Ammonia, and with the majority of the trigger level for COD (Table 3.1).

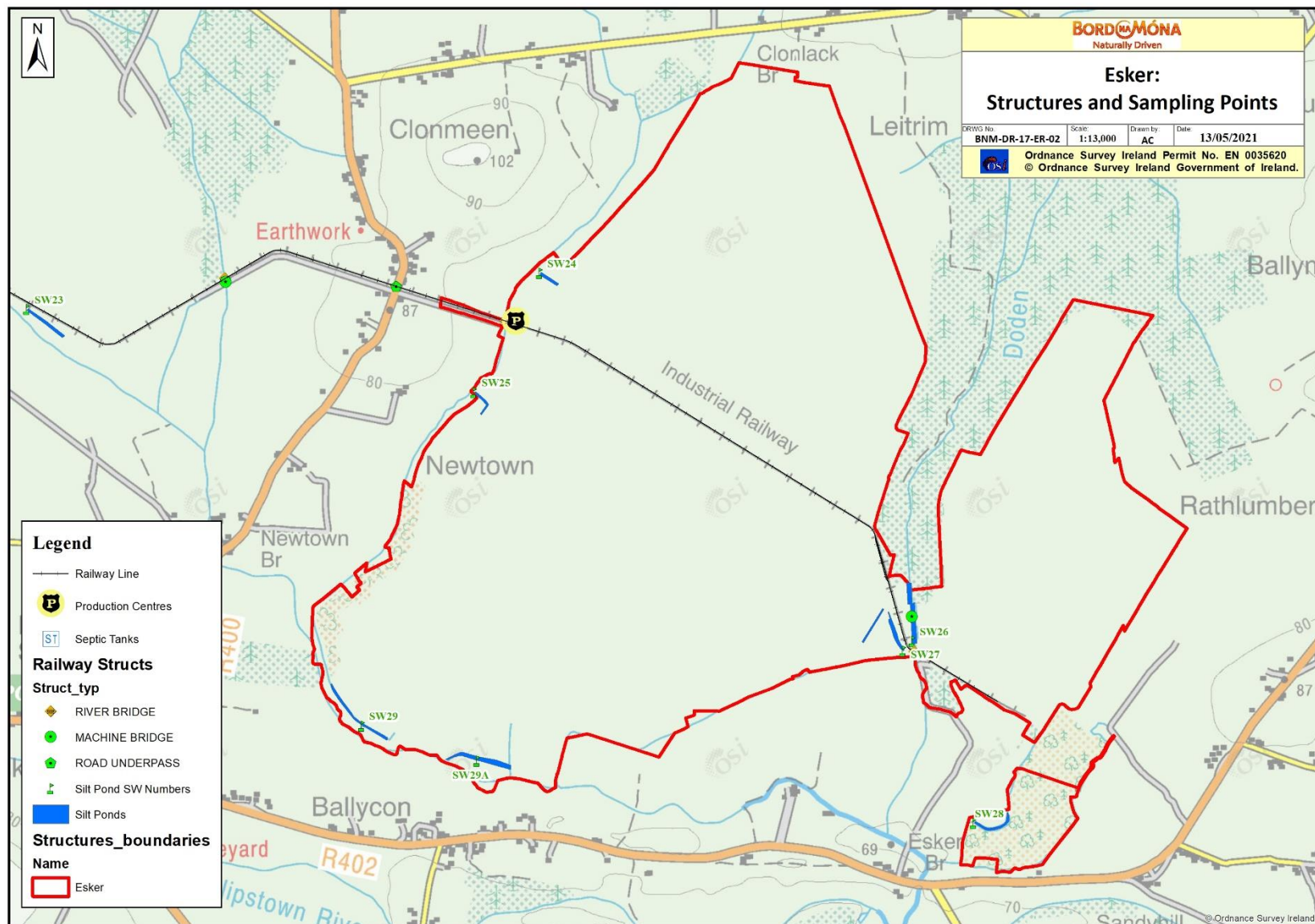


Figure 3.6. Map of Esker Bog showing structures and designated emission points.

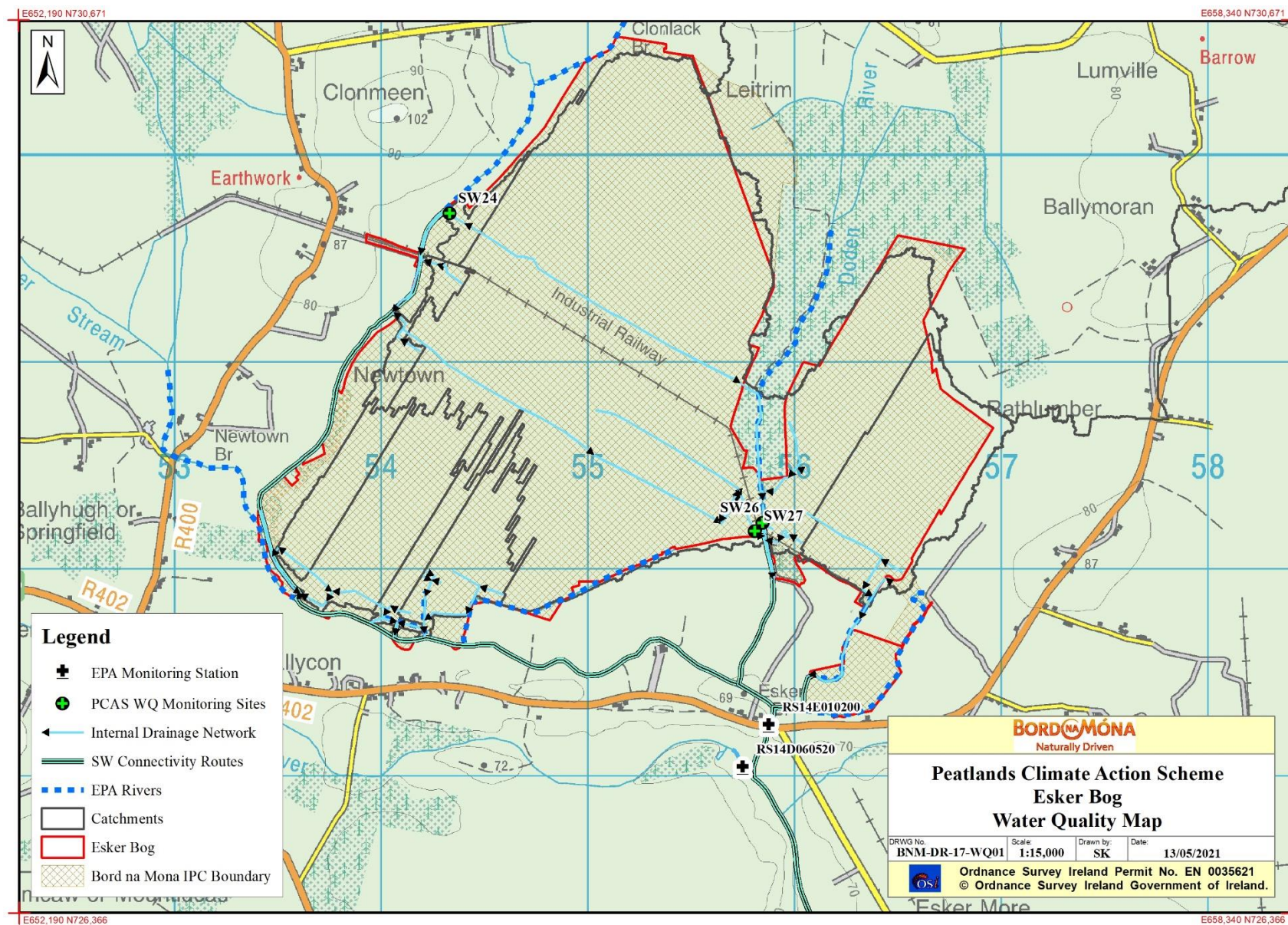


Figure 3.7. Water Quality map.

Table 3.1. Water quality monitoring results associated with Esker Bog, 2017-2020

Bog	SW	Monitoring	Sample Date	pH	SS	TS	Ammonia	TP	COD	Colour
Esker	SW-24	Q2 2020	09/06/2020	8.3	3	257	0.013	0.05	45	113
Esker	SW-25	Q2 2020	09/06/2020	8	21	412	0.026	0.31	88	202
Esker	SW-26	Q2 2020	09/06/2020	8.4	9	364	0.141	0.05	16	82.7
Esker	SW-27	Q2 2020	09/06/2020	8.6	10	212	1.44	0.05	41	177
Esker	SW-28	Q2 2020	09/06/2020	7.9	3	410	0.032	0.05	41	107
Esker	SW-29	Q2 2020	09/06/2020	8.5	5	569	0.06	0.05	66	109
Esker	SW29-A	Q2 2020	09/06/2020	7.9	9	651	0.396	0.05	60	124
Esker	SW-24	Q3 18	12/09/2018	7.6	52	276	0.02	0.05	49	86
Esker	SW-25	Q3 18	12/09/2018	7.1	5	222	0.83	0.11	87	164
Esker	SW-26	Q3 18	12/09/2018	7.3	5	166	4.6	0.06	86	351
Esker	SW-27	Q3 18	12/09/2018	7.5	6	296	0.53	0.06	37	76
Esker	SW-28	Q3 18	12/09/2018	7.6	5	316	0.1	0.05	39	100
Esker	SW-29	Q3 18	12/09/2018	6.2	5	231	5.6	0.05	159	446
Esker	SW29-A	Q3 18	12/09/2018	7.6	5	242	5	0.1	116	355
Esker	SW-24	Q1 17	02/03/2017	7.4	6	130	0.47	0.05	79	242
Esker	SW-25	Q1 17	02/03/2017	6.6	8	84	0.49	0.05	81	244
Esker	SW-26	Q2 17	28/06/2017	7.2	5	172	4.3	0.05	112	325
Esker	SW-27	Q2 17	28/06/2017	7.6	5	298	0.9	0.05	59	131
Esker	SW-28	Q2 17	28/06/2017	7.5	5	306	1.6	0.05	81	160
Esker	SW-29	Q2 17	28/06/2017	7.2	15	230	2.3	0.05	126	338
Esker	SW29-A	Q2 17	28/06/2017	7.1	10	135	3.1	0.05	113	367

3.5.1 Decommissioning and Rehabilitation Programme Water Quality Monitoring.

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

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

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

In the preparation of this monitoring programme, Bord na Moña have been providing the Local Authority Water Programme (LAWPRO) with details of the surface water emissions points associated with this bog and will be amending some of the proposed monitoring locations on foot of this engagement. LAWPRO have in turn provided details of their 2021 monitoring programme and these are included in the WQ map in Figure 3.7.

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 bogs 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

Esker 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

Esker Bog is likely to be currently 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. The EPA NEROS project carried out GHG flux research at Moyarwood Bog and found that Moyarwood Bog was overall a Carbon sink (sink for CO₂ and a source for Methane) 6 years after bog restoration was carried out (Renou-Wilson *et al.* 2018).

It is expected that Esker Bog will become a reduced Carbon source following rehabilitation. The site does have potential to become a carbon sink in part, in the longer-term. This depends on the success of the rehabilitation measures, the extent of development of *Sphagnum*-rich habitats, the balance of carbon fluxes from different cutaway habitats (some of the cutaway is expected to develop Reed Swamp and fen habitats with alkaline emission factors) and future climatic conditions. This site is expected to develop embryonic *Sphagnum*-rich peat-forming habitats along with scrub, some fen and some wetland habitats such as Reed Swamp. Birch woodland is expected to develop on the drier mounds and peripheral headlands.

3.9 Current ecological rating

(Following NRA (2009) Evaluation Criteria)

Current ecological rating (ranges from Local Importance (lower and higher value) to National Importance; following NRA (2009) Evaluation Criteria)

The majority of Esker Bog is deemed to be of **Local Importance (lower value)** due to the dominance of bare peat managed for industrial peat production. Some pioneer and semi-natural habitats such as birch woodland are rated higher and are deemed to be of **Local Importance (higher value)**.

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 naturally functioning peatland habitats.

3.10 Esker Bog Characterisation Summary

Esker Bog is located approximately 3.5km south-southeast of Rhode and c.6km east of Daingean in Co. Offaly. Esker Bog comprises two main sections, a larger area in the west and a smaller section in the east, that are divided by a stream (the Dogen River). A third, small, separate area is also included as part of Esker Bog which is located to the south-west of the other two bog areas

Peat production permanently ceased at Esker Bog in 2019. Esker Bog had a gravity drainage system.

The western section is predominantly bare peat with active field drains running in a northeast to south west direction. The eastern section is largely cutaway, and pioneer cutaway habitats have started to develop on this area in recent years, including Birch woodland on the higher (and drier) area with a mosaic of rush-dominated poor fen and bare peat over much of the remainder of this area. The small area of Esker Bog to the south- that has never been in production is dominated by mature Birch woodland with some small patches of old cutover bog wet grassland and Bracken.

The western section has deeper peats towards the western side, with shallower peats in the south-east corner and along the northern and eastern boundary. This area also slopes from north to south. The eastern section has shallow peats through the centre and north. The deeper peats in the western area lends itself towards development of embryonic peat forming habitats, although the lower parts of this area towards the southern boundary are likely to develop extensive wetland habitats. The shallower peat areas in the north-east parts of the western section and much of the eastern section are more suitable to the development of wetlands and fen, as they now naturally contains a basin which will hold water with significant ground-water/more alkaline influence.

There are areas of former production area that are constrained from rehabilitation due to the proposed Water Supply Project- Eastern and Midlands Region route. This is indicated to run along the southern side of the site and this development footprint, which is at pre-planning stage, is constrained out from rehabilitation.

4. CONSULTATION

4.1 Consultation to date

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

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

- Breeding and wintering bird usage of the site through surveys (commissioned by BnM).
- General consultation with range of stakeholders at annual Bord na Mona Biodiversity Action Plan review days 2010-2018.
- Midlands & East Regional WFD Operational Committee (River Basin Management Plans).
- Archaeological Liaison Committee (National Museum of Ireland & Dept of Culture Heritage and the Gaeltacht).
- Proposed WaterSupply Project – Eastern and Midlands Region pipeline (Irish Water).

To inform the current Plan, both national and local stakeholders, including neighbours whose land adjoins Esker 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 Esker Bog (see Appendix XI).

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

4.2 Issues raised by Consultees

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

4.2.1 Assessments of rehabilitation

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

4.2.2 *Restoration scope*

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

4.2.3 *Monitoring*

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

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

4.2.4 *Flooding of adjacent land*

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

4.2.5 *Land Management*

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

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

4.2.6 *Other issues (including amenity)*

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

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

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

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

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

4.3 Bord na Móna response to issues raised during consultation

4.3.1 Assessments of rehabilitation

AA screening will be undertaken on all the bogs as part of PCAS and this is currently being undertaken by external consultants for Esker 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. We are doing this by including all known archaeology on our GIS from the AIA process, and either excluding or defining a buffer zone around these features, which will then be excluded from any ground works in these areas in the final plan. Currently there are no known archaeological sites within Esker Bog. Nevertheless, it is anticipated that any archaeology will benefit hugely from the ultimate remit of the rehabilitation, in that water tables will be raised thereby preserving in-situ. There is also an identified procedure for managing reports of stray finds that may arise during rehabilitation works.

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

4.3.2 Restoration scope

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

4.3.3 Monitoring

As part of the PCAS, a monitoring and verification plan has been developed to support climate action and biodiversity objectives. This will include stratified monitoring of bog condition, habitats and biodiversity at several different scales. Some fauna monitoring (pollinator transect) is proposed as part of the monitoring and verification at Esker 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 Esker Bog.

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

4.3.4 Flooding of adjacent land

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

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

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

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

4.3.5 Land Management

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

It is expected that re-wetting will reduce area being colonised by Birch and other scrub species as conditions will be more suitable for wetter species. However, in drier areas that cannot be re-wetted, particularly where there is shallow (or no) residual peat, it is inevitable that drier vegetation communities, including Birch woodland will develop. Heather is not expected to be an important part of the vegetation at Esker as site environmental conditions (wetland conditions, alkaline/ground-water influence) do not suit this species.

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

4.3.6 Other issues (including amenity)

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

Other issues, including after-use and management issues outside the boundary of Esker Bog, are acknowledged but are specifically outside the scope of this rehabilitation plan. This includes reference to the cessation of turf-cutting on private lands. Bord na Móna rehabilitation proposals will not impact on private turf-cutting and will have no impact on private turf-cutting outside Bord na Móna boundaries.

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

4.3.7 *Concluding statement.*

- No specific issues were raised during consultation that required significant changes to the substance of the rehabilitation plan.
- Issues raised by several consultees in relation to potential impacts on adjacent land had already been accounted for during the hydrological analysis. Several marginal drains will not be blocked to avoid impacts on adjacent lands or turf-banks.
- A small portion of cutaway bog (10 ha) will be constrained from re-wetting as it is part of the Proposed Water Supply Project – Eastern and Midlands Region pipeline (Irish Water) route. It is anticipated that rehabilitation across the site will occur in advance of the construction of this pipeline. Constraining this area from re-wetting does not alter the overall substance of the rehabilitation plan (key goals and outcomes). There is expected to be ongoing consultation to further minimise the footprint of the constrained Irish Water footprint. This area will be allowed to colonise naturally in advance of the pipeline project.
- Bord na Móna do not propose to carry out any re-wetting within the footprint of the proposed Water Supply Project – Eastern and Midlands Region until a decision has been made by the relevant authorities in relation to the statutory consent applications for the project. It is expected that the footprint of the corridor will be rehabilitated post the construction of the proposed Water Supply Project – Eastern and Midlands Region.

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

- Bord na Móna are also planning rehabilitation measures in some adjacent bogs (e.g. Cavemount) in 2021. There are expected to be cumulative water quality and other ecosystem service benefits to receiving water bodies such as the Bilberry River from rehabilitation more than one bog in the same catchment.
- Re-wetting in general will benefit the future preservation of most known and unknown archaeological features.

6. SCOPE OF REHABILITATION

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

- The area of Esker Bog (Figure 3.1);
- EPA IPC Licence - Ref. P0503-01. 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. Esker Bog is part of the Allen Bog group (Clonsast sub-group).
- The proposed Scheme is designed to exceed the stabilisation requirements as defined by the IPC Licence. PCAS is designed to enhance the ecosystem services of Esker 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 will be accrued.
- The local environmental conditions of Esker Bog identify wetland rehabilitation as the most suitable rehabilitation approach for the majority of this site.
- 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 Esker Bog as **environmental stabilisation and deep peat re-wetting, and setting the site on a trajectory towards the development of embryonic peat-forming (*Sphagnum*-rich) vegetation communities on deep peat, and the development of Reed Swamp and fen on shallow more alkaline peat and other subsoils**.
- Rehabilitation of Esker Bog will support multiple National strategies of climate action, biodiversity action and other key environmental strategies such as the Water Framework Directive.
- **Time frame.** Rehabilitation measures will be carried out during the period of PCAS (2020-2025). The surrender of the licence is likely to extend beyond the PCAS timeframe.
- It is not proposed to carry out any rehabilitation in the narrow marginal raised bog remnants around the margins. Generally, these bog remnants are narrow, or are subject to turbary, and do not have positive bog restoration prospects.

6.1 Key constraints

- **Bog conditions.** Rehabilitation outcomes of sites are constrained by the environmental characteristics of these particular areas. For example, there is potential for raised bog restoration at some sites where there has not been significant industrial peat extraction and the peat body is largely intact (deep peat sites that are drained). At other sites, most of the peat mass has been removed, the environmental characteristics of these areas have therefore changed radically (peat depths, hydrology, water chemistry, substrate type, nutrient status), and there will therefore be different habitat outcomes (wetlands, fen, heathland, grassland and Birch woodland).
- At Esker Bog, remnant peat depths are in excess of 2.5m in the western section. By contrast, the smaller eastern section contains shallower residual peat and is partly cutaway. These two areas will therefore require different approaches to rehabilitation. There are local factors that will influence the future trajectory of this site (hydrological and underlying geological conditions) which need to be considered as part of the wider rehabilitation work.
- **Surrounding landscape and neighbours.** Another key constraint is the interaction between the Bord na Móna sites and the surrounding landscape. Care has to be taken that no active rehabilitation management is carried out that could negatively and knowingly impact on surrounding land. This includes any hydrological management on neighbouring farmland, as well as potential changes to the hydrology

of surrounding designated sites. It is anticipated that the work proposed here (blocking drains and re-wetting cutaway peatlands) will not have any adverse flooding impacts on adjacent land.

- **Archaeology.** The discovery of monuments or archaeological objects during peatland rehabilitation may potentially constrain the rehabilitation measures proposed for a particular area. While the rehabilitation will optimise hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future, any new archaeology may require rehabilitation measures will be reviewed and adapted. If this occurs, rehabilitation measures will be reviewed and adapted. An Archaeological Impact Assessment (Appendix XII) was carried out to mitigate against any impact on found archaeology at Esker Bog. The proposed rehabilitation will have no impact on any known archaeological material in the application area or the vicinity. In the worst-case scenario works affecting the surface and sub-surface of the bog might disturb previously unknown archaeological deposits or artefacts without preservation by record taking place. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it should be avoided and reported to Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.
- **Proposed Water Supply Project – Eastern and Midlands Region (Irish Water).** This proposed Irish Water Project that is currently in the pre-planning stage also traverses the southern headland of Esker Bog. It is expected that the enhanced rehabilitation measures planned for Esker will be carried out in advance of the construction of the pipeline, which is still subject to planning consent. Bord na Móna do not propose to carry out any rehabilitation works within the footprint of the proposed Water Supply Project – Eastern and Midlands Region until a decision has been made by the relevant authorities in relation to the statutory consent applications for the project. It is expected that the footprint of the corridor will be rehabilitated post the construction of the proposed Water Supply Project – Eastern and Midlands Region. The route of the proposed Water Supply Project – Eastern and Midlands Region crosses the southern headland of the main part of Esker Bog. This area of cutaway is at a relatively high elevation close to the edge of the bog and the footprint also takes part of the low-lying basin. This route will not significantly alter any re-wetting objectives or outcomes at a site scale as it is located close the margin of the site.

6.2 Key Assumptions

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

6.3 Key Exclusions

The scope of this rehabilitation plan does not cover:

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

7. CRITERIA FOR SUCCESSFUL REHABILITATION

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

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

Rehabilitation is generally defined by Bord na Móna as

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

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

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

- Rewetting of residual peat in the former area of industrial peat production to offset potential silt run off and to encourage/accelerate development of vegetation cover via natural colonisation, and reducing the area of bare exposed peat. See Table 7.1 for a summary of the criteria for successful rehabilitation and associated monitoring. The target will be the delivery of measures and this will be measured by an aerial survey after rehabilitation is completed.
- That there is a stabilizing/improving concentration of suspended solids and ammonia in discharges from Bord na Móna sites, associated with the measures undertaken to stabilize the peat surface by the blocking of the internal drainage system and the maximized rewetting of the peat surface.
- 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 an adjoining Corlea bog in Mountdillon over the past 3 yrs., post cessation of peat extraction with ongoing rehabilitation, were considered. These are indicating a downward trend in Ammonia concentrations. As the monthly monitoring program at Derrycolumb 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).

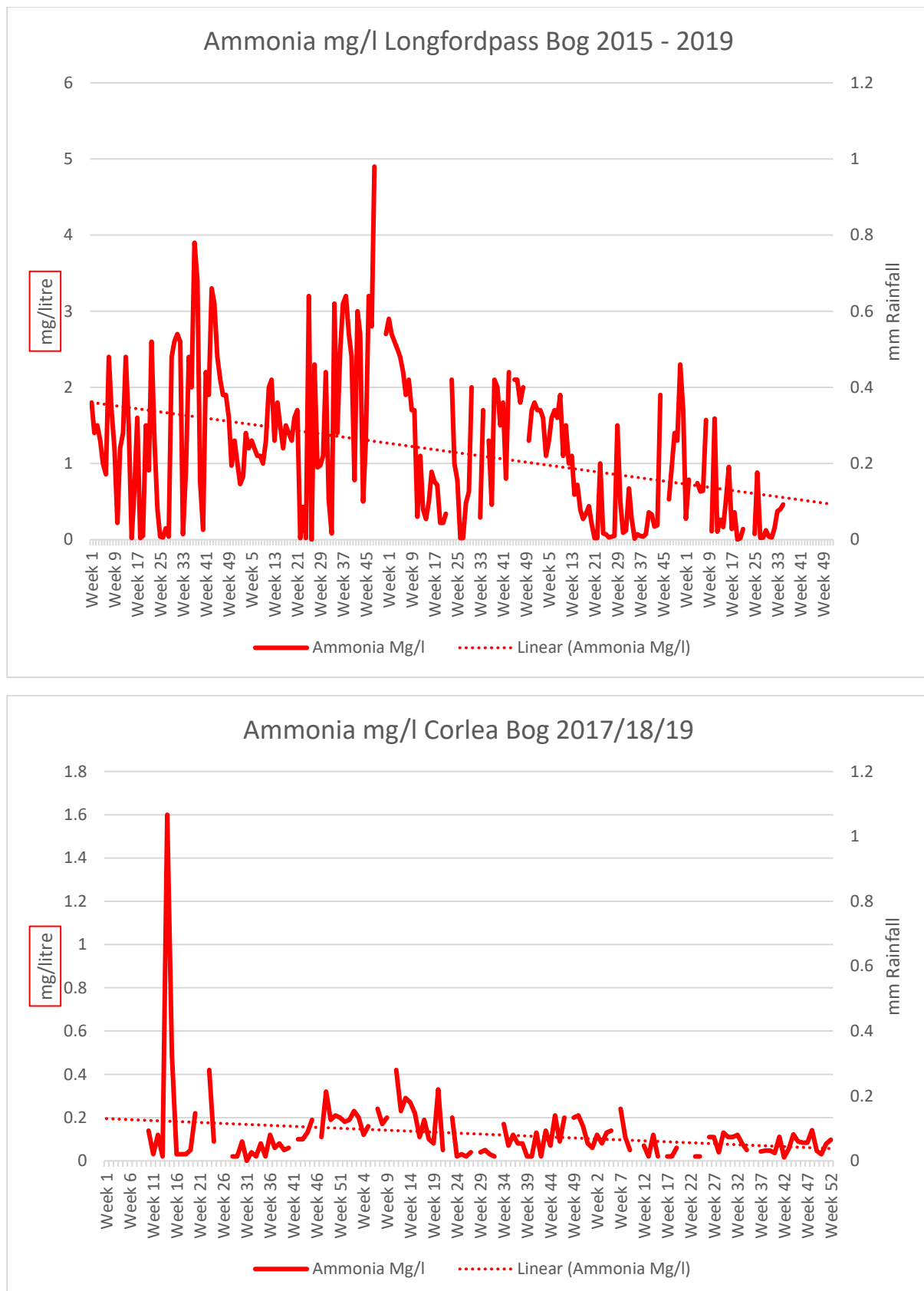


Figure 7.1. Ammonia levels over the period 2015-2019 at Longfordpass and Corlea.

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

- Optimising the extent of suitable hydrological conditions to optimise climate action and other ecosystem service benefits (optimising and maximising 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 and eventually naturally functioning peatland habitats (heath, scrub, poor fen and embryonic *Sphagnum*-rich raised bog peatland communities, where conditions are suitable). These habitats will generally establish initially as pioneer vegetation. 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. 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.
- Improvement in biodiversity and ecosystem services. This will be demonstrated by metrics outlined in Section 9.1 that can be used to measure changes in ecosystem services (e.g. water quality parameters, development of pioneer habitats, breeding bird monitoring). This will be measured by collecting a range of scientific data that can then quickly be adapted and into metrics that can be used to measure changes in various ecosystem services. Baseline monitoring will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.

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

Criteria type	Criteria	Target	Measured by	Expected Time-frame
IPC validation	Rewetting of the drained high bog area	Delivery of planned rehabilitation measures. This will be a combination of drain blocking, bunding and re-profiling	Aerial photography after rehabilitation has been completed – to demonstrate measures (drain-blocking)	2021-2024
IPC validation	Key water quality parameters Ammonia, Phosphorous, Suspended solids,	Stabilization Improvement of key water quality parameters	Water quality monitoring. Started in advance of the proposed rehabilitation.	2021-2023

	pH and conductivity			
IPC validation	Reducing pressure from peat production on the local water body catchment (WFD)	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	EPA WFD monitoring programme	WFD schedule
Climate action verification	Optimising the extent of suitable hydrological conditions to optimise climate action and setting the site on a trajectory towards establishment of a mosaic of compatible peatland habitats	Optimal extent of suitable hydrological conditions Indicators of establishment of compatible cutaway habitats	Aerial photography, Cutaway bog condition map 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	Biodiversity and ecosystem services. Habitat establishment Presence of key species – Sphagnum Breeding and wintering birds Pollinators	Improvement in biodiversity and ecosystem services.	Metrics that relate to selected biodiversity and ecosystem services Presence of key species – Sphagnum – Walkover survey Breeding birds – Breeding bird survey Wintering birds – survey of wintering waterbirds Pollinators – Pollinator walk Baseline monitoring to be carried out during the scheme when rehabilitation is complete. Sites can be re-monitored	2021-2024

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

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

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

- **Funding to pay for resources required to deliver the planned rehabilitation (Bord na Móna and external).** Bord na Móna maintains a Provision on its balance sheet to pay for these future costs when industrial peat extraction ceases. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence. It is expected that additional costs of enhanced rehabilitation will be supported by Government through the Climate Action Fund.
- **Bord na Móna to have sufficient resources (staff and training) to deliver the planned rehabilitation with required associated skills and competencies.**
- **Bord na Móna to have sufficient resources (suitable machinery) and staff to maintain this machinery.**
- **Weather conditions to be within normal limits over the rehabilitation plan timeframe.** Long periods of wet weather have the capacity to significantly affect ground conditions and constrain the delivery of rehabilitation. The potential impact of wet weather on ground conditions can be reduced by appropriate planning and management. Bord na Móna have significant experience of managing these issues through 70 years of working in these peatland environments.
- **Rehabilitation measures to be effective.** The rehabilitation measures proposed in this plan are based on 40 years of Bord na Móna experience of peatland management and best practise applied internationally in peatland management. Measures proposed in this plan have already been shown to be effective at other sites. Bord na Móna will apply a flexible and adaptable approach to the more innovative rehabilitation measures proposed in this plan. If measures are not initially effective, Bord na Móna will review any requirement for additional practical rehabilitation.
- **Natural colonisation of vegetation to develop semi-natural habitats at a rate within the normal limits.** The development of naturally functioning semi-natural habitats on 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 suitable 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 (Figures 8.1 & 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 Esker Bog will include:

- Re-wetting the deep peat areas of the bog using berms and field re-profiling. This enhanced measure seeks to create large (c. 45m x 60m) flat areas or cells of shallow (< 10 cm) water conditions on bare peat, across multiple fields that are enclosed by shallow berms to retain shallow surface water;
- Inoculation of *Sphagnum* on suitable deep residual peat.
- Re-wetting some deep peat areas and some of the drier parts of the bog through more intensive field drain blocking using a dozer or excavator to create up to seven peat blockages every 100 m along each field drain
- Optimise water retention in wetland areas, including placement of berms where required and the introduction of Reeds and other Rhizomes, where needed.
- Re-wetting some areas of the bog through regular field drain blocking using a dozer to create three peat blockages every 100 m along each field drain;
- Blocking drains in targeted existing pioneering vegetation mosaics, to accelerate re-wetting, and/or manage water levels to the correct height to accelerate the current trajectory towards Reed swamp and fen, using a dozer/excavator.
- Targeted fertiliser applications to accelerate vegetation establishment on headlands and high fields.
- Modifying water levels at outfalls, as it may be desirable to change and control water levels at the site over time, e.g. to increase water levels as the site becomes increasingly vegetated. This will further slow the movement of water through and out of Esker Bog. It may be desirable to change and control water levels at the site over time, e.g. to increase water levels as the site becomes increasingly vegetated.

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).

An indication of the areas for these various measures is shown in Table 8.1 and in Figure 8.5.



Figure 8.1. Aerial photo of Esker Bog. The majority of the bog is bare peat, with areas of vegetation at the northern end of the eastern side.



Figure 8.2. Peat Depth Map for Esker Bog (2020). There are pockets of deep residual peat (western area); the remainder is shallow cutaway.

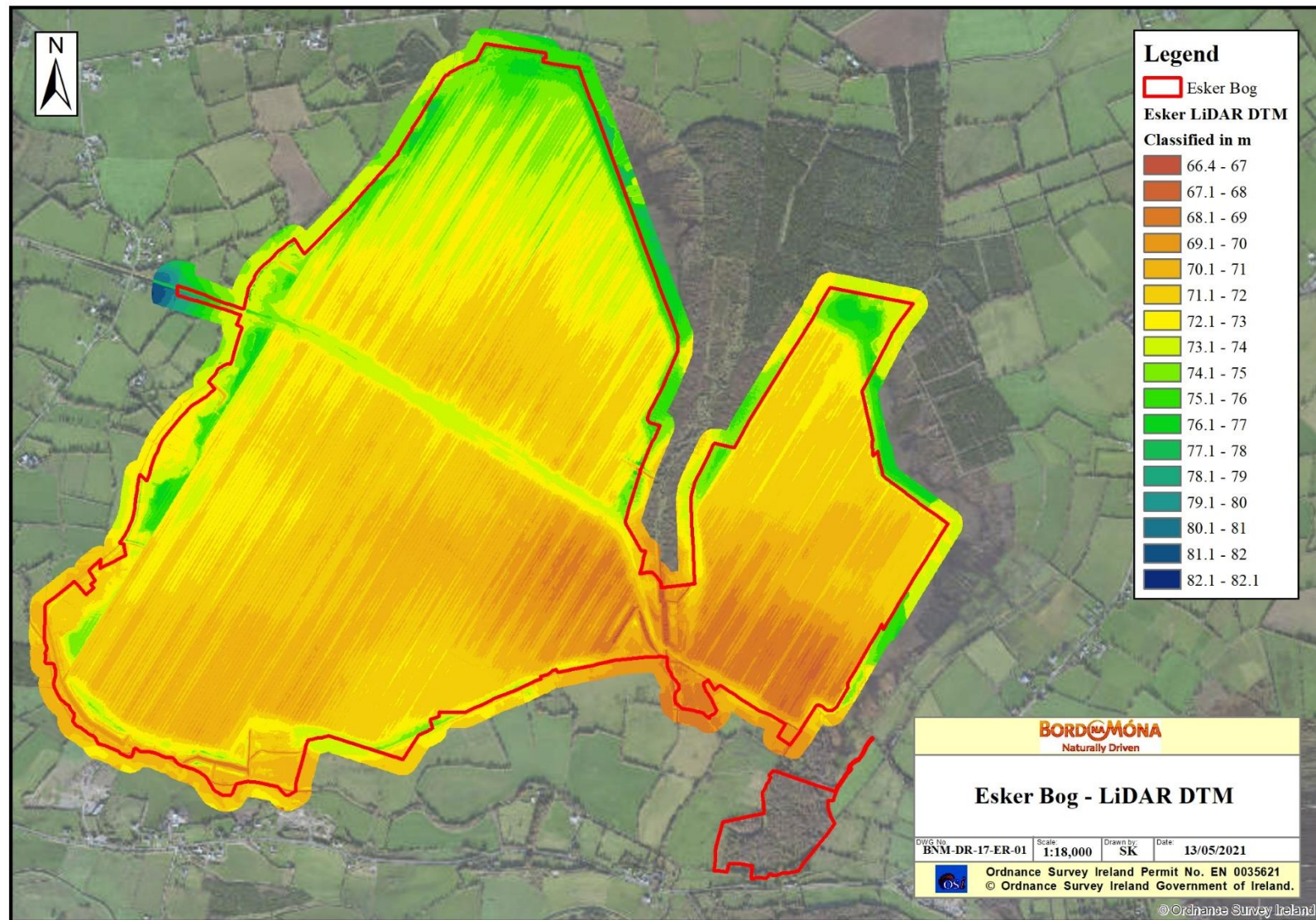


Figure 8.3. LIDAR topography map of Esker Bog. Low areas and basins are orange-yellow; more elevated areas are blue-green.

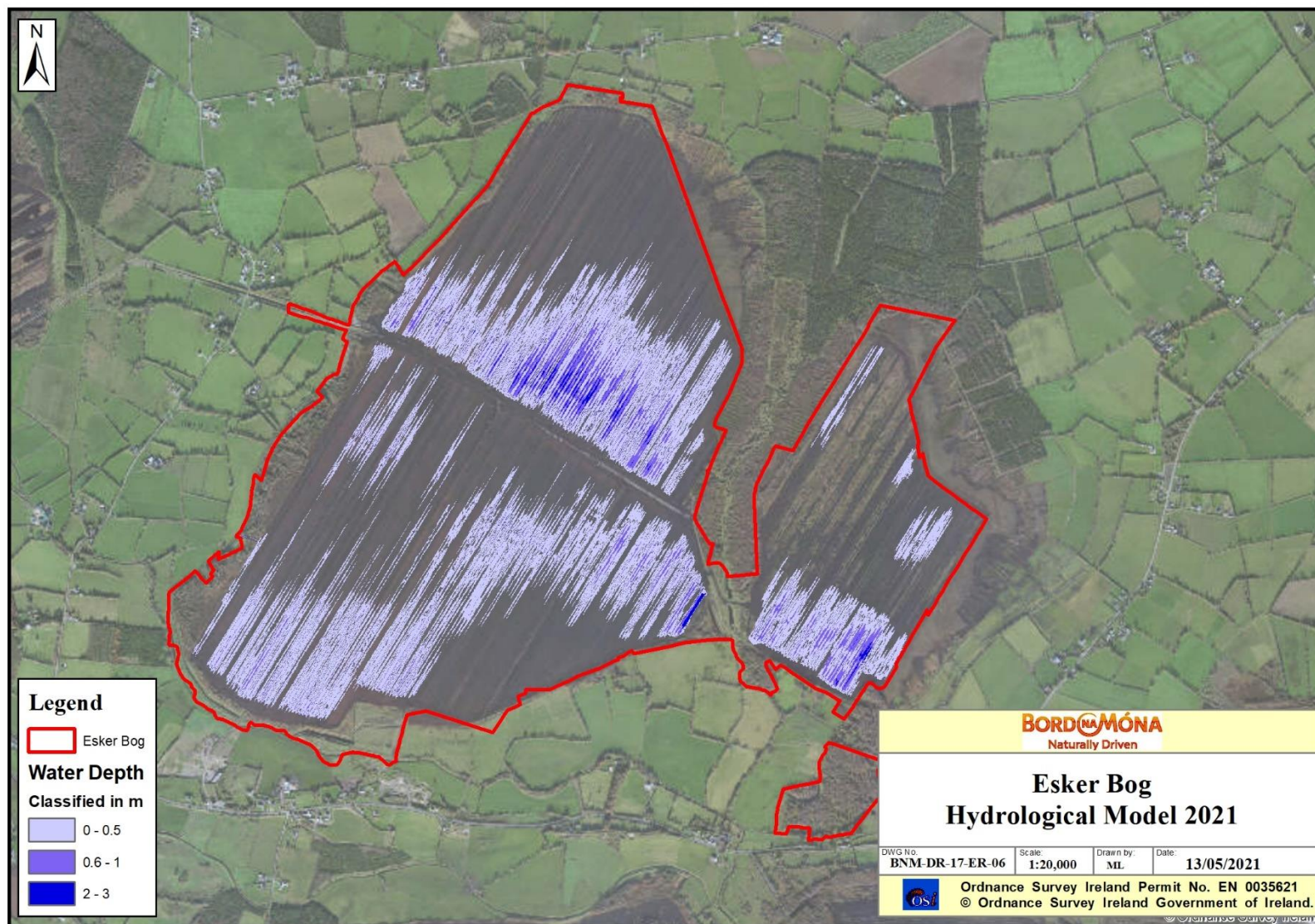


Figure 8.4. Hydrological modelling for Esker Bog showing range of expected water depths based on current topography. Small areas of both Esker East and West are modelled as basins that have the potential to develop wetland habitats.

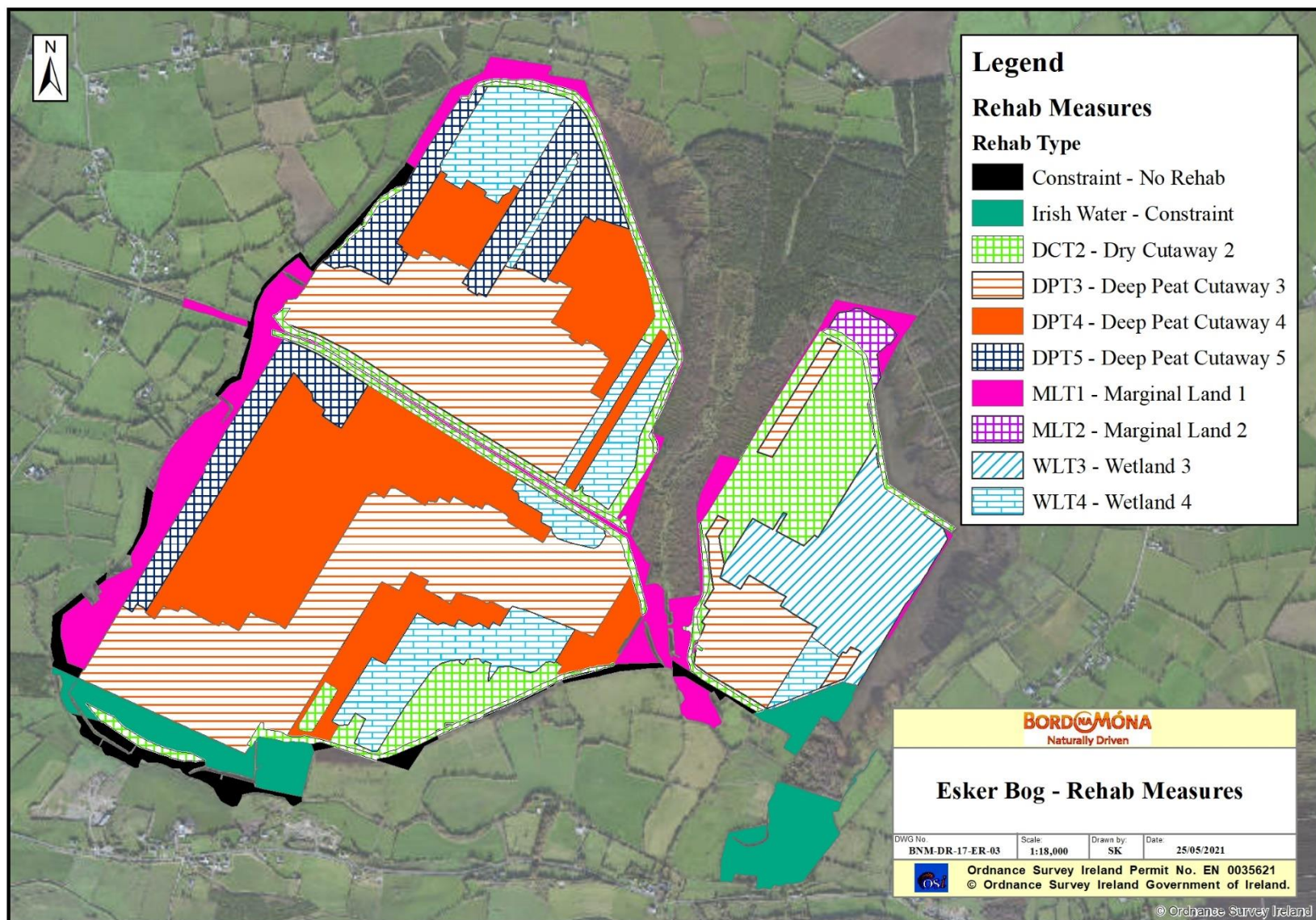


Figure 8.5 Indicative Enhanced Rehabilitation Plan. Note that the types of rehab and areas of rehab may change in response to stakeholder consultation and refinement of the enhanced rehabilitation measures.

