MOTT MACDONALD

BORD NA MÓNA

Remedial Environmental Impact Assessment Report

Bord na Móna Peat Extraction Substitute Consent Application

29 May 2020

Mott MacDonald
South Block
Rockfield
Dundrum
Dublin 16
D16 R6V0
Ireland

T +353 (0)1 2916 700
mottmac.com

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1 Introduction

1.1 Introduction

Bord na Móna are applying to An Bord Pleanála for Substitute Consent under Section 177E (Application for Substitute Consent) of the Planning and Development Act 2000 (PDA 2000), as amended and under Part 19 of the Planning and Development Regulations, 2001 (as amended).

Substitute Consent is effectively a form of retrospective consent and is being applied for with the aim of regularising the planning status of historic peat extraction carried out by Bord na Móna on 41 individual bog units.

This Remedial Environmental Impact Assessment Report (rEIAR) has been prepared to accompany the application to An Bord Pleanála (ABP) for Substitute Consent, as prescribed under Part XA 177F of the PDA 2000.

Bord na Móna's peat extraction activities on the 41 individual bog units assessed for this report have been regulated by the Environmental Protection Agency (EPA) since 2000 under the Integrated Pollution Control (IPC) licencing regime, under Part IV of the Environmental Protection Agency Act 1992. This application is for the bogs that are intended to be used by Bord na Móna in the future for peat production in line with our reduction in the extraction of peat from 6.5m tonnes in 2013 to 1.7m tonnes in 2019. Details of the individual bog units are provided in Table 1.1 and Appendix 1. The locations of the 41 bog units are also shown in Appendix 1.

The bog units have supplied milled peat to West Offaly Power Station, Lough Ree Power Station, Edenderry Power Station, Derrinlough Briquette Factory and the now closed Littleton Briquette Factory. Milled peat and sod moss have also been supplied to the horticultural market.

Bord na Móna's peat extraction and ancillary activities are described in Chapter 5 *Description of the Project* of this report.

1.2 Historical Context of Bord na Móna's Peat Extraction Activities

Bord na Móna is a semi-state agency established in 1946 under the Turf Development Act 1946 with the aim of providing security of energy supply and economic benefit for Irish Midland communities.

A historical overview of Bord na Móna's peat extraction activities and the role that Bord na Móna played in the supply of fuel and the economic growth of the Midlands is provided in Appendix 1.

1.3 Project Overview

The Substitute Consent applications relate to Bord na Móna's peat extraction activities associated with 41 bog units which form part of seven individual Integrated Pollution and Control (IPC) bog groups licenced by the Environmental Protection Agency (EPA). The bog units are

situated across counties Offaly, Westmeath, Laois, Meath, Kildare and Longford as described in Table 1.1 *Project Overview*.

Peat extraction related activities include the drainage of peat extraction areas, peat handling activities and ancillary works associated with peat extraction such as workshops, fuel storage areas and canteens. The end users of the peat include:

- Edenderry Power Plant,
- Lough Ree Power Plant;
- West Offaly Power Plant;
- Derrinlough Briquette Factory,
- Littleton Briquette Factory (now closed);
- Horticultural peat processing factories located at Kilberry (Athy County Kildare), Coolnamona (Portlaoise, County Laois) and Ballivor (County Meath); and
- Retail and domestic users.

Table 1.1: Project Overview

Ref	Bog	Bog Group	Functional Area
1	Bellair Nth	Boora	Offaly and Westmeath
2	Lemanaghan	Boora	Offaly
3	Noggusboy	Boora	Offaly
4	Boora	Boora	Offaly
5	Galros	Boora	Offaly
6	Killaun	Boora	Offaly
7	Derrinboy	Boora	Offaly
8	Derryclure	Boora	Offaly
9	Monettia	Boora	Offaly and Laois
10	Killaranny	Boora	Offaly
11	Bracklin	Derrygreenagh	Westmeath
12	Carranstown	Derrygreenagh	Meath and Westmeath
13	Ballivor	Derrygreenagh	Meath and Westmeath
14	Kinnegad	Derrygreenagh	Meath
15	Ballybeg	Derrygreenagh	Offaly
16	Ballaghurt	Blackwater	Offaly
17	Daingean (Derries)	Allen	Offaly and Westmeath
18	Daingean Rathdrum	Allen	Offaly
19	Clonad	Allen	Offaly
20	Ballykeane	Allen	Offaly
21	Esker	Allen	Offaly
22	Garrymore	Allen	Laois
23	Derrylea	Allen	Offaly and Kildare
24	Ticknevin	Allen	Offaly and Kildare
25	Glashabaun Sth	Allen	Offaly and Kildare
26	Glashabaun Nth	Allen	Offaly and Kildare
27	Codd Nth (Codd 2)	Allen	Offaly
28	Codd Sth (codd 1)	Allen	Offaly

Ref	Bog	Bog Group	Functional Area
29	Ballydermot North	Allen	Offaly and Kildare
30	Ballydermot South	Allen	Offaly and Kildare
31	Blackriver	Allen	Kildare
32	Barnaran	Allen	Kildare
33	Lodge	Allen	Kildare
34	Cuil na Gun (Coolnagun)	Mountdillon	Westmeath
35	Milkernagh	Mountdillon	Westmeath and Longford
36	Coolcraff	Mountdillon	Longford
37	Gilltown	Kilberry	Kildare
38	Allen	Kilberry	Kildare
39	Prosperous	Kilberry	Kildare
40	Kilberry	Kilberry	Kildare
41	Cuil na Carton (Coolnacartan)	Cuil na Mona	Laois

1.4 Remedial EIA Report Competencies

This Remedial EIA Report (hereafter referred to as rEIA Report or rEIAR) has been project managed, co-ordinated and produced by Mott MacDonald Ireland Limited.

Mott MacDonald are also responsible for preparing key chapters of this rEIAR.

In addition, expert consultants have been commissioned for technical chapters, based on their expertise and experience in peatlands and the receiving environment as detailed in Table 1.2.

Mott MacDonald is a corporate member of the Institute of Environmental Management and Assessment and holds its EIA Quality Mark. The Quality Mark Scheme allows organisations that lead the co-ordination of statutory EIAs to make a commitment to excellence in their EIA activities and have this commitment independently reviewed.

Mott MacDonald is a multidisciplinary consultancy with over 20 years' experience of undertaking complex and challenging environmental impact assessments and of writing environmental impact assessment reports for a wide range of projects. These include some of the world's largest infrastructure, engineering and development projects. Mott MacDonald maintains high professional standards amongst staff both individually and across technical areas of practice.

Individually our technical staff are subject to annual performance reviews which evaluate their Continued Professional Development. As a business we maintain technical "Practices" which are internal professional networks that span organisational and geographical boundaries. These help us to maintain high professional standards across technical disciplines as well as facilitating our contribution to the wider development of the Environmental Consulting industry.

Table 1.2: rEIAR Project Team

Organisation	Chapter Heading
Mott MacDonald	Project Management
Mott MacDonald has been involved in the practice of formal environmental impact assessment since the publication of the original *1985 EIA Directive*. Specifically in relation to the assessment of the environmental impacts of peat extraction, Mott MacDonald in Ireland have been involved in the environmental assessment of same for a range of projects over the last 6 years for Bord na	Environmental Impact Assessment Scoping Chapter 1 Introduction Chapter 3 EIA Methodology

Organisation	Chapter Heading
Móna involving the preparation of planning applications, environmental impact statements and Appropriate Assessment Screening Reports/Natura Impact Statements. The following individuals are responsible for the delivery of the Chapters / Specialist Topics: **Donna Hassett** Donna is the Project Manager on the project responsible for the delivery of the rEIAR. Donna has extensive experience as a Senior Consent and Environmental Consultant on Bord na Móna peat extraction projects. Donna successfully delivered the planning application, including an Environmental Impact Statement and a Natura Impact Statement, for the continued use and operation of Edenderry Power Plant. Donna also managed the IPC licence review for the Peat Extraction EIA / AA across approximately 75,000 hectares (ha) and the ecological baseline evaluations and ecological impact assessments of peat extraction activities across 36,000 ha of Bord na Móna 's lands supplying peat fuel to West Offaly Power and Lough Ree Power. **Bernard Dee** Bernard Dee is responsible for day-to-day management, quality assurance, co-ordination and collation of the EIA deliverables. Bernard has a 30-year career in planning and environmental practice, and primarily specialises in strategic planning and consenting processes for large scale infrastructural projects. Bernard has had a career encompassing town planning in local government, central government, semi-state and the private sector across a range of project types and scales. It is this mix of positions across the entire planning spectrum that gives Bernard the breadth and range of experience that he brings to projects. He has led interdisciplinary teams in the production of EIARs in support of Strategic Infrastructure Development (SID) applications to An Bord Pleanála as well as managing the consenting procedures for these SID applications. Most recently Bernard has been engaged in the electrical infrastructure field acting as both a consultant (ESB International) and as a project manager (EirGrid) on multiple SID projects. As a Senior Inspector in An Bord Pleanála (Planning Appeals Board) Bernard conducted Oral Hearings into large and complex cases with high public profile. **Caroline Lew** Caroline Lew holds an MSc in Environmental Science and has 13 years' experience in environmental consultancy. Caroline is experienced in co-ordinating and managing Environmental Impact Assessments for large scale infrastructure projects. **Rita Mansfield** Rita is a qualified ecologist with over fifteen years' experience in environmental consultancy services. Rita is experienced in the management, co-ordination and delivery of large-scale environmental projects for a variety of public and private sector clients. Rita's particular area of expertise is in complex Appropriate Assessments *(Habitats Directive*). She was the Senior Ecologist for the delivery of the NIS for Edenderry Power Plant. The NIS assessed and mitigated effects on the Long Derries SAC and the River Barrow and River Nore SAC as well as the in-combination impacts of peat harvesting. The potential impacts of the project concerned habitat damage by alterations of hydrology and by dust deposition. Planning permission (PL19.245295) was successfully obtained for the continued use and operation of the site in December 2016.	Chapter 4 Planning and Policy Context Chapter 5 Description of the Project Chapter 6 Consultation Chapter 7 Noise and Vibration Chapter 8 Air Quality Chapter 9 Climate Chapter 11 Surface Water Chapter 14 Cultural Heritage Chapter 15 Traffic and Transportation Chapter 16 Landscape and Visual Chapter 17 Population and Human Health Chapter 18 Material Assets Chapter 19 Interactions of the Foregoing

Organisation	Chapter Heading
Maria Pooley Maria has over 12 years' experience working in climate adaptation and climate resilience assessments, focussing primarily on the transport and energy infrastructure sectors. She has extensive experience of climate adaptation and resilience assessments within EIA and is currently lead author on the soon-to-be issued 2nd edition of the IEMA guidance 'Climate change adaptation and resilience in EIA'. She has worked on the climate assessment within a number of high profile EIAs, including HS2 Phase 2b and the Heathrow expansion before it was paused. She has also worked on a number of transport and wider infrastructure EIAs, developing and reviewing climate resilience assessments, ensuring they follow current industry best practice, reflect and make accurate use of the latest available climate projections (UKCP18 in the UK). **Alex Greenwood** Alex is an MSc qualified Chartered Environmentalist specialising in carbon management and assessment, a Member of the Institute of Environmental Management & Assessment (IEMA) with 12 years environmental assessment experience. She has multi-sector experience, including working on major transport and power sector projects. Alex has considerable experience of climate mitigation assessments within ESIA, as well as in data management and assessment for carbon footprinting and managing carbon reduction.	
BioSphere Environmental Services (BES). Lead by Dr Brian Madden, Principal Ecologist, BA (Mod.), PhD, MCIEEM, the project team includes three highly qualified (all to PhD level) and experienced peatland ecologists from BES. Of particular note is that the key team members have worked on projects which will be directly relevant to the IPC licence review project, namely: › Terrestrial and ornithological assessments of peat fuel harvesting and supply › Bird surveys (winter and breeding) on Bord na Móna midland raised bog sites. › Major infrastructural projects affecting peatland habitats, including the Owenniny Wind Farm, County Mayo (since 2009) and the Connemara 110 kV Reinforcement Project (ESB, 2011-2014) BES regularly works as an expert witness in relation to ecological issues	Chapter 10 Biodiversity
Hydro-Environmental ltd Anthony Cawley BE, M.Eng.Sc, C.Eng, M.I.E.I Anthony Cawley Consultant Hydrologist with Hydro Environmental in association with Bord Na Móna carried out the Flood Risk Assessments of the subject Bogs. The involvement of Anthony Cawley was in setting out the methodology of the flood risk analysis for the bogs, the review of flood inundation results and methodologies, input to the flood risk management and justification tests and in structuring and reviewing the flood risk assessment report. Anthony Cawley qualified with an honours degree in Civil Engineering from NUI Galway in 1987 and a post graduate master's degree in Engineering Hydrology from NUI Galway in 1990. He is a Chartered Civil Engineer with Specialist education and 28 years professional consulting experience in the water engineering field in a wide variety of activities relating to hydrology, hydrogeology and flooding, and hydrodynamic and hydraulic assessment of fluvial and tidal processes. Mr. Cawley has carried out well over 200 flood risk assessment studies on rivers, estuaries and coastal areas throughout Ireland. These studies ranged from scoping type assessments to detailed flood risk assessments involving hydrometric measurements river channel survey, hydraulic modelling and flood inundation mapping. Mr Anthony Cawley has successfully completed and defended at the oral hearing the hydrology, hydrogeology, geology and soils component of the EIS assessment for numerous road schemes and infrastructure projects over the past Fifteen years.	Chapter 12 Flood Risk

Organisation	Chapter Heading
Expert witness on hydrology and flooding related issues at numerous Oral Hearings for major Infrastructure projects (such as many of the Motorways, M6, M20/M21 N23, Landsdown Stadium redevelopment,). Also retained as an expert consultant to An Bord Pleanála for the Dublin Docks Gateway and Alexandra Basin projects in respect to flooding and hydrodynamic processes and is experienced in the requirements of SEA and AA. Hydrology Expert on behalf of ESB involved in Court proceedings in respect to the River Lee Flooding of Cork City in November 2009 UCC v's ESB.	
Hydro-Environmental Services (HES) Lead by Michael Gill (P.Geo., B.A., B.A.I., M.Sc., Dip. Geol, MIEI) Hydro-Environmental Services (HES) are a specialist hydrological, hydrogeological and environmental practice which delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland. HES's core areas of expertise and experience includes soils, subsoils, geology, hydrology and hydrogeology. HES routinely complete impact assessments for land soils and geology, hydrology and hydrogeology for a large variety of project types. Michael Gill (P.Geo., B.A., B.A.I., M.Sc., Dip. Geol, MIEI) regularly works as an expert witness in relation to geology, hydrogeology and peatland hydrology.	Chapter 13 Land Soils and Groundwater

1.5 Structure of the rEIAR

The Structure of this rEIAR is presented in Table 1.3. A standalone Non-Technical Summary also accompanies the substitute consent application.

Table 1.3: Structure of the rEIAR

Chapter	Topic
Chapter 1	Introduction
Chapter 2	Need for the Project and Alternatives Considered
Chapter 3	EIA Methodology
Chapter 4	Planning and Policy Context
Chapter 5	Description of the Project
Chapter 6	Consultation
Chapter 7	Noise and Vibration
Chapter 8	Air Quality
Chapter 9	Climate
Chapter 10	Biodiversity
Chapter 11	Surface Water
Chapter 12	Flood Risk
Chapter 13	Land, Soils and Groundwater
Chapter 14	Cultural Heritage
Chapter 15	Traffic and Transportation
Chapter 16	Landscape and Visual
Chapter 17	Population and Human Health
Chapter 18	Material Assets
Chapter 19	Interactions of the Foregoing

1.6 Limitations and Difficulties Encountered

Bord na Móna have been extracting peat from these bogs for many decades. Peat extraction commenced on the earliest bogs that form part of this application in the late 1940's. The retrospective impact assessments have been carried out based on the reasonable availability of information relating to the peat extraction operations and the environment. In addition to references within this rEIAR, the assessments have been limited by the following:

- While every effort has been made to source historical baseline environmental data within the timeframe of the Substitute Consent process, this rEIAR has been limited by the availability, completeness, accuracy, age and accessibility of publicly available data.
- Due to uncertainties, Green House Gas (GHG) emissions as a result of waterborne carbon losses or fires were not included in the assessment but are indicated to be *Good Practice* in the 2013 *Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands* the impact of rehabilitation methods on peat bogs which have ceased production was not included in this assessment as only the operational time period was considered).
- Data on quantities and uses of harvested peat was not available for each bog unit for the period 1985 – 1991 and was limited for the period 1992 to 2001 where horticultural peat was not included and limited for the period 1992 to 2012 where off-site usage destinations were not available.

2 Need for the Project and Alternatives Considered

2.1 Introduction

Article 5 of the Environmental Impact Assessment (EIA) Directive as amended by Directive 2014/52/EU states that the information provided in an Environmental Impact Assessment Report (EIAR) should include a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the final choice, taking into account the environmental effects.

This section of the rEIAR contains details of the project justification and alternatives considered.

2.2 Project Justification

Bord na Móna was formally set up in 1946 when the Turf Development Board was established as a statutory corporation under the title of Bord na Móna. At this time, the motivation for its establishment was equally social as it was economic. A strategic energy supply could be guaranteed, and, in the process, industrial employment could be provided, thus avoiding emigration, or rural depopulation. Since its establishment, Bord na Móna has acquired and developed approximately 80,000 ha of bogland which, in turn, has supported whole communities primarily in the Irish midlands.

While Bord na Móna peat extraction has provided fuel for electricity, heating and peat for horticulture use while sustaining communities in the midlands for the last 80 years, in recent years the company have accepted the need to move away from peat extraction, in a planned, orderly, and just manner.

In this application Bord na Móna are applying for Substitute Consent to regularise the planning status of its historic peat extraction (and ancillary works) for the bogs that are intended to be used by Bord na Móna in the future for peat production. Regularisation of the planning status of other bogs that have ceased peat production will be applied for at a later stage as required.

The justification for this project, which is the regularisation of past peat extraction in the bogs included in the application, and the need for peat production in these bogs since 2012 is set out below.

2.2.1 Edenderry Power Station

Peat was required for the co-firing of Edenderry Power Station with biomass under the existing planning permission which has been in place since 2015. Co-fuelling with biomass commenced in Edenderry Power Station in 2008 and prior to this, the station was fuelled on 100% peat.

The use of biomass has facilitated the orderly and regulated move away from energy peat by reducing the peat supplied to Edenderry Power Station since co-firing with biomass began. This Bord na Móna policy was consistent with government policy under the Just Transition, as referred to in the Government's Climate Action Plan.

2.2.2 Derrinlough Briquette Factory

Since 2018, Derrinlough briquette factory is the only remaining peat briquette factory in Ireland. For many years the factory has manufactured a fuel that has been used by a large number of domestic customers and householders that are not typically connected to networked heating infrastructure. In particular, by a disproportionately high number of households vulnerable to 'fuel poverty.

2.2.3 Horticultural Industry

Bord na Móna Horticulture has focussed on the manufacture, marketing, and sale of quality growing media products to both hobby gardeners and professional growers in 30 countries around the world.

The recent Key Issues Consultation Paper published by the Department of Culture, Heritage and the Gaeltacht states that "…*the Irish commercial horticultural industry makes a very significant contribution to the Irish gross agricultural output with a farm gate value of €437 million in 2018*.". This industry employs 6,600 persons directly and 11,000 persons indirectly. It is estimated that approximately 50% of the total industry output of €437m is dependent on peat as a growing medium. There have been ongoing efforts in the industry to use peat free substrates, however due to the variability and lack of uniformity a suitable alternative is not yet available. The Minister for Culture, Heritage and the Gaeltacht's recent consultation on the use of peat in the Horticulture Industry, opines that 'there is not at present a technically, environmentally suitable alternative material that could replace peat in professional horticultural crop production'. This project is required to support this industry.

Bord na Móna has been at the forefront of reducing peat in its retail compost products by operating substantial green waste composting operations in both the UK and Ireland production facilities in recent years. Bord na Móna have also introduced the use of coir and green compost into some of its retail ranges in both the Irish and UK markets. Bord na Móna have also launched peat free ranges in both Ireland and the UK.

2.2.4 Summary of Reduction in Peat Harvesting

In recent years Bord na Móna has addressed the need for decarbonisation with its Brown to Green strategy which accelerates the move away from peat into other businesses.

The continued extraction of peat has facilitated the transition phase which will see Bord na Móna become a leading provider of renewable energy on the island of Ireland, a leader in high-value recycling and provider of a range of new low carbon goods and services while ensuring they remain a very significant employer in the Midlands. There are currently over 800 persons directly employed by Bord na Móna in the peat industry and a significant additional number employed indirectly. This project, by regularising the planning status on the bogs included in this application, will ensure that Bord na Móna can continue to fulfil its mandate of creating and maintaining employment in the Midlands.

The extraction of peat in recent years has provided revenue for Bord na Móna to further develop their new decarbonisation, or Brown to Green, strategy. This revenue has been, and will be, utilised to develop and expand Bord na Móna's renewable energy businesses, supporting Government Policy. It has also been used to invest in the development of new business opportunities leveraging off Bord na Móna's key assets including their people and land bank to create and support sustainable employment in the midlands.

This project, the regularisation of peat extraction since 2012, will ensure that Bord na Móna can continue to provide essential services and products and will also protect local economies while ensuring the phased transition to alternative renewable and sustainable employment.

2.3 Alternatives Considered

2.3.1 Alternatives Locations Considered

Since its establishment, Bord na Móna has acquired approximately 80,000 ha of bogland, the majority of which was developed for the economic benefit of the country. The bogs included in this Substitute Consent application account for less than 23,000 ha. The bogs included are those located in proximity to the Derrinlough Briquette factory and the Edenderry Power Station as well as bogs suitable for the supply of horticultural peat.

The bogs included in this application are selected on the following criteria:

- Bogs that have been in production for many years and with suitable and adequate remaining peat for the supply of fuel and horticultural peat products;
- Bogs in proximity and accessible by rail to Derrinlough Briquette factory;
- Bogs in proximity and accessible by rail to Edenderry Power Station;
- Horticultural Bogs with suitable peat and road connection for the haulage of peat.

The bogs included in this application have been drained, developed and been in production for many years, some as far back as the 1940s.

Over the years Bord na Móna have exited bogs for conservation reasons. In the early 1970's one of Bord na Móna's staff Mr. Tom Barry (1915-1996), Peatland Environmental Officer, recognised and advocated the need to conserve and protect the best remaining examples of bogs for future generations. Mr. Barry championed the conservation of bogs in Ireland both on the national and the international stages. He identified the best remaining examples of bogs and agreed with the Board and Management of Bord na Móna to set aside a number of bog areas for conservation. Pollardstown Fen and a suite of other well-known sites were purchased by the company purely for the purpose of conservation (See Table 2.1). Following on from those bogs put forward by the company for conservation in the 1970s, a further series of bogs followed in the 1980s and 1990s, including Clara Bog, All Saint's Bog, Mongan Bog and Bellacorick Flush. These included raised bog and blanket bog areas originally acquired by Bord na Móna for peat production but now set aside for conservation. The ownership and management of the majority of these sites was transferred to the National Parks and Wildlife Service (NPWS), with several sites also being transferred to An Taisce, The Irish Wildlife Trust, and the Irish Peatland Conservation Council. The majority of the sites now in ownership by the state are protected areas [Special Areas of Conservation (SACs) and Natural Heritage Areas (NHAs)] and form the core of the State's raised bog restoration protected area network.

A number of additional sites have also been set aside by Bord na Móna for conservation and bog restoration. These include an area of Killaun Bog near Birr in County Offaly and Abbeyleix Bog in County Laois. They remain in Bord na Móna's ownership but are managed for biodiversity and conservation by the local communities. Bord na Móna developed its first Biodiversity Action Plan in 2010 and its second Biodiversity Action Plan in 2016. As part of these plans, additional sites that had been selected for peat production were set aside for conservation, bog restoration, and biodiversity. Two examples include Knockahaw Bog and

Ballysorrell Bog in Counties Tipperary and Laois respectively. Both sites have now been restored as part of Bord na Móna's Raised Bog Restoration Programme.

Table 2.1: Peatlands transferred from Bord na Móna ownership for conservation.

Site	New owner	County	Area (Ha)
Pollardstown Fen	State	Kildare	28
Raheenmore	State	Offaly	162
Redwood	State	Tipperary	162
Clara	State	Offaly	461
Garriskill	State	Offaly	112
Skeskin/Knockmoyle	State	Mayo	468
Lough Easky East	State	Sligo	607
Bellacorick Iron Flush	An Taisce	Mayo	8
Mongan Bog & Finlough	An Taisce	Offaly	144
Lough Boora Mesolithic Site	Irish Wildlife Trust	Offaly	14
All Saints	State	Offaly	112
Bellinagare	State	Roscommon	580
Carrowbehy	State	Roscommon	225
Lough Lurgeen	State	Galway	31
Trien	State	Roscommon	57
Camderry/Bogauns	State	Galway	45
Clooncullann/Funshin	State	Galway	118
Lissnageeragh/Keelogues	State	Galway	186
Lough Easky West	State	Sligo	597
Curraghlehannagh/Milltown	State	Galway	160
Shankhill West	State	Galway	120
Corbo	State	Roscommon	154
Crosswood	State	Westmeath	33
Castle French East	State	Galway	35
Cloonkeerin	State	Roscommon	49
Killsallagh	State	Galway	12
Moorfield	State	Roscommon	25
Moyclare	State	Offaly	76
Carrownagappaul	State	Galway	200

Bord na Móna carried out a baseline ecological assessment of all of its properties between 2009 and 2012, as part of its Biodiversity Action Plan. Several midlands raised bogs were initially partially drained in the 1980's in anticipation of peat production but were not subsequently fully developed, having been identified as having substantial ecological and conservation value and significant bog restoration potential as they still retained natural bog vegetation. Bord na Móna decided to conserve and restore these bogs and these sites now form the core of the Bord na Móna Raised Bog Restoration programme (2009-present).

The main objective of the Bord na Móna Raised Bog Restoration programme is to restore raised bog habitats by blocking drains and restoring bog hydrology. There is also a statutory obligation on Bord na Mona under its IPC Licences to decommission and rehabilitate all of its peatlands.

The Raised Bog Restoration Programme is an action of the Bord na Móna Biodiversity Action Plan. Re-wetting the bogs can aid the development of *Sphagnum*-rich plant communities and restore peatland habitat function. The methodology used for bog restoration was developed by the NPWS under the Dutch-Irish Restoration programme in the 1990s and has also been used extensively by the NPWS and also by Coillte. Drains are blocked using peat dams constructed by a specially modified excavator.

The total area of raised bog restored as part of the Bord na Móna Raised Bog Restoration Programme to date is 3,158 ha across 26 different sites. Bord na Móna have also targeted an additional 1,500 ha as part of this programme. This will significantly aid the states biodiversity commitments to the EU Habitats Directive in relation to Annex I raised bog habitat, outlined in the 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 SACs. The then Minister for Arts, Heritage and the Gaeltacht, also published a Review of Raised Bog Natural Heritage Area Network in 2014. NPWS have assessed the majority of Bord na Móna sites listed and it is expected that a number of these sites will be designated as SACs and NHAs in the future, to replace protected sites and Annex I habitat that has been damaged or lost by turf cutting and other activities.

In addition to restoring and conserving biodiversity, this bog restoration programme can also provide significant ecosystem services including maintaining storage of carbon within these bogs and the enhancement of active peat-forming *Sphagnum*-rich vegetation within these sites, creating carbon sinks in time. Re-wetting can also help attenuate flooding within catchments and improve water quality.

Bog restoration can also help provide sites for amenity and education to local communities, such as the community led Abbeyleix Bog Project. In 2010, Moore Gun Club approached Bord na Móna about the development of a conservation project at Ballydangan in Co. Roscommon focused on Red Grouse. This site held low numbers of this peatland bird, which is particularly rare now on lowland bogs. Since then, 234 ha of the bog have been leased by Bord na Móna to this local group for the development of a community project, which now employs several local people through a community employment scheme (Department of Social Protection). While Grouse numbers remain low so far, conservation management has already boosted numbers of breeding Curlew, whose breeding population nationally has significantly declined in recent years. Ballydangan and surrounding bogs remain an important stronghold for this iconic bird species. Bord na Móna has now completed bog restoration work on Ballydangan Bog with 3,744 peat dams constructed to block drains, helping to re-wet the bog.

2.3.2 Alternative Technologies/Processes and Mitigation Measures

Bord na Móna have been involved in peat production for many years and the technology and controls have advanced during these years.

A key feature of the Third Development Programme in the mid-seventies was the introduction of specially designed silt ponds to remove silt and reduce the suspended solids levels of effluent being discharged into the arterial drainage system. While initially introduced and trialled in Oweninny, County Mayo, silt ponds were gradually adopted across all active and newly developed bogs. The provision of many silt ponds was carried out in advance of the requirement to do so in the IPC licences issued for peat extraction in 2000.

Bord na Móna are currently providing assistance in a University College Dublin (UCD) project, *Strategies to improve Water Quality from Managed Peatlands*, (SWAMP) which is funded under the EPA Research Programme. The aim of this project is to investigate the pressures on Irish waters from drained peatlands and to evaluate or develop methods and treatment technologies at site levels and develop best practice guidelines.

Bord na Móna are included on the steering committee of this project which is one of the measures outlined in the River Basin Management Plan to address pressures from peat harvesting. The following technologies and control measures have been adopted to address issues that arose or were likely to arise in Bord na Móna bogs:

- Bord na Móna has developed and rolled out hydraulic harrows in dust sensitive areas to allow the operator to lift the harrow spoons while turning and travelling on headlands, thereby reducing the volume of dust that might become air-borne;
- Tea-centres and stockpiles have been relocated to more remote locations in the bog, away from the prevailing south westerly winds;
- To address waste stockpile plastic, Bord na Móna developed a polywrapper attachment for a tractor that allowed the polythene to be wrapped direct from the stockpile and allowed it then to be recycled off site and processed into polymer for reuse in blown plastic film;
- Bord na Móna developed suitable training videos and training packs for the training of production operatives on cleaner production methods;
- In Mountdillon, Bord na Móna developed a specific headland peat unit to lift and maintain the loose peat on the bogs headlands to reduce dust levels;
- For some dust sensitive locations Bord na Móna planted natural screening to capture any fugitive dust and prevent it from depositing on neighboring properties;
- Bord na Móna instigated fire patrols with some staff trained in firefighting;
- Bord na Móna commenced a fire warden programme in 2012 originating on lands outside our boundary. This comprised Bord na Móna volunteers who were trained and equipped to patrol our peatlands once weather conditions and associated bog fire risk was high;
- Bord na Móna achieved certification to ISO9001 the quality management system which installed a management system around peat production, sales and transport and maintenance;
- Bord na Móna achieved certification to ISO50001, the energy management system, to better measure and manage our energy use and associated carbon footprint;
- Bord na Móna developed an Archaeological Code of Practice agreement with the Department of Culture, Heritage and the Gaeltacht (DCHG) and the national Museum of Ireland (NMI) for how we manage our archaeological obligations.

3 EIA Methodology

3.1 Introduction

This chapter presents the requirement for a rEIA for the project and provides a description of the methodology applied to the preparation of this rEIAR.

3.2 Environmental Impact Assessment Screening

An EIAR is required to accompany a planning application for development of a class set out in Schedule 5 of the Planning and Development Regulations 2001, as amended which equals or exceeds, as the case may be, a limit, quantity or threshold set out for that class of development.

Schedule 5, Part 2 of the Planning and Development Regulations 2001 as amended includes:

> *"Peat extraction, including any related drainage of bogland, which would involve a new or extended area of 30 hectares of more."*

Peat extraction was categorised as exempted development under the Planning and Development Regulations 2001:

> *Class 17 (b) "Peat extraction in a new or extended area of 10 hectares or more, where the drainage of the bogland commenced prior to the coming into force of these Regulations."*

In August 2018, the Planning and Development Act 2000, as amended was amended by the Environment (Miscellaneous Provisions) Act 2011 which came into force in September 2012. The amendments included the following substitution for subsection 4 of the Act of 2000:

> *"(4) Notwithstanding paragraphs (a), (i), (ia) and (l) of subsection (1) and any regulations under subsection (2), development shall not be exempted development if an environmental impact assessment or an appropriate assessment of the development is required."*

Bord na Móna's peat extraction activities in the 41 bog units to which this rEIAR pertains, have extended over an area in excess of 30 ha. Therefore, Substitute Consent is required for historic peat extraction activities. This rEIAR has been prepared to accompany Bord na Móna's Substitute Consent applications for the 41 bog units that comprise the project.

3.3 EIA Directive

Directive 2014/52/EU amended the previous *EIA Directive (2011/92/EU)* on the assessment of the effects of certain public and private projects on the environment. *S.I. No. 296 of 2018* amended the *Planning and Development Act 2000* and the *Planning and Development Regulations 2001* in order to transpose into Irish Law the provisions of *Directive 2014/52/EU.*

The Directive requires that the EIAR provides:

> *"A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the*

project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge."

Article 3 states that the EIA shall:

"identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of the project on the following factors:

a) Population and human health;
b) Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;
c) Land, soil, water and climate;
d) Material assets, cultural heritage and landscape;
e) The interaction between the factors referred to in points (a) to (d).

Article 5 states that an EIAR shall include at least:

"a) a description of the project comprising information of the site, design, size and other relevant features of the project;

b) a description of the likely significant effects of the project on the environment;

c) a description of the features of the project and/or measures envisaged in order to avoid, prevent or reduce, and if possible, offset likely significant adverse effects on the environment;

d) a description of the reasonable alternatives studied by the developer which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment.

e) a non-technical summary of the information referred to in (a) to (d); and

f) any additional information specified in Annex IV relevant to the specific characteristics of a particular project or type of project and to the environmental features likely to be affected.

Annex IV requires *that 'the description of the likely significant effects on the factors specified in Article 3(1) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short term, medium term and long term permanent and temporary, positive and negative effects of the project. The description should take into account the environmental protection objective established at Union or member State level which are relevant to the project.'*

In addition, Annex IV requires:

"*A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved."*

3.4 Regulations and Guidelines

This rEIAR identifies, describes and presents an assessment of the retrospective impacts of the project on the environment, focusing on effects that are both likely and significant.

This rEIAR has been prepared in line with the following regulations and guidelines. Additional specialist guidelines are referenced in the technical chapters.

- Planning and Development Acts, 2000 to 2020, as amended, and associated Regulations.
- Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Statements (Draft 2017);
- Environmental Protection Agency (EPA) Advice Notes for Preparing Environmental Impact Statements (Draft 2015)
- Department of Housing, Planning and Local Government (2018) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment;
- European Commission Environmental Impact Assessment of Projects, Guidance on the preparation of the Environmental Assessment Report (*Directive 2011/92/EU* as amended by *2014/52/EU), 2017.*
- *European Communities (Environmental Impact Assessment) Regulations, 1989 to 2006*

In addition, specific reference documents are cited within specialist chapters of this EIAR, as appropriate.

3.5 Temporal Scope

Bord na Móna have carried out peat extraction on the 41 bog units for many decades (from 1948). This creates difficulties in defining the conditions prior to any activity taking place. Thus, this rEIAR describes changes that have occurred in the environment in the past as a result of peat extraction as far as possible in the context of a description of the current baseline environment. The retrospective impact assessments consider the consequences of change with regard to peat extraction activities and other activities (such as agriculture, forestry, channelization of watercourses, construction of weirs etc).

The temporal scope of this rEIAR is dealt with in the following manner:

- Historical context pre- September 2012: for robustness the rEIAR considers impacts associated with changes prior to 2012 in line with the coming into force of the *EIA Directive (85/337/EEC).* In many instances lack of available baseline information limits this to a description of the environment at the time, and it may not be possible to robustly assess the impact of peat extraction activities during this period. Difficulties in locating data have been recorded and referenced in the '*Limitations and Difficulties Encountered*' section of this rEIAR.
- September 2012 – Present day (2020) - having regard to the *Environment (Miscellaneous Provisions) Act 2011,* refer to Section 2.2 *Environmental Impact Assessment,* the remedial impact assessments will consider changes to the baseline environment between September 2012 and present day. This assessment will be based on publicly available information and Bord na Móna data. Data sources used to make this assessment are referred to in each technical chapter of this rEIAR.

3.6 Spatial Scope

Spatial (or geographical) scope refers to the area over which the rEIAR considers effects. Given the spatial area of the project, the impact assessments are based on macro level assessments where possible (i.e. surface water catchment areas or functional areas) where macro level approaches are not appropriate, assessments are based on individual bog units.

Ultimately, the environmental sensitivity of the surrounding geographical areas and the establishment of source-pathway-receptor linkages (i.e. the zones of influence) will determine the extent of the area to be assessed as part of the EIAR. This is defined in each of the technical chapters of the EIAR.

3.7 Identification of Likely Significant Impacts

Where appropriate and unless otherwise stated, the evaluation of historical impacts on the environment has been evaluated according to the criteria outlined in Table 3.1 below and as referenced in EPA Draft Guidelines 2017.

Table 3.1: Description of Effects

Description of Effects	
Quality of Effects It is important to inform the non-specialist reader whether an effect is positive, negative or neutral	**Positive Effects** A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).
	Neutral Effects No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error
	Negative/adverse Effects A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).
Describing the Significance of Effects ''Significance' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful (also see Determining Significance below.).	**Imperceptible** An effect capable of measurement but without significant consequences.
	Not significant An effect which causes noticeable changes in the character of the environment but without significant consequences
	Slight Effects An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
	Moderate Effects An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
	Significant Effects An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
	Very Significant An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
	Profound Effects

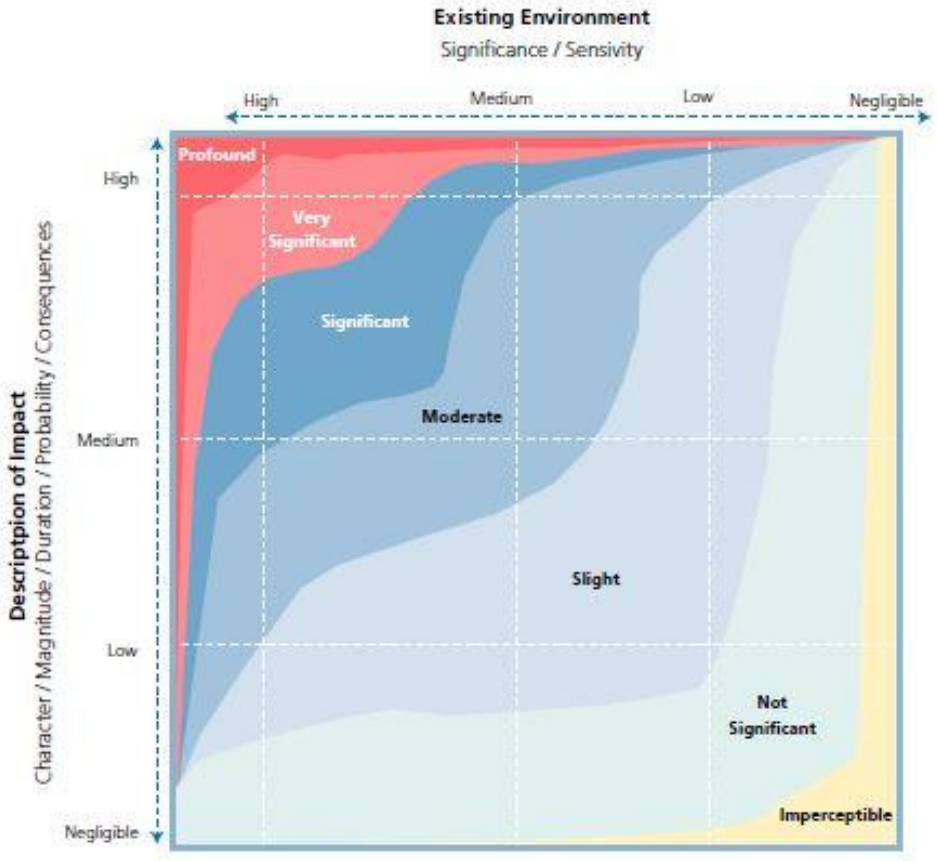
Description of Effects

	An effect which obliterates sensitive characteristics
Describing the Extent and Context of Effects Context can affect the perception of significance. It is important to establish if the effect is unique or, perhaps, commonly or increasingly experienced.	**Extent** Describe the size of the area, the number of sites, and the proportion of a population affected by an effect.
	Context Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?)
Describing the Probability of Effects Descriptions of effects should establish how likely it is that the predicted effects will occur – so that the CA can take a view of the balance of risk over advantage when making a decision.	**Likely Effects** The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.
	Unlikely Effects The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.
Describing the Duration and Frequency of Effects 'Duration' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful	**Momentary Effects** Effects lasting from seconds to minutes
	Brief Effects Effects lasting less than a day
	Temporary Effects Effects lasting less than a year
	Short-term Effects Effects lasting one to seven years.
	Medium-term Effects Effects lasting seven to fifteen years
	Long-term Effects Effects lasting fifteen to sixty years
	Permanent Effects Effects lasting over sixty years
	Reversible Effects Effects that can be undone, for example through remediation or restoration
	Frequency of Effects Describe how often the effect will occur. (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually)
Describing the Types of Effects	**Indirect Effects (a.k.a. Secondary Effects)** Impacts on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.
	Cumulative Effects The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.
	'Do-Nothing Effects' The environment as it would be in the future should the subject project not be carried out.
	`Worst case' Effects The effects arising from a project in the case where mitigation measures substantially fail.
	Indeterminable Effects

Description of Effects	
	When the full consequences of a change in the environment cannot be described.
	Irreversible Effects When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
	Residual Effects The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic Effects Where the resultant effect is of greater significance than the sum of its constituents, (e.g. combination of SOx and NOx to produce smog).

The significance of a potential impact is defined by the sensitivity of the receiving environment and the character of the predicted impact as shown in Figure 3.1. In some cases, magnitude or significance cannot be quantified with certainty, and in these cases professional judgement remains the most effective way to identify the significance of an impact.

Figure 3.1: Impact Assessment Methodology



Where significance of an effect is “High” or “Medium” (negative), mitigation is required.

3.8 Mitigation and Monitoring

There are four established strategies for the mitigation of effects - avoidance, prevention, reduction and offsetting.

Mitigation measures and monitoring that has been implemented for each environmental topic are set out in the technical chapters in the rEIAR.

3.9 Cumulative Effects

Cumulative or in-combination effects take account of the addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects. While a single activity may itself result in a minor impact, it may, when combined with other impacts (minor or significant), result in a cumulative impact that is collectively significant.

Cumulative effects considered in the assessment of each environmental topic take account of the following activities:

- third party operators that have operated within Bord na Móna's IPC licensed areas including contractors and private domestic sod peat cutting, including operators who were relocated in agreement with the National Park and Wildlife Service (NPWS) and those with established turbary rights.
- Rail lines, machine passes and drains constructed prior to 2012 are considered exempted development, and any impacts arising therefrom are assessed as cumulative impacts;
- Other Bord na Móna activities such as forestry, biomass, wind farms, fish farming and waste management etc.
- Wastewater treatment works,
- Agricultural activities.
- Facilities operating under IPC or industrial emissions licences (IEL) in proximity to the 41 bog units have been considered in the determination of cumulative effects.

3.9.1 Do-Nothing Effects

As outlined in the Draft *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA, 2017), the description of Do-Nothing effects relates to *the environment as it would be in the future should the subject project not be carried out*. In the context of this Substitute Consent application, the activities have already occurred. Do Nothing effects are therefore not considered further in this rEIAR.

3.10 Transboundary Effects

The nearest Bog Group (Mountdillon Bog Group) to Northern Ireland is located over 40 kilometres (km) from the border. In addition, there is no hydrological connectivity between the bogs and watercourses in Northern Ireland. Past peat extraction within the 41 bog units have not resulted in any significant effects on the environment of another country. Transboundary effects are therefore not considered further in this rEIAR.

3.11 Residual Impacts

Any likely significant impacts that have continued to exist post the mitigation and monitoring measures that have been implemented in the past are assessed for each environmental topic.

4 Planning and Policy Context

4.1 Introduction

This section of the remedial Environmental Impact Assessment Report (EIAR) presents the Planning and Policy Context of the project, both in terms of the historic and the current baseline policy context. This chapter describes the context at a European, National, Regional and Local level.

4.2 European Union Policy Context

4.2.1 European Green Deal and Just Transition

In December 2019, the EU Commission President Ursula von der Leyen launched the European Green Deal. This European Green Deal provides a legislative roadmap to translate the political ambition of Europe becoming the world's first climate neutral continent by 2050. The Green Deal also outlines investments needs and future financing tools and explains how to ensure a just and inclusive transition.

It concedes that in specific Regions across the EU, transitioning to a climate neutral economy will required substantial investment and acknowledges that the 'transition' will take time.

The EU Commission have formally designated specific geographical areas as 'Regions in Transition. 'These 'Regions in Transition' are traditionally home to the extractive fossil fuel sector, for example coal, lignite, peat and oil shale. The Irish Midlands is expressly recognised by the EU Commission as one of just 42 'Regions in Transition' and will be eligible to participate in the associated Just Transition Funding Mechanism in the coming years.

All of the 41 bogs are within the region defined as the Irish Midlands.

4.2.2 Renewable Energy Directive (RED)

The original Renewable Energy Directive 2009/28/EC (known as RED) established a regulatory framework for the promotion of the use of energy from renewable sources which set binding national targets on the share of renewable energy in energy consumption and in the transport sector to be met by 2020. Its overall aim was to make renewable energy sources account by 2020 for 20% of EU energy and for 10% of energy specifically in the transport sector (both measured in terms of gross final energy consumption, i.e. total energy consumed from all sources, including renewables). Ireland has a binding national overall target for renewable energy consumption of 16% in 2020. In order to achieve this target, the Irish Government decided that 40% of electricity consumed in 2020 will be generated using renewable energy sources with targets of 10% and 12% in transport and heat, respectively. At present, based on Sustainable Energy Authority of Ireland (SEAI)'s national projections, Ireland is expected to fall short of its mandatory European target for a 16% renewable energy share by 2020, with overall achievement approximately 14.2% by 2020 based on current progress.

4.2.3 Recast Renewable Energy Directive (RED II)

In 2014, the European Commissions '*A policy framework for climate and energy in the period from 2020 to 2030'*, established a framework for future European Union (EU) energy and

climate policies and promoted a common understanding of how to develop those policies after 2020. The Commission proposed that the EU 2030 target for the share of renewable energy consumed in its Member States should be at least 27%.

That proposal was endorsed by the European Council which also advised that Member States should be able to set their own, more ambitious, national targets in order to deliver their planned contributions to the Union 2030 target and exceed them. Also in 2014, the European Parliaments publication '*A 2030 framework for climate and energy policies*' and 2016 publication '*The renewable energy progress report'*, went further than '*A policy framework for climate and energy in the period from 2020 to 2030',* stressing that, in light of the Paris Agreement and the recent renewable technology cost reductions, it was desirable to be significantly more ambitious. The ambition set out in the Paris Agreement as well as technological developments, including cost reductions for investments in renewable energy, led to new objectives being set in the recast Renewable Energy Directive 2018/2001 (known as RED II).

RED II established a binding target of at least 32% of renewable energy for the EU by 2030. This target will be reviewed upwards in light of substantial cost reductions in the production of renewable energy, the EU's international commitments for decarbonisation, or in the case of a significant decrease in energy consumption in the EU. Member States are required to establish their contribution to the achievement of that target as part of their integrated national energy and climate plans. Also, in RED II, the Commission encouraged investments in new, flexible and clean technologies, and established an adequate strategy to manage the retirement of technologies which do not contribute to the reduction of emissions or deliver sufficient flexibility, based on transparent criteria and reliable market price signals. This Directive therefore has directly influenced the national policy context specifically relating to energy and renewable energy in Ireland, as discussed in the following section.

4.3 National Policy Context

4.3.1 Government White Paper – Ireland's Transition to a Low Carbon Energy Future 2015-2030

The Government White Paper entitled *Ireland's Transition to a Low Carbon Energy Future 2015-2030* sets out a framework to guide Ireland's energy policy development. This White Paper sets out to guide policy and actions that the Irish Government intends to take in the energy sector up to 2030 and also reaching out to 2050. The framework was developed in the context of the significant role played by European institutions in determining energy policy, markets and regulation. Similarly, it takes account of European and international climate change objectives.

The overall vision within the White Paper means that greenhouse gas (GHG) emissions from the energy sector will be reduced by between 80% and 95%, compared to 1990 levels, by 2050, and will fall to zero or below by 2100. However, specifically in terms of non-renewable energies such as peat bogs, the White Paper notes that:

''Fuels with higher carbon content (peat and coal) will become relatively more expensive and be replaced over time by fuels with lower carbon content, for example natural gas and renewables''.

The White Paper also includes reference to Bord na Móna's 2030 Sustainability report, which notes that its strategy to complete the replacement of large-scale peat production with alternative energy sources, including biomass, wind and solar will be complete by 2030.

4.3.2 Climate Action Plan 2019

The Climate Action Plan 2019 (CAP) sets out a 'roadmap' comprised of 183 no. actions to achieve net zero carbon energy system by 2050, and in the process, create a resilient, vibrant and sustainable country.

The CAP therefore commits Ireland to aim for at least 70% of Ireland's electricity supply to be generated from renewables by 2030 with no generation from peat and coal. To achieve Ireland's 2030 target, a detailed sectoral roadmap has been designed to deliver a cumulative reduction in emissions over the period 2021 to 2030 of 58 4 MtCO2eq. The analysis presented in the CAP shows that it is both technically feasible to meet the 2030 EU target, and also economically achievable.

In terms of peat bogs, the CAP notes that Bord na Móna will transition away from peat by 2028. The CAP also recognises that of the 50,000ha of Bord na Móna's land holding most, if not all of this land holding is under consideration for a wide variety of commercial future uses of which renewable energy projects constitute the greatest proportion.

4.3.3 National Mitigation Plan 2017

The first National Mitigation Plan (NMP) represents an initial step for Ireland on a pathway to achieve decarbonisation. The measures that will be implemented through this first plan will lay the foundations for transitioning Ireland to a low carbon, climate resilient and environmentally sustainable economy by 2050. The Government recognises that this first plan does not provide a complete roadmap to achieve the 2050 objective but begins the process of development of medium to long term mitigation choices for the next and future decades. The strategic aims of the NMP include:

- Policy will contribute to reductions in Ireland's greenhouse gas emissions and enhancement of sinks in a manner that achieves the optimum benefits at least cost;
- A stable and predictable policy and regulatory framework will be underpinned by rigorous analysis and appraisal, supported by strong research and analytical capacity; and
- The Government will pursue investment, innovation and enterprise opportunities towards building a competitive, low carbon, climate-resilient and environmentally sustainable economy.

In the context of Bord na Móna, the NMP identifies that fossil fuel subsides have potential to make fossil fuels more commercially attractive than some renewable energy types, which in turn acts as a barrier to carbon reduction. Therefore, the NMP outlines that these subsidies need to be identified and removed so that electricity supplied from peat production will no longer be subsidised. To assist the reduction of subsidised peat electricity generation, the NMP also outlines that it will support Bord na Móna in its attempt to become the largest supplier of sustainable biomass in Ireland.

4.3.4 Ireland 2040 - Our Plan (National Planning Framework) [2018]

Ireland 2040 - National Planning Framework (NPF), published by the Government in February 2018, is a 20-year planning framework designed to guide public and private investment, to create and promote opportunities for Irish citizens, and to protect and enhance Ireland's built and natural environment.

The NPF notes that the population of Ireland is projected to increase by approximately 1 million people by 2040 which will result in a population of roughly 5.7 million. This growth will place further demand on both the built and natural environment as well as the social and economic

fabric of the country. In order to strengthen and facilitate more environmentally focused planning at the local level, the NPF states that future planning and development will need to

"tackle Ireland's higher than average carbon-intensity per capita and enable a national transition to a competitive low carbon, climate resilient and environmentally sustainable economy by 2050, through harnessing our country's prodigious renewable energy potential."

The NPF states that Ireland's National Energy Policy is focused on three pillars:

i. Sustainability;

ii. Security of Supply; and

iii. Competitiveness.

In line with these principals, the National Strategic Outcome 8 (Transition to Sustainable Energy), notes that in creating Ireland's future energy landscape, new energy systems and transmission grids will be necessary to enable a more distributed energy generation which connects established and emerging energy sources, i.e. renewables, to the major sources of demand. To facilitate this, NPF acknowledges the need to:

'*Reinforce the distribution and transmission network to facilitate planned growth and distribution of a more renewables focused source of energy across the major demand centres*.'

Some of the key National Policy Objectives aimed at further achieving the transition to sustainable energy include:

National Policy Objective 52: The planning system will be responsive to our national environmental challenges and ensure that development occurs within environmental limits, having regard to the requirements of all relevant environmental legislation and the sustainable management of our natural capital;

National Policy Objective 54: Reduce our carbon footprint by integrating climate action into the planning system in support of national targets for climate policy mitigation and adaptation objectives, as well as targets for greenhouse gas emission reduction; and

National Policy Objective 55: Promote renewable energy use and generation at appropriate locations within the built and natural environment to meet national objectives towards achieving a low carbon economy by 2050.

4.3.5 National Peatlands Strategy

The National Peatlands Strategy (NPS) [2015] was published by the National Parks and Wildlife Services (NPWS) of the Department of Arts, Heritage and the Gaeltacht. It set out the principles which would guide Government policy in relation to all peatlands for the period to 2025.

The Vision Statement of the strategy recognised the multi-faceted contribution of the peatlands, noting that it *'aims to provide a long-term framework within which all of the peatlands within the State can be managed responsibly in order to optimise their social, environmental and economic contribution to the well-being of this and future generations'*

The operation of the three peat-burning Midlands stations was dealt with (NPS, Para. 5.2.4) noting that peat has been used as a source of fuel for power generation since the 1950s. The role of peat as an important domestic fuel source - in the context of 85% reliance on imported fuel, was noted, as was the contribution to the economies of the Midlands:

'Bord na Móna employed substantial numbers between the late 1940s and the mid-1980s but the number has reduced to over 2,000 people now. Combined with the numbers employed by the ESB, this constituted a significant social and economic benefit for the midlands, sustaining or creating communities. While the numbers employed in this area have significantly reduced, peat production for energy remains important for the local and National economy'.

In relation to the move away from peat harvesting, the Strategy noted:

P20 As part of Ireland's commitment to move towards a cleaner, more carbon efficient economy, means to reduce the dependency on peat as a source of fuel and horticultural compost will be fully explored.

It is noted that the commitment to moving away from peat harvesting set out in the NPS is reflected in Bord na Móna's corporate position that it will cease harvesting peat for the commercial generation of electricity in the coming years. The date for this change was originally targeted as 2030. However, on October 2018, Bord na Móna announced its intention to accelerate this strategy stating:

"Decarbonisation is the biggest challenge facing this planet. For Bord na Móna it presents both a serious challenge and a national opportunity. By accelerating the move away from peat into renewable energy, resource recovery, and new businesses we are supporting national policy and seizing the opportunity presented by decarbonisation. Standing still is not an option for Bord na Móna. We are embarking on a transition phase now which will see us become a leading provider of renewable energy on the Island of Ireland by 2026, a leader in high-value recycling and provider of a range of new low carbon goods and services. Allied to all of this, a key focus of our decarbonisation plan is ensuring that Bord na Móna remains a very significant employer in the Midlands of Ireland for the decades to come.''

Three key points of the Company's accelerated decarbonisation plan that are of relevance to the proposed development are:

- a steep increase in the supply of greenhouse-gas neutral biomass replacing peat to the three Midlands power stations;
- the complete end of using peat for energy brought forward by two years to 2028; and
- an immediate steep reduction in peat volumes down from a recent high of 6.5 million tonnes in 2013 to 2 million tonnes in 2020. Fast-tracking peat reduction and cessation will carry a significant associated reduction in carbon emissions.

4.4 Regional Policy Context

The Project (41 bog units) is within the functional area of the Eastern and Midlands Regional Assembly (EMRA) which was established 1 January 2015. The principle function of the EMRA is to deliver a Regional Spatial and Economic Strategy for the region which encompasses both the spatial policy of the region and the economic policy of the region in a single guiding document. This Regional Spatial and Economic Strategy (RSES) for the EMRA was made by the EMRA on 28 June 2019 and was subject of a Ministerial decision on 14 January 2020.

4.4.1 Regional Spatial and Economic Strategy for the Eastern and Midland Region 2019-2030

The RSES acknowledges the importance of peatlands as a unique landscape which in tandem acts as a key source of employment, biodiversity, wildlife and ecotourism vital to rural areas, whilst also acknowledging the significant damage to peatlands due to peat extraction and agricultural improvement. The RSES includes guiding principles to be applied to proposed development on peatlands, these are:

- Consideration of the potential contribution of peatlands to climate change mitigation and adaptation including renewable energy production;
- Consideration of habitats and species of environmental significance;
- Consideration of the potential contribution of peatlands to an existing or proposed greenway/Blueway/peatway network;
- Consideration of the ecosystem services and tourism potential provided by peatlands; and
- Development of peatlands shall ensure that there are no negative impacts on water quality.

In terms of policy, there are a number of policies which are intended to guide development in terms of landscape character and sustaining the character of the natural environment, such as Peatbogs.

However, specifically, Policy RPO 7.29 states that, the RSES will:

'Support collaboration between local authorities, the Bord na Móna Transition Team and relevant stakeholders and the development of partnership approaches to integrated peatland management that incorporate any relevant policies and strategies such as the Bord na Móna Biodiversity Plan 2016-2021 and the national Climate Mitigation and Adaptation Plans. This shall include support for the rehabilitation and/or re-wetting of suitable peatland habitats.

4.5 Local Policy Context

The Project is within the functional area of the following six local authorities:

- Kildare County Council;
- Offaly County Council;
- Laois County Council;
- Meath County Council;
- Westmeath County Council; and
- Longford County Council.

This section provides an overview of relevant policies in the context of the Project within each local authority.

4.5.1 Kildare County Development Plan 2017 – 2023

The Kildare County Development Plan 2017-2023 (Kildare Plan) was adopted by Kildare County Council on 1 March 2017. There is a proposed variation to the plan which recently went through the first stage consultation period, therefore the proposed variation to the plan is not a material consideration.

4.5.1.1 Peatlands

In terms of peatlands (Bogs), 14% of County Kildare is covered by bogs, most of the bogs within Kildare's peatland resources are designated Special Areas of Conservation (SAC) and Natural Heritage Areas, under the Habitats Directive, therefore it is a legal requirement to protect bogs. In terms of the proposed development, the Council policy on Bogs are noted below:

- Policy BL1 advises that the Council will 'ensure that a balanced approach is taken to the development of the county's peat resources and the restoration of cutaway bogs, in order to minimise the negative impact on biodiversity and the archaeological and cultural heritage of the county;
- Policy BL2 advises that the Council will 'seek a balance between the peat extraction potential of the county, whilst ensuring the protection and conservation of bogland habitats'; and;
- Policy BL4 states the Council will 'liaise with Bord na Móna, the Irish Peatland Conservation Council, Coillte and the National Parks and Wildlife Service of the Department of Housing, Planning, Community and Local Government to ensure the sustainable use of cutaway bogland, with due consideration given to their ecological and amenity value.