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

Type		Enhanced Rehabilitation Measure	Extent (Ha)
Deep peat	DPT3	More intensive drain blocking (max 7/100 m), + field reprofiling + blocking outfalls and managing overflows	161.2
Deep peat	DPT4	Berms and field re-profiling (45m x 60m cell) + blocking outfalls and managing overflows + drainage channels for excess water + <i>Sphagnum</i> inoculation	112.1
Deep peat	DPT5	Cut and Fill cell bunding (30m x 30m cell) + blocking outfalls and managing overflows + drainage channels for excess water + <i>Sphagnum</i> inoculation	45.0
Wetland	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	35
Wetland	WLT4	More intensive drain blocking (max 7/100 m), + blocking outfalls and managing overflows + transplanting Reeds and other rhizomes	51.72
Dry Cutaway	DCT2	Regular drain blocking (max 3/100m) + blocking outfalls and managing water levels with overflow pipes+ targeted fertiliser treatment	70.4
Marginal land	MLT1	No work required	43.6
Marginal land	MLT2	More intensive drain blocking (max 7/100 m)	3.3
Silt ponds		Silt ponds	2.4
Constraint	Constraint	Other Constraints (Pipeline)	13.8
Minimal Rehab	Constraint	IW Pipeline Corridor	29.6
Total			568.3

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

- Seek formal approval of the enhanced plan from the EPA;
- Agree an *ex ante* budget of eligible costs (based on the approved enhanced plan) with the Scheme regulator;
- Develop a detailed site plan with detailed site drawings outlining how the various rehabilitation methodologies (the proposed PCAS) will be applied to Esker Bog. This will take account of peat depths, topography, drainage and hydrological modelling. (See Figure 8.5 for an indicative view of the application of different rehabilitation methodologies);
- Carry out a hydrology and drainage management assessment of the proposed enhanced rehabilitation measures;
- Carry out a review of known archaeology and an archaeological impact assessment 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 (including the proposed Water Supply Project- Eastern and Midlands Region route).
- Carry out an ecological appraisal of the potential impacts of the planned rehabilitation, if needed, such as the presence of sensitive ground-nesting bird breeding species (e.g. breeding waders) or larval webs of Marsh Fritillary butterfly, etc. The scheduling of rehabilitation operations will be adapted, as mitigation; 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.
- See Esker Decommissioning and Rehabilitation Plan – Addendum 1 for more details of the NIS conclusion and the NIS mitigation measures.
- Track implementation and enforcement of the relevant IPC Licence conditions, the mitigation measures (AA) and other environmental control measures during the implantation of the rehabilitation plan.

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

- Carry out proposed measures as per the detailed site plan. This will include a combination of drain blocking, peat field re-profiling, cell-bunding and fertiliser applications targeting headlands, high fields and other areas (where required). All rehabilitation 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 inoculation of *Sphagnum*;
- Silt ponds will be monitored during this period and there will be continued maintenance and cleaning to prevent silt run-off from the site during the rehabilitation phase; and
- Submit an *ex post* report to the Scheme regulator to verify the eligible works 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 licence compliance costs of mandatory 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 'mandatory' rehabilitation provision (sufficient to discharge the requirement of Condition 10 in the licence) has been allocated to the site based on the area of different types of cutaway across the site (See Appendix I).

9. AFTERCARE AND MAINTENANCE

9.1 Programme for monitoring, aftercare and maintenance

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

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

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

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

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

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

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

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

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

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

10. REFERENCES

- Atherton, I, Bosanquet, SDS & Lawley, M (2010). Mosses and liverworts of Britain and Ireland - a field guide. British Bryological Society.
- Anderson, R., Farrell, C., Graf, M., Muller, F., Calvar, E., Frankard, P., Caporn, S., Anderson, P. (2017). An overview of the progress and challenges of peatland restoration in Western Europe. *Restoration Ecology*, Issue 2 Pages 271-282.
- Bord na Móna 2014. Blocking Drains in Irish raised bogs. The Bord na Móna Raised Bog Restoration Project. Cris, R. Buckmaster, S. Bain, C. Reed, M. (Eds) (2014) Global Peatland Restoration demonstrating SUCCESS. IUCN UK National Committee Peatland Programme, Edinburgh. <http://www.iucn-uk-peatlandprogramme.org/sites/www.iucn-uk-peatlandprogramme.org/files/IUCNGlobalSuccessApril2014.pdf>
- Bord na Móna. 2016. Bord na Móna Biodiversity Action Plan 2016-2021. Brosna Press, Ferbane. <http://www.bordnamona.ie/wp-content/uploads/2016/04/Biodiversity-Action-Plan-2016-2021.pdf>.
- Bord na Móna (2020). Bord na Móna Annual Report 2020. https://www.bordnamona.ie/wp-content/uploads/2020/07/M12822-BORD-NA-MONA_Annual-Report-2020_WEB2.pdf
- Bonn, A., Allott, T., Evans, M., Joosten, H. & Stoneman, R. (2017) Peatland restoration and ecosystem Services-science, policy and practice. Cambridge University Press.
- Carroll, J., Anderson, P., Caporn, S., Eades, P., O'Reilly C. & Bonn, A. 2009. Sphagnum in the Peak District. Current Status and Potential for Restoration. Moors for the Future Report No 16. Moors for the Future Partnership.
- Clark, D. and Rieley, J. 2010. Strategy for responsible peatland management. International Peat Society, Finland.
- Clark, D. (2010). Brown Gold. A history of Bord na Móna and the Irish peat industry. Gill Books.
- Cross, J.R. (2006). The Potential Natural Vegetation of Ireland. *Biology and Environment: Proceeding of the Royal Irish Academy*, Vol. 106B, No. 2, 65-116 (2006).
- Department of Communications, Climate Action and Environment 2019. National Climate Action Plan 2019. <https://www.dccae.gov.ie/en-ie/climate-action/publications/Pages/Climate-Action-Plan.aspx>
- Department of Housing, Planning, Community and Local Government 2017. Public consultation on the River Basin Management Plan for Ireland. Department of Housing, Planning, Community and Local Government. https://www.housing.gov.ie/sites/default/files/public-consultation/files/draft_river_basin_management_plan_1.pdf
- Department of Arts, Heritage and the Gaeltacht 2015. National Peatland Strategy. Department of Arts, Heritage and the Gaeltacht.
- <http://www.npws.ie/sites/default/files/general/Final%20National%20Peatlands%20Strategy.pdf>
- Eades, P., Bardsley, L., Giles, N. & Crofts, A. (2003). The Wetland Restoration Manual. The Wildlife Trusts, Newark.
- Environment Agency (2013). The Knotweed code of practise. Managing Japanese Knotweed on development sites. Environment Agency, Bristol, UK. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/536762/LIT_2695.pdf

- European Commission (2013). Interpretation manual of European Union Habitats. European Commission DG Environment Nature ENV B.3.
- EPA (2019). <http://gis.epa.ie/Envision>. EPA Envision Map Viewer. (Last Viewed: 31/12/2019).
- EPA (2020). Guidance on the process of preparing and implementing a bog rehabilitation plan. <http://www.epa.ie/pubs/reports/enforcement/guidanceontheprocessofpreparingandimplementingabogrehabilitationplan.html>
- Farrell, C. A. and Doyle, G. J. 2003. Rehabilitation of Industrial Cutaway Atlantic Blanket Bog, NW Mayo, Ireland. *Wetlands Ecology and Management*, 11, 21-35.
- Fernandez, F., Connolly K., Crowley W., Denyer J., Duff K. & Smith G. (2014) Raised Bog Monitoring and Assessment Survey (2013). Irish Wildlife Manuals, No. 81. National Parks and Wildlife Service, Department of Arts, Heritage and Gaeltacht, Dublin, Ireland.
- Gann, G.D., McDonald, T., Walder, B., Aronson, J., Nelson, C.R., Jonson, J., Hallett, J.G., Eisenberg, C., Guariguata, M.R., Liu, J., Hua, F., Echeverría, C., Gonzales, E., Shaw, N., Decleer, K. & Dixon, K.W. (2019). International Principles and Standards for the practice of Ecological Restoration. *Restoration Ecology* 27(S1): S1–S46.
- Grand-Clement, E., Anderson, K., Smith D., Angus, M., Luscombe D.J., Gatis, N., Bray L.S., Brazier R.E. (2015). New approaches to the restoration of shallow marginal peatlands *Journal of Environmental Management* 161.
- Günther, A., Barthelmes, A., Huth, V. et al. Prompt rewetting of drained peatlands reduces climate warming despite methane emissions. *Nat Commun* 11, 1644 (2020). <https://doi.org/10.1038/s41467-020-15499-z>
- Fossitt, J. (2000). A guide to habitats in Ireland. Kilkenny. The Heritage Council.
- Hinde, S., Rosenburgh, A., Wright, N., Buckler, M. and Caporn, S. 2010. Sphagnum re-introduction project: A report on research into the re-introduction of Sphagnum mosses to degraded moorland. *Moors for the Future Research Report 18*. Moors For The Future Partnership.
- Holden, J., Walker, J., Evans, M.G., Worrall, F., Bonn, A., 2008. In: DEFRA (Ed.), *A Compendium of Peat Restoration and Management Projects*.
- Joosten, H. and Clarke, D. 2002. *Wise Use of mires and peatlands – Background and Principles including a framework for Decision-making*. I.M.C.G. – I.P.S., Jyväskylä, Finland.
- Lindsay, R., 2010. *Peatbogs and Carbon: a Critical Synthesis to Inform Policy Development in Oceanic Peat Bog Conservation and Restoration in the Context of Climate Change* (Report to RSPB Scotland, Edinburgh).
- Mackin, F., Barr, A., Rath, P., Eakin, M., Ryan, J., Jeffrey, R. & Fernandez Valverde, F. (2017) Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.
- McBride, A., Diack, I., Droy, N., Hamill, B., Jones, P., Schutten, J., Skinner, A. and Street, M. 2011. *The Fen Management Handbook*, (2011), Scottish Natural Heritage, Perth.
- Minayeva, T. et al. (2017). Towards ecosystem-based restoration of peatland biodiversity. *Mires and Peat*, Volume 19 (2017), Article 01, 1–36, <http://www.mires-and-peat.net>
- McDonagh, E. (1996). Drain blocking by machines on Raised Bogs. Unpublished report for National Parks and Wildlife Service. https://www.npws.ie/sites/default/files/publications/pdf/McDonagh_1996_Drain_Blocking_Raised_Bogs.pdf.

- NPWS. (2014). Review of the raised bog Natural Heritage Area network. Department of Arts, Heritage and the Gaeltacht.
- NPWS. (2017a). National Raised bog Special Areas of Conservation management plan. Department of Arts, Heritage and the Gaeltacht.
[https://www.npws.ie/sites/default/files/files/FOR%20UPLOAD%20Plan\(WEB_English\)_05_02_18%20\(1\).pdf](https://www.npws.ie/sites/default/files/files/FOR%20UPLOAD%20Plan(WEB_English)_05_02_18%20(1).pdf)
- NPWS. (2017b). Actions for biodiversity 2017-2021. Ireland's 3rd national biodiversity plan. Department of Arts, Heritage and the Gaeltacht.
<https://www.npws.ie/sites/default/files/publications/pdf/National%20Biodiversity%20Action%20Plan%20English.pdf>
- NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill.
https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2019_Vol2_Habitats_Article17.pdf
- NRA (2009). Guidelines for Assessment of Ecological Impacts of National Road Schemes (Revision 2). National Roads Authority.
- NRA (2010). Guidelines on The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads. National Roads Authority.
<https://www.tii.ie/technical-services/environment/construction/Management-of-Noxious-Weeds-and-Non-Native-Invasive-Plant-Species-on-National-Road-Schemes.pdf>.
- Quinty, F. and L. Rochefort, 2003. Peatland Restoration Guide, second edition. Canadian Sphagnum Peat Moss Association and New Brunswick Department of Natural Resources and Energy. Québec, Québec.
- Regan, S., Swenson, M., O'Connor, M. & Gill, L. (2020). Ecohydrology, Greenhouse Gas Dynamics and Restoration Guidelines for Degraded Raised Bogs. EPA RESEARCH PROGRAMME 2014–2020. Report No.342. (2014-NC-MS-2). EPA Research Report. Prepared for the Environmental Protection Agency by Trinity College Dublin. www.epa.ie.
- Renou-Wilson F., Bolger T., Bullock C., Convery F., Curry J. P., Ward S., Wilson D. & Müller C. (2011). BOGLAND - Sustainable Management of Peatlands in Ireland. STRIVE Report No 75 prepared for the Environmental Protection Agency. Johnstown Castle, Co. Wexford.
- Renou-Wilson, F., Wilson, D., Rigney, D., Byrne, K., Farrell, C. and Müller C. (2018). Network Monitoring Rewetted and Restored Peatlands/Organic Soils for Climate and Biodiversity Benefits (NEROS). Report No. 238. Report prepared for the Environmental Protection Agency. Johnstown Castle, Co. Wexford.
- Schouten, M.G.C. 2002. Conservation and Restoration of Raised Bogs: Geological, Hydrological and Ecological Studies. Dúchas - The Heritage Service of the Department of the Environment and Local Government, Ireland; Staatsbosbeheer, the Netherlands; Geological Survey of Ireland; Dublin.
- Smith, G., O'Donoghue, P., O'Hora, K. & Delaney, E. (2011). Best Practice Guidance for Habitat Survey and Mapping. The Heritage Council.
- Stace, C. A. (1997). New Flora of the British Isles. Cambridge: Cambridge University Press.
- Thom, T., Hanlon, A., Lindsay, R., Richards, J., Stoneman R. & Brooks, S. (2019). Conserving Bogs – Management Handbook. <https://www.iucn-uk-peatlandprogramme.org/sites/default/files/header-images/Conserving%20Bogs%20the%20management%20handbook.pdf>

- Wilson, D., Renou-Wilson, F., Farrell, C., Bullock, C. and Muller, C. (2012). Carbon Restore – the potential of restored Irish peatlands for carbon uptake and storage; CCRP Report. EPA Wexford.
- Wilson, D., Dixon, S.D., Artz, R.R., Smith, T.E.L., Evans, C.D., Owen, H.J.F., Archer, E., & Renou-Wilson, F. (2015). Derivation of greenhouse gas emission factors for peatlands managed for extraction in the Republic of Ireland and the UK. *Biogeosciences Discuss.*, 12, 7491–7535.
- Wheeler, B. D., & Shaw, S. C. (1995). *Restoration of Damaged Peatlands – with Particular Reference to Lowland Raised Bogs Affected by Peat Extraction*. London: HMSO.
- Wittram, B. W., Roberts, G., Buckler, M., King, L., & Walker, J. S. (2015). *A Practitioners Guide to Sphagnum Reintroduction*. Edale: Moors for the Future Partnership.

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

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

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

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

Scope of rehabilitation

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

- EPA IPC Licence - Ref. P0503-01. 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. Esker bog is part of the Allen Bog group.
- The key objective of rehabilitation, as defined by this licence, is **environmental stabilisation** of the bog.
- The area of former industrial peat production at Esker Bog as defined by Figure 3.1.
- Minimising potential impacts on neighbouring land. Some boundary drains around Esker Bog will be left unblocked as blocking boundary drains could affect adjacent land.

Rehabilitation goals and outcomes

The key rehabilitation goal and outcome for Esker Bog is environmental stabilisation of the site via wetland creation and residual 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 wetland/peatland habitats.

Criteria for successful rehabilitation:

- Rewetting of residual peat in the former area of industrial peat production to offset potential silt run off and to encourage development of vegetation cover via natural colonisation, and reducing the area of bare exposed peat.
- That there is a stabilising/improving concentration of suspended solids and ammonia associated with the measures undertaken to stabilise the peat surface by the blocking of the internal drainage system

and the maximised rewetting of the peat surface. This will be demonstrated by developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog. This will be measured via water quality monitoring (suspended solids and ammonia).

- That the main water body associated with surface water from this bog continues to be excluded in the EPA's list of peat pressure water bodies as reported in the River Basin Management Plans. Where the water body has been identified as under pressure from peat extraction, that the intervening EPA monitoring programme associated with its Programme of Measures for this water body shows positive improvements in water quality impacts that were attributable to the original peat extraction activity.

Rehabilitation indicators

- Demonstrating the delivery of the rehabilitation through site visits and through updated aerial photography (indicating presence of peat barriers, elevated water levels and re-wetting).
- Stabilising potential emissions from the site (e.g. silt). The key target will be developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog.

Rehabilitation measures: (see Figure Ap-1)

- Blocking field drains in parts of the former industrial production area using a dozer/excavator to create regular peat blockages (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 (where needed).
- 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.
- No measures are proposed for areas that have already stabilised.
- 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 with dozer/excavator.
- 2021. 2nd phase. Further realignment of piped drainage and other re-wetting measures dependent on success of 1st phase re-wetting, as determined by ongoing monitoring of water levels and re-vegetation.
- Other enhancement measures such as fertiliser treatment will be carried out, if required. 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.

Table AP-1. Rehabilitation measures and target areas.

Type	Code	Description	Area (Ha)
Dry Cutaway	DCT1	Blocking outfalls and managing water levels with overflow pipes	70.4
Deep peat cutaway	DPT1	Regular drain blocking (3/100 m) + blocking outfalls and managing water levels with overflow pipes	318.3
Wetland	WLT1	Turn off or reduce pumping to re-wet cutaway + blocking outfalls and managing water levels with overflow pipes	86.8
Marginal land	MLT1	No work required	46.9
Silt ponds		Silt-ponds	2.4
Constraints		Other constraints	13.8
Minimal Rehab		IW Pipeline-Minimal Rehab	29.6
Total			568.3

Monitoring, after-care and maintenance

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

Validation and IPC Licence surrender

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

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

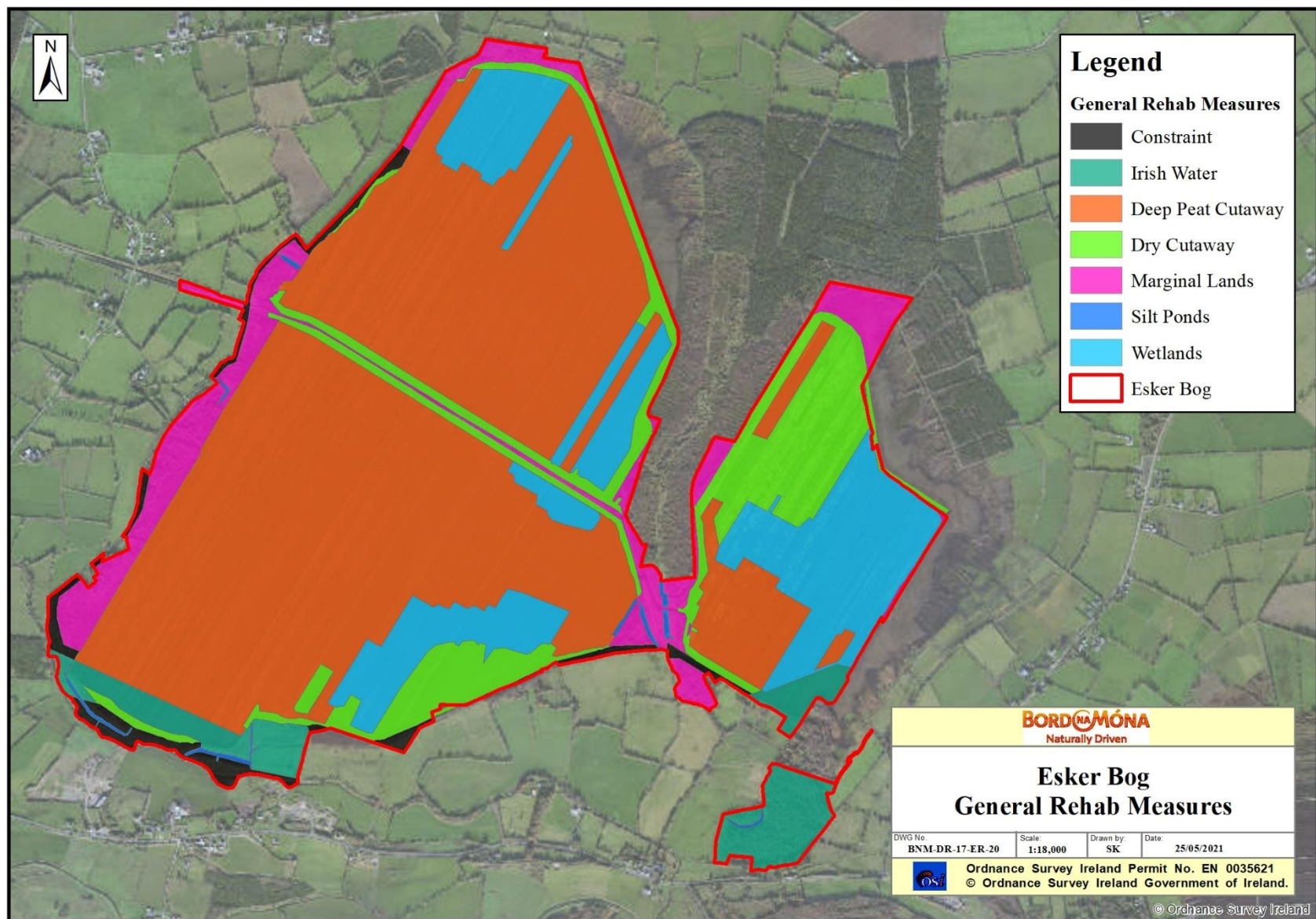


Figure Ap-1. Indicative Standard rehabilitation plan for Esker Bog.

APPENDIX II: BOG GROUP CONTEXT

The Allen -Clonsast Bog Group is located mainly in counties Offaly and Westmeath. Garrymore Bog is located in Co. Laois. All the associated bogs are located in the River Barrow Catchment area except Clonad Bog which is located in the Lower Shannon River Catchment.

The Allen- Clonsast Bog Group is one of the first developed bog groups in Ireland. Bord na Móna was set up in 1946 and it commenced the development of bogs to fuel power station and supply peat for the horticultural industry. The Allen - Clonsast bogs were developed for the supply of milled peat to the Edenderry Power Station, Croghan Power Station (now decommissioned) and the Croghan Briquette factory (now decommissioned).

Much of the Allen -Clonsast Bog complex became cutaway as long term peat production activity reduced the peat reserves on individual bogs. Rehabilitation measures comprising naturalisation and development of alternative after-uses have been already explored at the Allen -Clonsast Bog Group, including coniferous forestry, biomass, agricultural grassland, amenity use, rare species conservation management and wetland creation. Some of this was carried out in the 1980s. While agricultural fields and coniferous forestry have been developed successfully on the cutaway bogs at Allen - Clonsast, it was found that these require financial investment that exceeds any potential commercial output value. A windfarm has been constructed at Mountlucas Bog and another windfarm project is currently in development at Cloncreen.

The Long Derries SAC is located south of Ticknevin Bog. Ticknevin also contains a relatively large area of remnant raised bog that was never developed by Bord na Móna. This area, called Cloncannon bog, was assessed by consultants for NPWS as part of the review of the raised bog Natural Heritage Area network (NPWS 2014).

A breakdown of the component bog areas for the Allen - Clonsast Bog Group IPC License Ref. P0503-01, and current, indicative Peat Production Status, is outlined in Table Ap-2.

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

Bog	Area (Ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Ballycon	281	Cutaway Bog Ballycon was first developed for industrial peat harvesting in the 1960's and the majority of peat has been removed. Ballycon is considered a shallow peat cutaway bog.	Rehabilitation works were carried out in 2006 that consisted of drain blocking and bund construction. Some headlands were fertilised in 2015 to encourage the development of pioneer dry cutaway habitats and there was follow-up drain blocking in 2018. The site is now a mosaic of cutaway wetland and woodland habitats and is a Biodiversity Area. BnM has also operated a workshop on site. Part of the site was developed for conifer forestry in the 1980s and is leased to Coillte. There is a rail transport link along the southern boundary of the site.	2001	Draft 2020
Ballykeane	451	Cutaway Bog Ballykeane Bog was developed for industrial peat production in the 1970's. Ballykeane is a shallow peat cutaway bog.	Part of the site is cutaway and has started to develop pioneer vegetation. The majority of the bog is still bare peat. Part of Ballykeane Bog is being used as a herb production trial.	2020	Draft 2017

Cavemount	499	<p>Cutaway Bog</p> <p>Cavemount Bog was first developed for industrial peat production in the 1970's. Peat production ceased in 2015. Cavemount is a shallow peat cutaway bog.</p>	<p>Ongoing rehabilitation has been carried out across the site which is now developing as a wetland, holding nationally important numbers of wintering and breeding wetland birds.</p> <p>A portion of the site still has bare peat but is vegetating.</p> <p>Part of the site was developed for conifer forestry in the 1980s and is leased to Coillte. Flux tower and GHG monitoring onsite as part of the SmartBOG project.</p> <p>The site is a location for the CarePeat InterReg Project, of which BnM is an associated partner.</p> <p>There is a rail transport link through the site.</p>	2015	Draft 2020
Clonad	447	<p>Cutaway Bog</p> <p>Clonad Bog was first developed for industrial peat production in the 1970's.</p>	<p>The majority of the former production area is bare peat with some establishing cutaway habitats at various stages of development.</p> <p>There is a rail transport link through the site.</p> <p>The proposed Irish Water pipeline crosses this bog.</p>	2020	Draft 2017
Cloncreen	1,009	<p>Cutaway Bog</p> <p>Cloncreen Bog was first developed for industrial peat production in the 1970's. Peat production ceased in 2018 and the majority of peat has been cutaway. Cloncreen Bog is a shallow peat cutaway bog.</p>	<p>The site has developed a mosaic of pioneer cutaway habitats with some bare peat mosaics.</p> <p>Planning Permissions was granted in 2016 for Cloncreen Windfarm. Construction has started (summer 2020) on 22 turbines (Approx. 75 MW) at various locations around the site in association with linking road infrastructure, a sub-station and power-lines.</p> <p>There is a rail transport link through the site.</p> <p>The proposed Irish Water pipeline crosses this bog.</p>	2018	Draft 2017
Clonsast	1,534	<p>Cutover Bog</p> <p>Clonsast Bog was first developed for industrial peat production in the 1950's and was used for sod peat. Peat production ceased in 1980's. The majority of the bog was never converted to milled peat production and some relatively deep peat remains. Clonsast Bog is considered a deep peat cutover bog.</p>	<p>Clonsast has now established a mosaic of mature cutaway habitats.</p> <p>BnM formerly operated a farm at Clonsast. Farmland was developed on rehabilitated cutaway bog. The farm venture ceased in the 1980's and the farmland was sold.</p> <p>A significant portion of the site has been leased to Coillte and planted with conifer forestry in the 1980s. Some of the original research on establishing forestry on cutaway was established at Clonsast (Trench 14).</p> <p>BnM carried out a re-wetting trial in 2018. This site is largely stabilised.</p> <p>There is a rail transport link through the site.</p>	1980's	Draft 2017
Clonsast Bulge	379	<p>Cutover Bog</p> <p>Clonsast Bulge was first developed by BnM in the 1950's.</p>	<p>The majority of Clonsast Bulge used for peat extraction has been developed by Coillte for conifer forestry in the 1980's.</p> <p>Part of the site is undeveloped (Clonavoe Bog remnant).</p> <p>This site is largely stabilised.</p>	1960's	Draft 2017

Clonsast North	191	<p>Cutaway Bog</p> <p>Clonsast North was first developed by BnM in the 1930's. The remaining peat deposits at Clonsast North are generally shallow and so the bog is considered a shallow peat cutaway bog.</p>	<p>The cutaway is naturally colonising with a mosaic of Birch woodland and wetland. The site was partially re-wetted in 2018. There is a rail transport link through the site.</p>	2000's	Draft 2017
Daingean Derries	277	<p>Cutover Bog</p> <p>Daingean Derries was first developed in the late 1980's. Deep peat reserves remain. Daingean Derries is considered a deep peat cutover bog.</p>	<p>Daingean Derries Bog formerly supplied both horticultural peat and fuel peat. The majority of former production area is bare peat.</p> <p>Some bog restoration on part of the site completed in 2017-2018.</p> <p>There is a rail transport link through the site.</p>	2020	Draft 2017
Daingean Rathdrum	367	<p>Cutover Bog</p> <p>Daingean Rathdrum was first developed in the late 1980's. Deep peat reserves remain. Daingean Rathdrum is considered a deep peat cutover bog.</p>	<p>Daingean Rathdrum Bog formerly supplied both horticultural peat and fuel peat. The majority of former production area is bare peat.</p> <p>There is a rail transport link through the site. A small area of development bog (32 ha) has been restored.</p>	2020	Draft 2017
Daingean Townparks	90	<p>This bog was never drained or developed but there is a transport link along the margin of the site</p>	<p>Daingean Bog NHA (intact raised bog)</p> <p>There is a rail transport link through the site. No rehabilitation required.</p>	N/A	N/A
Daingean Raillink	5	N/A	N/A	N/A	N/A
Derrycricket	190	<p>Derrycricket was originally developed for peat production in the 1950's-1960's. Peat production at Derrycricket ceased in the 1980's.</p>	<p>Coilte developed approximately 80% of the former production area for conifer forestry in the 1980's.</p> <p>This site is largely stabilised.</p> <p>Transport link.</p>	N/A	N/A
Derrylea	665	<p>Cutover Bog</p> <p>Derrylea bog was first developed for commercial peat production in the 1940's. However, peat production at Derrylea predates BnM and is believed to have commenced in the 19th century. Despite a long history of production, deep peat reserves on much of the site with some shallow pockets of peat on the western half of the former production area. Derrylea Bog is considered a deep peat cutover bog.</p>	<p>Some rehabilitation has been completed around the margins of the bog.</p> <p>There is a rail transport link through the site.</p>	2020	Draft 2017
Derrycastle	389	<p>Cutover Bog</p> <p>Derrycastle Bog was first developed prior to 1975. Derrycastle is considered a deep peat cutover bog. Peat production at Derrycastle ceased in the 1980's.</p>	<p>Coilte have developed 80% of the former production area as conifer forestry. Rehabilitation was carried out to create a lake and wetland habitats in the 1990s. Derrycastle Lake Amenity area is leased to Portarlinton Community Development Association.</p> <p>This site is now largely stabilised.</p> <p>There is a rail transport link through the site.</p>	1980's	Draft 2017
Esker	567	<p>Cutover Bog</p> <p>Esker Bog was first developed in 1975. Peat production at Esker ceased in the 2020. There is deep peat remaining on the</p>	<p>The majority of the site is bare peat. The eastern portion is establishing cutaway habitats.</p> <p>There is a rail transport link through the site.</p>	2020	Draft 2021

		western side of the former production area but the eastern area is considered cutaway. Esker Bog is a deep peat cutover bog.	The proposed Irish Water pipeline crosses this bog.		
Garryhinch	814	Cutover Bog Garryhinch Bog was first developed in 1950's. Peat production ceased at Garryhinch in 2020. There is some deep peat remaining on much of the former production area. Garryhinch Bog is considered a deep peat cutover bog.	The majority of the site is re-vegetated with a range of wetland and woodland habitats. Extensive sod peat production (private and licenced by BnM) has occurred across the site in the past few years and these areas are bare peat.	2020	Draft 2017
Garrymore	307	Cutover Bog Garrymore Bog was first developed in the 1980's. Peat production at Garrymore ceased in the 2020. There is deep peat remaining. Garrymore Bog is considered a deep peat cutover bog.	Garrymore Bog formerly supplied horticultural peat. Part of the site is used for sod turf. The former production area is bare peat.	2020	Draft 2017
Mount Lucas	1225	Cutover Bog Peat Production at Mount Lucas commenced in the mid-1970's and ceased in 2020. Most of Mount Lucas is cutaway with shallow residual peat depths. The north-west corner of the former production area retains some pockets of deep peat. Mount Lucas is considered a shallow peat cutover bog.	Peat production ceased across a significant part of the site before 2005 with ongoing peat extraction in the western side up to 2020. The cutaway area has developed a mosaic of cutaway habitats with Birch woodland dominant. The recently ceased production area is bare peat. Mountlucas windfarm is now operational (since 2014). Some rehabilitation was carried out in association with windfarm construction, specifically the creation of small wetland features. A public amenity walking route was developed on the existing windfarm. This was opened in 2015. BnM have developed an aquaculture project in partnership with Bord Iascaigh Mhara and have developed herb production trials on site. There is a rail transport link through the site. The proposed Irish Water pipeline crosses this bog.	2020	Draft 2021
Total	9687				

APPENDIX III: ECOLOGICAL SURVEY REPORT

Ecological Survey Report <i>Note: This report outlines an ecological survey of the bog. This report should not be taken as a management plan for the site as other land-uses may still be considered. Information within this report may inform the development of other land-uses and identify areas with particular biodiversity value.</i>			
Bog Name:	<u>Esker</u>	Area (ha):	567 ha (1,401 acres)
Works Name:	Derrygreenagh	County:	Offaly
Recorder(s):	MMC & DF	Survey Date(s):	11 & 13 th August 2010
Habitats present (in order of dominance) <p>The most common habitats present on production bog and cutaway at this site include:</p> <ul style="list-style-type: none"> • Bare peat; • Pioneer poor fen communities dominated by Soft Rush and Bog Cotton (in eastern section); • Emerging Birch scrub (eastern section); • Small patches of closed Birch scrub eastern section; and • Silt Ponds with associated habitats such as scrub, Bracken, rank grassland, dry calcareous grassland and typical pioneer communities of disturbed areas. <p>The most common habitats present around the margins at this site include:</p> <ul style="list-style-type: none"> • Birch woodland; • Gorse scrub and Birch scrub developing of dry high bog around margins; • Raised bog (several fragments); • Dense Bracken; • Conifer plantation (part of adjacent Coillte conifer plantation); • Cutover bog (several small fragments); • Improved grassland (grazed zone between silt ponds and river at southern boundary); and • Depositing (Esker) river. 			
Description of site <p>Esker is located in Co. Offaly 4 km south of Rhode. The bog is linked to Cavemount Bog to the west and Ballycon Bog is situated to the south of this site. The landscape in this area is generally flat with Croghan Hill to the west. The Esker River flows along the southern side of the bog and forms a natural boundary. The majority of the bog is owned by Bord na Móna with a small section of high bog to the north-east being cut as turbary.</p> <p>The bog can be divided into three main areas due to the natural topography. The main part of the bog is the western section and this is bisected by a BnM railway line. This part of the site is almost completely in full production and the main habitat is bare peat. This bog is at a relatively young stage and red/brown <i>Sphagnum</i> peat is still being harvested from most of the bog. It was noticeable that the only minor vegetation developing at the ends of some fields and in the drains was a mixture of Birch scrub (eBir), dry grassland dominated by Purple</p>			

Moorgrass (gMol) and dry heath with Heather (dHeath). These are all pioneer communities associated with more acidic peat.

The only features of particular interest in the main section of the bog were the remnant habitats around the margins that are generally found on remnant high bog. A narrow band of Birch woodland (WN7) and scrub (WS1) dominated by Birch were the most prominent habitats. In some places, there was still some patches of remnant raised bog vegetation, generally dominated by Heather and being invaded by scrub, as they were quite dried out. Other parts of the margins are covered in a mosaic of Bracken and Birch scrub. Located along the north-east margin was the largest section of remnant raised bog. The boundary with the production bog is a high vertical bank and it is also being cut for turbary from the outer margin by private individuals. This section contains typical degraded raised bog plant communities with Heather, Hare's-tail Bog-cotton and White Beak-sedge prominent in the vegetation. There are frequent signs of drying out and degradation with old pools having been infilled. Hummocks of *S. capillifolium* and *S. papillosum* are occasionally frequent. The *Sphagnum* cover is high in sections but these seems to be a thin layer that is drying out and was dominated by species indicating disturbance such as *S. subnitens*. There are very poor prospects for attempting to restore active raised bog communities to this section of high bog.

The Esker River flows along the southern boundary. The river is typical of a lowland depositing river and is infilled with emergent riparian vegetation such as Reed Canarygrass and Bulrush. There is potential for Otter and Kingfisher along the river, although no signs of either species were noted. Some grassland has developed on mineral soil adjacent to the river and in association with silt ponds that have been constructed in this area. This grassland is grazed by cattle, although it was not fenced off. Further east along the river there is some improved grassland that is mapped as being part of the BnM property but is managed as farmland. The margin of the bog is marked by Gorse scrub.

Further east there is a smaller section of bog that is divided from the main section by a small ridge, although there is some connection via travel paths and the railway. This section of bog is a mixture of production bog and pioneer cutaway vegetation that is developing on some fields that have come out of production. The peat in this section has been extracted to a much greater extent and fen peat is the main peat type that remains in this section. The production bog is mainly surrounded by high bog along the eastern and northern margins. Most of this high bog apart from the most northern part of the site is outside the BnM property boundary. The zone between the two sections of bog is occupied by silt ponds and associated habitats such as disturbed vegetation (ED3), scrub and rank grassland (GS2) on the soil heaps and dry calcareous grassland (gCal) developing along the travel paths.

Towards the south-east part of the site there is another section that has never been in production. This area is dominated by mature Birch woodland (WN7) and also contains small patches of active and old cutover bog (PB4), wet grassland (GS4) that has developed on cutover peat and Bracken (HD1). There is likely to be ownership/boundary issues with this area as it was being grazed by cattle and had been fenced off.

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

None

Adjacent habitats and land-use

The surrounding landscape is typically low-lying and is dominated by farmland with improved grassland. Adjacent habitats include those of reclaimed cutover bog such as conifer plantation and wet grassland. The margins are typically dominated by scrub and Birch woodland developing on peat remnants.

Watercourses (major water features on/off site)

- The Esker Stream (river) flows along the southern boundary of the site.
- The bog and this river are within the River Barrow catchment.
- The Dogen River, a tributary of the Esker River, flows north to south and separates the eastern from the western side of the site.
- A third watercourse flows along the western boundary of the site and is also a tributary of the Esker Stream.

Peat type and sub-soils

The peat is mainly a brown/red *Sphagnum*-peat in the west side of the site. The eastern side is shallower and fen peats are exposed. The site is likely to be underlain with limestone tills, as these sub-soils are exposed around the margins of the site. The sub-soils along the southern margin are limestone-based sands and gravels lain down by the river. Grey Marl was exposed in some of the spoil taken from the silt ponds at the southern end of the site.

Fauna biodiversity

Birds

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

- Heron
- Mallard (nesting in drains on site during spring)
- Relatively large flock of Mistle Thrush (>30) in area of bare peat to the east of the site.
- Other more common species included Swallow, Pheasant, Blackbird, Finches, Wren, Wood Pigeon and Magpie.
- There is potential for Kingfisher along the Esker River.

Mammals

- Signs of Fox, Badger and Deer were noted around the margins of the site.
- Signs of Pine Marten noted on the site
- Potential for Otter along the Esker River

Other species

- Large White Butterfly

References

European Commission (1996). Interpretation manual of European Union habitats. Brussels. European Commission, DGXI.

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

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 bowzers. Only dedicated trained and competent personnel will carry out refuelling operations.
- Mobile storage such as fuel bowzers will be bunded to 110% capacity to prevent spills. Tanks for bowzers and generators shall be double skinned. When not in use, all valves and fuel trigger guns from fuel storage containers will be locked. All pumps using fuel or containing oil will be locally and securely bunded where there is the possibility of discharge to waters.
- Potential impacts caused by spillages etc. during rehabilitation will be reduced by keeping spill kits and other appropriate equipment on-site.
- Site activities will be carried out in accordance with 'best practice'. In order to ensure compliance and implementation of 'best practice', these measures will be communicated to relevant Bord na Móna staff and updated as required.

APPENDIX V: BIOSECURITY

No invasive plant species likely to be spread by PCAS activities have been recorded at Esker 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 plague² and Zebra Mussel will be adhered with throughout all rehabilitation activities.

² <https://www.biodiversityireland.ie/projects/invasive-species/crayfish-plague/>

APPENDIX VI: POLICY AND REGULATORY FRAMEWORK

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

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

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

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

1 EPA IPC Licence

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Allen/Clonsast bog group (Ref. PO-503 SB). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. The bog is part of the Allen/Clonsast Bog group. This regulatory requirement is the main driver of the development of this rehabilitation plan.

2 The Peatlands Climate Action Scheme (PCAS)

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

It is envisaged that Bord na Móna carry out an enhanced decommissioning, rehabilitation and restoration, under the proposed Scheme, and supported by the Climate Action Fund 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 additional costs associated with the additional and enhanced rehabilitation, i.e., those activities which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support under the proposed Scheme.

3 National Climate Policy

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

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

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

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

4 National Peatlands Strategy

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

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

In line with a National Peatlands Strategy recommendation, a Peatlands Strategy Implementation Group (PSIG), was established, assisted in the finalisation of the Strategy, is overseeing subsequent implementation and will

report to Government on an annual basis on the implementation of the actions and principles contained within the Strategy.

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

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

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

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

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

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

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

6 National Biodiversity Action Plan 2016-2021

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

7 National conservation designations

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

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

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

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

Bord na Móna has also responded to the needs of the NRBMP and provided several sites to the government for the relocation of turf-cutters from SACs. This is part of a suite of ongoing bog conservation measures in the

NRBMP to manage turf-cutting in protected sites. Bord na Móna and the National Parks and Wildlife Service continues to engage regarding the ongoing relocation of turf-cutters from protected raised bog sites.

9 All-Ireland Pollinator Plan 2015-2020

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

10 Land-use planning policies

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

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

11 National Archaeology Code of Practise

Bord na Móna operates under an agreed Code of Practice regarding archaeology with the Department of Arts, Heritage and the Gaeltacht and the National Museum of Ireland which provides a framework to enable the Company to progress peat extraction whilst carrying out archaeological mitigation. The Code replaced a set of Principles agreed with the Department of Arts, Heritage and the Gaeltacht in the 1990s. Under the Code Bord na Móna, the Minister and Director work together to ensure that appropriate archaeological mitigation is carried out in advance of peat extraction.

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

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

13 Bord na Móna commitments

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

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

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

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

14 Bord na Móna Strategic Framework for the future use of cutaway peatlands 2021 (Draft)

The general after-use strategy of Bord na Móna is outlined in the Bord na Móna Strategic Framework for Future-Use of Cutaway Bogs 2021 (Draft). This document outlines how Bord na Móna's cutover peatland estate is complex in nature with great variability in terms of peat depths, peat types, drainage, subsoil condition and environmental value. Thus, future options require consideration on a site-specific basis, also bearing in mind the considerable internal variation within bogs. The development of the land-bank will also take account of national needs, while also taking account of the various national legislation, policies and plans related to the management of peatlands. In general, Bord na Móna will seek to balance and optimise commercial, social, and environmental value of these sites, while taking account of the need for sustainability and their biodiversity value.

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

APPENDIX VII: DECOMMISSIONING

1. Condition 10 Decommissioning

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

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

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

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

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

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

Item	Description	Esker 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	Decommission and Removal of Porto-cabin tea centre and materials store
5	Decommissioning Fuel Tanks and associated facilities	Decommissioning and De-Gassing Mobile Fuel Tanks
6	Decommissioning and Removal of Bog Pump Sites	Not Applicable
7	Decommissioning or Removal of Septic Tanks	De-sludge Septic Tank

In addition, condition 7 of the license 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.

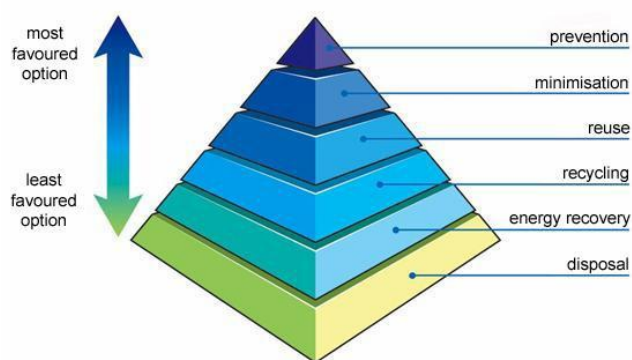
7.3.5 The tonnages and EWC Code for the waste materials listed in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* sent off-site for disposal/recovery.

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 an EPA Exit Audit (EA) and the eventual partial or full surrender of the licence.

2. Enhanced Decommissioning.

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

Item	Enhanced Decommissioning Type	Esker Decommissioning Plan
1	Removal of Railway Lines	Removal of Railway Lines
2	Decommissioning Bridges and Underpasses	Where 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	Where 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.*

Environmental stabilisation: The key objective of peatland rehabilitation is **environmental stabilisation** of the former industrial peat production areas and the stabilisation of any potential emissions from the bog that related to the former industrial peat extraction activities.

Environmental stabilisation is defined as:

- Carrying out planned peatland rehabilitation.

- Setting former bare peat industrial peat production areas on a trajectory towards naturally functioning peatland habitats, via planned peatland rehabilitation, the restoration of wetter hydrological conditions and encouragement of natural colonisation.
- Stabilisation or downward trajectory of key water quality parameters (e.g. suspended solids, ammonia),
- Meeting IPC Licence conditions.

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 may also 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 is reduced or stopped. The water chemistry of wetland cutaway frequently is strongly influenced by the more alkaline sub-soils that have been exposed during peat production. This means that pioneer vegetation is more typical of fen and wetland, rather than raised bog. Wetland cutaway will have a broad range of hydrological conditions depending on the local topography. In some cases, these wetlands may form deep water (> 0.5 m) whilst other areas may have the water table at or just below the surface of the ground.

APPENDIX IX. EXTRACTIVE WASTE MANAGEMENT PLAN

(Minimisation, treatment, recovery and disposal)

Objective:

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

Scope:

This plan covers IPPC Licence's Ref. P0503-01, Clonsast Group of Bogs in Counties Offaly and Kildare.

1.0 Extractive Waste:

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

1.1 Silt Pond excavations and maintenance.

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

1.2 Power Station screenings:

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

1.3 Bog Timbers:

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

2.0 P0503-01 IPPC Licence Extractive Waste Conditions

2.1 Condition 7.5 Extractive Waste Management

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

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

2.2 Condition 7.6 Waste Facility

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

2.3 Condition 7.7 Excavation Voids

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

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

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

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

3.0 Minimisation.

3.1 Silt pond excavation material and cleanings.

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

3.2 Power Station Screenings.

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

3.3 Bog Timbers.

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

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

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

4.2 Power Station Screenings.

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

4.3 Bog Timbers

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

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

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

5.2 Power Station Screenings.

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

5.3 Bog Timbers

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

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

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

6.2 Power Station Screenings.

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

6.3 Bog Timbers

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

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

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

5 (2a)(ii)

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

5 (2a)(iii)

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

5 (2a)(iv)

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

5 (2a)(v)

Peat mineral resources do not undergo any treatment.

5 (2b)

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

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

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

5 (3)

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

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

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

Classification in accordance Annex II.

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

Description of operations.

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

Closure plan. (Bog Rehabilitation Plan).

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

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

10.2 Cutaway Bog Rehabilitation Plan:

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

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

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

10.4 A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment. This plan including maps and ecological classifications are available on file at the 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 their placement back to the bog in smaller concentrated designated waste facilities does not constitute a risk to the prevention of water compliance.

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

Review.

This plan will be reviewed every five years, the first review to take place in September 2017. This review will entail an inspection of these waste facilities to ensure their placing, management, maintenance and stability comply with the requirements of the Extractive Waste Management requirements and condition 7.5, 7.6 and 7.7 of the 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
Esker	Offaly County Council - Chief Executive	Anne-Marie Delaney	08/01/2021	E-mail		
Esker	Offaly County Council - Senior Planner	Andrew Murray	08/01/2021	E-mail		
Esker	Offaly County Council - Heritage Officer	Amanda Pedlow	08/01/2021	E-mail		
Esker	Offaly County Council	Mary Hussey	08/01/2021	Email	11/02/2021	Email
Esker	Offaly County Councillors - Edenderry District	Cllr. Mark Hackett	08/01/2021	E-mail		
Esker	Offaly County Councillors - Edenderry District	Cllr. Noel Cribbin	08/01/2021	E-mail		
Esker	Offaly County Councillors - Edenderry District	Cllr. Eddie Fitzpatrick	08/01/2021	E-mail		
Esker	Offaly County Councillors - Edenderry District	Cllr. John Foley	08/01/2021	E-mail		
Esker	Offaly County Councillors - Edenderry District	Cllr. Robert McDermott	08/01/2021	E-mail		
Esker	Offaly County Councillors - Edenderry District	Cllr. Liam Quinn	08/01/2021	E-mail	24/01/2021	E-mail
Esker	TD Laois/Offaly	Barry Cowen	08/01/2021	E-mail		
Esker	TD Laois/Offaly	Charlie Flanagan	08/01/2021	E-mail		
Esker	TD Laois/Offaly	Sean Fleming	08/01/2021	E-mail		
Esker	TD Laois/Offaly	Carol Nolan	08/01/2021	E-mail	25/01/2021	E-mail
Esker	TD Laois/Offaly	Brian Stanley	08/01/2021	E-mail		
Esker	Eastern and Midland Regional Assembly		08/01/2021	E-mail		

Esker	Environmental Protection Agency	Brian Meeney	08/01/2021	E-mail		
Esker	National Parks and Wildlife Service	Brian Lucas	08/01/2021	E-mail		
Esker	NPWS Regional Network	District Conservation Officer	12/01/2021	E-mail		
Esker	Dept of the Housing Local Government and Heritage	Malcom Noonan (Minister of State at the Department of Housing, Local Government and Heritage)	08/01/2021	E-mail		
Esker	National Monuments Service	Margaret Keane	08/01/2021	E-mail		
Esker	National Museum of Ireland (Irish Antiquities Division)	Isabella Mulhall	08/01/2021	E-mail		
Esker	Minister for Environment, Climate and Communications	Minister - Eamon Ryan	08/01/2021	E-mail		
Esker	Minister of state for Agriculture with responsibility for Land use and Biodiversity	Pippa Hackett Minister of State for Land Use and Biodiversity	08/01/2021	E-mail		
Esker	Inland Fisheries Ireland	General e-mail contact	08/01/2021	E-mail		
Esker	Waterways Ireland	General e-mail contact	08/01/2021	E-mail	24/01/2021	E-mail
Esker	The Heritage Council	Lorcán Scott	08/01/2021	E-mail	04/01/2021	E-mail
Esker	An Forum Uisce (The Water Forum)	General e-mail contact	08/01/2021	E-mail		
Esker	An Taisce	General e-mail contact	08/01/2021	E-mail		
Esker	Friends of the Earth	Oisin Coughlan	08/01/2021	E-mail		
Esker	Friends of the Irish Environment	General e-mail contact	08/01/2021	E-mail		
Esker	Birdwatch Ireland	General e-mail contact	08/01/2021	E-mail		
Esker	Irish Peatlands Conservation Council	General e-mail contact	08/01/2021	E-mail	25/01/2021	E-mail
Esker	Irish Wildlife Trust	General e-mail contact	08/01/2021	E-mail	23/03/2021	E-mail
Esker	Bat Conservation Ireland	General e-mail contact	08/01/2021	E-mail		
Esker	Woodlands of Ireland	General e-mail contact	08/01/2021	E-mail		
Esker	Butterfly Conservation Ireland	Jesmond Harding/info email	08/01/2021	E-mail		
Esker	Community Wetlands Forum (part of Irish Rurallink)	General e-mail contact	08/01/2021	E-mail		

Esker	Offaly Public Participation Network (PPN)	General e-mail contact	08/01/2021	E-mail		
Esker	Sustainable Water Action Network (SWAN)	http://www.swanireland.ie/	08/01/2021	E-mail		
Esker	Irish Farmers Association (Laois Offaly and Westmeath Office)	General e-mail contact	08/01/2021	E-mail	23/01/2021	E-mail
Esker	Irish Farmers Association (Head Office)	General e-mail contact	08/01/2021	E-mail	23/01/2021	E-mail
Esker	National Association of Regional Game Councils	Email - nargc@nargc.ie	08/01/2021	E-mail		
Esker	Midlands National Shooting centre	General e-mail contact	08/01/2021	E-mail	24/01/2021	E-mail
Esker	ICMSA (Irish Creamery Milk Suppliers Association)	General e-mail contact	08/01/2021	E-mail		
Esker	ICSA (Irish Cattle and Sheep Farmers Association)	General e-mail contact	08/01/2021	E-mail		
Esker	Midlands & East Regional WFD Operational Committee	Ray Spain Co-ordinator Local Authority Water Programme	08/01/2021	E-mail		
Esker	Shannon Flood Risk State Agency Co-ordination Working Group	Jackie Stewart - Flood Risk management Policy	08/01/2021	E-mail		
Esker	CARO (Climate Action Regional Office) Eastern and Midlands	Alan Dunney	08/01/2021	E-mail		
Esker	Dr. Catherine Farrell Trinity College	General e-mail contact	Contact Initiated by Stakeholder		22/01/2021	E-mail
Esker	Francis Kenna OPW	General e-mail contact	Contact Initiated by Stakeholder		22-23/01/2021	E-mail
Esker	Irish Raptor Study Group	General E-mail contact	12/01/2021	E-mail		

Table APX -2 Response summary from Consultees contacted

Organisation	Summary of Response by Stakeholder	BnM Response
Offaly County Council	Request for all draft rehabilitation plans in Co. Offaly.	BnM provided the requested documents. A virtual meeting, including a general PCAS presentation, was held for Offaly County Council on 10/02/2021
Offaly County Council	Offaly County Council e-mailed a submission to outline potential for integration of PCAS with opportunities regarding the Offaly County Council Inaugural Digital Strategy 2020-2022.	A meeting on Offaly's digital strategy was held between BnM and Offaly County Council on 04/03/2021.
Offaly County Council	<p>Submission provided on behalf on Offaly County Council on a number of PCAS bogs including Esker on 22/02/2021. Key points raised were;</p> <ol style="list-style-type: none"> 1) Requested that details of security fencing to be identified and detailed on plans. 2) Long term rehabilitation plan to be provided addressing above areas of consideration post 2024 if required. 3) Public Rights of Way access locations are to be maintained with relevant stakeholders and marked on drawings. 4) A number of technical issues with draft rehabilitation plans. 5) Advised BnM to carefully consider after use of bogs as part of PCAS 6) Request that the impact of PCAS on surrounding roads be considered as part of rehabilitation plans. 7) Advised that long term management (post 2024) is considered by BnM. 8) Advised that Appropriate assessment and the habitats directive are taken into account by BnM. 9) Advised that BnM consider management of flooding & water pollution, fire risk, invasive species and waste management as part of PCAS. 	<p>A virtual meeting/general presentation on PCAS to between BnM and Offaly Councillors and OCC personnel was conducted on 10/02/2021. BnM provided further PCAS documentation on request, via e-mail on 27/01/2021. Refer to Section 4 for response on issues raised. Dialogue with Offaly County Council is ongoing.</p>
Irish Peatlands Conservation Council	<p>Responded to consultation regarding Esker 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;</p> <ol style="list-style-type: none"> 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 	<p>BnM responded 25/01/2021, all issues raised will be taken into account in future drafts of plan. Also advised that;</p> <ol style="list-style-type: none"> 1) We 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

	bring local communities along with restoration projects	
NPWS Regional Network	NPWS responded through e-mail thread on the 02, 03, 07, 09/12/2020 in relation to all PCAS bogs. The main points discussed were to advise of the requirement to investigate if assessment under the SEA and Birds directives for each site.	BnM acknowledged via e-mail to address queries on 09/12/2021. Also, a phone conversation with local NPWS Conservation Ranger on 11/01/2021 discussed biodiversity and rehabilitation measures on PCAS bogs including Esker.
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 Esker Bog. A virtual meeting on PCAS between BnM and NMI was held on 18/01/2021
Irish Farmers Association	Responded to consultation regarding Esker and the PCAS project at large on multiple dates throughout ongoing discourse. Specific submission on Esker Bog received from Westmeath, Offaly and Laois IFA Office. 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.
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.
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.

APPENDIX XII. ARCHAEOLOGY

Role of the Archaeological Liaison Officer

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



Code of Practice

22

Code of Practice

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



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

1) Purpose

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

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

2) Procedure

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

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

Your Archaeological Liaison Officer is

3) Records

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

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



Archaeological Impact Assessment of Proposed Bog Decommissioning and Rehabilitation at Esker Bog, Co. Offaly

Report For

Bord Na Móna Energy Ltd.

Author

Dr. Charles Mount

Bord Na Móna Project Archaeologist



Introduction

The EPA (2020) *Guidance on the process of preparing and implementing a bog rehabilitation plan* notes that the licensee should characterise the bog prior to embarking on detailed planning and implementation. This characterisation should detail how the land is classified in terms of statutory protections, e.g. as European sites, world heritage sites, RAMSAR sites, National Heritage Areas, national monuments, archaeological heritage, etc. This archaeological impact assessment report was prepared by Dr. Charles Mount for Bord na Móna Energy Ltd to fulfil this characterisation in relation to archaeological heritage. It represents the results of a desk-based assessment of the impact of proposed bog rehabilitation of c.567 hectares at Esker Bog, Co. Offaly 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 Esker Bog will include:

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

Esker Bog is located c.3.4km south-west of Rhode, Co. Offaly, and west of the R400 road. The bog occupies the townlands of Ballymorán, Clonmeen, Eskermore, Leitrim, Newtown and Rathlumber on OS 6 inch sheets Offaly Nos. 11 and 19.

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

- The IAWU Peatland Survey
- The Sites and Monuments Record that is maintained by the Dept of Housing, Local Government and Heritage
- The Excavations database
- Previous assessments

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

Desktop assessment

Recorded Monuments

The Record of Monuments and Places (RMP) for Co. Offaly which was established under Section 12 of the National Monuments (Amendment) Act, 1994 was examined as part of the assessment (DAHGI 1995). This record was published by the Minister in 1995 and includes sites and monuments that were known in Esker Bog before that date. This review established that there are no RMPs situated in the proposed



rehabilitation area or vicinity (see Fig. 1). The closest RMP to the rehabilitation area, OF011-053----, is the site of an enclosure located on dryland in Clonmeen townland more than c.36m north-west of the rehabilitation area.

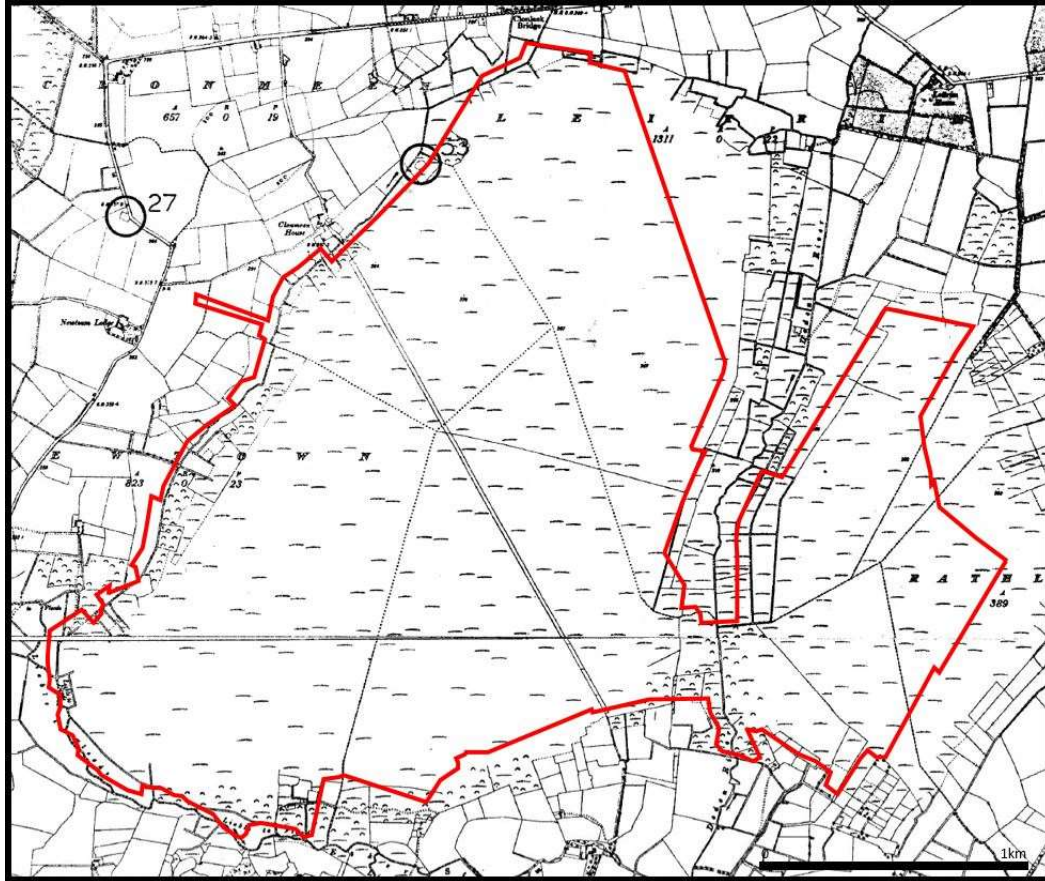


Fig. 1. Esker Bog, Co. Offaly, detail of the Record of Monuments and Places map sheets Nos. 11 and 19. The proposed rehabilitation area is outlined with the red line. There are no Recorded Monuments in the rehabilitation area.

Peatland survey

Esker Bog was surveyed by the Irish Archaeological Wetland Unit (IAWU) in 2001 as part of the Archaeological Survey of Ireland Peatland Survey, Licence number 01E0475. Only a single split timber and piece of brushwood OF -LTM 001 was identified in the bog during the survey (see Table 1). This archaeological sighting was notified to the Archaeological Survey of Ireland.

SMR_NO	IAWU Cat._No.	Site type	Townland	N.G.R. E	N.G.R. N	Depth BS m
OF011-062----	OF -LTM 001	Redundant record- Worked wood	Leitrim	254972	230311	1.02

Table 1. List of sites recorded by the IAWU in Esker 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 22nd of March 2021. The SMR consists of records included in the RMP and sites and monuments notified to the Dept. since the



publication of the RMP. This review established that there is only one entry in the SMR in the proposed rehabilitation area. SMR OF011-062---- is the sighting reported by the IAWU in 2001 as OF -LTM 001 (see Table 1 and Fig. 2). However, the SMR notes that 'The evidence is not sufficient to warrant its acceptance as the remains of an archaeological monument' and it is classed as a redundant record.

Reported finds

A number of archaeological finds from the bog are recorded in the files of the National Museum of Ireland. A bronze axehead (1983:80) from Rathlumber townland, a bog butter (2000:55) from Clonmeen townland and a second bog butter (1998:62) from Eskermore townland.

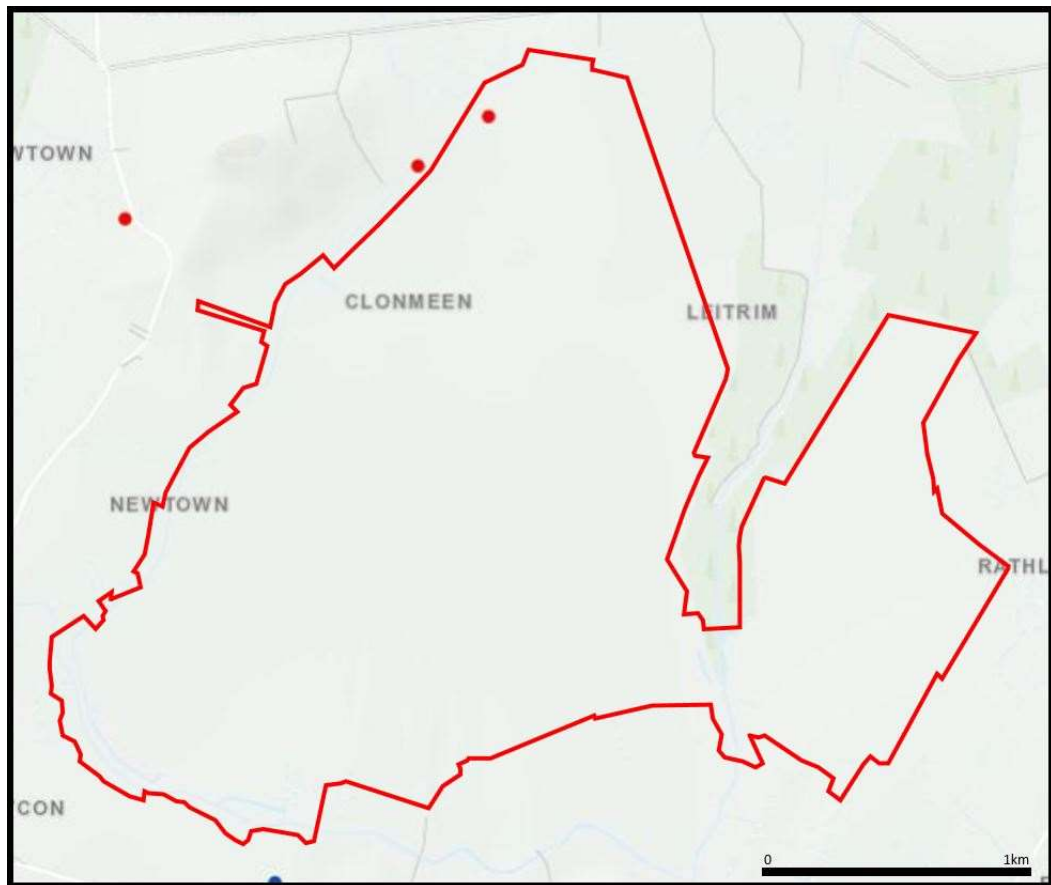


Fig. 2. Esker Bog, Co. Offaly, detail of the Sites and Monuments Record. The proposed rehabilitation area is outlined with the red line. There is one SMR redundant record in the rehabilitation area.

Archaeological investigations

Reports of archaeological excavations and licensed monitoring in the study area listed in the excavations database at excavations.ie were examined as part of the assessment. There are no additional reports of any archaeological investigations carried out in the rehabilitation area.

Previous assessments

Esker Bog has been the subject of an Environmental Impact Assessment Report carried out by Irish Archaeological Consultancy LTD in 2018 for Bord na Móna Energy Limited in relation to IPC Licence P0500-01. The assessment noted the wood identified in the IAWU survey in 2001 and noted that there was a



moderate potential for archaeological features to be uncovered during the course of any future development works in Esker Bog.

Impact assessment

There is one known sighting of worked wood in the rehabilitation area SMR OF011-062---- (see Table 1). This has not been accepted by the Archaeological Survey as the remains of an archaeological monument and has been classed as a redundant record.

Recommendations

The only known sighting of worked wood in the rehabilitation area (SMR OF011-062----) has not been accepted by the Archaeological Survey as the remains of an archaeological monument and has been classed as a redundant record. Therefore, its location does not need to be avoided. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it should be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.

Conclusion

This is a desk-based archaeological assessment and includes a collation of existing written and graphic information to identify the likely archaeological potential of the proposed rehabilitation area. The only known sighting of worked wood in the rehabilitation area (SMR OF011-062----) has not been accepted by the Archaeological Survey as the remains of an archaeological monument, has been classed as a redundant record, and does not need to be avoided. 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 1995. Recorded Monuments Protected under Section 12 of the National Monuments (Amendment) Act, 1994. County Offaly.

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

Dr. Charles Mount
23 March 2021

Appendix C Site Synopses

Site Name: River Barrow and River Nore SAC

Site Code: 002162

This site consists of the freshwater stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains, and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site passes through eight counties – Offaly, Kildare, Laois, Carlow, Kilkenny, Tipperary, Wexford and Waterford. Major towns along the edge of the site include Mountmellick, Portarlinton, Monasterevin, Stradbally, Athy, Carlow, Leighlinbridge, Graiguenamanagh, New Ross, Inistioge, Thomastown, Callan, Bennettsbridge, Kilkenny and Durrow. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow, and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore.

Both rivers rise in the Old Red Sandstone of the Slieve Bloom Mountains before passing through a band of Carboniferous shales and sandstones. The Nore, for a large part of its course, traverses limestone plains and then Old Red Sandstone for a short stretch below Thomastown. Before joining the Barrow it runs over intrusive rocks poor in silica. The upper reaches of the Barrow also run through limestone. The middle reaches and many of the eastern tributaries, sourced in the Blackstairs Mountains, run through Leinster Granite. The southern end, like the Nore runs over intrusive rocks poor in silica. Waterford Harbour is a deep valley excavated by glacial floodwaters when the sea level was lower than today. The coast shelves quite rapidly along much of the shore.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

- [1130] Estuaries
- [1140] Tidal Mudflats and Sandflats
- [1170] Reefs
- [1310] *Salicornia* Mud
- [1330] Atlantic Salt Meadows
- [1410] Mediterranean Salt Meadows
- [3260] Floating River Vegetation
- [4030] Dry Heath
- [6430] Hydrophilous Tall Herb Communities
- [7220] Petrifying Springs*
- [91A0] Old Oak Woodlands

[91E0] Alluvial Forests*

- [1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*)
- [1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*)
- [1092] White-clawed Crayfish (*Austropotamobius pallipes*)
- [1095] Sea Lamprey (*Petromyzon marinus*)
- [1096] Brook Lamprey (*Lampetra planeri*)
- [1099] River Lamprey (*Lampetra fluviatilis*)
- [1103] Twaite Shad (*Alosa fallax*)
- [1106] Atlantic Salmon (*Salmo salar*)
- [1355] Otter (*Lutra lutra*)
- [1421] Killarney Fern (*Trichomanes speciosum*)
- [1990] Nore Freshwater Pearl Mussel (*Margaritifera durrovensis*)

Good examples of alluvial forest (a priority habitat on Annex I of the E.U. Habitats Directive) are seen at Rathsnagadan, Murphy's of the River, in Abbeyleix estate and along other shorter stretches of both the tidal and freshwater elements of the site. Typical species seen include Almond Willow (*Salix triandra*), White Willow (*S. alba*), Rusty Willow (*S. cinerea* subsp. *oleifolia*), Crack Willow (*S. fragilis*) and Osier (*S. viminalis*), along with Iris (*Iris pseudacorus*), Hemlock Water-dropwort (*Oenanthe crocata*), Wild Angelica (*Angelica sylvestris*), Thin-spiked Wood-sedge (*Carex strigosa*), Pendulous Sedge (*C. pendula*), Meadowsweet (*Filipendula ulmaria*), Common Valerian (*Valeriana officinalis*) and the Red Data Book species Nettle-leaved Bellflower (*Campanula trachelium*).

A good example of petrifying springs with tufa formations occurs at Dysart Wood along the Nore. This is a rare habitat in Ireland and one listed with priority status on Annex I of the E.U. Habitats Directive. These hard water springs are characterised by lime encrustations, often associated with small waterfalls. A rich bryophyte flora is typical of the habitat and two diagnostic species, *Palustriella commutata* and *Eucladium verticillatum*, have been recorded.

The best examples of old oak woodlands are seen in the ancient Park Hill woodland in the estate at Abbeyleix; at Kyleadohir, on the Delour, Forest Wood House, Kylecorragh and Brownstown Woods on the Nore; and at Cloghristic Wood, Drummond Wood and Borris Demesne on the Barrow, though other patches occur throughout the site. Abbeyleix Woods is a large tract of mixed deciduous woodland which is one of the only remaining true ancient woodlands in Ireland. Historical records show that Park Hill has been continuously wooded since the 16th century and has the most complete written record of any woodland in the country. It supports a variety of woodland habitats and an exceptional diversity of species including 22 native trees, 44 bryophytes and 92 lichens. It also contains eight indicator species of ancient woodlands. Park Hill is also the site of two rare plants, Nettle-leaved

Bellflower and the moss *Leucodon sciuroides*. The rare Myxomycete fungus, *Licea minima* has been recorded from woodland at Abbeyleix.

Oak woodland covers parts of the valley side south of Woodstock and is well developed at Brownsford where the Nore takes several sharp bends. The steep valley side is covered by oak (*Quercus* spp.), Holly (*Ilex aquifolium*), Hazel (*Corylus avellana*) and Downy Birch (*Betula pubescens*), with some Beech (*Fagus sylvatica*) and Ash (*Fraxinus excelsior*). All the trees are regenerating through a cover of Bramble (*Rubus fruticosus* agg.), Foxglove (*Digitalis purpurea*), Great Wood-rush (*Luzula sylvatica*) and Broad Buckler-fern (*Dryopteris dilatata*).

On the steeply sloping banks of the River Nore, about 5 km west of New Ross, in Co. Kilkenny, Kylecorragh Woods form a prominent feature in the landscape. This is an excellent example of relatively undisturbed, relict oak woodland with a very good tree canopy. The wood is quite damp and there is a rich and varied ground flora. At Brownstown, a small, mature oak dominated woodland occurs on a steep slope. There is younger woodland to the north and east of it. Regeneration throughout is evident. The understorey is similar to the woods at Brownsford. The ground flora of this woodland is developed on acidic, brown earth type soil and comprises a thick carpet of Bilberry (*Vaccinium myrtillus*), Heather (*Calluna vulgaris*), Hard Fern (*Blechnum spicant*), Common Cow-wheat (*Melampyrum pratense*) and Bracken (*Pteridium aquilinum*).

Borris Demesne contains a very good example of a semi-natural broadleaved woodland in very good condition. There is quite a high degree of natural regeneration of oak and Ash through the woodland. At the northern end of the estate oak species predominate. Drummond Wood, also on the Barrow, consists of three blocks of deciduous woods situated on steep slopes above the river. The deciduous trees are mostly oak species. The woods have a well-established understorey of Holly, and the herb layer is varied, with Bramble abundant. The whitebeam *Sorbus devoniensis* has also been recorded here.

Eutrophic tall herb vegetation occurs in association with the various areas of alluvial forest and elsewhere where the floodplain of the river is intact. Characteristic species of the habitat include Meadowsweet, Purple Loosestrife (*Lythrum salicaria*), Marsh Ragwort (*Senecio aquaticus*), Ground Ivy (*Glechoma hederacea*) and Hedge Bindweed (*Calystegia sepium*). Indian Balsam (*Impatiens glandulifera*), an introduced and invasive species, is abundant in places.

Floating river vegetation is well represented in the Barrow and in the many tributaries of the site. In the Barrow the species found include water-starworts (*Callitriche* spp.), Canadian Pondweed (*Elodea canadensis*), Bulbous Rush (*Juncus bulbosus*), water-milfoils (*Myriophyllum* spp.), the pondweed *Potamogeton x nitens*, Broad-leaved Pondweed (*P. natans*), Fennel Pondweed (*P. pectinatus*), Perfoliated Pondweed (*P. perfoliatus*) and crowfoots (*Ranunculus* spp.). The water quality of the Barrow has improved since the vegetation survey was carried out (EPA, 1996).

Dry heath at the site occurs in pockets along the steep valley sides of the rivers especially in the Barrow Valley and along the Barrow tributaries where they occur in the foothills of the Blackstairs Mountains. The dry heath vegetation along the slopes of the river bank consists of Bracken and Gorse (*Ulex europaeus*) with patches of acidic grassland vegetation. Additional typical species include Heath Bedstraw (*Galium saxatile*), Foxglove, Common Sorrel (*Rumex acetosa*) and Creeping Bent (*Agrostis stolonifera*). On the steep slopes above New Ross the Red Data Book species Greater Broomrape (*Orobancha rapum-genistae*) has been recorded. Where rocky outcrops are shown on the maps Bilberry and Great Wood-rush are present. At Ballyhack a small area of dry heath is interspersed with patches of lowland dry grassland. These support a number of clover species, including the legally protected Clustered Clover (*Trifolium glomeratum*) - a species known from only one other site in Ireland. This grassland community is especially well developed on the west side of the mud-capped walls by the road. On the east of the cliffs a group of rock-dwelling species occur, i.e. English Stonecrop (*Sedum anglicum*), Sheep's-bit (*Jasione montana*) and Wild Madder (*Rubia peregrina*). These rocks also support good lichen and moss assemblages with *Ramalina subfarinacea* and *Hedwigia ciliata*.

Dry heath at the site generally grades into wet woodland or wet swamp vegetation lower down the slopes on the river bank. Close to the Blackstairs Mountains, in the foothills associated with the Aughnabriskey, Aughavaud and Mountain Rivers there are small patches of wet heath dominated by Purple Moor-grass (*Molinia caerulea*) with Heather, Tormentil (*Potentilla erecta*), Carnation Sedge (*Carex panicea*) and Bell Heather (*Erica cinerea*).

Salt meadows occur at the southern section of the site in old meadows where the embankment has been breached, along the tidal stretches of in-flowing rivers below Stokestown House, in a narrow band on the channel side of Common Reed (*Phragmites australis*) beds and in narrow fragmented strips along the open shoreline. In the larger areas of salt meadow, notably at Carrickloney, Ballinlaw Ferry and Rochestown on the west bank; Fisherstown, Alderton and Great Island to Dunbrody on the east bank, the Atlantic and Mediterranean sub types are generally intermixed. At the upper edge of the salt meadow in the narrow ecotonal areas bordering the grasslands where there is significant percolation of salt water, the legally protected species Borrer's Saltmarsh-grass (*Puccinellia fasciculata*) and Meadow Barley (*Hordeum secalinum*) are found. The very rare and also legally protected Divided Sedge (*Carex divisa*) is also found. Sea Rush (*Juncus maritimus*) is also present. Other plants recorded and associated with salt meadows include Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Sea Couch (*Elymus pycnanthus*), Spear-leaved Orache (*Atriplex prostrata*), Lesser Sea-spurrey (*Spergularia marina*), Sea Arrowgrass (*Triglochin maritima*) and Sea Plantain (*Plantago maritima*).

Glassworts (*Salicornia* spp.) and other annuals colonising mud and sand are found in the creeks of the saltmarshes and at the seaward edges of them. The habitat also occurs in small amounts on some stretches of the shore free of stones.

The estuary and the other E.U. Habitats Directive Annex I habitats within it form a large component of the site. Extensive areas of intertidal flats, comprised of substrates ranging from fine, silty mud to coarse sand with pebbles/stones are present. Good quality intertidal sand and mudflats have developed on a linear shelf on the western side of Waterford Harbour, extending for over 6 km from north to south between Passage East and Creadaun Head, and in places are over 1 km wide. The sediments are mostly firm sands, though grade into muddy sands towards the upper shore. They have a typical macro-invertebrate fauna, characterised by polychaetes and bivalves. Common species include *Arenicola marina*, *Nephtys hombergii*, *Scoloplos armiger*, *Lanice conchilega* and *Cerastoderma edule*. An extensive area of honey-comb worm biogenic reef occurs adjacent to Duncannon, Co. Wexford on the eastern shore of the estuary. It is formed by the polychaete worm *Sabellaria alveolata*. This intertidal *Sabellaria alveolata* reef is formed as a sheet of interlocking tubes over a considerable area of exposed bedrock. This polychaete species constructs tubes, composed of aggregated sand grains, in tightly packed masses with a distinctive honeycomb-like appearance. These can be up to 25cm proud of the substrate and form hummocks, sheets or more massive formations. A range of species are reported from these reefs including: *Enteromorpha* sp.; *Ulva* sp.; *Fucus vesiculosus*; *Fucus serratus*; *Polysiphonia* sp.; *Chondrus crispus*; *Palmaria palmate*; *Coralinus officinalis*; *Nemertea* sp.; *Actinia equine*; *Patella vulgate*; *Littorina littorea*; *Littorina obtusata* and *Mytilus edulis*.

The western shore of the harbour is generally stony and backed by low cliffs of glacial drift. At Woodstown there is a sandy beach, now much influenced by recreation pressure and erosion. Behind it a lagoonal marsh has been impounded which runs westwards from Gaultiere Lodge along the course of a slow stream. An extensive reedbed occurs here. At the edges is a tall fen dominated by sedges (*Carex* spp.), Meadowsweet, willowherbs (*Epilobium* spp.) and rushes (*Juncus* spp.). Wet woodland also occurs.

The dunes which fringe the strand at Duncannon are dominated by Marram (*Ammophila arenaria*) towards the sea. Other species present include Wild Clary/Sage (*Salvia verbenaca*), a rare Red Data Book species. The rocks around Duncannon ford have a rich flora of seaweeds typical of a moderately exposed shore and the cliffs themselves support a number of coastal species on ledges, including Thrift, Rock Samphire (*Crithmum maritimum*) and Buck's-horn Plantain (*Plantago coronopus*).

Other habitats which occur throughout the site include wet grassland, marsh, reedswamp, improved grassland, arable land, quarries, coniferous plantations, deciduous woodland, scrub and ponds.

Seventeen Red Data Book plant species have been recorded within the site, most in the recent past. These are Killarney Fern (*Trichomanes speciosum*), Divided Sedge, Clustered Clover, Basil Thyme (*Acinos arvensis*), Red Hemp-nettle (*Galeopsis angustifolia*), Borrer's Saltmarsh-grass, Meadow Barley, Opposite-leaved Pondweed (*Groenlandia densa*), Meadow Saffron/Autumn Crocus (*Colchicum autumnale*), Wild Clary/Sage, Nettle-leaved Bellflower, Saw-wort (*Serratula tinctoria*), Bird Cherry

(*Prunus padus*), Blue Fleabane (*Erigeron acer*), Fly Orchid (*Ophrys insectifera*), Ivy Broomrape (*Orobanche hederæ*) and Greater Broomrape. Of these, the first nine are protected under the Flora (Protection) Order, 2015. Divided Sedge was thought to be extinct but has been found in a few locations in the site since 1990. In addition plants which do not have a very wide distribution in the country are found in the site including Thin-spiked Wood-sedge, Field Garlic (*Allium oleraceum*) and Summer Snowflake. Six rare lichens, indicators of ancient woodland, are found including *Lobaria laetevirens* and *L. pulmonaria*. The rare moss *Leucodon sciuroides* also occurs.

The site is very important for the presence of a number of E.U. Habitats Directive Annex II animal species including Freshwater Pearl Mussel (both *Margaritifera margaritifera* and *M. m. durrovensis*), White-clawed Crayfish, Salmon, Twaite Shad, three lamprey species – Sea Lamprey, Brook Lamprey and River Lamprey, the tiny whorl snail *Vertigo moulinsiana* and Otter. This is the only site in the world for the hard water form of the Freshwater Pearl Mussel, *M. m. durrovensis*, and one of only a handful of spawning grounds in the country for Twaite Shad. The freshwater stretches of the River Nore main channel is a designated salmonid river. The Barrow/Nore is mainly a grilse fishery though spring salmon fishing is good in the vicinity of Thomastown and Inistioge on the Nore. The upper stretches of the Barrow and Nore, particularly the Owenass River, are very important for spawning.