4.5.1.2 Climate Change

The overall aim of the Kildare Plan in terms of Climate Change is to achieve a 'reasonable balance' between European and National Policies on climate change and enable resources to be harnessed in line with the sustainable development of County Kildare. In terms of policies on Climate Change the following general polices are relevant:

- Policy ER1 advises that the Council will ''respond to the European and National Energy Programme through the County Development Plan with policies and objectives that promote energy conservation, increased efficiency and growth of locally based renewable energy alternatives, in an environmentally and socially acceptable and sustainable manner.''

Specifically, in terms of the Project the Council will also support diversification of resources to support the reduction in Greenhouse Gas emissions, as evidenced by the policy below:

- Policy ER3 states that the Council will 'support regional, national and international initiatives for limiting emissions of greenhouse gases through energy efficiency and the development of renewable energy sources which make use of the natural resources in an environmentally and socially acceptable manner''.

4.5.1.3 Environment

The overall aim of the Kildare Plan in terms of Environment is to contribute towards the protection, conservation and management of natural heritage including sites designated at national and EU level and protected species and habitats outside of designated sites. In general terms the following polices are applicable in terms of the Project.

- Policy NH1 advises that the Council will 'facilitate, maintain and enhance as far as practicable the natural heritage and amenity of the county by seeking to encourage the preservation and retention of woodlands, hedgerows, stonewalls, rivers, streams and wetlands.

In the context of the Project there are a number of bogs which are identified as Special Areas of Conservation, (SAC) Natura 2000 sites, in this context the policy below is applicable:

- Policy NH4 states that the Council will support the conservation and enhancement of Natura 2000 Sites including any additional sites that may be proposed for designation during the

period of this Plan and to protect the Natura 2000 network from any plans and projects that are likely to have a significant effect on the coherence or integrity of a Natura 2000 Site.

4.5.1.4 Visual Impact and Landscapes

Further to the above there are a number of bogs which are identified as Natural Heritage Area's. Therefore, the Council policies on these sites are applicable and are set out below:

- Policy NH7 advises that it is the council policy to contribute towards the protection of the ecological, visual, recreational, environmental and amenity value of the county's Natural Heritage Areas and associated habitats; and
- Policy NH10 advises that it is the Council policy to restrict development within a proposed Natural Heritage Area to development that is directly related to the area's amenity potential subject to the protection and enhancement of natural heritage and visual amenities including biodiversity and landscapes.

The Council policy on Landscape sensitivity, is set out within the following policies:

- Policy LA 1 advises that it is the Council policy to 'ensure that consideration of landscape sensitivity is an important factor in determining development uses. In areas of high landscape sensitivity, the design, type and the choice of location of proposed development in the landscape will also be critical considerations; and
- Policy LA 2 which advises that it is the Council policy to protect and enhance the county's landscape, by ensuring that development retains, protects and, where necessary, enhances the appearance and character of the existing local landscape.

In terms of the Project there are specific polices for the 'Lowland Plains and Boglands Character Area', these include:

- Policy LL 4 which states that it is the Council policy to recognise that intact Boglands are critical natural resources for ecological and environmental reasons.

This in turn leads to Policy LL 5 which confirms the Councils policy on Boglands which is to recognise that cutaway and cut-over Boglands represent degraded landscapes and/or brownfield sites and thus are potentially robust to absorb a variety of appropriate developments.

4.5.2 Offaly County Development Plan 2014- 2020

The Offaly County Development Plan 2014-2020 (Offaly Plan) was adopted by Offaly County Council on 15 September 2014. Offaly County Council are currently reviewing the adopted development plan and are currently preparing an initial draft plan with a timeframe of Spring 2020.

4.5.2.1 Peatlands

County Offaly is covered by approximately 42,000 ha of boglands, 6000Ha of which is classified as highly sensitive in terms of the Council's landscape classification, the remaining 36,000Ha is within moderately sensitive areas under the Council Landscape classification. The following policies are therefore relevant in terms of peatlands and the Project:

- Policy NHP-12 ensures that peatland areas, which are designated for protection under international and national legislation, are conserved and managed appropriately to conserve their ecological, archaeological, cultural and educational significance.

Specifically, in terms of the Project the Council, within Policy RDP-11 will support the 'expansion' and 'employment' in 'industries' such as peatlands.

In support of policy, the following objective is applicable in general terms of the project:

- According to Objective EntO-05, *'it is an objective of the Council to identify, facilitate and promote the development of the county's peatlands where appropriate, in accordance with proper planning practice. Further, to seek the formulation of a coherent integrated land use plan for the sustainable and appropriate after-use of cutaway bogs in conjunction with adjoining local authorities. In seeking to achieve this objective, Offaly County Council will have regard to any national and regional policy, legislation or guidelines which may be published in the future, that will assist in further classifying the status of Offaly's peatlands".*

In terms of the Council's position on peatlands, the following objective is applicable:

- Objective EntO-06 states that the Council will continue to liaise and work alongside the enterprise agencies, including Bord na Móna, to develop enterprise space at various locations throughout the county, where feasible.

4.5.2.2 Climate Change

Climate Change is included within the overall aims of the Offaly Plan, the aim is to 'ensure that development promoted, supported or facilitated by the Development Plan provides for the adaptation to climate change and the promotion of renewable energy where possible including the increased risk of flooding'. The policy listed below is therefore of relevance, in achieving this aim.

- Policy EnvP-01 states that the Council will support proposals which reduce emissions to the air of greenhouse gases which contribute to a reduction and avoidance of human induced climate change. The Council supports and is committed to the National Climate Change Strategy and, in general to facilitating measures which seek to reduce emissions of greenhouse gases. In this regard, the Council will support any initiatives taken to provide for more sustainable forms of energy use.

4.5.2.3 Environment

The overall aims of the Offaly Plan in terms of Environment is relevant to the 'Project' these aims include:

- to ensure a high level of environmental protection ensuring the implementation of the policies and objectives of the plan through the observance of all legal requirements in terms of European Designated Sites; and
- to protect and conserve the high-quality natural environment, built and cultural heritage of the county while ensuring that any future development is facilitated in a manner which complements, respects and protects natural, built and cultural heritage features.

These aims are then addressed in policy terms within Policy NHP-12 which advises that the Council will ensure that peatland areas, which are designated for protection under international and national legislation, are conserved and managed appropriately to conserve their ecological, archaeological, cultural and educational significance.

4.5.2.4 Visual Impact and Landscapes

There are a number of peatlands which are identified as areas of high sensitivity and high amenity. Therefore, in general terms the following policy is applicable to development in these Peatlands:

- According to Policy LAP-09, 'It is Council policy to require that any necessary assessments, including landscape and visual impact assessments are provided when undertaking, authorising, or approving development in high sensitivity areas.

4.5.3 Laois County Development Plan 2017- 2023

The current Laois County Development Plan 2017-2023 (Laois Plan) was adopted by Laois County Council on 24 July 2017. The current Development Plan is under review; however, the process is in the early stages, therefore the proposed plan is not a material consideration.

4.5.3.1 Peatlands

In terms of peatlands, the Laois Plan confirms the council's approach to peatlands which is to support the development of the county's peat resource but recognizes the potential of the peatlands in terms of alternative energy production and tourism.

The most relevant policy relative to peatlands is listed below:

- Policy RUR5 confirms that the Council will support the appropriate sustainable management of peat extraction and related manufacturing activities subject to planning considerations and ensure that any plans or proposals associated with peatland development is subject to appropriate assessment screening in compliance with Habitats Directive, and subsequent assessment required.

4.5.3.2 Climate Change

Climate Change is among the main aims of the Laois Plan, the most relevant policy is set out below:

- Policy CC1 advises that the Council will support and facilitate the national objectives for climate adaptation and will work with the EPA, the EMRA and adjoining planning authorities in implementing future guidance for climate change proofing of land use plan provisions as is flagged in the National Climate Change Adaptation Framework.

4.5.3.3 Environment

The Laois Plan, identifies a number of Special Areas of Conservation (SAC's), Special Protection Areas [SPA's] and Natural Heritage Areas (NHA's) as a result of their international and national wildlife importance, there are a number of bogs identified within these designations, therefore the following policies are relevant to the Project:

- Policy OBJ 1 is to maintain, protect and where possible enhance the conservation value of existing European and national designated sites (SAC, SPA, NHA) in the county and any additional sites that may be proposed for designation during the period of this Plan; and
- Policy NH5 to preserve intact bogs and fens from drainage works for their biodiversity value as well as their functioning as water sinks and for carbon sequestration.

4.5.3.4 Visual Impact and Landscapes

The Laois Plan identifies a number of Landscape Character Types' (LCT's), in this case, LCT5 Peatland Areas is the most relevant, the relevant polices for this landscape character type is set out below:

- Policy LS40 Recognise the importance of peatlands for ecology, history, culture and for alternative energy production;
- Policy LS41 Conserve valuable habitats including any European and national designations;
- Policy LS44 Support the identification of projects that have the potential to achieve commercial value such as industrial developments, renewable energy, tourism

developments etc. while at the same time promoting high environmental standards and supporting Biodiversity objectives; and

- Policy LS45 Support the restoration of peatlands on suitable sites.

4.5.4 Meath County Development Plan 2013- 2019

The policy review below is based on the current Meath County Development Plan 2013-2019 (Meath Plan) which was adopted 22 January 2013. There is a proposed new Development Plan (Meath County Development Plan 2020-2026) which is currently within the final stages of public consultation. Notwithstanding this, the proposed development Plan is not yet a material consideration.

4.5.4.1 Peatlands

The Meath Plan recognises that there is potential for the utilisation of peatland within the County as protected areas for tourism, amenity and research purposes and will endeavour to work together with peatland stakeholders to secure the conservation of these areas. In terms of policy, the relevant policy on peatlands is listed below.

- Policy NH POL 11 advises that the Council will seek to ensure that peatland areas which are designated (or proposed for designation) as NHAs, SACs or SPAs are conserved for their ecological, archaeological, cultural and educational significance.

4.5.4.2 Climate Change

Climate Change is a key consideration of the Meath Plan, this is underlined by the core objective listed below:

- Core Principle 11. to integrate climate change considerations into the policies and objectives of Meath County Council and its key stakeholders.

There are a number of policies relative to climate change within the Meath Plan, the most relevant to the Project are listed below:

- Policy EC POL 4 to support the National Climate Change Strategy and, in general, to facilitate measures which seek to reduce emissions of greenhouse gases.

4.5.4.3 Environment

There are a number of bogs designated as candidate SAC's within County Meath as well as a number of Bog's designated as Natural Project.

- Policy NH POL 5, to permit development on or adjacent to designated Special Areas of Conservation, Special Protection Areas, National Heritage Area or those proposed to be designated over the period of the plan, only where an assessment carried out to the satisfaction of the Meath County Council, in consultation with National Parks and Wildlife Service, indicates that it will have no significant adverse effect on the integrity of the site; and
- Policy NH POL 6, to have regard to the views and guidance of the National Parks and Wildlife Service in respect of proposed development where there is a possibility that such development may have an impact on a designated European or National site, or a site proposed for such designation.

4.5.4.4 Visual Impact and Landscapes

There are a number of bogs identified within respective Landscape Character Types' (LCT's) and furthermore these bogs form part of the more area specific Landscape Character Area's (LCA's) of which the LCT's are formed. Therefore, the following policy is of relevance to the Project:

- Policy LC POL 2 To require that any necessary assessments, including landscape and visual impact assessments, are provided when undertaking, authorising, or approving development.

4.5.5 Westmeath County Council Development Plan 2014- 2020

The policy review below is from the current Westmeath Development Plan 2014-2020 (Westmeath Plan) which was adopted by Westmeath County Council on 18 February 2014. There is a revised Development Plan being prepared but is currently at an early stage of the consultation process so is not considered a material consideration at this stage.

4.5.5.1 Peatlands

The Westmeath Plan acknowledges the importance of peatlands as a characteristic part of the landscape in Westmeath. The Westmeath Plan includes the following specific peatland policies which are relevant to the Project:

- Policy P-PTL1 advises that the Council protect the county's designated peatland areas and landscapes, including any historical walkways through bogs and to conserve their ecological, archaeological, cultural, and educational heritage;
- Policy P-PTL2 states that the Council will ensure that peatland areas which are designated for protection under international and national legislation for their habitats, are conserved and managed appropriately to conserve their ecological, archaeological, cultural and educational significance;
- Policy P-PTL4 advises that the Council plan and prepare for the future sustainable and environmentally sensitive use of large industrial bog sites when peat harvesting finishes and to encourage a balanced approach to the redevelopment of cutaway bogs, including habitat creation; and
- Policy P-PTL5 states that the Council will exercise control of peat extraction, both individually and cumulatively, which would have significant impacts on the environment.

4.5.5.2 Climate Change

In general terms the Westmeath Plan acknowledges that the emission of greenhouse gases caused by fossil fuel combustion contributes to climate change and responds within policy to reduce greenhouse gas emission within the policy below:

- Policy P-EN4 advises that the Council support the National Climate Change Strategy and, in general, to facilitate measures which seek to reduce emissions of greenhouse gases.

4.5.5.3 Environment

There are a number of bog's identified as designated sites within the current Westmeath Plan, these include SPA's, SAC's and NHA's. Therefore, the Council policy on these designations is included below:

- Policy P-NAT2 to protect and conserve Special Areas of Conservation, candidate Special Areas of Conservation, Special Protection Areas and candidate Special Protection Areas,

designated by the National Parks and Wildlife Service of the Department of the Arts Heritage and the Gaeltacht under the EU Birds and Habitats Directives respectively;

- Policy P-NAT5 to require environmental assessment such as EIA (Environmental Impact Assessment) and/or ecological appraisal for development not directly connected with or necessary to the management of a European site, or a proposed European Site and which are likely to have significant effects on the European site either individually or cumulatively; and
- Policy P-NHA1 to protect and conserve Natural Heritage Areas and proposed Natural Heritage Areas.

4.5.5.4 Visual Impact and Landscapes

There are a number of general landscape policies which are relevant to the 'proposed development, these are listed below. More specifically, there are a number of bogs identified within the landscape character areas (LCA's) of the Westmeath Plan, therefore the polices of these LCA's is relevant and is also listed below:

- Policy P-LCA1 to protect the distinctiveness, value and sensitivity of County Westmeath's landscapes, including the Lakelands and to recognise their capacity to sustainably integrate development within them.
- Policy P-LLM1 to require that development is sensitively designed, so as to minimise its visual impact on the landscape, nature conservation, archaeology and groundwater quality.
- Policy P-LLM5 to conserve and enhance the high nature conservation value of the Landscape Character Areas and seek to maintain the interconnectivity or eco-networks linking sites such as small woods, wetlands and hedgerows; and
- Policy P-LLM7 to explore with the relevant agencies the future potential of cut away peatlands, including opportunities for habitat creation or amenity and recreation areas such as community woodlands or parklands.

4.5.6 Longford County Council Development Plan 2015- 2021

The Longford County Development Plan 2015-2021 (Longford Plan) was adopted 11 March 2015. At present the Council are preparing the proposed Longford County Development Plan 2021-2027, however the preparation is at an early stage, therefore the proposed plan is not a material consideration and does not form part of the policy review below.

4.5.6.1 Peatlands

In general terms, the following polices are relevant to the Project, and outline the approach to peatlands within the Longford Plan.

- Policy agr 4: It is the policy of the Council, in accordance with the relevant Government agencies, to investigate the development of suitable areas of underutilised land, such as cutaway/cutover bog for the growing of biomass/biofuels for the renewable energy industry. The use of cutaway/cutover bog shall be considered for the development of renewable energies.

4.5.6.2 Climate Change

The Longford Plan provides a general outline of the Council's approach to climate change, this is reflected in the below policy:

- Policy CLI 1, the Council recognises European and national objectives for climate adaptation and will work with the EPA, the Midland Regional Authority and neighbouring planning authorities in implementing future Guidance for climate change proofing of land use plan provisions as is flagged in the National Climate Change Adaptation Framework (DECLG, 2012). The Council will integrate as appropriate, the National Climate Change Adaptation Framework and any related Guidelines which may arise during its implementation.

4.5.6.3 Environment

There are a number of bogs identified as designated sites within the Longford Plan, these include SPA's, SAC's and NHA's. Therefore, Council policy on these designations is included below:

- Policy NHB 4, It is the policy of the Council to protect important geological or geomorphological sites in the County, including any sites proposed to be designated or designated as Natural Heritage Areas (NHAs); and
- Policy NHB 6, It is the policy of the Council to protect sites designated in National and European legislation, and in other relevant International Conventions, Agreements and Processes. This includes sites proposed to be designated or designated as:
  - Special Areas of Conservation under the Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora); and
  - Special Protection Areas under the Birds Directive (Council Directive 79/409/EEC on the conservation of wild birds).

4.5.6.4 Visual Impact and Landscapes

The peatlands are identified as a Landscape Character Unit within the Longford Plan, although it is acknowledged that this unit is of a low sensitivity the following policy is relevant to the Project:

- Policy LCA 1, It is the policy of the Council to protect and enhance the County's landscape, by ensuring that development retains, protects and, where necessary, enhances the appearance and character of the existing local landscape. Proposed developments which have a detrimental impact on the landscape will not normally be permitted.

4.6 Planning History

A planning history search has been carried of relevant planning applications in the vicinity of the 41 bog units to assist in the assessment of the historic cumulative impacts within the study area.

The search included all EIA/EIAR development from 2010 to present day using the local authority online application databases in the six counties (Kildare, Meath, Westmeath, Offaly, Laois and Longford) and the EIA Portal provided by the Department of Housing, Planning and Local Government.

Strategic Housing Developments (SHD) were not included within the search as these are within existing towns. The findings of the search are included in Appendix 4 *Planning and Policy Context* of this rEIAR.

5 Description of the Project

5.1 Introduction

This chapter of the rEIAR is divided into two sections. The first section describes the peat extraction activities, milled peat and sod moss production, ancillary activities such as drainage, transportation and other ancillary structures, and the second section provides a description of the location of the individual bog units.

5.2 Description of Peat Extraction Activities

Peat has been extracted from the 41 bog units using two different harvesting methods:

- Milling: to produce milled peat for fuel, either for power station supply (for example Edenderry Power Station), or for supply to briquette factories (such as Derrinlough Briquette Factory). Milled peat has also been used for horticultural peat.
- Sod Moss for the horticultural market – both the retail and professional markets.

The 41 bogs ae listed in Table 5.1 below. Further detail on the individual bog units is provided in Section 5.3 *Description of the Bog Units* and in Appendix 1. The locations of the 41 bog units are also shown in Appendix 1.

Table 5.1: Bord na Móna Bog Units

Ref	Bog	Functional Area	Bog Group
1	Bellair Nth	Offaly and Westmeath	Boora
2	Lemanaghan	Offaly	Boora
3	Noggusboy	Offaly	Boora
4	Boora	Offaly	Boora
5	Galros	Offaly	Boora
6	Killaun	Offaly	Boora
7	Derrinboy	Offaly	Boora
8	Derryclure	Offaly	Boora
9	Monettia	Offaly and Laois	Boora
10	Killaranny	Offaly	Boora
11	Bracklin	Westmeath	Derrygreenagh
12	Carranstown	Meath and Westmeath	Derrygreenagh
13	Ballivor	Meath and Westmeath	Derrygreenagh
14	Kinnegad	Meath	Derrygreenagh
15	Ballybeg	Offaly	Derrygreenagh
16	Ballaghurt	Offaly	Blackwater
17	Daingean (Derries)	Offaly and Westmeath	Allen
18	Daingean Rathdrum	Offaly	Allen
19	Clonad	Offaly	Allen

Ref	Bog	Functional Area	Bog Group
20	Ballykeane	Offaly	Allen
21	Esker	Offaly	Allen
22	Garrymore	Laois	Allen
23	Derrylea	Offaly and Kildare	Allen
24	Ticknevin	Offaly and Kildare	Allen
25	Glashabaun Sth	Offaly and Kildare	Allen
26	Glashabaun Nth	Offaly and Kildare	Allen
27	Codd Nth (Codd 2)	Offaly	Allen
28	Codd Sth (codd 1)	Offaly	Allen
29	Ballydermot North	Offaly and Kildare	Allen
30	Ballydermot South	Offaly and Kildare	Allen
31	Blackriver	Kildare	Allen
32	Barnaran	Kildare	Allen
33	Lodge	Kildare	Allen
34	Cuil na Gun (Coolnagun)	Westmeath	Mountdillon
35	Milkernagh	Westmeath and Longford	Mountdillon
36	Coolcraff	Longford	Mountdillon
37	Gilltown	Kildare	Kilberry
38	Allen	Kildare	Kilberry
39	Prosperous	Kildare	Kilberry
40	Kilberry	Kildare	Kilberry
41	Cuil na Carton (Coolnacartan)	Laois	Cuil na Móna

The upper acrotelm layer (which comprises the biologically active component of the bog) was completely removed from the majority of the 41 bog units when the bogs were initially developed for industrial peat extraction between the 1940s and the 1990s. The date that peat extraction commenced for each bog unit is provided in Appendix 1.

In general, peat for milled peat production was extracted from deep peat layers (which comprise dead plant material). Sod moss production generally occurred at the bog margins within bare peat areas, areas of cutover bog and areas of high bog.

The following sections provide a description of Bord na Móna's historic peat extraction (and related) activities and downstream end users.

5.2.1 Milled Peat Production

Milled peat was supplied by Bord na Móna to Bord na Móna's Edenderry Power Plant in County Offaly, West Offaly Power Station in County Offaly and Lough Ree Power Station in County Longford, and Derrinlough Briquette Factory in County Offaly for the manufacture of peat briquettes.

Milled peat also supplied horticulture peat for the manufacture of growing media products for the professional and retail/consumer markets.

Milled peat production requires good solar drying conditions and can commence anytime from mid-April onwards once suitable drying conditions exist. There are four stages to the production of milled peat;

- Milling - During the milling process the top 10-15 mm of the surface of each field was broken into peat crumbs by powered milling drums towed behind agricultural tractors (see Figure 5.1). This layer of crumbed or milled peat is called a crop and has a moisture content of about 80% when milled;
- Harrowing - After milling, the peat crop was dried. To assist in this drying, the loose peat was harrowed, or turned over (see Figure 5.2). The harrow consists of a series of spoons which are towed behind an agricultural tractor;
- Ridging - When the milled material was dried to 45-55% moisture content it was gathered into ridges in the centre of each field. The ridger consists of a pair of blades towed in an open V behind an agricultural tractor. The open V blades rest on the bog and channel the loose crop into a triangular ridge in the centre of each field (see Figure 5.3 and Figure 5.4)
- Harvesting - Harvesting is the final stage of the production process. Each individual ridge was lifted mechanically by a machine called a harvester, transferred and dropped on top of the adjoining field's ridge, until five ridges had been accumulated into a single large ridge. This ridge forms the final lift into the peat storage stockpile.

Every 11th field was typically used to stockpile the peat from the output of five fields either side; this is referred to as the 'Peco' method (see Figure 5.5 and Figure 5.6). In some areas a system known as "Haku" was utilized where the harvested peat was deposited into trailers and transported to a central stockpile on the headland.

A stock field typically received the crops from 10 fields i.e. five fields on either side. Weather permitting, the miller followed the harvester and the production cycle recommenced in the emptied fields. Each production cycle is known as a harvest. In a year of average weather conditions, approximately 12 harvests were completed. When the production season was over, the stockpiles were covered to keep the peat dry unless the peat was scheduled for immediate sale (see Figure 5.7). Peat was stored in these stockpiles until required for use.

Peat production areas were served by a network of permanent narrow gauge rail tracks, (approximately one metre in width). Temporary tracks were also constructed as required to transfer the peat from peat production areas.

In accordance with Section 49 of the *European Communities (Birds and Natural Habitats) Regulations 2011*, which prohibits the introduction and dispersal of invasive alien species (particularly plant species) listed on Part 1 (third column) of the 'Third Schedule' Bord na Móna have developed and implement a bio-security protocol that follows best practice guidelines issued by the National Roads Authority *The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads* (NRA, 2010).

Figure 5.1: Milling

Source: Bord na Móna

Figure 5.2: Harrowing

Source: Bord na Móna

Figure 5.3: Ridging (1 of 2)

Source: Bord na Móna

Figure 5.4: Ridging (2 of 2)

Source: Bord na Móna

Figure 5.5: Harvesting (Peco) (1 of 2)

Source: Bord na Móna

Figure 5.6: Harvesting (Peco) (2 of 2)

Source: Bord na Móna

Figure 5.7: Stock Protection

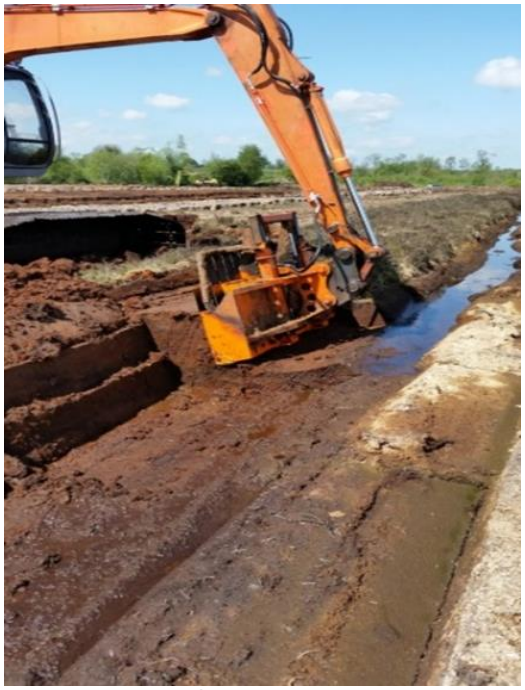
Source: Bord na Móna

5.2.2 Sod Moss Production

Sod moss is the term used to describe peat produced in block form for horticultural use. The sod moss was extracted mechanically with specially equipped excavators. The sods were cut from mini face-banks or the margins of trenches that were gradually widened and left on the bog to dry for approximately 12 months, reducing moisture content from 90% to 50% - 60%. Once the required moisture content was reached the sod moss was stockpiled at the edge of bog prior to transportation for processing. One layer was typically cut at a time until the horticultural peat was exhausted.

The following photos illustrate the sod moss production process. A portion of the sod moss was transported, via Heavy Goods Vehicles (HGVs), directly from the bog site to Dublin Port for shipment overseas. The remainder was transported to processing factories where it was broken down and re-blended to meet the applications for which it was to be used.

Figure 5.8: Sod Moss Extraction



Source: Bord na Móna

Figure 5.9: Sod Moss Stockpiles

Source: Bord na Móna

Figure 5.10: Sod Moss Drying

Source: Bord na Móna

Figure 5.11: Sod Moss Stockpiles

Source: Bord na Móna

5.2.3 Ancillary Activities

5.2.3.1 Drainage

As part of the development of the bogs for milled peat production, parallel surface water drains were created at intervals of 15m and the strip of bog between these drains formed the peat production fields. The fields were cambered to facilitate run-off and prevent standing water on the production fields. The drains fall towards the headland which is located at both ends of each production field. This headland allowed for the plant such as harrowers, millers or ridgers to turn from one field into the next field. The open drains were piped across the end of each production field allowing production plant and machinery to travel from field to field. The drainage network continued by either open channel or pipe to a silt pond or ponds prior to discharging to a local watercourse. Drainage was by gravity flow where possible, however in some bogs it was necessary to use pumped systems to drain the bogs (refer to Appendix 1). More detail regarding the design and capacity of the silt ponds is provided in Section 14.3.3.4 (Land, Soils and Groundwater).

5.2.3.2 Transportation

Some of the peat production areas are served by a permanent rail system, much of which was constructed in the 1950's and 1960's. In some areas temporary tracks were laid and removed as required to remove peat from production areas. This rail network allowed for direct delivery of peat by rail to Derrinlough Briquette Factory Edenderry Power Station, ESB power stations and to various lorry tippler locations.

The bogs that were served by the rail network are listed in the Appendix 1.

In some areas that were not served by permanent or temporary rail links, a system known as "Haku" was used. Here the peat was placed in trailers and transported to the headland, from where it was removed by road.

In other locations peat was transported by rail to a tippler where the peat was transported from the rail wagons to lorries for haulage by road.

5.2.3.3 Ancillary Structures and Features

There are a number of ancillary structures and features associated with peat extraction activities.

These are listed below and shown in Appendix 1.

- railway lines, rail underpasses/bridges;
- rail structures;
- work sites;
- production centres (including canteen structures);
- mobile fuel tanks;
- fixed fuel tanks;
- peat loading facility,

Fixed gas oil tanks have been stored at locations across the bog units. Loading and unloading of fuel oil has taken place at fixed locations serviced by oil-interceptors.

All tank and drum storage areas have been bunded and bunds have been integrity tested every two years in line with the IPC licences.

Refuelling of production machines took place in designated areas away from drains or rivers at a frequency of up to three times a week during the peak production season. This frequency was significantly reduced outside peak production. Refuelling of peat production plant took place on the bog using fixed bunded tanks or bunded service trains. The loading of tanks from the fuel supplier took place either directly into these fixed bunded tanks on the bogs or the fixed bunded main tanks at the workshop in the vicinity of the bog. At the workshops, concrete bunds and oil interceptors were provided and the service train was filled and travelled by rail to refill the plant machinery on the bog.

Welfare facilities were provided for employees involved in peat extraction on each bog. The existing foul sewage facilities at these sites have been replaced with portable serviced toilets and the foul sewage is removed off site for disposal in a licenced treatment plant on a weekly basis.

5.2.4 End Users

The following sections provide details of the main end users of extracted peat.

5.2.4.1 Derrinlough Briquette Factory

Derrinlough Briquette Factory is located in Birr, County Offaly and is operated by Bord na Móna Fuels Ltd. The bog units that historically have supplied peat to Derrinlough are listed in Appendix 1. Derrinlough operates under the Green House Gas (GHG) Permit Registration No. IE-GHG105-10401-3.

Derrinlough Briquette Factory was supplied by the following bog units in the Boora Bog Group: Lemanaghan, Noggusboy, Boora, Galros and Killaranny, Killaun with smaller quantities of peat coming from Derrinboy, Derryclure and Monettia. All of these bog units apart from Killaun, Moniettia, Derrinboy and Derryclure were equipped with an internal rail link to Derrinlough Briquette Factory. The peat from this bog unit was transported by rail. Some peat from Allen and Derrygreenagh Bogs Ballybeg, Daingean Derries, Daingean Rathdrum, Clonad, Mountlucas, Ballykeane and Esker bogs have also been used to supply Derrinlough.

Bord na Móna supplied domestic users with peat briquettes either loose, in bales or in brickeen form, i.e. single loose briquettes cut into three equal parts.

The factory operates 24 hrs a day, 7 days a week, producing up to 135,000 tonnes of briquettes per annum. The factory currently employs 62 staff during production and has been in operation since 1959/60.

The process involves tippling, blending, fine milling and screening, followed by a Peco drying process: the indirect drying of milled peat by means of hot water and steam while the peat is being pneumatically conveyed in an air/vapour stream. The peat, in finely divided form (all through a 10 mm. screen), dries rapidly from its intake moisture-circa 50% moisture content to 10% moisture content. At this moisture content briquettes can be formed under pressure in a specially designed press which extrudes the briquettes continuously into cooling runners some 70 metres long. The boiler fires on pulverised peat with oil used for start-ups.

5.2.4.2 Littleton Briquette Factory

Littleton Briquette Factory (near Thurles, County Tipperary) is now closed. It was located within the landbanks associated with IPC licence P0499-01 (Bord na Móna Fuels Ltd Littleton) and its operation controlled in accordance with the conditions specified in IPC licence P0499-01. Approximately 70% of the milled peat supply was delivered via Bord na Móna's internal rail network and approximately 30% was delivered by road for processing into peat briquettes. The

factory operated 24hrs a day seven days a week producing up to 90,000 tonnes of briquettes per annum. The factory was in operation since 1982 employing approximately 55 staff during production.

5.2.4.3 Horticultural Peat Processing

Bord na Móna produced approximately 359,000 tonnes of horticultural peat per annum. The processing factories are located at Kilberry (Athy County Kildare), Coolnamona (Portlaoise, County Laois) and Ballivor (County Meath). The bog units that supplied peat to these processing factories are listed in Appendix 1.

Horticultural peat consists of professional horticulture peat or horticultural retail peat. Professional Horticultural peat is certified to the Regeling Handels Potgronden ("RHP") quality standard. RHP is a product certification scheme, for substrates and soil improving materials that is accepted by the Dutch Accreditation Council. RHP is a widely accepted standard of peat suitable for use as a professional growing medium. A significant proportion of Bord na Móna's RHP peat was transported by road to Dublin port and exported to Europe. Horticultural peat not classified as RHP was used as professional or retail horticulture peat suitable for other growers. On occasion, peat not suitable for use as professional or retail horticultural peat may have been used as fuel supply peat.

5.2.4.4 Edenderry Power Plant

Edenderry Power Plant is located in the townland of Ballykilleen (Coolestown) approximately 6 km to the south of the town of Edenderry and approximately 3.5 km to the north of the village of Clonbulloge. Access to the site is gained via the R401 Regional Road. The site is approximately 32 ha in size.

Edenderry Power Limited (EPL) operates the existing peat/biomass co-fired power plant in accordance with the conditions of an Industrial Emissions Directive (IED) Licence (Reg. No. P0482-04) issued and monitored by the Environmental Protection Agency (EPA). The plant has a net electrical output of 118MW (128 MW gross) and produced approximately 694 MWhe of electricity in 2019.

The fuel inputs during 2019 were approximately 476,000 metric tonnes of peat (supplied by a spur of Bord na Móna Energy Limited's peatland rail network) and approximately 300,000 tonnes of biomass predominantly delivered by road via designated and agreed haul routes. The peat supply bogs for Edenderry were predominantly from the Allen Group.

Clonbulloge ash repository (Industrial Emissions Licence Registration No. W0049-02), accepts the ash from the combustion process at Edenderry Power Plant. The site is located approximately 3 km to the southwest of the site and is accessed by Bord na Móna Energy Limited's peatland rail network which directly links the ash collection system at the power plant with the repository. There is also vehicular access to the repository via a local road.

Co-fuelling of peat with biomass at the power plant commenced in 2008 at a rate of 2%. By 2019 the rate of co-fuelling with biomass had increased to 46.4%.

5.2.4.5 West Offaly Power Plant

West Offaly Power Plant is located in Shannonbridge in County Offaly and is the largest peat fired power plant in Ireland. Approximately 1.245 million tonnes of peat (supplied by a spur from Bord na Móna's peatland rail network and via the public road network) was supplied to West Offaly Power Plant in 2015. Peat was exclusively supplied to the power plant from Bord na Móna bogs.

The West Offaly Power Plant is owned and operated by the Electricity Supply Board (ESB).

The ESB operates the power plant in accordance with the conditions of an Industrial Emissions Licence (Registration Number P0611-02) which is regulated by the EPA.

5.2.4.6 Lough Ree Power Plant

Lough Ree Power Plant is located in Lanesborough, County Longford. Approximately 835,000 tonnes of peat (supplied by a spur from Bord na Móna's peatland rail network and via the public road network) was supplied to Lough Ree Power Plant in 2015. Peat was exclusively supplied to the power plant from Bord na Móna bogs.

Lough Ree Power Plant is owned and operated by the Electricity Supply Board (ESB). The ESB operates the power plant in accordance with the conditions of an Industrial Emissions Licence (Registration Number P0610-02) which is regulated by the EPA.

5.2.4.7 Retail and Domestic Users

Bord na Móna supplied horticultural products to the retail sector both within the island of Ireland and internationally. Bord na Móna also supplied products directly to domestic users and have depots located throughout the Republic of Ireland.

5.3 Description of the Bog Units

5.3.1 Boora Bog Group

The bog units within Boora Bog Group that form part of the substitute consent application(s) are:

- Bellair North;
- Lemanaghan;
- Noggusboy,
- Boora,
- Galros,
- Killaun,
- Derrinboy,
- Derryclure,
- Monettia and
- Killaranny.

All of these bog units have been used in the past to supply milled peat for the horticultural market, local power stations (Ferbane, Shannonbridge and West Offaly Power) and Derrinlough Briquette factory.

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

Noggusboy, Boora Bog, Galros, Killaun, Derrinboy, Derryclure, and Killaranny are fully located in the Shannon Lower catchment. Bellair North and Lemanaghan are located between the

Shannon Upper and Shannon Lower river catchments. Monettia is located between the River Barrow and the Shannon Lower catchment.

The Boora Group is one of the oldest bog groups in Ireland. Bord na Móna was set up in 1946 and it commenced the development of the Boora Bogs in 1946 with milled peat production commencing in 1955. Milled peat was produced in the Boora Bog for the supply of fuel peat to the power station in Ferbane which commenced power generation in 1957 and closed in 2001. The Boora bogs were also developed for the supply of milled peat to the Derrinlough Briquette factory, which commenced production in 1957. The date that development commenced as provided by Bord na Móna for each bog unit is listed in the Table 1.1 in Appendix 1.

The bog units in the Boora bog group cover an area of approximately 6,750ha. The areas of each of the bog units are provided in Appendix 1.

5.3.1.1 Bellair North

Bellair North Bog is located between Counties Offaly and Westmeath over 3.5 km south of Moate and 2 km south of the M6 motorway. This bog has a permanent rail line that is connected to West Offaly Power station and also to the Derrinlough briquette factory.

5.3.1.2 Lemanaghan

Lemanaghan Bog is located in County Offaly between Ferbane and Ballycumber. The majority of the bog is located to the north of the R436 regional road with a small portion located to the south of this road. The rail line from Bellair North runs through, and services, this bog and a guarded level crossing links the two sections of bog rail line where it crosses the road.

5.3.1.3 Noggusboy

Noggusboy Bog is located to the south of Ferbane and is bisected by the regional road R437 with milled peat production in recent years confined to the area to the east of this road. A permanent rail line runs through this bog and crosses the road R437 at a guarded level crossing.

5.3.1.4 Boora

Boora Bog is located to the south of the R357 regional road that runs between Cloghan and Blueball with the milled peat area located in the western portion of this bog.

5.3.1.5 Galros

Galros Bog is located to the south of Clongowney and is a supply bog for the Derrinlough Briquette Factory. The rail line on this bog connects this bog to the briquette factory with guarded rail crossing on the N62 national secondary road.

5.3.1.6 Killaun

Killaun Bog is located approx. 2.5 km north east of Birr and is primarily used a horticulture supply bog. A permanent rail line runs within the bog.

5.3.1.7 Derrinboy

Derrinboy Bog is located approx. 9 km north-east of Killaun Bog to the south of Kilcormac village. The bog is bisected by a local road that runs between Kilcormac and Cadamstown. There is no permanent rail line in Derrinboy Bog and peat was transferred within the bog using the Haku system.

5.3.1.8 Derryclure

Derryclure Bog is located approx. 3.5 km south of Tullamore adjacent to the N80 national secondary road. This bog is a “Haku” bog with no permanent rail line. Here the peat was placed in trailers and transported to the headland, from where it was removed by road.

5.3.1.9 Monettia

Monettia Bog is located between Counties Offaly and Laois, approx. 1.5 km south of Killeigh village. A permanent rail line runs through the centre of this bog.

5.3.1.10 Killaranny

Killaranny Bog is located to the east of Oughter Bog circa 8 km west of Tullamore. A permanent rail line connects this bog to Derrinlough briquette factory.

5.3.2 Derrygreenagh Bog Group

The bog units within Derrygreenagh Bog Group that form part of the substitute consent application(s) are:

- Bracklin
- Carranstown
- Ballivor
- Kinnegad
- Ballybeg

The Derrygreenagh group of bogs are sited between Rochfortbridge, Co. Westmeath in the west to Ballivor Co. Meath in the east and between Delvin Co. Westmeath in the north and Daingean, Co. Offaly in the south. The River Boyne is the major river catchment for the area with all bogs located in this catchment. A small area of bog in the southern section of Ballybeg is located in the River Barrow catchment. The location of the bog units is shown Appendix 1.

The date that development commenced as provided by Bord na Móna for each bog unit is listed in Appendix 1.

5.3.2.1 Bracklin

Bracklin Bog is located in County Westmeath approximately 6 km south of Delvin. This bog supplied horticultural peat and has a permanent rail line that runs south to the production centre in Ballivor Bog.

5.3.2.2 Carranstown

Carranstown Bog is located between Counties Westmeath and Meath immediately south of Bracklin Bog. This bog, which also supplied horticultural peat, is served by the rail line that runs from Bracklin Bog to Ballivor production centre.

5.3.2.3 Ballivor

Ballivor Bog is located approximately 3.5 km west of Ballivor town immediately south of Carranstown Bog. The bog, which supplied horticultural peat, has a rail line to the production centre located at the north of the bog.

5.3.2.4 Kinnegad

Kinnegad Bog, also known as Rossan Bog, is located in County Meath, 1.5 km south of Kinnegad and south of the M4/M6 motorway. This is a horticultural bog and has a small length of permanent rail line located in the northern section of the bog.

5.3.2.5 Ballybeg

Ballybeg Bog is located approx. 2 km west of Rhode in County Offaly. The bog was a supply bog for the Edenderry Power Station and is served by a rail link to this power station.

5.3.3 Blackwater Bog Group

Ballaghurt bog is the only bog unit included in this application that is part of the Blackwater Bog group. The Blackwater Bog Group is situated between Athenry, County. Galway in the West and Ferbane, Co. Offaly in the East and between Ballygar, Co. Roscommon in the North and Banagher, Co. Offaly in the South. Ballaghurt Bog is located in County Offaly approx. 7 km north-west of Ferbane in the Shannon Lower catchment. The bog has a permanent rail line that is connected to West Offaly Power station and also to the Derrinlough Briquette Factory. As shown in Appendix 1, the end use of the peat has been as supply peat for the manufacture of briquettes in Bord na Móna's last remaining briquette factory in Derrinlough or as supply to West Offaly Power Station. The location of the bog unit is shown in Appendix 1.

5.3.4 Allen Bog Group

The bog units within Allen Bog Group that form part of the substitute consent application(s) are:

- Daingean (Derries)
- Daingean (Rathdrum)
- Clonad
- Ballykeane
- Esker
- Garrymore
- Derrylea
- Ticknevin
- Glashabaun South
- Glashabaun North
- Codd North (Codd 2)
- Codd South (Codd 1)
- Ballydermot North
- Ballydermot South
- Blackriver
- Barnaran
- Lodge

These are shown in Appendix 1.

These bog units are situated in Tullamore, Co. Offaly in the west and Allenwood, Co. Kildare in the East and between Portarlington Co. Laois in the south and Edenderry in the North. The River Barrow is the major river catchment for these bogs with all partially or fully located within the Barrow catchment. Daingean (Derries), Daingean (Rathdrum) and Clonad are partially

located in the Lower Shannon catchment with a small area of Ticknevin located in the Boyne catchment.

The primary end use for all of the Allen Bogs other than Garrymore Bog has been supply of peat to the Edenderry Power Station. Garrymore bog has been used for the supply of horticultural peat and sod moss. Some sod moss was also produced in six of the bogs.

5.3.4.1 Daingean (Derries)

Daingean (Derries) Bog is located along the Westmeath and Offaly border, approximately 8 km north east of Tullamore and 3 km south of the M6 motorway. The bog is connected by rail to Edenderry Power Station and has been used primarily as a supply bog for the station.

5.3.4.2 Daingean (Rathdrum)

Daingean (Rathdrum) Bog is in County Offaly approximately 8 km north east of Tullamore. The rail line from Daingean (Derries) runs through, and services, this bog and a guarded level crossing links the two sections of bog rail line where it crosses the road.

5.3.4.3 Clonad

Clonad Bog is in County Offaly located approximately 10 km east of Tullamore, and to the south of the R462. A permanent rail line runs through this bog to Edenderry Power Station and was a supply bog for the power station.

5.3.4.4 Ballykeane

Ballykeane Bog is located in County Offaly approximately 13 km south east of Tullamore and to the west of the R400. A permanent rail line runs through this bog and traverses the local road by means of a road underpass. This bog was a supply bog for Edenderry Power Station.

5.3.4.5 Esker

Esker Bog is in County Offaly to the north of the R402 regional road, to the east of the R400 regional road and is almost midway between Daingean and Edenderry. A permanent rail line runs through this bog to the Edenderry Power Station and this bog was a fuel peat supply bog.

5.3.4.6 Garrymore

Garrymore Bog is in County Laois, approximately 3 km to the north of Mountmellick and to the east of the national road the N80. This bog was used for the production of horticultural milled peat and sod moss.

5.3.4.7 Derrylea

Derrylea Bog is in Counties Offaly and Kildare with the northern half of the bog located in Kildare and the southern half located in Offaly. It is located approximately 1.5 km northeast of Portarlington and to the east of the regional road R419 and to the north of R420/ R424. A permanent rail line connects this bog to the Edenderry Power Station and it was a supply bog for the station.

5.3.4.8 Ticknevin

Ticknevin Bog is in Counties Offaly and Kildare and is approximately 3 km southeast of Edenderry. A permanent rail line connects to this bog to the Edenderry Power Station for which it was a supply bog.

5.3.4.9 Glashabaun North

Glashabaun North Bog is located between Counties Offaly and Kildare and is located south of Ticknevin and to the east of the regional R401road. A permanent rail line runs through this bog to Edenderry Power station. This bog was used as a supply bog for the power station and also for the supply of horticultural sod moss.

5.3.4.10 Glashabaun South

Glashabaun South Bog is also located between Counties Offaly and Kildare and is approximately 7 km south of Edenderry and south of Glashabaun North. This bog was used as a supply bog for Edenderry Power Station and also for the supply of horticultural sod moss.

5.3.4.11 Codd North

Codd North Bog is located in County Offaly and is approximately 5 km south of Edenderry. A permanent rail line runs through this bog to the Edenderry Power Station. This bog was used as a supply bog for the power station and also for the supply of horticultural sod moss.

5.3.4.12 Codd South

Codd South is in County Offaly and lies south of Codd North Bog. A permanent rail line runs through this bog to the Edenderry Power Station. This bog was used as a supply bog for the power station and also for the supply of horticultural sod moss.

5.3.4.13 Ballydermot North

Ballydermot North is located in both Counties Offaly and Kildare and is approximately 1.5 km east of Clonbulloge and the regional road R401. There are two permanent rail lines in this bog, east to Blackriver Bog and south to Ballydermot South. This bog was used as a supply bog for Edenderry Power Station and also for the supply of horticultural sod moss.

5.3.4.14 Ballydermot South

Ballydermot South is in Counties Offaly and Kildare and lies south of Ballydermot North Bog and approximately 2.5 km north west of Rathangan. This bog was used as a supply bog for Edenderry Power Station and also for the supply of horticultural sod moss.

5.3.4.15 Blackriver

Blackriver is in County Kildare and lies to the east of the two Ballydermot Bogs and approximately 3 km north of Rathangan. There are two permanent rail lines in this bog, running North to Glashabaun South Bog and East to Barnaran Bog and West to Ballydermot Bog. The rail lines connect to Edenderry Power Station for which it was a supply bog.

5.3.4.16 Barnaran

Barnaran is in County Kildare and is located east of the Blackriver bog and approximately 4 km north east of Rathangan. The regional road R414 from Rathdangan to Allenwood runs through the eastern edge of the bog. A permanent rail line runs through this bog to the Edenderry Power Station for which it was a supply bog.

5.3.4.17 Lodge

Lodge is in County Kildare and is located 3.5 approximately km west of Allenwood and east of Barnaran Bog. The regional road R414 marks the northern boundary of this bog. A permanent

rail line runs through this bog and a guarded level crossing exists where it traverses the R414. This bog was a supply bog for Edenderry Power Station.

5.3.5 Mountdillon Bog Group

The bog units within Mountdillon Bog Group that form part of the consent application(s) are:

- Cuil na Gun
- Milkernagh
- Coolcraff

These are shown in Drawings in Appendix 1. The Mountdillion group of bogs are sited between Scramoge, Co. Roscommon in the West, and Coole, Co. Longford in the east and Rooskey, Co. Roscommon to the north and Tang, Co. Westmeath to the south. These bogs are located in the Upper Shannon catchment.

Available records show that Bord na Móna commenced the development of the Mountdillon Bogs including the Cuil na Gun bogs in the late 1940s with the production of sod turf beginning in 1952. A machine turf power station was constructed at Lanesborough in 1958 and a bridge was constructed over the Shannon to serve this station in 1956. Milled peat production in the Mountdillon Bog Group commenced in the 1960s.

The bogs have been used in the past as supply bogs for Lough Ree Power Station and for horticultural peat and sod moss.

5.3.5.1 Cuil na Gun

Cuil na Gun Bog is located in County Westmeath approximately 3 km south west of Coole. A permanent rail line runs through this bog and connects it to Milkernagh Bog.

5.3.5.2 Milkernagh

Milkernagh, also known as Corralanna, is located between Counties Longford and Westmeath approximately 12 km north east of Edgeworthstown and immediately north of Cuil na Gun Bog. This bog is divided by the regional road R395 which crosses the southern end of the bog. A permanent rail line runs through this bog and a guarded level crossing links the two sections of bog rail line where it crosses the R395.

5.3.5.3 Coolcraft

Coolcraft Bog is in County Longford, approximately 14 km north east of Edgeworthstown and immediately north east of Milkernagh Bog. A permanent rail line runs through this bog to Milkernagh Bog and a guarded level crossing links the two sections of bog rail line where it crosses the R396.

5.3.6 Kilberry Bog Group

The bog units within Kilberry Bog Group that form part of the substitute consent application(s) are:

- Gilltown
- Prosperous
- Allen
- Kilberry

The Kilberry group of bogs in County Kildare are sited between Clane, Co. Kildare in the east to Monasterevin, Co. Kildare in the west and between Johnstown Bridge, Co. Kildare in the North and Athy, Co. Kildare in the South. The River Barrow, River Boyne and River Liffey are the major river catchments for the area. Allen Bog is located the River Liffey and River Barrow catchments, Prosperous in the River Barrow and River Boyne catchments, Gilltown in the River Boyne catchment and Kilberry in the River Barrow catchment. The locations of these bogs are shown in Appendix 1.

From the records available, it appears that Bord na Móna commenced the production of moss peat in Kilberry in 1947. The estimated year that development commenced for each of the bog units is provided in Appendix 1.

5.3.6.1 Gilltown

Gilltown is in County Kildare, approximately 15 km north west of Naas and south of the M4 motorway. There is a permanent rail line at the northern end of this bog and this is confined to within the bog boundary.

5.3.6.2 Prosperous

Prosperous is in County Kildare, approximately 4 km north west of Clane and approximately 1.5 km north of Prosperous Village. There is a permanent rail line at the western and northern end of this bog and this is confined to within the bog boundary.

5.3.6.3 Allen

Allen Bog, also known as Mouds Bog, is in County Kildare, approximately 2 km south east of Kilmeage and between the regional roads R415 and R409. The permanent rail line in this bog is confined to within the Allen bog boundary.

5.3.6.4 Kilberry

Kilberry Bog is in County Kildare, approximately 5 km north of Athy and to the east of the regional road R417. The permanent rail line in this bog is confined to within the Kilberry bog boundary.

5.3.7 Cuil na Mona Bog Group

Cuil na Carton bog is located within the Cuil na Móna Bog Group (refer to Appendix 1). From the records available, it appears that Bord na Móna commenced the development of the Cuil na Móna Bogs in the late 1950s with the production of moss peat commencing in 1965. The commencement date for production at Cuil na Carton is provided in Appendix 1. The Cuil na Carton bog unit covers an area of approximately 568ha.

Cuil na Carton is in County Laois, approximately 4 km south west of Portlaoise and south of the M7 motorway and the regional road R445 and is located in the River Nore catchment. A permanent rail line runs through this bog.

6 Consultation

6.1 Introduction

This chapter of the rEIAR has been prepared in order to record the consultation carried out in respect of the substitute consent applications to which this rEIAR refers. The consultation carried out by Bord na Móna prior to submission of the substitute consent applications are outlined below and the main issues identified during this process are described.

It should be noted that only comments relating to historic peat extraction activities are referenced as this rEIAR is retrospective in nature and so does not relates to the environment as it would be in the future.

6.2 rEIAR Consultation

On 27th April 2020 consultation letters were issued to the following parties inviting comments on the rEIAR for the substitute consent applications;

- Meath County Council
- Kildare County Council
- Laois County Council
- Longford County Council
- Offaly County Council
- Westmeath County Council
- Department of Culture, Heritage and the Gaeltacht - Development Applications Unit
- Department of Planning, Housing and Local Government
- Minister for Community, Rural and Gaeltacht Affairs
- Environmental Protection Agency – Regional Inspectorate (Clonskeagh) and Regional Office (Westmeath)
- Office of Public Works
- The Eastern and Midland Regional Assembly
- An Taisce
- Inland Fisheries Ireland
- Eastern Regional Fisheries Board
- Shannon Regional Fisheries Board
- An Chomhairle Ealáion (The Arts Council)
- Fáilte Ireland
- Údarás na Gaeltachta
- Irish Water
- Transport Infrastructure Ireland
- Commission for Regulation of Utilities, Water and Energy
- Birdwatch Ireland
- Irish Wildlife Trust

- Bat Conservation Ireland
- Coillte
- Irish Peatlands Conservation Council
- Woodlands of Ireland
- Butterfly Conservation Ireland
- Meath-Westmeath Bog Heritage Group
- Wild Kildare
- Community Wetlands Forum c/o Irish Rurallink
- Irish Forum on Natural Capital CLG

The consultation letter explained the purpose of the substitute consent - being effectively a form of retrospective consent being applied for with the aim of regularising the planning status of historic peat extraction carried out by, or on behalf of, Bord na Móna on 41 individual bog units. If the substitute consent applications are successful, this (r) EIAR will also accompany (a) standard planning application(s) to local planning authorities, as appropriate, for consent for continued peat extraction.

6.3 Consultation Responses

The following table summarises consultation responses received and consequent responses. Copies of the consultation responses are included in Appendix 6 *Consultation*. In a number of instances responses had not been received at the time of drafting this rEIAR (May 2020).

Table 6.1: Consultation Response Summary

Stakeholder	Response Received	Summary of Key Issues	Response
Meath County Council	No response received	Not applicable	Not applicable
Kildare County Council	No response received	Not applicable	Not applicable
Laois County Council	No response received	Not applicable	Not applicable
Longford County Council	Response received 14th May 2020	The Planning Authority ask that specific attention would be given to the proposed developments proximity to the River Inny, Lough Kinale and Lough Gowna. The River Inny is also a direct source pathway from the proposed development to the Natura 2000 Site of Lough Ree SAC & SPA. Any effects either individually or cumulatively in resulting from the proposed development and any negative environmental effects on the River Inny and subsequently Lough Ree will need to be very carefully considered, accessed and mitigated for In relation to the contents of the rEIAR the applicant should satisfy themselves that all requirements as outlined in the EPAGuidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR) have been met.	While Longford County Council's comments are noted, as this rEIAR is retrospective it does not relate to proposed developments
Offaly County Council	Response received on 21st May 2020	The Planning Authority would like to receive additional information on the understanding that the informal consultation letter was actually a formal EIAR scoping request.	Additional information is provided in this rEIAR. It should be noted however that it was not the intention that the letter be considered a formal scoping request.
Westmeath County Council	Response received on 13th May 2020	More detailed mapping requested.	Detailed mapping is provided in Appendix 1 of this rEIAR and planning drawings accompany the application.
Department of Culture, Heritage and the Gaeltacht – Development Applications Unit	Response received 21st May 2020	The Department notes that only a portion of Bord na Móna's landholding of 80,000Ha is to be included in these Substitute Consent applications. Clarification in relation to the scope of Substitute Consent applications	Location mapping for the bog units included in this report is included in Appendix 1. Third party turf cutting has been assessed as a cumulative impact and details are provided in the document where relevant, particularly in Chapter 10: Biodiversity and Chapter 13: Land, Soils and Groundwater.

Stakeholder	Response Received	Summary of Key Issues	Response
		should be given in the application documentation. Precise mapping of the project area should be included. Where third party turf cutting is not included in the applications to the Board, the cumulative impacts of any such peat extraction together with milling and sod moss production on the same bogs should be assessed. The rEIAR should also include ancillary activities such as drain maintenance, settlement ponds and silt traps, disposal of silt etc The rEIAR should also include an assessment of any other off-site projects linked to the main project by the movement / transport of material to other sites and locations. It is unclear from the rEIAR what is proposed for the bogs which were omitted.	
Department of Planning, Housing and Local Government	No response received	Not applicable	Not applicable
Minister for Community, Rural and Gaeltacht Affairs	No response received	Not applicable	Not applicable
Environmental Protection Agency - (Central) Dublin	No response received	Not applicable	Not applicable
Environmental Protection Agency - (Regional) Athlone	No response received	Not applicable	Not applicable
Office of Public Works	No response received	Not applicable	Not applicable
The Eastern and Midland Regional Assembly	No response received	Not applicable	Not applicable
An Taisce	No response received	Not applicable	Not applicable

Stakeholder	Response Received	Summary of Key Issues	Response
Inland Fisheries Ireland	Response received 19th May 2020	IFI raised concerns relating to habitat/hydro-morphology /water quality. Noted that the mapping provided does not include all Bord na Móna owned peatlands.	Surface water quality is addressed in Chapter 12 Surface Water. Hydro-morphological alternations are addressed in Chapter 14 Land, Soils and Groundwater. Mapping is provided in Appendix 1 of this rEIAR and planning drawings accompany the application as they relate to the 41 bogs that are the subject of the Substitute Consent application.
Eastern Regional Fisheries Board	No response received	Not applicable	Not applicable
Shannon Regional Fisheries Board	No response received	Not applicable	Not applicable
An Chomhairle Ealáion (The Arts Council)	No response received	Not applicable	Not applicable
Fáilte Ireland	No response received	Not applicable	Not applicable
Údarás na Gaeltachta	No response received	Not applicable	Not applicable
Irish Water	No response received	Not applicable	Not applicable
Transport Infrastructure Ireland	No response received	Not applicable	Not applicable
Commission for Regulation of Utilities, Water and Energy	No response received	Not applicable	Not applicable
Birdwatch Ireland	No response received	Not applicable	Not applicable
Irish Wildlife Trust	No response received	Not applicable	Not applicable
Bat Conservation Ireland	No response received	Not applicable	Not applicable
Coillte	No response received	Not applicable	Not applicable
Irish Peatlands Conservation Council	Response received (letter) 12th May 2020	IPCC do not support continued extraction activities Importance of peatland conservation reiterated Contravention of statutory obligations highlighted IPCC would like to see rehabilitation action plans proposed for licensed sites and funding made available to allow target setting, monitoring and reporting Loss of archaeological heritage associated with peatland extraction raised	Archaeological heritage is addressed in Chapter 15 Cultural Heritage. While the IPCC comments are noted, as this rEIAR is retrospective it does not consider future rehabilitation plans.