The site supports many other important animal species. Those which are listed in the Irish Red Data Book include Daubenton's Bat, Badger, Irish Hare and Common Frog. The rare Red Data Book fish species Smelt (*Osmerus eperlanus*) occurs in estuarine stretches of the site. In addition to the Freshwater Pearl Mussel, the site also supports two other freshwater mussel species, *Anodonta anatina* and *A. cygnea*.

Three rare invertebrates have been recorded in alluvial woodland at Murphy's of the River. These are: *Neoascia obliqua* (Order Diptera: Syrphidae), *Tetanocera freyi* (Order Diptera: Sciomyzidae) and *Dictya umbrarum* (Order Diptera: Sciomyzidae). The rare invertebrate, *Mitostoma chrysomelas* (Order Arachnida), occurs in the old oak woodland at Abbeyleix and only two other sites in the country. Two flies (Order Diptera) *Chrysogaster virescens* and *Hybomitra muhlfeldi* also occur at this woodland.

The site is of ornithological importance for a number of E.U. Birds Directive Annex I species, including Greenland White-fronted Goose, Whooper Swan, Bewick's Swan, Bar-tailed Godwit, Peregrine and Kingfisher. Nationally important numbers of Golden Plover and Bar-tailed Godwit are found during the winter. Wintering flocks of migratory birds are seen in Shanahoe Marsh and the Curragh and Goul Marsh, both in Co. Laois, and also along the Barrow Estuary in Waterford Harbour. There is also an extensive autumnal roosting site in the reedbeds of the Barrow Estuary used by Swallows before they leave the country. The old oak woodland at Abbeyleix has a typical bird fauna including Jay, Long-eared Owl and Raven. The reedbed at Woodstown supports populations of typical waterbirds including Mallard, Snipe, Sedge Warbler and Water Rail.

Land use at the site consists mainly of agricultural activities – mostly intensive in nature and principally grazing and silage production. Slurry is spread over much of the area. Arable crops are also grown. The spreading of slurry and fertiliser poses a threat to the water quality of the salmonid river and to the populations of E.U. Habitats Directive Annex II animal species within the site. Many of the woodlands along the rivers belong to old estates and support many non-native species. Little active woodland management occurs. Fishing is a main tourist attraction along stretches of the main rivers and their tributaries and there are a number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. Both commercial and leisure fishing takes place on the rivers. There is net fishing in the estuary and a mussel bed also. Other recreational activities such as boating, golfing and walking, particularly along the Barrow towpath, are also popular. There is a golf course on the banks of the Nore at Mount Juliet and GAA pitches on the banks at Inistioge and Thomastown. There are active and disused sand and gravel pits throughout the site. Several industrial developments, which discharge into the river, border the site. New Ross is an important shipping port. Shipping to and from Waterford and Belview ports also passes through the estuary.

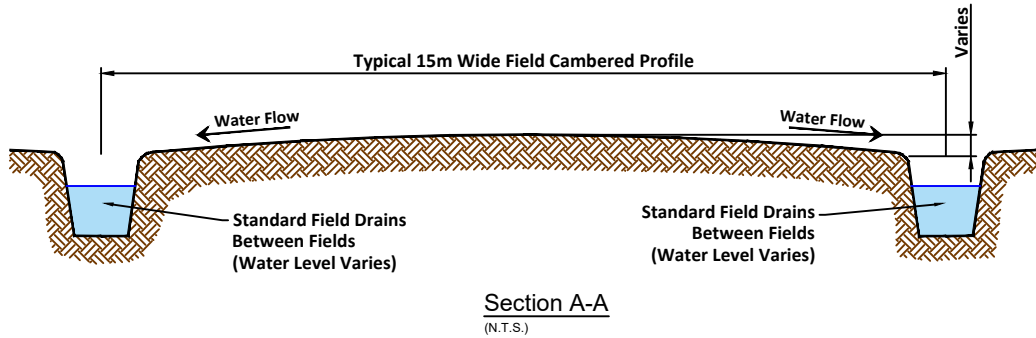
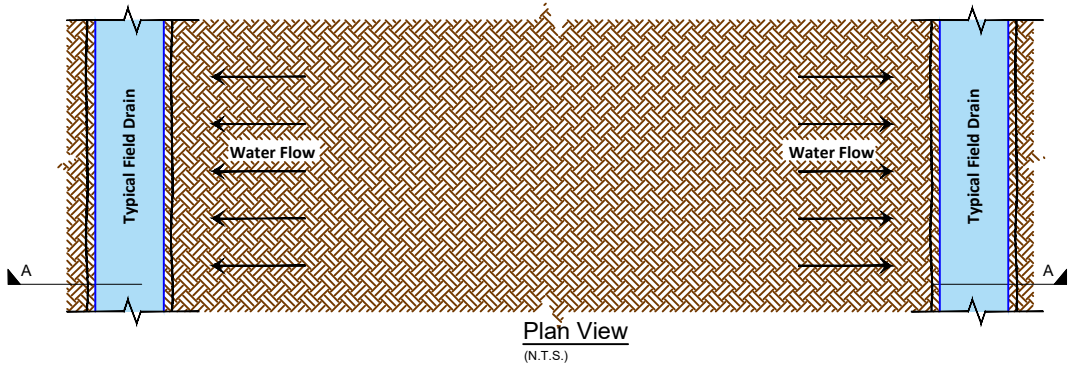
The main threats to the site and current damaging activities include high inputs of nutrients into the river system from agricultural run-off and several sewage plants, over-grazing within the woodland areas, and invasion by non-native species, for example Cherry Laurel (*Prunus laurocerasus*) and Rhododendron (*Rhododendron ponticum*). The water quality of the site remains vulnerable. Good quality water is necessary to maintain the populations of the Annex II animal species listed above. Good quality is dependent on controlling fertilisation of the grasslands, particularly along the Nore. It also requires that sewage be properly treated before discharge. Drainage activities in the catchment can lead to flash floods which can damage the many Annex II species present. Capital and maintenance dredging within the lower reaches of the system pose a threat to migrating fish species such as lamprey and shad. Land reclamation also poses a threat to the salt meadows and the populations of legally protected species therein.

Overall, the site is of considerable conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II of the E.U. Habitats Directive. Furthermore it is of high conservation value for the populations of bird species that use it. The occurrence of several Red Data Book plant species including three rare plants in the salt meadows and the population of the hard water form of the Freshwater Pearl Mussel, which is limited to a 10 km stretch of the Nore, add further interest to this site.

Appendix D Drawings of Proposed Rehabilitation Methodologies

Existing Layout:

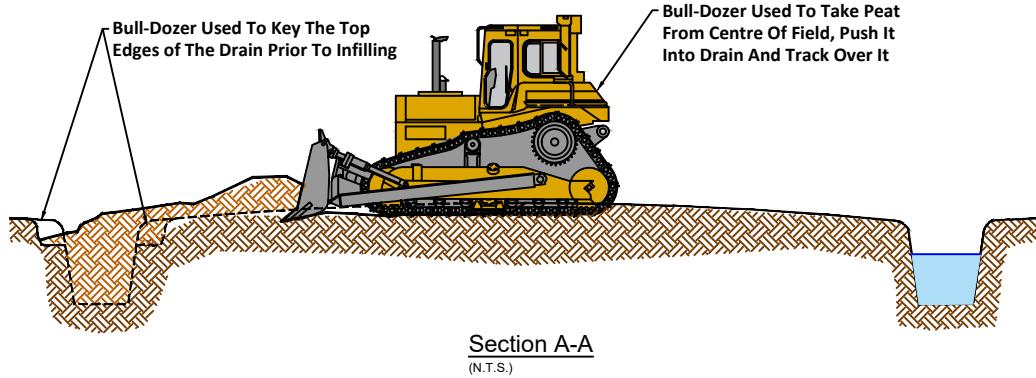
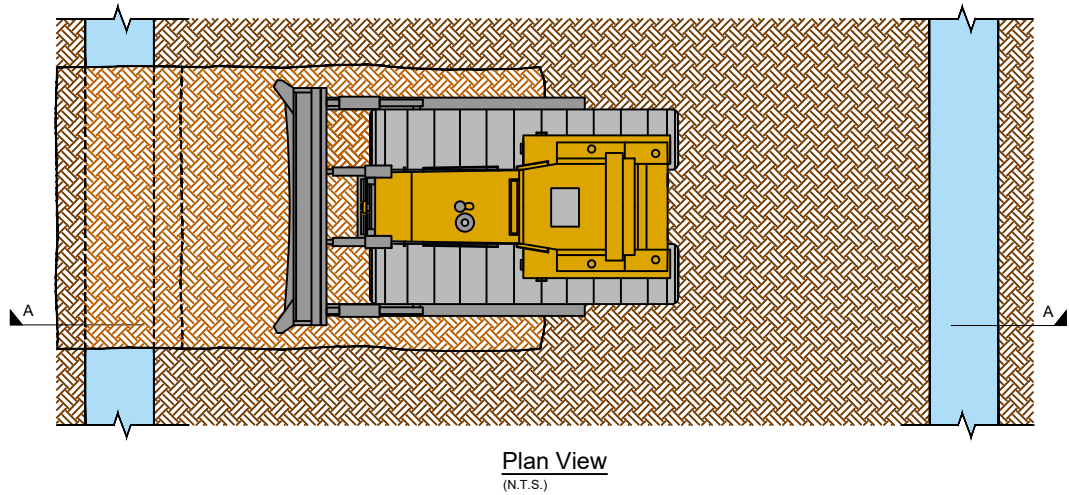
Typical existing bare peat fields are cambered (higher) in the centre and lower towards the drains, helping drainage of the fields but limiting the re-wetting of the central area. The concept of drain blocking is to raise the water levels in the drains to re-wet the cutaway and slow the water movement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



- NOTES:**
- FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
 - 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.
 - REFER TO RELEVANT SITE PLAN FOR No. OF DRAIN BLOCKS SPECIFIED PER 100M DRAIN LENGTH.
 - REFER TO RELEVANT SITE PLAN FOR SPECIFIC FINISHED GROUND LEVELS TO BE ACHIEVED.
 - ALL DETAILS TO BE AGREED WITH BORD NA MONA OPERATIONS PRIOR TO CONSTRUCTION.
 - OPERATORS TO CONFORM WITH ALL STANDARD OPERATING PROCEDURES.
 - 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.

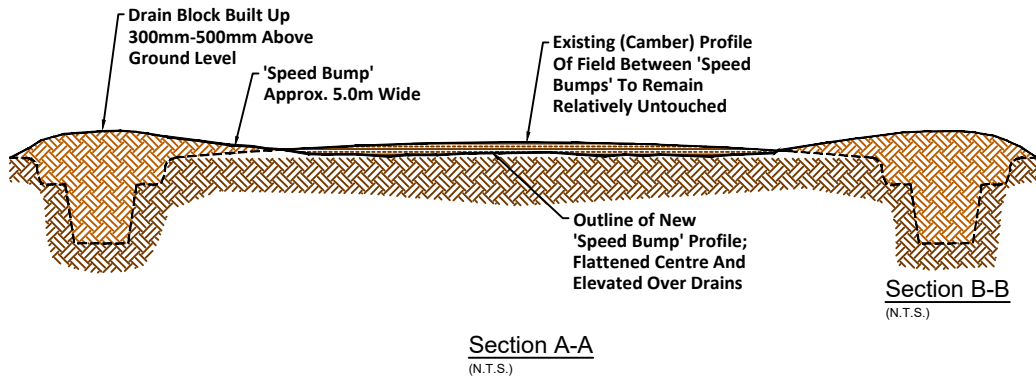
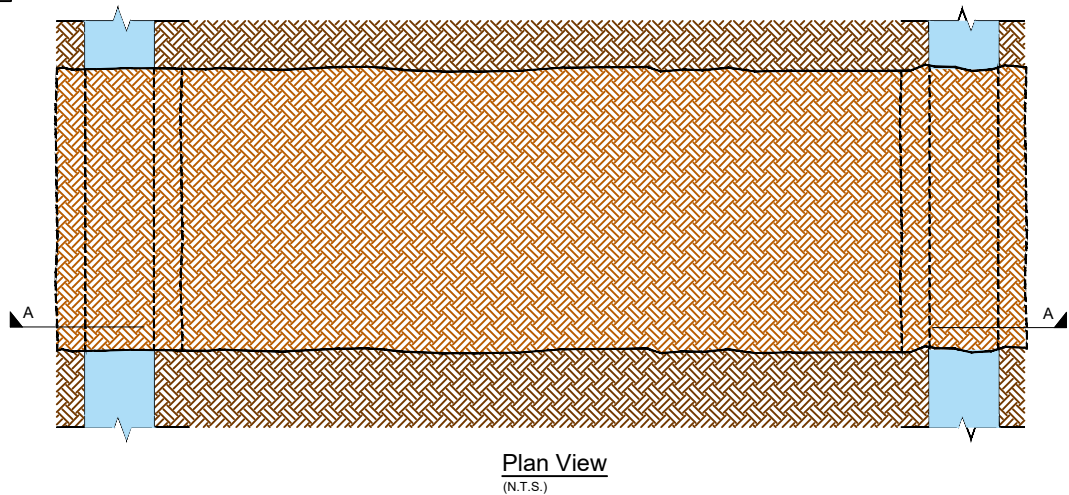
Phase 1 Forming 'Speed Bump'

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'.



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.



STATUS			
c	For Approval	P.K.	03/03/21
b	'Key' Added To Top Edges Of Drain at Drain Block Locations	P.K.	08/02/21
a	Issued For Information	P.K.	29/01/21
Rev	Description	Issued By	Date

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

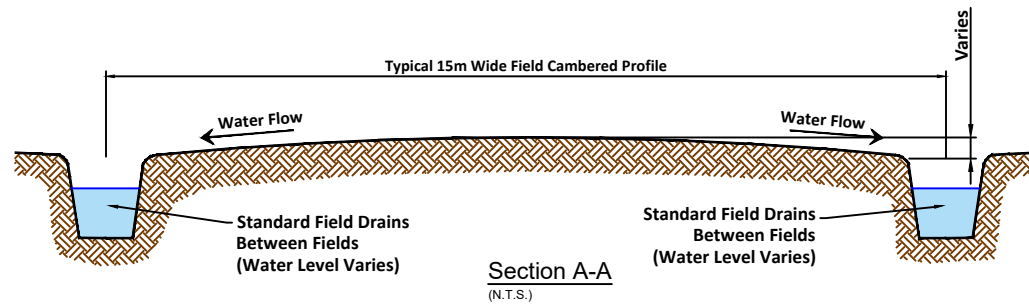
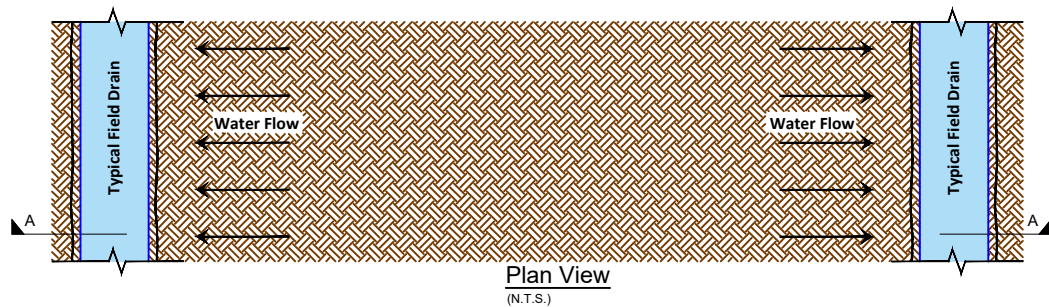
TITLE:
Rehabilitation Method DCT 2
'Speed Bump' Peat Drain Block

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.:				Rev:
PCAS-0100-008				c

Existing Typical Field 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.

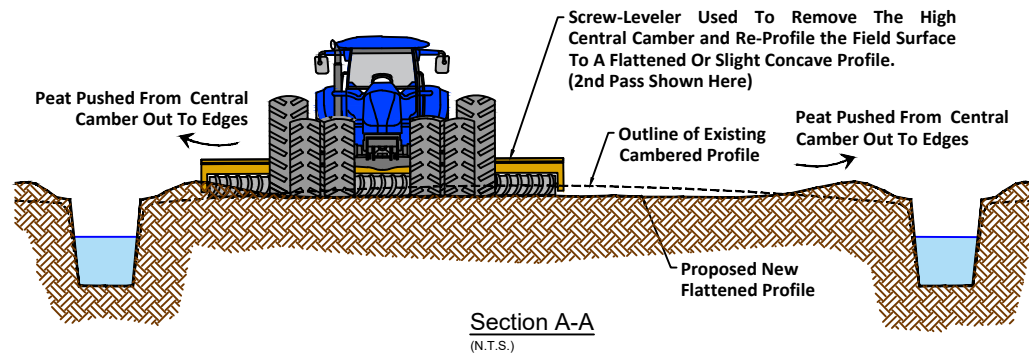
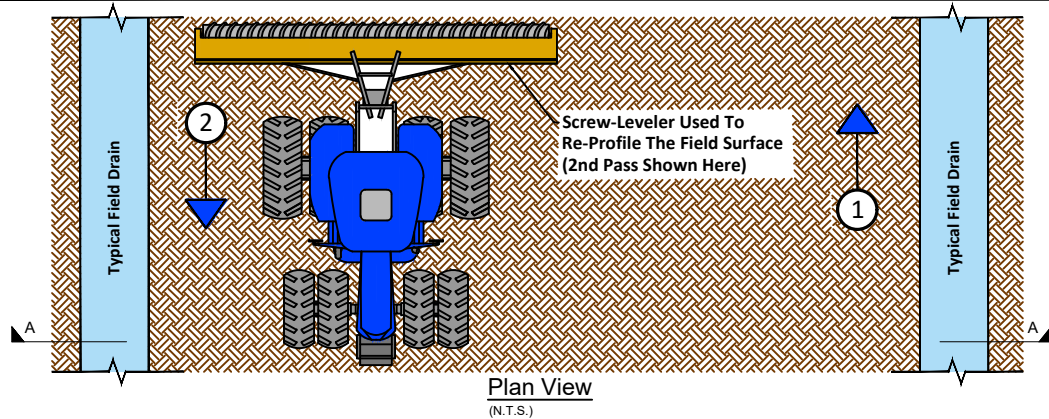
The concept of field re-profiling is to level the surface of the individual peat production fields to retain surface water at the required depth.



Phase 1 Re-Profiling of Field Surface

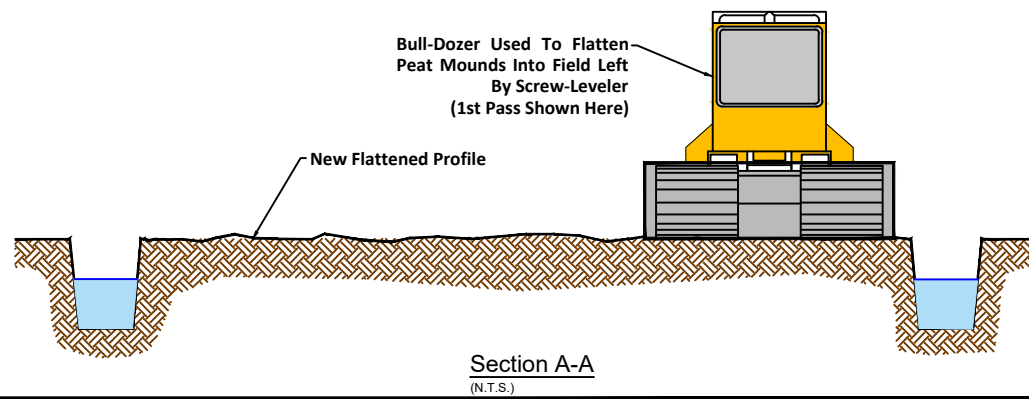
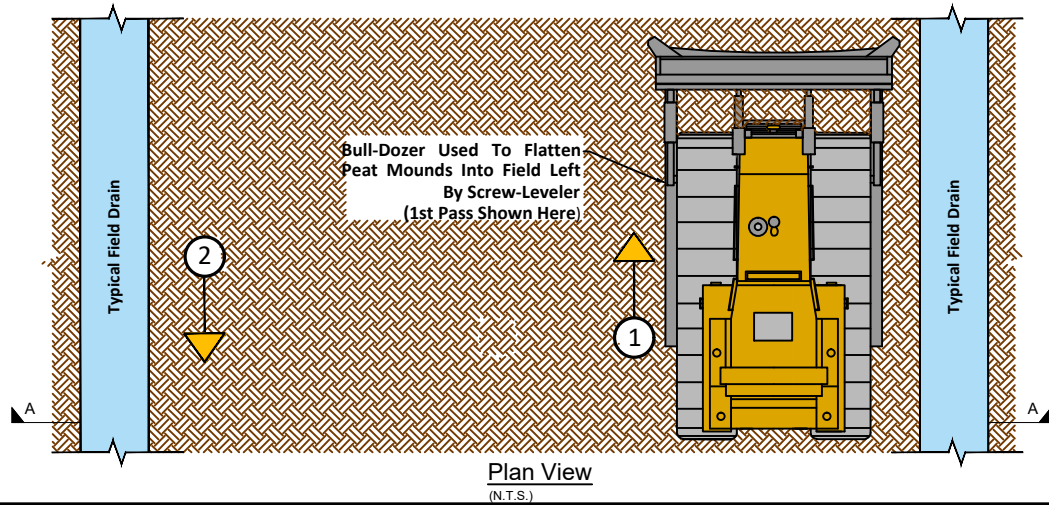
The production field is re-profiled using a screw-leveler to remove the high central camber from individual production fields and deposit the peat on the lower-lying edges of the same production field.

The Screw-Leveler is towed using a tractor, with a level axis, will run up one side ① of the production field and down the other side ②, sufficiently offset from drain to ensure the peat does not enter the drain but forms a mound beside the drain.



Phase 2 Leveling of Loose Peat

Next the Bull-dozer will run up one edge side ① of the production field and down the other side ② flattening the loose peat mounds, ensuring a minimal amount of peat enters the drains.



Phase 3 Peat Drain Blocking

Drain blocks are constructed using an Excavator operating at a perpendicular direction to the field drains.

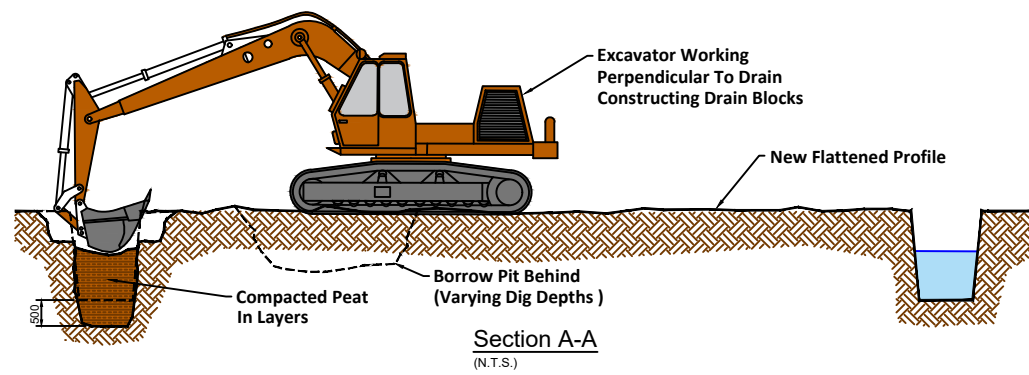
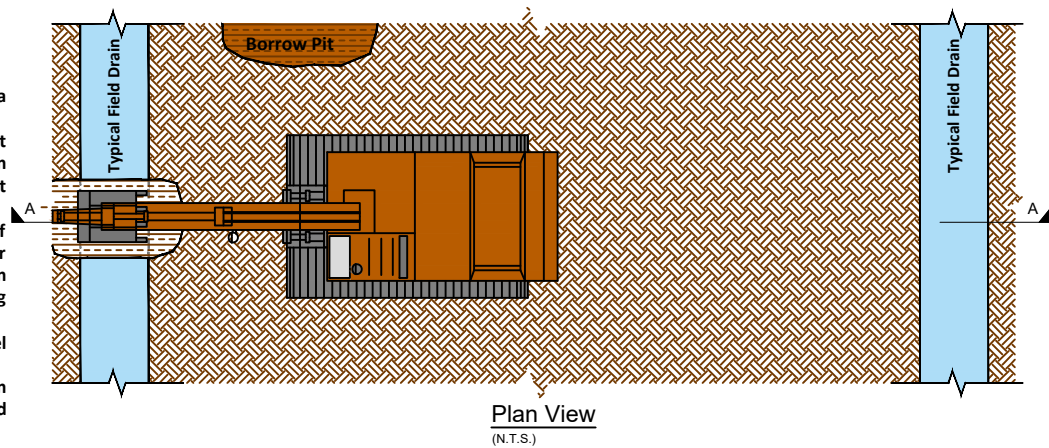
Key is cut in the drain approximately 500mm deep, and ensuring that it is wider than the actual drain. 500mm of peat is removed from bottom of drain also and placed behind the machine for replacement later.

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.

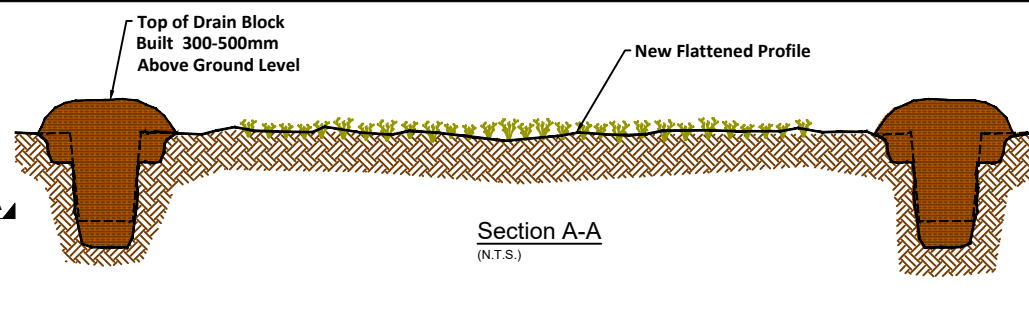
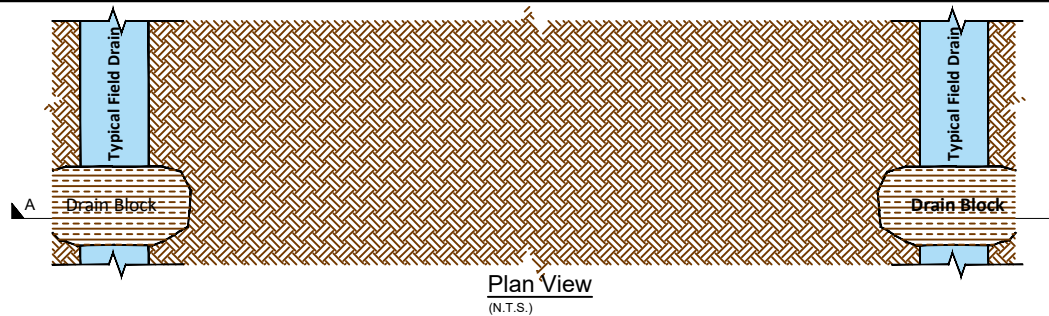
The borrow pit is back filled with the peat extracted from the bottom of drain. The sides of the borrow pit are to be pressed down and graded with the excavator bucket.

(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.)



Complete Flattened Field Profile

Field re-profiling is developed as a technique to slow the surface water loss from the bog and to retain as much water as possible on the site. Each re-profiled field will hold a shallow layer of water. In time, these shallows have been shown to quickly infill with peatland vegetation.



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

b	For Approval	P.K.	03/03/21
a	Issued For Information	P.K.	07/01/21
Rev	Description	Issued By	Date

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

PROJECT:

Peatland Climate Action Scheme
PCAS

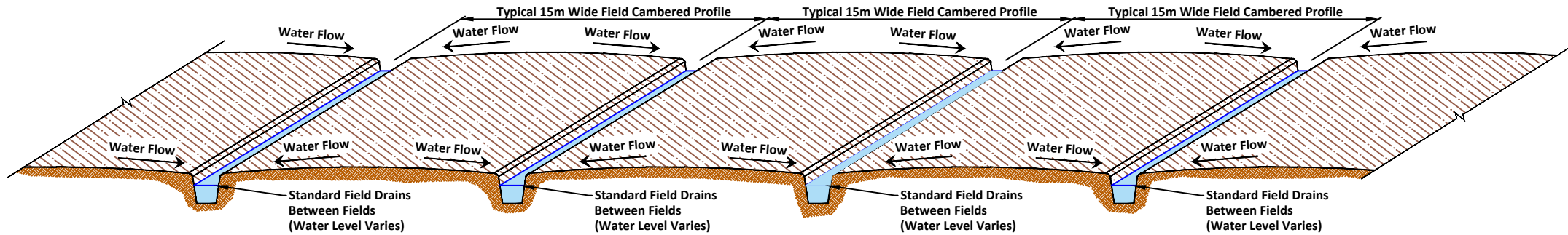
TITLE:

Rehabilitation Method DPT 3B
Field Re-profiling

Drawn By:	Checked By:	Approved:
CAD Designer	Discp. Lead	Design Lead
P.K.	D.K.	P.N.
Date: 18/12/20	Scale: Not to Scale	A3
Drawing No.: PCAS-0100-004		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:

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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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.

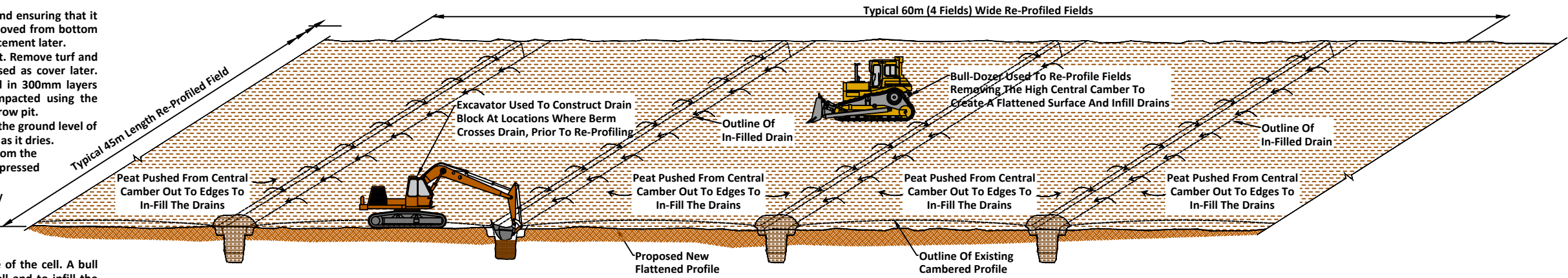
Key is cut in the drain approximately 500mm deep, and ensuring that it is wider than the actual drain. 500mm of peat is removed from bottom of drain also and placed behind the machine for replacement later.

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-dozer 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.

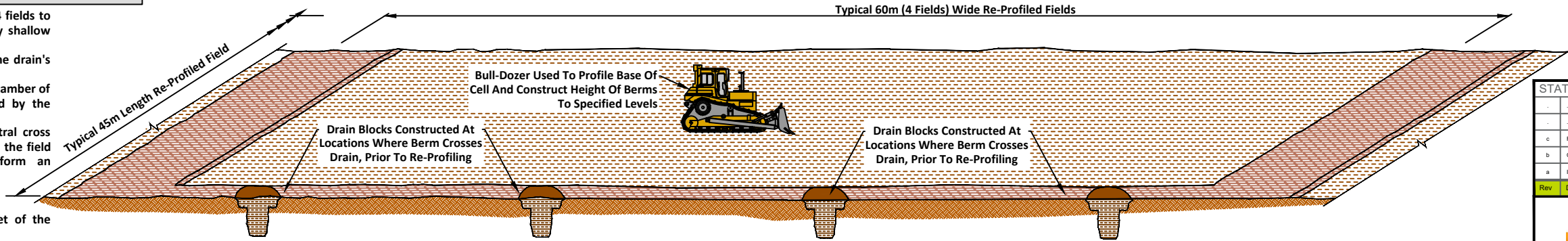
An Excavator is used to form a key(5m long) in the drain's edges where the berm crosses.

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.



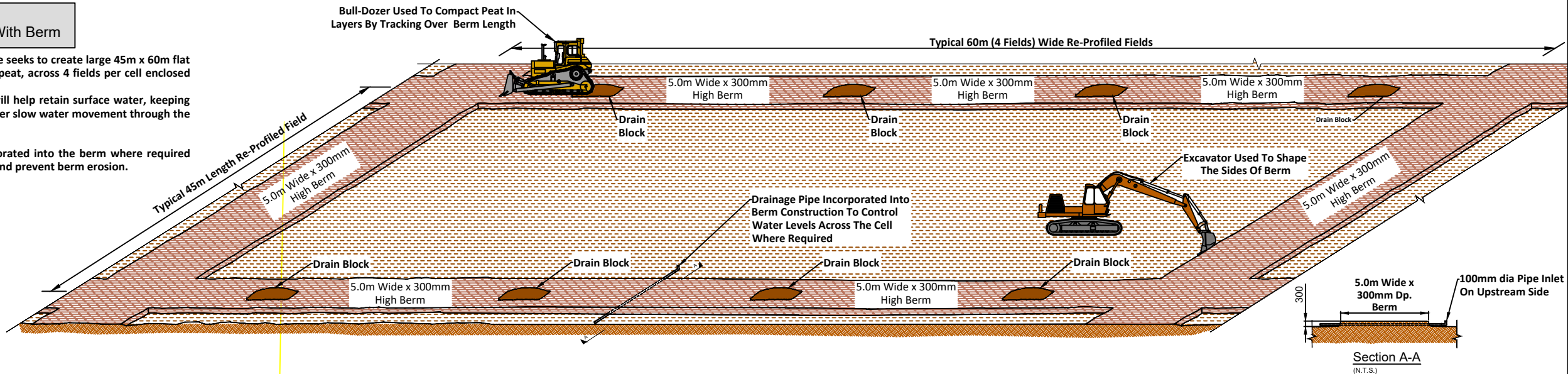
Final Profile:

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

BORD NA MONA
Naturally Driven

Bord Na Móna Engineering Department

LEABEG, TULLAMORE CO. OFFALY

Tel. 057 9345900

Fax. 057 9345160

PROJECT:

Peatland Climate Action Scheme (PCAS)

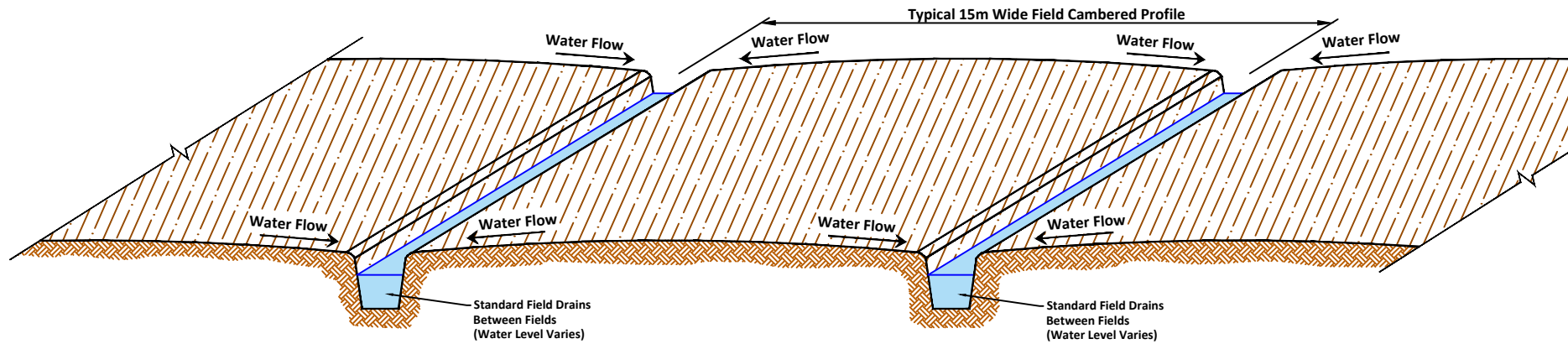
TITLE:

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

Drawn By:	Checked By:	Approved:
CAD Designer	Discp. Lead	Design Lead
P.K.	D.K.	P.N.
Date: 22/12/20	Scale: Not to Scale	A3 Stage: For Approval
Drawing No.: PCAS-0100-006		Rev: c

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.

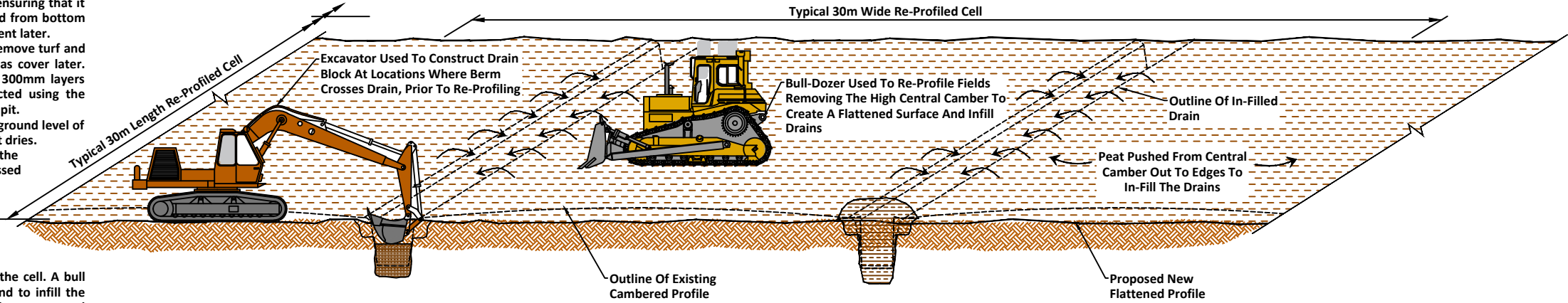


Phase 1

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.)