Stakeholder	Response Received	Summary of Key Issues	Response
		IPCC stated that the omission of rehabilitation from peat extraction activities was noted in the consultation letter. EPA licensees following the cessation of commercially viable peat from the individual bog units must rehabilitate sites. This activity must be included in the assessment.	
Woodlands of Ireland	No response received	Not applicable	Not applicable
Butterfly Conservation Ireland	Response received 12th May 2020	Butterfly Conservation Ireland favours peatland preservation and the restoration of damaged peatlands. Butterfly Conservation Ireland is particularly concerned at the impact of ongoing bog habitat loss on specialist Lepidoptera species.	No specific comments made relating to rEIAR.
Meath-Westmeath Bog Heritage Group	No response received	Not applicable	Not applicable
Wild Kildare	No response received	Not applicable	Not applicable
Community Wetlands Forum c/o Irish Rurallink	No response received	Not applicable	Not applicable
Irish Forum on Natural Capital CLG	No response received	Not applicable	Not applicable

7 Noise and Vibration

7.1 Introduction

This chapter of the rEIAR assesses retrospective noise impacts associated with Bord na Móna's peat extraction and ancillary activities at the 41 bog units, and indirect noise impacts associated with the transportation of peat.

Due to the nature of peat extraction activities, as described in Chapter 5 Description of the Project of this rEIAR significant vibration impacts which could give rise to nuisance or damage to properties are not likely to have occurred. No nuisance or damage in terms of vibration associated with peat extraction or the transportation of peat has ever been recorded. Vibration impacts associated with peat extraction activities, and the transportation of the peat either by road or by rail have therefore not been considered further in this rEIAR.

7.2 Methodology

The methodology employed comprises a review of the following IPC Licence Registration Numbers with respect to noise:

- P0500-01 (Boora Bog Group),
- P0501_01 (Derrygreenagh Bog Group),
- P0502_01 (Blackwater Bog Group),
- P0503_01 (Allen Bog Group),
- P0504_01 (Mountdillon Bog Group),
- P0506_01 (Kilberry Bog Group), and
- P0507_01 (Cuil na Mona Bog Group).

In addition, the noise limits and noise monitoring data specified in Industrial Emissions Licence Registration Number P0482-04 (Edenderry Power Plant) were also reviewed.

The study area relevant to the consideration of noise impacts is the bog units, ancillary activities including transport networks, the end users and the immediate environs.

7.3 Receiving Environment

The 41 bog units are located in rural areas of relatively flat topography where the predominant land use is agricultural.

According to GeoDirectory data, there are 354 properties within 150 metres of the IPC licence boundaries of the bog units comprising 273 residential, 32 commercial, 35 residential / commercial and 14 unknowns. Unknown is one that does not receive mail). This assessment assumes that Residential or Residential / Commercial properties are noise sensitive. The number of Noise Sensitive Receptors (NSRs) i.e. Residential or Residential / Commercial properties within 150 metres of the IPC licence boundaries of the bog units are detailed in Table 7.1.

Table 7.1: Noise Sensitive Receptors near the bog units

Ref	Bog	Total NSR within 150m of IPC Licence Boundary	Distance from closest NSR to historic peat extraction area (within 300m)	Distance from closest NSR to IPC Licence Boundary
1	Bellair Nth	8	100m	25m
2	Lemanaghan	20	18m	12m
3	Noggusboy	8	122m	25m
4	Boora	39	53m	Inside the boundary
5	Galros	6	86m	4m
6	Killaun	3	240m	26m
7	Derrinboy	1	-	-
8	Derryclure	18	163m	51m
9	Monettia	3	225m	53m
10	Killaranny	-	-	-
11	Bracklin	2	148m	10m
12	Carranstown	10	82m	59m
13	Ballivor	2	141m from Carranstown	140m
14	Kinnegad	9	-	39m
15	Ballybeg	6	76m	16m
16	Ballaghurt	14	150m	20m
17	Daingean (Derries)	4	225m	60m
18	Daingean Rathdrum	1	-	96m
19	Clonad	-	-	-
20	Ballykeane	8	160m	88m
21	Esker	4	271m	37m
22	Garrymore	-	-	-
23	Derrylea	8	71m	54m
24	Ticknevin	5	66m	54m
25	Glashabaun Sth	-	-	-
26	Glashabaun Nth	7	62m	Within
27	Codd Nth (Codd 2)	-	-	-
28	Codd Sth (codd 1)	1	-	-
29	Ballydermot North	-	-	-
30	Ballydermot South	10	91m	19m
31	Blackriver	3	190m	22m
32	Barnaran	6	165m	18m
33	Lodge	8	86m	26m
34	Cuil na Gun	3	170m	20m
35	Milkernagh	2	241m	120m
36	Coolcraff	3	35m	Within
37	Gilltown	31	106m	3m

Ref	Bog	Total NSR within 150m of IPC Licence Boundary	Distance from closest NSR to historic peat extraction area (within 300m)	Distance from closest NSR to IPC Licence Boundary
38	Allen	39	53m	Within
39	Prosperous	20	71m	9m
40	Kilberry	12	14m	14m
41	Cuil na Carton	13	115m	11m

7.4 Remedial Impact Assessment

7.4.1 Peat Extraction and Ancillary Activities

The noise associated with peat extraction activities was generated through the use of mobile plant which is similar to agricultural type machinery such as harvesters, tractors etc. and the use of both permanent and temporary rail tracks.

Peat production activities generally took place during daylight hours from 07.00. Workshops generally operated between 08.00 and 16.00.

Since April 2000 all peat extraction and associated activities at the 41 bog units have been carried out in accordance with the conditions prescribed in IPC licences regulated by the EPA. Noise has been regulated under Condition 8 of the licences:

> *8.1 Activities on-site shall not give rise to noise levels off site at any noise sensitive location which exceed the following sound pressure limits (Leq,30min) subject to Condition 3:*
>
> *Daytime: 55 dB(A) Night-time: 45 dB(A).*
>
> *8.2 There shall be no clearly audible tonal component or impulsive component in the noise emission from the activity at any noise sensitive location.*

Condition 3 states that:

> *3.3.1 Noise from the activity shall not give rise to sound pressure levels (Leq,30 min.) measured at noise sensitive locations which exceed the limit value(s) by more than 2 dB(A).*

As part of the IPC Licence application process, Bord na Móna was required to assess each site in relation to its noise output. Due to the expansive nature of the sites, and their similarity in terms of production activity, Bord na Móna commissioned a noise assessment study be undertaken at the Boora Bog Group and the Allen Bog Group in May 1999. This study is included in Appendix 7 *Noise*.

The results of the study indicated the following:

- A daytime result of LAeq = 60.5dB(A) was recorded at the perimeter of Ballykeane bog while three milling units were in operation at the bog, however, at the noise sensitive location, no noise attributable to the bog was audible.
- A daytime result of LAeq = 45dB(A) was recorded at the nearest noise sensitive receptor to Ballykeane bog. This is approximately 150m from the bog boundary and is below the

daytime guideline of 55 dB(A). A background daytime noise reading of 45.2dB(A) was recorded when no peat milling was taking place indicating that noise from harvesting activities is not audible at that location.

- An elevated night-time noise level of 49.4dB(A) was recorded at the noise sensitive location near Ballykeane bog (approximately 150m from the bog boundary). This was attributed to passing cars.
- Noise level measurements were undertaken adjacent to the rail line near Ballycon workshop in the Allen Bog Group when two locomotives were passing each other in order to measure a maximum noise level. The resulting noise level at the nearest noise sensitive location was predicted to be 30.7dB(A).
- Measurements were undertaken at Pollagh Bog where the nearest residence is located approximately 50m from a rail level crossing. The predicted noise levels at the nearest sensitive receptor were calculated to be 60.9dB(A). It is noted that the background noise levels at this location were also in exceedance of the recommended guideline of 55dB(A) due to works being carried out by a private peat operator adjacent to the level crossing during the monitoring period.

According to GeoDirectory data, the nearest sensitive receptors are close to the IPC licence boundary and peat extraction activities have most likely resulted in nuisance impacts at the closest NSL (refer to Table 7.1). The impacts would have been temporary, yet significant in their nature, and likely limited to periods of peat milling, harrowing, ridging and harvesting.

7.4.2 Road Traffic Noise

The impact that transportation of extracted peat has had on noise is difficult to assess, as detailed data relating to the transportation routes is not available. An assessment of the impact on traffic is presented in Chapter 15 *Traffic and Transportation* of this report. This impact analysis showed that for the three destinations which were in receipt of the most peat transported by road (for the period 2012 to 2019), the relative contribution to the overall traffic of the areas was between 0.22% and 0.50%. The overall contribution to HGV traffic in the area was between 2.60% and 9.28%. This is not expected to have had a discernible impact on road traffic noise, as an increase of at least 20% in traffic volumes is required for there to be a 1dB increase in traffic noise [1].

7.4.3 Cumulative Impacts

It is possible that significant cumulative impacts at noise sensitive locations that are within 150m of multiple bog units could have arisen in the past as a result of operations taking place in more than one field/bog at a time. As noise associated with peat extraction activities is similar in nature to the noise generated by agricultural machinery it is also possible that significant noise impacts occurred at locations as a result of peat harvesting operations and agricultural activities occurring simultaneously. The noise assessment study commissioned by Bord na Móna as part of the IPC licence application process recorded noise levels higher than the EPA limit values of 55 dBA due to cumulative impacts associated with third party operators.

[1] Calculation of Road Traffic Noise, Department of Transport UK, 1988.

7.5 Mitigation and Monitoring

Noise monitoring is not a requirement of the IPC licences and noise monitoring, other than that specified in Section 7.4 *Remedial Impact Assessment* of this rEIAR has been carried out by Bord na Móna at the 41 bog units.

7.6 Residual Impacts

As described in Section 7.4 *Remedial Impact Assessment* of this rEIAR, there are a number of sensitive receptors close to the IPC licence boundary and the historic peat production area and peat extraction activities have most likely resulted in nuisance impacts at the closest NSL (refer to Table 7.1). The impacts would have been temporary, yet significant in their nature, and likely limited to periods of peat milling, harrowing, ridging and harvesting.

8 Air Quality

8.1 Introduction

This chapter of the rEIAR assesses retrospective air quality impacts associated with Bord na Móna's peat extraction activities at the 41 bog units. Descriptions of the bog units and their locations are provided in Chapter 5 of this rEIAR. The primary issue with regards to air quality is atmospheric dust as a result of milled peat operations. This chapter also assesses air quality impacts arising from the transportation of peat, and from harvesting vehicles.

8.2 Methodology

8.2.1 Legislation and Guidance

The air quality assessment of this rEIAR is carried out in accordance with the 'EIA Directive' as amended by Directive 2014/52/EU and having regard, where relevant, to guidance listed in Chapter 3 *EIA Methodology*.

In 1996, the Air Quality Framework Directive (96/62/EC) was published and was subsequently transposed into Irish law by the Environmental Protection Agency Act 1992 (Ambient Air Quality Assessment and Management) Regulations 1999. This Directive aimed to protect human health and the environment by avoiding, reducing or preventing concentrations of air pollutants. As a Framework Directive, it required the European Commission to propose 'Daughter' Directives which set air quality limit and target values for seven pollutants, alert thresholds and guidance on monitoring, siting and measurement for individual pollutants. The Directive was followed by four Daughter Directives, which set out limit values for specific pollutants:

- The first Daughter Directive (1999/30/EC) addresses sulphur dioxide, oxides of nitrogen, particulate matter and lead.
- The second Daughter Directive (2000/69/EC) addresses carbon monoxide and benzene.

The first two Daughter Directives were transposed into Irish law by the Air Quality Standards Regulations 2002 (SI No. 271 of 2002).

- The third Daughter Directive, Council Directive (2002/3/EC) relating to ozone was published in 2002 and was transposed into Irish law by the Ozone in Ambient Air Regulations 2004 (SI No. 53 of 2004).
- The fourth Daughter Directive, published in 2007, relates to polyaromatic hydrocarbons (PAHs), arsenic, nickel, cadmium and mercury in ambient air and was transposed into Irish law by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2009 (S.I. No. 58 of 2009).

The Ambient Air Quality and Cleaner Air for Europe (CAFE) Directive 2008/50/EC on ambient air quality and cleaner air for Europe was adopted in May 2008. This Directive merged the first three existing Daughter Directives and one Council Decision into a single Directive on air quality.

The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). The fourth Daughter Directive was transposed into

Irish legislation by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I. No. 58 of 2009).

The key atmospheric emission associated with peat extraction in terms of air quality are fugitive Particulate Matter emissions (i.e. dust). There are no statutory limits for dust deposition in Ireland, however, EPA guidance suggests that a deposition of 10 mg/m^2/hour can generally be considered as posing a soiling nuisance. This equates to 240 mg/m^2/day. The EPA recommends a maximum daily deposition level of 350 mg/m^2/day when measured according to the TA Luft Standard 2002.

Before the peat is harvested, other activities are undertaken such as milling, harrowing, and ridging, which all have a dust emission potential. Each production cycle takes approximately three days from milling to harvesting. When harvesting is taking place in one area of the bog, milling, harrowing or ridging take place in other areas.

In 2018 Bord na Móna commissioned Mott MacDonald to carry out a Peat Dust Deposition Monitoring Study in order to provide a robust evidence base to determine the Zone of Influence (ZoI) for peat dust deposition. Further to a review of Bord na Móna's planned peat extraction activities in 2018, Killlaun Bog was nominated as a suitably representative bog unit for the study. The dust deposition study ran from June to December 2018. A copy of the report is included in Appendix 8 *Air Quality*. The study concluded that in general, rates of deposition outside the production areas are low and in the range of the regional background and below the EPA Best Practice Level. The results show that whilst there are some elevated rates of deposition that have been monitored, these are due to localised events. The effects are not spatially large and are located within a few tens of metres of the production area. As a conservative measure a zone of impact of dust impact of 150 metres from milled peat production zones has been assumed.

For the purposes of this chapter, the study area is defined as being 150m from the IPC licenced areas.

The following methodology was undertaken to assess the baseline environment and retrospective air quality impacts:

- A review of publicly available air quality data for the study area was undertaken (www.gis.epa.ie);
- A review of the seven IPC licences (for each of the Bog Groups) and Bord na Móna's Annual Environmental Reports was undertaken with regard to emissions to air;
- All sensitive receptors (residences) within 150m of a bog unit were identified and reported. The assessment of the impact on ecological sites is presented in Chapters 10 (Biodiversity) and Chapter 11 (Surface Water) in this rEIAR.
- Indirect atmospheric emissions associated with road haulage, rail and peat harvesting vehicles were also assessed.
- Significant atmospheric emission sources (i.e. EPA licensed industrial facilities) within and in proximity to the bog units were reviewed in the context of local baseline environment.

8.3 Receiving Environment

The 41 bog units are located within the rural East (Zone D). Zone D represents rural areas located away from large population centres.

According to GeoDirectory data, there are 354 properties within 150 metres of the IPC licence boundaries of the bog units comprising 273 residential, 32 commercial, 35 residential / commercial and 14 unknowns. Unknown is one that does not receive mail). This assessment assumes that Residential or Residential / Commercial properties are dust sensitive.

Table 8.1 presents the number of dust sensitive receptors (DSRs), i.e. Residential or Residential / Commercial properties, within approximately 150m of the IPC licence boundary for each of the bog units.

Table 8.1: Dust Sensitive Receptors within 150m of the Bog Units

Ref	Bog	Total DSR within 150m of IPC Licence Boundary	Distance from closest DSR to historic peat extraction area (within 300m)	Distance from closest DSR to IPC Licence Boundary
1	Bellair Nth	8	100m	25m
2	Lemanaghan	20	18m	12m
3	Noggusboy	8	122m	25m
4	Boora	39	53m	Inside the boundary
5	Galros	6	86m	4m
6	Killaun	3	240m	26m
7	Derrinboy	1	-	-
8	Derryclure	18	163m	51m
9	Monettia	3	225m	53m
10	Killaranny	-	-	-
11	Bracklin	2	148m	10m
12	Carranstown	10	82m	59m
13	Ballivor	2	141m (from Carranstown)	140m
14	Kinnegad	9	-	39m
15	Ballybeg	6	76m	16m
16	Ballaghurt	14	150m	20m
17	Daingean (Derries)	4	225m	60m
18	Daingean Rathdrum	1	-	96m
19	Clonad	-	-	-
20	Ballykeane	8	160m	88m
21	Esker	4	271m	37m
22	Garrymore	-	-	-
23	Derrylea	8	71m	54m
24	Ticknevin	5	66m	54m
25	Glashabaun Sth	-	-	-
26	Glashabaun Nth	7	62m	Within
27	Codd Nth (Codd 2)	-	-	-
28	Codd Sth (codd 1)	1	-	-
29	Ballydermot North	-	-	-
30	Ballydermot South	10	91m	19m

Ref	Bog	Total DSR within 150m of IPC Licence Boundary	Distance from closest DSR to historic peat extraction area (within 300m)	Distance from closest DSR to IPC Licence Boundary
31	Blackriver	3	190m	22m
32	Barnaran	6	165m	18m
33	Lodge	8	86m	26m
34	Cuil na Gun	3	170m	20m
35	Milkernagh	2	241m	120m
36	Coolcraff	3	35m	Within
37	Gilltown	31	106m	3m
38	Allen	39	53m	Within
39	Prosperous	20	71m	9m
40	Kilberry	12	14m	14m
41	Cuil na Carton	13	115m	11m

8.4 Remedial Impact Assessment

8.4.1 Peat Extraction Operations

This section considers impacts associated with historic peat extraction activities associated with the 41 bog units.

In the early eighties, Bord na Móna employed approximately 7,000 workers at peak times, and major civil works such as extensions of the railway network, railway underpasses, bridges and level crossings were carried out. Bord na Móna experienced an expansion in its horticultural business at this time. In 1986 an additional 666 ha of bog was acquired by Bord na Móna, which brought the total land in Bord na Móna's ownership to approximately 88,000 ha in Ireland.

Sixteen of the 41 of the bog units were brought into production post 1985. These are listed below:

Table 8.2: Bog Units brought into production post 1985

Ref.	Bog Group	Bog Unit	Local Authority	Date of First Production
1	Boora	Killaun	Offaly	2003
2	Boora	Derrinboy	Offaly	2003
3	Boora	Derryclure	Offaly	1992
4	Boora	Killaranny	Offaly	1989
5	Boora	Galros	Offaly	1988
6	Allen	Daingean (Derries)	Offaly & Westmeath	1999
7	Allen	Daingean (Rathdrum)	Offaly	2000
8	Allen	Garrymore	Laois	1999
9	Allen	Ticknevin	Offaly & Kildare	2000
10	Allen	Codd North	Offaly	1989

Ref.	Bog Group	Bog Unit	Local Authority	Date of First Production
11	Allen	Codd South	Offaly	1989
12	Derrygrenagh	Bracklin	Westmeath	1985
13	Derrygreenagh	Carranstown	Meath & Westmeath	1985
14	Kilberry	Prosperous	Kildare	2003
15	Blackwater	Ballaghurt	Offaly	1995
16	Mountdillon	Coolcraff	Longford	1989

Since April 2000 all peat extraction and associated activities at the 41 bog units have been carried out in accordance with the conditions prescribed in IPC licences regulated by the EPA. Dust emissions have been regulated under Condition 5 of the licences:

5.1 Boiler Combustion Efficiency shall be tested annually, and results reported on annually as part of the AER.

5.2 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.

5.3 Within three months of the date of grant of the licence, the licensee shall submit to the Agency for agreement, a proposal for the identification and monitoring of Dust Sensitive Locations (DSL's) on and off site for dust deposition. A report on this monitoring shall be submitted annually as part of the AER.

5.4 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 Emission Standards for Particle Deposition (IW1)].

5.5 In relation to Dust Control the licensee shall, within six months of date of grand of this licence, develop and implement procedures to ensure that:

- *shelter belts are planted in sensitive areas,*
- *harvesting in sensitive areas is avoided during windy weather,*
- *where possible machinery use grassed pathways,*
- *headlands are kept clean and free of loose peat,*
- *stockpiles are sheeted where possible,*
- *moving machinery maintains slow speeds when travelling along dusty headlands,*
- *when harvesting, the jib is maintained low to the stockpile,*
- *shelter belts are planted around outloading facilities,*
- *road transported peat is adequately covered (sheeted or similar),*
- *wind breaks are planted where-ever possible.*

In accordance with the conditions of Industrial Pollution Control (IPC) Licences, peat extraction activities at the bogs are restricted to an emission limit of less than 350 mg/m^2/day of dust at any DSL.

Peat extraction activities have most likely resulted in nuisance impacts at the closest DSL. The impacts would have been temporary, and occasional, yet significant in their nature, and likely limited to periods of peat milling, harrowing, ridging and harvesting.

Transportation of peat by rail would also have resulted in temporary nuisance impacts at sensitive receptors located within 150m of the rail lines. As the vehicles used for road haulage are covered, no dust impacts would have arisen from peat transported by road.

8.4.2 Road Haulage, Peat Extraction Vehicles and Rail

Some minor emissions associated with haulage and peat extraction vehicles will have occurred as a result of operations. Any negative impact was not significant and was restricted to the active peat extraction area/roadway.

8.4.3 End Users

The following peat fired power plants are located in proximity to the bog units which operate, or have operated, under EPA licences.

- Edenderry Power Plant in County Offaly has operated under an EPA licence since 1999. The most recent licence reference is Industrial Emissions (IE) Licence Registration Number P0482-04.
- Lough Ree Power Plant in County Longford has operated under an EPA licence since 2002. The most recent licence reference is Industrial Emissions (IE) Licence Registration Number P0610-03.
- West Offaly Power Plant in County Longford has operated under an EPA licence since 2002. The most recent licence reference is Industrial Emissions (IE) Licence Registration Number P0611-03.

The key atmospheric emissions associated with these power plants include Oxides of Nitrogen, Sulphur Dioxides and Particulate Matter. Atmospheric emissions from these power plants have been controlled under licence by the EPA such that significant adverse air quality impacts are not anticipated to have occurred.

8.4.4 Cumulative Impacts

As described in previous sections, the key atmospheric emission associated with peat extraction in terms of air quality is dust. The ZoI of dust impacts is 150m of the boundary of each bog unit. There are no land use activities that occur within this area, or directly adjacent to each bog unit that could potentially have resulted in significant cumulative impacts in relation to dust.

8.5 Mitigation and Monitoring

The following mitigation measures are conditioned under the IPC licencing regime, as regulated by the EPA and have been carried out to mitigate against air quality impacts:

- Shelter belts planted in sensitive areas;
- Production operations to be suspended in windy weather;
- Where possible machinery to use grassed pathways;
- Headlands to be kept clean and free of excessive loose peat;
- Stockpiles to be sheeted where possible;
- Moving machinery to maintain slow speeds when travelling along dusty headlands;
- When harvesting, the jib to be maintained low to the stockpile;
- Shelter belts to be planted around outloading facilities;
- Wind breaks to be planted wherever possible;

- Peat production activities to cease in identified dust sensitive areas in adverse weather conditions.
- Training and Awareness of good practice; and
- Modifications to machinery to reduce dust

Bord na Móna have monitored air quality in accordance with the conditions of the IPC licences. Any dust emission in exceedance of the emission limit value would have been regarded as a non-compliance and reported to the EPA in accordance with the licence conditions.

All milled peat hauled by road is covered or enclosed.All vehicles have been maintained in good operational order while on-site, minimising any emissions that have occurred.

8.6 Residual Impacts

Peat extraction activities have most likely resulted in nuisance impacts at the closest DSL. The impacts would have been temporary, and occasional, yet significant in their nature, limited to periods of peat milling, harrowing, ridging and harvesting.

Transportation of peat by rail would also have resulted in temporary nuisance impacts at sensitive receptors located within 150m of the rail lines. As the vehicles used for road haulage are covered, no dust impacts would have arisen from peat transported by road.

Some minor emissions associated with haulage and peat extraction vehicles will have occurred as a result of operations. Any negative impact was not significant and was restricted to the active peat extraction area/roadway.

9 Climate

9.1 Introduction

This chapter of the rEIAR describes two aspects in relation to climate. The first is an assessment of climate change and extreme weather. The second relates to greenhouse gas emissions resulting from the draining of the peatland, extraction activities and the indirect emissions from end users.

9.2 Methodology

9.2.1 Climate Policy and the EIA Directive

The EU Environmental Impact Assessment Directive 2014/52/EU (the 'revised EIA Directive') came into force on 16th April 2014 and was transposed into Irish law in 2018 through Statutory Instruments S.I. No. 296 of 2018[2].

The revised EIA Directive introduced for the first time the requirement for EIA to consider "*the impacts of a project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change*" (Annex IV, Information to the included within the EIA report).

Ireland's climate adaptation policy, first set out in the 2012 National Climate Change Adaptation Framework (NCCAF), was subsequently revised in the National Policy Position on Climate Change (NPPCC) in 2014. The NPPCC provides a high-level policy direction for Government to adopt and implement plans to enable Ireland to pursue the transition to a low carbon, climate resilient and environmentally sustainable economy by 2050. This was known as the "national transition objective".

The Climate Action and Low Carbon Development Act in 2015 established the national transition objective on a statutory basis. To facilitate this nationwide transition, the 2015 Act prescribed the formal development and submission of national mitigation and adaptation plans to Government. Under Section 5 of the 2015 Act, the Government is required to prepare a National Adaptation Framework (NAF) which must be reviewed every five years.

Ireland's first statutory NAF[3] was published in 2018 and sets out the national strategy to reduce the vulnerability of the country to the negative effects of climate change and to avail of positive impacts.

Under the NAF, Government Departments produced sectoral adaptation plans[4], published in 2019. The Government of Ireland's Biodiversity Adaptation Plan is of particular relevance, containing significant consideration of the restoration and ongoing adaptation of Ireland's peat bogs. The first objective in that plan is to "Protect, restore and enhance biodiversity to increase

[2] https://ptfs-oireachtas.s3.amazonaws.com/DriveH/AWData/Library3/HPLGdoclaid010818_095321.pdf

[3] https://www.dccae.gov.ie/en-ie/climate-action/topics/adapting-to-climate-change/national-adaptation-framework/Pages/default.aspx

[4] https://www.dccae.gov.ie/en-ie/climate-action/topics/adapting-to-climate-change/national-adaptation-framework/sectoral-adaptation-planning/Pages/Sectoral.aspx

the resilience of natural and human systems to climate change" and this includes ongoing peatland restoration (DCHG, 2019).

The 2019 Climate Action Plan[5] acknowledges the important role of biodiversity in both adaptation and mitigation. In order to reduce the country's greenhouse gas measures, one of the measures identified is a transition away from peat and coal burning power stations, and an increase in renewables. The Climate Action Plan also identified peatlands as the largest store of carbon in the Irish landscape (peatlands represent 64% of Ireland's total soil organic carbon stock), and identified a number of better management measures for these, including restoring/rewetting all raised bods designated as Special Areas of Conservation and Natural Heritage Areas in future.

The Climate Change Advisory Council[6] highlights the role of citizen engagement and just transition in climate action, mentioning Bord na Móna's Eco-Rangers schools programme that teaches students about the biodiversity in wetlands and the role of the next generation in re-establishing peatlands as places of ecological importance rather than sources of combustible energy (CCAC, 2019).

In November 2018, the European Commission published an evaluation of the EU strategy on Adaptation (European Commission, 2019). One of the principal findings was that adaptation must support and be supported by the protection of the EU's biodiversity through nature-based solutions and green adaptation actions.

The National Adaptation Framework indicates that local authorities are actively working in consultation with DCCAE to develop a regional approach to climate action. This would group certain local authorities together, based on similar geographical/topographical characteristics and existing synergies, to address threats and impacts of severe weather events and ongoing climate change risks. In January 2018, the Government established four Climate Action Regional Offices (CAROs).

9.2.2 Climate Change and Extreme Weather

The following methodology was applied to the assessment of climate change and extreme weather:

- A review of historical and current climate data, including extreme weather, focusing on the Irish Midlands.
- A literature review of the potential impacts of climate change and extreme weather relevant to the activities including both the core activities of peat extraction and the associated business functions. This review considered the following key questions:
  - To what extent has the changing climate impacted on Project activities?
  - To what extent have the Project activities affected climate resilience in the local environment?
  - How have the combined effects of climate change and the Project activities impacted the local area / environment?

[5] https://www.dccae.gov.ie/en-ie/climate-action/topics/climate-action-plan/Pages/climate-action.aspx

[6] The Climate Change Advisory Council (CCAC) was established in January 2016 as an independent expert body providing advice and recommendations to Government.

9.2.3 Greenhouse Gas Emissions

Natural (undrained) peatlands act as a long-term carbon sink. The amount of carbon stored through the sequestration of carbon dioxide (CO_2) exceeds the amount of carbon released due to methane (CH_4) emissions and that leached in natural water flows.[7] However, the drainage and extraction of peat for use in energy generation and horticulture affects the natural function of peatlands. CO_2 emissions from industrial peatlands can increase significantly due to a lowering of the water table, CH_4 emissions may decrease (although CH_4 emissions from ditches will increase) and waterborne carbon losses may increase.[7]

Greenhouse gases (GHGs)[8] are used as a measure of the impact of a project or process on climate change. While emission factors for industrial peatlands vary according to aspects such as climatic conditions, vegetation cover and drainage and management techniques, areas of peatland used for extraction purposes typically act as a net source of GHG emissions.[9] GHG emissions are also emitted from the machinery used to prepare and extract the peat, and from road and rail transport of the peat to processing plants or power stations.

Off-site GHG emissions are also important to consider when assessing the impact of industrial peat extraction. These can include the CO_2 released during the combustion of peat for energy generation and the loss of carbon to the atmosphere from horticultural peat products.[10] To avoid double counting of emissions such as those which are included in national energy sector reporting, these are presented separately in this assessment.

9.2.4 Temporal scope

For many of the bog units, peat extraction began many decades ago. Data on peat production areas and quantities is only available for the period 1995 to 2012 and peat production quantities for horticultural peat are excluded prior to 2002.

The retrospective climate impact assessment considers changes to the receiving baseline environment between 2012 1992 and present day in the context of the individual bog units. As a monthly breakdown of peat extraction data is not available and peat extraction is predominately a summer activity, it has been assumed that no peat production took place in October, November or December 2012 and so 2013 production figures are the earliest year considered. The assessment extends until 2019 as it is assumed no production occurred in the early months of 2020.

9.2.5 Spatial scope

This assessment has considered the on and off-site emissions from the extraction of peat. Although the receptor for GHGs is the global atmosphere, the geographical boundaries to the emissions sources considered in this assessment are outlined here.

On-site emissions include the loss of carbon associated with drainage and exposure of the peat surface, methane emissions from ditches and the soil, N_2O emissions from the peat surface, the loss of GHG emissions from peat stockpiles, and emissions from machinery associated with the

[7] Wilson et al., 2015. Derivation of Greenhouse Gas emission factors for peatlands managed for extraction in the Republic of Ireland and the United Kingdom. Available at: https://www.biogeosciences.net/12/5291/2015/bg-12-5291-2015.pdf

[8] A greenhouse gas is a gas that absorbs and emits radiant energy within the thermal infrared range. Greenhouse gases cause the greenhouse effect. This assessment looks at carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).

[9] Murphy et al., 2015. Benchmarking Environmental Impacts of Peat Use for Electricity Generation in Ireland – A Life Cycle Assessment. Available at: https://www.researchgate.net/publication/277193754_Benchmarking_Environmental_Impacts_of_Peat_Use_for_Electricity_Generation_in_Ireland-A_Life_Cycle_Assessment

[10] Environmental Protection Agency, 2019. Ireland's National Inventory Report 2019. Available at: http://www.epa.ie/pubs/reports/air/airemissions/ghg/nir2019/

extraction and transport of peat. For this assessment, transport emissions within Ireland have been included. GHG emissions from the transport of peat overseas (e.g. the shipping of horticultural peat to European destinations) have not been included.

Off-site emissions include combustion emissions from the burning of peat to generate electricity, GHG emissions associated with the manufacturing of briquettes and GHG emissions as a result of the application of peat for horticultural purposes.

9.2.6 Calculation approach

A best practice GHG assessment involves multiplying the activity, area or consumption data by a published emissions factor from a recognised source:

Emissions (tCO_2e)[11] = rate of activity (unit) x emission factor (tCO_2e/unit)

Where tCO_2e = tonnes of carbon dioxide equivalent

In this assessment, the best available activity data for the bog units and the most relevant emission factors were selected. Table 9.1 and Table 9.2 set out the emissions sources considered, the methodology applied (i.e. the source of emissions factors), and the project activity data used in the calculation.

Where activity or consumption data was not available, recognised benchmarks from industrial or academic sources have been used instead. Based on previous data, these indicate the typical GHG emissions associated with an activity using a relevant metric (e.g. mass, volume, cost).

This assessment identifies the major potential sources of on-site and off-site GHG emissions from the extraction of peat at the 41 bog units. These are indicated in Table 9.1 and Table 9.2.

9.2.6.1 On-site emissions

Table 9.1: On-site GHG emission sources

Emission source	GHG type	Methodology used	Included in both time periods (prior to 2012 and 2012-2019)	Available data
Loss of carbon associated with drainage and exposure of peat surface	CO_2	CO_2 emissions per area of bog, using: Equation 2.6. 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands.[12]	Yes	Area of bog units.
Soil methane emissions from drained organic soils and drainage ditches	CH_4	CH_4 emissions per area of bog, using: Equation 2.6. 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands.[12]	Yes	Area of bog units.
N_2O emissions from peatlands	N_2O	N_2O emissions per area of bog, using: Equation 7.7. 2006	Yes	Area of bog units.

[11] Tonnes of Carbon dioxide equivalent (tCO_2e) is a measure which allows the comparison of emissions from different greenhouse gases relevant to one unit of CO_2. It is calculated by multiplying the emissions by the global warming potential (GWP) of that greenhouse gas.

[12] IPCC, 2014. 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands. Available at: https://www.ipcc.ch/site/assets/uploads/2018/03/Wetlands_Supplement_Entire_Report.pdf

Emission source	GHG type	Methodology used	Included in both time periods (prior to 2012 and 2012-2019)	Available data
during peat extraction		IPCC Guidelines for National Greenhouse Gas Inventories. Vol 4 Chapter 7: Wetlands.[13]		
Losses from uncovered milled peat stockpiles	CO_2e	CO_2e emissions per area of stockpiles, using: Alm et al., 2007. Emission factors and their uncertainty for the exchange of CO_2, CH_4, and N_2O in Finnish managed peatlands.[14]	Yes	Tonnes of peat produced per bog unit (not available prior to 1992, horticultural peat not included before 2002). Average width and density of stockpiles (assumptions provided by BnM).
Machinery and transport	CO_2, CH_4, N_2O	GHG emissions per MJ of extracted peat, using Nilsson and Nilsson, 2004. The Climate Impact of Energy Peat Utilisation in Sweden – the Effect of former Land-Use and After-treatment.[15]	Yes	Tonnes of peat produced per bog unit (not available prior to 1992, horticultural peat not included before 2002).

9.2.6.2 Off-site emissions

Table 9.2: Off-site GHG emission sources

Emission source	GHG type	Methodology used	Included in both time periods (prior to 2012 and 2012-2019)	Available data
Combustion of peat for electricity generation	CO_2	CO_2 emissions per MJ of peat produced, using: 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Vol 2: Energy. Chapter 1.[16]	No. 2012-2019 only.	Tonnes of peat produced per bog unit. Primary use of peat produced from each bog unit.
Horticultural losses off-site	CO_2	CO_2 emissions per tonne of peat produced, using: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Vol 4	No. 2012-2019 only.	Tonnes of peat produced per bog unit. Primary use of peat produced from each bog unit.

[13] IPCC, 2006. 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Vol 4 Chapter 7: Wetlands. https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_07_Ch7_Wetlands.pdf

[14] Alm et al., 2007. Emission factors and their uncertainty for the exchange of CO2, CH4, and N2O in Finnish managed peatlands. Available at: https://www.researchgate.net/publication/215473536_Emission_factors_and_their_uncertainty_for_the_exchange_of_CO2_CH4_and_N2O_in_Finnish_managed_peatlands

[15] Nilsson and Nilsson, 2004. The Climate Impact of Energy Peat Utilisation in Sweden – the Effect of former Land-Use and After-treatment. Available at: https://www.researchgate.net/publication/215473536_Emission_factors_and_their_uncertainty_for_the_exchange_of_CO2_CH4_and_N2O_in_Finnish_managed_peatlands

[16] IPCC, 2006. 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Vol 2 Chapter 1: Energy. Available at: https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html

Emission source	GHG type	Methodology used	Included in both time periods (prior to 2012 and 2012-2019)	Available data
		Chapter 7:Wetlands Section 7.2.1.[13]		
Briquette manufacturing	CO_2e	GHG emissions per tonne of peat. Assumptions per tonne of peat processed based on annual emissions from Derrinlough Briquette Factory.[17]	No. 2012-2019 only.	Tonnes of peat produced per bog unit. Primary use of peat produced from each bog unit.

9.2.7 Assumptions and limitations

This section outlines the assumptions and limitations associated with this assessment.

9.2.7.1 Assumptions

In line with the methodology provided by Bord na Móna, the peat harvesting area is assumed to be the total bog area including headlands and drainage areas but excluding stockpile areas which are counted separately.

To calculate off-site emissions, it was assumed that the primary use of the peat bog was the dominant source of off-site emissions for that site. In reality, individual bog units are likely to produce peat which is used for more than one purpose.

For horticultural peat use, it is assumed that all off-site emissions occur in the extraction year.[13]

For GHG emissions from briquette manufacturing, it has been assumed that total annual emissions at Derrinlough Briquette Factory were as a result of the production of briquettes from peat supplied from bog units which listed Derrinlough supply as their primary use. If peat was supplied from other bog units, this would reduce the emissions intensity per tonne of peat processed.

9.2.7.2 Limitations

Data relating to fuel use from machinery used to extract the peat was not available. As a result, emissions from machinery used for extraction and associated with transporting the peat by road or rail from the site to the processing plant were based on benchmark emissions factors related to the energy of peat extracted.[15]

Due to uncertainties, GHG emissions as a result of waterborne carbon losses or fires were not included in the assessment but are indicated to be *Good Practice* in the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands.[12] The impact of restoration methods on peat bogs which have ceased production was not included in this assessment as only the operational time period was considered.

Data on quantities and uses of harvested peat was limited for the period 1992 to 2001 where horticultural peat was not included and limited for the period 1992 to 2012 where off-site usage destinations were not available.

[17] Environmental Protection Agency, 2015. Greenhouse Gas Emissions Permit. Available at: http://www.epa.ie/pubs/reports/air/etu/permit/IE-GHG105-10401-3%20(BnaM%20Derrinlough).pdf

9.2.7.3 Additional difficulties encountered

The results of a GHG assessment for peat extraction are sensitive to the emissions factor used to calculate the GHG fluxes from these peatland areas. As a result of spatial and temporal variability, the extraction method and the nutrient status of the peatland, a high degree of uncertainty is associated with these emission factors. In this assessment, two separate emission factors have been used to show a range of potential GHG emissions.

For the period 1992 to 2012, peat production figures relate to production areas rather than individual bog units for some sites. This may lead to overestimating the production from individual bog units where there was more than one bog unit in a production area. In the absence of more detailed data, peat harvested from production areas was the best approximation for each individual bog unit.

9.3 Receiving Environment

This section provides a summary of historical, current and projected climate change, including extreme weather, relevant to the Project area.

Ireland's temperate maritime climate means that the country experiences mild winters, cool summers, and can be humid and overcast for much of the year. Mean annual temperatures generally range between 9 °C and 10 °C. Summer mean seasonal maxima are between 18 °C and 20 °C. The highest temperature recorded in Ireland was 33.3 °C on 26 June 1887 at Kilkenny Castle in Kilkenny, while the lowest temperature recorded was -19.1 °C on 16 January 1881 at Markree Castle in Sligo. More recently, the highest November temperature recorded was 20.1°C, recorded in Kerry, Dooks on 1 Nov 2016[18].

The average annual precipitation across Ireland is approximately 1,230 mm. Precipitation generally decreases from the western half of the island towards the northeast. Annual precipitation in the western half of Ireland averages between 1,000 mm and 1,400 mm, whilst in the eastern half averages between 750mm and 1,000 mm. High elevations typically experience higher precipitation than lower elevation areas, with precipitation in many mountainous districts exceeding 2,000 mm per year.

For climate change purposes, 30-year averages are commonly considered, with the period from 1981 – 2010 often viewed as a "baseline" or current climate. A general description of the historical trends in climate in Ireland is presented up to approximately the current baseline, insights to current experiences of extreme weather as context for the present climate is then presented. The direction of projected future trends is subsequently indicated. It is not scientifically credible to consider climate change over a period as short as 10 years, so projections are set in the longer timeframe out to the 2050s (also because this is the timeframe for which robust climate change projections for Ireland are readily available).

9.3.1 Historical 1981 - 2012

Observations show that Ireland's climate is changing in terms of sea level rise, increases in average temperature, changes in precipitation patterns and weather extremes (EPA 2017). Temperatures have increased by about 0 8 °C over the period 1900 to 2012, an average of about 0 07 °C per decade. According to the EPA, mean annual surface air temperature in Ireland has observed an increase of approximately 0.8 °C over the last 110 years. The number

[18] Source: https://www.met.ie/climate

of observed warm days and heatwaves per year has increased while the number of cold snaps/frost days has decreased.

The table is extracted from the National Adaptation Framework (Government of Ireland, 2018) and provides a summary of observed (historical) and projected changes in climate in Ireland.

Figure 9.1: Observed and Projected Climate Changes and impacts for Ireland

Table 2 Summary of observed and projected climate changes and impacts for Ireland

Parameter	Observed	Projected	Example of Biophysical Im
Temperature	▪ Average temperatures have increased by 0.8°C since 1900, an average of 0.07°C per decade. ▪ The number of warm days (over 20°C) has increased while the number of cold days (below 0°C) has decreased.	▪ Projections indicate an increase in average temperatures across all seasons (0.9-1.7°C). ▪ The number of warm days is expected to increase and heat waves are expected to occur more frequently.	▪ Incidences of cold stress ar decrease while incidences will increase. ▪ The duration of the growin increase, occurring earlier farther.
Precipitation	▪ Increase in average annual national rainfall of approximately 60mm or 5% in the period 1981-2010, compared to the 30-year period 1961-1990. ▪ The largest increases are observed over the west of the country.	▪ Significant reductions are expected in average levels of annual, spring and summer rainfall. ▪ Projections indicate a substantial increase in the frequency of heavy precipitation events in Winter and Autumn (approx. 20%).	▪ The increased occurrence will result in increased pres supply. ▪ An increase in the frequen precipitation events will res fluvial and pluvial flood risk
Wind Speed and Storms	▪ No long-term change in average wind speed or direction can be determined with confidence. ▪ The number and intensity of storms in the North Atlantic has increased by approx. three storms per decade since 1950.	▪ Projections indicate an overall decrease in wind speed and an increase in extreme wind speeds, particularly during winter. ▪ The number of very intense storms is projected to increase over the North Atlantic region. Projections suggest that the winter track of these storms may extend further south and over Ireland more often.	▪ Increases in extreme wind impact on wind turbines ar of power supply. ▪ Infrastructure will be at risk increased occurrence of int (e.g. winter 2013/2014).
Sea Level and Sea Surface Temperature	▪ Historically, sea level has not been measured with the necessary accuracy to determine sea level changes around Ireland. However, measurements from Newlyn, in southwest England, show a sea level rise of 1.7cm per decade since 1916. These measurements are considered to be representative of the situation to the South of Ireland. ▪ Sea surface temperatures have increased by 0.85°C since 1950, with 2007 the warmest year in Irish coastal records.	▪ Sea levels will continue to rise for all coastal areas, by up to 0.8 m by 2100. The south of Ireland will likely feel the impacts of these rises first. ▪ Sea surface temperatures are projected to continue warming for the coming decade. For the Irish Sea, projections indicate a warming of 1.9°C by the end of the century.	▪ Significant increase in area coastal inundation and ero ▪ Increased risk to coastal aq water supply. ▪ Change in distribution fish ▪ Implications for fisheries ar industries.

Source: National Adaptation Framework (Government of Ireland, 2018)

9.3.2 Current 2012 - 2020

The most immediate climate-related risks in Ireland are those associated with extreme weather events, such as floods, precipitation and storms, or conversely, drought. Some of the broader impacts arising from extreme weather in the last decade were summarised in Ireland's Climate Action Plan (Government of Ireland, 2019). For example:

- The floods of Winter 2015/16 were considered to be the worst floods on record and occurred during what was also the wettest winter on record (with rainfall totals at 189% of normal). The Department of Transport, Tourism and Sport allocated €106 million alone for repairs to the rail network, regional and local roads and €8 million for national roads.
- Storm Ophelia in 2017 necessitated a massive national emergency response, shutting down schools and Government Buildings and disrupting business across the country. At the peak of Ophelia 385,000 homes and businesses were without power and 109,000 homes were left

without water supply. It has been reported that the cost of insurance claims due to 2017's Storm Ophelia-related damage was estimated at €45 million.

- 2018's Storm Emma was reported as costing Irish insurers an estimated €39 million.
- Summer 2018 saw prolonged drought conditions across the country, particularly in the eastern region.

Table 9.3 includes some of the main extreme weather events experienced in Ireland since 2012.

Table 9.3: Extreme weather events in Ireland since 2012

Date, Event	Description
September 2018, Storm Ali	Widespread strong winds and heavy rain. High winds were the cause of most damage. Maximum wind gust speeds of 90 mph recorded at Mace Head.
Summer 2018, heatwave / drought	All precipitation totals below long-term average (LTA) for the season. All 3 summer months had below average precipitation. Absolute drought conditions prevailed from late June until mid-July at stations in the East, Midlands, West and South. All mean seasonal air temperatures across the country were above LTA. Heat waves reported by the end of June; continued into July in some places.
March 2018, Storm Emma	Widespread heavy falls of drifting snow. Heaviest snow in the east and southeast with accumulations of up to 69 cm in the Wicklow mountains.
October 2017, Storm Ophelia	Gales and strong gales were reported at many stations on 16th October. Violent storm force winds reported in Cork. One station reported its highest gust speed on record 84 knots (155 km/hr)
Winter/Spring/Summer 2017, driest winter in 25 years followed by dry spring-summer	Country-wide below long term average (LTA) winter precipitation All seasonal mean temperatures above LTA, with over half of stations reported at least 1°C above normal; some reported mildest winter in 10 years
2013/14, winter storms	Exceptional run of winter storms - storm force winds on 12 different days Precipitation 150%-200% of LTA which fell on already waterlogged ground.

9.4 Remedial Impact Assessment

9.4.1 Weather and climate impacts

9.4.1.1 Climate impacts on peatlands

Projected increases in the occurrence of extreme weather events, such as heat waves, droughts, floods and storms, may have devastating consequences for Ireland's habitats[19] (Climate Ireland, 2017b). A report from the EPA (2012) highlighted that peatlands (raised bog, blanket bog) are among the protected habitats most vulnerable to climate impacts.

The main observable direct impacts of climate change on peat bog ecosystems, in common with species and communities more generally, are changes in phenology, species abundance and distribution, community composition, habitat structure and ecosystem processes. Although such impacts have been documented in many species and habitats, there remains great uncertainty

[19] http://www.climateireland.ie/#/tools/sectors/biodiversitys

about the timeframes over which these impacts will unfold across whole biological communities (such as bog units).

The Government of Ireland's Biodiversity Sectoral Adaptation Plan, citing academic references, states that it has been projected that 40% of the suitable climatic areas for peatlands in Ireland will be lost by 2075. Increasing temperature and precipitation changes will reduce the area that is suitable for active blanket bog. In addition, current models predict that drier summers and higher levels of more intense rainfall, which are likely to result in bog bursts and landslides, may, as well as damaging the bog, indirectly impact other habitats such as lakes (DCHG, 2019).

According to the Adaptation Plan, the summer heatwave and drought in 2018 affected peat bogs in Ireland, their functioning or their management, as a result of water shortages and high temperatures, for example.:

- Water levels on all midland raised bogs were low, which affected Sphagnum growth and maintenance. The resilience of Sphagnum (active raised bod) to regular drought events is unknown.
- Fires on Liffey Head Bog continued for several weeks, burning into peat and re-igniting. Significant knock-on effects for conservation staff workload and costs for fire management.
- Heat stress impairing work rate of rangers and managers.

9.4.1.2 Climate impacts on core peat extraction activities

In the absence of reliable data or monitoring of weather impacts on activities in the past, it is hard to draw any conclusion about the extent of these impacts. One perspective is that it is primarily only extreme weather (rather than trends in average climate) that may have any noticeable impact.

Therefore, the potential for increased frequency of occurrence or severity of extreme hot weather or stormy wet weather may be a concern in the future. However, over the period of 10 years from now, it is unlikely to be possible to detect a significant increase in extreme weather events attributable to the changing climate.

9.4.1.3 Impact of Project activities on local climate resilience

This section considers the question: To what extent have the activities affected climate resilience in the local area/environment?

This question is probably best considered in the context of the other environmental topics, primarily flood risk assessment, ecology (biodiversity) and water quality.

The concept of ecosystem-based adaptation (EbA) recognises that high quality, well-functioning ecosystems provide services which help people and the wider environment to adapt to the adverse effects of climate change. Undisturbed peat bogs undoubtedly offer resilience benefits locally, primarily through storage of flood water, ecological capacity for species adaptation, and delivery of improved water quality. EbA approaches commonly include wetland maintenance and restoration, and management and establishment of protected areas, among other things. At the same time, conservation, restoration and management can also contribute to climate change mitigation. In the context of the bog units in the Project, the twin benefits emphasised from restoration of degraded peatlands are increasing carbon storage and enhanced storage of flood water.

However, past peat extraction activities have already drained the bog units under consideration. The capacity for these bog units to provide the climate resilience benefits offered by undisturbed peat bogs is therefore extremely reduced.

9.4.2 GHG Emissions

For GHG emissions the receptor is the global atmosphere and therefore, unlike other environmental impacts, the emissions of a single project cannot be linked to a location specific receptor. The nature of GHG emissions and the global receptor means the cumulative impact is already considered.

9.4.2.1 1985 – 2012

For 1985 to 1991, data was not available detailing the areas and quantities of peat removed for all 41 bog units and so the GHG emissions released as a result of peat extraction during this period cannot be quantified. It should be noted that the requirement to undertake GHG assessments is relatively new, climate change was included in the 2002 Guidelines on the information to be contained in Environmental Impact Statements.[20] This helps to explain why the necessary data was not collected in historical times and why less consideration was given to mitigating the effects of GHG emissions in the past. While there is variation between different emission factors which show the net effect on GHG emissions from the extraction of peatland and regional variations are also apparent, the drainage and extraction of peat from natural peat bogs is widely shown to be a net source of GHG emissions.[7] As a result, a net increase in the emission of GHGs from all bog areas will have occurred compared to a natural bog state between 1985 and 1991.

For the period 1992-2001, production quantities of milled peat from each production area were available excluding peat extracted for horticultural purposes. As such, the calculated on-site GHG emissions are an underestimate of the total GHG emissions during this period. From 2002 onwards, horticultural peat was also included in the production quantities recorded. Off-site GHG emissions were not calculated for the period 1985 to 2012 as detailed data relating to the end-use of excavated peat was not available.

Table 9.4 shows the total on-site GHG emissions during this period for 40 bog units, data relating to Coolcraff bog unit was not available so has been excluded from this assessment. It has been assumed that production areas remain constant over the period 1985 to 2012 and is the same as the area provided for each bog unit in the 2012-2019 assessment. Table 9.5 shows the breakdown by each individual bog unit. This assessment was carried out using two different emission factors for CO_2 from peatlands managed for extraction: one from the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands[12], and an Ireland and UK specific factor from Wilson et al., 2015.[7] Where production tonnages were provided for combined bog units, these have been calculated together.

Table 9.4: On-site GHG emissions 1985 to 2012, all bog units

	On-site GHG emissions (tCO_2e)	Off-site GHG emissions (tCO_2e)
1985-1991	**Data not available.**	**Data not available.**
1992-2001	**2,500,920 – 3,376,873***	**Data not available.**
2002-2012	**3,111,894 – 4,066,657**	**Data not available.**

*underestimates on-site GHG emissions as emissions from stockpiles, machinery and transport do not include peat extracted for horticultural purposes.

[20] Environmental Protection Agency, 2002. Guidelines on the information to be contained in Environmental Impact Statements. Available at: http://www.epa.ie/pubs/advice/ea/guidelines/EPA_Guidelines_EIS_2002.pdf

Table 9.5: On-site GHG emissions 1992 to 2012

Ref	Bog	Bog group	Peat produced (t)	GHG emissions (tCO_2e) IPCC 2013 EF	GHG emissions (tCO_2e) Wilson et al., 2015 EF
1	Bellair Nth	Boora	144,146	148,485	99,654
2	Lemanaghan	Boora	2,152,116	494,269	390,563
3	Noggusboy	Boora	1,533,932	358,622	282,407
4	Boora	Boora	1,632,239	587,048	431,370
5	Galros	Boora	262,857	69,688	53,639
6	Killaun	Boora	150,309	99,393	68,600
7	Derrinboy	Boora	248,692	95,724	69,725
8	Derryclure	Boora	207,402	97,681	69,519
9	Monettia	Boora	905,037	250,986	191,718
10	Killaranny	Boora	1,502,943*	194,267	176,625
11	Bracklin	Derrygreenagh	554,949	457,278	310,805
12	Carranstown	Derrygreenagh			
13	Ballivor	Derrygreenagh			
14	Kinnegad	Derrygreenagh	271,337	108,468	78,639
15	Ballybeg	Derrygreenagh	1,274,710	314,445	245,147
16	Ballaghurt	Blackwater	1,864,037	315,389	266,483
17	Daingean (Derries)	Allen	341,933	184,477	129,540
18	Daingean Rathdrum	Allen			
19	Clonad	Allen	1,015,762	198,548	162,211
20	Ballykeane	Allen	1,409,915	235,482	199,605
21	Esker	Allen	1,172,651	241,047	194,802
22	Garrymore	Allen	54,566	78,119	51,680
23	Derrylea	Allen	353,257	187,880	132,106
24	Ticknevin	Allen	1,809,843**	272,939	237,536
25	Glashabaun Sth	Allen	205,843	272,150	180,598
26	Glashabaun Nth	Allen			
27	Codd Nth (Codd 2)	Allen	1,782,059	507,034	385,674
28	Codd Sth (Codd 1)	Allen			
29	Ballydermot North	Allen			
30	Ballydermot South	Allen			
31	Blackriver	Allen	1,902,105	573,512	432,243
32	Barnaran	Allen			
33	Lodge	Allen			
34	Cuil na Gun	Mountdillon	122,166	170,248	112,744

35	Milkernagh	Mountdillon	172,599	165,082	111,227
36	Coolcraff	Mountdillon	Data not available	Data not available	Data not available
37	Gilltown	Kilberry	395,718	117,848	88,990
38	Allen	Kilberry	336,697	133,638	96,972
39	Prosperous	Kilberry	195,563	69,287	51,016
40	Kilberry	Kilberry	409,675	274,957	189,557
41	Cuil na Carton	Cuil na Móna	381,522***	169,537	121,416
Total			**24,766,579**	**7,443,530**	**5,612,814**

*may include peat harvested at other bog units in the Pullough production area

**may include peat harvested at other bog units in the Lullymore production area

*** may include peat harvested at other bog units in the Coolnamona production area

9.4.2.2 2012 – Present day (2019)

On-site GHG emissions for all 41 bog units are shown in Table 9.6. This accounts for the emission sources outlined in Table 9.1. This assessment was carried out using two different emission factors for CO_2 from peatlands managed for extraction: one from the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands[12], and an Ireland and UK specific factor from Wilson et al., 2015.[7] Where production tonnages were provided for combined bog units, these have been calculated together.

Table 9.7 shows off-site GHG emissions from the combustion of peat to generate electricity, losses from horticultural peat, and the emissions associated with briquette manufacturing. Two sets of emission factors have been used to calculate the combustion emissions: one from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2: Energy, Chapter 1[16] and another used in Ireland's National Inventory Report, 2019.[10]

Table 9.6: On-site GHG emissions 2012 - 2019

Ref	Bog	Bog group	Peat produced (t)	GHG emissions (tCO_2e) IPCC 2013 EF	GHG emissions (tCO_2e) Wilson et al., 2015 EF
1	Bellair Nth	Boora	506,359	91,059	75,819
2	Lemanaghan	Boora	858,728	177,576	143,327
3	Noggusboy	Boora	678,266	281,022	202,871
4	Boora	Boora			
5	Galros	Boora	543,287	64,554	60,235
6	Killaun	Boora	0	28,587	18,210
7	Derrinboy	Boora	335,893	54,852	46,758
8	Derryclure	Boora	178,638	42,491	33,352
9	Monettia	Boora	505,75	102,170	82,875
10	Killaranny	Boora	487,288	63,514	57,602
11	Bracklin	Derrygreenagh	472,368	178,489	130,315
12	Carranstown	Derrygreenagh			
13	Ballivor	Derrygreenagh			

14	Kinnegad	Derrygreenagh	294,390	54,652	45,170
15	Ballybeg	Derrygreenagh	420,768	104,440	81,331
16	Ballaghurt	Blackwater	564,569	99,981	83,550
17	Daingean (Derries)	Allen	363,742	84,143	66,396
18	Daingean Rathdrum	Allen			
19	Clonad	Allen	563,358	86,567	74,963
20	Ballykeane	Allen	569,436	87,514	75,781
21	Esker	Allen	616,167	100,780	85,875
22	Garrymore	Allen	50,744	28,992	20,253
23	Derrylea	Allen	273,543	76,755	58,516
24	Ticknevin	Allen	785,097	191,963	149,900
25	Glashabaun Sth	Allen			
26	Glashabaun Nth	Allen			
27	Codd Nth (Codd 2)	Allen	850,335	192,257	152,383
28	Codd Sth (Codd 1)	Allen			
29	Ballydermot North	Allen			
30	Ballydermot South	Allen			
31	Blackriver	Allen	860,347	211,695	165,117
32	Barnaran	Allen			
33	Lodge	Allen			
34	Cuil na Gun	Mountdillon	174,074	68,843	49,977
35	Milkernagh	Mountdillon	153,691	63,748	46,014
36	Coolcraff	Mountdillon	4,866	33,067	21,234
37	Gilltown	Kilberry	277,914	52,524	43,235
38	Allen	Kilberry	210,581	53,465	41,466
39	Prosperous	Kilberry	255,978	40,399	34,740
40	Kilberry	Kilberry	372,397	113,040	85,108
41	Cuil na Carton	Cuil na Móna	292,083	71,467	55,801
Total			**12,520,664**	**2,900,605**	**2,288,174**

Table 9.7: Off-site GHG emissions 2012 - 2019

Ref	Bog	Bog group	Historical primary peat use	Combustion emissions (tCO_2) 2006 IPCC EF	Combustion emissions (tCO_2) EF from Ireland's National Inventory Report	Horticulture losses off site (tCO_2)	Emissions associated with Briquette manufacturing (tCO_2e)
1	Bellair Nth	Boora	WOP Supply	457,492	523,859		
2	Lemanaghan	Boora	Derrinlough Supply				190,718
3	Noggusboy	Boora	Derrinlough Supply				150,639
4	Boora	Boora					
5	Galros	Boora	Derrinlough Supply				120,661
6	Killaun	Boora	Derrinlough Supply				
7	Derrinboy	Boora	Hort RHP and Retail			554,223	
8	Derryclure	Boora	WOP Supply	161,398	184,812		
9	Monettia	Boora	Hort RHP and Retail			834,499	
10	Killaranny	Boora	Derrinlough Supply				108,224
11	Bracklin	Derrygreenagh	Hort RHP and Retail			779,407	
12	Carranstown	Derrygreenagh					
13	Ballivor	Derrygreenagh					
14	Kinnegad	Derrygreenagh	Hort RHP and Retail			485,744	
15	Ballybeg	Derrygreenagh	EPL Supply	380,161	435,310		
16	Ballaghurt	Blackwater	WOP Supply	510,084	584,081		
17	Daingean (Derries)	Allen	EPL Supply	328,639	376,313		

Ref	Bog	Bog group	Historical primary peat use	Combustion emissions (tCO_2) 2006 IPCC EF	Combustion emissions (tCO_2) EF from Ireland's National Inventory Report	Horticulture losses off site (tCO_2)	Emissions associated with Briquette manufacturing (tCO_2e)
18	Daingean Rathdrum	Allen					
19	Clonad	Allen	EPL Supply	508,990	582,828		
20	Ballykeane	Allen	EPL Supply	514,482	589,116		
21	Esker	Allen	EPL Supply	556,703	637,462		
22	Garrymore	Allen	Hort RHP and Retail (Sod Moss)			83,728	
23	Derrylea	Allen	EPL Supply	247,144	282,997		
24	Ticknevin	Allen	EPL Supply	709,330	812,230		
25	Glashabaun Sth	Allen					
26	Glashabaun Nth	Allen					
27	Codd Nth (Codd 2)	Allen	EPL supply	768,272	879,723		
28	Codd Sth (Codd 1)	Allen					
29	Ballydermot North	Allen					
30	Ballydermot South	Allen					
31	Blackriver	Allen	EPL Supply	777,318	890,081		
32	Barnaran	Allen					
33	Lodge	Allen					
34	Cuil na Gun	Mountdillon	LRP Supply	157,275	180,090		
35	Milkernagh	Mountdillon	LRP Supply	138,859	159,003		
36	Coolcraff	Mountdillon	LRP Supply	4,396	5,034		
37	Gilltown	Kilberry	Hort Retail			458,558	
38	Allen	Kilberry	Hort RHP and Retail			347,459	

Ref	Bog	Bog group	Historical primary peat use	Combustion emissions (tCO_2) 2006 IPCC EF	Combustion emissions (tCO_2) EF from Ireland's National Inventory Report	Horticulture losses off site (tCO_2)	Emissions associated with Briquette manufacturing (tCO_2e)
39	Prosperous	Kilberry	Hort RHP and Retail			422,364	
40	Kilberry	Kilberry	Retail Hort				
41	Cuil na Carton	Cuil na Móna	Retail Hort				
Total				**6,220,543**	**7,122,935**	**3,965,981**	**570,242**

For GHG emissions the receptor is the global atmosphere and therefore, unlike other environmental impacts, the emissions of a single project cannot be linked to a location specific receptor. The nature of GHG emissions and the global receptor means the cumulative impact is already considered.