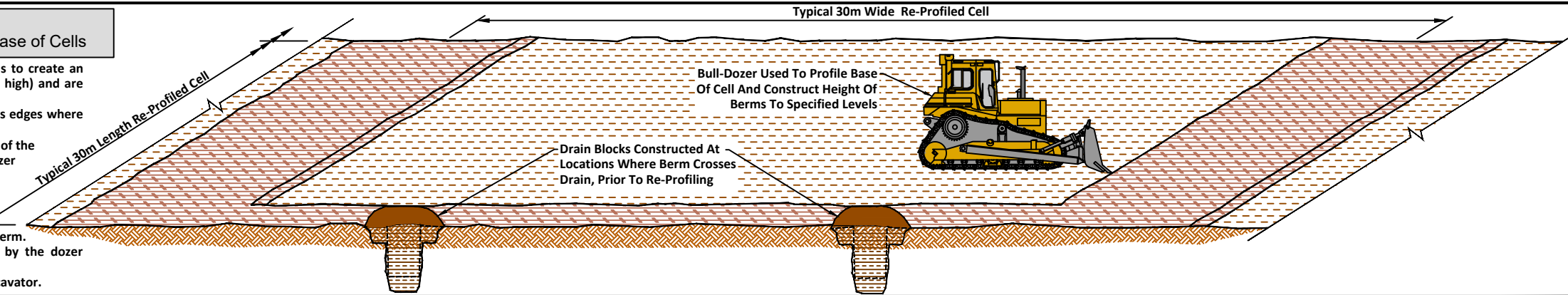
The centre of the cambered field is used as one side of the cell. A bull dozer is used to level and flatten the base of the cell and to infill the drains by removing the camber from the fields. Laser levels are mounted on bull-dozers to allow the machine drivers to move peat and create flat surfaces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

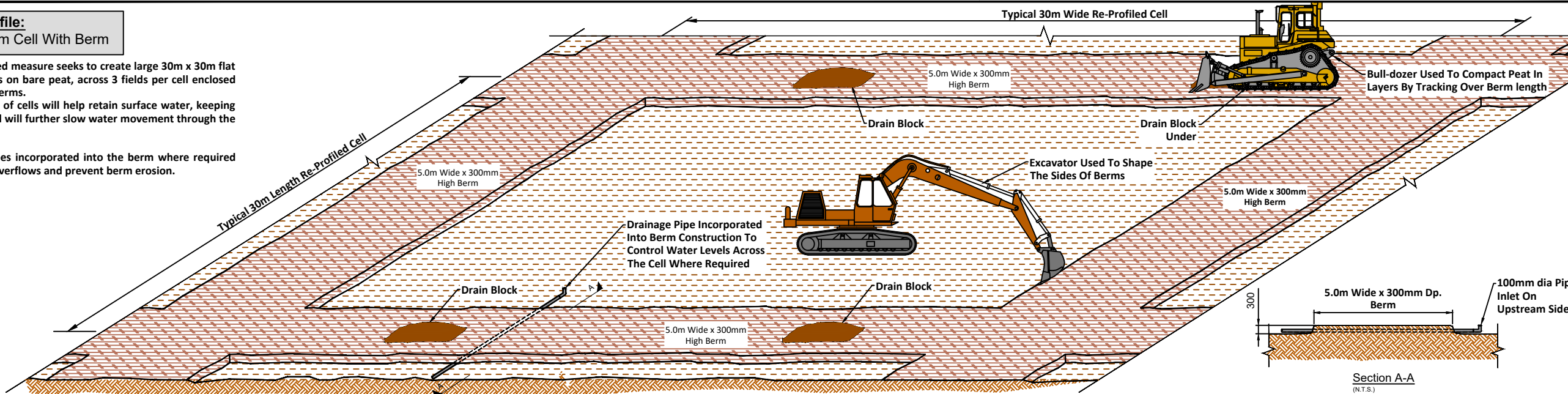


Final Profile:

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:

- FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
- 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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- REFER TO RELEVANT SITE PLAN FOR SPECIFIC FINISHED GROUND LEVELS TO BE ACHIEVED.
- ALL DETAILS TO BE AGREED WITH BORD NA MONA OPERATIONS PRIOR TO CONSTRUCTION.
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- 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
b	For Approval	P.K.	25/02/21
a	Issued For Information	P.K.	28/01/21

BORD NA MONA

Naturally Driven

Bord Na M6na Engineering Department
LEABEG, TULLAMORE CO. OFFALY
Tel. 057 9345900
Fax. 057 9345160

PROJECT:

Peatland Climate Action Scheme
PCAS

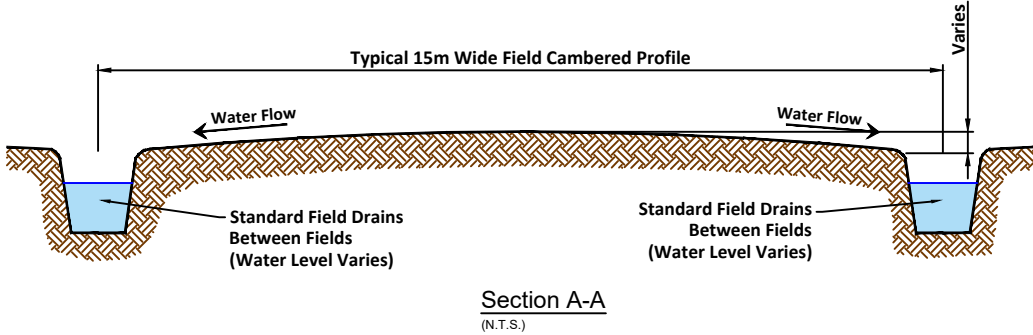
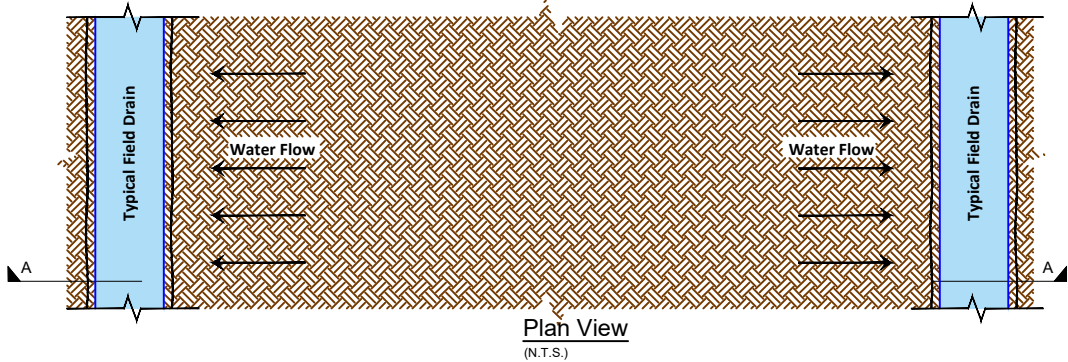
TITLE:

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

Drawn By:	Checked By:	Approved:
CAD Designer	Discip. Lead	Design Lead
P.K.	D.K.	P.N.
Date: 18/12/20	Scale: Not to Scale	A3
Drawing No.: PCAS-0100-007		Rev: b

Existing Layout:

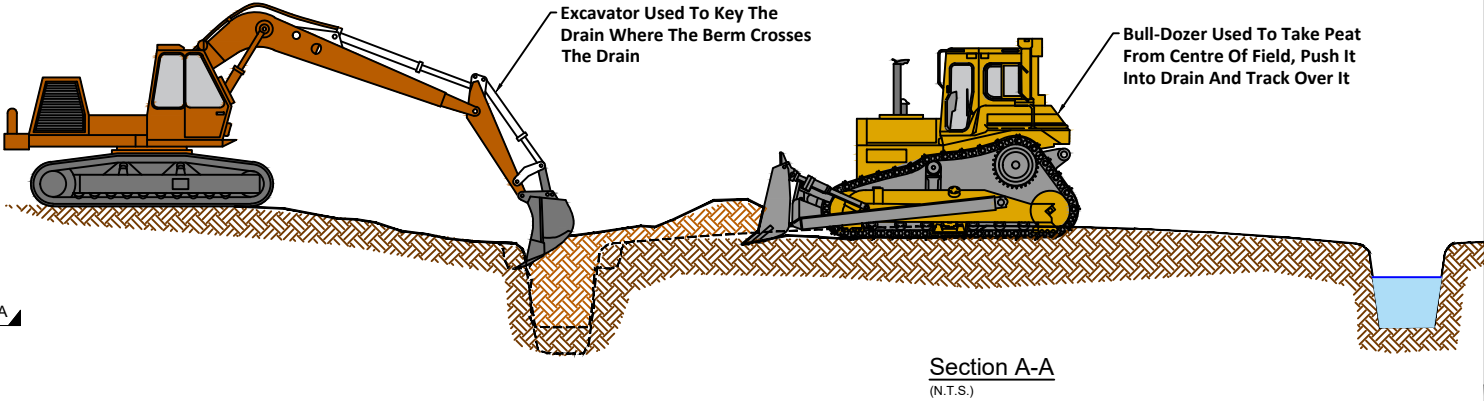
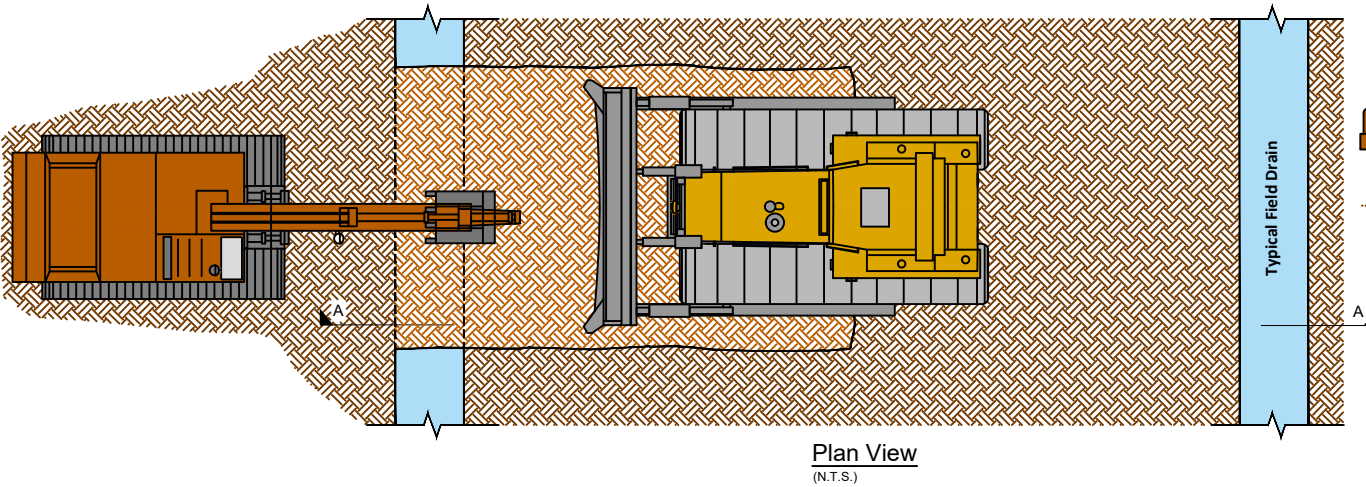
Typical existing bare peat fields are cambered (higher) in the centre and lower towards the drains, helping drainage of the fields but limiting the re-wetting of the central area. The concept of Cross berms is to slow the water movement through the bog.



- NOTES:**
- FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
 - 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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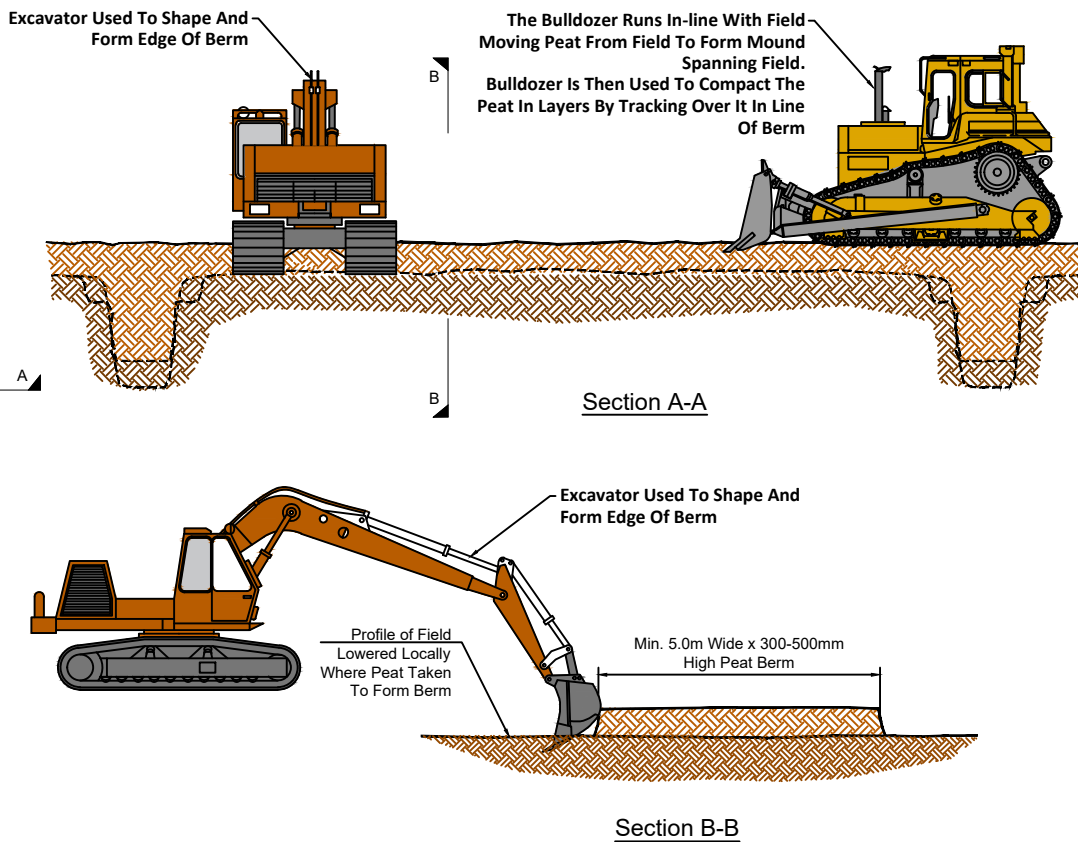
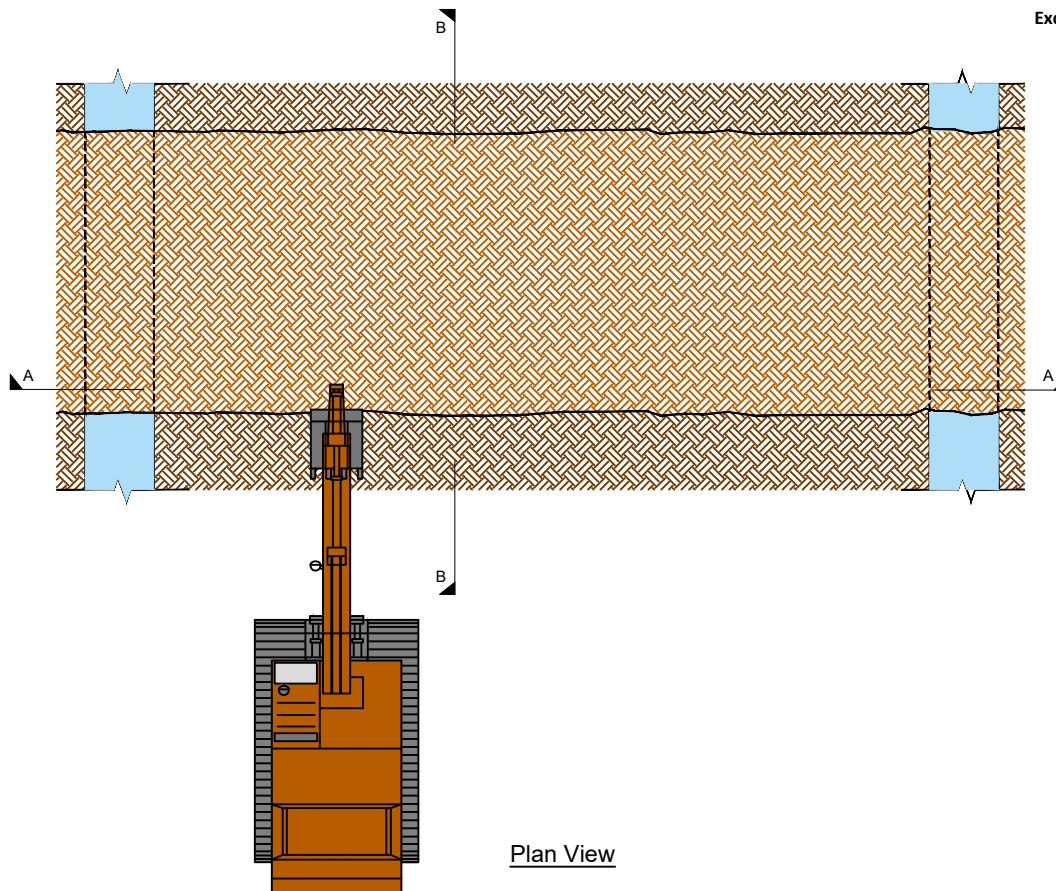
Phase 1 Forming Peat Berm

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 the bull-dozer tracking over the drain block.



Phase 2 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 a minimum 5m Wide x 300-500mm High Cross Berm. The peat material in the berm is compacted in layers by the dozer tracking over it. The excavator bucket is used to form and shape the edges of the compacted berm.



STATUS			
c	Berm Dimensions And Details Revised	P.K.	11/03/21
b	Berm Height Increased And Trench Detail Added	P.K.	25/02/21
a	Issued For Information	P.K.	29/01/21
Rev	Description	Issued By	Date

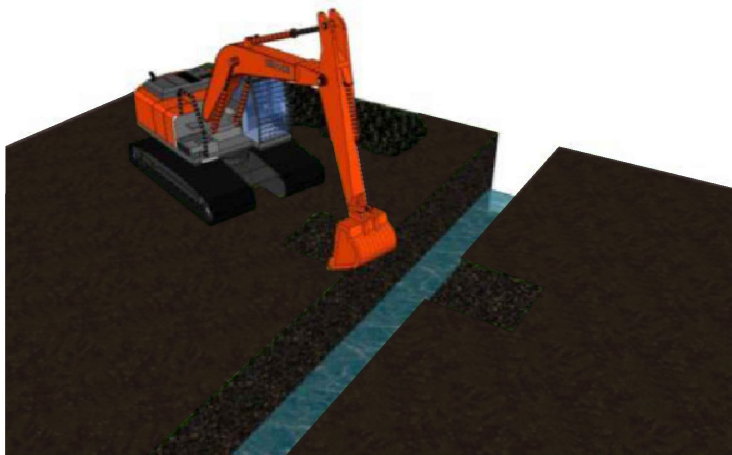
BORD NA MÓNA
Naturally Driven
Bord Na Móna Engineering Department
LEABEG, TULLAMORE CO. OFFALY
Tel. 057 9345900
Fax. 057 9345160

PROJECT:
Peatland Climate Action Scheme
PCAS

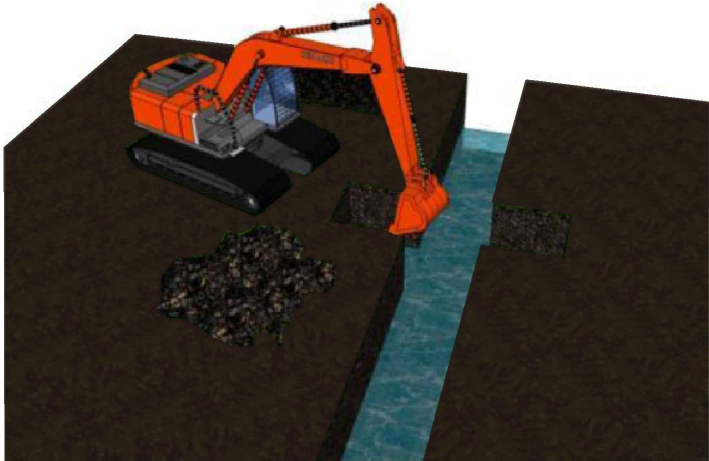
TITLE:
Rehabilitation Method WLT 3
Peat Berm

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: Information
Drawing No.: PCAS-0100-010				Rev: c

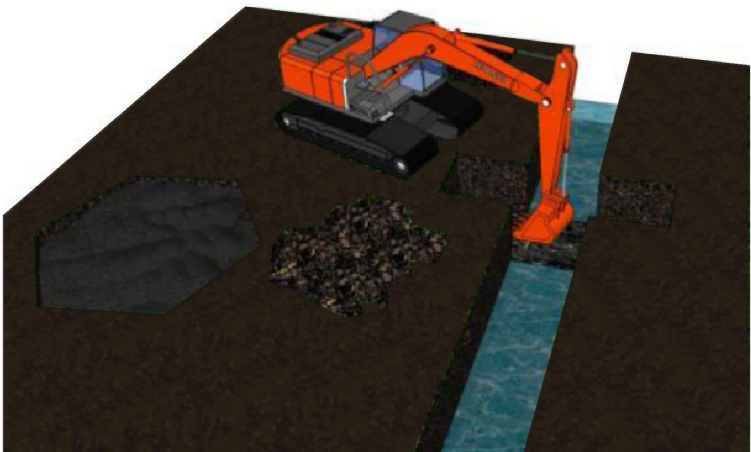
1. Before building of drain blocks, the sides and bottom of the ditch is cleaned using the excavator to remove dry degraded peat, to ensure a good peat-to-peat contact.
(If any vegetation present, it should be carefully removed and left aside for replacement at the end of the process.)



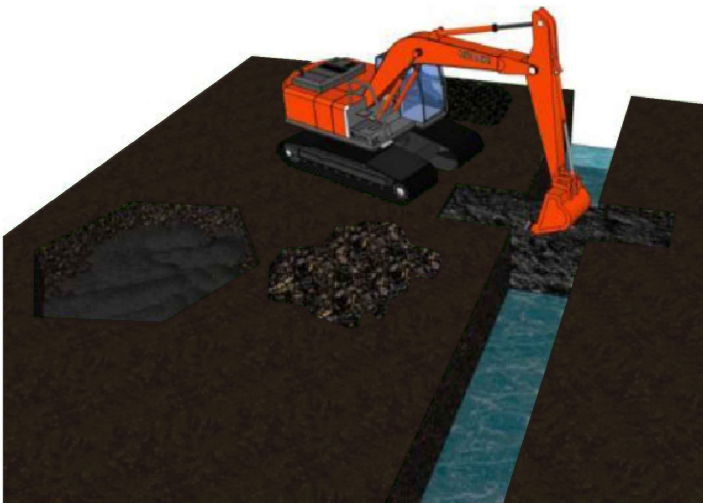
2. Cut key in either side of the drain approximately 500mm deep, and ensure that it is wider than the actual drain. Remove 500mm of peat from bottom of the drain also and place behind the machine for replacement later.



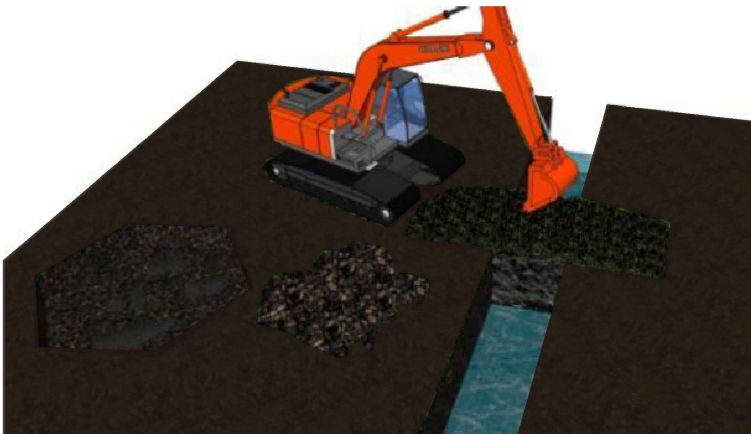
3. Open an area behind machine to be used as a borrow pit. Avoid using the surface layer of peat (top 100-200mm) which is likely to be very permeable. Only use the deeper, more compacted peat to build the drain block.
(If any vegetation present, it should be carefully removed and left aside for replacement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



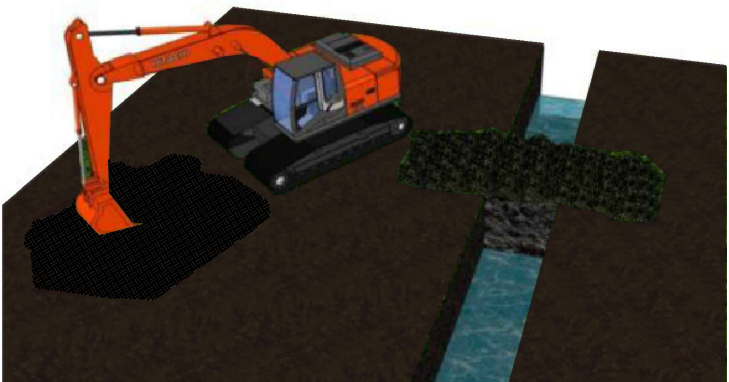
4. Dig out peat from the borrow pit and place into the drain compacting in 300mm layers. Compact the peat firmly using the excavator bucket before laying more peat from the borrow pit.



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 drain block, 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.		PROJECT: Peatland Climate Action Scheme PCAS	
BORD NA MÓNA Naturally Driven Bord Na Móna Engineering Department LEABEG, TULLAMORE CO. OFFALY Tel. 057 9345900 Fax. 057 9345160		TITLE: Rehabilitation Method WLT 4 Peat Drain Blocking	
STATUS b For Approval P.K. 25/02/21 a Issued for Information P.K. 29/01/21 Rev Description Issued By Date		Drawn By: CAD Designer P.K. Date: 13/01/21 Drawing No.: PCAS-0100-011	
Checked By: Discip. Lead D.K. Scale: N.T.S.		Approved: Design Lead P.N. Stage: For Approval Rev: b	

1. Before building of drain blocks, 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. Any vegetation should be carefully removed and left aside for replacement at the end of the process.



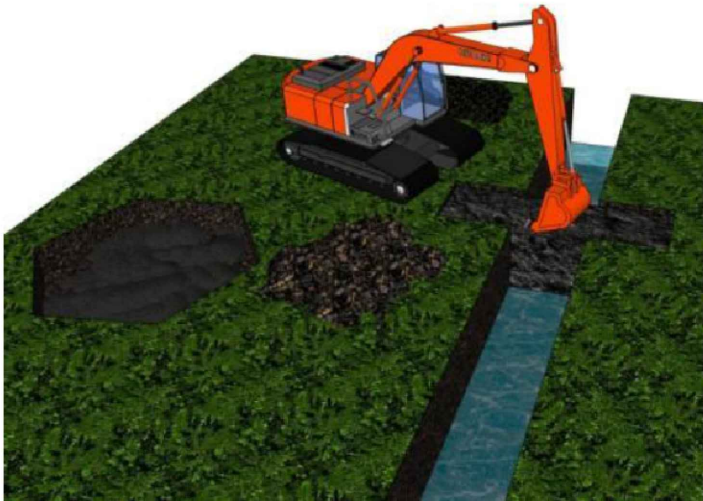
2. Cut key in either side of the drain approximately 500mm deep, and ensure that it is wider than the actual drain. Remove 500mm of peat from bottom of the drain also and place behind the machine for replacement later.



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. Any vegetation should be carefully removed and left aside for replacement at the end of the process.



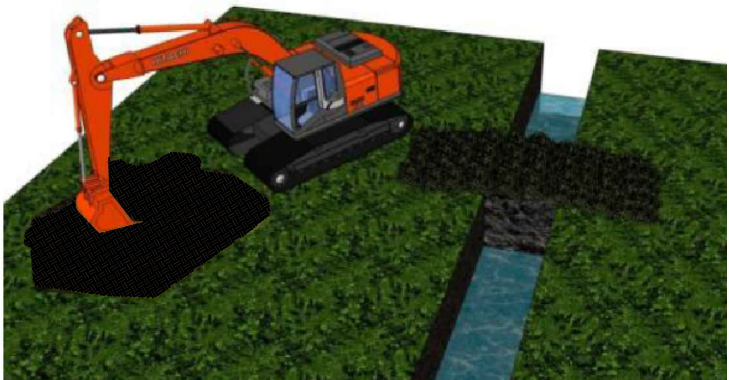
4. Dig out peat from the borrow pit and place into the drain compacting in 300mm layers. Compact the peat firmly using the excavator bucket before laying more peat from the borrow pit.



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 drain block, 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 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.

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BORD NA MÓNA

Naturally Driven

Bord Na Móna Engineering Department

LEABEG, TULLAMORE CO. OFFALY

Tel. 057 9345900

Fax. 057 9345160

STATUS

b	For Approval	P.K.	25/02/21
a	Issued for Information	P.K.	29/01/21
Rev	Description	Issued By	Date

PROJECT:

Peatland Climate Action Scheme
PCAS

TITLE:

Rehabilitation Method MLT 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: 28/01/21 Scale: N.T.S. A3 Stage: For Approval

Drawing No.: PCAS-0100-013 Rev: b

Appendix E Engineering and Rehabilitation Design Specification



PCAS Project

Ummeras Bog Rehabilitation Measures

Engineering and Rehabilitation Design Specification



DOCUMENT CONTROL SHEET

Client	Bord na Móna					
Project Title	Ummeras Bog Rehabilitation Measures					
Document Title	Engineering and Rehabilitation Design Specification					
Document No.	PCAS-0-UM-01-SP01					
This Document Comprises	DCS	TOC	Text	No. of Tables	No. of Figures	No. of Appendices
	1	1	34	1	11	2

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
0	TE	PK / LH /GD	DK	PN	BnM CIVIL ENG DEPARTMENT	12/03/2021

Contents

1. INTRODUCTION.....	5
2. SITE LOCATION	5
3. SCOPE OF WORKS	6
4. PROPOSED REHABILITATION MEASURES.....	7
4.1. REHABILITATION MEASURES PROPOSED AT UMMERAS BOG	9
4.1.1. DPT1 – Speed Bump Peat Drain Block.....	9
4.1.2. DPT2- Peat Drain Blocks.....	9
4.1.3. DPT4 - 45m x 60m Cell with Berms - Drain Blocks	10
4.1.4. DPT5 – 30m x 30m Cell with Berms with Drain Blocks.....	12
4.1.5. DCT1- Blocking outfalls and managing water levels with overflow pipes.....	12
4.1.6. DCT2 – Regular Drain blocking	12
4.1.7. WLT1– Designated Wetland Areas	12
4.1.8. WLT3 – Designated Wetland Areas	13
4.1.9. WLT4 – Peat Drain Block.....	13
4.1.10. MLT1 – Marginal Lands	14
4.1.11. Sphagnum Inoculation	14
4.1.12. Fertiliser application	15
5. METHODS OF SITE CONSTRUCTION (ELEMENTS OF VARIOUS REHABILITATION MEASURES)	15
5.1. PEAT DRAIN BLOCK	15
5.2. ‘SPEED-BUMP’ DRAIN BLOCK.....	18
5.3. BERM (300-500MM HIGH).....	20
5.4. SCREW LEVELLING/IN-FILLING OF PRODUCTION FIELD DRAINS	23
5.5. MODIFYING OUTFALLS AND CONTROLLING WATER LEVELS	25
5.5.1. ‘V’ Tap Across High Field to Control Water Levels	25
5.5.2. Blocking of Outfall.....	26
5.5.3. Raise Piped Culverts to control water levels	28
5.6. POST-REHABILITATION BOG DRAINAGE TO EXTERNAL NETWORK.....	29
5.6.1. DPT4 & DPT5 Cell drainage to external network	29
5.6.2. Rehabilitation measures Drainage to external network	31
6. SETTING OUT AND ARCHAEOLOGY BUFFER ZONES	32

6.1. SETTING OUT LOCATIONS OF REHABILITATION MEASURES 32

6.1.1. Archaeology Buffer Zone..... 33

6.1.2. Ecological Restriction Zone 33

7. EMERGENCY RESPONSE PLAN33

APPENDICES

1. Introduction

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within Kilberry Bog Group under IPC Licence (Ref. P0506-01). As part of Condition 10.2 of this licence, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area.

This document – *Ummeras Bog Engineering and Rehabilitation Design Specification* – should be read in association with both the *Ummeras Bog Site Characterisation and Monitoring 2021* and the *Ummeras Drainage Management Plan 2021*. These three reports should be read in association with **Ummeras Cutaway Bog Decommissioning and Rehabilitation Plan 2021**, which addresses **all** of the requirements of Condition 10.2 of IPC Licence Ref. P0506-01.

The – *Ummeras Bog Rehabilitation Measures Engineering and Rehabilitation Design Specification* – specifically focuses on the design specification of the peatland rehabilitation measures proposed for Ummeras Bog and includes the following:

- Description of the proposed rehabilitation measures.
- Identification of the location of the proposed rehabilitation measure.
- Description of the site-specific parameters that resulted in the selection of the proposed rehabilitation measures.
- Description of the method of implementation for each rehabilitation measure.
- Assessment of the likelihood of failure for each rehabilitation measure
- Description of the method of setting out and verification of completion of rehabilitation measures.
- An Emergency Response Plan is outlined in the event of failure of a rehabilitation element.

2. Site Location

Ummeras Bog is located approximately 2.5km south-west of Rathangan, 3km north of Mónasterevin and c.4.5km south-west of Rathangan. It straddles the border between Co. Offaly to the north and Co. Kildare to the south. The surrounding landscape is dominated by farmland, largely consisting of improved grassland. There is some conifer plantation on older cutover bog and other peatlands in the local area. The Grand Canal is located to the east of the site. The Slate River flows to the north of the site and meets the Figile, where it then flows south to the west of Ummeras Bog to meet the Barrow.

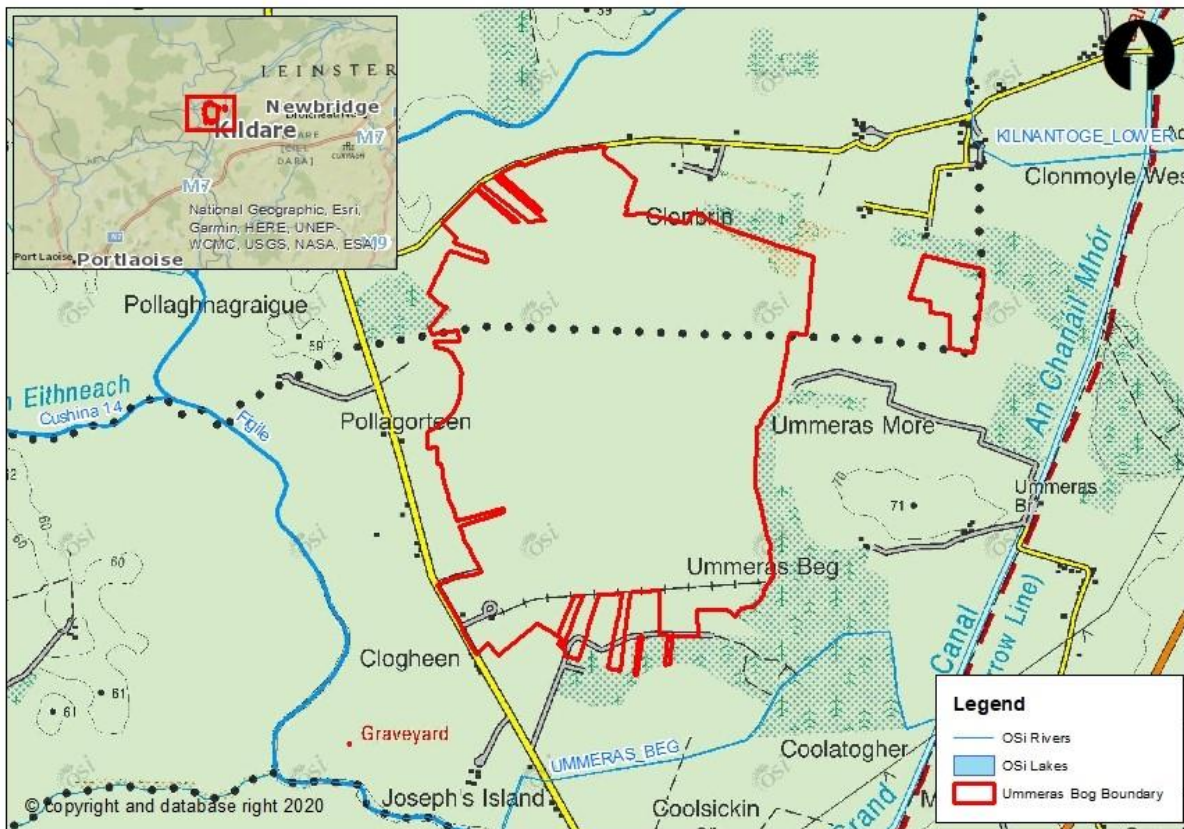


Figure 2.1 Ummeras Location Map

3. Scope of Works

The area of proposed rehabilitation measures for Ummeras Bog is approximately 283.7a. The rehabilitation measures can be summarised as follows:

- Provision of peat drain blocks within existing drains.
- Provision of berms.
- Field re-profiling.
- Provision of re-profiled field cells.
- Provision of control measures.
- Modifying outfalls.
- Managing water levels.

Pertinent rehabilitation methods are detailed in the following drawings, also provided as part of the PCAS package:

- PCAS-0100-001 Rehab Method DPT 1 – Speed Bump Peat Drain Block

- PCAS-0100-002 Rehab Method DPT 2 – Peat Drain Block
- PCAS-0100-006 Rehab Method DPT 4 – 45m x 60m Cell with Berms
- PCAS-0100-007 Rehab Method DPT 5 – 30m x 30m Cell with Berms
- PCAS-0100-008 Rehab Method DCT 2 – Speed Bump Peat Drain Block
- PCAS-0100-010 Rehab Method WLT3 – 300 to 500mm high Berm
- PCAS-0100-011 Rehab Method WLT4 – Peat Drain Block
- PCAS-0100-014 Rehab Method – Modifying Outfalls - Managing Water Levels

4. Proposed Rehabilitation Measures

The location of the Proposed rehabilitation measures within Ummeras Bog are identified in Figure 4.1 below. A description of each rehabilitation measure and the target area within Ummeras bog is outlined in Table 4.1

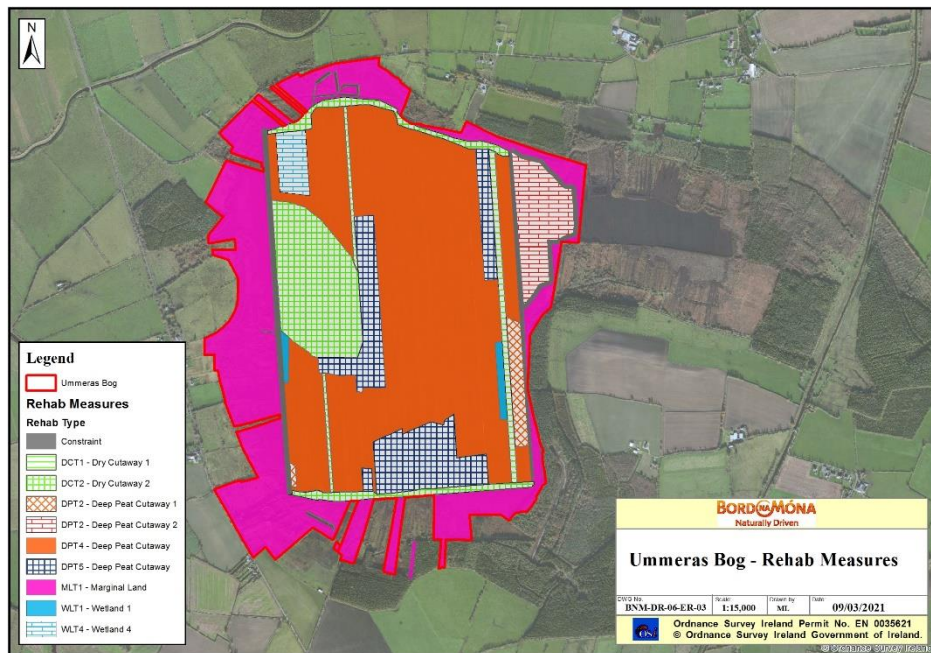


Figure 4.1 Proposed Enhanced Rehabilitation Plan for Ummeras Bog

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	4.0
	DPT2	More intensive drain blocking (max 7/100 m) + blocking outfalls and managing overflows	11.4
	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	120.8
	DPT5	Cut and Fill cell bunding (30m x 30m cell) + blocking outfalls and managing overflows + drainage channels for excess water + Sphagnum inoculation	26.6
Dry cutaway	DCT1	Blocking outfalls and managing water levels with overflow pipes	6.4
	DCT2	Regular drain blocking (3/100 m) + blocking outfalls and managing water levels with overflow pipes + targeted fertiliser treatment	28.7
	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	1.8
	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	1.1
	WLT4	More intensive drain blocking (max 7/100 m), + blocking outfalls and managing overflows + transplanting Reeds and other rhizomes	4.0
	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	79.0
	MLT2	More intensive drain blocking (max 7/100 m)	
	MLT3	More intensive drain blocking (max 7/100 m) + blocking outfalls and managing overflows with + boundary berm	
Other		Silt-ponds	
		Constraints	8.7
		Archaeology constraints	
		Riparian	
Total			292.5

Table 4.1 Rehabilitation measures and the proposed target area for Ummeras bog

The rehabilitation measures have been selected based on a number of site-specific measures below and the basis for the selection of the main rehabilitation types is outlined in the *Ummeras Site Categorisation and Monitoring 2021 Report*.

- Bog type, and peat depth;
- Drainage type, gravity or pumped;
- Hydrological and Topographical modelling;
- Type of surface (vegetated or not);
- Slope/topography;
- Hydrology and piezometer baseline data (where available).

The above criteria feeds into a rehabilitation decision matrix contained in Appendix A which provides a general basis for selecting a particular rehabilitation measure on a specific bog, in combination with site specific issues outlined in the *Ummeras Site Categorisation and Monitoring 2021 Report*, Table 4.1 outlines the particular rehabilitation measures for Ummeras Bog with a detailed description below.

4.1. Rehabilitation measures proposed at Ummeras Bog

The following are the proposed rehabilitation measures at Ummeras Bog outlining the process in general and the key criteria necessary to apply the measures to particular areas of the bog

4.1.1. DPT1 – Speed Bump Peat Drain Block

DPT1- Regular drain blocking (3/100 m) - blocking outfalls and managing water levels with overflow pipes are the elements within the DPT1 rehabilitation measure which are elaborated upon within Chapter 5

- This measure is proposed where the peat depth is generally in excess of 2 metres and the topography is relatively flat.
- DPT1 is adopted in sections of Ummeras bog as per Figure 4.1 The key criteria used to adopt the DPT1 approach in these areas is a deep peat profile in excess of 2 metres along with a relatively level topography.

4.1.2. DPT2- Peat Drain Blocks

DPT2 - More intensive drain blocking (Up to 7 drain blocks per 100 m), blocking of outfalls and managing overflows are the elements within the DPT2 rehabilitation measure which are elaborated upon within Chapter 5.

- DPT2- This measure is proposed where the peat depth is generally in excess of 2 metres and the topography is relatively flat and is considered an appropriate measure to align with bog best practice restoration.
- DPT2 is adopted within Ummeras bog as per Figure 4.1 The key criteria used to adopt the DPT2 approach in Ummeras bog is the presence of a deep peat profile in excess of 2 metres along with a relatively level topography. It is also considered that the DPT2 measure will not significantly alter the topography of the sub-catchments that they are located within.

4.1.3. DPT4 - 45m x 60m Cell with Berms - Drain Blocks

DPT4- Berms and field re-profiling (45m x 60m cell), blocking outfalls, managing overflows and drainage channels for excess water and *Sphagnum* inoculation are the elements within the DPT4 rehabilitation measure which are elaborated upon within Chapter 5.

The creation of cells will help retain shallow surface water, keeping peat wet while further slowing water movement through the bog.

The centre of the cambered field is used as one side of the cell. 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.

- DPT4 is adopted in sections of Ummeras bog as per Figure 4.1. The key criteria used to adopt the DPT4 approach is a deep peat profile generally in excess of 2 metres and areas that have gentle slopes that require bunding to maintain optimum hydrological conditions.
- **DPT4 A** is an alternative means of achieving a similar outcome to DPT4 and although DPT4A has been implemented and planned for other areas of Ummeras bog, there is a potential to substitute DP4A for DP4 in other areas. The DPT4A methodology is detailed in section 4.3 below. Rehabilitation Method DPT 4A Field Re-profiling with Cells and Berms.

DPT4A- Drain blocking at pre-determined intervals, field reprofiling, filling in of drains, Cross berms, blocking outfalls and managing overflows are the elements within the DPT4A rehabilitation measure which are elaborated upon within Chapter 5.

As part of the ongoing rehabilitation measures trials at Ummeras Bog, a variation to DPT4 evolved. This option of using a screw leveller as well as a dozer to re profile the production fields was identified during the trials. The screw levelling apparatus that was originally used to provide the convex camber on the field when peat harvesting was taking place is inverted which allows the screw leveller to now create a concave camber to the production field and thus reducing significantly the number of passes by the bulldozer to create the desired profile. In addition, the bulldozer places the loose peat within the drains removing their original function and increasing the area to be rehabilitated. The provision of the drain blocks and cross berms are still necessary to ensure there are no preferential flow paths through the drains path. The cross berms which run between high fields control wave action and sheet flow and depending on the intervals between the high fields,

longitudinal berms can also be provided to create cells, this approach is seen as a viable alternative to DPT4 Cells due to the following points:

- Simpler construction process to DPT4;
- Broader range of time in which it is expected to be able to carry out the measure (not as sensitive to bad weather as DPT4);
- Equal to or better rehabilitation impacts expected compared to DPT4;
- Increase in extent of re-wetted peat and target water-levels;
- Improvement in health and safety as drains are infilled;
- Potential for improved operator productivity.

The following phases outline the processes of DPT4A which has the capacity replace DPT4 measures in areas of Ummeras Bog, further detail in relation to the measures below are outlined in Section 5.

Phase 1: Re-Profiling of Field Surface

The first operation in the re-profiling process begins with using a Screw-Leveller to remove the high central camber from individual production fields and deposit the peat on the lower-lying edges of the same production field.

Phase 2: Infilling of Drains

Next the Bull-dozer will run up one side of the production field and down the other side with the front blade at an angle placing the peat in the drain.

Phase 3: Final Levelling of Drains & Field

The Bull-dozer will track over the first of the infilled drains and then back down the other drain compacting and levelling the peat. It will also make a pass down the middle of field flattening any peat mounds left between Screw Leveller and Bulldozer runs.

Phase 4: Drain Blocking

Drain blocks are constructed using an Excavator operating at a perpendicular direction to the field drains. Key drain blocks will be located downstream of the measures prior to infilling of the drains to ensure no release of silt occurs during the activities.

Phase 5: Cross berms

Cross berms will be placed at regular centres essentially creating large cells across the production fields which will control unfavourable wave action and sheet flow where the measure is located in level areas.

4.1.4. **DPT5 – 30m x 30m Cell with Berms with Drain Blocks**

DPT5 Cut and Fill cell bunding (30m x 30m cell), blocking outfalls and managing overflows, drainage channels for excess water, *Sphagnum* inoculation are the elements within the DPT5 rehabilitation measure which are elaborated upon within Chapter 5.

The creation of cells will help retain surface water, keeping peat wet further slowing water movement through the bog.

- DPT5 is adopted in sections of Ummeras bog as per Figure 4.1. The key criteria used to adopt the DPT4 approach in these areas is a deep peat profile generally in excess of 2 metres and areas that have gentle slopes that require bunding to maintain optimum hydrological conditions.
- DPT5 is adopted rather than DPT4 within areas where it is positioned higher along the hydrology gradient and in areas where it is anticipated to be slightly more difficult to wet.

4.1.5. **DCT1- Blocking outfalls and managing water levels with overflow pipes**

Blocking outfalls and managing water levels with overflow pipes

DCT1- Blocking outfalls and managing water levels with overflow pipes

- DCT1 is adopted in sections of Ummeras bog as per Figure 4.1. The key criteria used to adopt the DCT1 approach in these areas is a dry cutaway condition.

4.1.6. **DCT2 – Regular Drain blocking**

DCT2- Regular drain blocking (3/100 m) blocking outfalls and managing water levels with overflow pipes and targeted fertiliser treatment

- DCT2 is adopted in sections of Ummeras bog as per Figure 4.1. The key criteria used to adopt the DCT2 approach in these areas is a dry cutaway condition.

4.1.7. **WLT1– Designated Wetland Areas**

WLT1- Turn off or reduce pumping to re-wet cutaway, blocking of outfalls and managing water levels with overflow pipes, are the elements within the WLT1 rehabilitation measures which are elaborated upon within Chapter 5.

Areas prone to seasonal winter inundation are designated for wetland creation. Standing water will be allowed to occur resulting in increased water storage. Areas of Ummeras as shown as WLT1 in Figure 4.1 match this criterion.

- WLT1 is adopted in sections of Ummeras bog as per Figure 4.1, The key criteria used to adopt the WLT1 Areas that are likely to develop into wetlands which can largely be determined from a combination of LIDAR images, supplemented by flood mapping and surveys of levels (with the latter referencing existing water levels such as silt ponds or other outfalls from the site). Wetland cutaway has 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. Optimal peatland rehabilitation seeks to maintain a water table just above the ground level (circa. 100mm \pm 50mm) during the summer.

4.1.8. WLT3 – Designated Wetland Areas

WLT3- Turn off or reduce pumping to re-wet cutaway, blocking of outfalls and managing water levels with overflow pipes, Targeted blocking of outfalls within a site, provision of larger berms to re-wet cutaway and transplanting Reeds and other rhizomes are the elements within the WLT3 rehabilitation measures which are elaborated upon within Chapter 5.

Areas prone to seasonal winter inundation are designated for wetland creation. Standing water will be allowed to occur resulting in increased water storage. Areas of Ummeras as shown as WLT3 in Figure 4.1 match this criteria.

- WLT3 is adopted in sections of Ummeras bog as per Figure 4.1, The key criteria used to adopt the WLT3 Areas that are likely to develop into wetlands can largely be determined from a combination of LIDAR images, supplemented by flood mapping and surveys of levels (with the latter referencing existing water levels such as silt ponds or other outfalls from the site). Wetland cutaway has 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. Optimal peatland rehabilitation seeks to maintain a water table just above the ground level (circa. 100mm \pm 50mm) during the summer.

4.1.9. WLT4 – Peat Drain Block

WLT4 More intensive drain blocking (Up to 7 drain blocks per 100 m), blocking outfalls and managing overflows and transplanting Reeds and other rhizomes are the elements within the WLT4 rehabilitation measure which are elaborated upon within Chapter 5.

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

This method is similar as that described under Deep Peat methodologies as Dry Cutaway methodology 'DCT3', but is provided in areas more prone to flooding

- WLT4 is adopted in sections of Ummeras bog as per Figure 4.1. The key criteria to adopt the WLT4 approach includes areas that are subject to seasonal winter inundation but generally dry out during the summer with the drainage in place. The objective of the measures to eliminate the drainage functionality and to maintain summer water levels close to the ground surface. Areas that are likely to develop into wetlands in a similar manner to that outlined in WLT4.

4.1.10. **MLT1 – Marginal Lands**

Lands around the margin of the former peat production area

Marginal lands are defined as those areas (generally around the margins but can also be located on islands within sites) where industrial peat production has not taken place. These can be identified from habitat maps coupled with aerial images of the sites.

The habitat present on these sites can vary substantially, from near-intact raised bog remnants to cutover bog associated with domestic turf-cutting and the varied habitats such activities create (potentially including grasslands, wetlands and woodlands, as well as dry heath or peatland habitats).

It will be dependent upon the habitats and management objectives for the bog as a whole and in particular, adjacent areas of peatland where rehabilitation is being undertaken.

No rehabilitation measures are proposed in the MLT1 areas.

4.1.11. **Sphagnum Inoculation**

The main objective of *Sphagnum* inoculation 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.

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 and this can be scattered by hand or planted into the peat substrate. The use of significant volumes of *Sphagnum* donor material is constrained by the small amount of suitable donor material and donor sites. It is therefore proposed to use *Sphagnum* donor material developed in greenhouses (e.g. Beadaplugs), where suitable donor material can be made available. These *Sphagnum* plugs will then be planted into each cell (c. 1-5m² is suggested per cell for planting plugs).

4.1.12. Fertiliser application

In some instances, cutaway bog areas are very slow to colonise naturally. Areas where vegetation is slower to naturally colonise tend to be drier areas such as headlands and high fields that dry out in the summer.

It is proposed to use fertiliser to help accelerate natural colonisation on headlands (the area around the edges of the production bogs) and on high fields (former stockpile fields). Both areas are prone to drying in the summer, inhibiting vegetation establishment and growth. This enhanced measure will be combined with other measures to optimize ecosystem service benefits. Fertiliser will be applied during the August-September period to encourage seedling establishment towards the end of the growing season. Seedlings that establish in the spring tend to suffer greater rates of mortality as the peat dries out in the summer and this factor is significantly reduced in the later summer-autumn period.

Where applied, it is proposed to use a slow-release, Phosphorous-rich fertiliser (such as Rock Phosphate) to accelerate natural colonisation and the development of pioneer vegetation cover. Low application rates (aligned to 50% of the recommended rate provided by the Forest Service Guidelines for fertilisation of forestry on peat) will be used. Furthermore, due to Bord na Móna's organic certification status on its landholding, any fertilisers applied will need to conform to these standards.

5. Methods of Site Construction (Elements of various rehabilitation measures)

This Section covers the design and construction approach to the elements which make up the enhanced rehabilitation measures described in section 4 above which includes site clearance; peat drain blocking, berm construction, field re-profiling, provision of re-profiled field cells and managing water levels where required.

5.1. Peat Drain block

Basis for design:

Peat drain blocking is a common proven rehabilitation measure on many bogs in Ireland, resulting in a successful re-wetting of peat through the reduction of water flowing off the bog. This measure is used in the DPT2 and the WLT4 rehabilitation methodologies.

Description of process:

Drain blocks are formed using a tracked excavator operating at a perpendicular direction to the field drains. The method used follows the approach outlined by McDonagh (1996) in accordance with the **Best Practise in Raised Bog Rehabilitation in Ireland (2017)**.

- A key is cut in the drain approximately 500mm deep ensuring that it is wider than the actual drain. A 500mm depth of peat is removed from bottom of drain also and placed behind the

machine for replacement later. (If any vegetation present, it is 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.)

- An area behind the machine, within reach of the excavator arm, is used as a borrow pit. Degraded peat is removed from the surface. This material is placed close by to be used as cover later.
- 'Clay' like peat is extracted from pit and compacted in 300mm layers using the excavator bucket, to form the drain block. 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 then back filled with the peat extracted from the bottom of the drain. The sides of the borrow pit are pressed down and graded with the excavator bucket.

Risks identified:

- Erosion of the drain block particularly in steeply sloping sections.
- Failure of drain block resulting in localised negative impact on rehabilitation measure (excessive ponding etc.).
- Failure of drain block resulting in localised escape of silt/sediment.
- Failure of drain block resulting in localised increase in hydrostatic pressures to adjacent drain blocks.
- Failure of drain block resulting in localised increase in hydrostatic pressure to berms enclosing different rehabilitation measure types.
- Failure of drain block resulting in an increase in water flow to hydraulic breaks protecting adjoining lands.
- **Mitigation through design:**
 - The selection of an appropriate drain block spacing.
 - Drain blocks are formed at a minimum of 300mm higher than the adjacent ground level and are relatively wide to create a relatively strong structure out of peat that will mitigate water flow eroding the drain block construction.
 - The provision of a key in the drain coupled with the compaction of peat in layers (max depth 300mm), ensures a tight seal is maintained and a strong structure is developed to mitigate the formation of preferential flow paths around the edges of the drain block. Design follows best practise.

- Operators assigned to this work element are familiar with the technique and process and provide effective robust drain blocks. The operators are experienced and capable of adapting to the particular conditions encountered within the bog.
- Qualified, experienced Engineers overseeing the works during the installation phase ensure that quality procedures of the various elements are implemented and effectively meet the standards for quality service and performance.
- **Mitigation through maintenance and avoidance:**
 - Ongoing monitoring of completed peat drain blocks in the weeks after formation will ensure they have consolidated.
 - The risk associated with peat drain block failure from an environmental and rehabilitation measures impact is generally categorised as low as a peat drain block failure will result in an impact that is localised and silt control measures are provided upstream of all discharge points. There is an allowance for a reactive approach to remediation measures where required.
 - A post rehabilitation Lidar and imagery survey will take place which will capture any areas where failures occurred resulting in remediation measures in a particular area if required. The Lidar survey will be implemented when the rehabilitation measures have been in place for a reasonable period of time allowing areas of weakness or potential concern to become apparent.
 - In the event of a peat drain block failure, the adjacent peat drain blocks will generally have sufficient capacity to accommodate any additional hydrostatic pressures generated ensuring the negative impact is localised.
 - If, after heavy rainfall, significant water flows in the drains cause localised drain block failure, the regular and frequent placing of drain blocks along the drain further downstream will mitigate the impact to the immediate area.
 - Peat drain blocks are designed to retain water on the cutover resulting in a reduction in discharge into the boundary drains, preventing any negative impacts on adjacent agricultural land. (See chapter 7 below 'Emergency Failure Response' outlining mitigation measures to be put in place should any risks of unexpected hydrological impacts occur).



Figure 5.1.1 Peat drain block trials at Castlegar bog

5.2. 'Speed-Bump' Drain Block

Basis for design:

Peat drain blocking is a common proven rehabilitation measure on many bogs in Ireland, resulting in a successful re-wetting of peat through the reduction of water flowing off the bog. This measure is particularly effective for bare peat areas that are not prone to flooding and is used in the DPT1 and the DCT2 rehabilitation methodologies.

Description of process:

- Drain blocks are formed using a bulldozer operating at a perpendicular direction to the field drains. First a key is cut from both edges of the drain using the bulldozer, approximately 500mm deep ensuring that it is wider than the actual drain.
- 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'.
- Fields are then completed with Speed Bumps (at an approximate ratio of 3 Per 100m). Speed bumps are profiled to ensure that the overall field profile is lower in the centre and higher over the drain blocks. The drain block is built up and compacted by the bull-dozer tracking over it to at least 300-500mm above the ground level of the bog, to allow for subsequent shrinkage of the peat as it dries.

Risks identified:

- Erosion of the drain block particularly in steeply sloping sections.
- Failure of drain block resulting in localised negative impact on rehabilitation measure (excessive ponding etc.).

- Failure of drain block resulting in localised escape of silt/sediment.
- Failure of drain block resulting in localised increase in hydrostatic pressures to adjacent drain blocks.
- Failure of drain block resulting in localised increase in hydrostatic pressure to berms enclosing different rehabilitation measure types.
- Failure of drain block resulting in an increase in water flow to hydraulic breaks protecting adjoining lands.
- **Mitigation through design:**
 - The selection of an appropriate drain block spacing.
 - Drain blocks are formed at a minimum of 300mm higher than the adjacent ground level and are relatively wide to create a relatively strong structure out of peat that will mitigate water flow eroding the drain block construction.
 - The provision of a key in the drain ensures a tight seal is maintained and a strong structure is developed to mitigate the formation of preferential flow paths around the edges of the drain block.
 - Operators assigned to this work element are familiar with the technique and process and provide effective robust drain blocks. The operators are experienced and capable of adapting to the particular conditions encountered within the bog.
 - Qualified, experienced Engineers overseeing the works during the installation phase ensure that quality procedures of the various elements are implemented and effectively meet the standards for quality service and performance.
- **Mitigation through maintenance and avoidance:**
 - Ongoing monitoring of completed peat drain blocks in the weeks after formation will ensure they have consolidated.
 - The risk associated with peat drain block failure from an environmental and rehabilitation measures impact is generally categorised as low as a peat drain block failure will result in an impact that is localised and silt control measures are provided upstream of all discharge points. There is an allowance for a reactive approach to remediation measures where required.
 - A post rehabilitation Lidar and imagery survey will take place which will capture any areas where failures occurred resulting in remediation measures in a particular area if required. The Lidar survey will be implemented when the rehabilitation measures have been in place for a reasonable period of time allowing areas of weakness or potential concern to become apparent.

- In the event of a peat drain block failure, the adjacent peat drain blocks will generally have sufficient capacity to accommodate any additional hydrostatic pressures generated ensuring the negative impact is localised.
- If, after heavy rainfall, significant water flows in the drains cause localised drain block failure, the regular and frequent placing of drain blocks along the drain further downstream will mitigate the impact to the immediate area.
- As peat drain blocks are designed to retain water on the cutover resulting in a reduction in discharge into the boundary drains, preventing any negative impacts on adjacent agricultural land. (See chapter 7 below 'Emergency Failure Response' outlining mitigation measures to be put in place should any risks of unexpected hydrological impacts occur).



Figure 5.2.1 'Speed-Bump' Peat Drain Block at Carrickhill Bog

5.3. Berm (300-500mm high)

Basis for Design:

The concept of cross berms is to optimise the extent of re-wetted peat and target water levels, create enclosed areas of peat with shallow water levels and slow the water movement through the bog. These berms are used in the DPT4, DPT5 and WLT3 methodologies.

The berm design adopts an empirical design approach. It is proposed to apply proven sizes, proportions, materials, and assemblies from existing successful rehabilitation measures and flood defense berm features carried out in the past by Bord na Móna. The proposed berms are relatively shallow, circa 300mm high (minimum) and are constructed across or perpendicular to the fields acting to enclose an area to retain a shallow layer of surface water (circa 100mm).

Description of process:

- A tracked excavator working perpendicular to the drain is used to form a 500mm deep key in the drain edges where the berm crosses.
- A strip of peat 5m in width is taken from the central camber of the field, pushed into the drain, using the bucket of a tracked bulldozer. The peat is compacted by the bull-dozer tracking over the drain block to ensure the peat forms a tight seal in the drain.
- A key is also formed similarly in the drain on the opposite side of the production field at the end of the proposed berm and the drain infilled and compacted as above.
- 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 a minimum 5m Wide x 300 / 500mm high cross berm. Consistency of peat is important, which should be firm enough to be shaped and compacted. The peat berm is compacted using the dozer and when this complete the excavator trims and shapes the completed berm. The berm is circa 5m (minimum) in width.

Risks identified:

- Peat berm failure resulting in localised negative impact on rehabilitation measure (excessive ponding etc.)
- Peat berm failure resulting in localised escape of silt/sediment.
- Increase in hydrostatic pressures to adjacent restoration methods leading to berm failure.
- Increase in hydrostatic pressure to berms enclosing different rehabilitation measure types leading to berm failure.
- Overtopping of berm resulting in an uncontrolled escape of silt/sediment.
- Subsidence of berm.
- **Mitigation through design:**
 - Peat Berms are not proposed for use in areas subject to seasonal winter inundation.
 - It is recognized that consistency of peat is important, in that it should be firm enough to be shaped and compacted.
 - Peat Berms are constructed circa 300mm (min.) higher than the adjacent ground level to create targeted hydrological conditions. The berms are built to a minimum width of 5m to create a low wide strong structure that is capable of maintaining these suitable hydrological conditions.
 - The berm installation process includes a key formation in the drains. A 500mm deep key is formed by taking a strip of peat from the field and pushing it in to the drain where

it is compacted by the bulldozer ensuring a tight seal. The excavator trims and shapes the completed berm.

- The low and robust design of the peat berms means that overflow pipes are not required for all berms and it is expected that in flatter ground, water will overflow over the berms with minimal risk of erosion. Where necessary they will be incorporated to ensure water levels are controlled, do not rise over top of the berm and mitigate against the erosion of the berm while ensuring water level control.
- Operators assigned to this work element are familiar with the technique and process and provide effective robust berms. The operators are experienced and capable of adapting to the particular conditions encountered within the bog.
- Qualified, experienced Engineers overseeing the works during the installation phase ensure that quality procedures of the various elements are implemented and effectively meet the standards for quality service and performance.

- **Mitigation through maintenance and avoidance:**

- Avoidance of berms in areas subject to seasonal winter inundation.
- A post construction lidar and imagery survey will capture the impact of the completed rehabilitation measures indicating if any appropriate remedial action is required or deemed necessary.
- As peat berms are designed to retain a shallow level of water on the cutover there will be no increase in water discharging into the boundary drains preventing any negative impacts on adjacent agricultural land. (See chapter 7 below 'Emergency Failure Response' outlining mitigation measures to be put in place should any risks of undesirable hydrological impacts occur).



Figure 5.3.1 Peat Berm at Castlegar Bog

5.4. Screw levelling/In-filling of Production field drains

Basis for Design:

This concept of field re-profiling is to level the surface of the individual peat production fields to retain surface water at the required depth. From previous Bord na Móna experience and in similar environments in Castlegar bog, the geometry and process as set out above has proven effective by creating a suitable flat profile where water is held at suitable levels by edge berms forming a cell. The basis of empirical design is previous experience. This measure which includes a screw leveller combined with a dozer is used in the DPT4A methodology.

Description of process:

- The first operation in the re-profiling process requires the blocking of the downstream field drains to mitigate silt run-off.
- The Screw-Leveller will remove the high central camber from individual production fields and deposit the peat on the lower-lying edges of the same production field. The Screw-Leveller, with a level axis, will run up the first side of the production field and down the other side close to the edge of the drain, resulting in some of the peat being tipped into the drain.

- Next the Bulldozer will run up the first side of the production field and down the other side with the front blade at an angle placing the peat in the drain.
- The Bulldozer will then track over the first of the infilled drains and then back down the other drain compacting and levelling the peat. It will also make a pass down the middle of field flattening any peat mounds left between Screw Leveller and Bulldozer runs.
- The original channels will be carefully filled in with suitable material as specified on the drawings. The materials shall be compacted in accordance with the requirements on drawings.

Risks identified:

- Uncontrolled escape of silt/sediment into adjacent drains and downstream during rainfall events.
- Excess surface water flow leading to 'Sheet flow' and erosion of silt and emerging vegetation from surface of the bog.
- **Mitigation through design:**
 - Risk of additional silt created by peat disturbance. Field drains upstream and downstream will be blocked to mitigate water flow in the drain minimising silt run-off. (See chapter 7 below 'Emergency Failure Response' outlining mitigation measures to be put in place should any risks of undesirable increased movement of peat occur during construction stage).
 - Peat drain blocks to be provided immediately after field reprofiling to prevent preferential flow paths in infilled drains.
 - Operators assigned to this work element are familiar with the technique and process. The operators are experienced and capable of adapting to the particular conditions encountered within the bog.
 - Qualified, experienced Engineers overseeing the works during the installation phase ensure that quality procedures of the various elements are implemented and effectively meet the standards for quality service and performance.
- **Mitigation through maintenance and avoidance:**
 - A post construction lidar and imagery survey will capture the impact of the completed rehabilitation measures highlighting if any appropriate remedial action is required or deemed necessary.



Figure 5.4.1 Field re-profiling using Screw-Leveller

5.5. Modifying Outfalls and Controlling Water Levels

A description of several techniques in respect of outfall modification and management of water levels follows.

Some, such as blocking of outfalls, are applicable across multiple rehabilitation prescriptions, whilst techniques such as the cutting of 'taps' through high production fields are more applicable to those bogs which are subject to periodic inundation. This inundation may be due to rainfall or flooding or where water needs to be diverted from one part of the bog to another by way of management, or to create wetland areas. Both measures are essential to the management of water levels.

5.5.1. 'V' Tap Across High Field to Control Water Levels

Basis for Design:

This is effectively a method for diverting surface water from one side of a high field to another, to manage the water level in both fields and eventually direct excess surface water towards an outfall.

This approach has been implemented across various Bord na Móna bogs to manage water levels and an example of this is Baunmore Bog in Littleton Bog Group.

Description of process:

- 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.

Risk and Proposed Mitigation Measures:

- The analysis of Lidar maps and topography in conjunction with the Drainage Management Plan will be elemental to targeting the most appropriate locations for the "tap".



Figure 5.5.1.1 'V' Tap across a high field at Baunmore to control water levels

5.5.2. Blocking of Outfall

Basis for Design:

March 2021

The blocking of outfalls drains on the cutaway is a measure that is only carried out in a limited number of circumstances where it is essential to manage hydrology by raising water levels in a particular area and controlling the overflow via a new channel or pipe at an appropriate level.

It is an effective method of controlling water loss from the bog and is proven in its effectiveness in Littleton Bog. This measure is used in the DPT1, DPT2, DPT3A, DPT3B, DPT4A, DPT4, DPT5 and MLT2 rehabilitation methodologies.

Description of process:

- An Excavator is used to form a key on either side of the drain which forms the outfall from the bog or field. A 500mm depth of peat is removed from bottom of drain also and placed behind the machine for replacement later. (If any vegetation present, it is 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.)
- A strip of peat is taken from the centre of the adjacent field, pushed into the drain, and compacted by the bull-dozer tracking over the drain block from the opposite side of the drain to the excavator. For a deep drain the peat will be compacted in layers of 300mm using the bucket of the excavator. The approximate width of the block is 3-5 times the width of the drain.
- The block drain block is built up at least 300mm above the ground level of the bog to allow for subsequent shrinkage of the peat as it dries and it will be wide enough to prevent water moving around the blockage, to prevent further leakage when the block subsides.

Where possible and available, vegetation is used to cover the peat forming the outfall blockage. This measure is strongly linked with the next in respect of water level management.

Risk and Proposed Mitigation Measures:

- Complete filling of drains should require little ongoing maintenance if carried out to a high standard.
- Prior to infilling, any loose or dried out peat in the base or sides of drain should be removed.
- Blocking of outfalls will be planned so that it will be fully completed in one day and will be carried out in suitable weather conditions.
- Adequate compaction of the peat will be ensured.
- Water level management will be considered and an overflow channel or pipe will be constructed at an appropriate level.

Periodic inspections will be conducted to ensure they remain robust and are working effectively.

5.5.3. Raise Piped Culverts to control water levels

Basis for Design:

This measure is particularly effective for cutaway bogs with relatively flat basins where raising of pipes produces water flow at a higher invert level, within specified areas of the pre-existing drainage network. This measure is utilised in methodologies DPT1, DCT2, WLT1, WLT2, WLT3 and WLT4. It may also be used in place of a controlled weir where required for other rehab methodologies.

Description of process:

- The drain shall be temporarily blocked upstream of the existing outfall pipe or diverted if blocking of drain is not feasible. Water will still exit at the designated emission points via the silt ponds.
- A new transverse field drain, and pipe is then placed at a higher specified invert level than the existing outfall.
- The pipe shall be placed and covered in accordance with manufacturers specifications and adequate cover shall be provided to protect the pipe integrity.

Risk and Proposed Mitigation Measures:

- Blocking of the outfalls upstream of existing silt ponds will prevent increased silt run-off. The drain will be temporarily blocked upstream or diverted.
- Works will only be carried out in suitable weather conditions.



Figure 5.5.3.1 Raised water outlet at Cavemount

5.6. Post-Rehabilitation Bog drainage to external network

The following section sets out the drainage paths for the proposed rehabilitation measures at Ummeras Bog to ensure a defined route for water to discharge back to the external network remains post rehabilitation measures.

5.6.1. DPT4 & DPT5 Cell drainage to external network

DPT4 & DPT5 measures make up the majority of the area within Ummeras bog that is undergoing rehabilitation measures. Within these areas of Ummeras bog where The DPT4 & DPT5 cells are located there is a risk of the water levels increasing to excessive depths, particularly in winter months and during large flood events should there not be a defined route for the water to discharge back to the external drainage network.

In Ummeras Bog where catchments flow into the areas that DPT4, or DPT5 measures are proposed, as the contributing catchment area increases through subsequent cells there will be greater potential for the cells downstream to be overtopped, increasing risk of erosion of the bunds and generating excessive water depths. To mitigate against this, it is proposed to interconnect the cells with overflow pipes and direct the water flow towards the outfalls. It will not be necessary in all instances to pipe the cells such as where smaller catchments upstream or no localised depressions exist as infrequent

overtopping of these cells is not considered a significant risk given the robust design of the cells. However, in line with a precautionary approach it is proposed to include overflow pipes in any cells with a minimum contributing catchment area of 2 hectares. This area is taken from previous experience of drainage within Ummeras bog and can be adjusted with the provision of further pipes in the relevant cells to reduce the catchment area if required. Indicative overflow locations are shown in Figure 5.6.2.1 and thus creating a flow path through the cells to the outfalls.

The two hectare area threshold is an initial threshold adopted based on previous experience within Ummeras and other Bord na Móna Bogs. However, this threshold is subject to change from bog to bog depending on a number of factors such as rate of effective rainfall, rate of infiltration etc. However, it is anticipated that the area adopted will enable an assessment of the approach and inform an adjustment of the threshold should it be required.

It should be noted in some instances where catchments are located in depressions and cannot be drained without the use of overflow pipes, then these will also be proposed regardless of whether the cells have a contributing catchment area of <2 hectares or not.

Within the DPT4, DPT4A & DPT5 measures there is an ability to come back on site and install additional pipes to cells and additional taps, where deemed necessary as hydrological conditions begin to stabilise.

As can be seen in Figure 5.6.2.1, DPT4 & Cell drainage it is proposed to have overflow pipes from cell to cell in the direction of flow. The flow paths throughout the site following the rehabilitation measures have been considered based on current and anticipated topography. The cells have been designed to drain towards a specific discharge point or open drain which will extend to the outfall. The overall drainage routes and how they connect into the river channels is shown within Figure 5.6.4.1

These main drainage routes will consist of a series of open drains and culverts through the high fields where required (taps) and will align with existing discharge outfall points. Some minor modifications may be required based on final surface levels across the site to ensure gravity flow can be maintained. Based on the overall catchment size draining to the outfalls in Ummeras Bog it is proposed to tap the high fields with 450mm pipes, which will have an estimated capacity of 0.68 m³/s assuming free flowing and a gradient of 0.05. This is considered conservative in the context of the contributing catchment area and calculated flows for a 1% AEP event. Furthermore, this size of pipe (450mm) is a typical size utilized within BnM bogs to drain similar or greater catchments areas. Any open drains connecting to the taps will have equal to or greater capacity than the 450mm Pipe.

Due to the nature of the measures it is not possible to specify specific levels prior to the rehabilitation measures as the level will depend on amendments to topography through field reprofiling and other measures which will manipulate the ground profile locally. However, an assessment of current and anticipated surface levels along with levels of the current piped outfall indicates that an adequate fall can be achieved (at a higher elevation than the current piped outfall).

Figure 5.6.2.1 Demonstrates the general direction of flow of water through the cells towards the main drainage routes and outfalls.

5.6.2. Rehabilitation Measures - Drainage to external network

The other measures such as DPT 2, DCT1, DCT2, Wetland measures etc. do not alter the topography of the sub-catchment in which they are contained or do not create berms which enclose the measures and therefore it is anticipated that the pre-rehabilitation flow path to the discharge location will be retained. This is because topographical flow paths for surface water out of the bog (by gravity) will be retained in these areas and the bog is not dependent on a pumping regime to ensure ponding does not occur.

The potential for increased groundwater levels, and to a lesser extent, marginal alteration of the topographical catchments has been assessed within the Ummeras Drainage management plan in line with a precautionary approach. With gravity drainage routes retained it is anticipated that groundwater levels will reach the surface of the peat fields but no higher than this. This is also relevant to the area of high bog to the North West where DPT2 is proposed where the pre-rehabilitation flow paths will be retained.

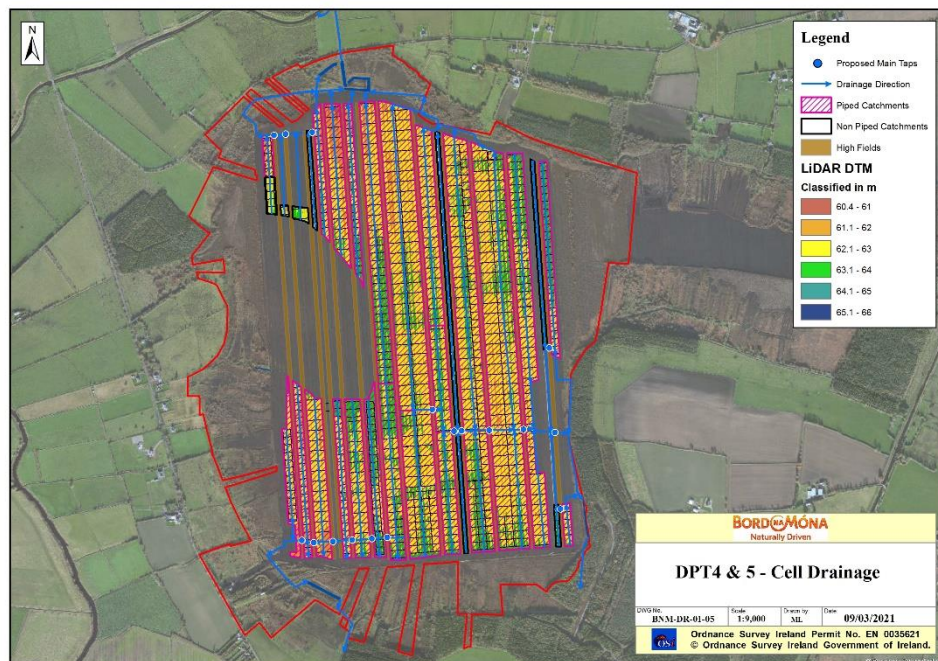


Figure 5.6.26.2.1 Post – rehabilitation Drainage to external network

6. Setting Out and Archaeology Buffer Zones

6.1. Setting Out Locations of Rehabilitation Measures

The following outlines the procedure for the setting out of locations of rehabilitation measures:

- Prior to commencement on site, co-ordinates of all drain blocks berm locations will be published onto the Bord na Móna ArcGIS Online Cloud.
- Operations staff will access that data using the ESRI Fields Maps application, on high accuracy GPS tablets.
- Locations of these drain blocks and berms will be presented to the machine drivers via the built-in GPS tablet and ESRI application and the machine drivers will use this technology to locate the position of the measures.
- In areas where additional clarity is required as in the case where rehabilitation measures are located in proximity to a designated or a protected site, then the location of the proposed boundary or restricted area will be set out and marked on site by Bord na Móna surveyors.

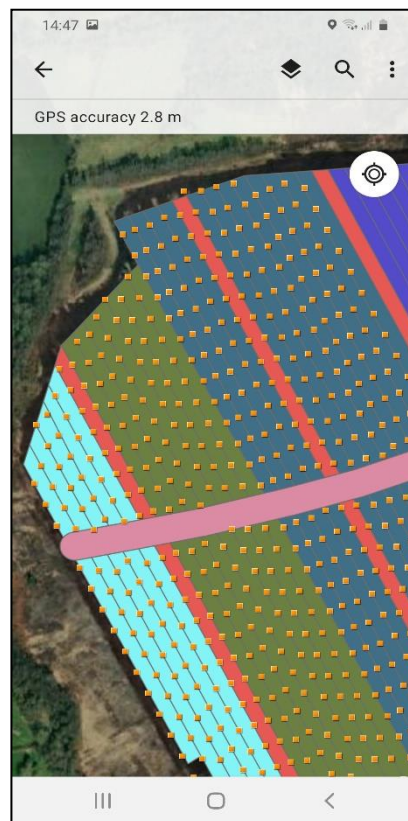


Figure 6.1.1 An example of the onscreen setting out interface

- Engineering staff will use the same ArcGIS cloud technology to verify the rehabilitation measures being carried out. This will enable weekly GIS status maps of works being carried out on a site.



Figure 6.1.2 An example of a site verification survey

6.1.1. Archaeology Buffer Zone

- There are currently no archaeology areas identified in Ummeras Bog.

6.1.2. Ecological Restriction Zone

- There is currently no Ecological Restriction Zone proposed for Ummeras Bog however this may change prior to commencement of the measures. and if so a buffer zone will be provided.
- As referred to in Section 6.1 the location of the proposed boundary to this buffer zone will be set out and marked on site by Bord na Móna surveyors prior to measures commencing in that location, at the appropriate time prior to the commencement of activities.

7. Emergency Response Plan

The Emergency Response Procedure is included in Appendix B and outlines the procedures to be implemented in the event of a Peat Spillage as follows:

- Isolate the source of peat spillage the source of which could include a silt pond failed berm or failed drain block.

- Assess the extent of the peat spill and follow to bog outfall.
- Switch off any associate bog pumps.
- Construct dry peat berms around extent of peat flow and monitor.
- If the peat spillage is assessed to have the potential to extend to a receiving water deploy a silt curtain on the receiving water.
- Continue clean as instructed by/under direction of Local Authority/ Inland Fisheries Ireland / EPA.

Appendix A

Decision Matrix

Appendix B

Emergency Response Plan

Appendix F Environmental Management Plan



Peatland Climate Action Scheme

Environmental Management Plan

Prepared by
Bord na Móna, Civil Engineering Office



DOCUMENT CONTROL SHEET

Client	Bord na Móna					
Project Title	Peatland Climate Action Scheme					
Document Title	Environmental Management Plan					
Document No.	PCAS-RP-01-EMP					
This Document Comprises	DCS	TOC	Text	List of Tables	List of Figures	No. of Appendices
	1	1	19	4	0	2

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
-	Draft	DM	EMcD/MMcC/ DK/CC	PN	BnM Engineering Dept.	28-04-2021
A	Final	DM	EMcD/MMcC/ DK/CC	PN	BnM Engineering Dept.	10-05-2021

Contents

1.0	Introduction	4
2.0	Proposed Rehabilitation Works	5
3.0	Envisaged Sequence of Works	6
3.1	Site Preparation Works	6
3.2	General Description of Works.....	6
4.0	Management & Mitigation Measures.....	7
4.1	Site Management.....	7
4.2	Health & Safety	7
4.3	Restricted Activities	8
4.4	Archaeology	8
4.5	Ground Water & Surface Water Management.....	8
4.6	Drainage Management Plan Measures.....	9
4.7	Traffic & Transport Management	9
4.8	Noise Management.....	9
4.9	Dust Management	10
4.10	Fuel Management.....	10
4.11	Waste Management	11
4.12	Soil Management	11
4.13	Fire Safety	12
5.0	Maintenance Access Requirements.....	13
6.0	Protection of Existing Vegetation	13
7.0	Protected Habitats	13
8.0	Ecology	14
9.0	Peat Dam and Peat Berm Construction	14
10.0	Biosecurity.....	15
11.0	Emergency Response Procedures.....	16
12.0	Reporting.....	16
	APPENDIX A – STANDARD OPERATING PROCEDURES (SOPs).....	17

1.0 Introduction

Bord na Móna have identified a footprint of 33,000 ha of their estate as peatlands suitable for enhanced rehabilitation. This proposed Peatlands Climate Action Scheme (PCAS) will significantly exceed the requirements of the rehabilitation and decommissioning obligations under existing Environmental Protection Agency (EPA) Integrated Pollution Control (IPC) Licence Conditions. Improvements supported by PCAS will ensure that environmental stabilisation is achieved, and significant additional benefits are realised through optimising climate action benefits. This decommissioning, rehabilitation and restoration process will be referred to in subsequent sections of this report as ‘the works’.

The objectives of the Environmental Management Plan (EMP) are to:

- a) Identify management responsibilities and reporting requirements for environmental management;
- b) Identify the relevant Environmental Commitments;
- c) Set out the environmental protection measures to be implemented;
- d) Outline how compliance with the EMP will be achieved; and
- e) Promote best environmental practices for the duration of the development.

This Environmental Management Plan should be read in conjunction with the following site-specific documents for the relevant bog where works are taking place:

- Rehabilitation Plan,
- Preliminary Health & Safety Plan,
- Engineering Construction Package,
- Environmental File,
- Ecology File,
- Associated IPC Licence,
- Training Pack,

The Rehabilitation Plan gives details on the proposed works and outlines control measures and associated monitoring in order to mitigate against any detrimental impacts that may arise on site during the works. It also outlines Bord na Móna’s responsibilities under the existing IPC Licence Conditions with respect to peatland rehabilitation.

2.0 Proposed Rehabilitation Works

The enhanced rehabilitation measures are outlined and detailed in the site-specific Rehabilitation Plan, Engineering Construction Package, Environmental File & Ecology File. These measures are grouped into rehabilitation packages and their suitability for the deployment in different 'high level' categories of land types are outlined in Table 2-1. The Standard Rehab Methodology Drawings in Table 2-2 should be followed with respect to the execution of the various methodologies on site.

Table 2-1 Rehabilitation Packages

Code	Description
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 (7/100 m) + blocking outfalls and managing overflows with a controlled weir outfall + Sphagnum inoculation
DPT3	More intensive drain blocking (7/100 m), + field reprofiling + blocking outfalls and managing overflows with a controlled weir outfall + Sphagnum inoculation
DPT4	Berms and field re-profiling (45m x 60m cell) + blocking outfalls and managing overflows with a controlled weir outfall + drainage channels for excess water + Sphagnum inoculation
DPT5	Cut and Fill cell bunding (30m x 30m cell) + blocking outfalls and managing overflows with a controlled weir outfall + drainage channels for excess water + Sphagnum inoculation
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
DCT3	More intensive drain blocking (7/100 m) + blocking outfalls and managing overflows with a controlled weir outfall + targeted fertiliser treatment
Wetland	
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
WLT4	More intensive drain blocking (7/100 m), + blocking outfalls and managing overflows with a controlled weir outfall + transplanting Reeds and other rhizomes
WLT5	More intensive drain blocking (7/100 m), + field reprofiling + blocking outfalls and managing overflows with a controlled weir outfall + transplanting Reeds and other rhizomes
Marginal Land	
MLT1	No work required
MLT2	More intensive drain blocking (7/100 m)

Table 2-2 – Schedule of Standard Rehab Methodology Drawings

Drawing No.	Drawing Title
PCAS-0100-001	Rehabilitation Method DPT1
PCAS-0100-002	Rehabilitation Method DPT2
PCAS-0100-003	Rehabilitation Method DPT3A
PCAS-0100-004	Rehabilitation Method DPT3B
PCAS-0100-005	Rehabilitation Method DPT4A
PCAS-0100-006	Rehabilitation Method DPT4
PCAS-0100-007	Rehabilitation Method DPT5
PCAS-0100-008	Rehabilitation Method DCT2
PCAS-0100-009	Rehabilitation Method DCT3
PCAS-0100-010	Rehabilitation Method WLT3
PCAS-0100-011	Rehabilitation Method WLT4
PCAS-0100-012	Rehabilitation Method WLT5
PCAS-0100-013	Rehabilitation Method MLT2
PCAS-0100-014	Modifying of Outfalls & Managing Water Levels
PCAS-0100-015	Field Re-profiling
PCAS-0100-016	Boundary Berm

3.0 Envisaged Sequence of Works

This section provides an outline of the envisaged sequence of works associated with the project. Bord na Móna Operations Risk Assessment Method Statements (RAMS) should include a detailed description of the works, particularly those works which have the potential to impact public spaces. Mitigation measures for these impacts should also be proposed within the RAMS.

3.1 Site Preparation Works

Bord na Móna Operations will be responsible for security of the site and as such, will be required to carry out, among others, the following tasks:

- Ensure that a relevant and robust site induction process is in place for all site personnel.
- Ensure that all site personnel have valid Safe Pass card, and valid CSCS card where applicable.
- Ensure that access to the site by unauthorised persons is restricted, by appropriate means.

The site compound may be used as a storage area for various materials throughout the course of the works. Typical materials to be stored include fuels, plant and equipment. Temporary water supply, electricity and sewerage to be satisfied by Bord na Móna Operations as required.

3.2 General Description of Works

The works involves the construction of peat dams, berms and the adoption of various peat bunding techniques in addition to monitoring activities as per the IPC Licence requirements.

The scope of works is described as, but are not limited to, the following:

- Silt pond inspections fortnightly and cleaning bi-annually.
- Sampling of the silt pond outlet every month.
- Refuelling of machines.
- Unloading of fuel from supplier into a double skinned tank onsite.
- Unloading of oil barrels from a pick-up and depositing into the oils store.
- Other materials being delivered to site by BNM and third parties.
- Idle travel out the bog bringing operators to machines to facilitate welfare breaks.
- Collection of loose polythene out the bog and stockpile at the centre.
- Collection of old unused concrete pipes and transport back to centre.