A summary of on and off-site GHG emissions is shown in Table 9.8.

Table 9.8: Total on and off-site GHG emissions

	On-site GHG emissions (tCO_2e)	Off-site GHG emissions (tCO_2e)
1985-1991	**Data not available.**	**Data not available.**
1992-2001	**2,500,920 – 3,376,873***	**Data not available.**
2002-2012	**3,111,894 – 4,066,657**	**Data not available.**
2012-2019	**2,288,174 – 2,900,605**	**10,756,766 – 11,659,158**

*does not include stockpile, machinery or transport emissions from peat harvested for horticultural purposes.

Table 9.9: Average annual on and off-site GHG emissions

	On-site average annual (tCO_2e)	Off-site average annual (tCO_2e)
1985-1991	**Data not available.**	**Data not available.**
1992-2001	**337,687***	**Data not available.**
2002-2012	**369,696**	**Data not available.**
2012-2019	**414,372**	**1,665,594**

Calculated from the upper estimate of emissions.

*does not include stockpile, machinery or transport emissions from peat harvested for horticultural purposes.

On-site

The extraction of peat results in on-site GHG emissions from a loss of CO_2 and N_2O associated with the drainage and exposure of the peat surface, methane emissions from drained organic soils and drainage ditches, losses from uncovered peat stockpiles and from machinery and transport use. In 2017, the most recent year of available data, Ireland's GHG emissions were 3,239,840 tCO_2e for LULUCF.[10] Using an annual average from the upper calculated value between 2012 and 2019, on-site GHG emissions from the 41 bog units would account for 13% of this amount.

Off-site

Off-site GHG emissions are released from the combustion of peat to produce electricity, losses from horticultural products and as part of the peat briquette manufacturing process. Using an average annual value for the upper estimate of off-site emissions calculated between 2012 and 2019, emissions from these sources would account for 2.7% of Ireland's total emissions of greenhouse gases including indirect emissions from solvent use (without LULUCF) in 2017.

In 2017, there were 2,452,000 tCO_2e emitted from peat fuel for Ireland's energy Industries.[10]

Using an annual average from the upper calculated value, off-site combustion emissions from the 41 bog units would account for 42% of this value.

For the period 1992 to 2019, the average annual emissions show an increasing in trend in GHG emissions from the 41 bog units. This is partly a result of emissions from stockpiles, machinery

or transport from peat harvested for horticultural purposes not being included for the period 1992-2001.

9.5 Mitigation and Monitoring

The choice of method for peat bog rehabilitation once peat production has ceased has the potential to influence the overall GHG emissions from peat production areas. These impacts were not included in this assessment as it focussed only on the emissions during the operational period of the peat bogs. After-uses may include afforestation, re-wetting and natural regeneration.[9] Murphy et al. (2015)[9] show that for Irish peat bogs, afforestation reduces the overall GHG impact by the greatest amount as the carbon sequestered through growing biomass is greater than the carbon lost through peat decomposition once production has finished. However, the most appropriate rehabilitation approach is likely site specific and should consider other factors such as biodiversity and hydrological implications.

Peat is one of the most carbon intensive fossil fuel sources. CO_2 emissions from the combustion of peat are higher than from oil, natural gas and coal.

Opportunities to reduce the GHG emissions from peat combustion include the co-firing of peat fuel with other biomass types, as is the case at Edenderry Power Plant. Sources of indigenous biomass may include energy crops, forest residues and co-products from the wood processing industry.[9] For these fuels, GHG accounting guidance is to use a combustion CO_2 emissions value of '0' to account for the CO_2 absorbed by fast-growing bioenergy sources during their growth. There are still other GHG emissions from combustion which are not absorbed during growth.[21]

Whilst peatlands are typically considered resilient to climate change, due to the capacity of peat to store water through dry periods, degraded systems are much more vulnerable to climate-induced hydrological change due to their compromised resilience. Rehabilitation of peatland is important for climate adaptation and mitigation strategies, as well as for conserving their unique biodiversity. Bord na Móna's Biodiversity Action Plan (2016 – 2021) recognises that investment in rehabilitation of peatlands can have enormous benefits for society both in terms of social and natural capital. Bord na Móna is working to develop and implement best practice measures in terms of rehabilitation (https://www.bordnamona.ie/transform/biodiversity/biodiversity-objectives/).

A raised bog rehabilitation programme is underway and Bord na Móna recognises that the future of the bog areas will also be determined by changes in climate. Alongside rehabilitation, eco-hydrological monitoring and collection of data on the status and condition of bog units is important. Bord na Móna's Biodiversity Action Plan includes many activities around collection and synthesis of ecology data, monitoring and mapping of the bog units.

In accordance with the IPC licenses, Bord na Móna has a commitment to rehabilitate sites once extraction activities are complete. There is therefore the possibility that the Project activities may in fact result in a positive improvement to local climate resilience after all phases of Bord na Móna s work is complete.

[21] BEIS, 2019. UK Government GHG Conversion Factors for Company Reporting. Available at: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019

9.6 Residual Impacts

The extraction of peat has resulted in on-site GHG emissions from a loss of CO_2 and N_2O associated with the drainage and exposure of the peat surface, methane emissions from drained organic soils and drainage ditches, losses from uncovered peat stockpiles and from machinery and transport use.

In 2017, the most recent year of available data, Ireland's GHG emissions were 3,239,840 tCO_2e for LULUCF.[10] Using an annual average from the upper calculated value between 2012 and 2019, on-site GHG emissions from the 41 bog units would account for 13% of this amount.

Off-site GHG emissions are released from the combustion of peat to produce electricity, losses from horticultural products and as part of the peat briquette manufacturing process. Using an average annual value for the upper estimate of off-site emissions calculated between 2012 and 2019, emissions from these sources would account for 2.7% of Ireland's total emissions of greenhouse gases including indirect emissions from solvent use (without LULUCF) in 2017.

In 2017, there were 2,452,000 tCO_2e emitted from peat fuel for Ireland's energy Industries.[10] Using an annual average from the upper calculated value, off-site combustion emissions from the 41 bog units would account for 42% of this value.

10 Biodiversity

10.1 Introduction

This remedial terrestrial ecological assessment is concerned with the impacts of peat harvesting from the 41 Bord na Móna bogs between approximately 1985 and 2020. Impacts both within the Bord na Móna properties and in adjoining areas are considered.

The focus is on bog habitats, with particular emphasis on habitats listed on Annex I of the EU Habitats Directive. Also considered are the following:

- Rare flora – legally protected and/or Red-listed species.
- Wintering birds, especially species listed on Annex I of the EU Birds Directive and/or Red-listed.
- Breeding birds, especially species listed on Annex I of the EU Birds Directive and/or Red-listed.
- Mammals, especially species listed on Annex II of the EU Habitats Directive and/or Red-listed.
- Other important species, such as marsh fritillary butterfly (Annex II listed) etc.

The baseline assessment for each site is derived from available information (mostly in-house Bord na Móna data) and site visits.

10.2 Methodology

10.2.1 Desk Review

The following sections provide an overview of the sources of information used in the baseline assessments.

10.2.1.1 Habitats/flora

Site descriptions and habitat maps are derived mainly from the baseline ecological reports prepared by the Bord na Móna ecology team (i.e. the Site Rehabilitation Plans). These reports are based on detailed field surveys carried out between 2010 and 2017.

Aerial photography was also reviewed during the compilation of the habitat descriptions, i.e. the OSI series of photographs (for years 1995, 2000 and 2005) as well as publicly available aerial imagery (e.g. the BING map series) and satellite imagery (Google Earth).

10.2.1.2 Birds

The descriptions (where available) of the wintering and breeding birds associated with the sites were made largely on detailed field surveys of sites carried out by BioSphere Environmental Services between 2012 and 2019. These surveys followed standard methodologies, including use of transect sampling and Vantage Point observations.

Detailed data for winter and breeding birds for some of the sites in the Mountdillon Group was available from the EIAR for the proposed Derryadd Wind Farm development.

10.2.1.3 Mammals and Other Fauna Interests

Information on mammals and other fauna is taken from the Bord na Móna site reports.

A baseline survey for bats was carried out by Bord na Móna in 2013 for various sites in the Derrygreenagh and Allen Groups.

10.2.2 Site Surveys

A site visit (or visits) were made to all the sites between 2013 and 2017. All visits were carried out by Dr Brian Madden and Dr Derek McLoughlin.

Although all habitats of conservation interest were targeted during the site visits, due to the predominant peatland nature of the sites, the main focus was to assess the areas of high bog which were identified on the Bord na Móna habitat maps and to consider habitats of conservation interest lying outside of the Bord na Móna property boundary (the latter initially identified from aerial photography). In addition, the site visits were useful in determining changes within the sites since the habitat maps were compiled, i.e. areas that were of ecological interest at the time of the Bord na Móna habitat survey but had since been put into commercial production.

The site visits comprised walk-over surveys of the habitats of interest, with notes made on key attributes, particularly the following:

- The area or extent of the habitat (estimated approximately);
- The presence of typical species of the relevant habitats;
- The wetness of the surface in the case of high bog habitats, and especially whether the water table was at or near the surface;
- The approximate extent of bog moss (Sphagnum spp.) coverage, with crude coverage categories of 0-25%, 25-50%, >50%;
- The condition of the habitat - in the case of high bog especially (i) whether there were drains (recent or old) on the surface or along the margins, (ii) whether the habitat has been subjected to burning, and (iii) whether there were bare peat patches and/or tear patterns;
- The presence of 'negative species', such as conifers or *Sarracenia purpurea*, or the dominance of one or two bog species, such as *Trichophorum germanicum* or *Calluna vulgaris*;
- The potential of the habitat to support important species of conservation importance, especially Annex I bird species (Birds Directive), Annex II species (Habitats Directive), and Red listed species (various lists);
- Potential connectivity with Natura 2000 sites and potential use by Qualifying Interests or Special Conservation Interests; and
- Future prospects in the case of high bog where: (i) a maintained hydrological regime appears possible or (ii) whether there appears to be potential for rewetting in the case of damaged bog.

During the site surveys, casual records of birds or species such as badger were also collected.

10.2.3 Classification of Habitats

Habitats are classified according to Fossitt (2000). As bogs were a principal focus of the study, it is noted that the relevant categories are as follows:

- PB1 Raised bog – refers to areas of high bog; and

- PB4 Cutover bog - refers to areas where part of the original peat mass has been removed.

The PB1 raised bog category is linked to three Annex I habitats of the EU Habitats Directive as follows:

- [7110] Active raised bogs (priority status);
- [7120] Degraded raised bogs still capable of natural regeneration; and
- [7150] Depressions on peat substrates of the *Rhynchosporion*.

Owing to the conservation importance of Annex I habitats, the definitions as contained in the Interpretation Manual of European Union Habitats (July 2007) are presented here.

10.2.3.1 Active raised bogs (priority status):

Acid bogs, ombrotrophic, poor in mineral nutrients, sustained mainly by rainwater, with a water level generally higher that the surrounding water table, with perennial vegetation dominated by colourful Sphagna hummocks allowing for the growth of the bog (*Erico-Sphagnetalia magellanici, Scheuchzerietalia palustris p., Utricularietalia intermededio-minoris p., Caricetalis fusca p.*). Typically, pools may be present in western UK, Ireland, Finland and Sweden. The term “active” must be taken to mean still supporting a significant area of vegetation that is normally peat forming, but bogs where active formation is temporarily at a standstill, such as after a fire or period of drought, are included.

10.2.3.2 Degraded raised bogs still capable of natural regeneration

These are raised bogs where there has been disruption (usually anthropogenic) to the natural hydrology of the peat body, leading to surface desiccation and/or species change or loss. Vegetation on these sites usually contains species typical of active raised bog as the main component, but the relative abundance of individual species is different. Sites judged to be still capable of natural regeneration will include those areas where the hydrology can be repaired and where, with appropriate rehabilitation management, there is a reasonable expectation of re-establishing vegetation with peat-forming capability within 30 years. Sites unlikely to qualify as SACs are those that consist largely of bare peat, that are dominated by agricultural grasses or other crops, or where components of bog vegetation have been eradicated by closed canopy woodland.

10.2.3.3 Depressions on peat substrates of the Rhynchosporion

Highly constant pioneer communities of humid exposed peat or, sometimes sand, with Rhynchospora alba, *R. .fusca*, *Drosera intermedia, D. rotundifolia, Lycopodiella inundata*, forming on stripped areas of blanket bogs or raised bogs, but also on naturally seep- or frosted-eroded areas of wet heaths and bogs, in flushes and in the fluctuation zone of oligotrophic pools with sandy , slightly peaty substratum. These communities are similar, and closely related, to those of shallow bog hollows (51.122) and of transition mires (54.57).”

In addition, reference is made to a document prepared by the Department of Arts, Heritage and the Gaeltacht (2014) entitled “*Review of Raised Bog Natural Heritage Area Network*”. Of particular relevance is Addendum 2 “*Current Eco-Hydrological Condition Ireland’s Raised Bog NHAs and Non-Designated Sites*”. This describes a model developed to describe the potential for raised bog restoration. The methodology developed to undertake the eco-hydro assessments makes use of detailed topographic data for each raised bog site obtained from LiDAR surveys to assess the potential for the bog surface to support active raised bog. By using the detailed topographic survey data, it is possible to model eco-hydrological conditions (based on the raised bog’s slope, drainage patterns and rainfall) and relate these conditions to

recent ecological surveys. In this way it is possible to determine the area of a bog that has suitable conditions for the development of active raised bog habitat, whether or not active raised bog currently occurs on that area. The eco-hydrological modelling process can therefore quantify the restoration potential of a raised bog. The assessment is based on the assumption that drains on the high bog and cutover bog are present but that the underlying peat substrate remains intact. Where deep drains have been cut through the underlying peat substrate into the mineral soils, a much greater loss of water may be occurring which cannot be addressed by the current modelling process. In the present study, classification of bog as the Annex I Degraded Raised Bog habitat was in compliance with the definition as given in the Interpretation Manual of European Union Habitats. It is noted however, that application of the recently developed model (as described above) may show that some of these high bog areas have low or negligible potential for restoration to active bog.

10.2.4 Evaluation of conservation importance of sites

The ecological assessment of the importance of a site, or part of a site, is made in accordance with the system devised by the National Roads Authority - *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009). Whilst the NRA guidelines were devised specifically for road schemes, they can be applied to general environmental impact assessment. The NRA system uses the following five-point scale:

- International Importance
- National Importance
- County Importance
- Local Importance (higher value)
- Local Importance (lower value)

For sites supporting winter wetland bird populations, reference is made to the standard 1% thresholds for national (all-Ireland) and international importance (see Crowe 2006, Boland & Crowe 2012, Crowe & Holt 2013, Wetlands International 2012). Evaluation of bird populations at sites may also be made on the basis of the presence of species listed in Annex I of the EU Birds Directive or species listed as ‘Birds of Conservation Concern’, either on the Red list (High conservation concern) or Amber List (Medium conservation concern) (after Colhoun & Cummins 2013). As evaluating sites due to the presence of such is not quantitative, a subjective assessment may need to be made – for instance, the regular presence within the site of a breeding pair of merlin (Annex I species) or curlew (red-listed) would be of more significance than the occasional record of hunting or passing birds.

10.2.5 Impact Assessment

The impact assessment of the harvesting of peat at the sites is made in accordance with the guidance by the National Roads Authority - *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009). In the impact assessment, consideration is given to both direct and indirect impacts. For this project, in the case of raised bog ‘indirect’ hydrological impacts on adjoining areas of high bog outside of Bord na Móna ownership are of particular relevance. Cumulative impacts are also considered. The most common cumulative impact within the Bord na Móna ownership area is peat cutting not related to the core Bord na Móna commercial businesses. This includes traditional turf plots and sod turf sites.

10.3 Receiving Environment

The following sections present the baseline receiving environment for the 41 bogs detailed in Table 1.1 *Project Overview* of this rEIAR.

10.3.1 Bellair North Bog

10.3.1.1 Ecological Baseline

Bellair North Bog is located on the Westmeath/Offaly border approximately 6 km south of Moate. The site is connected to Bellair South Bog, with the Athlone to Dublin rail line between the two sites. Bellair North can be divided into two sectors, a large eastern section and a smaller western section, with a narrow strip joining the two sectors. The majority of the site is currently in active production for milled peat.

The Boor River flows from the south-western tip of the site.

The surrounding habitat type is largely agricultural land though further areas of remnant high bog and cutover adjoin the site in parts.

Habitats and Vegetation

The majority of Bellair North Bog is in active commercial production and comprises bare peat (ED2). There is very little regenerating cutaway (Recolonising bare ground ED3).

High bog (PB1) and cutover bog (PB4) are well represented in the marginal areas of the site. The remnant high bog varies in extent and quality. Within the western sector, there are two substantial areas of high bog. In the extreme west, there is a remnant area of high bog (mostly outside Bord na Móna property) which extends to the rail line. This bog is largely intact, has a typical raised bog flora and is noticeably wet in places with *Rhynchospora alba* frequent. Sphagnum cover is good. This bog adjoins a large area of bog to the east that is no longer in active production. While drained in the past, there appears to have been little removal of peat from the bog here and re-vegetation has been good. Most of the drains are naturally filling in with Sphagnum spp., *Rhynchospora alba* and *Eriophorum angustifolium*. The eastern margin which adjoins the active peat fields is drier than the rest. This complex of high bog is classified as the Annex I habitat Degraded raised bog still capable of natural regeneration [7120], with the Annex I habitat Depressions on peat substrates (Rhynchosporian) [7150] well represented in the area of intact bog.

A further area of high bog occurs to the north of the local road. This area has not been ditched though there are some old drains that are now largely filled in. The condition of this bog is variable, partly due to a fire event in recent years. However, parts are wet and support good Sphagnum growth. This bog is also classified as the Annex I habitat Degraded raised bog still capable of natural regeneration [7120].

In the eastern sector of the site, there are areas of high bog (PB1) and cutover bog (PB4) along the north boundary but the high bog areas are much disturbed from turbary and the surface is generally dry. A substantial area of high bog also occurs along the eastern margin (mostly outside of Bord na Móna property). This is variable in quality and parts have been burnt in the past. However, it generally has a well developed flora and is noticeably wet in places with good Sphagnum development. *Rhynchospora alba* is frequent in places. This complex of bog is classified as the Annex I habitat Degraded raised bog still capable of natural regeneration [7120]. The Annex I habitat Depressions on peat substrates (Rhynchosporian) [7150] is well represented.

Areas of cutover bog (PB4) are associated with the marginal areas, and these support bog woodland (WN7) and scrub (WS1) in places.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Bellair North Bog.

Wintering Birds

Meadow pipit (Red-listed) is widespread in the marginal areas and snipe (Amber-listed) has been recorded. Also, woodcock (Red-listed) has been recorded in the degraded bog in the western sector of the site.

Breeding Birds

No specific survey information is available for the site though meadow pipit (Red-listed) and skylark (Amber-listed) were considered to be widespread in marginal areas in summer 2016. A local (reliable) source indicated that curlew (Red-listed) was present on the degraded bog in the western sector of the site in summer 2016. Snipe could be expected to breed on the large areas of high bog in the western and eastern sectors of the site.

Mammals

Badger and the Irish hare occur on site.

Bellair North Bog was not included in the 2013 baseline bat survey of Bord na Móna properties. However, surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected to be associated with habitats along the site boundaries. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

10.3.1.2 Designated Sites

There are no designated sites in the immediate vicinity of Bellair North Bog. Clonydonnin Bog NHA (code 0565) is located approximately 2 km to the west (west side of R444 road).

10.3.1.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value.

The high bog remnants at the eastern, western and northern boundaries of the site have considerable conservation value – these areas of high bog qualify as the Annex I habitat 'Degraded raised bogs still capable of regeneration' [code 7120] and support the Annex I habitat 'Depressions on peat substrates (Rhynchosporian)' [7150]. These bog areas are rated as **County Importance.** The other areas of marginal high bog, and also the areas of cutover bog, are rated as **Local Importance (higher value**).

The Red-listed meadow pipit breeds on the various high bog and cutover bog areas, and it appears curlew may also breed. A further Red-listed species, woodcock, has been recorded in winter.

Figure 10.1: Bellair North Bog: west end.

Source: BioSphere Environmental Services.

Note: Image (looking northwards) shows an area of mostly intact raised bog that is classified as degraded raised bog. The Annex I habitat depressions on peat substrates (Rhynchosporian) is also represented.

Figure 10.2: Bellair North Bog: west end.

Source: BioSphere Environmental Services.

Note: Image of well-vegetated high bog that has been ditched and probably scraped of surface vegetation in the past. However, the bulk of the peat mass is still present and drains are becoming filled in with vegetation. This area is considered as degraded raised bog.

Figure 10.3: Bellair North Bog: east end.

Source: BioSphere Environmental Services.

Note: Image of area of high bog that adjoins commercial peat field – this large area is classified as degraded raised bog and includes good examples of the Annex I habitat depressions on peat substrates (Rhynchosporian).

Figure 10.4: Bellair North Bog: east end.

Source: BioSphere Environmental Services.

Note: Image (looking southwards) of deep drain between high bog and commercial peat field – this is resulting in water loss from the high bog

10.3.2 Lemanaghan Bog

10.3.2.1 Ecological Baseline

Lemanaghan Bog is located approximately 4 km east of Ferbane in Co. Offaly. The site is connected by rail link to Bellair South Bog to the north and to the Blackwater Group to the west. The R436 Ferbane-Clara road passes along much of the southern boundary – one large area of production bog, Derrynagun, occurs to the south of the road. The N62 Ferbane to Athlone road skirts the extreme western tip of the site. A local road passes through the northern part of the site and cuts off the northernmost sector.

A mineral island containing farmland and associated habitats is located close to the centre of the main section of the bog and is partially owned by Bord na Móna. A roadway extends through the bog to this mineral island. A relatively large area of the main site has been given over to private sod-peat production.

Various tributaries of the Boora River flow along the margins of the site.

The surrounding habitat type is largely agricultural land though further areas of remnant high bog and cutover adjoin the site in parts.

Habitats and Vegetation

The majority of Lemanaghan Bog is in active commercial production and comprises bare peat (ED2).

There are several bands of cutaway vegetation several fields wide that have developed in the southern half of the main sector of the site and also to the west of the mineral island (Recolonising bare ground ED3). Part of the cutaway has been taken out of active production.

High bog (PB1) and cutover bog (PB4) are well represented in the marginal areas of the site. The remnant high bog varies in extent and quality. In the northernmost sector, the milled peat fields are edged on both sides by high bog (mostly outside Bord na Móna property) – this is variable in quality with parts wet and with moderate Sphagnum cover as well as locally frequent *Rhynchospora alba*. Other areas of high bog and cutover occur along the margins though these are all of relatively small size.

A large area of high bog occurs to the south of the R436 road (known as Curraghalassa Bog) – this has been taken out of production as it has cultural interests. This area is considered to qualify as the Annex I habitat Degraded raised bog still capable of natural regeneration [7120]. Further degraded bog occurs just north of the R436 though this has been ditched in the past and the surface is fairly dry and dominated by *Calluna vulgaris*.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Leamanaghan Bog.

Wintering Birds

Recent winter surveys have shown that the majority of Lemanaghan Bog is of low value for wintering birds. The remnant high bog and cutover bog habitats and the regenerating cutaway attract hunting hen harrier on a fairly regular basis. Whooper swans, which winter at several sites in the wider area, may use the site on occasions (though in small numbers) when ponds form during wet periods. Meadow pipit, a Red-listed species, occurs widely on site, along with various Amber listed species including kestrel, sparrowhawk, snipe, skylark, stonechat and

linnet. Also, woodcock (Red-listed) has been recorded in the degraded bog in the western sector of the site.

Breeding Birds

A survey of breeding birds in 2016 showed that the site has relatively low interest. Meadow pipit (Red-listed) is widespread in marginal areas of high bog and cutover, along with skylark (Amber-listed). Snipe breeds on site, along with stonechat, mistle thrush and linnet (all Amber listed).

Mammals

Badger and the Irish hare occur on site. Lemanaghan Bog was not included in the 2013 baseline bat survey of Bord na Móna properties. However, surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected to be associated with habitats along the site boundaries. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

10.3.2.2 Designated Sites

There are no designated sites in the immediate vicinity of Lemanaghan Bog. Ferbane Bog SAC (code 0575) is located just over approximately 2 km to the west. The Grand Canal pNHA (code 02104) is located to the south of the site.

10.3.2.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value.

The various high bog remnants along the margins of the site, as well as the cutover and re-generating bog areas, all provide useful biodiversity and are rated as **Local Importance (higher value**).

Curraghalassa Bog to the south of the R436 has considerable conservation value and supports the Annex I habitat 'Degraded raised bogs still capable of regeneration' [code 7120] – this bog area is rated as **County Importance.**

The Red-listed meadow pipit breeds on the various high bog and cutover bog areas. Hen harrier (Annex I) is regular on site in winter and woodcock (Red-listed) has been recorded.

Figure 10.5: Lemanaghan Bog: view of wet patch of bog within remnant and cutover bog in southeast sector of site.

Source: BioSphere Environmental Services.

Note: Snipe has been recorded nesting in this general area while hen harrier occurs in winter.

Figure 10.6: Lemanaghan Bog: view of high bog alongside commercial peat fields in extreme northern sector of site (looking southwards)

Source: BioSphere Environmental Services.

Note: This high bog is of local conservation interest.

10.3.3 Noggusboy Bog

10.3.3.1 Ecological Baseline

Noggusboy Bog is located approximately 3 km south of Ferbane in Co. Offaly. The bog is dissected by the R437 Ferbane to Tullamore Road, while the R357 and the N62 form boundaries along part of the site's southern and western boundaries. The Grand Canal flows close to the northern boundary of the site while the Silver River flows close to the eastern boundary.

The western side of the site (west of R437) is a mix of regenerating cutaway habitats, including ponds and pools. Much of the eastern sector is still in commercial production though a substantial area of high bog exists to the north.

The surrounding habitat type is largely agricultural land though further areas of remnant high bog and cutover, as well as forestry, are also present.

Habitats and Vegetation

The western sector of the site is a mosaic of regenerating habitats on cutaway, including developing wetlands with open water (useful for wetland birds), swamp vegetation and poor fen. A section in the central area has been planted with conifer trees by Coillte.

The eastern sector is still largely in commercial peat production and comprises bare peat (ED2). There is very little regenerating cutaway (Recolonising bare ground ED3).

The northern part of the east sector comprises high bog (PB1) and cutover bog (PB4). The remnant high bog has not been ditched and is noticeably wet in places with good Sphagnum growth, as well as *Rhynchospora alba* and *Eriophorum angustifolium*. This complex of high bog is classified as the Annex I habitat Degraded raised bog still capable of natural regeneration [7120], with the Annex I habitat Depressions on peat substrates (Rhynchosporian) [7150] well represented.

Throughout the site, areas of cutover bog (PB4) are associated with the marginal areas and these now support bog woodland (WN7) and scrub (WS1) in places.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Noggusboy Bog.

Wintering Birds

The flooded western sector attracts whooper swans, with numbers in some winters attaining National Importance. Various duck species also winter.

Breeding Birds

A range of wetland bird species breed in the regenerating bog within the western sector – these include lapwing, ringed plover and in some years black-headed gull.

Meadow pipit (Red-listed) and skylark (Amber-listed) breed widely within the site.

Mammals

Badger and the Irish hare occur on site.

Noggusboy Bog was not included in the 2013 baseline bat survey of Bord na Móna properties. However, surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected to be associated with habitats along the site boundaries. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

10.3.3.2 Designated Sites

There are no designated sites in the immediate vicinity of Noggusboy Bog.

The Grand Canal pNHA (code 02104) is located approximately 500 m to the north of the site.

10.3.3.3 Conservation Evaluation of Site

The sector of the eastern part of the site that is in current commercial production for industrial peat harvesting has no intrinsic conservation value.

The high bog remnant in the northern part of the eastern sector has considerable conservation value – this area of high bog qualifies as the Annex I habitat 'Degraded raised bogs still capable of regeneration' [code 7120] and supports the Annex I habitat 'Depressions on peat substrates (Rhynchosporian)' [7150]. This bog is rated as **County Importance.**

The other areas of remnant high bog, and also the areas of cutover bog, and the regenerating cutaway in the western part of the site are rated as **Local Importance (higher value**).

The Red-listed Lapwing breeds within the site, while in some winters nationally important numbers of whooper swan (Annex I listed) occur on site.

10.3.4 Boora Bog

10.3.4.1 Ecological Baseline

Boora Bog is located approximately 4.5 km north of Kilcormac in Co. Offaly. Boora is a large site, stretching c.7 km from east to west and up to 4 km from north to south. The bog is one of the older sites to have had post development cutaway and much of this has been developed for forestry by Coillte or is part of the Lough Boora Discovery Park developed by Bord na Móna.

In recent times, the only commercial peat production has been in the westernmost sector, with future production confined mainly to the southwest part.

The surrounding habitat type is largely agricultural land developed from former bog.

Habitats and Vegetation

A large proportion of Boora Bog has been planted for commercial afforestation (WD4) by Coillte.

Elsewhere, regenerating cutaway bog is well developed and parts are managed actively for biodiversity.

The commercial peat production in the southwest comprises bare peat (ED2).

Rare Flora

The Red-listed Blue Fleabane is widely distributed in parts of the site, such as in disturbed grassland along the cycle track. A further Red-listed species, Alder Buckthorn, has been recorded from site (Curtis & McGough 1988, Wyse Jackson *et al.* 2016).

Wintering Birds

The Lough Boora Discovery Park supports a range of important species during winter, including Whooper Swan, Golden Plover and Lapwing.

Breeding Birds

The Lough Boora Discovery Park supports a range of important species during summer, including Lapwing, Snipe and Redshank.

Mammals

Badger and the Irish hare occur on site.

Boora Bog was not included in the 2013 baseline bat survey of Bord na Móna properties. However, surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected to be associated with habitats along the site boundaries. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

10.3.4.2 Designated Sites

The Lough Boora pNHA (code 01365) is located in the centre of the Lough Boora Parklands.

10.3.4.3 Conservation Evaluation of Site

The majority of the site is cutaway bog that has been developed for commercial forestry and biodiversity. The forestry is not of any particular ecological interest, while the regenerating

cutaway varies from L**ocal Importance (higher value**) to **County** or even **National Importance**.

The commercial peat fields in recent production in the western sector of the site have no intrinsic ecological value.

10.3.5 Galros Bog

10.3.5.1 Ecological Baseline

Galros Bog is a relatively small bog site located approximately 5 km north of Birr in Co. Offaly. The N62 Cloghan to Birr road skirts the western boundary. A local road passes through the southernmost part of the site. Galros is situated in a small basin, with esker ridges along the northern, western and south-west boundaries. The majority of Galros is currently in peat production.

The surrounding habitat type is largely agricultural land. Conifer plantation has been developed on cutover bog immediately to the southwest

Habitats and Vegetation

The majority of Galros Bog is in active commercial production and comprises bare peat (ED2).

Most of the cutaway is free of developing vegetation. There is however a substantial area of regenerating cutaway vegetation in the southwest sector. Thick marl is widely exposed, and this is vegetated by wet, poor fen vegetation dominated by sedges (Carex spp.). Several small patches of black bog rush are present here and some *Scorpidium scorpoides* (rich fen indicator) has been found. This area has good potential to develop as alkaline fen.

A small area of remnant high bog occurs in the southeast corner, with a fringe of regenerating cutover bog along much of the perimeter.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Galros Bog.

Wintering Birds

Winter surveys for birds have not been carried out at Galros Bog.

Breeding Birds

There have been no breeding bird surveys carried out at Galros Bog. In 2016, meadow pipit (Red-listed) was found to be widespread in marginal areas, along with skylark (Amber-listed).

Mammals

The Irish hare occurs on site.

Galros Bog was not included in the 2013 baseline bat survey of Bord na Móna properties. However, surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected to be associated with habitats along the site boundaries. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

10.3.5.2 Designated Sites

There are no designated sites in the immediate vicinity of Galros Bog.

Lough Coura pNHA (code 0909) is located approximately 1 km to the north of Galros.

10.3.5.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value.

The regenerating vegetation in the southwest sector, which includes developing rich fen vegetation, is of ecological interest and is rated as **Local Importance (higher value**).

The other marginal habitats, including occasional patches of high bog and regenerating cutover, provide useful biodiversity and are rated as **Local Importance (higher value**).

10.3.6 Killaun Bog

10.3.6.1 Ecological Baseline

Killaun Bog is located approximately 5 km east of Birr in Co. Offaly. The R440 road forms a boundary with the southern margin of the site, while the Birr to Kilcormac local road skirts the northern boundary. The site is an outlier and not directly connected to other Bord na Móna sites.

The majority of the site is currently in production for horticultural peat. Most of the margins are edged by remnant high bog or cutover bog, with an extensive complex of bog habitats in the southernmost part of the site (latter used by a school in Birr as educational resource, with a boardwalk in place).

The surrounding habitats include further remnant high bog and cutover bog, afforestation and agricultural land.

Habitats and Vegetation

The majority of Killaun Bog is in active commercial production and comprises bare peat (ED2). There are no significant areas of regenerating cutaway within the site.

High bog (PB1) and cutover bog (PB4) are well represented in the marginal areas of the site. The remnant high bog varies in extent and quality, with much of it comprising relatively narrow strips that have been ditched in the past. These tend to be dry and dominated by *Calluna vulgaris*, with *Sphagnum* cover variable. Trees from nearby plantations have invaded parts of high bog, especially along the western margins.

A substantial complex of high bog and old cutover in the south of the site is considered to qualify as the Annex I habitat Degraded raised bog still capable of natural regeneration [7120]. The Annex I habitat Depressions on peat substrates (Rhynchosporian) [7150] is also represented. An area of rich fen, which may correspond to the Annex I habitat Alkaline Fens [code 7230] occurs in the extreme southeast of the site. This fen has developed in an area of cutover bog. The Annex II listed mollusc *Vertigo geyeri* has been recorded here (source: Bord na Móna Rehabilitation Plan). Extensive stands of bog woodland (WN7) dominated by birch are also found here.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Killaun Bog.

Wintering Birds

Meadow pipit (Red-listed) is widespread in the marginal areas during winter. Snipe is also present, while hen harrier (Annex I listed) has been recorded on site.

Breeding Birds

No specific survey information is available for the site though meadow pipit (Red-listed) and skylark (Amber-listed) were considered to be widespread in marginal areas in summer 2016. Snipe could be expected to breed on the large high bog area in the southern sector of the site.

Mammals

Otter (Annex II listed species) has been recorded in the southern sector of the site. Badger and the Irish hare occur on site.

Killaun Bog was not included in the 2013 baseline bat survey of Bord na Móna properties. However, surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected to be associated with habitats along the site boundaries. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

10.3.6.2 Designated Sites

There are no designated sites in the vicinity of Killaun Bog.

10.3.6.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value.

The high bog remnants along the boundaries of the site have conservation value – the large area of bog in the southern sector qualifies as the Annex I EU Habitats Directive habitat 'Degraded raised bogs still capable of regeneration' [code 7120] and also supports the Annex I habitat 'Depressions on peat substrates (Rhynchosporian)' [7150]. A further Annex I habitat, Alkaline fen, appears to be present along with the Annex II species, *Vertigo geyeri*. This bog complex is rated at least of **County Importance** but could be up-rated to **National Importance** should the population of *Vertigo geyeri* be found to be still present and to have a favourable conservation status. The other areas of high bog, and also the areas of cutover bog, are rated as **Local Importance (higher value**).

The occurrence of otter on site (probably on an occasional basis) is of note as otter is listed on Annex II of the EU Habitats Directive.

The Red-listed meadow pipit breeds on the various high bog and cutover bog areas.

Figure 10.7: Killaun Bog: view of high bog in southern sector (looking northeast)

Source: BioSphere Environmental Services
Note: This large area is classified as Degraded raised bog and supports the Annex I habitat Depressions on peat substrates (Rhynchosporian).

Figure 10.8: Killaun Bog: view of deep drain along edge of high bog in southern sector (looking eastwards).

Source: BioSphere Environmental Services.

10.3.7 Derrinboy Bog

10.3.7.1 Ecological Baseline

Derrinboy Bog is located approximately 3.5 km south of Kilcormac in south Co. Offaly. The site is divided into two sections by a local road. Derrinboy is an outlier and not directly connected to other Bord na Móna sites.

The majority of the site is currently in production for horticultural peat. Most of the margins were edged by remnant high bog or cutover bog. The Black River flows close to the eastern boundary.

Most of the site is surrounded by agricultural land, though there is further bog habitat to the northwest and east.

Habitats and Vegetation

The majority of Derrinboy Bog is in active commercial production and comprises bare peat (ED2). There are no significant areas of regenerating cutaway within the site.

High bog (PB1) and cutover bog (PB4) are well represented in the marginal areas of the site. The remnant high bog varies in extent and quality, with much of it comprising relatively narrow strips that are subject to turbary. These tend to be dry and dominated by *Calluna vulgaris*, with *Sphagnum* cover variable.

An area of high bog in the northeast of the western sector of the site (outside of Bord na Móna property) is largely intact and supports a typical raised bog flora, including Sphagnum mosses. Although small in size (<5 ha) this bog, which is relatively undisturbed and situated within an oval shaped basin, is considered to qualify as the Annex I habitat Degraded raised bog still capable of natural regeneration [7120]. The Annex I habitat Depressions on peat substrates (Rhynchosporian) [7150] is also represented.

Extensive stands of bog woodland (WN7) dominated by birch occur on some of the cutover areas of bog along the margins of the site.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Derrinboy Bog.

Wintering Birds

Meadow pipit (Red-listed) is widespread in the marginal areas during winter. Snipe is also present.

Breeding Birds

No specific survey information is available for the site though meadow pipit (Red-listed) and skylark (Amber-listed) were considered to be widespread in marginal areas in summer 2016.

Mammals

Badger and the Irish hare occur on site.

Derrinboy Bog was not included in the 2013 baseline bat survey of Bord na Móna properties. However, surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected to be associated

with habitats along the site boundaries. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

10.3.7.2 Designated Sites

There are no designated sites in the vicinity of Derrinboy Bog.

10.3.7.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value.

The high bog remnants along the boundaries of the site have conservation value – the area of bog in the northeast sector qualifies as the Annex I EU Habitats Directive habitat 'Degraded raised bogs still capable of regeneration' [code 7120] and also supports the Annex I habitat 'Depressions on peat substrates (Rhynchosporian)' [7150]. This bog complex is rated of **County Importance.** The other areas of high bog, and also the areas of cutover bog, are rated as **Local Importance (higher value**).

The Red-listed meadow pipit breeds on the various high bog and cutover bog areas.

Figure 10.9: Derrinboy bog: northeast end of western sector (looking eastwards).

Source: BioSphere Environmental Services.

Note: View is of intact high bog (outside of Bord na Móna property) which supports the Annex I habitats Degraded raised bog and Depressions on peat substrates (Rhynchosporian).

Figure 10.10: Derrinboy bog: northeast end of western sector (looking southeast).

Source: BioSphere Environmental Services.

Note: View of deep drain along edge of commercial peat field. Note direct physical impact on the marginal strip of high bog from wet peat thrown up during drain maintenance.

10.3.8 Derryclure Bog

10.3.8.1 Ecological Baseline

Derryclure Bog is located approximately 6 km south of Tullamore in Co. Offaly. The N80 Tullamore to Mountmellick road passes close to the western boundary of the site, and there is a bog track along much of the southern boundary. Derryclure is an outlier and not directly connected to other Bord na Móna sites. A landfill site has been constructed on bog along the western margin of the site.

The majority of the site is currently in production for horticultural peat. However, a substantial part is classified as a Bord na Móna biodiversity area.

Most of the site is surrounded by agricultural land.

Habitats and Vegetation

The majority of Derryclure Bog is in active commercial production and comprises bare peat (ED2). There are no significant areas of regenerating cutaway within the site.

High bog (PB1) remnants and cutover bog (PB4) are represented in the southeast and southwest sectors. Here the remnant high bog areas comprised relatively narrow strips that are subject to turbary. These tend to be dry and dominated by *Calluna vulgaris*, with *Sphagnum* cover variable. Extensive stands of bog woodland (WN7) dominated by birch occur on the cutover areas.

Two substantial areas of high bog towards the centre of the site have not been cut though surface drains had been inserted over much of the area. These areas, which are zoned as a Bord na Móna Biodiversity Area, are mainly wooded, mostly with Scot's pine and a mix of deciduous species especially birch. Research by Bord na Móna has shown that bog woodland has been present on site here since at least the second edition of the OSI 6 inch map (mapped as mixed conifers). It appears that part of this woodland was planted at some stage and since then there has been natural colonisation of the open bog areas. Open high bog areas remain with parts being fairly wet and with good Sphagnum cover. Examples of the Annex I habitat Depressions on peat substrates (Rhynchosporian) [7150] are present.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Derryclure Bog.

Wintering Birds

Meadow pipit (Red-listed) is widespread in the marginal areas during winter. Snipe is also present. Golden plover (Annex I species) has been recorded roosting on the bare peat.

Breeding Birds

No specific survey information is available for the site though meadow pipit (Red-listed) and skylark (Amber-listed) were considered to be widespread in marginal areas in summer 2016. The Red-listed woodcock would be expected in the woodland and the habitat is suitable for nesting merlin.

Mammals

Badger and the Irish hare occur on site.

Derryclure Bog was not included in the 2013 baseline bat survey of Bord na Móna properties. However, surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected to be associated with habitats along the site boundaries. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

10.3.8.2 Designated Sites

Hawkswood Bog NHA (code 2355) is located approximately 1 km southwest of Derryclure Bog.

10.3.8.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value.

The high bog remnants and cutover bog along the southeast and southwest boundaries of the site have conservation value at a local level and are rated as **Local Importance (higher value**).

The Bord na Móna Biodiversity Area has been rated of **County Importance** on the basis of the long history of woodland on the bog and also for substantial remaining areas of high bog which support in parts the Annex I habitat Depressions on peat substrates (Rhynchosporian) [7150].

The Red-listed meadow pipit breeds and winters on the various high bog and cutover bog areas.

Figure 10.11: Derryclure bog: view of high bog with mixed woodland (looking northwards over eastern block).

Source: BioSphere Environmental Services.

Note: This area has been zoned a Bord na Móna biodiversity area.

Figure 10.12: Derryclure bog: view of high bog with encroaching pine trees within the Bord na Móna biodiversity area.

Source: BioSphere Environmental Services.

Figure 10.13: Derryclure bog: parts of the remaining open high bog are wet and support the Annex I habitat Depressions on peat substrates (Rhynchosporian).

Source: BioSphere Environmental Services.

Figure 10.14: : Derryclure bog: the biodiversity area is edged by deep drains – this is contributing to the drying of the high bog which aids the spread of pine trees into the remaining open areas of high bog.

Source: BioSphere Environmental Services.

10.3.9 Monettia Bog

10.3.9.1 Ecological Baseline

Monettia Bog is located on the Laois/Offaly border approximately 3 km southwest of Killeigh. The site is an outlier and not directly connected to other Bord na Móna sites. The majority of the site is currently in production for horticultural peat. There is extensive private and sod peat production along the margins.

The eastern tip of the site is very close to the main channel of the River Barrow, with a silt pond discharge point direct to the river. The Clodiagh River flows close to the western boundary of the site.

The surrounding habitat type is largely agricultural land.

Habitats and Vegetation

The majority of Monettia Bog is in active commercial production and comprises bare peat (ED2).

There is very little regenerating cutaway (Recolonising bare ground ED3), with some strips dominated by rushes in marginal areas.

High bog (PB1) and cutover bog (PB4) are well represented in the marginal areas of the site. The remnant high bog varies in extent and quality. Much of that along the west boundary is quite dry and subject to local turbary. This is dominated by *Calluna vulgaris*, with *Sphagnum* cover low. A large area of relatively intact high bog occurs along the eastern boundary. While this has been ditched in the past, the surface drains are mostly filled in with *Sphagnum, Rhynchospora alba* and *Eriophorum angustifolium*. Overall, the surface is damp to wet and there are some pools with *Menyanthes trifoliata*. This area of bog is considered to qualify as the Annex I habitat Degraded raised bog still capable of natural regeneration [7120]. The Annex I habitat Depressions on peat substrates (Rhynchosporian) [7150] is also well represented here.

Areas of cutover bog (PB4) are associated with the marginal areas, with stands of bog woodland (WN7) and scrub (WS1) in places.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Monettia Bog.

Wintering Birds

Meadow pipit is widespread in the marginal areas and woodcock has been recorded (both Red-listed). Snipe and Jack snipe (both Amber-listed) have been recorded on the remnant high bog and cutover bog areas.

Breeding Birds

No specific survey information is available for the site though meadow pipit (Red-listed) and skylark (Amber-listed) were considered to be widespread in marginal areas in summer 2016. Snipe could be expected to breed on the large high bog area in the eastern sector of the site.

Mammals

Otter (Annex II listed species) has been recorded in the southern sector of the site. Badger and the Irish hare occur on site.

Moniettia Bog was not included in the 2013 baseline bat survey of Bord na Móna properties. However, surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected to be associated with habitats along the site boundaries. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

10.3.9.2 Designated Sites

The River Barrow and River Nore SAC (code 02162) occurs within several hundred metres of the south-eastern tip of the site, with a silt pond draining direct to the river channel. The SAC is selected for the following Annex I habitats and Annex II species:

- Estuaries [1130]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- Reefs [1170]
- Salicornia and other annuals colonising mud and sand [1310]
- Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]
- Mediterranean salt meadows (Juncetalia maritimi) [1410]
- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]
- European dry heaths [4030]
- Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]
- Petrifying springs with tufa formation (Cratoneurion) [7220]
- Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]
- Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]
- Vertigo moulinsiana (Desmoulin's Whorl Snail) [1016]
- Margaritifera margaritifera (Freshwater Pearl Mussel) [1029]
- Austropotamobius pallipes (White-clawed Crayfish) [1092]
- Petromyzon marinus (Sea Lamprey) [1095]
- Lampetra planeri (Brook Lamprey) [1096]
- Lampetra fluviatilis (River Lamprey) [1099]
- Alosa fallax fallax (Twaite Shad) [1103]
- Salmo salar (Salmon) [1106]
- Lutra lutra (Otter) [1355]
- Trichomanes speciosum (Killarney Fern) [1421]
- Margaritifera durrovensis (Nore Pearl Mussel) [1990]

10.3.9.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value.

The high bog remnants along the eastern and western boundaries of the site have conservation value – the large area of bog in the eastern sector qualifies as the Annex I EU Habitats Directive habitat 'Degraded raised bogs still capable of regeneration' [code 7120] and also supports the

Annex I habitat 'Depressions on peat substrates (Rhynchosporian)' [7150]. This bog complex is rated as **County Importance,** while the other areas of high bog, and also the areas of cutover bog, are rated as **Local Importance (higher value**).

The occurrence of otter on site (probably on an occasional basis) is of note as otter is listed on Annex II of the EU Birds Directive.

The Red-listed meadow pipit breeds on the various high bog and cutover bog areas, woodcock (also Red-listed) has been recorded in winter.

Figure 10.15: Monettia Bog: high bog in southeast sector.

Source: BioSphere Environmental Services.

Note: This large area is classified as Degraded raised bog and supports the Annex I habitat Depressions on peat substrates (Rhynchosporian). Surface drains have now mostly filled in with Sphagnum spp., Rhynchospora alba and Eriophorum angustifolium.

10.3.10 Killaranny Bog

10.3.10.1 Ecological Baseline

Killaranny Bog is located approximately 10 km west of Tullamore in Co. Offaly. The site is divided into main two sections by a stream (canal supply), while a bog track further separates the southwest sector from the rest of site.

Habitats and Vegetation

The majority of the eastern section is becoming revegetated with scrub and heather, with a dry heath type vegetation dominant.

The majority of the western section has been in active commercial production and comprises bare peat (ED2).

A substantial areas of high bog (PB1) occurs in the northwest (c.13 ha is size). This is relatively intact and wet, with locally good Sphagnum growths (up to 50% cover in places). This area is considered to qualify as the Annex I habitat Degraded raised bog still capable of natural regeneration [7120]. The Annex I habitat Depressions on peat substrates (Rhynchosporian) [7150] is also well represented.

Regenerating cutaway occurs in the southwest sector, including some ponds.

Cutover bog (PB4) is well represented in the marginal areas of the site, often with scrub and bog woodland development.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Killaranny Bog.

Wintering Birds

Winter bird surveys have not been carried out at Killaranny Bog.

Breeding Birds

No specific survey information is available for the site though meadow pipit (Red-listed) and skylark (Amber-listed) were considered to be widespread in marginal areas in summer 2016.

Mammals

Badger, pine marten and the Irish hare been recorded on site.

Killaranny Bog was not included in the 2013 baseline bat survey of Bord na Móna properties. However, surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected to be associated with habitats along the site boundaries. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

10.3.10.2 Designated Sites

There are no designated sites in the immediate vicinity of Killaranny Bog. The Grand Canal pNHA (code 02104) occurs within 1 km of the site.

10.3.10.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value.

The high bog remnant in the northwest sector has considerable conservation value as it qualifies as the Annex I EU Habitats Directive habitat ‘Degraded raised bogs still capable of regeneration’ [code 7120] and also supports the Annex I habitat ‘Depressions on peat substrates (Rhynchosporian)’ [7150]. This bog complex is rated at least of **County Importance.**

Other small areas of high bog, and also the areas of regenerating cutaway and cutover bog, are rated as **Local Importance (higher value**).

10.3.11 Bracklin Bog

10.3.11.1 Ecological Baseline

Bracklin Bog is located approximately 4 km to the northwest of Ballivor village. It is contiguous with the north-west corner of Carranstown bog and lies just south of Lisclogher and Lisclogher West (separated from latter sites by a third class road). Access is available from a series of tracks to the south and also from the road to the north.

Apart from the westernmost sector, which is in commercial peat production, Bracklin has been out of commercial production for a long period (parts since the 1980s) and comprises a substantial area of regenerating cutaway bog as well as remnant high bog and cutover bog.

Further cutover or remnant bog adjoins the site to the east and to some extent to the north but otherwise the site is surrounded by agricultural land.

Habitats and Vegetation

The western quarter of Bracklin Bog is in commercial peat production and comprises bare peat (ED2).

The majority of the site comprises cutaway where re-generation is well advanced. Vegetation includes swards of degraded bog dominated by *Calluna vulgaris*, bog woodland (WN7) and scrub (WS1). Birch is the commonest tree species.

Substantial areas of remnant high bog also occur, some of which may be classified the Annex I habitat Degraded raised bog. Old cutover areas are found along the margins of the site.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Bracklin Bog.

Wintering Birds

Bracklin bog provides useful habitat for wintering birds. Hen harrier has been recorded during winter surveys and there is potential within the site for roosting birds. Meadow pipit and woodcock (both Red-listed) occur in winter, along with various Amber-listed species, including kestrel, snipe and linnet.

Breeding Birds

While Bracklin bog is a large site with substantial areas of regenerating bog, it has limited potential for breeding birds of conservation importance due to the prevalence of scrub and the absence of any substantial area of wetland habitat. However, it does support breeding woodcock and meadow pipit (Red-listed) and a range of Amber-listed species including sparrowhawk, snipe, skylark, mistle thrush, stonechat and linnet.

Mammals

Badger and the Irish hare have been recorded on site.

Bracklin Bog was not included in the 2013 baseline bat survey of Bord na Móna properties. However, surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected to be associated

with habitats along the site boundaries. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

10.3.11.2 Designated Sites

There are no sites designated for conservation within the immediate area of Bracklin Bog.

The site is within 1 km (approximately) of the River Boyne and River Blackwater SAC (code 02299).

10.3.11.3 Conservation Evaluation of Site

The area of the site that is in current commercial production for industrial peat harvesting has no intrinsic conservation value.

The majority of the site comprises regenerating cutaway communities and there are substantial areas of high bog which provide useful local biodiversity and are rated at least of **Local Importance (higher value**). The regenerating areas of old cutover bog are also given this rating.

The remnant areas of high bog along the southern boundary (two of which are on south side of local access road) and along the northeast boundary are classified as the Annex I habitat 'Degraded raised bogs still capable of regeneration' [7120]. The associated Annex I habitat Depressions on peat substrates (Rhynchosporian) is also represented here. This high bog is rated of **County Importance**.

10.3.12 Carranstown Bog

10.3.12.1 Baseline Ecology

Carranstown Bog is located approximately 2 km west-northwest of Ballivor village. It adjoins Ballivor to the south (though split by the R156) and the southeast end of Bracklin to the northwest. Access is available from the R156 road which runs south of the site.

The majority of Carranstown is in commercial production. Regenerating cutaway bog and some high bog remnants occur along the margins in the north-east, east and southeast and to a lesser extent along the western margin.

Carranstown bog is generally surrounded by agricultural lands, though strips of remnant and cutover bog occur along the north-northeast and eastern margins, as well as to the southwest. Some areas of scrub occur on the cutover. A conifer plantation skirts the southeast margin.

Habitats and Vegetation

The largest portion of Carranstown Bog is in commercial peat production and comprises bare peat (ED2).

The eastern sector of the site had not been fully developed and contains a mosaic of high bog (PB1), cutover bog (PB4), and bog woodland (WN7) dominated by birch. A sward of *Calluna vulgaris* is developing on a cutaway area. A strip of regenerating cutaway also occurs along the westernmost margin of the site. Further remnant high bog and cutover bog occurs to the west of the site (separated by a local road).

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Carranstown Bog.

Wintering Birds

Carranstown bog has limited potential for wintering birds of conservation importance.

Golden plover and lapwing have been recorded in winter surveys resting on bare peat within the site. Meadow pipit, a species Red-listed due to declines in the breeding population, occurs on site during the winter. Various Amber-listed species occur on site during winter, mostly at the eastern end, and include sparrowhawk, kestrel, snipe, skylark and stonechat.

Breeding Birds

Carranstown bog has limited potential for breeding birds of conservation importance.

Two Red-listed species have been recorded breeding on site, woodcock and meadow pipit. Various Amber-listed species also breed, including sparrowhawk and skylark.

Mammals

Badger, the Irish hare and pine marten have been recorded on site.

Carranstown Bog was not included in the 2013 baseline bat survey of Bord na Móna properties. However, surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected to be associated with habitats along the site boundaries. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

10.3.12.2 Designated Sites

There are no sites designated for conservation within the immediate area of Carranstown Bog.

10.3.12.3 Conservation Evaluation of Site

The area of the site that is in current commercial production for industrial peat harvesting has no intrinsic conservation value.

The remnant high bog area in the eastern end of site is substantial in size. While much of it had been surfaced drained, there is an area of relatively intact raised bog without drains in the extreme eastern end of site (and this continues outside of Bord na Móna property). Some intact bog without surface drains also occurs in the northern part of the complex where turbary occurs. As a complex, this high bog area is classified as the Annex I habitat 'Degraded raised bogs still capable of regeneration' [code 7120] and is rated as of **County Importance**.

The other areas of remnant high bog, cutover bog and regenerating cutaway bog in the westernmost sector of site and along the margins provide useful local biodiversity and are rated as of **Local Importance (higher value**).

10.3.13 Ballivor Bog

10.3.13.1 Ecological Baseline

Ballivor Bog is located just over 2 km west-southwest of Ballivor village. Access is available through the Works Area from the R156 road which runs north of the site. The site is connected by a rail link to Carranstown Bog to the north.

A substantial part of Ballivor Bog has been in recent commercial peat production and comprises bare peat.

Ballivor Bog is almost entirely surrounded by farmland though there are stands or strips of woodland (conifers and mixed) to the northwest, southwest and east, along with some remnant bog to the northwest.

Habitats and Vegetation

The largest portion of Ballivor Bog is in commercial peat production and comprises bare peat (ED2). An extensive area of cutaway occurs in the western sector, with birch scrub (WS1), degraded raised bog (PB1) and poor fen (PF2) vegetation in parts. Further regenerating cutaway occurs in the northeast sector.

A substantial area of relatively intact high bog occurs in the southwest sector. This has a typical raised bog flora and is wet in places. This complex of bog is classified as the Annex I habitat Degraded raised bog. Also represented here is the Annex I habitat Depressions on peat substrates (Rhynchosporian).

Small areas of high bog (PB1) occur along the margins elsewhere within the site. Old cutover bog (PB4) occurs in marginal areas of the site, with Bog woodland (WN7) well developed in places.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Ballivor Bog.

Wintering Birds

Ballivor bog has limited potential for wintering birds of conservation importance.

Golden plover has been recorded roosting on bare peat, while peregrine has been observed resting on peat ridge (both Annex I listed species).

Meadow Pipit, a species Red-listed due to declines in the breeding population, is widespread on site through the winter.

Various Amber-listed species have been recorded on site in winter, including sparrowhawk, kestrel, snipe, Jack snipe and skylark.

Breeding Birds

Ballivor bog has limited potential for breeding birds of conservation importance.

Two Red-listed species have been recorded breeding on site, woodcock and meadow pipit. Various Amber-listed species also breed, including sparrowhawk, snipe, skylark, mistle thrush, stonechat and linnet.

Mammals

Badger and the Irish hare occur on site.

Ballivor Bog was not included in the 2013 baseline bat survey of Bord na Móna properties. However, surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected to be associated with habitats along the site boundaries. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

10.3.13.2 Designated Sites

There are no sites designated for conservation within the immediate area of Ballivor Bog.

The River Boyne and River Blackwater SAC (code 02299) is located approximately 1.3 km to the south of the site.

10.3.13.3 Conservation Evaluation of Site

The area of the site that is in current commercial production for industrial peat harvesting has no intrinsic conservation value.

The cutaway bog in the western and north-eastern sectors of the site comprises a range of vegetation communities including scattered wetlands and is considered of high biodiversity value. On the basis of habitats and associated breeding birds, a rating of **Local Importance (higher value**) is assigned to the cutaway bog areas.

The high bog in the westernmost part of the site is largely intact and of significant size. While damaged by turbary in places, the bog has substantial conservation value and qualifies as the Annex I habitat 'Degraded raised bogs still capable of regeneration' [7120]. The associated Annex I habitat Depressions on peat substrates (Rhynchosporian) is also represented here. This high bog is rated of **County Importance**.

The other remnant areas of high bog and cutover bog areas, including areas of bog woodland, are rated as **Local Importance (higher value**).

Figure 10.16: View of intact high bog in westernmost sector of Ballivor Bog.

Source: BioSphere Environmental Services.
Note: The Annex I habitats Degraded raised bogs still capable of regeneration and Depressions on peat substrates (Rhynchosporian) are represented here.

Figure 10.17: View of regenerating cutaway vegetation in western sector.

Source: BioSphere Environmental Services.

10.3.14 Kinnegad (Rossan) Bog

10.3.14.1 Ecological Baseline

Kinnegad bog is located approximately 1 km south of the Kinnegad town. It is an isolated bog with no rail connections to other Bord na Móna bog sites. The site is managed as a horticultural bog. The M5 motorway runs just a little to the north of the site, while the R401 road runs close to the eastern side of the site.

The site is almost entirely surrounded by agricultural land. A cement and quarry works occur to the west of the bog site.

Habitats and Vegetation

The majority of Kinnegad Bog is bare peat (ED2), with industrial production still in progress over much of the area.

There are several fields in the central area of the site which are presently out of production. Re-generating dry bog and scrub occur here, along with a silt pond.

A substantial area of high bog (PB1) occurs in the westernmost part of the site. This was prepared for development in the 1980s but never fully put into production. While deep drains still occur, it has since regenerated into degraded bog dominated by a sward of *Calluna vulgaris*. A mosaic of high bog remnants and cutover bog (PB4) occurs in the northeast of the site, with fragments of remnant bog and cutover elsewhere along the margins.

A mineral island is located at the southern end of the site. An area of hazel dominated woodland occurs here (WN2). Patches of bog woodland (WN7) and scrub (WS1) occur elsewhere along the margins.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Kinnegad Bog.

Wintering Birds

Kinnegad bog has limited potential to support wintering birds of conservation importance reflecting the extent of the commercial peat fields at this site.

Golden plover, an Annex I Birds Directive species, occurs regularly on and around the site, with birds often resting or roosting on the bare peat.

Peregrine (Annex I listed) breeds locally and birds use the site for hunting and at times roost on peat mounds.

The marginal areas of remnant bog and cutover bog support meadow pipit (Red-listed), while kestrel, snipe and linnet (all Amber-listed) occur on a regular basis.

Breeding Birds

Kinnegad Bog has limited potential for breeding birds of conservation importance.

However, the remnant and cutover bog habitats along the margins support breeding meadow pipit (Red-listed). Snipe (at least one pair) occur on site, along with a range of other Amber listed species including skylark, stonechat and linnet. Site provides hunting habitat for kestrel and buzzard (both considered to nest nearby).

Mammals

Signs of badgers have been recorded on site. The Irish hare is widespread throughout the site.

The baseline survey for bats carried out in 2013 recorded three species of bat present on site, as follows: soprano pipistrelle, common pipistrelle and leisler's. All the bats were recorded along the linear features of well developed hedgerows at the north western side of the bog. No bats were recorded in areas of open peat habitat.

10.3.14.2 Designated Sites

The nearest designated site for conservation is Mount Heavy Bog SAC, which is located 3.2 km to the north of Kinnegad Bog.

10.3.14.3 Conservation Evaluation of Site

The area of the site that is in current commercial production has no intrinsic conservation value.

The area of remnant high bog in the western part of the site may qualify as the Annex I habitat 'Degraded raised bogs still capable of regeneration' [code 7120] - this high bog area is rated as at least **Local Importance (higher value**) but may be of **County Importance.**

Cutover bog in the northwest and along the south-eastern margin is rated as of Local Importance (hi**gher value).** Other habitats on site including the hazel woodland and patches of bog woodland are also given this rating.

Site at times supports golden plover (Annex I listed), as well as peregrine and meadow pipit (latter Red-listed).

10.3.15 Ballybeg Beg

10.3.15.1 Ecological Baseline

Ballybeg Bog is located to the west of the R400 road and between Croghan Hill and the town of Rhode. It is contiguous with Derryarkin bog to the north and Cavemount bog to the south. The most southern sector is an outlier from the main site which lies between a local road and the Grand Canal pNHA – this is known as Coole Bog.

In addition to commercial peat production, a large area (c.60 ha) of cutaway east of the main railway line has been planted with alder as a biomass trial for East Offaly Power. The northeast section of the site is used for gravel extraction.

Ballybeg is a pumped bog with main pumps being located near the centre of the site and connected to a drainage system that flows through a series of silt ponds and onto the Yellow River via a tributary.

The site is adjoined by slivers of bog to the east and north-west, with agricultural land to the south and west.

Habitats and Vegetation

Ballybeg Bog is sharply divided into three main ecological units: the northern part which has been out of production for some time and is re-vegetating cutaway, the southern part which is in commercial industrial production, and the small southern outlier of largely intact raised bog, known as Coole bog.

The northern cutaway sector contains a range of habitats but is dominated by birch scrub (WS1) or developing bog woodland (WN7). There are some small wetlands with permanent or temporary water. Wetland vegetation, however, is poorly developed and is mainly a Soft Rush dominated vegetation. Poor fen (PF2) vegetation is developing in parts. Bare peat (ED2) still occurs in places. As noted, a substantial portion of the cutaway has been developed as an Alder biomass trial and is classified as short rotation coppice (WS4).

The southern part of the site is in commercial peat production and most of this comprises bare peat (ED2). A portion to the east of the railway line and west-southwest of the Works area comprises disturbed ground associated with the old Rhode Power Station. This area is dominated by a range of cutaway habitats characteristic of drier substrates, with scrub (WS1), dense bracken (HD1) and dry grassland (GS).

An area of undeveloped high bog (PB1) occurs in the southernmost sector of the site (part of this bog is not within Bord na Móna ownership). This is largely intact bog though there is active turbary along the western margin and a network of surface drains had been inserted in the past. This bog is considered to qualify as the Annex I habitat ‘Degraded raised bogs still capable of regeneration’ [7120]. A remnant strip of high bog also occurs along the northeast boundary, while patches of cutover bog (PB4) occur in places along the margins of the site.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Ballybeg Bog.

A notable plant species, blue fleabane (*Erigeron acris*), was recorded at several locations in the northern part of the site in a survey in August 2010. The plants were growing on old spoil heaps. This plant is listed in the Irish Red Data Book (Curtis & McGough 1988). Blue fleabane

is an annual species of dry pastures and sandy and gravelly habitats such as esker ridges. Naturally it would not be expected within bog habitats.

Wintering Birds

Ballybeg bog has limited potential for wintering birds of conservation importance. Hen harriers have been recorded passing through the site, while the Red-listed meadow pipit is widespread throughout the site. A range of Amber-listed species occur, including kestrel, sparrowhawk, snipe, skylark, starling and linnet. The bare peat sector of the site attracts roosting golden plover. Whooper swans pass over the site but there is no suitable habitat to support feeding or roosting swans.

Breeding Birds

Ballybeg bog has limited potential for breeding birds of conservation importance. Snipe (Amber listed) breed on site (at least 2 pairs), along with wetland species such as mallard and moorhen.

Meadow pipit (Red-listed) breeds widely in the northern cutaway bog area, as well as on the raised bog in the south. Skylark is also a widespread breeding species, with at least 2 pairs of linnet (both are Amber-listed species).

Mammals

Signs of badgers have been noted within the site. The Irish hare is frequent throughout. Pine marten is likely to occur in the area of woodland and scrub in the northern end of the site.

The baseline survey for bats carried out in 2013 recorded three species of bat present on site, as follows: soprano pipistrelle, common pipistrelle and leisler's. Most of the bats were recorded along scrub vegetation and water bodies. No bats were recorded in areas of open peat habitat.

10.3.15.2 Designated Sites

There are no sites designated for conservation within the Ballybeg site. The Grand Canal pNHA is located adjacent to the site at the southern end. The pNHA includes an area of raised bog (part of Coole bog) which adjoins the Bord na Móna property.

10.3.15.3 Conservation Evaluation of Site

The area of the site that is in current commercial production for industrial peat harvesting has no intrinsic conservation value. This is essentially the entire southern sector of the main site.

The cutaway bog in the northern sector of the site comprises a range of vegetation communities including scattered wetlands and is considered of high biodiversity value. This sector of the site supports breeding snipe, skylark and meadow pipit (latter Red listed). On the basis of habitats and associated breeding birds, a rating of **Local Importance (higher value**) is assigned to this area.

The raised bog in the southernmost part of the site (Coole Bog) is largely intact and of significant size. While damaged by turbary along its western margin, the bog has substantial conservation value and qualifies as the Annex I habitat 'Degraded raised bogs still capable of regeneration' [7120]. This high bog is rated of **County Importance**. The other remnant areas of high bog and the cutover bog areas are rated as **Local Importance (higher value**).

The presence of a substantial population (in several locations) of blue fleabane is **of Local Importance (higher value)**. The long-term presence of this species on site will depend on the availability of exposed gravel substrates.

10.3.16 Ballaghurt Bog

10.3.16.1 Ecological Baseline

Ballaghurt Bog is located approximately 6 km south of Ballynahown in Co. Offaly. The site comprises three separate entities – an eastern sector, a western sector, and Clonlyon Glebe pNHA (latter located within a small topographical basin). The complex is connected to the main Blackwater Bog by a rail link. The River Blackwater flows through the eastern sector of the site.

The site is mostly surrounded by agricultural land. Areas of remnant high bog and cutover bog border the site in places, along with scrub and wet grassland.

Habitats and Vegetation

The majority of the site is in active production and is classified as bare peat (ED2). One strip in the eastern section is classified as pioneer dry heath and is not used for peat extraction. Clonlyons Glebe bog was developed by Bord na Móna in the 1980s and 1990s but has only come into full commercial production in recent years. Some of the fields in the easternmost sector of the site have only recently been cleared of surface vegetation and still support remnants of plants of *Calluna vulgaris, Eriophorum angustifolium* and the moss *Campylopus introflexus*. [note that Clonlyons Bog is not within the area being applied for substitute consent]

Areas of remnant high bog (PB1) and cutover bog (PB4) occur along the various margins of the site (some outside Bord na Móna property). Apart from one exception, the areas of high bog are relatively small in extent, with surfaces mostly dry and tending to be dominated by *Calluna vulgaris*. Cover by bog mosses (*Sphagnum* spp.) is mostly low.

A substantial area of largely intact high bog occurs in the northeast of the site, north of the road between Doon and Clonmacnoise. Some surface drains had been inserted in the southern sector though these are now mostly infilled with *Sphagnum* mosses and other bog plants. This bog supports a typical raised bog flora, and has wet areas dominated by *Rhynchospora alba*. This bog is considered to conform to the Annex I habitat Degraded raised bog still capable of natural regeneration [7120]. The related Annex I habitat Depressions on peat substrates (Rhynchosporian) [7150] is also represented.

Parts of the cutover bog have developing bog woodland (WN7) and scrub (WS1).

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Ballaghurt Bog.

Wintering Birds

Ballaghurt Bog has low potential to support wintering birds of conservation importance. Golden plover would be expected to roost on the bare peat fields at times.

Meadow pipit (a Red-list species) occurs on the various areas of high bog and cutover bog along the margins of the site. Snipe (Amber-listed) were flushed from several areas of remnant and cutover bog in November 2016.

Breeding Birds

Meadow pipit (Red-listed) breeds in the various areas of high bog and cutover bog.

Mammals

Badger and Irish hare have been recorded within marginal habitats around the site.

Otter (Annex II listed species) has been recorded on site.

Surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected to be associated with habitats along the site boundaries. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

10.3.16.2 Designated Sites

While Clonlyons Glebe is a pNHA, it is understood that an NPWS survey to select raised bogs for designation as actual Natural Heritage Areas reviewed the status of Clonlyons Bog (Derwin et al. 2002) and did not recommend its further designation as an NHA "as 80% of the bog has been drained" and it was considered too damaged to be designated at that stage.

There are no further designated sites within the vicinity of Ballaghurt Bog.

10.3.16.3 Conservation Evaluation of Site

The majority of this site is in commercial peat production and has no intrinsic conservation value.

Apart from one exception, the various areas of remnant high bog are all relatively small in size and/or in a degraded state – such areas are rated as **Local Importance (higher value),** as are the various areas of cutover bog. Other habitats such as bog woodland are also given this rating.

The high bog north of the road between Doon and Clonmacnoise is considered to conform to the Annex I habitat Degraded raised bog still capable of natural regeneration [7120] and supports the Annex I habitat Depressions on peat substrates (Rhynchosporian) [7150] – this area of bog is rated as of **County Importance**.

Otter, an Annex II listed species and a qualifying interest for the SAC, occurs on the site.

Meadow pipit, a Red-listed species, is widespread on the marginal bog habitats.

Figure 10.18: View of intact bog to north of road, northeast sector of Ballaghurt Bog

Source: BioSphere Environmental Services.

Note: This bog supports the Annex I habitats Degraded raised bog and Depressions on peat substrates (Rhynchosporian). View is looking westwards.

Figure 10.19: View of road and marginal strip (c.20 m wide) which separates the intact high bog from commercial peat fields. View is looking eastwards.

Source: BioSphere Environmental Services

10.3.17 Daingean Derries Bog

10.3.17.1 Ecological Baseline

Daingean Derries bog is a medium sized site located approximately 7.5 km northwest of Daingean. It is linked with a further bog, Daingean Rathdrum, to the southeast.

Daingean Derries is a relatively new production bog and comprises primarily bare peat that is in commercial production.

There are strips of cutover bog and some patches of remnant high bog along the margins and these habitats occur more extensively in the eastern end of the site (part of which is privately owned).

The adjacent habitat type is mainly intensive agricultural land.

Habitats and Vegetation

The majority of Daingean Derries bog is in active commercial production and comprises bare peat (ED2).

Most of the margins of the site are marked by strips of old cutover bog (PB4) or remnant patches of high bog (PB1). The areas of remnant high bog are located along the western and southern boundaries of the peat fields, with a further area in the extreme east of the site (no production in this area). Bog woodland (WN7) and scrub (WS1) dominated by birch are frequent in the cutover bog habitat. Gorse scrub is also present along the margins.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Daingean Derries Bog.

Wintering Birds

Daingean Derries bog has limited potential for wintering birds of conservation importance.

In winter 2013/14, Peregrine was recorded several times over the site, including one resting on bare peat. Golden Plover was recorded roosting on bare peat in winter 2012/13. The marginal habitats are frequented by various Amber listed species, including Kestrel, Snipe and Linnet.

Breeding Birds

Daingean Derries has limited potential for breeding birds of conservation importance reflecting the extent of commercial peat fields. However, 1-3 territorial Snipe were recorded in the eastern cutover area in summers 2013 and 2014. Also, in summer 2014 two pairs of Lapwing (Red listed) attempted to breed in the southeast sector of the site. Meadow Pipit (Red listed) breeds in the marginal habitats, along with Skylark and Linnet (both Amber listed.

Mammals

Signs of badgers have been recorded within the site. The Irish hare occurs on site.

10.3.17.2 Designated sites

There are no sites designated for conservation within or adjoining Daingean Derries bog.

Raheenmore Bog SAC (code 02033) occurs within 2 km to the east of the site.

10.3.17.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic significant conservation value - this is rated as **Local Importance (lower value**).

The marginal cutover bog and remnant bog habitats provide good biodiversity and are given a rating of **Local Importance (higher value**).

The breeding birds include several notable species, including Snipe, Lapwing (latter one year only) and Meadow Pipit (Red-listed), and are rated as **Local Importance.**

10.3.18 Daingean Rathdrum Bog

10.3.18.1 Ecological Baseline

Daingean Rathdrum bog is located approximately 4.5 km northwest of Daingean. It is connected by railway line to Daingean Derries bog to the northwest, with Daingean Townparks bog approximately 1 km to the southeast (and separated by the Grand Canal). The site is 381 ha in area.

Daingean Rathdrum is a relatively new production bog and comprises primarily bare peat that is in commercial production.

There are marginal strips of remnant and cutover bog around the commercial peat fields. More extensive remnant and cutover bog habitats occur in the southeast sector of the site. Part of this is privately owned and is used for milled peat production.

A tributary of the Silver River flows along the northern boundary of the site.

The adjacent habitat type is mainly intensive agricultural land.

Habitats and Vegetation

The majority of Daingean Rathdrum bog is in active commercial production and comprises bare peat (ED2).

The margins around the peat fields are marked by strips of old cutover bog (PB4) or remnant patches of high bog (PB1). Bog woodland (WN7) and scrub (WS1) dominated by birch are frequent in these habitats.

The southern/south-eastern sector of the site contains a mix of remnant bog (PB1), old cutover bog (PB4) and bare peat (ED2). A large area (32 ha) which had been used for milled peat in the past has now re-vegetated with heather (*Calluna vulgaris*) and is classified as dry heath (HH1). The remnant high bog in this area is used intensively for domestic sod peat production.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Daingean Rathdrum Bog.

Wintering Birds

Daingean Rathdrum bog has limited potential for wintering birds of conservation importance. During winter surveys, Peregrine and Golden Plover were recorded passing over the site and these species may roost on the bare peat fields at times. The remnant bog in the southeast supports Amber listed species such as Snipe and Skylark.

Breeding Birds

The majority of Daingean Rathdrum bog has limited potential to support breeding birds of conservation importance. However, up to six territorial Snipe were recorded in the cutover and remnant bog areas in the southeast of the site. Meadow Pipit (Red listed) breeds in the marginal habitats, along with Skylark and Linnet (latter both Amber listed).

Mammals

Signs of badgers have been recorded within the site. The Irish hare occurs on site.

10.3.18.2 Designated sites

There are no sites designated for conservation within Daingean Rathdrum bog. However, the site is linked by a rail corridor to Daingean Townparks NHA (code 02033) to the southeast, and the rail corridor passes over the Grand Canal pNHA (code 02104).

Raheenmore Bog SAC (code 2033) occurs within 2 km to the northeast of the site.

10.3.18.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value - this is rated as **Local Importance (lower value**).

The remnant high bog habitats and notably the more extensive example in the southeast of the site provides good biodiversity and is given a rating of at least **Local Importance (higher value**).

The various areas of regenerating cutover bog are also rated as **Local Importance (higher value**).

The breeding birds include several notable species, including Snipe (up to 6 pairs) and Meadow Pipit, and are rated as **Local Importance.**

10.3.19 Clonad Bog

10.3.19.1 Ecological Baseline

Clonad Bog is located approximately 3 km south of Daingean town. The site is contiguous with Mountlucas bog to the east and Daingean (Townparks) to the northwest. There are two main lobes to the bog that are separated by a narrow connection with some cutaway habitats developing.

Clonad bog is primarily bare peat that is under commercial production. The western side has a variable topography and there are glacial ridges and mounds underlying the peat that are visible in the overlying peat. A grassy pioneer vegetation is developing where sub-soil is exposed.

A relatively large area of remnant high bog and cutover bog occurs in the northeast sector, though the bog has been degraded by private sod-peat cutting.

Clonad bog is on the boundary between the Shannon and Barrow river catchments. The Philipstown River forms part of the boundary along the northeast lobe of undeveloped bog.

The surrounding habitat type is almost entirely agricultural land.

Habitats and Vegetation

The majority of Clonad bog is in active commercial production and largely comprises bare peat (ED2). There is some pioneering cutaway vegetation developing (Recolonising bare ground ED3), including a dry grassland mosaic in the area of glacial ridges and mounds in the northwest sector.

An area of regenerating cutaway between the western and eastern lobes of the site is dominated by birch scrub (WS1) and pioneering poor fen (PF2).

The northeast sector of the site comprises remnant high bog (PB1) and old cutover bog (PB4). While the high bog is degraded in parts and has been burnt in the last few years, there is a central wet area on the bog with good Sphagnum cover (>50%) including *S. papillosum, S. subnitens* and *S. tenullum*. Areas dominated by *Rhynchospora alba* are also present. The intact high bog merges into an area of cutover bog (PB4) that is quite disturbed. Small stands of bog woodland (WN7) and scrub (WS1) occur in the cutover. This area of wet bog is considered to qualify as the Annex I habitat Degraded raised bog still capable of natural regeneration [7120]. The Annex I habitat Depressions on peat substrates (Rhynchosporian) [7150] is also represented. A track separates the commercial peat field from the high bog.

Small areas of remnant high bog and cutover bog also occur in the extreme northwest sector and along the west/southwest boundary.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Clonad Bog.

Wintering Birds

Clonad bog has limited potential for wintering birds of conservation importance. Golden plover were recorded during winter surveys roosting on the bare peat (peak of 350 February 2013).

Meadow pipit (Red-listed) is widespread on the remnant and cutover bog in the northeast and this area also supports snipe, skylark and linnet (Amber-listed species).

Breeding Birds

Clonad bog has limited potential to support breeding birds of conservation importance.

One pair of snipe was recorded on remnant bog in the extreme northwest of the site. Meadow pipit (Red-listed) breeds widely in the remnant high bog and cutover bog habitats, along with skylark (Amber-listed). Other Amber-listed species breeding on site include stonechat and linnet.

Mammals

Signs of badgers have been recorded within the site. The Irish hare occurs widely on site.

The baseline survey for bats carried out in 2013 recorded four species of bat present on site, as follows: common pipistrelle, soprano pipistrelle, myotis whiskered/Brandt's and leisler's. The majority of the bats were recorded along the riparian habitat and hedgerow in the eastern part of the site. Bats were also recorded along a mineral bank on the western side of the bog. No bats were recorded in areas of open peat habitat.

10.3.19.2 Designated Sites

No part of Clonad Bog is within a site designated for nature conservation. However, the site adjoins the Daingean Townparks NHA (code 02033) to the northwest (separated by a local road).

10.3.19.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value.

The undeveloped raised bog in the northeast section has conservation value and qualifies as the Annex I EU Habitats Directive habitat 'Degraded raised bogs still capable of regeneration' (code 7120). A further Annex I habitat, Depressions on peat substrates (Rhynchosporian), is also represented. This sector of the site is rated as **County Importance**.

The remnant areas of high bog in the extreme northwest and along the west boundary of the site, along with strips of cutover bog elsewhere along the margins, are also rated as **Local Importance (higher value**). The few examples of developing cutaway habitats in the main area of the site are rated as of **Local Importance (lower value)**.

Golden plover (Annex I species) utilises the bare peat fields as roost sites. The Red-listed meadow pipit breeds on the various high bog and cutover bog areas. Various Amber-listed bird species also breed on site, including snipe, stonechat and skylark.

Figure 10.20: View of intact high bog in northeast sector of Clonad bog, looking northwards.

Source: BioSphere Environmental Services.
Note: This bog is classified as the Annex I habitat Degraded Raised Bog (November 2016).

Figure 10.21: View of surface of the intact high bog at Clonad.

Source: BioSphere Environmental Services.
Note: The Annex I habitat Depressions on peat substrates (Rhynchosporian) is well represented in the wetter zone (November 2016).

10.3.20 Ballykeane Bog

10.3.20.1 Ecological Baseline

Ballykeane Bog is located approximately 1 kilometre west of the village of Walsh Island and 3 km east of Geashill. The site lies approximately 1 km south of Mountlucas Bog and the two sites are connected by a railway link.

The majority of Ballykeane is in active peat production and is classified as bare peat. A narrow fringe of cutover bog and fragments of high bog surround most of the margins. A small outlier plot of remnant and cutover bog contiguous occurs several hundred metres south of the main site. Ballykeane is underlain with a mixture of gravel and shell marl.

Tributaries of the Cushina river flow along both the east and west boundaries of Ballykeane.

The site is surrounded by agricultural land, with some small areas of woodland scrub in the northwest and quarry activity along the western boundary.

Habitats and Vegetation

The majority of Ballykeane bog is in active commercial production and comprises bare peat (ED2). There is some pioneering cutaway vegetation developing in a sector of the central area of the site (area is out of production). This area of Recolonising bare ground (ED3) has a sparse covering of soft rush (*Juncus effusus*) on shallow peat.

Marginal habitats around the site include cutover bog (PB4) and remnant high bog (PB1). The largest area of high bog is in the southernmost part of the site (see Figure 10.22). Bog woodland (WN7) and scrub (WS1) has developed in places.

Silt ponds (FL8) occur in the northeast and southeast sectors.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Ballykeane Bog.

Wintering Birds

Ballykeane bog has limited potential for wintering birds of conservation importance as it largely comprises bare peat fields. Whooper swans have been recorded in small numbers on grassland and a quarry lake to the west of the site.

Meadow pipit (Red-listed) occurs in the marginal areas of remnant and cutover bog, along with species such as kestrel, sparrowhawk, snipe and skylark (all Amber-listed). A high count of 52 snipe was made in a small area of cutover in the south of the site on 14th November 2016.

Breeding Birds

Ballykeane bog has limited potential to support breeding birds of conservation importance. meadow pipit (Red-listed) breeds in the marginal strips of remnant and cutover bog habitats, along with skylark and linnet (both Amber-listed).

Wet grassland to the west (associated with an active quarry) and southwest of the site supported breeding lapwing and an estimated four pairs of snipe, with a further pair of snipe on cutover/remnant bog to south of site.

Mammals

Signs of badgers have been recorded within the site. The Irish Hare occurs on site.

The baseline survey for bats carried out in 2013 recorded two species of bat present on site, as follows: common pipistrelle and leisler's. All the bats were recorded along the linear features of a gravel track with a hedgerow on one side. No bats were recorded in areas of open peat habitat.

10.3.20.2 Designated Sites

There are no sites designated for conservation within or adjoining Ballykeane bog.

10.3.20.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value.

The marginal remnant and cutover habitats are limited in extent but provide local biodiversity and support meadow pipit (Red-listed) and several Amber-listed bird species – these are rated as **Local Importance (higher value**).

Figure 10.22: View of high bog to southwest of Ballykeane bog, looking southwards.

Source: BioSphere Environmental Services.

Note: The surface of this bog remnant is dry due to local cutting. (November 2016)

10.3.21 Esker Bog

10.3.21.1 Ecological Baseline

Esker Bog is located to the east of the R400 road and to the north of the R402 road. Cavemount Bog occurs approximately 1 kilometre to the west, with Ballycon to the south and Cloncreen to the southeast.

The Esker River flows along part of the southern boundary of the bog and continues in an east-southeast direction. A tributary of the Esker, the Doden River, flows north to south through the site and divides the bog into two main units. A further unnamed tributary of the Esker flows along the western boundary of the site.

The main part of the site is to the west of the Doden River and is almost in complete commercial production. A smaller unit occurs east of the Doden River and the majority of this is also in full production. Most of the site is edged by narrow strips of remnant or developing cutaway habitats, mostly birch scrub but also some raised bog remnants.

In the extreme southeast, there is an outlying plot of cutover bog that is dominated by bog woodland and scrub.

The site is entirely surrounded by farmland on its southern and western sides. Small areas of bog adjoin the site at the northeast and eastern margins. Conifer plantations occur to the north-northeast.

Habitats and Vegetation

Esker Bog can be conveniently divided into western and eastern sectors, with the Doden River providing a natural division. The western sector is by far the largest and is entirely in commercial production (classified as bare peat ED2) apart from marginal strips of remnant high bog and cutover habitats. These comprise mostly bog woodland (WN7) and scrub (WS1) dominated by birch and willow, with gorse and dense bracken in places. Much of the remnant high bog (PB1) still has bog vegetation but this is usually dominated by *Calluna vulgaris* reflecting the drying conditions. The largest such area is in the northeast of the site but this is highly disturbed due to local cutting.

The smaller section of the site to the east of the Doden River is now mostly in production, though there is a sector of out-of-production cutaway with developing pioneer cutaway vegetation, including poor fen (PF2) and birch scrub (WS1). The production area is edged along the eastern boundary by a near continuous strip of remnant high bog (outside of Bord na Móna site boundary). However, this is highly disturbed from ongoing local cutting.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Esker Bog.

Wintering Birds

Esker Bog has limited potential for wintering bird species of conservation importance. Golden plover is attracted to the site for roosting purposes, while peregrine and merlin pass through on occasions and both were recorded resting on bare peat (all Annex I EU Bird Directive species). Supports several Amber-listed species, including kestrel and snipe.

Breeding Birds

Esker bog has limited potential to support breeding birds of conservation importance.

Meadow pipit (Red-listed) breeds within the marginal strips, along with skylark and linnet (both Amber-listed species).

Mammals

Signs of badgers and pine martens have been noted along the margins of the site. The Irish Hare occurs on site.

Otter could be expected along the local watercourses.

The baseline survey for bats carried out in 2013 recorded five species of bat present on site, as follows: soprano pipistrelle, common pipistrelle, daubenton's, myotis whiskered/Brandt's and leisler's. All bat contacts were recorded along the linear features of well developed hedgerows at the northern side of the bog. All daubenton's bats were recorded at a large drainage pond near the entrance to Esker Bog. No bats were recorded in areas of open peat extraction.

10.3.21.2 Designated Sites

There are no sites designated for conservation within or adjoining Esker Bog.

10.3.21.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value.

The marginal habitats, and especially the remnant high bog, cutover bog and bog woodland, provide habitat diversity and are rated as **Local Importance (higher value).** An area of regenerating out-of-production cutaway in the eastern sector is rated as **Local Importance (lower to higher value)**.

Golden plover (Annex I species) utilises the bare peat fields as roost sites. The Red-listed meadow pipit breeds on the high bog and cutover bog areas. Various Amber-listed bird species also breed on site, including kestrel, snipe, stonechat and skylark.

Figure 10.23: View of remnant high bog along eastern margin of Esker Bog, looking southwards

Source: BioSphere Environmental Services.

Note: This bog is in a disturbed state mainly due to local cutting. November 2016.

10.3.22 Garrymore Bog

10.3.22.1 Ecological Baseline

Garrymore Bog is located to the immediate west of the larger Garryhinch Bog. While it is a relatively young production bog, almost the entire site has been fully developed and is bare peat. Garrymore is not connected by rail link to the other sites in the group. The margins of the site comprise strips of cutover bog and some remnant high bog. Much of the cutover has been exhausted by private sod peat production.

Garrymore bog is located in the River Barrow catchment, with the main channel of the Barrow within 1 km of the southwest boundary of the site. A small stream, called Cottoner's Brook, flows along the east side of the bog, with a further stream along the southwest sector.

Garrymore is almost entirely surrounded by farmland. Some conifer plantation occurs to the south, north and northwest.

The site is surrounded by agricultural land, with some small areas of woodland scrub in the northwest and quarry activity along the western boundary.

Habitats and Vegetation

The majority of Garrymore bog is in active commercial production and comprises bare peat (ED2).

The margins of the site comprise old cutover bog (PB4) and patches of remnant high bog (PB1). The northern margin is the least disturbed and contains remnant high bog with relatively high Sphagnum cover in places, including *Sphagnum cuspidatum, S. capillifolium S. papillosum* and *S. subnitens*. The high bog in the northern and north-eastern areas of the site are considered to qualify as the Annex I habitat Degraded raised bogs still capable of regeneration' [code 7120]. The Annex I habitat Depressions on peat substrates (Rhynchosporian) [7150] is also represented here.

Much of the old cutover is vegetated by a dry heath community, with *Calluna vulgaris* and bog cotton (*Eriophorum* spp.) frequent. Birch scrub (WS1) is occasional. The eastern and southern margins are dominated by old cutover, while the western margin has mostly been developed for milled peat.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Garrymore Bog.

A notable plant species, alder buckthorn (*Frangula alnus*), occurs along the Cottoner's Brook stream in the southeast of the site (M. McCorry pers., comm.). This plant is listed in the Irish Red Data Book (Curtis & McGough 1988).

Wintering Birds

The majority of Garrymore bog has low potential to support wintering birds of conservation importance.

However, surveys have shown that the marginal remnant and cutover bog habitats attracted hunting hen harriers (with a winter roost in the adjacent Garryhinch bog). Merlin has also been recorded, while golden plover have been observed roosting on the bare peat. The Red-listed

meadow pipit is widespread in the marginal areas during winter. Sparrowhawk and kestrel have been recorded, along with snipe, stonechat and linnet (all Amber-listed species).

Breeding Birds

Meadow pipit (Red-listed) breeds widely in the cutover and remnant high bog habitats, along with skylark, stonechat and linnet (all Amber-listed). Displaying snipe and woodcock were recorded within a complex of bog habitat to southwest of site.

Mammals

Signs of badgers have been recorded within the site. The Irish hare occurs on site.

The baseline survey for bats carried out in 2013 recorded two species of bat present on site, as follows: common pipistrelle and soprano pipistrelle. Most of the bat records were from the scrub vegetation and mature deciduous trees along the eastern border of the bog. No bats were recorded in areas of open peat extraction.

10.3.22.2 Designated sites

There are no sites designated for conservation within or adjoining Garrymore bog.

The River Barrow and River Nore SAC (code 02162) occurs approximately within 1 km of the southwest margin of the site. The SAC is selected for the following Annex I habitats and Annex II species:

- Estuaries [1130]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- Reefs [1170]
- Salicornia and other annuals colonising mud and sand [1310]
- Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]
- Mediterranean salt meadows (Juncetalia maritimi) [1410]
- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]
- European dry heaths [4030]
- Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]
- Petrifying springs with tufa formation (Cratoneurion) [7220]
- Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]
- Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]
- Vertigo moulinsiana (Desmoulin's Whorl Snail) [1016]
- Margaritifera margaritifera (Freshwater Pearl Mussel) [1029]
- Austropotamobius pallipes (White-clawed Crayfish) [1092]
- Petromyzon marinus (Sea Lamprey) [1095]
- Lampetra planeri (Brook Lamprey) [1096]
- Lampetra fluviatilis (River Lamprey) [1099]
- Alosa fallax fallax (Twaite Shad) [1103]
- Salmo salar (Salmon) [1106]
- Lutra lutra (Otter) [1355]

- Trichomanes speciosum (Killarney Fern) [1421]
- Margaritifera durrovensis (Nore Pearl Mussel) [1990]

10.3.22.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value.

The remnant high bog and cutover bog habitats are extensive in area and provide local biodiversity – these are rated as **Local Importance (higher value**).

The remnant high bog in the north and northeast of the site has good Sphagnum development and is considered to qualify as the Annex I habitat Degraded raised bogs still capable of regeneration' [code 7120]. The Annex I habitat Depressions on peat substrates (Rhynchosporian) [7150] is also well represented here. The high bog areas in the north and northeast of the site are rated as **County Importance.**

The remnant high bog and cutover habitats support meadow pipit (Red-listed) and several Amber-listed bird species.

Figure 10.24: View of remnant high bog at northern end of Garrymore Bog, looking westwards.

Source: BioSphere Environmental Services.

Note: This high bog area is classified as the Annex I habitat degraded raised bog.

Figure 10.25: Parts of the high bog are wet, with Sphagnum mosses and Rhynchospora alba frequent.

Source: BioSphere Environmental Services

Figure 10.26: Garrymore Bog, north end. View of deep drain along edge of high bog, looking westwards.

Source: BioSphere Environmental Services
Note: Deposition of peat along the marginal strip of high bog from drain maintenance operations

10.3.23 Derrylea Bog

10.3.23.1 Ecological Baseline

Derrylea bog lies within 1 km to the northeast of Portarlington and approximately 500 m to the east of Derryounce bog (sites separated by the R419 road). The site measures 672 ha.

While Derrylea has been in sod peat production since the 1950s, the bog was only converted to milled peat production in 1998. Extensive bog timber made sod peat and milled peat production difficult. The production bog is characterised by a series of long deep drains orientated E-W that are typical of a former sod production bog. Some of the drains are lined with remnant high bog that has now been colonised by scrub or strips of bog woodland. The areas between the drains are now mostly in milled peat production and comprise bare peat.

There are relatively large areas of remnant high bog and cutover bog habitats along the margins, especially the south boundary.

The Cushina River flows close to the northern boundary of the site. The Cushina is a tributary of the River Barrow.

The site is almost entirely surrounded by farmland.

Habitats and Vegetation

The majority of Derrylea bog is in active commercial production and comprises bare peat (ED2).

Remnant high bog (PB1) and old cutover bog (PB4) occur along much of the site boundaries. While disturbed, the high bog retains typical raised bog features, including good Sphagnum growth in places, and is considered to qualify as the Annex I habitat 'Degraded raised bogs still capable of regeneration' A further Annex I listed habitat 'Depressions on peat substrates (Rhynchosporian)' is also well represented.

Scrub (WS1) and bog woodland (WN7), mostly dominated by birch, is well developed in parts of the cutover. One stand of bog woodland in the east of the site supports Alder Buckthorn (*Frangula alnus*), a Red Data Book species

Other habitats which occur along the margins of the commercial peat fields are dry heath (HH1) and poor fen (PF2).

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) associated with Derrylea Bog.

Alder Buckthorn (*Frangula alnus*), a Red Data Book species (Curtis & McGough 1988, Wyse Jackson *et al.* 2016), occurs in woodland on the site.

Wintering Birds

Derrylea Bog has low potential for wintering birds of conservation importance.

A hunting Hen Harrier was recorded over the marginal bog and scrub in winter 2013/14, while Sparrowhawk, Kestrel and Buzzard were observed on a regular basis. Other species of interest (Amber listed) include Snipe, Skylark, Starling and Linnet.

Breeding Birds

Derrylea bog has limited potential to support breeding birds of conservation importance.

Snipe and Woodcock (latter Red listed) breed in the marginal areas. Meadow Pipit (Red listed) breeds in the areas of remnant and cutover bog habitats, along with Skylark and Linnet.

Mammals

Signs of badgers and pine marten have been recorded within the site. The Irish hare occurs on site.

The baseline survey for bats carried out in 2013 recorded five species of bat present on site, as follows: common pipistrelle, soprano pipistrelle, leisler's, natterer's and the myotis whiskered/Brandt's species. All of the bat records were from the mineral bansk or from well developed hedgerows along the periphery of the site. No bats were recorded in areas of open peat extraction.

10.3.23.2 Designated sites

There are no sites designated for conservation within or adjoining Derrylea bog.

The River Barrow and River Nore SAC (code 02162) occurs approximately within 1-2 km south of the site. The SAC is selected for the following Annex I habitats and Annex II species:

- Estuaries [1130]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- Reefs [1170]
- Salicornia and other annuals colonising mud and sand [1310]
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]
- Mediterranean salt meadows (*Juncetalia maritimi*) [1410]
- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]
- European dry heaths [4030]
- Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]
- Petrifying springs with tufa formation (*Cratoneurion*) [7220]
- Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]
- Alluvial forests with Alnus glutinosa and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]
- *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016]
- *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029]
- *Austropotamobius pallipes* (White-clawed Crayfish) [1092]
- *Petromyzon marinus* (Sea Lamprey) [1095]
- *Lampetra planeri* (Brook Lamprey) [1096]
- *Lampetra fluviatilis* (River Lamprey) [1099]
- *Alosa fallax fallax* (Twaite Shad) [1103]
- *Salmo salar* (Salmon) [1106]
- *Lutra lutra* (Otter) [1355]
- *Trichomanes speciosum* (Killarney Fern) [1421]
- *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]

10.3.23.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value - this is rated as **Local Importance (lower value**).

The marginal remnant high bog habitats, especially along the southern and northern boundaries, are extensive in area and provide local biodiversity. Part of the remnant high bog has good Sphagnum development and qualifies as the Annex I EU Habitats Directive habitat 'Degraded raised bogs still capable of regeneration' [7120]. The Annex I habitat Depressions on peat substrates (Rhynchosporian) [7150] is also well represented. These habitats, which support Meadow Pipit (Red listed) and several Amber listed breeding birds, as well as a plant species listed in the Red Data Book, are rated as **County Importance**.

Cutover habitats are now well vegetated with bog and scrub and are rated **Local Importance (higher value**).

10.3.24 Ticknevin Bog

10.3.24.1 Ecological Baseline

Ticknevin bog is located approximately 2 km southeast of Edenderry and just south of the Grand Canal. It lies north of Glashabaun North bog, being separated by an esker ridge (part of which forms the Long Derries SAC).

The majority of Ticknevin bog is in milled peat production and is largely bare peat. The western lobe of the site, extending to the Edenderry Road, comprises a substantial area of remnant high bog and cutover bog. Further remnant high bog and cutover bog occurs at the eastern end of the site.

Ticknevin bog is located on the borders of the Barrow and Boyne catchments.

A substantial area of mostly intact raised bog to the west of the Edenderry Road is owned by Bord na Móna but is being retained for biodiversity purposes.

Habitats and Vegetation

The majority of Ticknevin bog is in active commercial production and comprises bare peat (ED2).

There is a large area of cutover bog (PB4) and remnant high bog (PB1) to the west of the commercial peat fields extending to the Edenderry Road. There is active sod peat cutting along the northern and southern margins of the high bog. Surface drains had been inserted across the high bog but these have now been infilled. The vegetation is dominated by heather (*Calluna vulgaris*) and bog cotton (*Eriophorum angustifolium)* and there is good Sphagnum cover in places.

A substantial relatively intact raised bog occurs to the west of the Edenderry Road (Cloncanon). Notably, surface drains have not been inserted at this bog.

The high bog on both sides of the Edenderry Road is classified as the Annex I habitat 'Degraded raised bogs still capable of regeneration' [code 7120]. A further Annex I habitat, 'Depressions on peat substrates (Rhynchosporian)' [7150], is also present and widespread in places.

Cutover bog, with small patches of high bog, occurs at the eastern and southeastern margins of the site. This cutover is mostly dry with heath (HH1) and dense bracken (HD1).

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Ticknevin Bog.

Wintering Birds

Ticknevin Bog has limited potential for wintering birds of conservation importance. In winter 2013/14, Golden Plover and Peregrine were recorded on the bare peat and also flying over the site.

The remnant area of bog in the western part of the site provides habitat for species such as Kestrel, Snipe, Skylark and Linnet (all Amber-listed).

Breeding Birds

Meadow Pipit (Red-listed) breeds widely in the cutover and remnant high bog habitats at the western and eastern ends of the site. Skylark is also frequent in these bog habitats, with Linnet also present as a breeding species. Snipe (2 pairs) breed on the cutover and remnant bog at the western end of the site.

Mammals

The Irish hare occurs on site.

The baseline survey for bats carried out in 2013 recorded three species of bat present on site, as follows: common pipistrelle, soprano pipistrelle and the myotis whiskered/Brandt's species. All of the bat records were from well-developed hedgerows along the periphery of the site. No bats were recorded in areas of open peat extraction.

10.3.24.2 Designated sites

There are no sites designated for conservation within Ticknevin bog.

However, the site is adjacent to two designated areas as follows:

- The Long Derries, Edenderry cSAC (code 0925) occurs just south of the site and for several hundred metres is contiguous with the site boundary
- The Grand Canal pNHA (code 02104) occurs just north of Ticknevin bog.

10.3.24.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value.

The remnant high bog in the western end of the site (extending to east of Edenderry Road) qualifies as the Annex I habitat 'Degraded raised bogs still capable of regeneration' (code 7120). The Annex I habitat 'Depressions on peat substrates (Rhynchosporian)' [7150] is also represented here. This high bog is rated as **County Importance.**

The intact raised bog to the west of Edenderry Road (Cloncanon) is of high conservation value and is rated at least of **County Importance**.

The cutover bog habitats along the margins provide local biodiversity and are rated as **Local Importance (higher value**).

10.3.25 Glashabaun South Bog

10.3.25.1 Ecological Baseline

Glashabaun South bog is separated from Glashabaun North bog by the Cushaling River corridor. It is contiguous with Lullybeg bog to the south, Blackriver bog to the southwest, Derrybrennan bog to the northeast and Killina bog to the east. An island of improved agricultural land adjoins Glashabaun to the east.

Glashabaun South bog comprises mostly regenerating cutaway bog and conifer forest. The regenerating bog is mostly dry, heath type vegetation and scrub. There are some deep drains but no significant wetland areas.

Habitats and Vegetation

The majority of Glashabaun South bog comprises cutaway bog habitats that are fairly mature, with frequent bog woodland (WN7) and scrub (WS1) dominated by birch. Pioneering poor fen communities (PF2) are also represented though in general wetland habitats are poorly developed. A substantial part of the eastern sector of the site has been planted with conifer forest (WD4) dating to the 1990s. Along the margin of the plantation there is a substantial strip of birch woodland. There is active peat production being carried out in the northwest sector of the site (classified as bare peat ED4).

An area of relatively intact high bog (PB1) occurs in the extreme northwest corner of the site. This is divided into two by a rail track, with surface drains inserted in the sector to the east but no drains in that to the west. This area of high bog is considered to qualify as the Annex I habitat Degraded raised bog still capable of natural regeneration [7120]. The Annex I habitat Depressions on peat substrates (Rhynchosporian) [7150] is also represented here.

Cutover bog (PB4) and some remnant high bog in the southeast corner is being used for sod peat production.

Rare Flora

The embankments of the railway line support important populations of two rare plant species, Basil Thyme (*Clinopodium acinos*) and Blue Fleabane (*Erigeron acer*). Both species are listed in the Irish Red Data Book (Wyse Jackson *et al.* 2016Curtis & McGough 1988), while Basil Thyme is also listed on the Flora Protection Order (2015) (Curtis & McGough 1988)

Both plants also occur in Glashabaun North bog. These plants are typically found on sandy and gravelly habitats and naturally would not be expected within bog habitats. In both Glashabaun sites, the source for these plants is undoubtedly the esker ridge within the Long Derries, Edenderry SAC.

Wintering Birds

Glashabaun South bog has limited potential for wintering birds of conservation importance.

Hen Harrier was recorded foraging on site in winter 2012/13, and Kestrel, Buzzard and Sparrowhawk are regular. Snipe occurs sparsely, along with Woodcock. Other Amber listed species include Skylark, Stonechat and Linnet.

Breeding Birds

Glashabaun South bog has limited potential to support breeding birds of conservation importance. This partly reflects the absence of wetland habitats.

Meadow Pipit (Red listed) breeds widely throughout the site, while at least two pairs of Woodcock (Red listed) bred along the edge of the forest (in birch and/or conifers). The site also supports breeding Sparrowhawk, Skylark, Stonechat and Linnet (all Amber listed species).

Mammals

Signs of badger and the Irish stoat were recorded on site. The Irish hare occurs throughout.

Otter has been recorded along the Cushaling River. Otter is listed on Annex II of the EU Habitats Directive.

The baseline survey for bats carried out in 2013 recorded five species of bat present on site, as follows: common pipistrelle, soprano pipistrelle, daubenton' bat, leisler's and the myotis whiskered/Brandt's species. The majority of records were recorded along the mineral bank and the associated water body located in the centre of the site along a railway line. No bats were recorded in areas of open peat extraction.

10.3.25.2 Designated sites

There are no sites designated for conservation within or adjoining Glashabaun South bog.

The Long Derries, Edenderry SAC (code 0925) occurs on the esker ridge north of Glashabaun North (c.1.5 km north of Glashabaun South).

10.3.25.3 Conservation Evaluation of Site

A substantial part of Glashabaun South bog has been planted with conifer forest and has no intrinsic conservation value – rated as **Local Importance (lower value**). Also given this rating is the area of the site presently in commercial peat production (in northwest).

Much of the site is cutaway bog with well developed secondary habitats, especially birch dominated bog woodland. These habitats, which support breeding Meadow Pipit and Woodcock (both Red listed) and several Amber listed breeding birds, are rated as **Local Importance (higher value)**.

The area of remnant high bog in the northwest of the site qualifies as the Annex I habitat 'Degraded raised bogs still capable of regeneration' (code 7120). The Annex I habitat 'Depressions on peat substrates (Rhynchosporian)' [7150] is also represented here. This area is rated as of **County Importance**.

The presence on site (along railway embankments) of a substantial population of the rare plants Basil Thyme and Blue Fleabane is of importance at the level of **County Importance**. The long-term presence of these species on site will depend on the availability of exposed gravel substrates

10.3.26 Glashabaun North Bog

10.3.26.1 Ecological Baseline

Glashabaun North bog is located between Ticknevin bog to the north and Glashabaun South bog to the south. It is separated from Ticknevin by an esker ridge, part of which forms the Long Derries, Edenderry SAC. It is separated from Glashabaun South by the Cushaling River corridor. Codd North bog lies to the west (separated by the Edenderry Road).

Glashabaun North is largely bare peat with production still in progress over much of the area. There are some narrow strips of regenerating cutaway bog within the site, with strips of remnant high bog along much of the northern and southern boundaries.

Agricultural land occurs to east and northwest of the site.

Habitats and Vegetation

The majority of Glashabaun North bog is in active commercial production and comprises bare peat (ED2). There are some strips out of production and these are developing typical pioneering cutaway habitats, notably poor fen (PF2) dominated by soft rush (*Juncus effusus*) and bog cotton (*Eriophorum angustifolium*) and birch scrub (WS1).

A strip of remnant high bog (PB1), which is dry and mostly in a degraded state and now dominated by heather (*Calluna vulgaris*), occurs along much of the northern boundary of the commercial peat fields. This strip adjoins the Long Derries, Edenderry SAC, which is partially located within the northwest corner of the site. The sector of the SAC which overlaps with Glashabaun North bog had been used as a gravel pit in the past.

Further remnant high bog, which is also dry and partly degraded, occurs in the southernmost part of the site.

Rare Flora

The gravel pit (within the SAC) and the bases of the railway tracks support important populations of two rare plant species, Basil Thyme (*Clinopodium acinos*) and Blue Fleabane (*Erigeron acer*). Both species are listed on the Irish Red List (Wyse Jackson *et al.* 2016), while Basil Thyme is also listed on the Flora Protection Order (2015) (Curtis & McGough 1988).

Both plants occur widely in the gravel pit (and elsewhere in the SAC) and were also noted at several locations along the railway. These plants are typically found on sandy and gravelly habitats and naturally would not be expected within bog habitats.

Wintering Birds

Glashabaun North bog has limited potential for wintering birds of conservation importance.

Golden Plover and Peregrine were recorded during winter surveys on the bare peat and also flying over the site.

The remnant high bog and regenerating cutaway areas provide foraging habitat for Kestrel, Sparrowhawk, Snipe, Skylark and Linnet (all Amber-listed species).

Breeding Birds

Glashabaun North bog has limited potential to support breeding birds of conservation importance.

Meadow Pipit (Red-listed) breeds widely in the remnant high bog and cutover bog habitats. The site also supports breeding Sparrowhawk, Skylark and Linnet (Amber listed species).

Mammals

Badgers occur in the Long Derries, Edenderry SAC and would be expected on Glashabaun North at times. The Irish hare occurs on site.

Otter has been recorded along the Cushaling River. Otter is listed on Annex II of the EU Habitats Directive.

The baseline survey for bats carried out in 2013 did not record any bat species. However, the transects were through areas of open bog, with none from marginal hedgerows.

10.3.26.2 Designated sites

The Long Derries, Edenderry SAC (code 0925) occurs on the esker ridge north of Glashabaun North. The western section of the SAC, now a gravel pit, overlaps with the Bord na Móna property. The SAC is selected for the presence of the priority Annex I habitat 'Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco Brometalis) (*important orchid sites) (6210). The SAC supports populations of two legally protected species, Green-winged Orchid (*Orchis morio*) and Basil Thyme (*Acinos arvensis*), as well as a rich, calcareous flora.

10.3.26.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value - this is rated as **Local Importance (lower value**).

The section of the site which overlaps with the Long Derries, Edenderry SAC is of **International Importance**.

The presence on site (along railway embankments) of a substantial population of the rare plants Basil Thyme and Blue Fleabane is of importance at the level of **County Importance**. The long-term presence of these species on site will depend on the availability of exposed gravel substrates.

The remnant and cutover bog habitats, mainly along the northern and southernmost boundaries, provide local biodiversity. Of particular note is the strip of bog which skirts the esker ridge (and SAC site) as this represents a transition between raised bog and the calcareous habitats of the esker. These habitats, which support Meadow Pipit (Red listed) and several Amber listed breeding birds, are rated as **Local Importance (higher value**).

10.3.27 Codd North Bog

10.3.27.1 Ecological Baseline

Codd North (Sheridans) bog is located to the western side of the Edenderry to Rathangan road, with Glashabaun North bog immediately to the east. It occurs north of Codd South bog, the sites being separated by the corridor of the Figile River. The site can be divided into two sectors, a large square shaped sector alongside the Edenderry Road and a rectangular shaped sector to the northwest.

The majority of Codd 2 bog is in active production, with only small areas of cutover bog and remnant high bog along the boundaries (mostly the northern boundary).

The lands to the north and west are privately owned lands.

Habitats and Vegetation

The majority of Codd North bog is in active commercial production and comprises bare peat (ED2).

As the site is a relatively new production bog, there are no developing pioneering cutaway habitats.

Remnant high bog (PB1) and cutover (PB4) habitats are represented along the northern boundary of the site. The high bog has had surface drains inserted but may still qualify as the Annex I habitat 'Degraded raised bogs still capable of regeneration'.

Rare Flora

The embankment of the railway line supports important populations of two rare plant species, Basil Thyme (*Clinopodium acinos*) and Blue Fleabane (*Erigeron acer*). Both species are Red-listed listed in the Irish Red Data Book, while Basil Thyme is also listed on the Flora Protection Order (2015). (Curtis & McGough 1988, Wyse Jackson *et al.* 2016).

These plants are typically found on sandy and gravelly habitats and naturally would not be expected within bog habitats. At Codd, the source for these plants is undoubtedly the esker ridge within the Long Derries, Edenderry SAC (c.1.5 km to northeast).

Wintering Birds

Codd North bog has limited potential to support wintering birds of conservation importance.

Peregrine was recorded over the site and perched on a peat mound one occasion. Golden Plover was recorded roosting on the bare peat.

The marginal area of cutover and high bog along the northern boundary provides habitat for Kestrel, Sparrowhawk, Snipe, Skylark and Meadow Pipit (all Amber listed species).

Breeding Birds

Codd North bog has limited potential to support breeding birds of conservation importance.

The remnant bog in the northwest of the site supports nesting Skylark.

Meadow Pipit (Red listed) breeds in the cutover and remnant high bog habitats along the northern boundary. The site also supports breeding Skylark, Stonechat and Linnet (Amber listed species).

Mammals

The Irish hare occurs on site.

The baseline survey for bats carried out in 2013 recorded three species of bat present on site, as follows: common pipistrelle, soprano pipistrelle, leisler's, and the myotis whiskered/Brandt's species. The majority of records were from the riparian strip of the Cushaling River. No bats were recorded in areas of open peat extraction.

Other important species

White clawed crayfish was recorded from the Figile River during drainage works in the 1990s. White clawed Crayfish is listed on Annex II of the EU Habitats Directive.

10.3.27.2 Designated sites

There are no sites designated for conservation within or adjoining Codd North bog.

However, the site is within approximately 1 km of the The Long Derries, Edenderry cSAC (code 0925).

10.3.27.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value.

The remnant high bog habitat along the northern boundary has been disturbed by drains and local cutting but still provides local biodiversity and may qualify as the Annex I habitat Degraded raised bogs still capable of regeneration'. This habitat is rated, at the least, as Local Importance (higher value). The other marginal habitats, including cutover bog and scrub, are also rated as Local Importance (higher value).

The presence on site (along railway embankments) of populations of the rare plants Basil Thyme and Blue Fleabane is of importance at the level of **County Importance**. The long-term presence of these species on site will depend on the availability of exposed gravel substrates.

10.3.28 Codd South (Codd 1) Bog

10.3.28.1 Ecological Baseline

Codd South bog is located to the western side of the Edenderry to Rathangan road. It occurs south of Codd North bog, the sites being separated by the corridor of the Figile River. Codd South bog adjoins Ballydermot bog to the south, with a railway line and hedgerow strip between the two sites.

The majority of Codd South bog is in active production. There is a spur of high bog at the northwest end, which is being used to produce Sphagnum sod moss. Elsewhere along the margins there are patches of old cutover bog. A small area of conifer forest has been planted on old cutover at the site entrance at Cushaling bridge.

Agricultural land occurs to the west of the site, while a private milled peat production bog occurs to the northwest.

Habitats and Vegetation

The majority of Codd South bog is in active commercial production and comprises bare peat (ED2). There are no significant areas of regenerating cutaway bog vegetation present on the production bog.

A spur of high bog (PB1) in the northwest is being used for Sphagnum sod moss. When inspected in 2013, this high bog was classified as the Annex I habitat 'Degraded raised bogs still capable of regeneration'.

A small remnant of high bog along the western margin has been drained and part contains mature bog woodland (WN7) with Birch and Scot's Pine. A block of Oak has been planted in this area and there are numerous saplings (indicating self-seeding). Other deciduous tree species are present, including Alder, Hazel and Holly. Patches of cutover bog (PB4) occur in several locations along the margins, including south of the conifer plantation (WD4) at the site entrance.

Rare Flora

The embankment of the railway line supports important populations of two rare plant species, Basil Thyme (*Clinopodium acinos*) and Blue Fleabane (*Erigeron acer*). Both species are Red-listed, while Basil Thyme is also listed on the Flora Protection Order (2015) (Curtis & McGough 1988, Wyse Jackson *et al.* 2016).

These plants are typically found on sandy and gravelly habitats and naturally would not be expected within bog habitats. At Codd, the source for these plants is undoubtedly the esker ridge within the Long Derries, Edenderry SAC (c.3 km to northeast).

Wintering Birds

Codd South bog has limited potential to support wintering birds of conservation importance.