- Remove old machines from bogs, returning to the centre for cutting and collection by a scrap contractor.
- Lifting and collecting unused sections of rail line along mainline.
- Lifting laid permanent rail line and polythene.
- Decommissioning works including, but not limited to plastic clean up, lifting of rail lines etc.
- Provision of temporary welfare facilities for the Bord na Móna staff.
- Construction of peat dams within existing drains.
- Construction of peat bunds and berms.

4.0 Management & Mitigation Measures

4.1 Site Management

The works shall be managed and supervised by competent and qualified personnel and all works shall be carried out under appropriate supervision, best practice, current health and safety measures and also suitable quality control. Facilities for site employees shall be provided within the site compound.

Implementation of the mitigation measures for the works will be the responsibility of Bord na Móna Operations and supervision of the works will be carried out by this Bord na Móna Department incorporating Site Supervisors and the Project Supervisor Construction Stage (PSCS).

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

4.2 Health & Safety

All works shall be carried out so as to comply with all the requirements of the Safety and Health at Work Act 2005 and any subsequent regulations or amendments and with the requirements of the Health and Welfare at Work (Construction) Regulations, (SI 291 of 2013), any subsequent amendments and any other relevant Health and Safety legislation. All construction staff on site shall have a current Safe Pass card and relevant CSCS card. All works shall be carried out in a safe manner and in accordance with the above legislation and any other guidance notes issued by the Health and Safety Authority. In particular, all excavation works shall be carried out in accordance with the *HSA Publication: A Guide to Safety in Excavations*.

The PSCS will provide a site-specific Construction Stage Safety and Health Plan and will provide risk assessments and method statements for the works. On completion of the works the PSCS shall prepare a detailed safety file.

All site personnel/site visitors will be required to wear Personal Protective Equipment (PPE) and undergo the established site induction process prior to entering the site.

Bord Na Móna Operations should ensure that regular audits are carried out at the site, to ensure that measures and process outlined in the site health and safety plan are adhered to. Dangerous occurrences, incidents, near misses and unsafe acts should be recorded, with recorded action taken to prevent all further occurrences.

4.3 Restricted Activities

Species-specific seasonal restrictions on the proposed activities may be required in line with elements highlighted in the site-specific Rehabilitation Measures & Ecology File.

Regarding vegetation clearance, should it be required, all works will comply with Section 40 of the Wildlife Act. Please refer to Vegetation Clearance SOP ECO-004 for specific guidance. For the avoidance of doubt – no felling works will be carried out as part of the proposed works.

There may also be a requirement to protect other ecological receptors such as colonies of breeding Marsh Fritillary (a butterfly species), the breeding or resting places of Otter and possibly amphibians or reptiles which utilise locations such as drains or other water features.

Where clearance is required during the restricted period, the Department of Agriculture, Food and Marine advise that under Section 37 of the Forestry Act, 1946:

It is illegal to uproot any tree over ten years old or to cut down any tress of any age (including trees which form part of a hedgerow) unless a Felling Notice has been lodged at the Garda Station nearest to the trees at least 21 days before felling commences.

The Closed Period “40(1) (a) it shall be an offence for a person to cut, grub, burn or otherwise destroy during the period beginning on the 1st day of March and ending on the 31st day of August in any year, any vegetation growing on any land not then cultivated. (b) it shall be an offence for a person to cut, grub, burn or otherwise destroy any vegetation growing in any hedge or ditch during the period mentioned in paragraph (a) of this subsection”

As per guidance from Inland Fisheries Ireland, any instream works proposed to be undertaken in any rivers streams and watercourses should be undertaken between July and September and in all cases must be agreed in advance with Inland Fisheries Ireland.

Measures to avoid the inadvertent transfer of alien invasive species (aquatic or terrestrial) will be required.

The Project Ecologist or Environmental Manager will advise Bord na Móna Operations on site-specific application of these restrictions to individual sites.

4.4 Archaeology

The discovery of monuments or archaeological objects during the works can constrain the rehabilitation measures proposed for a particular area. If this occurs, rehabilitation measures will be reviewed and adapted where required. An archaeological impact assessment for the site has been carried out and is included in the site-specific Rehabilitation Plan. The recommendations of this assessment have been incorporated into the site-specific Rehabilitation Plan, Engineering Construction Package, Environmental File & Ecology File to minimise impacts on known archaeology.

In addition, Bord na Móna Operations will adhere to the Archaeology Code of Practise relating to management of stray archaeological finds that may arise during the works.

4.5 Ground Water & Surface Water Management

A key component of the works is the potential hydrological impact rehabilitation may have on the bog, surrounding lands and lands downstream which may be hydrologically linked to the bog.

Measures should be taken to protect groundwater and surface water at the site during the works. Drip trays, spill kits and mobile bund systems should be used where required to prevent loss of chemicals/fuels to ground. Plant and equipment should be refilled in a bunded or hardstand area using a drip tray or mobile bund.

Damaged containers should be removed from site and disposed of appropriately to avoid further use. Fuels and oils on site should be stored securely to avoid damage. Relevant staff have received emergency response training for pollution events and be trained in the use of spill kits and handling and refuelling.

Management Activities will comply with Condition 6 of the IPC Licence as follows:

- Intensive sampling of 70% of our bog catchments
- Monthly sampling silt pond outlets
- Fortnightly silt pond inspections
- Bi-annual silt pond maintenance as per procedure

All works should be carried out in line with the site-specific Engineering Construction Package, Environmental File & Ecology File in addition to the *Inland Fisheries "Guidelines on protection of fisheries during construction works in and adjacent to waters"*.

4.6 Drainage Management Plan Measures

Drainage Management Plans (DMP) have been developed for each bog to establish the baseline hydrological performance of the bog and the surrounding drainage network. The plan sets out the characterisation of the bog and surrounding lands, the existing performance of the drainage network and the level of flood risk. The plan identifies the potential hydrological zone of influence of the bog and the objectives, risks and opportunities associated with the rehabilitation of the bog.

The plan assesses the potential impact of the various rehabilitation measures which are proposed on the local drainage network and flood risk. It sets out, where necessary, mitigation measures required to reduce impacts to an acceptable level. The plan sets out the measures which are required to be delivered in parallel with the rehabilitation plan as well as the long-term operation and retention of the drainage network and associated infrastructure. The plan assesses the level of residual risk, the potential impact due to climate change and the adaptability of measures in response to these climate change impacts.

The DMP forms the basis of the detailed design drawings, included in the Engineering Construction Package, and should be read in conjunction with this report.

4.7 Traffic & Transport Management

All machines will be regularly checked and maintained prior to arrival at the site to prevent hydrocarbon leakage. No direct discharges to waters will be made.

4.8 Noise Management

Notwithstanding that there is little likelihood of a significant adverse impact, noise generation is expected as part of the works. It is envisaged that the main noise sources at the site will include earthworks plant and equipment and associated traffic.

Management Activities will comply with Condition 8 of the IPC Licence as follows:

- Activities on-site shall not give rise to noise levels off site at any noise sensitive location which exceed the following sound pressure limits ($L_{eq,30min}$):
 - Day-time: 55 dB(A)
 - Night-time: 45 dB(A)
- There shall be no clearly audible tonal component or impulsive component in the noise emission from the activity at any noise sensitive location.

The works will be restricted to within the footprint of the proposed rehabilitation area. The works will have due regard to noise limits and hours of operation (i.e. dusk and dawn) to minimise any potential disturbance on resident and local fauna that utilise the site and immediate environs. The proposed measures will be restricted to daylight hours and there will be no requirement for artificial lighting.

Bord na Móna Operations will be obliged to take specific noise abatement measures as part of the works and in line with the recommendations of BS5228-1 2009. These measures will typically include:

- No plant used on site will be permitted to cause an ongoing public nuisance due to noise
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations.

4.9 Dust Management

Dust generation is not expected as part of the works. The nature of the proposed works will naturally reduce the production of dust on site, as reprofiling site levels encourages settlement of water on the surface of the bog.

Activities that could give rise dust will be managed under the relevant conditions under Condition 5 of the IPC licence as follows:

- The licensee shall ensure that all operations on-site shall be carried out in a manner such that air emissions and/or dust do not result in significant impairment of, or significant interference with amenities or the environment beyond the site boundary.
- Activities on-site shall not give rise to dust levels off site at any Dust Sensitive Location which exceed an emission limit of 350 mg/m²/day. [The sampling method to be in accordance with German TA Luft Immission Standards for Particle Deposition (IW1)].

4.10 Fuel Management

Fuels and oils used for plant and equipment on the site shall be stored in a bunded area within the site compound as required. This area shall be inspected regularly, and the bund shall be adequate to contain a minimum of 110% of the volume of the largest container of oil and fuel stored. Spill protection equipment such as absorbent mats, shall be available on site to contain any oil spill that may occur, and procedures shall be in place to deal with any such spillage. All plant shall be provided with drip trays and spill kits. Plant operators shall carry out a visual inspection of their vehicle daily and shall be trained in how to deal with any uncontrolled spillage of oil.

All plant refuelling will take place using mobile fuel bowzers or fixed bunded tanks. Only dedicated trained and competent personnel will carry out refuelling operations. Fuelling and lubrication of equipment shall only be carried out in designated areas away from surface water drainage features and ecologically sensitive areas. Hoses and valves will be checked regularly for signs of wear and will be closed and securely locked when not in use.

Fuel management to ensure no impact on the environment will be managed in accordance with Condition 9 of the IPC Licence as follows:

- No potentially polluting substance or matter shall be permitted to discharge to off-site surface waters, off site storm drains or groundwaters.
- The loading and unloading of fuel oils shall be carried out in designated areas protected against spillage and leachate run-off. While awaiting disposal, all materials shall be collected and stored in designated areas protected against spillage and leachate run-off.
- The licensee shall have in storage an adequate supply of containment booms and/or suitable absorbent material to contain and absorb any spillage.

- The licensee shall maintain a log of bi-annual inspections of all rail and tractor transported fuelling units. These inspections as a minimum should record any damage or leaks or flaws in rolling stock that could result in accidental spillage.

4.11 Waste Management

All waste arising from the works shall be managed and disposed of in a way that ensures the provisions of the Waste Management Act 1996 and associated amendments and regulations are applied.

Waste Management will be conducted in accordance with Condition 7 of the IPC Licence as follows:

- Disposal or recovery of waste shall take place only as specified in Schedule 2(i) Hazardous Wastes for Disposal/Recovery and Schedule 2(ii) Other Wastes for Disposal/Recovery of this licence and in accordance with the appropriate National and European legislation and protocols. No other waste shall be disposed of/recovered either on-site or off-site without prior notice to, and prior written agreement of, the Agency.
- Waste sent off-site for recovery or disposal shall only be conveyed to a waste contractor, as agreed by the Agency, and only transported from the site of the activity to the site of recovery/disposal in a manner which will not adversely affect the environment.
- A full record, which shall be open to inspection by authorised persons of the Agency at all times, shall be kept by the licensee on matters relating to the waste management operations and practices at this site. This record shall as a minimum contain details of the following.
 - The names of the agent and transporter of the waste.
 - The name of the persons responsible for the ultimate disposal/recovery of the waste.
 - The ultimate destination of the waste.
 - Written confirmation of the acceptance and disposal/recovery of any hazardous waste consignments sent off-site.
 - The tonnages and EWC Code for the waste materials listed in Schedule 2(i), Hazardous Wastes for Disposal/Recovery and Schedule 2(ii) Other Wastes for Disposal/Recovery sent off-site for disposal/recovery.
 - Details of any rejected consignments.

4.12 Soil Management

If soil contamination is encountered during the works arising from an accidental fuel spillage, this should be managed in accordance with Conditions 4, 7 & 9 of the IPC Licence as follows:

- The licensee shall notify the Agency by both telephone and email to the Agency's Headquarters, or to such other Agency office as may be specified by the Agency, as soon as practicable after the occurrence of any of the following:
 - Any release to atmosphere resulting in significant impairment of, or significant interference with amenities or the environment.
 - Any emission which does not comply with the requirements of this licence.
 - Any incident with the potential for environmental contamination of surface water or groundwater, or posing an environmental threat to air or land, or requiring an emergency response by a Local Authority.
 - The licensee shall include as part of the notification, date and time of the incident, details of the occurrence, and the steps taken to minimise the emissions and avoid recurrence.
- The licensee shall make a record of any incident as set out in above. The notification given to the Agency shall include details of the circumstances giving rise to the incident and all actions taken to minimise the effect on the environment and minimise wastes generated.

- A summary report of reported incidents shall be submitted to the Agency as part of the AER. The information contained in this report shall be prepared in accordance with any relevant guidelines issued by the Agency.
- In the case of any incident as set out above which relates to discharges to water, the licensee shall notify the appropriate Regional Fisheries Board, as soon as practicable after such an incident.
- In the event of any incident, as set out above having taken place, the licensee shall notify the appropriate Local Authority as soon as practicable, after such an incident.
- In the case of any incident, as set out above, which has the potential to impact the conservation objectives of the Special Areas of Conservation and Natural Heritage Areas identified in Attachment 10.1 of the IPC application having taken place, the licensee shall notify Dúchas of the Department of Arts, Heritage, Gaeltacht and the Islands as soon as practicable after such an incident.
- The licensee shall as part of their AER, or more frequently as may be necessary, notify and supply maps to the Agency of boglands, and discharges from same, intended to be included in the subsequent years' development and operational programmes.

4.13 Fire Safety

The ***Bord na Móna Fire Prevention & Fire Fighting Procedures*** in addition to the ***Bord na Móna Fire and Environmental Plan*** outline requirements for fire prevention and fighting in peat bogs and works locations.

It is the intention of Bord na Móna to identify the potential for and take all practicable measures to prevent the outbreak of fire by means of ensuring:

- Implementation of the above policy and procedures.
- Activities are risk assessed to identify potential fire hazards and allow for implementation of suitable control measures to eliminate or reduce to a minimum associated risk.
- Selection of suitable equipment and machinery which is used appropriately and adequately inspected and maintained by competent personnel.
- Installation, where appropriate, of fire-fighting equipment.
- Proper use, storage, and disposal of flammable materials.
- Use of permit to work system, as appropriate, where hot works are to be undertaken.

Bord na Móna Operations must ensure that all fire egress and access points are kept clear and free from obstruction. Emergency access to the various works zones shall be provided and maintained for the duration of the project.

- Unobstructed fire egress during the project.
- Adequate fire safety procedures.
- Access/egress for emergency vehicles.

5.0 Maintenance Access Requirements

The site-specific Drainage Management Plan (DMP) indicates that the effectiveness of a hydraulic break depends upon the drain's ability to convey water away.

The hydraulic breaks identified in the site-specific Engineering Construction Package will require routine monitoring by Bord na Móna, following the works, to ensure the drain is functioning as intended.

6.0 Protection of Existing Vegetation

Where peat extraction has ceased on a site several years ago it is typical for pioneer vegetation to have established on site via natural colonisation, which was encouraged by the cessation of disturbance from peat extraction activity. During this period, the field drainage system naturally breaks down in certain areas, accelerating natural colonisation. The development of pioneer habitats reflects the underlying environmental conditions with the key factor being topography and hydrology.

Regarding vegetation clearance, should it be required, all works will comply with Section 40 of the Wildlife Act. Please refer to Vegetation Clearance SOP ECO-004 for specific guidance. For the avoidance of doubt – no felling works will be carried out as part of the proposed works.

The Closed Period “40(1) (a) it shall be an offence for a person to cut, grub, burn or otherwise destroy during the period beginning on the 1st day of March and ending on the 31st day of August in any year, any vegetation growing on any land not then cultivated. (b) it shall be an offence for a person to cut, grub, burn or otherwise destroy any vegetation growing in any hedge or ditch during the period mentioned in paragraph (a) of this subsection”

The site-specific Ecology File will detail the application of these restrictions to individual sites where required.

7.0 Protected Habitats

Bord na Móna is committed to protecting the diverse habitats in proximity to our estate on which a wide range of Ireland's native animals and plants depend. Sites in proximity to SACs and NHAs have been identified in the site-specific Rehabilitation Plan, Engineering Construction Package, Environmental File & Ecology File for the relevant bog where works are taking place.

Bord na Móna Operations shall incorporate appropriate mitigation measures from the NIS into the CEMP as required to mitigate against adverse impacts on these protected habitats where required, in particular any measures stipulated in Appropriate Assessment reporting.

8.0 Ecology

Measures should be taken by Bord na Móna Operations to protect flora and fauna during the works are outlined in the site-specific Ecology File. The works should be limited to daylight hours, in proximity to watercourses, to allow otters, foxes and other wildlife to forage along the watercourses at dawn, dusk and during the night.

Works will take cognisance of any identified Ecological Restriction Zones (ERZ's) to protect sensitive ecological receptors such as birds (breeding or non-breeding), amphibians or reptiles, invertebrates (e.g. Marsh Fritillary) or mammals (such as Otter) and any particularly sensitive habitats.

In advance of works, all site personnel will receive a toolbox talk with regards to the protection of sensitive receptors onsite, and the prevention of the spread of invasive species.

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

In addition, it is the responsibility of Bord na Móna to undertake any or all measures stipulated in Appropriate Assessment Reporting where required. Refer to the site-specific Environmental and/or Ecology File for specific guidance.

9.0 Peat Dam and Peat Berm Construction

Refer to ***Engineering Methods for Peatland Rehabilitation*** in the Engineering Construction Package for specific guidance on Peat Dam and Peat Berm Construction. The main objective of peat dam construction, as a rehabilitation measure, is to block drains with peat to raise water levels, re-wetting peat and slowing water movements through the site. Peat berm construction follows a similar principle to create large (e.g. 45m x 60m) cells to retain shallow surface water. The creation of cells helps retain surface water, keeping peat wet and slows water movement through the bog.

Geotechnical failures of peat embankments and dams can occur by the lateral displacement of an intact block of peat material due to reductions in the embankment self-weight following partial drying of the crest material and an increase in the active hydrostatic pressures following an increase in the depth of retained water after an intense rainfall event. These factors must be considered when carrying out horizontal and vertical stability calculations for peat embankments and dams.

It is important to create a 'key' for the dam / berm to mitigate against local failures of the peat material used in the construction when subject to associated hydraulic forces from the water being retained. This technique also improves the overall strength of the dam by creating a foundation and reduces sub-surface flows through the area.

Risk mitigation against dam and berm failure will be employed initially via design, whereby maximum water levels for each site will be specified in the site-specific Engineering Construction Package. Following construction, regular inspections of berms will be carried out.

If a local failure to a peat dam or berm occurs, the water will follow a pathway towards the nearest silt pond allowing any peat sediment from the local failure to be captured in the silt pond prior to discharging from the bog.

Where the risk cannot be mitigated against (in the case where the bog sits on an existing flood plain for example) emergency measures will be outlined in the Bord na Móna Emergency Response Procedure document.

10.0 Biosecurity

The potential for importation or introduction of non-native plant species (such as Japanese Knotweed, Himalayan Balsam, etc.) during the works 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 bogs identified under PCAS. The works will have due regard to the relevant biosecurity measures as follows:

- Records of problematic invasive species identified within the bog units will be marked out with signs to highlight areas of infestation to personnel, including a buffer.
- 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/or washing vehicles prior to entering the work area.
- Plant shall be inspected upon arrival and departure from site.
- All site users shall be made aware of these procedures and appropriate treatment methodologies.

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 order to prevent the introduction and spread of aquatic invasive species, biosecurity will be required for all PPE, equipment, plant and machinery components before entering (or which are likely to enter) drains and watercourses on the site and again before leaving the site:

- Protective gloves should be worn when using any disinfectant solution in any of the procedures listed below.
- Visually inspect all equipment that has come into contact with the water for evidence of attached plant or animal material, or adherent mud or debris. This should be done before leaving the site.

- Remove any attached or adherent material (vegetation and debris) before leaving the site of operation.
- Ensure that all water is drained from any live wells and other water retaining compartments, tanks and other equipment before transportation elsewhere.
- It is recommended to apply disinfectant to the undercarriage and wheels of the vehicle/machine after steam cleaning or power hosing.
- Wet or live wells and other water retaining compartments in survey boats must be cleaned, rinsed or flushed with a 1% solution of Virkon Aquatic or another proprietary disinfection product. Alternatively, a 5% solution (100 ml / 20 litre solution) of chlorine bleach should be used. Rinse thoroughly with clean water.
- Footwear should be dipped in or scrubbed with a disinfectant solution (e.g. 1% solution of Virkon Aquatic or another proprietary disinfection product) and thoroughly dried afterwards.
- All PPE should be visually inspected and any attached vegetation or debris removed. Where appropriate, the gear should be wiped down with a cloth soaked in 1% solution of Virkon Aquatic or another proprietary disinfection product. Alternatively, a 5% solution (100 ml / 20 litre solution) of chlorine bleach should be used. Rubber gloves must be worn when undertaking this procedure.
- Survey equipment should also be sprayed with 1% solution of Virkon Aquatic.

11.0 Emergency Response Procedures

It is the intention of Bord na Móna to identify the potential for and take all practicable measures to prevent the occurrence of an emergency situation. However, in preparation for this possible occurrence, an Emergency Response Procedure will be prepared, implemented, maintained, and periodically reviewed by Bord na Móna Operations to minimise the potential for injury and ensure safe evacuation of persons.

Emergency Response Procedures are outlined for each location Appendix A

12.0 Reporting

Bord na Móna have a defined methodology for delivering the Peatland Climate Action Scheme. This is facilitated via adherence to our robust quality systems and project execution plans that have been developed to apply LEAN project management processes to our design and documentation. Bord na Móna teams adopt these key tools to the benefit of all projects and will adopt a formal reporting mechanism in line with the requirements of the IPC Licence. These reporting mechanisms are outlined in the site-specific Engineering Construction Package, Environmental File & Ecology File.

It is Bord na Móna policy to report, and where necessary, investigate any environmental incidents.

APPENDIX A – STANDARD OPERATING PROCEDURES (SOPs)

Bord na Móna Standard Operating Procedures with respect to Environmental & Biodiversity activities should be followed including, but not limited to, the documents listed in Table B-1 and Table B-2.

Table A-1 – Schedule of Biodiversity Standard Operating Procedures (SOP)

Code	Description
ECO 0001	Protection of Otter
ECO 0002	Prevention of disturbance (Birds)
ECO 0003	Protection of Marsh Fritillary
ECO 0004	Vegetation Clearance
ECO 0005	Protection of Amphibians and Reptiles
ECO 0006	Invasive Species

Table A-2 – Schedule of Environmental Standard Operating Procedures (SOP)

Code	Description
ENV017	Archaeological Findings
EP 5.0	General Emergency Preparedness & Response
SPIP	Silt Pond Inspection Procedure
SPMP	Silt Pond Maintenance Procedure
	Waste Management Procedure
	Gas Oil Loading Procedure

BORD NA MÓNA Naturally Driven	Procedure: ECO-001	Rev: 1
Title: Protection of Otter	Approved:	Date: 16/03/21

1) Purpose

To describe the environmental measures required to protect Otter across the Peatlands Climate Action Scheme (PCAS).

2) Scope

To avoid likely significant effects of disturbance, displacement or physical injury to Otter which occur or are likely to occur at any locations where Bord na Móna may be carrying out PCAS activities with the potential for effects.

The potential for negative effects will be avoided through adherence to Best Practice measures and the use of confirmatory surveys to establish any requirements such as derogations and/or restriction zones around confirmed breeding or resting sites as appropriate.

This Procedure should be read in association with any other pertinent procedures, in particular around vegetation clearance and working near water.

3) Related Documents

Bord na Mona Silt Pond Maintenance Procedure

Bord na Mona Silt Pond Inspection Procedure

National Roads Authority (2006). Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes. The National Roads Authority, Dublin.


National Roads Authority (2008.) Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes. The National Roads Authority, Dublin.

Highways Agency (1999). Design Manual for Roads and Bridges - Nature Conservation Advice in Relation to Otters HA81/99. The Highways Agency, London.

4) Procedure

Environmental Controls

1. The PCAS project team will liaise with the Bord na Móna Ecology Team who will approve and provide guidance on all on site activities which could have an ecological impact.
2. All PCAS staff will receive environmental training and/or an Environmental site induction/Toolbox talk before being allowed to work on a Bord na Móna bog.
3. Work will only be able to take place once the Bord na Móna Ecology Team has signed off on the installation of any required mitigation measures.
4. Adherence to any specified mitigation measures are to be subject to audit by the Bord na Móna Ecology Team and/or Site Supervisor/Environmental Officer or PSCS as appropriate.
5. Implementation of the mitigation measures for the works will be the responsibility of Bord na Móna Operations and supervision of the works will be carried out by this Bord na Móna Department incorporating Site Supervisors and the Project Supervisor Construction Stage (PSCS).

 BORD NA MÓNA Naturally Driven	Procedure: ECO-001	Rev: 1
Title: Protection of Otter	Approved:	Date: 16/03/21

6. In addition, implementation of the mitigation measures will be monitored and inspected by Bord na Móna Environmental, Ecology and Engineering Departments, who are independent of Bord Na Móna Operations. Project Ecologists, Engineers and Environmental Compliance Officers will be appointed for each bog and they will ensure that measures are carried out in accordance with this Environmental Management Plan. The Project Ecologist, Environmental Compliance Officer, Engineer, H & S Manager, Site Supervisor and PSCS will have a ‘stop works’ authority.

7. Where non-compliance is detected, a system of follow up and corrective action will be implemented.

Preparation

1. Confirmatory surveys will be carried out 150m upstream and downstream of suitable Otter habitat where relevant activities are programmed to occur. This will include silt ponds (cleaning and maintenance), channelized sections of watercourses and bog drainage channels with connectivity to suitable habitat. These confirmatory Otter surveys will be undertaken no more than 12 months in advance of proposed activities, during the period November and April when vegetation cover is reduced. For silt ponds surveys will include an area comprising the pond plus a 50m buffer.
2. Confirmatory surveys will be undertaken by a suitably qualified ecologist.
3. The results of surveys will be communicated to the site manager responsible for scheduling activities on a need to know basis.
4. Zones or locations containing confirmed breeding or resting locations (holts/couches) are to be delineated with signage at an appropriate distance (150m) to prevent disturbance.
5. In addition, any restriction zones are to be digitised and provided in shapefile format for upload to machine/site supervisor PDA’s where this facility is available.
6. These Ecological Restriction Zones (ERZs) will be marked out at regular intervals using a combination of appropriate signage or visual markers as appropriate, prior to works or activities commencing during the identified sensitive period.
7. The above will be carried out by a suitably qualified Ecologist/ Bord na Móna Ecology Team.
8. Surveys results will be confirmed no less than 3 days prior to scheduled activities commencing.
9. If required any derogation applications will be made by the Bord na Móna Ecology Team/designated project manager.

Operator Training

1. All PCAS operators will receive a toolbox talk by a suitably qualified Ecologist/ Bord na Móna Ecology Team, to educate them on any relevant restrictions prior to the commencement of activities.
2. This will include any restricted areas, the requirement for same, the location of reference documentation such as the schedule of mitigation measures, and the procedure to follow if in doubt as to the locations of activities in respect of any restricted areas.
3. A copy or map illustrating the restriction zones per bog, and periods wherein activities can be undertaken will be available at all times at the site office.

BORD NA MÓNA Naturally Driven	Procedure: ECO-001	Rev: 1
Title: Protection of Otter	Approved:	Date: 16/03/21

- Where pertinent, a schedule of Mitigation Measures per bog will also be available at all times in the site office.

Responsibilities

- The appointed PCAS Site Supervisor/PSCS as appropriate will be responsible for recording attendance at toolbox talks and making sure all operators have access to the required reference material, including drawings of restricted areas/ ERZ's.
- The appointed PCAS Site Supervisor /PSCS as appropriate as will be responsible for the scheduling of activities
- The appointed PCAS Site Supervisor /PSCS as appropriate must be aware of any other site-specific ¹mitigation around Otter
- The Bord na Móna Ecology Team or Project Ecologist is responsible for conformance auditing.
- If a derogation is required, any activities under same will be overseen by the Bord na Móna Ecology Team or appointed Project Ecologist.
- Local NPWS will be made aware of any derogated works/activities before commencement.

Carrying out Activities

- No works or activities are to be carried out in restricted areas or identified ERZ's during the relevant period as specified by the project ecologist. No works will be carried out within 150m of an active holt.
- NPWS will be notified of any confirmed active holts.
- As per NRA (2006) guidelines, following consultation with NPWS, works or activities closer to such breeding holts may take place – provided appropriate mitigation measures are in place, e.g. screening and/or restricted working hours on site;
- No wheeled or tracked vehicles (of any kind) will be used within 20m of active, but non-breeding, otter holts. Light work, such as digging by hand or scrub clearance will not take place within 15m of such holts, except under licence (NRA, 2006);
- Where holts are present in close proximity to invasive activities, but are determined not to require destruction, such activities may commence once recommended alternative mitigation measures to address otters have been complied with (NRA, 2006);
- Only operators who have received the required training and toolbox talks are to be assigned duties within the above period.
- Conformance will be audited through compliance checks by the Bord na Móna Ecology Team /Project Ecologist with 'stop-works' authority.
- Activities will only be carried out between 08.00 and 17.30 to minimise the potential for disturbance.

5) Records


Evidence of approval (electronic)
Archive files

¹ F

BORD NA MÓNA Naturally Driven	Procedure: ECO-001	Rev: 1
Title: Protection of Otter	Approved:	Date: 16/03/21

Revision Index			
Revision	Date	Description of change	Approved

DRAFT

	Procedure: ECO-002	Rev: 1
Title: Disturbance to Birds of Conservation Concern	Approved:	Date: 06/04/21

1) Purpose

To describe the environmental measures required to avoid significant disturbance to bird species of conservation concern during the PCAS scheme.

2) Scope

To avoid likely significant effects of disturbance or displacement at a scale likely to result in significant effects to breeding or wintering bird species of conservation concern, which occur or are likely to occur at any locations where Bord na Móna may be carrying out PCAS activities.

The potential for negative effects will be avoided through adherence to Best Practice measures and the use of confirmatory surveys to establish any requirements such as restricted areas and/or restriction zones around confirmed breeding or roosting sites as appropriate. Suitable restriction buffers have been derived from a review of Best Practice and is provided as an Appendix to this document.

This Procedure should be read in association with any other pertinent procedures, in particular around vegetation clearance and working near water.

3) Related Documents

Bord na Mona Silt Pond Maintenance Procedure

Bord na Mona Silt Pond Inspection Procedure

National Roads Authority (2008.) Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes. The National Roads Authority, Dublin.

Livezey KB, Fernández-Juricic E, Blumstein DT. Database of bird flight initiation distances to assist in estimating effects from human disturbance and delineating buffer areas. Journal of Fish and Wildlife Management 7(1):181-191; e1944-687X. doi: 10.3996/082015-JFWM-078

Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. & Thompson, D. 2013. Raptors: a field guide to survey and monitoring (3rd Edition). The Stationery Office, Edinburgh.


Gilbert, G., Gibbons, D.W. & Evans, J. 2011 Bird Monitoring Methods. The Royal Society for the Protection of Birds, Sandy, England.

Scottish National Heritage (2016) Dealing with Construction and birds. Guidance Version 3. SNH, Battleby, Scotland.

4) Procedure

Environmental Controls

1. The PCAS project team will liaise with the Bord na Móna Ecology Team who will approve and provide guidance on all on site activities which could have an ecological impact.
2. All PCAS staff will receive environmental training and/or an Environmental site induction/Toolbox talk before being allowed to work on a Bord na Móna bog.

	Procedure: ECO-002	Rev: 1
Title: Disturbance to Birds of Conservation Concern	Approved:	Date: 06/04/21

3. Work will only be able to take place once the Bord na Móna Ecology Team has signed off on the installation of any required mitigation measures.
4. Adherence to any specified mitigation measures are to be subject to audit by the Bord na Móna Ecology Team and/or PCAS Site Supervisor/Environmental Officer or PSCS as appropriate.
5. Where non-compliance is detected, a system of follow up and corrective action will be implemented.

Preparation

1. Desktop review to check available baseline data to identify potential disturbance risks from proposed PCAS activities to breeding or wintering birds. If there is potential for disturbance risks, then confirmatory surveys are required.
2. Confirmatory surveys will be undertaken by a suitably qualified ecologist to identify the presence of any bird species of conservation concern which may potentially be disturbed. The survey will typically include habitats suitable for ground nesting birds, in particular sensitive species (e.g. Lapwing/Ringed Plover/Curlew/Red Grouse) but also buildings scheduled for decommissioning, potential winter period feeding or roosting areas for Wildfowl, roosting areas for Hen Harrier etc.
3. All surveys will take place prior to the commencement of any scheduled activities, and will follow Best Practice survey techniques.
4. The results of surveys will be communicated to the PCAS PSCS/ Site Supervisor/Environmental Officer (as appropriate) responsible for scheduling activities. For highly sensitive species such as nesting Curlew or roosting Hen Harrier precise locations of nesting or roosting will not be disseminated.
5. Zones or locations containing confirmed nesting attempts by species including but not limited to Lapwing, Ringed Plover, Black-headed Gull, Common Sandpiper, Curlew, Merlin are to be delineated at an appropriate distance to prevent disturbance.
6. Alternatively, the extent of any zones may be provided by the Ecology Team via ArcGis online Cloud for use on tablets by PCAS operators/Site Supervisor as appropriate.
7. These Ecological Restriction Zones (ERZs) (e.g. 800m around identified Curlew nests) will be marked out at regular intervals using a combination of appropriate signage or visual markers as appropriate, prior to works commencing during the identified sensitive period.
8. Any buildings will similarly be identified.
9. The above will be carried out by a suitably qualified Ecologist and/or under supervision by a suitably qualified ecologist.
10. Surveys results will be confirmed where appropriate prior to scheduled activities commencing.

Operator Training

1. All PCAS operators will receive a toolbox talk by a suitably qualified Ecologist/ Bord na Móna Ecology Team, to educate them on any relevant restrictions prior to the commencement of activities.

BORD NA MÓNA Naturally Driven	Procedure: ECO-002	Rev: 1
Title: Disturbance to Birds of Conservation Concern	Approved:	Date: 06/04/21

2. This will include any restricted areas, the requirement for same, the location of reference documentation such as the schedule of mitigation measures, and the procedure to follow if in doubt as to the locations of activities in respect of any restricted areas.
3. A copy or map illustrating the restriction zones per bog, and periods wherein activities can be undertaken will be available at all times at the site office.
4. Where pertinent, a schedule of Mitigation Measures per bog will also be available at all times in the site office.

Responsibilities

1. The appointed PCAS Site Supervisor/PSCS as appropriate will be responsible for recording attendance at toolbox talks and making sure all operators have access to the required reference material, including drawings of restricted areas/ ERZ's.
2. The appointed PCAS Site Supervisor /PSCS as appropriate as will be responsible for the scheduling of activities.
3. The appointed PCAS Site Supervisor PSCS as appropriate must be aware of any other site specific mitigation around disturbance to birds.
4. The Bord na Móna Ecology Team or Project Ecologist is responsible for conformance auditing.
5. If a derogation is required, any activities under same will be overseen by the Bord na Móna Ecology Team or appointed Project Ecologist.
6. Local NPWS will be made aware of any derogated or licensed works/activities before commencement.


Carrying out Activities

1. No PCAS works or activities are to be carried out in restricted areas or identified ERZ's during the relevant period as specified by the project ecologist.
2. Only operators who have received the required training and toolbox talks are to be assigned duties within the above period.
3. Conformance will be audited through compliance checks by the Project Ecologist/ PSCS/Environmental Officer as appropriate (with 'stop-works' authority).
4. Certain Activities may occur in ERZ's in instances where breeding attempts have finished/birds are no longer present – this can only occur following confirmation from the Project Ecologist that it is OK for activities to proceed. In general the use of headlands for travel through, and /or rail lines will be permitted within ERZ's where it is considered birds may be habituated to such regular movements.
5. Activities will only be carried out between 08.00 and 17.30 to minimise the potential for disturbance.


5) Records

Evidence of approval (electronic)
Archive files

Revision Index			
Revision	Date	Description of change	Approved

	Procedure: ECO-002	Rev: 1
Title: Disturbance to Birds of Conservation Concern	Approved:	Date: 06/04/21

DRAFT

 BORD NA MÓNA Naturally Driven	Procedure: ECO-003	Rev: 1
Title: Protection of Marsh Fritillary	Approved:	Date: 22/04/21

1) Purpose

To describe the environmental measures required to protect Marsh Fritillary during PCAS activities.

2) Scope

To avoid effects of disturbance/physical injury to and secondary habitat loss in respect of Marsh Fritillary which occur or are likely to occur at PCAS decommissioning and rehabilitation locations. This includes in situ larvae and adults, in known or previously identified colony locations.

The potential for negative effects will be avoided through adherence to Best Practice measures and the use of confirmatory surveys pre-commencement of PCAS activities to establish any requirements such as restriction zones around colonies/areas of suitable habitat containing larval webs etc.

This SOP should be read in association with other sheets, in particular around vegetation clearance.

3) Related Documents

SOP for vegetation clearance – ECO-004

National Roads Authority (2008.) Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes. The National Roads Authority, Dublin.

Fowles & Smith, (2006) Mapping the habitat quality of patch networks for the marsh fritillary *Euphydryas aurinia* (Rottemburg, 1775) (Lepidoptera, Nymphalidae) in Wales, Journal of Insect Conservation 10:161-177.

Warren, M.S (1994) The UK status and suspected metapopulation structure of a threatened European butterfly, the marsh fritillary *Eurodryas aurinia*. Biological Conservation 67, 239-249.

Harding, J.M. (2008). Discovering Irish Butterflies & their Habitats. Published by Jesmond Harding.

4) Procedure

Environmental Controls

1. The PCAS project team will liaise with the Bord na Móna Ecology Team who will approve and provide guidance on all on site activities which could have an ecological impact.
2. All PCAS staff will receive environmental training and/or an Environmental site induction/Toolbox talk before being allowed to work on a Bord na Móna bog.
3. PCAS work will only be able to take place once the Bord na Móna Ecology Team has signed off on the installation of any required mitigation measures.
4. Adherence to any specified mitigation measures are to be subject to audit by the Bord na Móna Ecology Team and/or PCAS Site Supervisor/Environmental Officer or PSCS as appropriate.

BORD NA MÓNA Naturally Driven	Procedure: ECO-003	Rev: 1
Title: Protection of Marsh Fritillary	Approved:	Date: 22/04/21

- Where non-compliance is detected, a system of follow up and corrective action will be implemented.

Preparation

- Desktop review to check available baseline data to identify potential disturbance risks from proposed PCAS activities to Marsh Fritillary. If there is potential for disturbance risks, then confirmatory surveys are required before any activities are carried out.
- Confirmatory surveys will be undertaken by a suitably qualified ecologist to confirm the presence of any previously identified Marsh Fritillary colonies.
- All surveys will take place prior to the commencement of any scheduled PCAS activities and will follow Best Practice survey techniques.
- The results of surveys will be communicated to the PCAS PSCS/ Site Supervisor/Environmental Officer (as appropriate) responsible for scheduling activities.
- Zones or locations containing confirmed Marsh Fritillary Colonies are to be delineated with signage at an appropriate distance to prevent disturbance.
- Alternatively, the extent of any zones may be provided by the Ecology Team via ArcGis online Cloud for use on tablets by PCAS operators/Site Supervisors.
- These Ecological Restriction Zones (e.g. 50m around identified colonies will be marked out at regular intervals using a combination of appropriate signage or visual markers as appropriate, prior to works commencing during the identified sensitive period.
- The above will be carried out by a suitably qualified Ecologist and/or under supervision by a suitably qualified ecologist.
- Surveys results will be confirmed where appropriate prior to scheduled activities commencing.

Operator Training

- All PCAS operators will receive a toolbox talk by a suitably qualified Ecologist/ Bord na Móna Ecology Team, to educate them on any relevant restrictions prior to the commencement of activities.
- This will include any restricted areas, the requirement for same, the location of reference documentation such as the schedule of mitigation measures, and the procedure to follow if in doubt as to the locations of activities in respect of any restricted areas.
- A copy or map illustrating the restriction zones per bog, and periods wherein activities can be undertaken will be available at all times at the site office.
- Where pertinent, a schedule of Mitigation Measures per bog will also be available at all times in the site office.

Responsibilities

- The appointed PCAS site supervisor/PSCS as appropriate will be responsible for recording attendance at toolbox talks and making sure all operators have access to the required reference material, including drawings of restricted areas/ ERZ's.
- The appointed PCAS site supervisor/PSCS as appropriate as will be responsible for the scheduling of activities
- The appointed PCAS site supervisor/PSCS as appropriate must be aware of any other site specific mitigation around disturbance to invertebrates.

BORD NA MÓNA Naturally Driven	Procedure: ECO-003	Rev: 1
Title: Protection of Marsh Fritillary	Approved:	Date: 22/04/21

4. The Bord na Móna Ecology Team or Project Ecologist is responsible for conformance auditing
5. If a derogation/license is required, any activities under same will be overseen by the Bord na Móna Ecology Team or appointed Project Ecologist.
6. Local NPWS will be made aware of any derogated or licensed works/activities before commencement.


Carrying out Activities

1. No PCAS works or activities are to be carried out in restricted areas or identified ERZ's during the relevant period as specified by the project ecologist.
2. Only PCAS operators who have received the required training and toolbox talks are to be assigned duties within the above period.
3. Conformance will be audited through compliance checks by the Project Ecologist/ PSCS/Environmental Officer as appropriate (with 'stop-works' authority).
4. Activities may occur in ERZ's in instances where breeding has finished or larvae are confirmed by the Project Ecologist as not present – this can only occur following confirmation from the Project Ecologist that it is OK for activities to proceed.
5. Certain activities may be permitted once no usage of vehicles with the potential for trampling ground areas are being used i.e. activities by hand, carried out on foot etc, or activities of a H&S nature.

5) Records

Evidence of approval (electronic)
Archive files

Revision Index			
Revision	Date	Description of change	Approved

 BORD NA MÓNA Naturally Driven	Procedure: ECO-004	Rev: 1
Title: Vegetation Clearance	Approved:	Date: 04/05/21

1) Purpose

To describe the environmental measures required for vegetation clearance during PCAS activities.

2) Scope

Section 40 of the Wildlife Act 1976, as amended by Section 46 of the Wildlife (Amendment) Act 2000, restricts the cutting, grubbing, burning or destruction by other means of vegetation growing on uncultivated land or in hedges or ditches during the nesting and breeding season for birds and wildlife, from 1st March to 31st August, inclusive.

The scope of this SOP is to ensure the protection of bird species using scrub, hedgerow or ground vegetation during PCAS activities.

The potential for negative effects will be avoided through adherence to Best Practice measures.

Typical exemptions will still apply for example, for health and safety reasons, the destruction of noxious weeds, during works permitted under statute etc.

This SOP should be read in association with other sheets, in particular around Marsh Fritillary, Birds and invasive species.

3) Related Documents

SOP for protection of Marsh Fritillary – ECO-003

SOP for Protection of Birds – ECO-002

SOP for treatment of Invasive Species – ECO-005

National Roads Authority (2008.) Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes. The National Roads Authority, Dublin.

Section 40 of the Wildlife Act 1976, as amended by Section 46 of the Wildlife (Amendment) Act 2000,

4) Procedure

Environmental Controls

1. The PCAS project team will liaise with the Bord na Móna Ecology Team who will approve and provide guidance on all on site activities which could have an ecological impact.
2. All PCAS staff will receive environmental training and/or an Environmental site induction/Toolbox talk before being allowed to work on a Bord na Móna bog.
3. PCAS Work will only be able to take place once the Bord na Móna Ecology Team has signed off on any required mitigation measures.
4. Adherence to any specified mitigation measures are to be subject to audit by the Bord na Móna Ecology Team and/or Site Supervisor/Environmental Officer or other specified person as appropriate.

BORD NA MÓNA Naturally Driven	Procedure: ECO-004	Rev: 1
Title: Vegetation Clearance	Approved:	Date: 04/05/21

- Where non-compliance is detected, a system of follow up and corrective action will be implemented.

Preparation

- Zones or locations containing confirmed sensitive receptors/areas to be avoided completely during the bird nesting season are to be delineated with signage at an appropriate distance to prevent disturbance.
- Alternatively, the extent of any zones may be provided by the Ecology Team via ArcGis online Cloud for use on tablets by operators.
- The above will be carried out by a suitably qualified Ecologist and/or under supervision by a suitably qualified ecologist.
- Surveys results will be confirmed where appropriate prior to scheduled activities commencing.

Operator Training

- All PCAS operators will receive a toolbox talk by a suitably qualified Ecologist/ Bord na Móna ecology team, to educate them on any relevant restrictions prior to the commencement of activities.
- This will include any restricted areas, or areas where (if known) a confirmatory survey by an Ecologist is required in advance of vegetation clearance
- A copy or map illustrating the restriction zones's per bog, and periods wherein activities can be undertaken will be available at all times at the site office.
- Where pertinent, a schedule of Mitigation Measures per bog will also be available at all times in the site office.

Responsibilities

- The appointed PCAS site supervisor/PSCS as appropriate will be responsible for recording attendance at toolbox talks and making sure all operators have access to the required reference material, including drawings of restricted areas/ ERZ's.
- The appointed PCAS site supervisor//PSCS as appropriate as will be responsible for the scheduling of activities
- The appointed PCAS site supervisor//PSCS as appropriate must be aware of any other site specific mitigation around vegetation clearance.
- The Bord na Móna ecology team or Project Ecologist is responsible for conformance auditing
- If a derogation/license is required, any activities under same will be overseen by the Bord na Móna ecology team or appointed Project Ecologist.
- Local NPWS will be made aware of any derogated or licensed works/activities before commencement.

Carrying out Activities

- The following approach will be taken in order to comply with the Wildlife Acts:


BORD NA MÓNA Naturally Driven	Procedure: ECO-004	Rev: 1
Title: Vegetation Clearance	Approved:	Date: 04/05/21

2. Where practical, vegetation clearance will be carried out outside of the restricted period (1st March to 31st August).
3. Where activities are required within the closed season, it is the responsibility of the Site Supervisor/Manager to inform the Project Ecologist and seek consultation as to compliance with Section 40.
4. If necessary, a survey will then be carried out by the Project Ecologist for the presence of active birds' nests (i.e. nests with eggs or young birds) as deemed likely to occur within a suitable timeframe preceding activities.
5. If such are found, where feasible the area will be avoided until the nesting attempt/breeding is complete. If avoidance is not feasible, the Project Ecologist will seek a derogation license from the NPWS. Such works cannot take place until this derogation license is received.
6. The locations of any temporarily restricted areas may be provided via ArcGIS cloud for Site Supervisor oversight.
7. Fire prevention must govern all work practices on or near all areas of gorse, bog and forestry.
8. The Project Ecologist can provide Guidance on when works may proceed.

5) Records

Evidence of approval (electronic)
Archive files

Revision Index			
Revision	Date	Description of change	Approved

 BORD NA MÓNA Naturally Driven	Procedure: ECO-005	Rev: 1
Title: Protection of Amphibians and Reptiles	Approved:	Date: 04/05/21

1) Purpose

To describe the environmental measures required to protect Amphibians and Reptiles during Peatland Climate Action Scheme (PCAS) activities.

2) Scope

To avoid effects of disturbance/physical injury to and secondary habitat loss in respect of Amphibians and Reptiles which occur or are likely to occur at PCAS activities. This includes in situ spawn and adults, in suitable habitat or previously identified locations.

The potential for negative effects will be avoided through adherence to Best Practice measures and the use of confirmatory surveys pre-commencement of activities to establish any requirements such as restriction zones around colonies/areas of suitable habitat containing known Amphibian and Reptiles, and if required translocation in line with Best Practice.

This SOP sheet should be read in association with other sheets, in particular around vegetation clearance.

3) Related Documents

SOP for vegetation clearance – ECO-004

National Roads Authority (2008.) Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes. The National Roads Authority, Dublin.

‘Amphibian Habitat Management Handbook’. John Baker, Trevor Beebee, John Buckley, Tony Gent and David Orchard (2011). Amphibian and Reptile Conservation, Bournemouth, ISBN: 978-0-9566717-1.


Meehan, (2013) National Smooth Newt Survey 2013 Report, Irish Wildlife Trust

4) Procedure

Environmental Controls

1. The PCAS Project Team will liaise with the Bord na Móna Ecology Team who will approve and provide guidance on all on site activities which could have an ecological impact.
2. All PCAS staff will receive environmental training and/or an Environmental site induction/Toolbox talk before being allowed to work on a Bord na Móna bog.
3. PCAS Work will only be able to take place once the Bord na Móna Ecology Team has signed off on the installation of any required mitigation measures.
4. Adherence to any specified mitigation measures are to be subject to audit by the Bord na Móna Ecology Team and/or Site Supervisor/Environmental Officer or PSCS as appropriate.
5. Where non-compliance is detected, a system of follow up and corrective action will be implemented.

Preparation

	Procedure: ECO-005	Rev: 1
Title: Protection of Amphibians and Reptiles	Approved:	Date: 04/05/21

1. Confirmatory surveys will be undertaken by a suitably qualified ecologist to identify the presence of Amphibians and Reptiles.
2. All surveys will take place prior to the commencement of any scheduled PCAS activities and will follow Best Practice survey techniques.
3. The results of surveys will be communicated to the PCAS PSCS/ Site Supervisor/Environmental Officer or PSCS (as appropriate) responsible for scheduling activities.
4. Zones or locations containing confirmed high usage areas (e.g. drains containing frog spawn / Newts) are to be delineated with signage at an appropriate distance to prevent disturbance.
5. Alternatively, the extent of any zones may be provided by the Ecology Team via ArcGis online Cloud for use on tablets by operators.
6. These Ecological Restriction Zones (e.g. 5m around identified colonies will be marked out at regular intervals using a combination of appropriate signage or visual markers as appropriate, prior to works commencing during the identified sensitive period.
7. The above will be carried out by a suitably qualified Ecologist and/or under supervision by a suitably qualified ecologist.
8. Surveys results will be confirmed where appropriate prior to scheduled activities commencing.

Operator Training

1. All PCAS operators will receive a toolbox talk by a suitably qualified Ecologist/ Bord na Móna Ecology Team, to educate them on any relevant restrictions prior to the commencement of activities.
2. This will include any restricted areas, the requirement for same, the location of reference documentation such as the schedule of mitigation measures, and the procedure to follow if in doubt as to the locations of activities in respect of any restricted areas.
3. A copy or map illustrating the restriction zones per bog, and periods wherein activities can be undertaken will be available at all times at the site office.
4. Where pertinent, a schedule of Mitigation Measures per bog will also be available at all times in the site office.

Responsibilities

1. The appointed PCAS Site Supervisor/PSCS as appropriate will be responsible for recording attendance at toolbox talks and making sure all operators have access to the required reference material, including drawings of restricted areas/ ERZ's.
2. The appointed PCAS Site Supervisor/PSCS as appropriate as will be responsible for the scheduling of activities
3. The appointed PCAS Site Supervisor/PSCS as appropriate must be aware of any other site specific mitigation around disturbance to amphibians or reptiles.
4. The Bord na Móna Ecology Team or Project Ecologist is responsible for conformance auditing
5. If a derogation/license is required, any activities under same will be overseen by the Bord na Móna Ecology Team or appointed Project Ecologist.

BORD NA MÓNA Naturally Driven	Procedure: ECO-005	Rev: 1
Title: Protection of Amphibians and Reptiles	Approved:	Date: 04/05/21

- Local NPWS will be made aware of any derogated or licensed works/activities before commencement, such as translocation.


Carrying out Activities

- Should PCAS activities be proposed and scheduled for areas proximal to previously identified habitat suitable for breeding common frog or smooth newt during the species' respective breeding seasons (frogs: January-March and newts: March-May), confirmatory surveys following standardised methodologies will be required at those locations to confirm the presence/absence of breeding adults and/or spawn. Licenses may be required for certain survey types.
- If evidence of frog or newts is confirmed proximal to the work locations, it is essential the areas are fenced off with appropriate signage in order to protect these areas during construction activities;
- Protecting the hydrological regime of the habitat is particularly important. Thus, it is particularly important that the Project Ecologist/Site Supervisor has a clear understanding of the drainage characteristics of wet areas such as ponds, pools and drains which have the potential to support breeding amphibians along the route to ensure that these areas are maintained into the future;
- No works or activities are to be carried out in restricted areas or identified ERZ's during the relevant period as specified by the project ecologist.
- Only operators who have received the required training and toolbox talks are to be assigned duties within the above period.
- Conformance will be audited through compliance checks by the PCAS Project Ecologist/ PSCS/Site supervisor as appropriate (with 'stop-works' authority).
- Activities may occur in ERZ's in instances where breeding has finished or species are confirmed by the Project Ecologist as not present – this can only occur following confirmation from the Project Ecologist that it is OK for activities to proceed
- Certain activities may be permitted once no usage of vehicles with the potential for trampling ground areas are being used i.e. activities by hand, carried out on foot etc.
- As a conservation measure, translocation should be an option of last resort, and any necessary license should be obtained before undertaking translocation, following consultation with NPWS.
- NPWS may require notification of the receiving location in advance of issuing a license.
- NPWS License link is as follows:
- <https://www.npws.ie/licences/disturbance/breeding-places>
- See also Appendix I for extracted translocation procedure from the 'Amphibian Habitat Management Handbook'

5) Records


Evidence of approval (electronic)
Archive files

Revision Index

	Procedure: ECO-005	Rev: 1
Title: Protection of Amphibians and Reptiles	Approved:	Date: 04/05/21

Revision	Date	Description of change	Approved

DRAFT

	Procedure: ECO-005	Rev: 1
Title: Protection of Amphibians and Reptiles	Approved:	Date: 04/05/21

Appendix 1 Translocation Procedures

Translocation of Common Frog spawn


- **Site security:** Proposed translocation sites should have a sympathetic land owner and appropriate land management plus, ideally, nature reserve status and statutory nature conservation designation.
- **Habitat quality** both aquatic and terrestrial habitats should meet the criteria outlined in Section 9 of the ‘Amphibian Habitat Management Handbook’ or be readily restorable to such condition. Any necessary restoration should be completed prior to translocation.
- **Predators and competitors:** Large populations of predators such corvids, gulls, rats and aquatic invertebrates should be absent from a reintroduction site and its environs.
- **Consultation and agreements:** It is essential to consult widely with and gain the approval of all interested parties including landowners and managers of recipient sites.
- **Preparing a reintroduction site:** Where necessary the terrestrial habitat should be managed to meet the necessary criteria before ponds are created. Preference should be given to creating scrapes of differing depths based on the natural water table rather than using lined pools. An advantage of lined pools is that they may be topped up with water artificially and, even if not needed for the long term, temporary lined pools may be a useful insurance against desiccation at the start of a project. Artificial refugia should be provided to help maximise the number of froglets surviving to disperse from the damp pond margins. Discarded roof tiles, slightly raised to allow froglets to crawl beneath or leafy branches, e.g. sycamore, which dry to provide many hiding places, should be laid around the water’s edge.
- **Translocating Spawn:** The donor population should be the closest one to the new site and certainly within the same geographical area. To ensure the best chance of success a reintroduction should take place over three successive years. This establishes a mixed-age structure in the new population relatively rapidly. The equivalent to at least approximately 4,000-8,000 eggs, should be obtained from the donor site.
- **Freshly laid spawn** is best because it travels well. Sections should be cut with sharp scissors and transported in a bucket containing approximately 5 l of water (at a depth of approximately 5-10 cm) from the ponds in which the spawn originated. Buckets with snap-on lids make good transport containers. A hole cut in the centre of the lid allows ventilation but prevents water spillage during transport. Spawn should be moved to the recipient site rapidly, certainly within one or two days. During transportation care should be taken to avoid exposing the spawn to extreme temperatures (for example leaving it in the sun).
- **Free swimming tadpoles** without any signs of limb development can also be moved. Well-developed spawn, or tadpoles showing signs of metamorphosis, should not be translocated because mortality during transportation can be high in these developmental stages. Tadpoles are susceptible to suffocation and should be moved in cool water with minimal amounts of dissolved or suspended organic matter.

BORD NA MÓNA Naturally Driven	Procedure: ECO-005	Rev: 1
Title: Protection of Amphibians and Reptiles	Approved:	Date: 04/05/21

Translocation of Smooth Newts

NRA (2008) provides guidance on mitigation, compensation and enhancement measures (at p80) which should be considered.

“In those situations where capturing and relocating important newt populations is considered appropriate, breeding ponds should be encircled by drift fencing and pitfall traps prior to the spring migration period, and newts captured on their way to breed. Netting and draining-down of ponds should also take place to remove as many of the remainder as possible. Where large populations of newts are found close to the proposed works, amphibian-proof fencing can be helpful in protecting the resident animals. Permanent fencing can also be used to guide newts to purpose-built tunnels and other safe crossing structures, although their effectiveness for newts remains largely unknown.”

	Procedure: ECO-006	Rev: 1
Title: Invasive Species	Approved:	Date: 04/05/21

1) Purpose

To describe the Environmental/Biosecurity Measures required to avoid the introduction, establishment and spread of non-native invasive species (Terrestrial Flora) from activities associated with the PCAS Scheme.

2) Scope

To avoid likely significant effects from the introduction, establishment and spread of non-native invasive species to Bord na Mona works during activities undertaken under PCAS.

The potential for negative effects will be avoided through adherence to Best Practice measures and the use of confirmatory surveys pre-commencement of activities to establish any requirements such as e.g. restriction zones (15m) around Invasive Plant species infestation locations as appropriate.

This SOP should be read in association with other sheets, in particular around vegetation clearance.

3) Related Documents

SOP for vegetation clearance – ECO-004

Waste Management Procedures

Managing Japanese knotweed on development sites - The Knotweed Code of Practice produced by the Environmental Agency (2013);

NRA Guidelines on The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (2010);


Managing Invasive Non-native Plants in or near Freshwater, Environment Agency (2010);

Best Practice Management Guidelines Japanese knotweed *Fallopia japonica*, Invasive Species Ireland (2015);

4) Procedure

Environmental Controls

1. The PCAS Project Team will liaise with the Bord na Móna Ecology Team who will approve and provide guidance on all on site activities which could have an ecological impact.
2. All PCAS staff will receive environmental training and/or an Environmental site induction/Toolbox talk before being allowed to work on a Bord na Móna bog.
3. PCAS Work will only be able to take place once the Bord na Móna Ecology Team has signed off on the installation of any required mitigation measures.
4. Adherence to any specified mitigation measures are to be subject to audit by the Bord na Móna Ecology Team and/or PCAS Site Supervisor/Environmental Officer or PSCS as appropriate.

 BORD NA MÓNA Naturally Driven	Procedure: ECO-006	Rev: 1
Title: Invasive Species	Approved:	Date: 04/05/21

- Where non-compliance is detected, a system of follow up and corrective action will be implemented.

Preparation

- Desktop review to check available baseline data to identify potential disturbance risks from proposed PCAS activities to known infestations of invasive species. If there is potential for disturbance risks, then confirmatory surveys are required.
- Confirmatory surveys will be undertaken by a suitably qualified ecologist to identify the presence of any infestations or locations of invasive species.
- All surveys will take place prior to the commencement of any scheduled PCAS activities, and will follow Best Practice survey techniques.
- Unknown infestations that are recorded during the scheme will also be managed in the same way.
- The results of surveys will be communicated to the PCAS PSCS/ Site Supervisor/Environmental Officer responsible for scheduling activities.
- Zones or locations containing confirmed invasive species are to be delineated with signage at an appropriate distance to prevent disturbance.
- Alternatively, the extent of any zones may be provided by the Ecology Team via ArcGIS online Cloud for use on tablets by operators/supervisors.
- These Ecological Restriction Zones (e.g. 15m around identified Japanese Knotweed) will be marked out at regular intervals using a combination of appropriate signage or visual markers as appropriate, prior to activities commencing.
- The above will be carried out by a suitably qualified Ecologist and/or under supervision by a suitably qualified ecologist.
- Surveys results will be confirmed where appropriate prior to scheduled activities commencing.

Operator Training

- All PCAS operators will receive a toolbox talk by a suitably qualified Ecologist/ Bord na Móna Ecology Team, to educate them on any relevant restrictions prior to the commencement of activities.
- This will include any restricted areas, the requirement for same, the location of reference documentation such as the schedule of mitigation measures, and the procedure to follow if in doubt as to the locations of activities in respect of any restricted areas.
- A copy or map illustrating the restriction zones per bog, and periods wherein activities can be undertaken (if applicable) will be available at all times at the site office.
- Where pertinent, a schedule of Mitigation Measures per bog will also be available at all times in the site office.

Responsibilities

- The appointed PCAS Site Supervisor/PSCS as appropriate will be responsible for recording attendance at toolbox talks and making sure all operators have access to the required reference material, including drawings of restricted areas/ ERZ's.
- The appointed PCAS Site Supervisor /PSCS as appropriate as will be responsible for the scheduling of activities

BORD NA MÓNA Naturally Driven	Procedure: ECO-006	Rev: 1
Title: Invasive Species	Approved:	Date: 04/05/21

3. The appointed PCAS Site Supervisor /PSCS as appropriate must be aware of any other site specific mitigation around invasive species, such as steam clean protocols.
4. The Bord na Móna Ecology Team /Project Ecologist or Environmental Officer is responsible for conformance auditing.

Carrying out Activities


Invasive terrestrial Flora such as Japanese Knotweed

1. A toolbox talk will be provided by the invasive Project Ecologist with the PSCS, Site engineers and general operatives to explain about all invasive species identified within the bog and the restrictions that will apply for the duration of any planned activities.
2. The toolbox talk will cover all pertinent topics including all relevant invasive species close to activities or works and the biosecurity measures to be implemented while working. The invasive species toolbox talk will cover the full lifecycle of every activity.
3. If required any Japanese Knotweed infestations will be treated or suitably contained.
4. This will take place under supervision from the Project Ecologist/Site Supervisor/Environmental Manager.
5. All surveys will take place prior to the commencement of activities and will follow Best Practice survey techniques.
6. No General Operative will be allowed to work without completing the toolbox talk;
7. The PSCS/Site Manager will ensure that only licensed hauliers are collecting and disposing of any potentially contaminated materials;
8. The Schedule of Mitigation Measures per bog will also be available at all times in the site office.

5) Records

Evidence of approval (electronic)
Archive files

Revision Index			
Revision	Date	Description of change	Approved

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

1) Purpose

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

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

2) Procedure

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

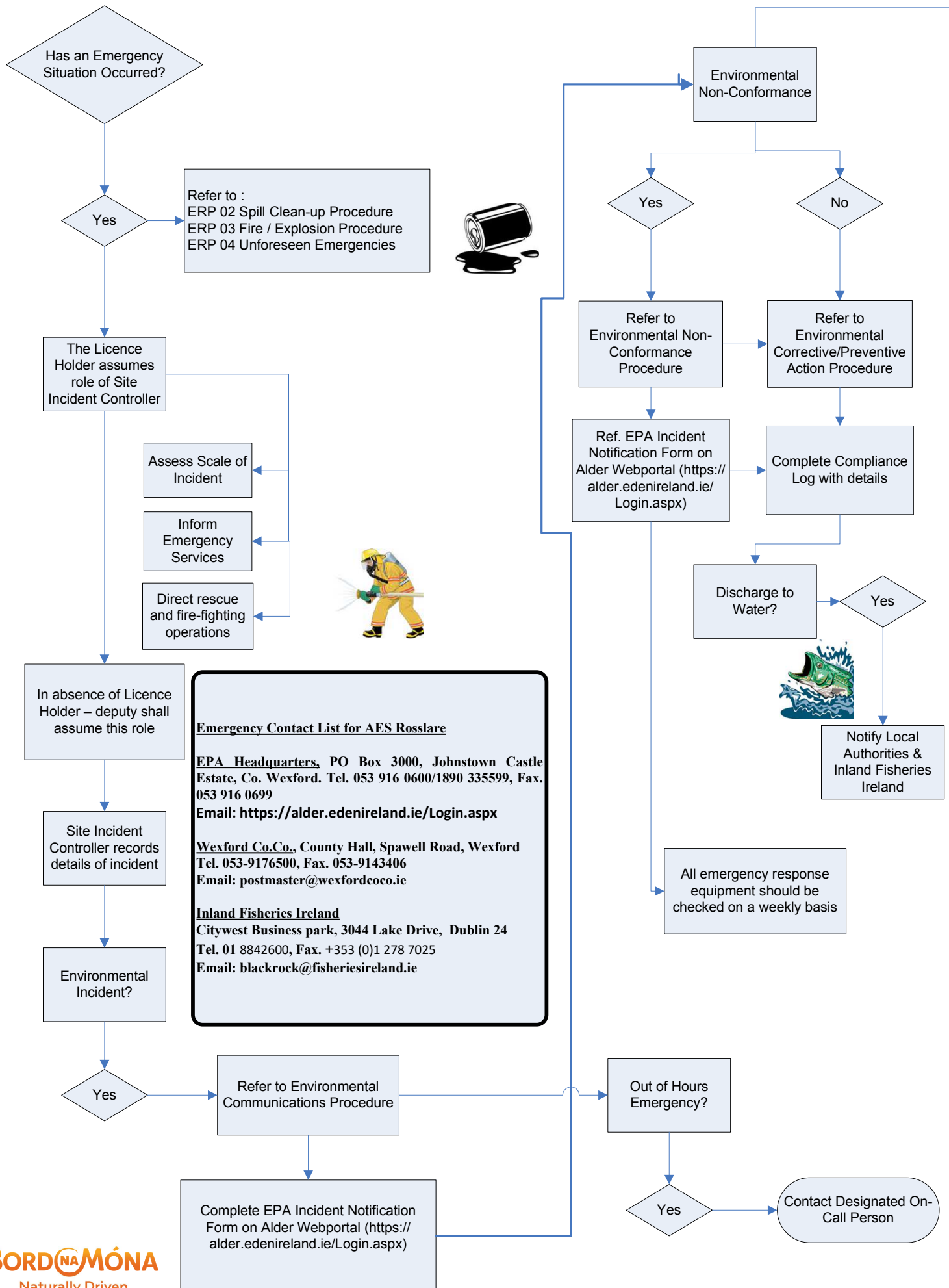
NOTE: Our archaeological heritage is a finite, non-renewable resource. Once a site is destroyed its information is lost forever and we have lost the chance to understand a little more about our past, where we have come from and perhaps the opportunity to learn for the future.

Your Archaeological Liaison Officer is

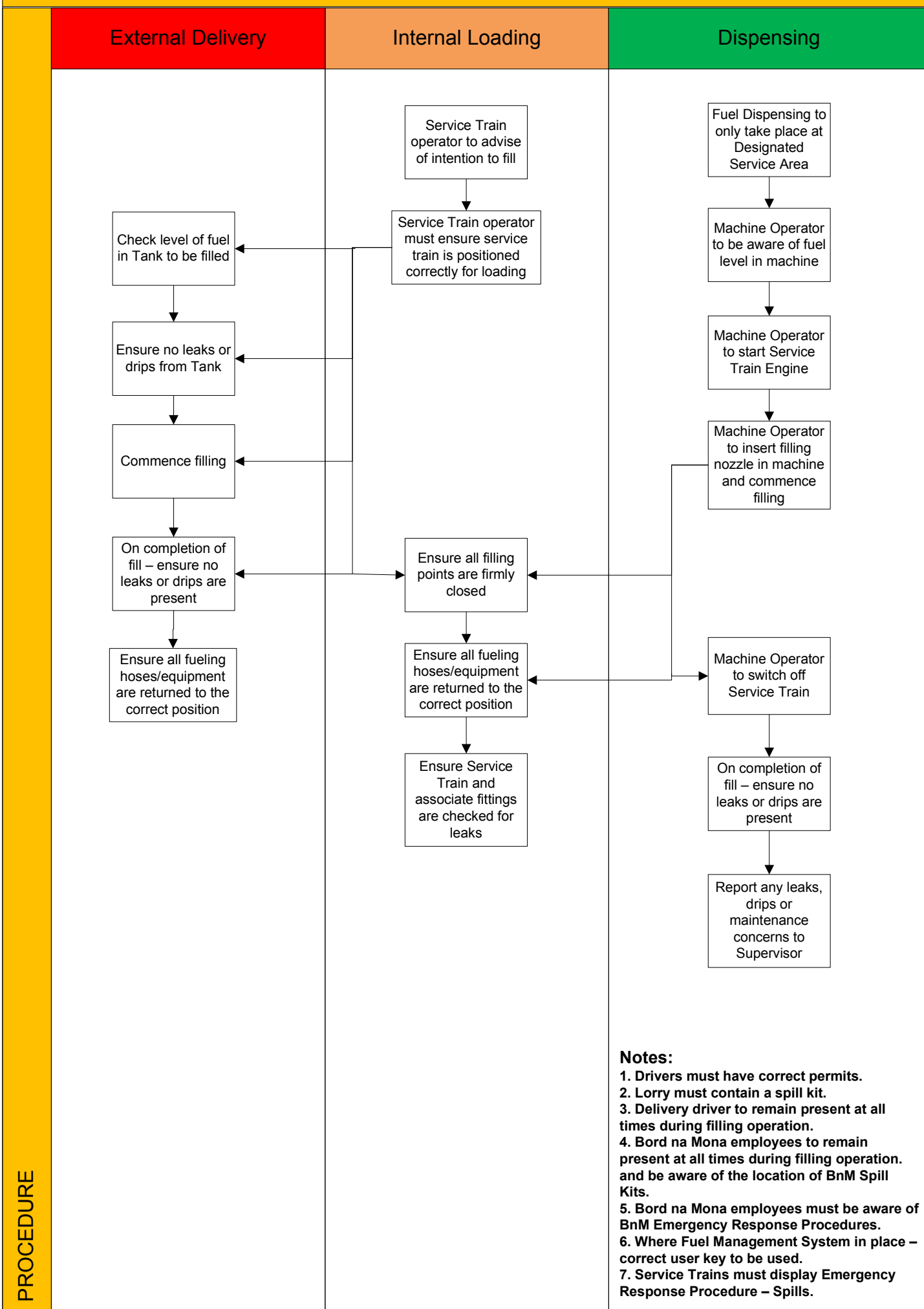
3) Records

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

EP 5.0 General Emergency Preparedness & Response



Gas Oil Loading Procedure – Rev.1



Procedure: SPIP

Operations Manager

Page: 1 of 1

Date: _____

Rev: 3

Silt Pond Inspection Procedure

1. Purpose

The purpose of this procedure is to provide for visual inspection of all silt ponds on a fortnightly basis in accordance with Condition 6.7 of the Bord na Mona Energy Ltd IPC Licence's P0499-01 to P0507-01. This will be used for determining the silt pond de-silting roster.

2. Scope

The scope of this procedure covers all silt ponds treating drainage water from production bogs across the licence areas P0499-01 to P0507-01. .

3. Responsibility

It is the responsibility of the Operations Leader and the Team Leader to ensure all silt ponds are inspected on a fortnightly basis and that these inspections are returned to the Environmental Co-ordinator for filing at the facility office.

4. Procedure

- 4.1 Record the Silt Pond identification number on the Inspection Log.
- 4.2 Inspect the full length of the Silt Pond including inlets and outlet, noting the location of peat silt visible on the surface.
- 4.3 Tick the appropriate box on the Inspection Log to indicate the condition of the pond and record the date and time.
- 4.4 For ponds in series, the final pond should be clean at all times.
- 4.5 If a pond is observed as being 3/4 full during the fortnightly inspection, or at any other time arrangements should be made for the de-silting of the pond immediately.
- 4.6 Inspect the Outfall from the silt pond to the receiving water (River) and record any observations.
- 4.7 Once the silt pond has been cleaned, the date of de-silting should be logged on the Inspection Log and recorded on the Silt Pond Wall Chart.

Operations Manager

Procedure:SPMP

Page: 1 of 2

Date: _____

Rev: 3

Silt Pond Maintenance Procedure

1. Purpose.

The purpose of this procedure is to provide for a maintenance procedure of all silt ponds associated with IPC Licence's P0499-01 to P0507-01. Pond cleaning will be determined by the silt pond inspection procedure.

2. Scope.

The scope of this procedure covers all silt ponds treating drainage water from the Licence areas P0499-01 to P0507-01.

3. Responsibility.

It is the responsibility of the Operations Manager to ensure ponds are cleaned as required by the silt pond inspection procedure.

4. Procedure

4.1 If the silt pond system has a by-pass channel or a stand-by pond then the drainage should be diverted through these. If not, then the inlet to the pond should be blocked using a gate valve or by switching off any applicable pumps, for the duration of the maintenance activity.

4.2 If the outlet from the pond has a weir then the level should be lowered so as to de-water the silt. If not, then the outlet pipe should be blocked.

4.3 The pond should be cleaned from the inlet to the outlet either from one side, if the width allows, or from both sides, if not.

4.4 The silt should be deposited as far back from the silt pond as possible on top of the existing silt pond or retained in a peat berm, if sludge is at risk of leaking back into the silt pond.

4.5 When the pond has been cleaned the inlet should be opened and the pond allowed to fill before lowering the outlet weir.

4.6 If the drainage was diverted during the maintenance, then it should be redirected back into the pond.

4.7 If there are signs of peat silt deposited upstream or downstream of the pond, within the site boundary, then they should also be cleaned, starting up-stream. This should occur once the pond has been cleaned and before the outlet weir has been lowered.

4.8 Once cleaned, the date should be entered on to the inspection log.

4.9 All machine operators must be fully versed with the above procedure with a copy posted in the machine.

Waste Management Procedure

1. Purpose

To define the correct procedure to be followed when removing and disposing of wastes from sites across all licenced bogs.

2. Scope

The scope of this procedure covers all bogs in the Licence areas P0499-01 to P0507-01, and Waste Facilities WL0049-02 and WL0199-02. It also covers the requirements of Condition 7 of these IPC licences and is detailed in Bord na Mona Peat/AES Service Level Agreement (SLA).

3. Responsibility

The implementation of this Procedure is the responsibility of the Resource Manager or his/her deputy.

4. Reporting

- Prior to the recovery and handling of waste, please liaise with your Environmental Coordinator and/or Compliance Operations Lead to schedule and coordinate its disposal.
- Ensure that a record of all waste receipts is maintained and a copy provided to the relevant Environmental Coordinator.
- On a monthly basis, stores shall provide the relevant IPC Licence Coordinator with a copy of all waste receipts for the Waste Management file.
- On a quarterly basis, AES shall provide each store and the IPC Licence Coordinator with a quarterly report as per the SLA.

5. Waste Collection Procedure

Table 1 outlines the procedures for the handling of waste and subsequent disposal routes.


6. Reference Documents

Attachment 1: AES Service Level Agreement (SLA).

Litter Action Plan: Prevention and control of litter arising from Bord na Mona's activities and from unauthorised dumping on and around its property.

Table 1: Waste Management Plan		
Waste Type	Waste Handling Procedure	Disposal Route
Plant & Equipment	<ul style="list-style-type: none">All production equipment shall be transferred to tea centers/workshops for assessment for retention, sale or scrapping.	-
	<ul style="list-style-type: none">Tractors, trailers, excavators, dozers identified for D&R work, peat sales or drainage/silt pond maintenance shall be retained at the main works.	
Hazardous Waste	<ul style="list-style-type: none">Hazardous materials/liquids/batteries shall be removed from all machinery identified for scrap.	-
	<ul style="list-style-type: none">All waste or unused fuels, oils, greases, batteries etc shall be brought into the main works and deposited into existing hazardous waste receptacles i.e. barrels, waste oils tanks, battery boxes etc.	AES/ENVA
Transformers	<ul style="list-style-type: none">Redundant transformers shall be transported to workshops. Prior to disposal, transformer oils shall be testing for the presence of PCB's. Only third part contractors ENVA ltd shall be permitted to pump and disposed of transformer oils.Transformer shall be then send for metals recycling	AES/ENVA/ (Subcontractor - metals recycling)
Scrap Metal	<ul style="list-style-type: none">All scrap metal collected shall be stored in short to medium term designated areas with adequate hard standing, space and access for collection by AES contractors using heavy equipment (scissors, grab, articulated trucks). <p>Note: to maximise the potential scrap value, store scrap loose and do not deposited into skips</p>	AES (Subcontractor - metals recycling)
Polythene	<ul style="list-style-type: none">All waste polythene, rolled and loose shall be gathered and stored at designated areas with adequate hard standing, access and easy reach for collection. In order of preference, polythene shall be disposed of as follows:<ol style="list-style-type: none">Rolled Polythene – collected by ADN Ltd for recovery/recycling - qualifies for a financial rebate.Loose Polythene - collected by ADN Ltd for recovery/recycling - no financial rebate due to transportation costs.Contaminated Polythene – polythene rejected by ADN Ltd shall be disposed of to landfill via AES ltd.	ADN Ltd / AES
Polybrane	<ul style="list-style-type: none">All waste polybrane recovered from both permanent and temporary rail shall be stored separately to polythene and assessed for reuse/ disposal. Polybrane designated for disposal shall be directly transferred to Drehid landfill.	Reuse – to be determined Disposal - Drehid Landfill
Tyres	<ul style="list-style-type: none">All used tyres shall be gathered and stored in a suitable hard standing area for collection	AES
Concrete Pipes	<ul style="list-style-type: none">Redundant concrete pipes shall be:<ul style="list-style-type: none">collected and transported to the nearest compound for reuse (D&R projects/Drainage/neighboring farm use).Crushed in-situ.	-
Asbestos	<ul style="list-style-type: none">Removal and disposal of asbestos carried out by specialist's waste contractors only. If found, do not handle or disturbed and ensure Health & safety guidelines are adhered to.	Specialist's waste contractors
C&D Waste	<ul style="list-style-type: none">All C&D waste shall be segregated to ensure disposal costs are minimised as follows:<ul style="list-style-type: none">Remove of all internal appliances, furniture, windows, roof felt, guttering etc to general waste skip.Segregate timber from concrete and place in separate skipsSegregate metals and transport to nearest loose metals storage compound	AES (Subcontractor - metals recycling)
Peat Stockpiles	<ul style="list-style-type: none">Unsalable stockpiles shall be leveled/decommissioned as per SOP FS-BM-02 "Bog Maintenance Plan"	Operations
Illegal fly tipping	<ul style="list-style-type: none">The locations of illegal dumping and fly tipping sites shall be documented and reported to local BnM environmental officers. <p>Note: The local county council should be notified of the dumping and a landfill levy exemption letter requested prior to the removal or disposal of waste.</p>	AES

Appendix G Standard Operating Procedure for Otter

	Procedure: ECO-001	Rev: 1
Title: Protection of Otter	Approved:	Date: 16/03/21

1) Purpose

To describe the environmental measures required to protect Otter across all Bord na Móna activities.

2) Scope

To avoid likely significant effects of disturbance, displacement or physical injury to Otter which occur or are likely to occur at any locations where Bord na Móna may be carrying out activities with the potential for effects.

The potential for negative effects will be avoided through adherence to Best Practice measures and the use of confirmatory surveys to establish any requirements such as derogations and/or restriction zones around confirmed breeding or resting sites as appropriate.

This Procedure should be read in association with any other pertinent procedures, in particular around vegetation clearance and working near water.

3) Related Documents

Bord na Mona Silt Pond Maintenance Procedure

Bord na Mona Silt Pond Inspection Procedure

National Roads Authority (2006). Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes. The National Roads Authority, Dublin.

National Roads Authority (2008.) Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes. The National Roads Authority, Dublin.


Highways Agency (1999). Design Manual for Roads and Bridges - Nature Conservation Advice in Relation to Otters HA81/99. The Highways Agency, London.

4) Procedure

Environmental Controls

1. Each project, scheduled activity or proposed works will liaise with the Bord na Móna ecology team who will approve and provide guidance on all on site activities which could have an ecological impact.
2. All staff will receive environmental training and/or an Environmental site induction/Toolbox talk before being allowed to work on a Bord na Móna bog.
3. Work will only be able to take place once the Bord na Móna ecology team has signed off on the installation of any required mitigation measures.
4. Adherence to any specified mitigation measures are to be subject to audit by the Bord na Móna ecology team and/or Site Supervisor/Environmental Officer or PSCS as appropriate.
5. Where non-compliance is detected, a system of follow up and corrective action will be implemented.

Preparation

 BORD NA MÓNA Naturally Driven	Procedure: ECO-001	Rev: 1
Title: Protection of Otter	Approved:	Date: 16/03/21

1. Confirmatory surveys will be carried out 150m upstream and downstream of suitable Otter habitat where relevant activities are programmed to occur. This will include silt ponds (cleaning and maintenance), channelized sections of watercourses and bog drainage channels with connectivity to suitable habitat. These confirmatory Otter surveys will be undertaken no more than 12 months in advance of proposed activities, during the period November and April when vegetation cover is reduced. For silt ponds surveys will include an area comprising the pond plus a 50m buffer.
2. Confirmatory surveys will be undertaken by a suitably qualified ecologist.
3. The results of surveys will be communicated to the site manager responsible for scheduling activities on a need to know basis.
4. Zones or locations containing confirmed breeding or resting locations (holts/couches) are to be delineated with signage at an appropriate distance (150m) to prevent disturbance.
5. In addition, any restriction zones are to be digitised and provided in shapefile format for upload to machine PDA's where this facility is available.
6. These Ecological Restriction Zones will be marked out at regular intervals using a combination of appropriate signage or visual markers as appropriate, prior to works or activities commencing during the identified sensitive period.
7. The above will be carried out by a suitably qualified Ecologist/ Bord na Móna ecology team.
8. Surveys results will be confirmed no less than 3 days prior to scheduled activities commencing.
9. If required any derogation applications will be made by the Bord na Móna ecology team/designated project manager.

Operator Training

1. All operators will receive a toolbox talk by a suitably qualified Ecologist/ Bord na Móna ecology team, to educate them on any relevant restrictions prior to the commencement of activities.
2. This will include any restricted areas, the requirement for same, the location of reference documentation such as the schedule of mitigation measures, and the procedure to follow if in doubt as to the locations of activities in respect of any restricted areas.
3. A copy or map illustrating the restriction zones's per bog, and periods wherein activities can be undertaken will be available at all times at the site office.
4. Where pertinent, a schedule of Mitigation Measures per bog will also be available at all times in the site office.

Responsibilities

1. The appointed site manager/PSCS as appropriate will be responsible for recording attendance at toolbox talks and making sure all operators have access to the required reference material, including drawings of restricted areas/ ERZ's.
2. The appointed site manager/PSCS as appropriate as will be responsible for the scheduling of activities
3. The appointed site manager/PSCS as appropriate must be aware of any other site specific mitigation around Otter
4. The Bord na Móna ecology team or Project Ecologist is responsible for conformance auditing

BORD NA MÓNA Naturally Driven	Procedure: ECO-001	Rev: 1
Title: Protection of Otter	Approved:	Date: 16/03/21

5. If a derogation is required, any activities under same will be overseen by the Bord na Móna ecology team or appointed Project Ecologist.
6. Local NPWS will be made aware of any derogated works/activities before commencement.

Carrying out Activities

1. No works or activities are to be carried out in restricted areas or identified ERZ's during the relevant period as specified by the project ecologist. No works will be carried out within 150m of an active holt.
2. NPWS will be notified of any confirmed active holts.
3. As per NRA (2006) guidelines, following consultation with NPWS, works or activities closer to such breeding holts may take place – provided appropriate mitigation measures are in place, e.g. screening and/or restricted working hours on site;
4. No wheeled or tracked vehicles (of any kind) will be used within 20m of active, but non-breeding, otter holts. Light work, such as digging by hand or scrub clearance will not take place within 15m of such holts, except under licence (NRA, 2006);
5. Where holts are present in close proximity to invasive activities, but are determined not to require destruction, such activities may commence once recommended alternative mitigation measures to address otters have been complied with (NRA, 2006);
6. Only operators who have received the required training and toolbox talks are to be assigned duties within the above period.
7. Conformance will be audited through compliance checks by the Bord na Móna ecology team /Project Ecologist with 'stop-works' authority.
8. Activities will only be carried out between 08.00 and 17.30 to minimise the potential for disturbance.

5) Records

Evidence of approval (electronic)
Archive files

Revision Index			
Revision	Date	Description of change	Approved