Golden Plover were recorded roosting on the bare peat. The remnant and cutover bog areas support Snipe, Skylark, Meadow Pipit and Linnet, while Kestrel hunts along the margins (all Amber listed species)

Breeding Birds

Codd South bog has limited potential to support breeding birds of conservation importance.

The remnant bog in the northwest of the site supports nesting Skylark.

Meadow Pipit (Red listed) breeds in the cutover and remnant high bog habitats along the northern boundary. The site also supports breeding Skylark (Amber listed species).

Mammals

The Irish hare occurs on site.

The baseline survey for bats carried out in 2013 recorded three species of bat present on site, as follows: common pipistrelle, soprano pipistrelle, leisler's, and the myotis whiskered/Brandt's species. The majority of records were from the riparian strip of the Cushaling River. No bats were recorded in areas of open peat extraction.

Other important species

White clawed crayfish was recorded from the Figile River during drainage works in the 1990s. White clawed Crayfish is listed on Annex II of the EU Habitats Directive.

10.3.28.2 Designated sites

There are no sites designated for conservation within or adjoining Codd North bog.

However, the site is within approximately 3 km of the The Long Derries, Edenderry cSAC (code 0925).

10.3.28.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value.

The remnant high bog habitat along the northern boundary has been disturbed by recent sod production but still provides local biodiversity. In 2013 this high bog was classified as the Annex I listed habitat 'Degraded raised bogs still capable of regeneration' and rated as at least of **Local Importance (higher value)** but possibly as **County Importance**.

The other marginal habitats, including cutover bog, scrub and woodland, are rated **as Local Importance (higher value).**

The presence on site (along railway embankments) of populations of the rare plants Basil Thyme and Blue Fleabane is of importance at the level of **County Importance**. The long-term presence of these species on site will depend on the availability of exposed gravel substrates.

10.3.29 Ballydermot North Bog

10.3.29.1 Ecological Baseline

Ballydermot North bog is located between Codd South to the north and Ballydermot South bog to the south. The northern and southern boundaries are marked by railway lines. The Edenderry to Rathangan Road forms the eastern boundary, with Blackriver bog occurring to the other side of the road. Agricultural land occurs to the west of the site. A works area is located towards the centre of the site.

The majority of Ballydermot North bog is in commercial production. There is, however, a relatively large area of production related cutaway bog within the central area of the site.

Sphagnum sod moss is being harvested from some high bog in the southwest part of the site, while there is some remnant high bog along the western boundary.

Habitats and Vegetation

The greater part of Ballydermot North bog is in active commercial production and comprises bare peat (ED2). The site is drained by several long arterial drains orientated east-west between several series of production fields. The drains are lined with high peat fields (remnant sod-peat cutting strip), which have developed bog woodland (WN7), scrub (WS1) or dry heath (HH1) vegetation.

The production related cutaway bog within the central area of the site is located on a mound and some of this area has been planted with conifers. The main secondary habitats are birch scrub (WS1), dry heath (HH1) dominated by heather and some poor fen vegetation (PF2).

Some remnant high bog (PB1) in the southwest sector of site has been drained in the past and part is being harvested for Sphagnum sod moss. Much of this area is dominated by *Calluna vulgaris* and overall Sphagnum cover is low. This area of high bog continues south of the Bord na Móna property.

Rare Flora

The embankment of the railway line supports important populations of two rare plant species, Basil Thyme (*Clinopodium acinos*) and Blue Fleabane (*Erigeron acer*). Both species are listed in the Irish Red Data Book (Curtis & McGough 1988), while Basil Thyme is also listed on the Flora Protection Order (1999).

These plants are typically found on sandy and gravelly habitats and naturally would not be expected within bog habitats.

Wintering Birds

Ballydermot North bog has limited potential to support wintering species of conservation importance.

A Hen Harrier was recorded hunting over the cutaway bog habitats in February 2014. Peregrine is regular over the site and has been recorded perched on peat mounds. Golden Plover roost on the bare peat fields. The site provides suitable habitat for a range of Amber listed species, including Kestrel, Sparrowhawk, Snipe, Woodcock, Skylark and Linnet.

Breeding Birds

Ballydermot North bog has limited potential to support breeding species of conservation importance.

Meadow Pipit (Red listed) breeds in the regenerating cutaway habitats and in the remnant high bog habitats. These habitats also support breeding Skylark and Linnet (Amber listed species).

Mammals

Badger and the Irish hare occur on site.

The baseline survey for bats carried out in 2013 recorded five species of bat present on site, as follows: common pipistrelle, soprano pipistrelle, leisler's, daubentons and the myotis whiskered/Brandt's species. No bats were recorded in areas of open peat extraction.

10.3.29.2 Designated sites

There are no designated sites within or adjoining Ballydermot North Bog.

The site is within approximately 3 km of the The Long Derries, Edenderry cSAC (code 0925).

10.3.29.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value - this is rated as **Local Importance (lower value**).

The regenerating cutaway bog habitats in the central area of the site provide local biodiversity and support Meadow Pipit (Red-listed) and several Amber-listed bird species – this area is rated as **Local Importance (higher value**).

The complex of high bog in the southwest sector of the site, comprising sod peat strip, area with old drains and relatively intact bog outside Bird na Móna property, is classified as the Annex I listed habitat 'Degraded raised bogs still capable of regeneration' and rated as between **Local Importance (higher value**) and **County Importance**.

The presence on site (along railway embankments) of a substantial population of the rare plants Basil Thyme and Blue Fleabane is of importance at the level of **County Importance**. The long-term presence of these species on site will depend on the availability of exposed gravel substrates.

10.3.30 Ballydermot South Bog

10.3.30.1 Ecological Baseline

Ballydermot South bog is located south of Ballydermot North bog. The eastern boundary is marked by the Edenderry to Rathangan Road, with Blackriver bog occurring to the other side of the road. Agricultural land occurs to the south and west of the site. A main Bord na Móna Works area is located in the southeast corner.

The majority of Ballydermot South bog is in commercial production. There is some vegetated cutaway bog in the northern sector. A large area of raised bog occurs in the southeast corner (known as Clonroosk Little Bog).

Habitats and Vegetation

The eastern and southern sectors of the Ballydermot South bog are in active commercial production and comprise bare peat (ED2). The production sector is drained by several long arterial drains orientated north-south. Linear strips of vegetation, including birch scrub, have developed along the margins of the drains

The cutaway in the north contains a mix of birch scrub (WS1) and developing birch woodland (WN7), as well as pioneering poor fen vegetation (PF2). Some standing water is also present.

The southern boundary of the site is marked by a well-developed strip of bog woodland (WN7), which contains Scot's pine, rowan, hawthorn and wild cherry in addition to birch. The woodland is partly on remnant high bog, with some open high bog still present.

The south-western lobe of the site contains a large area of remnant raised bog (PB1) (Clonroosk Little Bog). Part of this bog is in private ownership though the larger part is owned by Bord na Móna. While sod peat production occurs along the eastern side, the bog is largely intact and has an active core (estimated at 4 ha). The bog supports a well developed raised bog flora, including bog rosemary (*Andromeda polifolia*) and a diverse Sphagnum flora. Surface drains were inserted over much of the bog surface in late 2013 and early 2014 though these were subsequently infilled.

Rare Flora

The embankment of the railway line supports important populations of two rare plant species, Basil Thyme (*Clinopodium acinos*) and Blue Fleabane (*Erigeron acer*). Both species are listed in the Irish Red Data Book (Curtis & McGough 1988), while Basil Thyme is also listed on the Flora Protection Order (1999).

These plants are typically found on sandy and gravelly habitats and naturally would not be expected within bog habitats.

Wintering Birds

Ballydermot South bog has limited potential to support wintering species of conservation importance.

A Hen Harrier was recorded hunting over the cutaway bog habitats in the northwest sector in October 2014. Golden Plover roost on the bare peat fields. The site provides suitable habitat for a range of Amber listed species, including Teal, Kestrel, Sparrowhawk, Snipe, Skylark and Linnet.

Breeding Birds

Ballydermot North bog has limited potential to support breeding species of conservation importance.

Meadow Pipit (Red listed) breeds widely on Clonroosk Little bog and in the cutaway bog habitats. Skylark is also widespread in these areas. Teal may have bred in the wet cutaway habitats in 2013. Snipe (2 pairs) were recorded on Clonroosk Little bog. Other Amber listed species recorded breeding were Stonechat and Linnet.

Mammals

Badger and the Irish hare occur on site.

The baseline survey for bats carried out in 2013 recorded five species of bat present on site, as follows: common pipistrelle, soprano pipistrelle, leisler's, daubentons and the myotis whiskered/Brandt's species. No bats were recorded in areas of open peat extraction.

10.3.30.2 Designated sites

There are no designated sites within or adjoining Ballydermot North Bog.

The site is within approximately 4 km of the The Long Derries, Edenderry cSAC (code 0925).

10.3.30.3 Conservation Evaluation of Site

The greater part of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value - this is rated as **Local Importance (lower value**).

The regenerating cutaway bog habitats in the central area of the site and the remnant high bog and bog woodland habitats along the southern boundary provide local biodiversity and are rated as **Local Importance (higher value**).

Clonroosk Little bog was surveyed in 2013 and classified as having a total area of 68.9 ha of high bog, which included 4.0 ha of active raised bog and less than 1 ha of degraded raised bog (capable of restoration) (source: Department of Arts, Heritage and the Gaeltacht, 2014) . Active raised bog is listed with priority status on Annex I of the EU Habitats Directive. Such a large expanse of mostly intact high bog which includes an active core would merit a rating of at least **County Importance**. While surface drains were inserted subsequently, these are now infilled and good recovery is expected.

The presence on site (along railway embankments) of a substantial population of the rare plants Basil Thyme and Blue Fleabane is of importance at the level of **County Importance**. The long-term presence of these species on site will depend on the availability of exposed gravel substrates.

10.3.31 Blackriver Bog

10.3.31.1 Ecological Baseline

Blackriver bog is located approximately 2 km to the north-northwest of Rathangan. It adjoins Barnaran and Lullybeg bogs to the east, Glashabaun South to the northeast and Ballydermot to the west (though latter separated by Edenderry to Rathangan road). A Bord na Móna Works centre is located along the eastern boundary and there is an extensive railway network through the site.

The bog was originally a sod peat bog that has since been converted to milled peat. It is drained by several large, deep drains orientated north-south that separate the peat fields.

While the majority of Blackriver bog is under commercial peat production, there are substantial areas of remnant and cutover bog in the north and northwest of the site, with a smaller area in the extreme southwest.

The Crabtree River flows along the north-eastern boundary of the site. The Crabtree joins the Figile River which continues westwards along the northern end of the site.

Killinthomas forest and agricultural land occurs to the south of the site.

Habitats and Vegetation

The majority of Blackriver bog is in active commercial production and comprise bare peat (ED2). Linear strips of vegetation, including birch scrub (WS1), patches of bog woodland (WN7) and dry heath (HH1), have developed along the margins of the deep drains

Some peat fields in the northwest have been out of production for a number of years and are developing pioneering fen vegetation (PF2) dominated by soft rush (*Juncus effusus*) and bog cotton (*Eriophorum angustifolium*).

There is a substantial complex of remnant high bog (PB1) and cutover bog (PB4) in the north and northwest of the site. While much of the high bog has had surface drains inserted, these have been infilled and recovery has been good. Sphagnum growth is well developed in parts. This area of high bog is considered to qualify as the Annex I habitat Degraded raised bog still capable of natural regeneration [7120]. The Annex I habitat Depressions on peat substrates (Rhynchosporian) [7150] is also represented here. The remnant high bog merges with cutover bog, some of which is being actively worked.

A smaller area of remnant high bog and cutover occurs in the southwest corner of the site though this is mostly covered by birch scrub (WS1) and bog woodland (WN7). A well-developed strip of bog woodland occurs along much of the southern boundary of the site. As well as birch, the following are present: Scot's pine, oak, rowan, holly, guelder rose and alder buckthorn.

Well-developed woodland is also present along the Crabtree River north of the Works area. While dominated by birch, there are patches with elements of oak-ash-hazel woodland (WN2). Species present include ash, hazel, hawthorn, blackthorn, purging blackthorn, alder buckthorn, spindle and guelder rose. The presence of calcareous loving species is due to spoil that has been deposited here from silt ponds.

Rare Flora

The embankments of the railway lines support important populations of two rare plant species, Basil Thyme (*Clinopodium acinos*) and Blue Fleabane (*Erigeron acer*). Both species are listed

in the Irish Red Data Book (Curtis & McGough 1988), while Basil Thyme is also listed on the Flora Protection Order (2015). These plants are typically found on sandy and gravelly habitats and naturally would not be expected within bog habitats (Wyse Jackson *et al.* 2016, Curtis & McGough 1988),

Alder Buckthorn (*Frangula alnus*), a Red listed species, occurs in woodland on the site.

Wintering Birds

Blackriver bog has limited potential for supporting wintering species of conservation importance, as it lacks suitable wetland habitat for species such as swans.

Hen Harrier was recorded foraging over the site on one occasion in winter 2013/14, while species such as Kestrel and Sparrowhawk are regular in the site. Golden Plover was recorded roosting on the bare peat on several occasions.

The site, and especially the remnant high bog and cutover bog in the northern sector, supports Snipe, Skylark and Meadow Pipit. Other species recorded of note include Woodcock and Linnet (all Amber listed species).

Breeding Birds

While much of Blackriver bog has low potential to support breeding species of conservation importance, the northern complex of remnant high bog and cutover bog is of high importance as it held breeding Curlew (Red listed) in 2013 and 2014. Snipe (2 pairs) also bred here.

Woodcock was recorded along the woodland strip at the southern boundary, while Meadow Pipit bred widely on site (both Red listed).

Sparrowhawk, Skylark and Linnet also bred on site (Amber listed species).

Mammals

Signs of badger and the Irish hare occurs on site.

The baseline survey for bats carried out in 2013 recorded seven species of bat present on site, as follows: common pipistrelle, soprano pipistrelle, daubenton' bat, leisler's, brown long-eared bat, natterer's and the myotis whiskered/Brandt's species. The majority of records were recorded along mineral banks, woodland edge or hedgerows. A single soprano pipistrelle was recorded in an area of open peat extraction.

Other important species

White Clawed Crayfish has been recorded from the Crabtree River (current status unknown). White Clawed Crayfish is listed on Annex II of the EU Habitats Directive.

10.3.31.2 Designated sites

There are no sites designated for conservation within or adjoining Blackriver bog.

The Long Derries, Edenderry SAC (code 0925) occurs on the esker ridge c. 3 km north of Blackriver.

10.3.31.3 Conservation Evaluation of Site

The greater part of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value - this is rated as **Local Importance (lower value**).

The substantial area of remnant high bog in the northern part of site is classified as the Annex I 'Degraded raised bogs still capable of regeneration' (code 7120). The Annex I habitat Depressions on peat substrates (Rhynchosporian) [7150] is also represented here. The high bog adjoins cutover bog. This high bog complex supports breeding Curlew, a rare species in Ireland. A rating of County to National Importance is given to this area of bog.

Several small areas of remnant bog and cutover bog occur along the margins of the commercial peat fields. These habitats are rated as **Local Importance (higher value**). Bog woodland is particularly well developed along the southern and parts of the eastern boundaries and supports Alder Buckthorn, a Red Data Book species. The woodland strips are rated as **Local Importance (higher value**).

The presence on site (along railway embankments) of a substantial population of the rare plants Basil Thyme and Blue Fleabane is of importance at the level of **County Importance**. The long-term presence of these species on site will depend on the availability of exposed gravel substrates

For breeding birds, the site is rated of importance at the level of at least **County Importance** due to the presence of Curlew but also Woodcock and Meadow Pipit (all Red Listed species).

10.3.32 Barnaran Bog

10.3.32.1 Ecological Baseline

Barnaran bog is located in the southern sector of the Ballydermot Bog Group. It adjoins Blackriver bog to the west, Lullybeg and Lullymore bog to the north and is linked to Lodge bog to the east. The Lullymore Heritage Park is located just on the north-eastern margin of the site. A mineral island used for agriculture protrudes into the northern part of Barnaran. Agricultural lands occur to the south and southeast.

Much of Barnaran is in commercial peat production. The bog was originally a sod peat bog that has since been converted to milled peat. It is drained by several large, deep drains orientated east-west that separate the peat fields. A large area of production related cutaway bog with developing habitats is located in the northwest of the site. A strip of remnant and cutover bog that is now dominated by bog woodland lines most of the southern boundary of the site.

The Crabtree River flows along the northwest boundary of the site. The main channel of the Slate River flows within 1 km of the southeast boundary of the site.

Habitats and Vegetation

At least half of Barnaran bog is in active commercial production and comprises bare peat (ED2).

The northwest sector of the site has been out of production for more than 20 years and has developed fairly mature cutaway habitats. The area is dominated by bog woodland (WN7) and scrub (WS1), with birch being frequent. Some developing pioneering fen vegetation (PF2) dominated by soft rush (*Juncus effusus*) and bog cotton (*Eriophorum angustifolium*) occur but the cutaway is largely dry.

The southern boundary is characterised by a mix of remnant raised bog (PB1) and bog woodland (WN7).

Rare Flora

The embankments of the railway lines support important populations of two rare plant species, Basil Thyme (*Clinopodium acinos*) and Blue Fleabane (*Erigeron acer*). Both species are listed in the Irish Red Data Book, while Basil Thyme is also listed on the Flora Protection Order (2015) (Wyse Jackson *et al.* 2016, Curtis & McGough 1988),

These plants are typically found on sandy and gravelly habitats and naturally would not be expected within bog habitats.

Wintering Birds

Barnaran bog has low potential for supporting wintering species of conservation importance. Golden Plover was recorded roosting on the bare peat in winter 2013/14.

A range of Amber listed species occur on site, including Kestrel, Sparrowhawk, Snipe, Woodcock, Skylark and Linnet.

Breeding Birds

Barnaran bog has low potential to support breeding species of conservation importance.

Meadow Pipit (Red listed) breeds in the cutaway habitats, along with Skylark and Linnet (Amber listed species). Sparrowhawk, also an Amber-listed species, breeds on site.

Mammals

Badger and the Irish hare occur on site.

The baseline survey for bats carried out in 2013 recorded two species of bat present on site, as follows: common pipistrelle, soprano pipistrelle. The majority of records were from the riparian/scrub habitat near the western side of the bog.

10.3.32.2 Designated sites

There are no sites designated for conservation within or adjoining Blackriver bog.

10.3.32.3 Conservation Evaluation of Site

The greater part of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value - this is rated as **Local Importance (lower value**).

The developing cutaway habitats in the northwest sector of the site and the remnant high bog with bog woodland along the southern boundary provide local biodiversity and are rated as **Local Importance (higher value**).

The presence on site (along railway embankments) of a substantial population of the rare plants Basil Thyme and Blue Fleabane is of importance at the level of **County Importance**. The long-term presence of these species on site will depend on the availability of exposed gravel substrates.

10.3.33 Lodge Bog

10.3.33.1 Ecological Baseline

Lodge bog is located adjacent to Lullymore and is c.3 km west of Allenwood. It supplies milled fuel peat as part of the Derrygreenagh Group to Edenderry Power. It is linked by railway to Barnaran bog to the west. The R414 road skirts sections of the east and north boundaries.

The majority of the site is still in commercial production and is largely bare peat. A series of deep drains orientated in a northeast-southwest direction run across the site. There are scattered areas of cutaway with developing pioneering vegetation within the production area.

Remnant high bog and cutover bog habitats occur along the southern and eastern boundaries.

A large sector of high bog (PB1) to the northwest of the site was gifted to the Irish Peatland Conservation Council by Bord na Móna in 2005 and this bog is now managed for nature conservation

Habitats and Vegetation

The majority of Lodge bog is in active commercial production and comprises bare peat (ED2). The deep drains which run across the site are flanked by high fields on both sides, with the verges supporting typical cutaway habitats including birch scrub (WS1) and dry heath (HH1). Elsewhere there are small areas of pioneer cutaway vegetation at areas which have come out of production. Patches of poor fen vegetation (PF2) are found in the wetter areas, with dry grassland communities (GS1) in the drier areas. The scarce orchid, marsh helleborine (*Epipactus palustris*), was found in the grassland vegetation.

Along the southern margin there occurs a mosaic of remnant high bog (PB1) and cutover bog (PB4), with well-developed bog woodland (WN7) in places. The cutover bog has been used by private sod peat cutters. Similar habitats occur along the eastern margin but here the private cutting is more intense. A large silt pond is located along the northeast boundary.

Rare Flora

The embankments of the railway lines support a population of the rare plant species, Basil Thyme (*Clinopodium acinos*). This species is listed in the Irish Red Data Book (Curtis & McGough 1988) and also on the Flora Protection Order (2015) (Wyse Jackson *et al.* 2016, Curtis & McGough 1988).

Basil Thyme is typically found on sandy and gravelly habitats and naturally would not be expected within bog habitats.

Wintering Birds

Lodge bog has limited potential to support wintering birds of conservation importance.

The areas of bare peat attract roosting Golden Plover. The site supports some Amber listed species, including Teal, Sparrowhawk, Kestrel, Snipe, Skylark and Linnet.

Breeding Birds

Lodge bog has limited potential to support breeding birds of conservation importance.

However, the presence of a nesting pair of Curlew on the IPCC Nature Reserve within c.500 m of the boundary is of note.

Meadow Pipit (Red listed) breeds in the remnant areas of high bog and cutaway bog along the margins of the site. Skylark and Linnet, Amber listed species, were recorded nesting on site.

Mammals

Badger and the Irish hare occur on site.

The baseline survey for bats carried out in 2013 recorded four species of bat present on site, as follows: Common pipistrelle, leisler's, brown long-eared bat and the myotis whiskered/Brandt's species. The majority of records were recorded along the mineral bank and the hedgerows. No bats were recorded in areas of open peat extraction.

10.3.33.2 Designated sites

There are no sites designated for conservation within or adjoining Lodge Bog.

The Grand Canal pNHA occurs within c.1 km of the southeast boundary of the site.

10.3.33.3 Conservation Evaluation of Site

The greater part of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value - this is rated as **Local Importance (lower value**).

Some of the developing cutaway bog vegetation is of interest, especially the patches of calcareous grassland which support marsh helleborine. Also of interest are the marginal remnant high bog and cutover bog habitats along the southern and eastern boundaries. These habitats are rated as **Local Importance (higher value**).

The presence on site (along railway embankments) of a population of the rare plants Basil Thyme is of importance at the level of **County Importance**. The long-term presence of these species on site is dependent on the availability of exposed gravel substrates.

10.3.34 Coolnagun Bog

10.3.34.1 Ecological Baseline

Coolnagun (Cuil na Gun) Bog is located in Co. Westmeath, approximately 7 km west of Castlepollard. Lough Derravarragh is located approximately 1 km to the east of Coolnagun and the River Inny flows along the east side of Coolnagun and enters Lough Derravarragh. There is a rail connection from Coolnagun Bog towards Milkernagh Bog to the north. This railway is positioned along the eastern margin of the production bog has only been constructed in the past few years. Other bogs within the Mostrim group are scattered around Coolnagun, but there are no rail connections. A Works area is located along the eastern margin of the site.

There is extensive private milled peat production on adjoining bogs to the north and east of Coolnagun and adjacent to the River Inny.

Coolnagun Bog was formerly a sod peat bog and supplied sod peat fuel to the local area but began harvesting milled peat in 2007. Several low-lying areas were inundated (2000) prior to silt-ponds and pumps being installed by 2004.

There are signs of former sod peat production within some of the high bog margins around the current production area. A former sod peat production area (White's Bog) to the south of the site was leased for private sod peat production in the past but is now being partially developed for milled peat. The southern part of White's bog is still privately leased for sod peat production, which is on a large scale.

Part of Coolnagun at the southern end of the site is now leased to a third party (Inny Junction production bog area). It is separated from the rest of the site by a local un-named river, although there is a small bridge.

The site is largely surrounded by agricultural grassland, bog woodland, remnant high bog, cutover bog and conifer woodland, along with fringing areas of wet grassland, riparian wetland habitats and scrub.

Habitats and Vegetation

The majority of Coolnagun Bog comprises bare peat (ED2) which runs in an approximately east-west direction with a southern section that is separated from the main area by an unnamed stream (FW2), running northwest – southeast towards the River Inny (FW2).

A relatively large area of high bog (PB1) occurs throughout the Coolnagun Bog site. This high bog is primarily located along the northern and southern fringes of the site, although several of these areas are quite fragmented and disturbed.

Along the northern fringe, high bog that supports the Annex I habitats Degraded raised bog capable of natural regeneration [7120] and Depressions on peat substrates (*Rhynchosporion*) [7150], occurs in the north west (c.10ha) and north east (c.12ha) corners. Both of these areas of high bog have deep drains and bank faces along their southern edge and sod peat extracted from around their northern peripheries.

The southern sector of the site comprises several areas of high bog of which two are considered to support the Annex I habitats Degraded raised bog capable of natural regeneration [7120] and Depressions on peat substrates (*Rhynchosporion*) [7150]. These two areas are each approximately 10ha and are located in the southern part of the site. One of these areas has been partially ditched and is located south west of the unnamed tributary of the River Inny and adjacent to the main River Inny channel. It is contiguous with an area of approximately 60ha to the northwest that was also ditched, but is in a much more disturbed state. The second area is

located to the north east of the unnamed tributary of the River Inny, adjacent to the sod peat harvesting area. Lough Ruddan, a small acidic lake (FL1/FL2), poor fen (PF2) and associated wetland habitats, is located approximately 150m east of this area of high bog.

The other areas of high bog are dominated by *Calluna vulgaris* and are in a disturbed state with little or no *Sphagnum* cover. This includes an area of c. 60ha that appears to have previously been screw-levelled and ditched. This area is located in the south western corner of the site and comprises pioneering species that are dominated by *Calluna vulgaris,* and *Sphagnum* is generally absent. This area, by virtue of its size, can be classified as Degraded raised bog capable of natural regeneration [7120]. A similar area of c.15ha occurs in the extreme north east corner.

Garriskill SAC and SPA is located within 50m of the southern boundary of the site and within c.800m of the peat production area. Qualifying Interests for the site comprise: Active raised bogs [7110], Degraded raised bogs still capable of natural regeneration [7120] and Depressions on peat substrates of the *Rhynchosporion* [7150].

An area of heavily disturbed high bog in the mid-west of the site is subject to relatively intense grazing by livestock.

Some areas of bog woodland (WN7) and scrub (WS1) occur along the south and northeast fringes of the site.

Cattle grazed wet grassland (GS4) dominated by *Juncus effusus* and the grasses *Holcus lanatus* and *Anthoxanthum odoratum* occur along the unnamed stream towards the south of the site.

Several areas of cutover bog domestic and commercial sod peat areas are located along the south east of the site. The cutover bog (PB4) is re-vegetating in parts with a mix of poor fen (PF2) species such as *Juncus effusus* and *Eriophorum angustifolium.*

Other habitats along the margins of the site include bog woodland (WN7), riparian woodland (WN5), tall herb swamp (FS2) along the River Inny (FW2). Improved agricultural land (GA1) also occurs in the centre of the site, although is not in Bord na Móna ownership.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Coolnagun Bog.

Wintering Birds

The Annex I whooper swan regularly passes over the site and will occasionally use flooded area where they occur. These birds are probably associated with Lough Derravaragh and the River Inny. Greenland white-fronted geese have been recorded overflying near the site during the autumn migration period, possibly en route to Lough Iron SPA, where the species is a Special Conservation Interest.

The Red-listed golden plover (Annex I) was recorded along with Amber-listed snipe, kestrel sparrowhawk and the Green-listed buzzard. Golden plover is widespread throughout the winter on open agricultural land and on bare peat fields where it roosts.

Meadow pipit (a Red list species) would occur on the various areas of high bog and cutover bog along the margins of the site.

Breeding Birds

The commercial active peat fields at this site would not support breeding birds. Meadow pipit (Red-listed) and skylark (Amber-listed) breed at least in the area of high bog around the periphery of the site. Snipe (Amber-listed) would be expected to breed on the remnant raised bog in the north and south of the site.

Mammals

Signs of badgers and otters have been recorded along the margins of the site with otters being recorded moving along the main stream running through the site. The Irish hare is widespread on the site.

Surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected where birch scrub occurs on old cutover bog and where hedgerows adjoin the bog margin. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

10.3.34.2 Designated Sites

Garriskill Bog SPA (Site Code: 004102) and SAC (Site Code: 000679) is located to the south of Coolnagun Bog and runs within 50m of the southern boundary of the site and c.800m from the peat production area. The Special Conservation Interests for the SPA comprise:

- [A395] Greenland White-fronted Goose

The Qualifying interests for Garriskill Bog SAC comprise:

- [7110] Active raised bogs
- [7120] Degraded raised bogs still capable of natural regeneration
- [7150] Depressions on peat substrates of the *Rhynchosporion*

Lough Derravaragh NHA (Site Code: 000684) is located 300m east of Coolnagun Bog site.

Lough Derravaragh SPA (Site Code: 004043) is located 500m south east of the site. The Special Conservation Interests for the SPA comprise:

- [A038] Whooper Swan
- [A059] Pochard
- [A061] Tufted Duck
- [A125] Coot
- [A999] Wetland and Waterbirds

10.3.34.3 Conservation Evaluation of Site

The area of the site that is in commercial peat production has no intrinsic conservation value. However, the bare peat fields are expected to provide a roost site for the wintering Annex I species, golden plover and occasionally whooper swan.

The areas of re-vegetating cutover bog and fringing habitats including bog woodland, scrub, and wet grassland areas riparian zones provide useful habitat for wildlife and have biodiversity value – these areas are rated as **Local Importance (higher value**).

The River Inny is notable importance with a diversity of associated semi-natural habitats and species including the Annex II otter. It is rated **County Importance.**

The areas of high bog identified in the northern and southern parts of the site have considerable conservation value and support the Annex I habitats Degraded raised bog and Depressions on peat substrates (Rhynchosporion). Although it is disturbed through past and ongoing drainage activities, this area is considered of **County Importance**.

10.3.35 Milkernagh Bog

10.3.35.1 Ecological Baseline

Milkernagh is located in west Co. Westmeath, 8 km west of Castlepollard and 12 km east of Edgeworthstown, in Co. Longford. It is one of a series of bogs in the Mostrim group with Coolnagun Bog located to the south and Coolcraff to the north. There is a Bord na Móna railway linking Coolnagun to Milkernagh Tippler loading facility. The site is split into northern and southern sections by the R395 Road between Castlepollard and Edgeworthstown. The River Inny flows south close to the east side of the site towards Lough Derravaragh.

The majority of the northern section is in active milled peat production and is bare peat. It has a pumped drainage system. This area was formerly a sod peat production bog, before it was re-developed for milled peat in the 2000's. There are several fields that are divided by deep drainage trenches orientated north-south.

The eastern margin extends to the River Inny along one section. There is a buffer zone of vegetated cutaway/disturbed cutover bog between the riparian zone and the production bog. Two smaller units of bog are situated to the south of the road and are separated by a tributary of the Inny. One of these unit comprises remnant raised bog and has been zoned a Biodiversity Area by Bord na Móna.

The site is largely surrounded by riparian wetland habitats, conifer woodland, bog woodland and scrub and cutover bog along with fringing areas of wet grassland and agricultural grassland.

Habitats and Vegetation

The majority of Milkernagh Bog comprises bare peat (ED2).

Several areas of cutover bog and domestic and commercial sod peat areas are located along the margins of the west of the site. The cutover bog (PB4) is re-vegetating in parts with a mix of poor fen (PF2) species such as *Juncus effusus*, *Eriophorum angustifolium* along with *Trichophorum germanicum*. Deep drains and trenches are present in this area and *Calluna vulgaris* dominates in some of the peripheral drier areas.

A considerable area (c.55ha) of high bog (PB1) occurs in the north of the site of which the majority has been ditched in the past. Overall, a somewhat typical raised bog flora occurs in this area despite the deep drains throughout this sector. *Calluna vulgaris* dominates in these dryer areas.

Despite a large proportion of this area having been drained using deep ditches, by reason of the relatively large area of coverage and the somewhat circular shape of the sector, it is considered that this area supports the Annex I habitats Degraded raised bog capable of natural regeneration [7120]. The Annex I habitat Depressions on peat substrates (*Rhynchosporion*) [7150] also occurs in small pockets. Domestic sod turf cutting occurs through the entire north-eastern and south-western edges of this sector.

An area of high bog (PB1) covering c. 10 ha occurs in the north eastern corner of the site. This high bog supports the Annex I habitats Degraded raised bog capable of natural regeneration [7120] and Depressions on peat substrates (*Rhynchosporion*) [7150]. A small amount of domestic peat cutting occurs on the northern point of this area.

The deep drainage trenches that were created during the sod-peat production period at the site have largely re-vegetated with poor fen (PF2), scrub (WS1) and reed and large sedge swamp (FS1)-type vegetation. Some indicators of rich fen (PF1)-type vegetation occur in the north western corner of the peat production area.

Two high bog areas adjacent to the R395 road support the Annex I habitats Degraded raised bog capable of natural regeneration [7120]. The one to the north of the road is approximately 15 ha is separated from the main production area by a small stream and agricultural grassland. The second is situated south of the road, measures approximately 9ha and is zoned a Biodiversity Area by Bord na Móna. Extensive turf-cutting activities are not a feature at either of these areas of bog.

Other habitats along the margins of the site include bog woodland (WN7), riparian woodland (WN5), wet grassland (GS4) tall herb swamp (FS2) along the River Inny (FW2) and cutover bog (PB4). Improved agricultural land (GA1) also occurs within the site boundary.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Milkernagh Bog.

Wintering Birds

The Annex I whooper swan regularly passes over the site and will occasionally use flooded area where they occur. These birds are probably associated with Loughs Kinale, Derragh, Derrevaragh and the River Inny. Greenland white-fronted geese have been recorded overflying near the site during the autumn migration period, possibly en route to Lough Iron SPA, where the species is a Special Conservation Interest.

The Red-listed golden plover (Annex I) was recorded along with Amber-listed snipe, kestrel sparrowhawk, and the Green-listed buzzard was also recorded on site. Golden plover is widespread throughout the winter on open agricultural land and on bare peat fields where it roosts.

Meadow pipit (a Red list species) would occur on the various areas of high bog and cutover bog along the margins of the site.

Breeding Birds

The commercial active peat fields at this site would not support breeding birds. Meadow pipit (Red-listed) and skylark (Amber-listed) breed at least in the area of high bog around the periphery of the site. Snipe (Amber-listed) would be expected to breed on the remnant raised bog in the north and southwest of the site.

Mammals

Signs of badgers and otters have been recorded along the margins of the site with otters being recorded moving along drains throughout the site. The Irish hare is widespread on the site.

Surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected where birch scrub occurs on old cutover bog and where hedgerows adjoin the bog margin. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

10.3.35.2 Designated Sites

Lough Kinale and Derragh Lough SPA (Site Code: 004061) and NHA (Site Code: 000985) is situated 3 km north of the site.

The Special Conservation Interests for the SPA comprise:

- [A059] Pochard
- [A061] Tufted Duck
- [A999] Wetland and Waterbirds

Lough Derravaragh NHA (Site Code: 000684) is located 2 km south of Milkernagh site.

Lough Derravaragh SPA (Site Code: 004043) is located 3.1 km south of the site. The Special Conservation Interests for the SPA comprise:

- [A038] Whooper Swan
- [A059] Pochard
- [A061] Tufted Duck
- [A125] Coot
- [A999] Wetland and Waterbirds

10.3.35.3 Conservation Evaluation of Site

The area of the site that is in commercial peat production has no intrinsic conservation value. However, the bare peat fields are expected to provide a roost site for the wintering Annex I species, golden plover and occasionally whooper swan.

The areas of re-vegetating cutover bog and fringing habitats including bog woodland, scrub, wet grassland areas along the deep drains provide useful habitat for wildlife and have biodiversity value – these areas are rated as **Local Importance (higher value**).

The River Inny is notable importance with a diversity of associated semi-natural habitats and species including the Annex II otter. It is rated **County Importance.**

The area of high bog in the northern part of the site has considerable conservation value and supports the Annex I habitats Degraded raised bog and Depressions on peat substrates of the *Rhynchosporion*. Although it is disturbed through past and ongoing drainage activities, this area is considered of **County Importance** due to it relatively large area of coverage.

The area of high bog in the northeast of the site measures c. 10 ha and supports the Annex I habitats Degraded raised bog and Depressions on peat substrates of the *Rhynchosporion*. It is also considered of **County Importance.**

The two areas of high bog adjacent to the R395, support the Annex I habitat Degraded raised bog and are considered of **County Importance.**

10.3.36 Coolcraff Bog

10.3.36.1 Ecological Baseline

Coolcraff Bog is located approximately 6.5 km south of the town of Granard in Co. Longford and is accessed from a secondary road that leads off the main Castlepollard-Granard Road (R396). The River Inny borders the bog to the east and south and there is some private commercial peat production on peatland to the south of the site adjacent to the River Inny. The majority of the site has been brought into full milled peat production capability in recent years, although almost 100 ha of high bog occur in the north of the site, most of which is within the Bord na Móna site boundary. The majority of the high bog within the Bord na Móna boundary has previously been ditched. Approximately 20 ha of this area has been zoned a Biodiversity Area by Bord na Móna.

The site is largely surrounded by riparian wetland habitats, a lowland river, raised bog, bog woodland and conifer woodland along with fringing areas of wet grassland and agricultural grassland.

Habitats and Vegetation

The majority of Coolcraff Bog comprises bare peat (ED2).

A considerable area of high bog (PB1) occurs in the north of the site which is divided into a north western sector and a north eastern sector by a mineral spur on which a small works area is located. The north western sector comprises an area c.12 ha of high bog to the west with typical raised bog flora in which a small amount of domestic turf-cutting takes place, and a larger area of c.32ha that has been drained with deep ditches and is very degraded. This area comprises primarily *Calluna vulgaris* and *Narthecium ossifragum,* with a low cover of *Sphagnum capillifolium.* When the various fringing contiguous areas of high bog are taken into account, the total cover of high bog in this sector is c. 45ha. Although a large proportion of this area has been drained using deep ditches, by reason of the relatively large area of coverage, the somewhat circular shape of the sector, and the limited domestic peat extraction, it is considered that this area supports the Annex I habitat Degraded raised bog capable of natural regeneration [7120]. The high bog to the west of this sector also supports the Annex I habitat Depressions on peat substrates (Rhynchosporian) [7150]. A mineral island occurs within this sector and comprises scrub (WS1) and bog woodland (WN7).

The north eastern sector of the site covers c. 20ha and also comprises relatively intact bog and previous ditched high bog. Although there is active domestic turf cutting in the eastern part of this sector, both the intact and previously ditched areas support the Annex I habitats Degraded raised bog still capable of natural regeneration [7120] and Depressions on peat substrates (Rhynchosporion) [7150]. It is mapped as a Bord na Móna Biodiversity Area.

The recently ditched high bog of c.7ha occurs in the southwest of the site.

Other habitats along southern margins of the site include bog woodland (WN7), riparian woodland (WN5), wet grassland (GS4) tall herb swamp (FS2) along the River Inny (FW2) and cutover bog (PB4). Improved agricultural grassland (GA1) also occurs within the fringes of the site.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Coolcraff Bog.

Wintering Birds

The Annex I listed whooper swan regularly passes over the site and will occasionally use flooded areas where they occur. These birds are probably associated with Loughs Kinale and Derragh, and the River Inny. Greenland white-fronted geese have been recorded overflying the site during the autumn migration period, possibly en route to Lough Iron SPA, where the species is a Special Conservation Interest.

The Red-listed golden plover (Annex I) was recorded along with Amber-listed snipe, kestrel sparrowhawk, and the Green-listed buzzard was also recorded on site. Golden plover is widespread throughout the winter on open agricultural land and on bare peat fields where it roosts.

Meadow pipit (a Red list species) would occur on the various areas of high bog and cutover bog along the margins of the site.

Breeding Birds

The commercial active peat fields at this site would not support breeding birds. Meadow pipit (Red-listed) and skylark (Amber-listed) breed at least in the area of high bog around the periphery of the site. Snipe (Amber-listed) would be expected to breed on the remnant raised bog in the north and southwest of the site.

The Amber-listed sand martin has previously been recorded nesting in an old quarry on site.

Mammals

Signs of badgers and otters have been recorded along the margins of the site with otters being recorded moving along drains throughout the site. The Irish hare is widespread on the site.

Surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected where birch scrub occurs on old cutover bog and where hedgerows adjoin the bog margin. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

10.3.36.2 Designated Sites

Lough Kinale and Derragh Lough SPA (Site Code: 004061) and NHA (Site Code: 000985) is situated c. 300m north of the site.

The Special Conservation Interests for the SPA comprise:

- [A059] Pochard
- [A061] Tufted Duck
- [A999] Wetland and Waterbirds

10.3.36.3 Conservation Evaluation of Site

The area of the site that is in commercial peat production has no intrinsic conservation value. However, the bare peat fields are expected to provide a roost site for the wintering Annex I species, golden plover and occasionally whooper swan.

The areas of re-vegetating cutover bog and fringing habitats including bog woodland, scrub and tall reed swamp provide useful habitat for wildlife and have biodiversity value – these areas are rated as **Local Importance (higher value**).

The recently ditched high bog in the southwest of the site is rated as **Local Importance (higher value**).

The River Inny is notably important with a diversity of associated semi-natural habitats and species including the Annex II otter. It is rated of **County Importance.**

The area of high bog in the northern part of the site has considerable conservation value and supports the Annex I habitats Degraded raised bog and Depressions on peat substrates of the *Rhynchosporion*. From the present assessment, the overall rating for this area is given as of **National Importance**.

Figure 10.27: Photograph from August 2016 facing north in the north eastern sector of the Coolcraff site showing area of degraded raised bog capable of natural regeneration.

Source: BioSphere Environmental Services

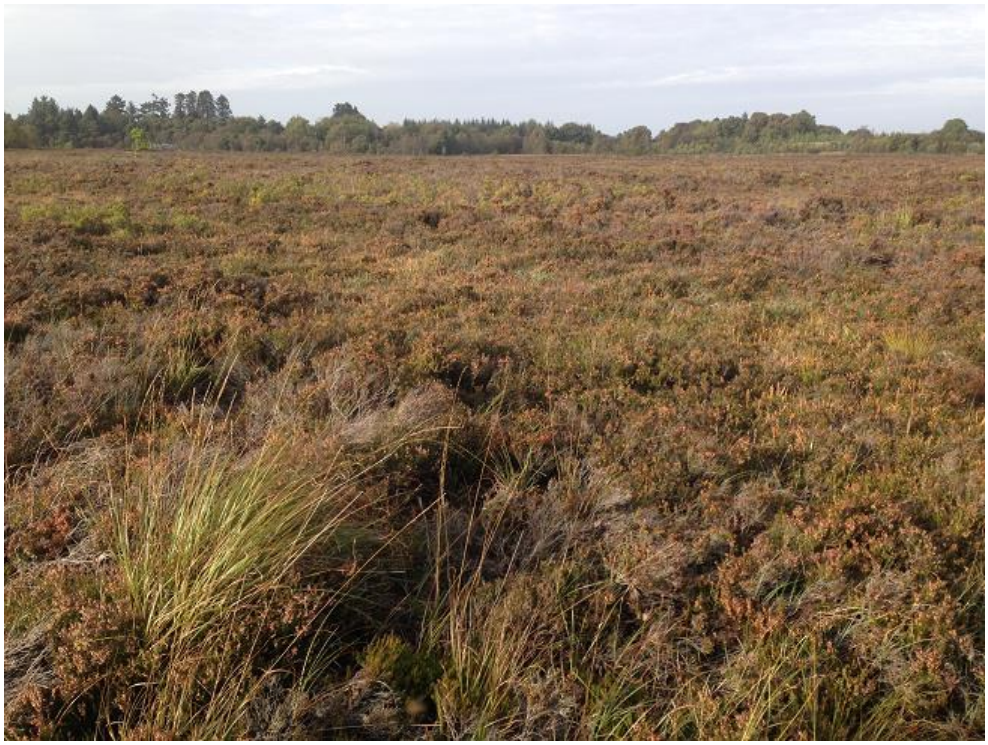
Figure 10.28: Photograph from August 2016 facing north towards north-western sector of recently screw-levelled bog.

Source: BioSphere Environmental Services

Figure 10.29: Photograph facing north over north-western sector at border between recently screw-levelled zone and ditched area with vegetation still existing.

Source: BioSphere Environmental Services

Figure 10.30: Photograph facing north of north-eastern sector showing typical degraded bog vegetation dominated by *Calluna vulgaris*.



Source: BioSphere Environmental Services

Note: This area is considered to be the Annex I habitat Degraded raised bog capable of natural regeneration [7120] due to its area of coverage (c.32ha) and overall circular shape.

10.3.37 Gilltown Bog

10.3.37.1 Ecological Baseline

Gilltown Bog is located approximately 5 km north of Prosperous in Co. Kildare. It is part of the Kilberry Group of horticultural bogs. The site is adjacent to the Timahoe Bogs (both out of production) to the west. Gilltown bog is situated within a natural, oval-shaped basin and is mostly surrounded by farmland. A conifer plantation adjoins the south-east boundary of the site.

Habitats and Vegetation

The vast majority of Gilltown Bog is in active production and comprises bare peat (ED2).

An area of remnant high bog (PB1) and cutover bog (PB4) occurs in the northeast sector of the site. However, much of the high bog has been subject to drainage and turbary is extensive in parts. The surface of the high bog is generally dry, with Sphagnum cover low throughout (<25%). *Calluna vulgaris, Molinia caerulea* and *Eriophorum vaginatum* are the principal higher plant species. The margins of the site are mostly colonised by bog woodland (WN7) and scrub (WS1). Several peat fields along the western margin have not been in production for some time and are colonised by dry bog vegetation, with *Calluna vulgaris* dominant.

A small wetland or pond (FL8) occurs in the northern part of the production bog. This is a small basin which appears to be connected to the local silt pond. This comprises wetland vegetation, such as *Typha latifolia*, and birch scrub. It appears that the birch is advancing at the expense of the open wetland habitats.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Gill Bog.

Wintering Birds

Gilltown Bog has not been surveyed for birds but has limited potential to support species of conservation importance (reflecting the extent of the commercial peat fields).

Snipe has been recorded on site in the past.

Breeding Birds

Meadow pipit (Red-listed) and skylark (Amber-listed) were recorded in summer 2016 on the remnant high bog and cutover bog in the northeast sector. Species such as mallard, moorhen, sedge warbler and reed bunting nest at the pond system in the north of the site.

Mammals

Signs of badgers have been recorded on site. The Irish hare occurs on site.

Gill Bog was not included in the 2013 baseline bat survey of Bord na Móna properties. However, surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected to be associated with habitats along the site boundaries. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

10.3.37.2 Designated Sites

The nearest designated site for conservation is Hodgestown Bog NHA, which is located just over 1 km to the south of Gilltown.

Donadea Woods pNHA occurs to the east of Gilltown, with a distance of approximately 2 km between the two sites.

10.3.37.3 Conservation Evaluation of Site

The area of the site that is in current commercial production has no intrinsic conservation value.

The areas of remnant high bog and cutover bog in the northeast sector provide useful local biodiversity and are rated **Local Importance (higher value).** Other habitats on site including the strips of bog woodland and the wetland in the north of the site are also given this rating.

Site supports breeding meadow pipit (Red-listed).

10.3.38 Allen Bog

10.3.38.1 Ecological Baseline

Allen (Mouds) Bog is located approximately 2 km southeast of Kimeage in Co. Kildare. It is c. 1 km north of Mouds Bog Special Area of Conservation. Much of the bog has been in full commercial in recent times though the westernmost sector is out of production and a dry heath vegetation cover has become established. Substantial remnant areas of high bog occur along parts of the margins.

The surrounding habitat type is largely agricultural land.

Habitats and Vegetation

The majority of Allen Bog is in active commercial production for horticultural peat and comprises bare peat (ED2).

A relatively large area in the west of the site has not been harvested for at least 10 years and is dominated by dry heath vegetation

Areas of high bog occur along the northeast, northwest, west and southwest boundaries. The high bog along the northern sector comprises two triangular shaped areas with parts outside of the Bord na Móna property. The sector in the northwest is the most extensive and best developed. Surface drains are now mostly filled in and there is good Sphagnum cover as well as species such as *Rhynchospora alba* and *Eriophorum angustifolium*. A further area of high bog of substantial size occurs along the southeast boundary – only parts of this are within Bord na Móna ownership. These areas of high bog are considered to qualify as the Annex I habitat Degraded raised bog still capable of natural regeneration [7120]. The Annex I habitat Depressions on peat substrates (Rhynchosporian) [7150] is also well represented here. Further areas of high bog occur along the south-eastern but these are largely degraded due to turbary.

Cutover bog (PB4) is also represented in the marginal areas of the site, along with stands of bog woodland (WN7) and scrub (WS1) in places.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Allen Bog.

Wintering Birds

Winter bird surveys have not taken place at this site.

Breeding Birds

No specific survey information is available for the site though meadow pipit (Red-listed) and skylark (Amber-listed) were considered to be widespread in marginal areas in summer 2016. Snipe could be expected to breed on the various high bog areas.

A pair of Peregrines breed locally and birds have been seen at the site.

Mammals

Badger and the Irish hare occur on site.

Allen Bog was not included in the 2013 baseline bat survey of Bord na Móna properties. However, surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected to be associated

with habitats along the site boundaries. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

10.3.38.2 Designated Sites

Mouds Bog SAC (code 02331) occurs within 1 km of the southern part of Allen Bog.

The SAC is selected for the following Annex I habitats:

- [7110] Active raised bogs
- [7120] Degraded raised bogs still capable of natural regeneration
- [7150] Depressions on peat substrates of the *Rhynchosporion*

10.3.38.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value.

The high bog remnants along the northeast, northwest, west and southwest boundaries of the site have conservation value – these are considered to qualify as the Annex I EU Habitats Directive habitat 'Degraded raised bogs still capable of regeneration' [code 7120] and also supports the Annex I habitat 'Depressions on peat substrates (Rhynchosporian)' [7150] – the high bog that is classified as Annex I habitats is rated as **County Importance,** while the other areas of high bog, and also the areas of regenerating dry heath and cutover bog, are rated as **Local Importance (higher value**).

The Red-listed meadow pipit breeds on the various high bog and cutover bog areas.

10.3.39 Prosperous Bog

10.3.39.1 Ecological Baseline

Prosperous Bog is located approximately 2 km from Prosperous in Co. Kildare. The Prosperous to Donadea road runs along the western boundary of the site. The site is an outlier and not directly connected to other Bord na Móna sites.

The majority of the site is currently in production for horticultural peat. Most of the margins are edged by remnant high bog or cutover bog.

The surrounding land-use is mainly agriculture.

Habitats and Vegetation

The majority of Prosperous Bog is in active commercial production and comprises bare peat (ED2). There are no areas of regenerating cutaway within the commercial peat fields.

Remnant high bog (PB1) and cutover bog (PB4) are well represented in the marginal areas of the site, with scrub and bog woodland frequent. A substantial area of relatively intact high bog occurs in the southwest sector. Along the eastern side the remnant high bog has locally good Sphagnum cover along with such raised bog species as *Andromeda polifolio* and *Rhynchospora alba*. At least two areas of the remnant high bog (located in northeast and southwest) are considered to qualify as the Annex I habitat Degraded raised bog still capable of natural regeneration [7120]. The Annex I habitat Depressions on peat substrates (Rhynchosporian) [7150] is also represented.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Prosperous Bog.

Wintering Birds

Winter bird surveys have not been carried out at this site.

Breeding Birds

No specific survey information is available for the site though meadow pipit (Red-listed) and skylark (Amber-listed) were recorded in marginal areas in summer 2016.

Mammals

Badger, the Irish hare and pine marten have been recorded on the site.

Prosperous Bog was not included in the 2013 baseline bat survey of Bord na Móna properties. However, surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected to be associated with scrub and woodland habitats along the site boundaries. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

10.3.39.2 Designated Sites

There are no designated sites in the vicinity of Prosperous Bog.

10.3.39.3 Conservation Evaluation of Site

The majority of the site is in current commercial production for industrial peat harvesting and has no intrinsic conservation value.

The high bog remnants along the boundaries of the site, while relatively limited in extent, have conservation value as they still have good Sphagnum cover in places and support localised species such as Andromeda polifolia - the two best examples of high bog along the northeast and southwest margins are classified as the Annex I EU Habitats Directive habitat 'Degraded raised bogs still capable of regeneration' [code 7120] and also support the Annex I habitat 'Depressions on peat substrates (*Rhynchosporian*)' [7150] – rated as of **County Importance.**

The other areas of high bog and the cutover bog, often with well-developed scrub and bog woodland, are rated as **Local Importance (higher value**).

The Red-listed meadow pipit breeds on the various high bog and cutover bog areas.

10.3.40 Kilberry Bog

10.3.40.1 Ecological Baseline

Kilberry Bog is located approximately 1 km east of Athy in Co. Kildare.

It is a horticultural bog and is not connected by rail to other Bird na Móna sites. A large wooded, mineral island, known as Derryvullagh Island, is situated towards the centre of the site (designated a pNHA).

Kilberry is surrounded by agricultural lands.

Habitats and Vegetation

The majority of Kilberry Bog has been in recent commercial production and comprises bare peat (ED2). However, significant areas have now come out of production and are in the process of re-vegetation, with bog, heath and scrub habitats developing.

Cutover bog (PB4) is frequent along the margins but there are no substantial areas of high bog remaining. Some ponds have developed to the east of Derryvullagh Island and these provide useful wetland habitat.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Kilberry Bog.

Wintering Birds

Kilberry Bog has been surveyed for winter birds. Of particular note is that the site supports a Hen Harrier winter roost (birds arrive on site in evening and settle in tall heather).

Whooper Swans roost on the developing wetlands.

Breeding Birds

The wetlands support breeding Lapwing (3 pairs, 2020). Snipe also breeds, while Meadow Pipit (Red-listed) is widespread.

Mammals

Signs of badgers have been recorded on site. The Irish hare occurs on site.

Kilberry Bog was not included in the 2013 baseline bat survey of Bord na Móna properties. However, surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected to be associated with habitats along the site boundaries. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

10.3.40.2 Designated Sites

As noted, the Derryvullagh Island pNHA occurs within the site. (pNHA site list published on a non-statutory basis in 1995 but have not since been statutorily proposed or designated).

10.3.40.3 Conservation Evaluation of Site

The area of the site that is in current commercial production has no intrinsic conservation value.

The regenerating areas of cutaway and the various cutover bog areas (many now re-vegetated) provide useful local biodiversity and are rated **Local Importance (higher value).**

Site supports breeding Lapwing and Meadow Pipit (both Red-listed). Whooper Swans (Annex I listed) occur in winter.

10.3.41 Coolnacartan (Cuil na Carton) Bog

10.3.41.1 Ecological Baseline

Coolnacartan (Cuil na Carton) Bog is located just 2 km southwest of Portlaoise town. The M7 motorway lies a little to the north and the N8 road to the east. Access is through the Bord na Móna works in the northeast. There are rail links to Cashel Bog to the east and Coolnamona Bog to the northwest.

Commercial production is now limited to two main areas of the site, though there is private cutting along the margins. There are substantial areas of regenerating cutaway, cutover bog and remnant high bog within the site.

The site is surrounded largely by farmland but there are forestry plantations to the north and to the southeast.

Habitats and Vegetation

A substantial part of Coolnacartan Bog is in active commercial production and comprises bare peat (ED2).

There are large areas of regenerating cutaway in the south and central areas of the site (Recolonising bare ground ED3). These areas are mostly dry and dominated by *Calluna vulgaris* and developing birch scrub. Wet areas dominated by *Eriophorum angustifolium* are also present.

High bog (PB1) and cutover bog (PB4) are present in the marginal areas of the site, notably the western and north-western sectors. The remnant high bog areas are generally dry and subject to ongoing turbary. Bog woodland (WN7) and scrub (WS1) is present in the cutover areas.

Rare Flora

There are no known legally protected plant species (Flora (Protection) Order 2015) or vascular plant species listed on the Irish Red List (Wyse Jackson *et al.* 2016) associated with Coolnacartan Bog. However, the localised *Frangula alnus*, listed in the Irish Red Data Book (Curtis & McGough 1988), has been recorded just outside of the site along the margin of Colt Wood.

Wintering Birds

Coolnacartan bog has limited potential for wintering birds of conservation importance. However, the areas of remnant, cutover and regenerating cutaway bog provide good habitat for foraging hen harrier and merlin (both Annex I listed species). Golden plover (Annex I listed) have been recorded roosting on the bare peat.

The Red-listed woodcock has been recorded while meadow pipit (also Red-listed) is widespread.

Snipe occur on site, along with stonechat and linnet (all Amber-listed).

Breeding Birds

Coolnacartan bog has limited potential for breeding birds of conservation importance.

Meadow pipit (Red-listed) breeds widely within the site. Woodcock (Red-listed) also breeds though the actual breeding locations may be off-site. Various Amber-listed species breed on site, including skylark, stonechat, mistle thrush and linnet.

Mammals

Badger and the Irish hare occur on site.

Coolnacartan Bog was not included in the 2013 baseline bat survey of Bord na Móna properties. However, surveys for bat species at other cutaway bog sites have shown that the open areas of bog have low potential to support bats and most records are from linear features along the margins including hedgerows and scrub. At this site, bats could be expected to be associated with habitats along the site boundaries. The commonest species recorded in surveys of midland bog habitats are soprano pipistrelle, common pipistrelle and Leisler's bats.

Invertebrates

The Annex II marsh fritillary butterfly has been recorded along the railway on the eastern margin of the site.

10.3.41.2 Designated Sites

There are no designated sites in the vicinity of Coolnacartan Bog. The River Barrow and River Nore SAC is within 4 km of the southwest sector of the site.

10.3.41.3 Conservation Evaluation of Site

The area of site that is in current commercial production for industrial peat harvesting has no intrinsic conservation value.

The regenerating cutaway, the various high bog remnants and the cutover bog areas provide useful biodiversity areas and are rated as **Local Importance (higher value**).

The Red-listed species meadow pipit and woodcock breed within the site. In winter, the Annex I species hen harrier, merlin and golden plover occur.

The Annex II marsh fritillary butterfly has been recorded on site.

Figure 10.31: Coolnacartan bog: view of small area of remnant high bog in south-east sector of site.

Source: BioSphere Environmental Services

10.4 Remedial Impact Assessment, Cumulative Impacts and Mitigation

Table 10.1 overleaf presents both the impact assessment and mitigation sections of this chapter.

Table 10.1: Remedial Impact Assessment and Mitigation (Biodiversity)

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
Bellair North	Bord na Móna data indicate that Bellair Bog was first drained in 1970, with first peat production in 1976. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. Areas of cutover bog (PB4) are associated with the marginal areas, and these support bog woodland (WN7) and scrub (WS1) in places. With drainage of the bog dating back to 1970 and first production in 1976, it can be expected that the raised bog habitat was removed or largely removed by 1985. Since 1985, the annual development works would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog. This would have been of most significance for the substantial area of relatively intact high bog in the western and eastern sectors (latter outside of Bord na Móna property) which support the Annex I habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150]. This expected adverse impact is rated as Significant.	Various small plots along the northeastern margin of site are classified as rented turf plots. The recent cutting of high bog in these marginal areas is not considered an impact of significance as these areas have been for a long period highly disturbed both physically and hydrologically.	It appears that a buffer strip has been established between the commercial peat fields and the edge of the large area of recovering degraded bog and intact high bog in the western end of the site. However, it is not known if the deep drain between the degraded bog and the commercial fields has been blocked. It appears that mitigation has not been provided to reduce water loss from the high bog (and Annex I listed habitats) in the easternmost sector of the site. It is not known if a monitoring programme has been established to evaluate the effectiveness of the mitigation.
Lemanaghan	Bord na Móna data indicate that Lemanaghan Bog was first drained in 1951, with first peat production in 1955. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating back to 1951 and first production in 1955, it can be expected that the raised bog habitat was removed by 1985. Since 1985, the annual development works would have lowered the height of the commercial peat fields, which would	Various relatively small plots of high bog are classified as turbary allocated, rented turf plots and one sod peat site. Recent cutting in these marginal areas is not considered an impact of significance as these areas have been disturbed both physically and hydrologically for a long period.	It is not known if mitigation had been provided to reduce water loss from the various areas of high bog which adjoin the commercial peat fields at this site.

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
	have caused continued drawdown of water from adjoining areas of high bog. As such areas have long been disturbed the impact is considered at a Local level of significance.		
Noggusboy	Bord na Móna data indicate that Noggusboy Bog was first drained in 1951, with first peat production in 1955. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating back to 1951 and first production in 1955, it can be expected that the bulk of the raised bog habitat was removed by 1985. Since 1985, the annual development works would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from the adjoining area of high bog in the north of the site. The loss of water is an impact of significance with potential adverse effects on the two Annex I habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150].	A small amount of turbary has taken place on site in recent times but this is not considered a significant impact.	It is not known if mitigation had been provided to reduce water loss from the high bog (and Annex I listed habitats) in the north of the site.
Boora	Bord na Móna data indicate that Boora Bog was first drained in 1954, with first peat production in 1959. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating back to 1954 and first production in 1959, it can be expected that the raised bog habitat was removed by 1985. Since 1985, the annual development works would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog and cutover bog. As such areas had	Apart from forestry and biodiversity, there are no other activities taking place on the site.	Due to the relatively low recent and existing ecological interest at this site, specific mitigation may not have been necessary for terrestrial ecological interests.

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
	already been disturbed the impact is considered at a Local level of significance		
Galros	Bord na Móna data indicate that Galros Bog was first drained in 1983, with first peat production in 1988. OSI Aerial photography from 1995 indicates that while the site was drained and already in production high bog appeared to be still present over much of the site. With Galros Bog first drained as recently as 1983 and first peat production in 1988, it can be concluded with a high degree of certainty that much of the high bog was still present in 1985 and would have been classified as the Annex I habitat 'Degraded raised bogs still capable of regeneration' [code 7120]. The loss of the raised bog habitat at this site since 1985 due to peat production is rated as an Irreversible Adverse Impact of International Significance	There appears to be no other activities taking place on this site in the recent past.	Due to the relatively low recent and existing ecological interest at this site, specific mitigation may not have been necessary for terrestrial ecological interests
Killaun	Bord na Móna data indicate that Killaun Bog was first drained in 1996, with first peat production in 2003. Review of OSI Aerial photography from 1995 indicates that while surface drains had been inserted across the entire site by 1995, a very substantial area in the southern sector still had surface vegetation as late as 2000 which it is considered would have been classified as the Annex I habitat Degraded Raised Bog (this conclusion is made by close examination of aerial photographs, including comparing with the present high bog vegetation in southernmost part). Also, the deep drain along the margin of the existing area of high bog in the southern part of site had not been inserted in 2000 (though present in 2005). With Killaun Bog first drained in 1996 and first peat production in 2003, it can be concluded with certainty that the raised bog habitat was removed entirely since 1985. As recently as 2000, a substantial area of what is expected to have been the Annex I habitat Degraded Raised Bog was still present. While the ecological quality of the original intact bog is not known, taking the size of the site into account and from the quality of	It appears that there are no other activities being carried on at this site.	It is understood that a 30m buffer strip exists between the commercial peat fields and the margin of the high bog in the southernmost part of site in order to protect the hydrology of the bog and associated Annex I habitats. However, it is not known if the deep drain along the margin of the high bog has been blocked to reduce water loss from the bog. It is noted that production in the fields immediately adjoining the high bog in the south of the site had ceased by 2020, which is expected in the long-term to lessen the continued loss of water from the high bog. It is not known if a monitoring programme has been established to evaluate the effectiveness of the mitigation.

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
	the remnants that remain it can be assumed that much of it was intact and part may have been Active Raised Bog (Annex 1 with priority status). At the least, the Annex I habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150] would have been widespread. The loss of the raised bog habitats at this site since the 2000s due to peat production is rated as an Irreversible Adverse Impact of International Significance. Since the initial stripping of the surface, the annual peat harvesting would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog including the area of conservation importance in the southern part of the site, which supports the Annex I habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150], as well as potentially the fen vegetation which supports the Annex II species Vertigo geyeri. This expected hydrological impact is considered as Significant.		
Derrinboy	Bord na Móna data indicate that Derrinboy Bog was first drained in 1988, with first peat production in 2003. Review of OSI Aerial photography from 1995 indicates that while surface drains had been inserted across the entire site by 1995, a substantial area in the northern part of eastern sector still had surface vegetation as late as 1995 or even 2000 which it is considered would have been classified as the Annex I habitat Degraded Raised Bog (this conclusion is made by close examination of aerial photographs). With Derrinboy Bog first drained in 1988 and first peat production in 2003, it can be assumed that the site was largely or entirely raised bog habitat which has since been removed. As recently as 1995 or even 2000, a substantial area of what is expected to have been the Annex I habitat Degraded Raised Bog was still present in the northernmost part of the eastern sector. While the ecological quality of the original intact bog	While turbary occurs at several locations around the commercial peat fields, the recent cutting of high bog in these marginal areas is not considered an impact of significance as these areas have been highly disturbed both physically and hydrologically for a long period	It appears that mitigation had not been provided to reduce water loss from the high bog (and Annex I listed habitats) in the northeast sector of the site.

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
	is not known, taking the size of the site into account and from the quality of the remnants that remain it can be assumed that much of it was intact and part may have been Active Raised Bog (Annex 1 with priority status). At the least, the Annex I habitats habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150] would have been widespread. The loss of the raised bog habitats at this site since the 2000s due to peat production is rated as an Adverse Impact of International Significance. Since the initial stripping of the surface, the annual peat harvesting would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog including the area of conservation importance in the northeast of the western sector of the site, which supports the Annex I habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150]. This expected hydrological impact is considered as Significant.		
Derryclure	Bord na Móna data indicate that Derryclure Bog was first drained in 1987, with first peat production in 1992. Review of OSI Aerial photography indicates that by 1995 the surface vegetation had largely been removed, though some bog vegetation may have remained in the extreme southwest sector up to about 2000, possibly Annex I habitat Degraded Raised Bog (this conclusion is made by close examination of aerial photographs). With Derryclure Bog first drained in 1987 and first peat production in 1992, it can be concluded with certainty that the raised bog habitat was removed entirely since 1985. As recently as 2000, some habitat of what is expected to have been the Annex I habitat Degraded Raised Bog was still present. While the ecological quality of the original intact bog is not known, taking the size of the site into account and from the quality of the remnants that remain it can be assumed that much of it was intact and part may have been Active Raised	Turbary occurs in the south-eastern part of the site and has removed high bog which (based on remaining area) would have been rated at least of Local Importance (high value) The presence of a landfill along the western boundary of the site has removed permanently an area of raised bog (Annex I listed habitat).	It is understood that a 30 m buffer strip exists along the margins of the Bord na Móna biodiversity area in order to protect the hydrology of the bog and associated Annex I habitats. However, it is not known if the first production drains surrounding the high bog areas have been blocked to reduce drainage from the high bog. It is not known if a monitoring programme has been established to evaluate the effectiveness of the mitigation.

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
	Bog (Annex 1 with priority status). At the least, the Annex I habitats habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150] would have been widespread. The loss of the raised bog habitats at this site since the late 1980s due to peat production is rated as an Irreversible Adverse Impact of International Significance. Further permanent loss of raised bog occurred as a result of the landfill development. Since the initial stripping of the bog surface, the annual peat harvesting would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water for the adjoining areas of high bog including the Bord na Móna Biodiversity Area, which supports the Annex I listed habitat 'Depressions on peat substrates (Rhynchosporian)'. This expected hydrological impact is considered as Significant.		
Monettia	Bord na Móna records indicate that Monettia Bog was first drained in 1976, with first production in 1982. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. In 1995, turbary along margins was less advanced to that at present. With drainage of the bog dating back to 1976 and first production in 1982, it can be expected that the raised bog habitat was removed or largely removed by 1985. Since 1985, the annual development works would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog. This would have been of most significance for the substantial area of relatively intact high bog in the southeast sector which supports the Annex I habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150]. This is rated as a Significant Adverse Impact.	The eastern part of the high bog in the southeastern sector of site is used for turbary. Past and ongoing cutting has removed high bog, i.e. Annex I habitat, which is a Significant Adverse Impact. Drainage to facilitate such cutting is expected to have led to water loss from the adjoining high bog. Past cutting of high bog in marginal areas elsewhere on site is not considered an impact of significance as these areas have been cut for turbary for long periods and are highly disturbed both physically and hydrologically.	It is understood that a 30 m buffer strip has been established from the commercial peat fields to the margin of the high bog in southeast of site in order to protect the hydrology of the bog and associated Annex I habitats. It is not known if the deep drain along the margin of the high bog has been blocked to reduce water loss from bog. It is not known if a monitoring programme has been established to evaluate the effectiveness of the mitigation.

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
Killaranny	Bord na Móna data indicate that Kilaranny Bog was first drained in 1983, with first peat production in 1989. Review of OSI Aerial photography from 1995 indicates that surface drains had been inserted across the entire site by 1995. With Kilaranny Bog first drained in 1983 and first peat production in 1989, it is expected that much of the high bog would have been still relatively intact in 1985 and, at the least, would have qualified as the Annex I habitat 'Degraded raised bogs still capable of regeneration' [code 7120]. The loss of the raised bog habitat at this site since the 1985 due to peat production is rated as an Irreversible Adverse Impact of International Significance. Since the initial stripping of the surface, the annual peat harvesting would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from the adjoining area of high bog in the northwest sector, which supports two Annex I listed habitats – this is rated as a Significant Adverse Impact.	Turbary has occurred widely in the easternmost sector of site and also in the southwest (classified as 'Turbary Allocated'). However, cutting of high bog in these marginal areas is not considered an impact of significance as the bog here has long been disturbed both physically and hydrologically.	It appears that mitigation has not been provided to reduce water loss from the high bog (and Annex I listed habitats) in the northwest sector of the site.
Bracklin	Bord na Móna data indicate that Bracklin Bog was first drained in 1979, with first peat production in 1985. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating to 1979 and first production in 1985, it can be expected that the raised bog surface vegetation was largely removed by 1985. Since 1985, the annual development works would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog in the marginal areas – this is rated as a Significant impact.	There appears to be no further activities taking place at Bracklin Bog in the recent past.	It is not known if mitigation had been provided to reduce water loss from the high bog areas (and Annex I listed habitats) at this site.

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
Carranstown	Bord na Móna data indicate that Carranstown Bog was first drained in 1979, with first peat production in 1985. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating to 1979 and first production in 1985, it can be expected that the raised bog surface vegetation was largely removed by 1985. Since 1985, the annual development works would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog and especially the complex of high bog in the eastern sector – this is rated as a Significant impact.	An area in the eastern sector of the site is classified as 'Turbary Allocated'. Recent turbary here has resulted in the loss of high bog (Annex I listed Degraded Raised Bog) and has affected the hydrology of the adjoining area. This is rated as a Significant Impact.	It is not known if mitigation had been provided to reduce water loss from the high bog area (and Annex I listed habitats) in the eastern end of the site.
Ballivor	Bord na Móna data indicate that Ballivor Bog was first drained in 1948, with first peat production in 1953. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating back to 1948 and first production in 1953, it can be expected that the original raised bog habitat was removed by 1985. Since 1985, the annual development works would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from the adjoining area of high bog in the western sector of the site – as this high bog supports two Annex I listed habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150], this impact is rated as Significant.	A small area of Ballivor Bog in the northeast sector is classified as Turbary Allocated. The recent cutting of this high bog is not considered as an impact of significance.	It is not known if mitigation had been provided to reduce water loss from the high bog area (and Annex I listed habitats) in the westernmost sector of the site.
Kinnegad	Bord na Móna data indicate that Kinnegad Bog was first drained in 1977, with first peat production in 1982.	Part of the remnant big in the northeast of site is classified as 'Turbary Allocated'.	It appears that a buffer strip has been established between the high bog in the west and the adjoining

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
	OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating back to 1977 and first production in 1982, it can be expected that the raised bog habitat was largely removed by 1985. Since 1985, the annual development works would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from the adjoining area of high bog in the western sector of site. As this high bog is of conservation importance, the impact is rated as Significant.	Recent cutting in these marginal areas is not considered an impact of significance as these areas have been disturbed both physically and hydrologically for a long period.	commercial peat fields to lessen water loss from the high bog (classified as Annex I Degraded Raised Bog). However, drains may also need to be blocked to reduce water loss. It is not known if a monitoring programme has been established to evaluate the effectiveness of the mitigation.
Ballybeg	Bord na Móna data indicate that Ballybeg Bog was first drained in 1951, with first peat production in 1955. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating back to 1951 and first production in 1955, it can be expected that the raised bog habitat was largely removed by 1985. Since 1985, the annual development works would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog and cutover bog along the margins – as these areas are of Local Importance, this impact is rated as of Significance in a local context.	A small area of Coole Bog is classified as Turbary Allocated. As this extends into the high bog area, recent cutting in this area has had both a direct impact (loss of Annex I habitat) and an indirect impact (water loss from adjoining high bog) - this impact is considered as Significant.	Due to the relatively low recent and existing ecological interest at this site, specific mitigation may not have been necessary for terrestrial ecological interests.
Ballaghurt	Bord na Móna records indicate that Ballaghurt 1 Bog (i.e. western sector) was first drained in 1975, with first production in 1980 and Ballaghurt 2 Bog (i.e. eastern sector) was first drained in 1990 and first production 1995.	The recent cutting of high bog to the north of the R444 road is rated as an impact of significance.	It is not known if mitigation had been provided to reduce water loss from the high bog area (and Annex I listed habitats) to the north of the R444 road.

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
	OSI Aerial photography from 1995 indicates that the site was fully drained by 1995 and largely in commercial production. However, it appears that surface vegetation still existed in the western end of the eastern sector. With drainage of the western sector dating back to 1975, it can be expected that the raised bog habitat was removed or largely removed before 1985. The eastern sector was presumably intact bog prior to drainage in 1990. By 1995 much of it had the surface completely removed though it is apparent that a substantial area of vegetated bog (but with surface drains) still existed in the western end. A strip of high bog classified as heath vegetation still occurs there today. While the ecological quality of the original intact bog is not known, taking the size of the site into account and from the quality of the remnants that remain it can be assumed that much of it was intact and part may have been Active Raised Bog (Annex 1 with priority status). At the least, the Annex I habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150] would have been widespread. The loss of the raised bog habitats at this site since the late 1980s due to peat production is rated as an Irreversible Adverse Impact of International Significance. Since 1990, the annual development works would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog. This would have been of most significance for the substantial area of relatively intact high bog to the north of the R444 road which support the Annex I habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150].		
Daingean (Derries)	Bord na Móna records indicate that Daingean Derries Bog was first drained in 1995, with first production in 1999.	Two areas in the easternmost part of site are classified as Rented Turf Plots. Recent cutting of bog here is not expected to have a significant ecological impact as the area	Due to the relatively low recent and existing ecological interest at this site, specific mitigation may not have been necessary for terrestrial ecological interests.

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
	OSI Aerial photography from 1995 confirms that the site was drained but still apparently vegetated in 1995 With Daingean Derries Bog first drained as recently as 1995 and first peat production in 1999, it can be concluded with certainty that the raised bog habitat was removed entirely since 1985. While the ecological quality of the original intact bog is not known, taking the size of the site into account and from the quality of the remnants that remain it can be assumed that much of it was intact and part may have been Active Raised Bog (Annex 1 with priority status). At the least, the Annex I habitats habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150] would have been widespread. The loss of the raised bog habitats at this site since the 2000s due to peat production is rated as an Irreversible Adverse Impact of International Significance. Since the initial stripping of the surface, the annual peat harvesting would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog though these are all small in size.	is already highly disturbed from cutting activities It appears that there are no other activities being carried on at this site.	
Daingean Rathdrum	Bord na Móna records indicate that Daingean Derries Bog was first drained in 1995, with first production in 1999. OSI Aerial photography from 1995 confirms that the site was drained but still apparently vegetated in 1995. With Daingean Rathdrum Bog first drained as recently as 1995 and first peat production in 1999, it can be concluded with certainty that the raised bog habitat was removed entirely since 1985. While the ecological quality of the original intact bog is not known, taking the size of the site into account and from the quality of the remnants that remain it can be assumed that much of it was intact and part may have been Active Raised Bog (Annex 1 with priority status). At the least, the Annex I	Much of the remaining high bog in the easternmost part of site is classified as 'turbary allocated' and 'sod peat site'. Recent cutting here has removed raised bog habitat which is classified as a Significant Adverse Impact. It appears that there are no other activities being carried on at this site.	It appears that a buffer zone has been established between the commercial peat fields and the high bog in the eastern sector of the site to lessen water loss from the high bog. It is not known if blocking of drains has taken place to minimise water loss from the high bog. It is not known if a monitoring programme has been established to evaluate the effectiveness of the mitigation

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
	habitats habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150] would have been widespread. The loss of the raised bog habitats at this site since the 2000s due to peat production is rated as an Irreversible Adverse Impact of International Significance. Since the initial stripping of the surface, the annual peat harvesting would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog in the eastern sector of the site.		
Clonad	Bord na Móna records indicate that Clonad Bog was first drained in 1956, with first production in 1962. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating back to 1956 and first production in 1962, it can be expected that the raised bog habitat was removed by 1985. Since 1985, the annual development works would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog. This would have been of most significance for the substantial area of relatively intact high bog in the northeast sector which supports the Annex I habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150].	A sector of the high bog in the northeast part of site is classified as turbary allocated. Recent cutting has removed high bog (classified as Annex I habitat Degraded Raised Bog), which is rated as a Significant Adverse Impact. Area of high bog in the extreme northwest of site alongside road is classified as 'turf plots rented'. Recent removal of peat from here could have had an adverse hydrological impact on the Daingean Bog NHA to the other side of the road.	It appears that a buffer strip has been provided between the high bog and the commercial peat fields in the northeast sector of the site to lessen the long-term drying out of this high bog as a result of the peat works. If not already done, local drains may need to be blocked to reduce water loss from the high bog It is not known if a monitoring programme has been established to evaluate the effectiveness of the mitigation.
Ballykeane	Bord na Móna records indicate that Esker Bog was first drained in 1951, with first production in 1955. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial	A small area of high bog along the western boundary of site is classified as turbary allocated. Recent turbary at this location is not considered an impact of significance as	Due to the relatively low recent and existing ecological interest at this site, specific mitigation may not have been necessary for terrestrial ecological interests.

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
	peat production footprint appearing the same as it is at present. With drainage of the bog dating back to 1951 and first production in 1955, the original raised bog habitat had been removed by 1985. Since 1985, the annual development works would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog. This would have been of most significance for the area of relatively intact high bog to the southwest of the site (outside of Bord na Móna property) – as this bog is already in a disturbed state due to ongoing turbary, the impact is rated at the Local level of significance.	the bog has been disturbed both physically and hydrologically for a long period.	
Esker	Bord na Móna records indicate that Esker Bog was first drained in 1959, with first production in 1965. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating back to 1959 and first production in 1965, it can be concluded that the original raised bog habitat was removed by 1985. Since 1985, the annual development works would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog (principally in the northeast and to the east of the property). As these areas are already highly disturbed both physically and hydrologically, this impact is at most of local significance.	There are no other activities occurring on Esker Bog. Turbary occurs on the high bog to the east which is outside of Bord na Móna property.	Due to the relatively low recent and existing ecological interest at this site, specific mitigation may not have been necessary for terrestrial ecological interests.
Garrymore	Bord na Móna records indicate that Garrymore Bog was first drained in 1992, with first production in 1999. OSI Aerial photography from 1995 indicates that the site was drained but still vegetated in 1995.	An area of high bog in the northeast of site is classified as turbary allocated. Recent cutting of this bog has had both direct and indirect hydrological adverse impacts on	It is not known if mitigation had been provided to reduce water loss as a result of commercial and turbary cutting from the high bog area (and Annex I listed habitats) along the northern margin of this site.

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
	With Garrymore Bog first drained as recently as 1992 and first peat production in 1999, it can be concluded with certainty that the raised bog habitat was removed entirely since 1985. While the ecological quality of the original intact bog is not known, taking the size of the site into account and from the quality of the remnants that remain it can be assumed that much of it was intact and part may have been Active Raised Bog (Annex 1 with priority status). At the least, the Annex I habitats habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150] would have been widespread. The loss of the raised bog habitats at this site since the 2000s due to peat production is rated as an Irreversible Adverse Impact of International Significance. Since the initial stripping of the surface, the annual peat harvesting would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog including the area of conservation importance in the southern part of the site, which supports the Annex I habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150] – this hydrological impact is rated as Significant.	the high bog, which is classified as the Annex I habitat Degraded Raised Bog. It appears that there are no other activities being carried on at this site.	
Derrylea	Bord na Móna records indicate that Derrylea Bog was first drained in 1968, with first production in 1972. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating back to 1968 and first production in 1972, it can be expected that the original raised bog habitat was removed by 1985. Since 1985, the annual development works would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining	It appears that there have been no other activities being carried out at this site in recent times.	It is not known if mitigation had been provided to reduce water loss as a result of commercial cutting from the high bog areas (and Annex I listed habitats) along the northern and southern.

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
	areas of high bog. This would have been of most significance for the substantial areas of relatively intact high bog along the southern and northern margins of the site which supports the Annex I habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150].		
Ticknevin	Bord na Móna records indicate that Ticknevin Bog was first drained in 1977, with first production in 2000. OSI Aerial photography from 1995 indicates that while the site was drained it was still largely vegetated. While Ticknevin Bog was first drained as long ago as 1977, the first peat production was not until 2000. From aerial photographs dating to 1995, it appears that high bog with surface vegetation was still present then. While the ecological quality of the original intact bog is not known, taking the size of the site into account and from the quality of the remnants that remain it can be assumed that much of it was intact and part may have been Active Raised Bog (Annex 1 with priority status). At the least, the Annex I habitats habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150] would have been widespread. The loss of the raised bog habitats at this site since the 2000s due to peat production is rated as an Irreversible Adverse Impact of International Significance. Since the initial stripping of the surface, the annual peat harvesting would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog including the area of conservation importance in the western part of the site, which supports the Annex I habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150]. This impact is rated at Significant.	Part of the high bog in the western end of the side is classified as 'rented turf plots'. Recent cutting of this bog has had both direct (loss of habitat) and indirect hydrological adverse impacts of significance on the high bog, which is classified as the Annex I habitat Degraded Raised Bog. It appears that there are no other activities being carried on at this site in the recent past.	It is not known if mitigation had been provided to reduce water loss as a result of commercial cutting from the high bog area (and Annex I listed habitats) to the west of the commercial peat fields. To control the potential adverse effects of dust deposition on the conservation objectives of the Long Derries, Edenderry SAC, the following mitigation measures have been implemented by Bord na Móna: Shelter belts are planted in sensitive areas, where appropriate; Production operations are suspended in windy weather; Where possible machinery uses grassed pathways; Headlands are kept clean and free of excessive loose peat; Stockpiles are sheeted where possible; Moving machinery is maintained at slow speeds when travelling along dusty headlands; When harvesting, the jib is maintained low to the stockpile; Shelter belts are planted around outloading facilities; Wind breaks are planted wherever possible; and Peat production activities cease in identified dust sensitive areas in adverse weather conditions.

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
	Since 1985, and prior to the implementation of mitigation, dust deposition from the continued harvesting of peat could have had an adverse impact on the conservation objectives of the adjoining Long Derries, Edenderry SAC.		
Glashabaun Sth	Bord na Móna records indicate that Glashabaun South Bog was first drained in 1946, with first production in 1950. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating back to 1946 and first production in 1950, most of the original raised bog habitat had been removed by 1985. However, up to 1995 a substantial area of high bog remained in the north west sector (where some still remains today). While the ecological quality of this bog at the time is not known, from the high bog that remains it can be assumed that at the least it would have been classified as the Annex I habitat 'Degraded raised bogs still capable of regeneration' [code 7120]. The loss of this raised bog habitat since 1995 due to peat production is rated as an Irreversible Adverse Impact of High Significance.	Some sections of site in the southwest are classified as 'sod peat plots'. As the high bog here has been in a disturbed state for a long period, recent cutting here is not considered as significant.	It is not known if mitigation had been provided to reduce water loss as a result of commercial cutting from the high bog area (and Annex I listed habitats) in the northwest sector of the site.
Glashabaun Nth	Bord na Móna records indicate that Glashabaun North Bog was first drained in 1946, with first production in 1950. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating back to 1946 and first production in 1950, the original raised bog habitat had been removed by 1985. Since 1985, the annual development works would have lowered the height of the commercial peat fields, which would	Two small areas of high bog along the southern margin of site are classified as 'sod peat plots'. As these are very minor in size, the impact by recent cutting is not considered as significant.	To control the potential adverse effects of dust deposition on the conservation objectives of the Long Derries, Edenderry SAC, the following mitigation measures have been implemented by Bord na Móna: Shelter belts are planted in sensitive areas, where appropriate; Production operations are suspended in windy weather; Where possible machinery uses grassed pathways; Headlands are kept clean and free of excessive loose peat; Stockpiles are sheeted where possible;

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
	have caused continued drawdown of water from adjoining areas of high bog. This would have been of most significance for the areas of relatively intact high bog along the northern boundary of the site and that in the extreme south – this impact is rated at the Local level of significance. Since 1985, dust deposition from the continued harvesting of peat could have had an adverse impact on the conservation objectives of the adjoining Long Derries, Edenderry SAC.		Moving machinery is maintained at slow speeds when travelling along dusty headlands; When harvesting, the jib is maintained low to the stockpile; Shelter belts are planted around outloading facilities; Wind breaks are planted wherever possible; and Peat production activities cease in identified dust sensitive areas in adverse weather conditions.
Codd Nth (Codd 2)	Bord na Móna records indicate that Codd North Bog was first drained in 1983, with first production in 1989. OSI Aerial photography from 1995 and 2000 indicates that while the site was drained and some peat production underway, there was still substantial areas of high bog and especially in the northwest sector. While Codd North bog was first drained in 1983, the first peat production was not until 1989. From aerial photographs dating to 1995, it appears that high bog with surface vegetation was still present over much of the site as late as 1995 and even 2000. While the ecological quality of the original intact bog is not known, taking the size of the site into account it can be assumed that much of it was intact and at the least would have been classified as the Annex I habitat habitat 'Degraded raised bogs still capable of regeneration' [code 7120]. The loss of the raised bog habitat at this site since the 1990s due to peat production is rated as Irreversible Adverse Impact of International Significance. Since the initial stripping of the surface, the annual peat harvesting would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog and notably the area of high bog in the northwestern part of the site, this adverse impact is rated as Significant.	Apart from a small area classified as 'Sod Turf' to the north of the site entrance, there appears to be no other activities carried on at this site.	It is not known if mitigation had been provided to reduce water loss as a result of commercial cutting from the high bog area (and Annex I listed habitats) in the northwest sector of the site.

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
Codd Sth (codd 1)	Bord na Móna records indicate that Codd South Bog was first drained in 1983, with first production in 1989. OSI Aerial photography from 1995 indicates that while the site was drained and some peat production underway, the site was still largely high bog with surface vegetation. While Codd North bog was first drained in 1983, the first peat production was not until 1989. From aerial photographs dating to 1995, it appears that high bog with surface vegetation was still present over much of the site as late as 1995 and even 2000. While the ecological quality of the original intact bog is not known, taking the size of the site into account it can be assumed that much of it was intact and at the least would have been classified as the Annex I habitat habitat 'Degraded raised bogs still capable of regeneration' [code 7120]. The loss of the raised bog habitat at this site since the 1990s due to peat production is rated as an Irreversible Adverse Impact of International Significance. More recently (post 2012) sod peat production in the northwest sector has had significant adverse impacts on an area of high bog which had been classified as the Annex I habitat 'Degraded raised bogs still capable of regeneration' – this impact is rated as Significant and may be irreversible.	Apart from a small area classified as 'Rented Turf Plots' in the northwest, there appears to be no other activities carried on at this site.	It is not known if mitigation had been provided to reduce water loss as a result of commercial sod cutting from the high bog area (and Annex I listed habitats) in the northwest sector of the site.
Ballydermot North	Bord na Móna records indicate that Ballydermot North Bog was first drained in 1946, with first production in 1950. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating back to 1946 and first production in 1950, the original raised bog habitat had been removed by 1985. Since 1995, an area of intact high bog in the south west sector of site has been used for sod - this impact is rated as Significant.	Apart from a small area classified as 'Sod Turf' to the north of the main site entrance, there appears to be no other ongoing activities at this site.	It is not known if mitigation had been provided to reduce water loss as a result of commercial sod cutting from the high bog area (and Annex I listed habitats) in the southwest sector of the site.

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
Ballydermot South	Bord na Móna records indicate that Ballydermot South Bog was first drained in 1946, with first production in 1950. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating back to 1946 and first production in 1950, the original raised bog habitat had been removed by 1985. In 2013 surface drains were inserted across much of Clonroosk Bog in the southwest of site in preparation for sod peat extraction – while since blocked, substantial damage was caused to the bog which may have affected the Active Bog core (Annex I habitat with priority status). This impact is rated as Significant in at least a National context.	Apart from a very small area classified as 'Turf Plot' in the north sector of cutaway, there appears to be no other ongoing activities at this site.	Drains inserted across the surface of Clonroosk Bog have been blocked. It is understood that continued monitoring is being undertaken to establish the effectiveness of remedial works carried out to block drains at Clonroosk Bog.
Blackriver	Bord na Móna records indicate that Blackriver Bog was first drained in 1946, with first production in 1950. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating back to 1946 and first production in 1950, most of the original raised bog habitat had been removed by 1985. However, since the initial stripping of the surface, the annual peat harvesting would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog in the northern part of the site eastern sector of the site. This is rated as a Significant Adverse Impact.	A large area of the high bog in the northern part of the site is classified as 'Sod turf plots'. As this high bog comprises two Annex I listed habitats, 'Degraded raised bogs still capable of regeneration' and 'Depressions on peat substrates (Rhynchosporian)' this impact is rated as an Irreversible Adverse Impact of National Significance. The recent cutting into the high bog is expected to have had an adverse disturbance effect on nesting Curlew (Red-listed species), a species highly sensitive to disturbance. Other areas of sod turf plots along the western margin of the site are in areas which are already highly disturbed and fragmented and the impact here is of low significance.	It is not known if mitigation had been provided to reduce water loss as a result of commercial and turbary cutting from the high bog area (and Annex I listed habitats) in the north of the site, and to prevent disturbance to nesting Curlew.

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
Barnaran	Bord na Móna records indicate that Barnaran Bog was first drained in 1951, with first production in 1955. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating back to 1951 and first production in 1955, it is expected that most of the original raised bog habitat had been removed prior to 1985.	There are several small plots of bog classified as Turbary Allocated or Rented Turf Plots. The impact of recent cutting at these plots is not expected to have any significant ecological impacts.	Due to the relatively low recent and existing ecological interest at this site, specific mitigation may not have been necessary for terrestrial ecological interests.
Lodge	Bord na Móna records indicate that Blackriver Bog was first drained in 1951, with first production in 1955. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating back to 1951 and first production in 1955, most of the original raised bog habitat had been removed by 1985. However, since the initial stripping of the surface, the annual peat harvesting would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog to the northwest (now managed for nature conservation) and along the southern boundary (recently used for private sod peat production)e. This is rated as a Significant Adverse Impact.	Since 1985, private sod peat cutting has removed a substantial area of high bog (classified as the Annex I habitat Degraded Raised Bog) from along the southern sector of the site. This is rated as an Irreversible Significant Adverse Impact.	It is not known if mitigation had been provided to reduce water loss from the high bog along the southern margin of the site as a result of sod peat cutting.
Cuil na Gun	Bord na Móna data indicate that Coolnagun (Cuil na Gun) Bog was first drained in 1947, with first peat production in 1953. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present.	Recent turbary workings along the northern margin of site is not considered an impact of significance as these areas had already highly disturbed but physically and hydrologically. Peat extraction immediately adjacent, and slightly overlapping, the boundary of the southern sector of the site by a private	It is not known if mitigation had been provided to re-wet the c. 60ha of bog in the southwest of the site that appears to have previously been screw-levelled and ditched but is classified as the Annex I habitat Degraded Raised Bog. It is not known if mitigation had been provided to reduce water loss as a result of recent commercial works from

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
	With drainage of the bog dating back to 1947 and first production in 1953, it can be expected that the raised bog habitat was removed or largely removed by 1985. Since 1985, the annual development works would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog. This would have been of most significance for an area of relatively intact high bog in the southern sector which supports the Annex I habitats 'Degraded raised bogs still capable of regeneration' [code 7120]. This is rated as a Significant Adverse Impact.	operator is likely to degrade the Annex I habitat Degraded raised bog capable of natural regeneration [7120] – this is considered an Irreversible Significant Adverse Impact.	the high bog (Annex I listed habitats) in the north and northeast sections of the site.
Milkernagh	Bord na Móna data indicate that Milkernagh Bog was first drained in 1947, with first peat production in 1953. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating back to 1947 and first production in 1953, it can be expected that the raised bog habitat was removed or largely removed by 1985. Since 1985, the annual development works would have lowered the height of the commercial eat fields, which would have caused continued drawdown of water from adjoining areas of high bog. This would have been of most significance for an area of relatively intact high bog in the northern sector which support the Annex I habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and Depressions on peat substrates (*Rhynchosporion*) [7150].	Active domestic turf extraction in the northern and southwestern sectors of the site is expected to have had adverse impacts on the Annex I habitats Degraded raised bog and Depressions on peat substrates of the *Rhynchosporion* – this is considered a Significant Adverse impact.	It is not known if mitigation had been provided to reduce water loss from the high bog areas in the north, northeast and southernmost sectors of the site as a result of recent commercial works.
Coolcraff	Bord na Móna data indicate that Coolcraff Bog was first drained in 1981, with first peat production in 1989. Review of OSI Aerial photography from 1995 indicates that while surface drains had been inserted across the entire site by 1995, a substantial area in the northern part of the site had surface vegetation as late as June 2016 which it is considered	Turbary occurs at several locations around the commercial peat fields. However, recent cutting of high bog in these marginal areas is not considered an impact of significance as these areas had already	It is not known if mitigation had been provided to reduce water loss as a result of commercial and turbary cutting from the high bog area (and Annex I listed habitats) in the northwest and northeast of the site.

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
	would have been classified as the Annex I habitat Degraded Raised Bog. Coolcraff Bog was first drained in 1981 and first went into peat production in 1989. However, a considerable sector to the north of the site only came into production in 2016/2017. It can be therefore assumed that the site was largely raised bog habitat well into the 1980s which has since been removed. A substantial area of what is expected to have been the Annex I habitat 'Degraded raised bogs still capable of regeneration' [code 7120] was still present in the northernmost part of the site until the end of 2016. While the ecological quality of the original intact bog is not known, taking the size of the site into account and from the quality of the remnants that remain it can be assumed that much of it was the Annex I habitat 'Degraded raised bogs still capable of regeneration' [code 7120] until it came into operation in 1989. The loss of the raised bog habitats at this site due to peat production since the late 1980s, and in the case of the northern sector, 2016, is rated as an Irreversible Adverse Impact of International Significance. Since the initial stripping of the surface, the annual peat harvesting would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog including the area of conservation importance in the northeast of the western sector of the site, which supports the Annex I habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150] – this expected hydrological impact is rated as Significant.	been highly disturbed both physically and hydrologically.	
Gilltown	Bord na Móna records indicate that Gilltown Bog was first drained in 1977, with first production in 1982. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present.	Part of the remnant high bog in the northeast is classified as 'Turbary Allocated' and 'Rented Turf Plots'. Recent cutting here has removed high bog habitat which is considered an Adverse Significant Impact in a Local context.	Due to the relatively low recent and existing ecological interest at this site, specific mitigation may not have been necessary for terrestrial ecological interests.

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
	With drainage of the bog dating back to 1977 and first production in 1982, most of the original raised bog surface had been removed by 1985. Since then, the annual peat harvesting would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog in the northeast. As the hydrology of this area of high bog was also being affected by turbary activity, the impact by water loss is not considered as of significance.		
Allen	Bord na Móna records indicate that Allen Bog was first drained in 1966, with first production in 1972. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating back to 1966 and first production in 1972, it can be expected that the majority of the raised bog habitat was removed by 1985. Since 1985, the annual development works would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog. This would have been of most significance for the substantial areas of relatively intact high bog along the northern, western and southwestern sectors (parts of which are outside Bord na Móna owned lands) which support the Annex I habitats 'Degraded raised bogs still capable of regeneration' and 'Depressions on peat substrates (Rhynchosporian)'. This adverse impact is rated as Significant. Also, surface drains were inserted in parts of the high bog which resulted in hydrological impacts to the bog. The drains would have also affected adjoining high bog outside of Bord na Móna property. This impact is rated as of Significance.	The southeastern sector of site is used for turbary ('Allocated Turbary' and 'Sod Turf'). Recent cutting of high bog in this area is not considered an impact of significance as the bog had been highly disturbed both physically and hydrologically	It is not known if mitigation had been provided to reduce water loss as a result of recent commercial works from the high bog (Annex I listed habitats) along the northern, western and southwestern sectors (parts of which are outside Bord na Móna owned lands) of the site.

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
Prosperous	Bord na Móna data indicate that Prosperous Bog was first drained in 1991, with first peat production in 2003. Review of OSI Aerial photography from 1995 indicates that the surface vegetation had been removed by 1995 With Prosperous first drained in 1991 and first peat production in 2003, it can be concluded with certainty that the raised bog habitat was removed entirely since 1985. While the ecological quality of the original intact bog is not known, taking the size of the site into account and from the quality of the remnants that remain it can be assumed that much of it was intact and part may have been Active Raised Bog (Annex 1 with priority status). At the least, the Annex I habitats habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150] would have been widespread. The loss of the raised bog habitats at this site since the 2000s due to peat production is rated as an Irreversible Adverse Impact of International Significance. Since the initial stripping of the surface, the annual peat harvesting would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog including the area of conservation importance along the eastern and western margins of the site, which support the Annex I habitats 'Degraded raised bogs still capable of regeneration' [code 7120] and 'Depressions on peat substrates (Rhynchosporian)' [7150] – this impact is rated as Significant.	It appears that the only other activity being carried on at this site is a small area classified as 'Turbary Allocated' to the west side of the Prosperous road.	It is not known if mitigation had been provided to reduce water loss as a result of recent commercial works from the high bog (Annex I listed habitats) along the eastern and western margins of the site.
Kilberry	Bord na Móna records indicate that Kilberry Bog was first drained in 1945, with first production in 1948. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating back to 1945 and first production in 1948, the original raised bog surface had been removed by 1985.	The marginal bog along the western boundary is classified as 'Turbary Allocated'. Recent cutting here is not considered a significant impact.	Due to the relatively low recent and existing ecological interest at this site, specific mitigation may not have been necessary for terrestrial ecological interests. No commercial peat works are allowed in the sector of the site where Hen Harriers roost in winter.

Bog	Remedial Impact Assessment	Cumulative Impacts	Mitigation and Monitoring
	Since then, the annual peat harvesting would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of cutover bog. As these strips were already highly disturbed, this is not considered an impact of significance.		
Cuil na Carton	Bord na Móna records indicate that Coolnacartan (Cuil na Carton) Bog was first drained in 1962, with first production in 1966. OSI Aerial photography from 1995 indicates that the site was in full commercial production at the time, with the commercial peat production footprint appearing the same as it is at present. With drainage of the bog dating back to 1962 and first production in 1966, the original raised bog surface had been removed by 1985. Since then, the annual peat harvesting would have lowered the height of the commercial peat fields, which would have caused continued drawdown of water from adjoining areas of high bog and cutover bog. As these areas were already highly disturbed from turbary, this is not considered an impact of significance.	Much of the remaining high bog in the western sector of the site is classified as 'Sod Turf Sites'. The recent removal of high bog by turbary is rated as a Significant impact.	Due to the relatively low recent and existing ecological interest at this site, specific mitigation may not have been necessary for terrestrial ecological interests

10.5 Residual Impacts

For terrestrial ecological interests, it appears that for a number of sites buffers strips have been established to reduce the impact of drainage of surface and groundwater from areas of conservation interest (mainly high bog comprising Annex I listed habitats) due to activities in the Production Fields. Drainage impacts will vary from site to site depending on the depth and density of drainage in the production fields, the depth of harvesting of the peat relative to the high bog areas, and the hydrology and hydrogeology of the areas.

From Bord na Móna mapping data showing the intended harvesting in 2020, such strips appear to have been in place pre-2020 where appropriate in the following sites (or sectors of the sites):

- Monettia Bog
- Killaun Bog
- Derryclure Bog
- Bellair North Bog (west end only)
- Kinnegad Bog
- Clonad Bog

It is not known when the strips were established or if the effectiveness has been monitored. At these sites, in addition to the establishment of buffer strips, local drains may need to have been blocked to create hydraulic barriers to lessen water loss from the high bog areas beyond the drains (it is not known if such drain blocking has been carried out).

Apart from the above, it not apparent that mitigation has been carried out at the sites to reduce or minimise loss of high bog habitat over the years since 1985 or to reduce the loss of water from the remaining areas of relatively intact high bog (some of which are outside of Bord na Móna ownership).

As mitigation for terrestrial ecological interests does not appear to have been practiced during production works, and as the effectiveness of the use of buffer strips has not been established by long-term monitoring, it is concluded that in general for terrestrial ecology the Residual Impacts will be the same as the Remedial Impact Assessments which are detailed in Table 10.1 .

11 Surface Water

11.1 Introduction

This chapter of the rEIAR assesses the retrospective impacts associated with the historic peat extraction and ancillary activities in the 41 bog units that comprise this project. Descriptions of the bog units and their locations are provided in Chapter 5 of this rEIAR.

This chapter addresses water quality impacts only. Impacts relating to flood risk are addressed in Chapter 12 Flood Risk, impacts relating to groundwater and hydromorphological alterations are addressed in Chapter 14 *Land, Soils and Groundwater.*

This chapter assesses the historic impacts of peat extraction on the water quality environment and describes the mitigation and monitoring that has been carried out.

11.2 Methodology

11.2.1 Legislation and Guidance

The EU Water Framework Directive (2000/60/EC) (WFD) established a framework for the protection of both surface and groundwater. Transposing legislation (S.I. No. 792 of 2009, European Communities Environmental Objective (Surface Water) Regulations 2009 as amended) outlines the water protection and water management measures required in Ireland to maintain high or good status of waters where it exists and to prevent any deterioration in existing water status. Water bodies comprise both surface and groundwater bodies, and the achievement of a good status for these depends also on the achievement of 'good' status by dependent ecosystems.

The first cycle of the River Basin Management Plan (RBMP) ran from 2009-2015, where eight separate plans were devised for all of the River Basin Districts (RBDs) with the objective of achieving at least 'good' status for all waters by 2015 (noting that later dates were set for certain waterbodies noted to be under significant pressures). The second cycle of the River Basin Management Plan: 2018-2021, was published by the Department of Housing, Planning and Local Government in April 2018.

Article 5 of the WFD stated that characterisation is to be carried out for each river basin district, or for the portion of an international river basin district falling within its territory. There are three separate objectives that are of particular relevance to the characterisation of water quality and hydrology (Article 4.1):

- To prevent deterioration of the status of all water bodies;
- To protect, enhance and restore all water bodies with the aim of achieving Good Status by 2015, with some limited exceptions, or by the dates set out in the river basin management plans; and
- To reverse any significant and sustained upward trend in the concentration of any pollutant resulting from the impact of human activity on groundwater.

The *European Communities Environmental Objectives (Surface Waters) Regulations, 2009* give effect to the criteria and standards to be used for classifying surface waters in accordance with the ecological objectives approach of the WFD. In accordance with the regulations, waters classified as 'High' or 'Good' must not be allowed to deteriorate. Waters classified as less than

good must be restored to at least good status within a prescribed timeframe. In addition, the regulations address certain shortcomings identified by the European Court of Justice in relation to Ireland's implementation of the *Dangerous Substances Directive (76/464/EEC, as amended)*. The regulations set standards for biological quality elements and physico-chemical conditions, supporting biological elements (e.g. temperature, oxygen balance, pH, salinity, nutrient concentrations and specific pollutants), which must be complied with. These parameters establish the "ecological status" of a water body.

The following sources and publications were used in the preparation of this chapter of the rEIAR:

- European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (S.I. 272 of 2009);
- Environmental Protection Agency (May 2017): Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports;
- Environmental Protection Agency (September 2015): Draft - Advice Notes on Current Practice (in the preparation of Environmental Impact Statements);
- Environmental Protection Agency (September 2015): Draft – Revised Guidelines on the Information to be contained in Environmental Impact Statements;
- CIRIA 2006: Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London, 2006; and,
- Environmental Protection Agency (2006): Environmental Management in the Extractive Industry (Non-Scheduled Minerals).
- Environmental Protection Agency (EPA), WFD Status Geodatabase (all waterbodies); Environmental Protection Agency (EPA), Online maps https://gis.epa.ie/EPAMaps/default;
- Environmental Protection Agency (EPA), Catchments website: https://www.catchments.ie/
- National Peatland Strategy (NPWS, 2015).

11.2.2 Approach Methodology

This assessment involved desktop research supported by a review of water survey data to evaluate whether a fundamental, material or detectable change in water quality might have occurred from past peat extraction within the 41 bogs. The assessment included a review of publicly available water quality data and Water Framework Directive data for the study area (www.gis.epa.ie), including EPA data on the historic biological (Q-Value) for the waterbody catchments. The seven IPC licences (for each of the Bog Groups) and conditioned monitoring returns were reviewed with regard to emissions to water.

The influence of external activities such as adjacent farming, forestry, other land-uses (including peat extraction outside of the bog units), wastewater treatment works was considered in the assessment of historic impacts on peat extraction activities.

11.2.2.1 Study Area

The Department of Housing, Planning and Local Government in their River Basin Management Plan for Ireland 2018 – 2021 states that the environmental impacts associated with peat extraction generally relate to suspended solids, ammonia and hydromorphological alterations (note hydromorphological alterations are dealt with in Chapter 14) and that high levels of ammonia are released from peat-extraction activities during the draining process and, along with suspended solids, may be causing ecological impacts in receiving water bodies.

The pathway for environmental effects on the aquatic environment is therefore via bog drainage. Drainage within the bogs is achieved through a network of open drains and pipes with all surface water discharges directed through silt ponds prior to discharge to local water courses.

This chapter therefore describes the aquatic environment in the study area relative to historic peat extraction activities and assesses the likelihood of impact on surface water quality from the potential effects of ammonia and suspended solids.

11.3 Receiving Environment

This section describes the baseline conditions within the study area in terms of aquatic ecology and water quality.

11.3.1 Catchment Overview

11.3.1.1 Boora Bog Group

The Boora Bog Group is spread across three watercourse catchments: the Lower Shannon, Upper Shannon and the Barrow. The majority however are located within the Lower Shannon catchment. This bog group spans across three counties: Kildare, Laois and Offaly, with the majority of the group located in County Offaly. The Boora bog group is made up of a total of 10 bog units. The majority of the bog units in the Boora Bog Group do drain into the River Brosna, which flows into the River Shannon downstream.

11.3.1.2 Derrygreenagh Bog Group

The Derrygreenagh Bog Group is spread across three counties, Meath, Offaly and Westmeath. However, the majority of this bog group is located within the Boyne catchment, with the exception of a very small part of bog located in the Barrow catchment.

11.3.1.3 Blackwater Bog Group

The Blackwater bog group is located within County Offaly and only consists of one bog unit: Ballaghurt Bog Unit. The Blackwater bog group is situated within the Lower Shannon catchment, with two small sections of c. 300m spilling into the Upper Shannon catchment.

11.3.1.4 Allen Bog Group

The Allen bog group spreads across counties Kildare, Laois, Offaly and Westmeath. It is also spread across three watercourse catchments: the Lower Shannon, the Boyne and the Barrow.

11.3.1.5 Mountdillon Bog Group

The Mountdillon (Mostrim Peat) Bog Group is located between counties Longford and Westmeath. There are a total of three bog units within this bog group. The southern end of this bog group, which contains two of the bog units, is located in County Westmeath, with the northern end in County Longford. This bog unit is entirely located in the Upper Shannon catchment.

11.3.1.6 Kilberry Bog Group

The Kilberry Bog Group is located entirely in County Kildare and there are a total of four bog units within this bog group. One bog unit, the Kilberry bog unit, is located far further south than

the other bog units. However, the Kilberry bog group is spread across three catchments: The Liffey and Dublin Bay catchment, the Boyne and the Barrow catchment.

11.3.1.7 Cuil na Mona Bog Group

The Coolnamona bog group is a small bog group with only one bog unit contained within it: Coolnacartan bog unit. The Coolnamona bog group is located in County Laois. This bog group spans over two separate catchments, the Nore catchment and the Barrow catchment

The hydrological connectivity between bog drainage within the 14 bogs and waterbody catchments is presented in Table 11.1:

Table 11.1: Surface Water Catchments

Ref	Bog Group	Bog	Catchment (WFD)
1	Boora	Bellair Nth	Upper Shannon 26G Lower Shannon 25A
2	Boora	Lemanaghan	Upper Shannon 26G Lower Shannon 25A
3	Boora	Noggusboy	Lower Shannon 25A
4	Boora	Boora	Lower Shannon 25A
5	Boora	Galros	Lower Shannon 25B
6	Boora	Killaun	Lower Shannon 25B
7	Boora	Derrinboy	Lower Shannon 25A
8	Boora	Derryclure	Lower Shannon 25A
9	Boora	Monettia	Lower Shannon 25A Barrow 14
10	Boora	Killaranny	Lower Shannon 25A
11	Derrygreenagh	Bracklin	Boyne 07
12	Derrygreenagh	Carranstown	Boyne 07
13	Derrygreenagh	Ballivor	Boyne 07
14	Derrygreenagh	Kinnegad	Boyne 07
15	Derrygreenagh	Ballybeg	Boyne 07
16	Blackwater	Ballaghurt	Lower Shannon 25B
17	Allen	Daingean (Derries)	Lower Shannon 25A
18	Allen	Daingean Rathdrum	Barrow 14 Lower Shannon 25A
19	Allen	Clonad	Barrow 14 Lower Shannon 25A
20	Allen	Ballykeane	Barrow 14
21	Allen	Esker	Barrow 14
22	Allen	Garrymore	Barrow 14
23	Allen	Derrylea	Barrow 14
24	Allen	Ticknevin	Barrow 14
25	Allen	Glashabaun Sth	Barrow 14
26	Allen	Glashabaun Nth	Barrow 14
27	Allen	Codd Nth (Codd 2)	Barrow 14
28	Allen	Codd Sth (codd 1)	Barrow 14

Ref	Bog Group	Bog	Catchment (WFD)
29	Allen	Ballydermot North	Barrow 14
30	Allen	Ballydermot South	Barrow 14
31	Allen	Blackriver	Barrow 14
32	Allen	Barnaran	Barrow 14
33	Allen	Lodge	Barrow 14
34	Mountdillon	Cuil na Gun	Upper Shannon 26F
35	Mountdillon	Milkernagh	Upper Shannon 26F
36	Mountdillon	Coolcraff	Upper Shannon 26F
37	Kilberry	Gilltown	Boyne 07
38	Kilberry	Allen	Liffey and Dublin Bay 09
39	Kilberry	Prosperous	Boyne 07 Barrow 14
40	Kilberry	Kilberry	Barrow 14
41	Cuil na Mona	Cuil na Carton	Barrow 14 Nore 15

The hydrological connectivity of the bogs to European sites is presented in Table 11.2. A remedial Natura Impact Statement (rNIS) has been prepared in support of the Substitute Consent application. Further details on effects on peat extraction on European Sites hydrologically connected to the bogs is presented therein.

Table 11.2: Surface Water Connectivity to European Sites

	Date of Designation	Bogs Hydrologically connected	First Drained
River Shannon Callows SAC and Middle Shannon Callows SPA	2002 and 1996	Galros	1983
		Ballaghurt 1	1975
		Ballaghurt 2	1990
		Daingean Rathdrum,	1996
		Bellair North,	1970
		Lemanaghan,	1951
		Noggusboy,	1951
		Boora,	1954
		Derrinboy,	1988
		Derryclure,	1987
		Monettia,	1976
		Kilaranny	1983
		Daingean (Derries),	1995
		Killaun,	1996
River Little Brosna Callows SPA	1996	Killaun	1996
River Barrow and River Nore SAC	2002	Ticknevin,	1976
		Daingean Rathdrum,	1996

	Date of Designation	Bogs Hydrologically connected	First Drained
		Clonad,	1956
		Ballykean,	1951
		Esker,	1959
		Garrymore,	1992
		Derrylea,	1968
		Glashabaun North,	1946
		Glashabaun South,	1946
		Codd North,	1983
		Codd South,	1983
		Ballydermot North,	1946
		Ballydermot South,	1946
		Blackriver,	1946
		Barnaran,	1951
		Lodge,	1951
		Kilberry,	1945
		Cuil na Carton	1962
		Monettia	1976
		Prosperous	1991
River Barrow and River Nore SPA	2010	Cuil na Carton	1962
River Boyne and River Blackwater SAC and SPA	2003 and 2011	Ballybeg,	1951
		Kinnegad,	1977
		Ballivor,	1948
		Carranstown,	1979
		Bracklin,	1979
		Gilltown,	1977
		Propserous	1991
Lough Derravaragh SPA	1995	Coolnagun	1947
		Milkernagh	1947
		Coolcraff	1981
Lough Iron SPA	1995	Coolnagun	1947
Lough Ree SAC & Lough Ree SPA	2002 & 1995	Coolnagun	1947
		Milkernagh	1947
		Coolcraff	1981
North Dublin Bay SAC & South Dublin Bay SAC & North Bull Island SPA & South Dublin Bay SPA	1999, 2000, 1986 & 1995	Mouds/Allen	1966

11.3.2 Water Quality

11.3.2.1 Historical Context

The Environmental Protection Agency (EPA) has carried out biological water quality monitoring on selected watercourses all over the Republic of Ireland since the early 1970's. In order to gain an understanding of historical water quality in the watercourses hydrologically connected to Bord na Móna's 41 bogs a review of the EPA's historical biological water quality monitoring was carried out.

The draining of bogs started as early as the 1940's. The date of initial bog drainage is shown in Table 11.2. At the time of initial drainage, the works would likely have resulted in the direct release of sediment to the local watercourses and would have had an associated increase in nutrient leaching. Production on these drained bogs generally starts a few years after draining. As such, the effects of drainage on the local watercourses were, for the most part, in effect well in advance of the temporal scope of this rEIAR. Thus, the historical baseline, against which the assessment of effects is made, would already have been affected by bog drainage.

Boora Bog Group

The draining of bogs in Boora bog group started as far back as 1951, with Noggusboy and Lemanaghan bog being the first to be drained. Further groups of bogs were drained in the 80s. The watercourses that drain the Boora bog group eventually flow into the Lower River Shannon.

The EPA has carried out monitoring on rivers which drain the Boora bog group. Q Ratings are available for the River Silver [Kilcormac], both upstream and downstream of Boora bog units.

Table 11.3 Historical EPA Biological Quality Rating (Q Values) for the River Silver [Kilcormac].

Station Code	1981	1984	1987	1993	1996	1999	2002	2005	2008	2011	2014	2017
RS25S020100	5	5	5	4	4	4-5	4-5	4-5	4	4-5	4-5	4-5
RS25S020700	4	4-5	4	4	4	4	4	4	4	4	4	4

On the River Brosna, there are sites upstream of discharge points for bog units and sites downstream that are monitored by the EPA. The site furthest upstream, of Bellair North, Lemanaghan and the River Silver [Kilcormac] confluence, has an average rating of between Q3-4 and Q4, as shown below. Station 0800 is located downstream of Bellair North bog unit and the Lemanaghan bog unit, but upstream of the River Silver [Kilcormac] confluence. This site has shown some jumps in ratings over the years. From Q5 in 1987, to Q3* (* indicating a notable feature such as siltation) and then back up to Q4-5 in 2005. The Lemanaghan and Bellair North bog units had both been in production since 1955 and 1976 respectively. Then downstream of the River Silver [Kilcormac] confluence, into which receiving waters for the Boora, Noggusboy and Derrinboy bog units flow, station 1000 has a general rating of Q3-4 since 1984. There was an increase from 1984 to 1987 from Q3-4 to Q4-5. On average however, there has only been a

slight decline in water quality from the upstream site to the downstream site, with the decline mainly occurring after the River Silver [Kilcormac] confluence.

Table 11.4 Historical Biological Quality Rating (Q Values) for the River Brosna obtained from epa.ie

Station Code	1984	1987	1993	1996	1999	2002	2005	2007	2008	2009	2010	2011	2014	2017
RS25B090600	4	4	4	-	3-4	-	-	-	3-4	-	-	3-4	3-4	4
RS25B090800	4	5	3*	3-4	3	3-4*	4-5	-	-	-	-	4	4	4
RS25B091000	3-4	4-5	3-4	3-4	3-4	3	3	-	-	3-4*	-	4	-	3-4

The River Camcor which drains the Killaun bog unit flows into the River Little Brosna which is also monitored by the EPA. The Table below details the historical ratings for selected sites. Station 0700 is upstream of the River Camcor confluence and station 1000 is downstream. There appears to be a decline in both sites between 1987 and 1993. However, an interesting observation is the fact that 2005 to 2017, the downstream site was generally given a better rating than the upstream site. This may be due to a multitude of factors including larger dilution due to the River Camcor entering the waterbody. The Killaun bog was drained in 1996 and production started in 2003. After production started it appears that water quality improved downstream on the River Little Brosna. The River Shannon Callows SAC downstream was designated in 2003 when production started on the Killaun bog.

Table 11.5 Historical Biological Quality Rating (Q Values) for the River Little Brosna obtained from epa.ie.

Station Code	1981	1984	1987	1993	1996	1999	2002	2005	2008	2011	2014	2017
RS25L020700	4-5	4	4	3-4	3	4	3-4	3	3-4	4	3-4	3-4
RSS25L021000	4	4-5	5	3-4	3-4	3-4	3-4	3-4	4	4	4	4

Derrygreenagh Bog Group

The Derrygreenagh Bog group has five bog units included within it and the main watercourses into which the receiving watercourses for these bog units flow into are the River Boyne, the River Deel [Raharney] and the River Stonyford 07. All three of these watercourses in the vicinity of the bog units within Derrygreenagh Bog group are designated at some point as the River Boyne and River Blackwater SAC. This SAC was designated in June 2003.

The EPA carry out biological water quality monitoring on each of the three main watercourses downstream of Derrygreenagh Bog Group. There appears to have been a slow decline at both the upstream and downstream sites since 1971, which may indicate that it is due to existing background pressures in the catchment. However, there was a drop in quality at both sites in 1994 which continued until the present day. The last bog units in this area to start production were no later than 1985.

Table 11.6 Historical Biological Quality Rating (Q Values) for the River Deel [Raharney] obtained from epa.ie.

Station Code	1971	1976	1978	1982	1985	1990	1994	1997	2000	2003	2006	2009	2012	2015	2018
RS07D010200	5	4-5	4-5	4	4-5	4-5	3-4	3-4	3-4	3-4	3-4	3-4	3-4	4	3-4
RS07D010600	5	4	4	4-5	4-5	4-5	4	3-4	4	3-4	4	3-4	3-4	3-4	4

Table 11.7 Historical Biological Quality Rating (Q Values) for the River Boyne obtained from epa.ie.

Station Code	1979	1981	1986	1990	1994	1997	2000	2003	2004	2005	2006	2007	2008	2009	2012	2014	2015	2018
RS07B040600	4	4	4-5	4	4	3-4	3	3	-	-	3-4	-	-	3-4	3-4	-	3-4	3-4
RS07B041000	4	5	5	3-4	3-4	4	3-4	4	-	-	4	-	-	4	4	-	4	3-4

Blackwater Bog Group

The Blackwater bog group only has one bog unit contained within it: the Ballaghurt bog unit. The watercourses that drain this bog unit eventually flow into the Lower River Shannon downstream, where here it is designated as both the River Shannon Callows SAC and the Middle Shannon Callows SPA. The River Shannon Callows SAC was first designated as an SAC in January 2002. Although there is one bog unit here there is a south-western section and a north-eastern section. Each of these sections were drained at separate times, one in 1975 and the other in 1990. Production on the bog drained in 1975 started in 1980 and for the other one production commenced in 1995. Therefore, production has started on these bogs before the designation of the downstream Natura 2000 site.

The EPA carry out biological water quality monitoring on both the River Blackwater [Shannonbridge] which receives all of the discharge points for this bog group.

The Table below shows the historical monitoring data for the River Blackwater [Shannonbridge] for the only two monitoring stations on this watercourse. The upstream site is station 0110 and the downstream site is station 0200. It is noted however that the upstream site is still below one section of the Ballaghurt bog unit and one discharge from the second section, so therefore cannot fully be recognized as a reference site. However, there is a slight decline in water quality over the years after 1999, which is after production started on both sections of this bog. This site shows slight changes each year both increasing and decreasing in quality. In contrast however, the site downstream has shown an increase in quality after 2002. It must also be noted that in 2002 on the downstream site was marked with an asterisk which may indicate siltation.

Table 11.8 Historical Biological Quality Rating (Q Values) for the River Blackwater obtained from epa.ie.

Station Code	1988	1993	1996	1999	2002	2005	2009	2011	2014	2017
RS25B270110	4-5	4	4	4	3-4	4	3-4	4	3-4	4
RS25B270200	3	3-4	3-4	3	3-4*	4	4	4	4	4

Allen Bog Group

The Allen bog group has a total of 17 bog units contained within it, and it is spread across the Lower Shannon, Boyne and Barrow catchments. However, the majority of these bog units are within the Barrow catchment with most of these bogs draining into the River Figile. The River Barrow downstream is designated as the River Barrow and River Nore SAC. This SAC was designated in January 2002.

The table below shows the historical data for water quality monitoring on the River Daingean. In this case, station 0200 is actually just downstream of Clonad, Daingean Derries and Daingean Rathdrum bogs as there are no sites upstream. Station 0520 is further downstream. Here it does show that water quality improves downstream. However, in this case, the site closest to the bog units has either a 'Poor' or 'Bad' water quality status. The improvement downstream is likely to be due to dilution factors and assimilation.

Table 11.9 Historical Biological Quality Rating (Q Values) for the River Daingean obtained from epa.ie.

Station Code	1981	1984	1986	1989	1990	1993	1997	2000	2003	2006	2009	2011	2015	2017
RS14D060200	3	3	3	2	2	2-3	2-3	2	3	2-3	2-3	3	2-3	2-3
RS14D060520	-	-	3-4	3	-	3	3-4	3	3-4	3	3-4	3-4*	-	3-4

There is a large cluster of bog units in the Allen group that are located near the River Figile: Ticknevin, Lodge, Ballydermot North, Ballydermot South, Codd 1, Codd 2 / Sheridans, Glashabaun North, Glashabaun South, Blackriver and Barnaran. The last bog units here to be drained were the Codd 1 and Codd 2 / Sheridans bogs in 1983, with Ticknevin being the last bog to start production in 2000. The Tables below show the historical water quality data obtained from the EPA on the River Figile. Station 0050 is upstream of the whole cluster of bog units in this area, station 0100 is in the middle, station 0300 is downstream of the River Daingean confluence and station 0600 is downstream of the River Cushina. Interestingly, the upstream site has the worst overall rating but does improve after 2003. From this data it is clear that water quality improves along the River Figile. Considering that station 0100 is in the middle of this cluster of bogs, and water quality improves the further downstream along its length, this is likely to be due to the fact that dilution rates are higher and the river has a higher assimilation capacity. Water quality at station 0100 also declines after 2000 which is after Ticknevin bog goes into production. Station 0300 is downstream of the River Daingean that although is a

receiving water for some bog units in the Allen group would add a considerable dilution factor. Similarly, station 0600 is downstream of the River Cushina confluence.

Table 11.10 Historical Biological Quality Rating (Q Values) for the River Figile obtained from epa.ie.

Station Code	1975	1976	1979	1986	1989	1990	1993	1994	1997	2000
RS14F010050	-	-	-	-	2	1-2	2	1	1/0	1-2
RS14F010100	-	-	-	3-4	3-4	-	3-4	-	2	3
RS14F010300	3-4	4	4	4	4	-	-	-	3-4	4-5
RS14F010600	-	-	5	4	4	-	4	-	-	-

Table 11.11 Historical Biological Quality Rating (Q Values) for the River Figile obtained from epa.ie. (Continued)

Station Code	2003	2006	2009	2011	2015	2017	2019
RS14F010050	2	2-3	2-3	3	3	3	-
RS14F010100	3	3-4	3-4	3-4	3-4	3-4	-
RS14F010300	4	4	-	4	4	4	-
RS14F010600	-	3-4	-	-	-	-	-

Mountdillon (Mostrim Peat) Bog Group

The Mountdillon (Mostrim Peat) Bog Group has a total of three bog units within it which are all located in close proximity to eachother. There are a series of lakes in the area and the main watercourse is the River Inny [Shannon]. There are connections between this bog group and the following Natura 2000 sites: Garriskil Bog SAC, Derragh bog SAC, Garriskil Bog SPA, Lough Iron SPA, Lough Kinale and Derragh Lough SPA and Lough Derravaragh SPA. There are no SACs designated for aquatic qualifying interests or fish downstream of this bog unit.

The EPA carry out biological water quality monitoring on the River Inny [Shannon], into which the small tributaries that drain the Mountdillon (Mostrim Peat) bog group flow into. The table below details the historical water quality monitoring data on sites upstream and downstream of the bog units. Milkernagh bog unit was drained in 1947 and production started in 1953, as was the Coolnagun bog unit. The Coolcraff bog unit was drained in 1981 and production started in 1989. Station 0600 is located upstream of the bog units and station 0750 is the nearest downstream, with station 0800 being further downstream but more regularly monitored.

Table 11.12 Historical Biological Quality Rating (Q Values) for the River Inny [Shannon] obtained from epa.ie.

Station Code	1971	1973	1977	1981	1984	1987	1992	1996	1999	2002	2005	2008	2009	2011	2014	2017
RS26I010600	-	-	4-5	4-5	4-5	4	3-4	3-4	-	3-4*	3-4	-	-	3-4	3-4	3-4
RS26I010750	-	-	-	-	-	-	3-4	3-4	3-4	4	3-4	-	-	-	-	-
RS26I010800	4	4-5	4	4	4-5	4	3-4	4	4	3-4	4	4	-	4	3-4	4

Kilberry Bog Group

The Kilberry bog group has a total of four bog units located within it and it is spread throughout the Barrow, Boyne and Liffey and Dublin Bay catchments. Therefore, the main watercourses that are downstream of the receiving watercourses for this bog unit are the River Barrow, the River Boyne and the River Liffey. The Boyne downstream is designated as the River Boyne and River Blackwater SAC, designated in June 2003. The Gilltown and prosperous bog units are upstream of this SAC and were drained in 1977 and 1991 respectively, with production starting in 1982 and 2003 respectively.

The Barrow downstream is designated as the River Barrow and River Nore SAC, which was designated in January 2002. The Kilberry bog unit is upstream of this SAC. This bog unit was drained in 1945 and production started in 1948.

The EPA carry out monitoring on the River Barrow downstream of Kilberry bog unit, and on the River Blackwater [Longwood] downstream of the Gilltown and Prosperous bog units, as shown in the tables below.

Table 11.13 Historical Biological Quality Rating (Q Values) for the River Barrow obtained from epa.ie (up to 1989).

Station Code	1971	1973	1974	1975	1976	1978	1979	1980	1982	1986	1989
RSB14B011400	5	-	5	-	-	-	-	4	-	4	4
RSB14B011900	1	-	2	-	2-3	2	-	4	4	4	4

Table 11.14 Historical Biological Quality Rating (Q Values) for the River Barrow obtained from epa.ie (from 1989 up to 2014).

Station Code	1991	1994	1997	2000	2003	2005	2006	2007	2008	2009	2011	2014
RSB14B011400	-	4	4	4	4	-	4	-	-	-	4	-
RSB14B011900	-	4	3-4	4	4	-	4	-	-	-	4	3-4

Table 11.15 Historical Biological Quality Rating (Q Values) for the River Blackwater [Longwood] obtained from epa.ie.

Station Code	1976	1981	1985	1990	1994	1997	2000	2003	2006	2009	2012	2015	2018
RS07B020060	-	-	-	-	-	4	4	3	4	4	3	3	3
RS07B020100	4-5	3-4	3-4	3-4	4	4	4	4	4	3-4	3-4	3-4	3-4

Coolnamona Bog Group

The watercourses that drain the Coolnamona Bog group eventually flow into the River Nore. The Clonawoolan stream is one of the receiving watercourses for discharges from the Coolnamona bog group. The River Nore downstream is designated as the River Barrow and River Nore SAC, which was designated in January 2002. The Coolnamona bog group also only consists of one bog unit: the Coolnacartan bog unit. This bog unit was drained in 1962 and production started in 1966. The EPA carry out biological monitoring on the Clonawoolan Stream, the main receiving watercourse for the discharges from Coolnamona bog group, and the Cappancloghy Stream which the Fatharnagh stream flows into, which originates from Coolnacartan bog. The table below historical water quality monitoring data for the Clonawoolan stream at the only EPA monitoring site on this watercourse.

Table 11.16 Historical Biological Quality Rating (Q Values) for the Clonawoolan Stream obtained from epa.ie.

Station Code	1987	1988	1989	1991	1995	1998	2001	2005	2007	2010	2013	2016	2019
RS15C191100	1	2	2-3	2-3	2-3	3-4	2	2-3	2-3	2-3	3	3	3

Table 11.17 Historical Biological Quality Rating (Q Values) for the River Nore obtained from epa.ie.

Station Code	1979	1981	1984	1987	1991	1995	1998	2001	2004	2007	2008	2010	2013	2016	2019
RS15N010700	4	-	3-4	4	4	4	3-4	4	3-4	3-4	-	4	4	4-5	4
RS15N010900	-	-	4	4-5	4	4	3-4	3-4	3-4	4	-	4	4	4-5	4-5

11.3.2.2 Recent Water Quality

The Water Framework Directive (WFD) status for the water bodies receiving drainage from the 41 bog is presented below from the date of first river basin cycle. Presently (2013-2018) The majority of the receiving waterbodies have a status of either moderate or good, with the following water bodies having a poor status: Shannon (Upper)_120, Clodiagh (Tullamore)_050, Daingean_010, Daingean _020, Daingean_030, Blackwater (Longwood)_010, Slate_010, Slate)_020, Slate_030, Slate_040, Slate_050, Triogue_010, Trigoue_020, Trioigue_030, Triogue_040, and the Clonawoolanstream_010.

This table also indicates the risk status of the receiving waterbodies in the context of the WFD and the River Basin Management Plan First Cycle.

Table 11.18: Water Quality - Historic (sourced from www.epa.ie)

Ref	Bog	River	Water Body	WFD Status				WFD Risk
				2007-2009	2010-2012	2010 – 2015	2013 - 2018	2010-2015
BOORA BOG GROUP								
1	Bellair Nth	MOATE STREAM_010	IE_SH_25M050400	Poor	Moderate	Moderate	Poor	At Risk
		BROSNA_090	IE_SH_25B090710	Unassigned	Good	Good	Good	Not at Risk
		BROSNA_100	IE_SH_25B090761	Moderate	Moderate	Moderate	Moderate	At Risk
		BROSNA_110	IE_SH_25B090800	Unassigned	Good	Moderate	Good	Not at Risk
		BROSNA_120	IE_SH_25B090950	Moderate	Good	High	Good	Not at Risk
		BROSNA_130	IE_SH_25B091000	Moderate	Good	Good	Moderate	Not at Risk
		BROSNA_140	IE_SH_25B091200	Moderate	Moderate	Moderate	Moderate	At Risk
		BOOR_010	IE_SH_26B071100	Moderate	Good	Good	Good	Not at Risk
		CLONMORE_010	IE_SH_26C260570	Unassigned	Unassigned	Unassigned	Unassigned	Not at Risk
		BOOR_020	IE_SH_26B071200	Unassigned	Good	Moderate	Moderate	At Risk
		SHANNON (Upper)_120	IE_SH_26S021800	Poor	Poor	Poor	Poor	At Risk
2	Lemanaghan	BOOR_020	IE_SH_26B071200	Unassigned	Good	Moderate	Moderate	At Risk
		SHANNON (Upper)_120	IE_SH_26S021800	Poor	Poor	Poor	Poor	At Risk
		BROSNA_100	IE_SH_25B090761	Moderate	Moderate	Moderate	Moderate	At Risk
		BROSNA_110	IE_SH_25B090800	Unassigned	Good	Good	Good	Not at Risk
		BROSNA_120	IE_SH_25B090950	Moderate	Good	High	Good	Not at Risk
		BROSNA_130	IE_SH_25B091000	Moderate	Good	Good	Moderate	Not at Risk
		BROSNA_140	IE_SH_25B091200	Moderate	Moderate	Moderate	Moderate	At Risk
3	Noggusboy	BROSNA_120	IE_SH_25B090950	Moderate	Good	High	Good	Not at Risk
		BROSNA_130	IE_SH_25B091000	Moderate	Good	Good	Moderate	Not at Risk
		BROSNA_140	IE_SH_25B091200	Moderate	Moderate	Moderate	Moderate	At Risk

Ref	Bog	River	Water Body	WFD Status				WFD Risk
				2007-2009	2010-2012	2010 – 2015	2013 - 2018	2010-2015
4	Boora	SILVER (KILCORMAC)_050	IE_SH_25S020700	Good	Moderate	Moderate	Moderate	At Risk
		BROSNA_120	IE_SH_25B090950	Moderate	Good	High	Good	Not at Risk
		BROSNA_130	IE_SH_25B091000	Moderate	Good	Good	Moderate	Not at Risk
		BROSNA_140	IE_SH_25B091200	Moderate	Moderate	Moderate	Moderate	At Risk
5	Galros	RAPEMILLS_010	IE_SH_25R010300	Moderate	Good	Good	Moderate	Not at Risk
		RAPEMILLS_020	IE_SH_25R010500	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
6	Killaun	RAPEMILLS_010	IE_SH_25R010300	Moderate	Good	Good	Moderate	Not at Risk
		RAPEMILLS_020	IE_SH_25R010500	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
		CAMCOR_050	IE_SH_25C020700	Moderate	Good	Good	Good	Not at Risk
		LITTLE BROSNA_050	IE_SH_25L020800	Unassigned	Good	Good	Good	Not at Risk
		LITTLE BROSNA_060	IE_SH_25L021000	Good	Good	Good	Good	Not at Risk
		INCHERKY_010	IE_SH_25I020930	Unassigned	Unassigned	Unassigned	Unassigned	
7	Derrinboy	SILVER (KILCORMAC)_020	IE_SH_25S020200	Moderate	Good	Moderate	Moderate	At Risk
		SILVER (KILCORMAC)_030	IE_SH_25S020400	Moderate	Moderate	Moderate	Moderate	At Risk
		SILVER (KILCORMAC)_040	IE_SH_25S020500	Moderate	Good	Good	Good	Not at Risk
		SILVER (KILCORMAC)_050	IE_SH_25S020700	Good	Moderate	Moderate	Moderate	At Risk
		BROSNA_120	IE_SH_25B090950	Moderate	Good	High	Good	Not at Risk

Ref	Bog	River	Water Body	WFD Status				WFD Risk
				2007-2009	2010-2012	2010 – 2015	2013 - 2018	2010-2015
		BROSNA_130	IE_SH_25B091000	Moderate	Good	Good	Moderate	Not at Risk
		BROSNA_140	IE_SH_25B091200	Moderate	Moderate	Moderate	Moderate	At Risk
8	Derryclure	KILLEENMORE_010	IE_SH_25Q440920	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
		TULLAMORE_030	IE_SH_25T030300	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
		TULLAMORE_040	IE_SH_25T030400	Poor	Poor	Poor	Moderate	At Risk
		CLODIAGH (TULLAMORE)_050	IE_SH_25C060500	Moderate	Moderate	Poor	Poor	At Risk
		BROSNA_100	IE_SH_25B090761	Moderate	Moderate	Moderate	Moderate	At Risk
		BROSNA_110	IE_SH_25B090800	Moderate	Moderate	Moderate	Good	Not at Risk
		BROSNA_120	IE_SH_25B090950	Moderate	Good	High	Good	Not at Risk
		BROSNA_130	IE_SH_25B091000	Moderate	Good	Good	Moderate	Not at Risk
		BROSNA_140	IE_SH_25B091200	Moderate	Moderate	Moderate	Moderate	At Risk
9	Monettia	CLODIAGH (TULLAMORE)_030	IE_SH_25C060340	Good	Good	Good	Good	Not at Risk
		CLODIAGH (TULLAMORE)_040	IE_SH_25C060360	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
		CLODIAGH (TULLAMORE)_050	IE_SH_25C060500	Moderate	Moderate	Poor	Poor	At Risk
		BROSNA_100	IE_SH_25B090761	Moderate	Moderate	Moderate	Moderate	At Risk
		BROSNA_110	IE_SH_25B090800	Moderate	Moderate	Moderate	Good	Not at Risk
		BROSNA_120	IE_SH_25B090950	Moderate	Good	High	Good	Not at Risk
		BROSNA_130	IE_SH_25B091000	Moderate	Good	Moderate	Moderate	Not at Risk
		BROSNA_140	IE_SH_25B091200	Moderate	Moderate	Moderate	Moderate	At Risk

Ref	Bog	River	Water Body	WFD Status				WFD Risk
				2007-2009	2010-2012	2010 – 2015	2013 - 2018	2010-2015
		PIGEONHOUSE_010	IE_SE_14P200000	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
		BARROW_020	IE_SE_14B010200	Good	Good	Good	Good	Under Review
10	Killaranny	BROSNA_100	IE_SH_25B090761	Moderate	Moderate	Moderate	Moderate	At Risk
		DERRYCOOLY STREAM_010	IE_SH_25D130400	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
		BROSNA_110	IE_SH_25B090800	Moderate	Moderate	Moderate	Good	Not at Risk
		BROSNA_120	IE_SH_25B090950	Moderate	Good	High	Good	Not at Risk
		BROSNA_130	IE_SH_25B091000	Moderate	Good	Moderate	Moderate	Not at Risk
		BROSNA_140	IE_SH_25B091200	Moderate	Moderate	Moderate	Moderate	At Risk
DERRYGREENAGH BOG GROUP								
11	Bracklin	DEEL (RAHARNEY)_030	IE_EA_07D010200	Moderate	Moderate	Good	Moderate	Not at Risk
		DEEL (RAHARNEY)_040	IE_EA_07D010300	Moderate	Moderate	Good	Good	Not at Risk
		DEEL (RAHARNEY)_050	IE_EA_07D010400	Moderate	Moderate	Moderate	Moderate	At Risk
		DEEL (RAHARNEY)_060	IE_EA_07D010600	Moderate	Moderate	Moderate	Good	At Risk
		BOYNE_050	IE_EA_07B040800	Good	Good	Good	Good	Not at Risk
		BOYNE_060	IE_EA_07B040900	Unassigned	Moderate	Moderate	Good	At Risk
12	Carranstown	BOYNE_060	IE_EA_07B040900	Unassigned	Moderate	Moderate	Good	At Risk
		STONYFORD_040	IE_EA_07S020400	Moderate	Moderate	Good	Moderate	Not at Risk
		DEEL (RAHARNEY)_060	IE_EA_07D010600	Moderate	Moderate	Moderate	Good	At Risk
13	Ballivor	BOYNE_060	IE_EA_07B040900	Unassigned	Moderate	Moderate	Good	At Risk
14	Kinnegad	KINNEGAD_020	IE_EA_07K010100	Unassigned	Moderate	Moderate	Moderate	At Risk

Ref	Bog	River	Water Body	WFD Status				WFD Risk
				2007-2009	2010-2012	2010 – 2015	2013 - 2018	2010-2015
		BOYNE_030	IE_EA_07B040400	Moderate	Good	Good	Moderate	Not at risk
		BOYNE_040	IE_EA_07B040600	Moderate	Moderate	Moderate	Moderate	At Risk
		BOYNE_050	IE_EA_07B040800	Good	Good	Good	Good	Not at Risk
15	Ballybeg	YELLOW (CASTLEJORDAN)_020	IE_EA_07Y020100	Moderate	Moderate	Good	Good	Not at Risk
		BOYNE_030	IE_EA_07B040400	Moderate	Good	Good	Moderate	Not at risk
		BOYNE_040	IE_EA_07B040600	Moderate	Moderate	Moderate	Moderate	At Risk
		BOYNE_050	IE_EA_07B040800	Good	Good	Good	Good	Not at Risk
BLACKWATER BOG GROUP								
	Ballaghurt	BLACKWATER (SHANNONBRIDGE)_010	IE_SH_25B270110	Moderate	Moderate	Good	Good	
		BLACKWATER (SHANNONBRIDGE)_020	IE_SH_25B270200	Moderate	Moderate	Good	Good	Not at Risk
		SHANNON (LOWER)_010	IE_SH_25S012000	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
ALLEN BOG GROUP								
17	Daingean (Derries)	SILVER (TULLAMORE)_030	IE_SH_25S030300	Moderate	Good	Good	Good	Not at Risk
		SILVER (TULLAMORE)_040	IE_SH_25S030500	Moderate	Moderate	Good	Moderate	Not at Risk
		BROSNA_100	IE_SH_25B090761	Moderate	Moderate	Moderate	Moderate	At Risk
		BROSNA_110	IE_SH_25B090800	Moderate	Moderate	Moderate	Good	Not at Risk

Ref	Bog	River	Water Body	WFD Status				WFD Risk
				2007-2009	2010-2012	2010 – 2015	2013 - 2018	2010-2015
18	Daingean Rathdrum	SILVER (TULLAMORE)_020	IE_SH_25S030100	Moderate	Good	Good	Good	Not at Risk
		DAINGEAN_010	IE_SE_14D060100	Unassigned	Poor	Poor	Poor	At Risk
		FIGILE_040	IE_SE_14F010300	Moderate	Moderate	Moderate	Moderate	At Risk
		FIGILE_050	IE_SE_14F010400	Moderate	Good	Good	Good	Review
		FIGILE_060	IE_SE_14F010500	Moderate	Good	Good	Good	Review
		FIGILE_080	IE_SE_14F010600	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
19	Clonad	DAINGEAN_010	IE_SE_14D060100	Unassigned	Poor	Poor	Poor	At Risk
		DAINGEAN_020	IE_SE_14D060200	Poor	Poor	Poor	Poor	At Risk
		DAINGEAN_030	IE_SE_14D060400	Poor	Poor	Poor	Poor	At Risk
		FIGILE_040	IE_SE_14F010300	Moderate	Moderate	Moderate	Moderate	At Risk
		FIGILE_050	IE_SE_14F010400	Moderate	Good	Good	Good	Review
		FIGILE_060	IE_SE_14F010500	Moderate	Good	Good	Good	Review
		FIGILE_080	IE_SE_14F010600	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
20	Ballykeane	ENAGHAN STREAM_010	IE_SE_14E020300	Unassigned	Good	Good	High	Not at Risk
		CUSHINA_030	IE_SE_14C040100	Moderate	Good	Good	Good	Not at Risk
		FIGILE_080	IE_SE_14F010600	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
21	Esker	FIGILE_040	IE_SE_14F010300	Moderate	Moderate	Moderate	Moderate	At Risk
		FIGILE_050	IE_SE_14F010400	Moderate	Good	Good	Good	Under Review
		FIGILE_060	IE_SE_14F010500	Moderate	Good	Good	Good	Under Review
		FIGILE_080	IE_SE_14F010600	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
22	Garrymore	COTTONERS BROOK_010	IE_SE_14C150500	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
		BARROW_050	IE_SE_14B010550	Unassigned	Unassigned	Unassigned	Unassigned	Under Review

Ref	Bog	River	Water Body	WFD Status				WFD Risk
				2007-2009	2010-2012	2010 – 2015	2013 - 2018	2010-2015
		BARROW_040	IE_SE_14B010500	Unassigned	Unassigned	Moderate	Moderate	At Risk
23	Derrylea	FIGILE_080	IE_SE_14F010600	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
25 & 26	Glashabaun Sth & Glashabaun Nth & Blackriver & Ballydermot Nth,& Ballydermot Sth Codd 1& 2 Barnaran Ticknevin	FIGILE_020	IE_SE_14F010100	Moderate	Moderate	Moderate	Moderate	At Risk
		FIGILE_030	IE_SE_14F010200	Moderate	Moderate	Moderate	Moderate	At Risk
		FIGILE_040	IE_SE_14F010300	Moderate	Moderate	Moderate	Moderate	At Risk
		FIGILE_050	IE_SE_14F010400	Moderate	Good	Good	Good	Under Review
		FIGILE_060	IE_SE_14F010500	Moderate	Good	Good	Good	Under Review
		FIGILE_080	IE_SE_14F010600	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
		BARROW_090	IE_SE_14B011000	Good	Good	Poor	Poor	At Risk
33	Lodge	SLATE_050	IE_SE_14S010100	Unassigned	Moderate	Moderate	Moderate	At Risk
		SLATE_060	IE_SE_14S010210	Poor	Moderate	Moderate	Moderate	At Risk
		SLATE_070	IE_SE_14S010300	Moderate	Good	Good	Moderate	Not at Risk
		FIGILE_080	IE_SE_14F010600	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
		BARROW_090	IE_SE_14B011000	Good	Good	Poor	Poor	At Risk
MOUNTDILLON BOG GROUP								
34	Cuil na Gun	INNY_070	IE_SH_26I010800	Good	Good	Moderate	Good	At Risk
		INNY_060	IE_SH_26I010700	Poor	Good	Good	Good	Not at Risk
		INNY_080	IE_SH_26I011000	Good	Good	Good	Good	Not at Risk
35	Milkernagh	INNY_060	IE_SH_26I010700	Poor	Good	Good	Good	Not at Risk
		INNY_070	IE_SH_26I010800	Good	Good	Moderate	Good	At Risk
36	Coolcraff	INNY_050	IE_SH_26I010600	Unassigned	Moderate	Moderate	Moderate	At Risk
		INNY_060	IE_SH_26I010700	Poor	Good	Good	Good	Not at Risk
		INNY_070	IE_SH_26I010800	Good	Good	Moderate	Good	At Risk
KILLBERRY BOG GROUP								

Ref	Bog	River	Water Body	WFD Status				WFD Risk
				2007-2009	2010-2012	2010 – 2015	2013 - 2018	2010-2015
37	Gilltown	BLACKWATER (LONGWOOD)_010	IE_EA_07B020060	Good	Poor	Poor	Poor	At Risk
		BLACKWATER (LONGWOOD)_020	IE_EA_07B020100	Moderate	Moderate	Moderate	Moderate	At Risk
		BLACKWATER (LONGWOOD)_030	IE_EA_07B020200	Poor	Unassigned	Unassigned	Unassigned	At Risk
		BOYNE _060	IE_EA_07B040900	Unassigned	Moderate	Moderate	Good	At Risk
38	Allen	AWILLYINISH STREAM_010	IE_EA_09A020300	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
		LIFFEY_100	IE_EA_09L011200	Moderate	Moderate	Moderate	Moderate	Under Review
		LIFFEY_110	IE_EA_09L011300	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
		LIFFEY_120	IE_EA_09L011500	Moderate	Good	Good	Good	Not at Risk
39	Prosperous	SLATE_010	IE_SE_14S010000	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
		SLATE_020	IE_SE_14S010020	Poor	Poor	Poor	Poor	At Risk
		SLATE_030	IE_SE_14S010036	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
		SLATE_040	IE_SE_14S010050	Poor	Poor	Poor	Poor	At Risk
		SLATE_050	IE_SE_14S010100	Unassigned	Moderate	Moderate	Moderate	At Risk
		SLATE_060	IE_SE_14S010210	Poor	Moderate	Moderate	Moderate	At Risk
		SLATE_070	IE_SE_14S010300	Moderate	Good	Moderate	Good	Not at Risk
		BLACKWATER (LONGWOOD)_010	IE_EA_07B020060	Good	Poor	Poor	Poor	
		BLACKWATER (LONGWOOD)_020	IE_EA_07B020100	Moderate	Moderate	Moderate	Moderate	

Ref	Bog	River	Water Body	WFD Status				WFD Risk
				2007-2009	2010-2012	2010 – 2015	2013 - 2018	2010-2015
40	Kilberry	ATHY STREAM_030	IE_SE_14A060600	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
		BARROW_130	IE_SE_14B011500	Moderate	Moderate	Good	Good	Not at Risk
CUIL NA MONA								
41	Cuil na Carton	TRIOGUE_010	IE_SE_14T010100	Moderate	Moderate	Good	Good	Under Review
		TRIOGUE_020	IE_SE_14T010200	Poor	Poor	Poor	Poor	At Risk
		TRIOGUE_040	IE_SE_14T010400	Poor	Moderate	Moderate	Poor	At Risk
		CLONAWOOLAN STREAM_010	IE_SE_15C191100	Poor	Poor	Poor	Poor	At Risk
		CAPPANACLOGHY_030	IE_SE_15C060990	Unassigned	Unassigned	Unassigned	Unassigned	Under Review
		NORE_90	IE_SE_15N010900	Good	Good	Good	High	Not at Risk

The table below lists watercourses that the EPA has identified as being under pressure due to the Extractive industry as part of the 2018-2021 River Basin Management Plan and includes all peat extraction including Bord na Móna and other peat extraction operators.

Table 11.19: Water Bodies at Risk due to the Extractive Industry

River	Water Body
BOOR_020	IE_SH_26B071200
BLACKWATER (SHANNONBRIDGE)_010	IE_SH_25B270110
DERRYCOOLY STREAM_010	IE_SH_25D130400
SILVER (TULLAMORE)_010	IE_SH_25S030010
DAINGEAN_010	IE_SE_14D060100
TULLAMORE_020	IE_SH_25T030100
DAINGEAN_020	IE_SE_14D060200
DAINGEAN_030	IE_SE_14D060400
FIGILE_040	IE_SE_14F010300
ESKER STREAM_020	IE_SE_14E010200
FIGILE_030	IE_SE_14F010200
SLATE_050	IE_SE_14S010100
SLATE_010	IE_SE_14S010000
AWILLYINISH STREAM_010	IE_EA_09A020300
COTTONERS BROOK_010	IE_SE_14C150500
KINNEGAD_020	IE_EA_07K010100
BOYNE_040	IE_EA_07B040600
BLACKWATER (LONGWOOD)_040	IE_EA_07B020300
BOYNE_060	IE_EA_07B040900
INNY_050	IE_SH_26I010600
INNY_070	IE_SH_26I010800
CLONAWOOLAN STREAM_010	IE_SE_15C191100

Source: EPA

11.3.3 Review of Licences for Environmental Objectives Regulations

The effluent discharges from the bogs have been regulated in accordance with the conditions of Industrial Pollution and Control (IPC) Licence Registration Numbers P0500 to P0507 since 2000. Discharge authorisations from the bog groups were examined by the EPA in 2012/2013 in line with the objectives of the Water Framework Directive and in accordance with the;

- European Communities Environmental Objectives (Surface Water) Regulations 2009, S.I. No. 272 of 2009,
- European Communities Environmental Objectives (Surface Water) (Amendment) Regulations 2012, S.I. 327 of 2012,
- European Communities Environmental Objectives (Groundwater) Regulations 2010 , S.I. No. 9 of 2010,
- European Communities Environmental Objectives (Groundwater)(Amendment) Regulations 2012, S.I. 149 of 2012.

Emissions to water are controlled under Condition 6 of the licenses. Condition 6.1 states that no specified emission to water shall exceed the emission limit values set out in Schedule 1(i): suspended solids emission limit value = 35mg/l. Condition 6 relates to the following:

- The submission and approval of a surface water discharge monitoring programme (Condition 6.2);
- The submission of a proposal for the installation of a flow proportionate composite sampler to one representative process effluent surface water discharge point within the licensed area (Condition 6.3);
- Monitoring and analyses of each agreed emission monitoring location as specified in Schedule 1(ii) Monitoring of Emissions to Water of this licence (Condition 6.4). Schedule 1 (ii) specifies quarterly monitoring of the following parameters: pH, Flow, Suspended Solids, Total Solids, Ammonia, Total Phosphorous, Colour and COD.
- Development and implementation of a surface water drainage programme to ensure that all surface water discharge from the boglands is via an appropriately designed silt pond treatment arrangement (Condition 6.6).
- Operational procedure for desilting and cleaning of the silt ponds including inspection of the ponds (Conditions 6.7 and 6.8);
- Programme to upgrade all the sedimentation pond treatment system addressing provision of additional ponds, weir or pipe installation (inlet and outlet), pond configuration, use of baffles, performance efficiency and frequency of de-silting (Condition 6.9).
- Within three years of date of grant of the licences all existing silt ponds serving operational bogs shall achieve the following minimum performance criteria (flood periods excepted):
  - Maximum flow < 10 cms-1
  - Silt design capacity of lagoons, minimum 50m3 per nett ha of bog serviced
- All new ponds installed shall be designed to achieve these stated minimum design criteria (Condition 6.10).
- Desilting of all silt ponds prone to flooding by 1st November each year (Condition 6.11), and the implementation of procedures to ensure adequate silt control as specified in Condition 6.12.

11.4 Remedial Impact Assessment

11.4.1 Risk to Water Quality

A review of publicly available water quality data was carried out on the water bodies into which the bogs drain. Hydrological connectivity between the bogs and European designated sites is presented and Q values and the WFD status and risk are presented from the mid-1980's to 2018.

Boora Bog Group

The draining of bogs in Boora bog group started as far back as 1951

In general, when looking at historical biological water quality ratings from the EPA on downstream watercourses there has been a slight decline in quality. This could be due to active production on bog units upstream of these watercourses and which drain into their tributaries. However, there are also existing background pressures here, especially agriculture and commercial forestry. In some cases, there has been an improvement in water quality, such as in the Little River Brosna.

Derrygreenagh Bog Group

There appears to have been a slow decline at both the upstream and downstream sites from the Derrygreenagh Bog Group since 1971, which may indicate that it is due to existing background pressures in the catchment. However, there was a drop in quality at both sites in 1994 which continued until the present day. The last bog units in this area to start production were no later than 1985. It is possible that this decline may be due to peat extraction in these bogs but it cannot be said for certain. Interestingly, the same occurred in the River Boyne. Station 0600 upstream of both the River Deel [Raharney] and River Stonyford 07 confluences and station 1000 downstream of these confluences also showed a decline around this time, from 1990 onwards. Specific monitoring records for these bog units would have to be obtained in order to definitively assess potential impacts on receiving waters.

Blackwater Bog Group

Overall there does not appear to be any particularly obvious declines in water quality for the River Blackwater [Shannonbridge]. There are slight drops in water quality on the upstream site but this also shows improvement year after year followed again by a slight decline. This may be due to a multitude of factors including background water quality issues or cumulative impacts from peat extraction. As well, the downstream site shows a general improvement after 2002, which also may be due to other factors in the study area. At the same time, the EPA do indicate siltation impacts downstream. It is not possible at this time to quantify or assess historical impacts arising from the Blackwater bog group that may be affecting the receiving waters due to the lack of targeted historical monitoring.

Allen Bog Group

Historical data for water quality monitoring on the River Daingean shows that water quality improves downstream. The site closest to the bog units has either a ‘Poor’ or ‘Bad’ water quality status. The improvement downstream is likely to be due to dilution factors and assimilation.

The available EPA data shows some negative downstream impacts on water quality arising from the cluster of bogs draining to the Figile. It also shows however that water quality improves further downstream, which may indicate that this impact is assimilated to some degree. However, as this is a wide area with many existing background pressures, and in the lack of bog specific historical monitoring, it cannot be said for certain if these impacts are indeed caused by peat extraction here. Nonetheless it is likely that it would be a contributing factor.

Mountdillon Bog Group

Milkernagh bog unit was drained in 1947 and production started in 1953, as was the Coolnagun bog unit. The Coolcraff bog unit was drained in 1981 and production started in 1989. Station 0600 is located upstream of the bog units and station 0750 is the nearest downstream, with station 0800 being further downstream but more regularly monitored.

Data shows that there has been a gradual decline in water quality over the years at both the upstream and downstream sites. While the upstream site had a higher rating in the first few years. However, between 1987 and 1992 there was a decline at all sites. The las bog unit was drained in 1981 and production began in 1989 which may have contributed to a decline but again the site upstream also declined around this time. This may be due to existing background pressures such as agriculture, but it cannot be ruled out that the peat extraction activities in Mountdillon bog group, and other commercial milled peat extraction upstream and downstream, did not cumulatively add to this.

Kilberry Bog Group

For the River Barrow, station 1400 which is upstream, showed to have better water quality status in 1971 when monitoring began, and declined to Q4 in 1980 and has stayed at this rating ever since. The site downstream, station 1900, however started in 1971 with the lowest Q value of Q1 indicating WFD status 'Bad'. This continued with a low rating until 1980, which saw a sharp jump in improvement to Q4, and has mostly stayed at this rating since. Production had started in Kilberry bog unit upstream since 1948, so it is unclear what may have caused these changes in quality. However, there was a decline from the upstream site to the downstream site up until 1980. After this point they were rated relatively the same. For the River Blackwater [Longwood] however, while ratings have been generally the same, most recently the upstream site has actually had a lower rating than the downstream site. Again, this is likely to be due to background issues with maybe an improvement showing downstream due to dilution factors.

Coolnamona Bog Group

The water quality in Clonawoolan Stream has remained fairly poor. It is noted that production on this bog had commenced in 1966, well before EPA monitoring began. The water quality appears to have improved slightly over the years but is still considered to be Poor. The EPA also carry out monitoring on the River Nore upstream and downstream of the Cappancloghy 15 stream, into which all of the watercourses that drain the Coolnacartan bog unit flow into. This data shows that overall since 1984 both sites have had similar ratings, with both sites also showing an improvement from 2010. In general, the downstream site also shows an improvement in water quality.

The Clonawoolan stream in general has had poor water quality and this could be due to upstream peat extraction activities from the Coolnacartan bog unit. However, it may also be due to a multitude of factors including background agricultural pressures. So, it is likely that any potential impacts from the bog would be acting in combination with existing pressures. Without specific monitoring data for this bog it is not possible to quantify any potential impact on receiving waters.

11.4.2 Summary

The water quality in the waterbodies within the study area has varied in response to many different pressures within the catchment. Examples of other pressures are agricultural, commercial forestry, urban wastewater treatment. Examination of water quality data in the receiving water bodies shows that it is likely that peat extraction activities have had an adverse impact on water quality in receiving water bodies, however, much of this impact has occurred in the temporal scope of this rEIAR (i.e. 1985). It is not possible to quantify the magnitude or significance of that impact given the multitude of other factors that have influenced these water bodies.

11.4.3 Surface Water Management

The bog groups are regulated by the EPA under IPC Licences Registration No's. 0500 to 0506. Discharge authorisations from the bog groups were examined by the EPA in 2012/2013 in line with the objectives of the Water Framework Directive, and revised IPC licenses were issued by the EPA to Bord na Móna Energy Limited further to these reviews in 2012/2013. In accordance with the revised licenses, a composite sampler was installed at a single location for each bog group from 2015 to 2019. The composite sampler took a flow proportional composite sample over a 24-hour period and weekly grab samples were taken for analysis of ammonia in order to track trends in the monitoring results and track the relationships between the ammonia concentrations and other factors.

The results indicate very occasional exceedances of the ammonia trigger levels for each bog (determined by Bord na Móna and approved by the EPA). It is not possible to identify any obvious link between periods of production, winter maintenance or silt pond maintenance events on the concentration of ammonia discharging from the peatlands. The only link expected would be that related to rainfall events and seasonal weather patterns and the subsequent surface water runoff and associated ammonia concentrations.

11.5 Mitigation and Monitoring

Since 2000 mitigation and monitoring of surface water impacts have been carried out in accordance with the conditions of IPC Licences Registration No's. 0500 to 0507.

Existing mitigation/control measures that were implemented (and continue to be implemented) under the IPC licences have limited runoff rates from the bog units, and included:

- Appropriately designed silt pond treatment arrangement with an emission limit value for suspended solids of: 35mg/l for all surface water outfalls from boglands.
- Field drains with low gradients.
- Silt ponds were cleaned at least twice a year to maintain adequate storage and treatment (sedimentation/settlement) capacity.

11.6 Residual Impacts

The water quality in the waterbodies within the study area has varied in response to many different pressures within the catchment. Examples of other pressures are agricultural, commercial forestry, urban wastewater treatment. Examination of water quality data in the receiving water bodies shows that it is likely that peat extraction activities have had an adverse impact on water quality in receiving water bodies, however, in the majority of cases this impact has occurred at a time in advance of the temporal scale of this assessment. It is possible that the initial impacts are having legacy effects on the receiving waterbodies e.g. due to the level of historic sedimentation that would have occurred at initial bog drainage. However, in the absence of data it is not possible to quantify the magnitude or significance of the impact given the multitude of other factors that have influenced these water bodies.

12 Traffic and Transportation

12.1 Introduction

This chapter of the rEIAR addresses the impacts of peat extraction in the 41 bog units (outlined in Chapter 5) on the traffic and transportation network of the surrounding areas.

The extracted peat was transported from each bog to its destination either by rail, or by road haulage, depending on the destination or end use of the peat. The mode of transport was dependent on the location of the bog, and the surrounding infrastructure, with some bogs transporting peat via a combination of these two methods.

12.2 Methodology

Road haulage data between the years of 2012 and 2019 inclusive was made available by Bord na Móna, showing the tonnage of peat transported, and the number of runs taken. This was compared with existing traffic conditions at each of the locations to assess the impact of the peat extraction on the traffic of the area. The relative impact that traffic generated had on the areas was taken as the ratio of the traffic generated by the peat production and existing traffic and was expressed as a percentage.

Where the sites were served by the national primary road network, the TII Traffic Data website (www.nratrafficdata.ie) has been utilised to identify annual average daily traffic (AADT) for the roads between the production site and the destination.

As exact routes taken for peat transported by road are not available, a direct route was chosen between each of the identified bogs and their destination. The assumed routes minimised the usage of smaller local roads where possible.

Generally, sites which were not serviced by the national primary road network utilised rail exclusively for peat transport.

12.3 Receiving Environment

The profile of the road haulage of peat is such that a small number of destinations comprised the vast majority of the total peat transported by road. The three largest of these are:

- Lough Ree Power Station
- West Offaly Power Station
- Dublin Port

12.4 Remedial Impact Assessment

The impact that the peat extraction has had on the surrounding road networks historically is difficult to assess, as detailed data relating to the transportation is not available. An impact analysis was carried out, utilising available haulage information.

The following details are presented in Table 12.1*;*

- The number of runs made to each of these facilities between 2012 and 2019
- An average number of runs per day in this eight-year period between 2012 and 2019, based on 252 working days a year.
- The bog group (as outlined in Chapter 5) which constituted the majority of the supply to the area
- A TII traffic counter with the lowest Annual Average Daily Traffic (AADT) between the destination and the key area which supplied it. Lowest AADT was chosen conservatively as development traffic would have the largest impact on the lowest AADT.
- The relative impact of the traffic generated by the peat production on the connecting road, expressed as a percentage. This was obtained by dividing the traffic generated by the total daily traffic of the area.
- The number of HGVs travelling the route daily was established using TII traffic data, and this was also compared to the generated traffic to establish a relative impact. This was obtained in the same manner as with the AADT, by dividing the traffic generated by the total daily HGV traffic of the area and expressed as a percentage.

Table 12.1: Impact Analysis

Destination	Runs 2012-2019	Average Daily Runs	Key Supply Area	Traffic Counter	Lowest AADT	Relative impact (%)	Daily HGV (% HGV)	Relative impact - HGV (%)
Lough Ree Power Station	51245	26	Cuil na Gun	TMU N04 110.0 W	11657	0.22%	977 (8.38%)	2.60%
West Offaly Power Station	45275	23	Boora Bog Group	TMU N62 100.0 S	4456	0.50%	242 (5.43%)	9.28%
Dublin Port	33313	17	Kilberry Bog Group	TMU N78 030.0 S	4443	0.37%	211 (4.75%)	7.83%

As the routes taken between facilities are not known, a direct route was assumed. The assumed routes minimised the usage of smaller local roads where possible.

For each of the areas, the traffic counter selected was located on this direct route, and in the instance where there were multiple traffic counters, the one with the lowest AADT was chosen to gauge the area where the impact of the traffic would be largest.

As can be seen in Table 12.1 *Impact Analysis,* the average daily runs are marginal when compared with the AADT or the daily HGV movements of the connecting road. This impact analysis showed that for the three destinations which are in receipt of the most peat transported by road, the relative contribution of the peat extraction to the overall traffic of the areas was between 0.22% and 0.50%. The overall contribution to HGV traffic in the area was between 2.60% and 9.28%. For the purposes of this assessment, this contribution was deemed to be negligible. By its nature this approach considers cumulative effects also.

63% of all peat produced in the bogs under consideration was transported by rail to its end point, with the remaining 37% transported by road. Table 12.2 shows data provided by Bord na Móna regarding the supply of peat by road to each of the end points, showing the total amount of peat and the number of runs made in this eight-year period.

Table 12.2: Road Haulage 2012-2019

Substitute Consent Bogs (by Bog Group)		Boora Bog Group	Blackwater Bog Group	Derrygreenagh Bog Group	Allen Bog Group	Kilberry Bog Group	Cuil na Gun	Cuil Na Mona	Total
Lough Ree Power Station	Number of Runs	248		11,678	10,400	4,692	24,225	2	**51,245**
	Tonnage	6,402		319,030	289,164	127,884	674,248	59	**1,416,786**
Ballivor Hort Processing Plant	Number of Runs	1		72		49			**122**
	Tonnage	24		1,681		1,208			**2,912**
Derrinlough Briquette Factory	Number of Runs	13,236		622	3,312			2276	**19,446**
	Tonnage	328,242		17,008	91,205			61345	**497,800**
Cuil na Mona Hort Processing Plant	Number of Runs	3,280		805	26	3,697		1298	**9,106**
	Tonnage	84,093		21,000	699	92,294		34368	**232,454**
West Offaly Power Station	Number of Runs	18,002		4,254	12,600	635		5784	**41,275**
	Tonnage	436,094		117,043	346,761	16,783		161094	**1,077,776**
Kilberry Hort Processing Plant	Number of Runs	1,287		1,269	2,220	3,509		1767	**10,052**
	Tonnage	30,678		33,688	54,783	94,509		48176	**261,834**
Edenderry Power Station	Number of Runs	76		343	565			766	**1,750**
	Tonnage	2,097		9,376	14,625			21678	**47,776**
Littleton Briquette Factory	Number of Runs	17		6	2			6	**31**
	Tonnage	420		163	56			156	**795**
Others	Number of Runs	18,318		1,577	206	1,726	289	68	**22,184**
	Tonnage	404,966		34,400	5,078	37,149	8,670	1839	**492,102**
Dublin Port	Number of Runs	5,331		9,225	157	18,488		112	**33,313**
	Tonnage	125,575		237,617	4,386	471,798		2762	**842,138**
Total	Total Number of Runs	59,796	-	29,851	29,488	32,796	24,514	12079	**188,524**
	Total Tonnage	1,418,590	-	791,006	806,757	841,624	682,918	331477	**4,872,374**

As evidenced above, road haulage was not evenly distributed to the destinations. The three destinations that utilised the most peat transported by road (Lough Ree Power Station, West Offaly Power Station and Dublin Port) accounted for 68% of the total peat transported this way and 67% of the total runs made.

Peat production declined for the production period 2013 – 2019 as shown in Table 12.3 below:

Table 12.3: Peat production 2013-2019

Year	Estimated tonnes of peat produced
2013	2,916,713
2014	2,047,918
2015	1,633,460
2016	1,493,499
2017	1,710,072
2018	1,881,665
2019	837,337

Table 12.4 shows a breakdown of the supply of peat to the destinations historically.

Table 12.4: Peat End Points

Site	2012-2019 Peat Supplied by Rail (tonnes)	2012-2019 Peat Supplied by Road (tonnes)
Lough Ree Power Station	-	1,416,786
West Offaly Power Station	1,817,544	1,077,776
Edenderry Power Station	4,067,575	47,776
Derrinlough Briquette Factory	1,598,263	497,800

As discussed previously, Lough Ree Power Station and West Offaly Power Station were the two largest recipients of peat via the road network. These four end points constituted 62% of the overall peat transported by road between 2012 and 2019.

The traffic generated due to historic peat extraction activities have had a minimal impact on road users, as a large proportion of the product is transported via the private rail network. Where road transport is utilised, the facilities are in close proximity to the national primary road network, which they do not saturate.

12.5 Mitigation and Monitoring

No mitigation or monitoring has been carried out.

12.6 Residual Impacts

As outlined above, the traffic generated due to historic peat extraction activities have a minimal impact on road users, as a large proportion of the product is transported via the private rail network. Where road transport is utilised, the facilities are in close proximity to the national primary road network, which they do not saturate.

13 Flood Risk

13.1 Introduction

Bord na Móna (and Hydro-Environmental ltd.) have carried out a Flood Risk Assessment of the 41 bogs, in accordance with the flood risk requirements as set out in the Department of Environment, Heritage and Local Government *The Planning System and Flood Risk Management - Guidelines to Planning* (DEHLG, 2009). A copy of the Flood Risk Assessment Report is included in Appendix 13 *Flood Risk.*

This chapter presents a summary of the Bord na Móna Flood Risk Assessment Report.

13.2 Methodology

The 41 bog units were grouped by their IPC Licence Bog Group and assessed under the following headings:

- Site Location
- Bog Description
- Regional Hydrology
- Historical Flooding
- Groundwater Flood Risk
- Fluvial Flood Risk
- Pluvial Flood Risk
- Climate Change

13.2.1 Historical Flooding

Data on historical flooding was collected from the Office of Public Works (OPW's) national flood information portal, www.floodinfo.ie, and reviewed in conjunction with aerial flood mapping from 2009 and 2015 events, and historical Ordnance Survey maps. Anecdotal information from Bord na Móna employees and site managers was also collected and assessed.

13.2.2 Groundwater Flood Risk

Groundwater flood risk was assessed using the Preliminary Flood Risk Assessment (PFRA) maps and local knowledge on past groundwater flood events.

13.2.3 Fluvial Flood Risk

Fluvial flood risk was assessed by first identifying the regional hydrology, including river catchments and sub-basins, for each bog. The OPW's PFRA maps were also reviewed, in particular the High-End Future Scenarios in relation to each bog. Information on the OPW's Arterial Drainage Schemes, the Drainage Districts, and on embankments as taken over by the Land Commission was also collated and reviewed.

13.2.4 Pluvial Flood Risk

Pluvial modelling of the bogs was undertaken in order to determine the volume of greenfield runoff (Q_{BAR}). This was done using the formula from The Institute of Hydrology Report No.124 (IH 124, 1994), where:

$Q_{BAR} = 0.00108 \times AREA^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$, and

- AREA = catchment area determined using a topographical model produced using 2008 LiDAR survey data and 2015 field survey data.
- SAAR = standard annual average rainfall determined from rainfall data from Met Eireann and/or EPA Hydronet for 18 or 24 hour durations
- SOIL = the soil index defined as:

$$\frac{(0.15S_1 + 0.30S_2 + 0.40S_3 + 0.45S_4 + 0.50S_5)}{(S_1 + S_2 + S_3 + S_4 + S_5)}$$

  Where Soil Type 2 (S_2) has been selected as the soil type for all bog catchments.

Three scenarios were modelled for each bog; 100-year return period, 100-year return period plus 30% for climate change, and 1,000-year return period.

Where the bogs have surface water pumps, these pumps were disregarded in relation to the pluvial modelling, such that the “worst case” scenario is modelled, i.e. no pumps operating.

13.2.5 Climate Change

Based on review of DEFRA (UK) guidance and OPW guidance, climate change is assessed in the pluvial modelling for a 100-year storm by increasing the rainfall by an additional 30% to account for climate change.

13.3 Receiving Environment

A summary of the conclusions from the Flood Risk Assessment is provided in Table 13.1. In relation to all bog units, groundwater seepage has not been identified as a source of flooding and is therefore not included in the Flood Risk Assessment presented in Appendix 13 *Flood Risk*.

Where Bord na Móna has identified that a bog is Flood Zone A Justification Tests have been carried out in accordance with *The Planning System and Flood Risk Management - Guidelines to Planning* (DEHLG, 2009).

The findings of the Justification Tests are included in the Flood Risk Assessment Report (Bord na Móna, 2020) included in Appendix 13 *Flood Risk.*

Table 13.1: Flood Risk Identification – Summary from Flood Risk Assessment Report

Bog Unit	Historical Flooding	Fluvial Flood Risk	Pluvial Flood Risk	Works Area Flood Risk	Peat Production Area Flood Risk
Bellair North	During periods of heavy rainfall, when the pump P15-10 is pumping, flooding has occurred downstream of the silt pond that discharges through outfall SW37. Bord na Móna has mitigated this issue by switching off the pump in periods of wet weather and consequently flooding occurs to the production areas. There is available storage capacity in the peat production area for these flood events.	Outfalls will become submerged when the water levels of the rivers into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the adjoining water courses if their levels ever rise during flood events. If this were to occur, based on the size and characteristics of the watercourses the duration would be relatively short.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelled flood levels also indicated that the Works Areas including the buildings and peat lorry loading area would not be impacted by these flood events.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Lemanaghan	The 2009 aerial imagery are the only historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area does occur on occasion.	Outfalls will become submerged when the water levels of the rivers into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the adjoining water courses if their levels ever rise during flood events. If this were to occur, based on the size and characteristics of the watercourses the duration would be relatively short.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelled flood levels also indicated that the Works Areas including the buildings would not be impacted by these flood events.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Noggusboy	The aerial imagery of the 2009 flood event shows flooding in the western area of the bog and a small area in the eastern section. The western area is now developing as a wetland as the pump is no longer in operation.	Outfalls will become submerged when the water levels of the rivers into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the adjoining water courses if their	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is	• Outside 1,000-year flood event extents. • Flood Zone C	• High Probability • Flood Zone A • Justification Test required

Bog Unit	Historical Flooding	Fluvial Flood Risk	Pluvial Flood Risk	Works Area Flood Risk	Peat Production Area Flood Risk
	There are no other historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area does occur on occasion.	levels ever rise during flood events. If this were to occur, based on the size and characteristics of the watercourses the duration would be relatively short.	significant storage available on the bog to attenuate this flood water. The modelled flood levels also indicated that the Works Areas including the buildings would not be impacted by these flood events.	• Appropriate for all types of development • No Justification Test required	
Boora	The aerial imagery of the November 2009 flood event shows some minor flooding in the centre of the bog. There are no other historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area does occur on occasion.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the adjoining water courses if their levels ever rise during flood events. If this were to occur, based on the size and characteristics of the watercourses the duration would be relatively short.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelled flood levels also indicated that the Works Areas including the buildings would not be impacted by these flood events.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Galros	There are no historical records of any flooding events or any historical flooding of the site, however from local Bord na Móna knowledge flooding of the peat production area has occurred, particularly at the lower, southern end of the site.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the adjoining water courses if their levels ever rise during flood events. If this were to occur, based on the size and characteristics of the watercourses the duration would be relatively short.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelled flood levels indicated that flooding will not impact areas outside of the production areas and that the welfare centre at the northern end of the site is above the predicted flood level.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Killaun	There are no historical records of any flooding events or any	Outfalls will become submerged when the water levels of the	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up	• Outside 1,000-year	• High Probability

Bog Unit	Historical Flooding	Fluvial Flood Risk	Pluvial Flood Risk	Works Area Flood Risk	Peat Production Area Flood Risk
	historical flooding of the site, however from local knowledge flooding of the peat production area does occur on occasion.	receiving waters into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the adjoining water courses if their levels ever rise during flood events. If this were to occur, based on the size and characteristics of the watercourses the duration would be relatively short.	within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelled flood levels also indicated that the Works Areas including the buildings area would not be impacted by these flood events.	flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• Flood Zone A • Justification Test required
Derrinboy	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area does occur on occasion.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the adjoining water courses if their levels ever rise during flood events. If this were to occur, based on the size and characteristics of the watercourses the duration would be relatively short.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelled flood levels also indicated that the Works Areas including the buildings area would not be impacted by these flood events.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Derryclure	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area does occur on occasion.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the adjoining water courses if their levels ever rise during flood events. If this were to occur, based on the size and	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelled flood levels also indicated that the Works Areas including the	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required

Bog Unit	Historical Flooding	Fluvial Flood Risk	Pluvial Flood Risk	Works Area Flood Risk	Peat Production Area Flood Risk
		characteristics of the watercourses the duration would be relatively short.	buildings area would not be impacted by these flood events.		
Monettia	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area does occur on occasion.	Outfalls will become submerged when the water levels of the rivers into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the adjoining water courses if their levels ever rise during flood events. If this were to occur, based on the size and characteristics of the watercourses the duration would be relatively short.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelled flood levels also indicated that the Works Areas including the buildings and peat lorry loading area would not be impacted by these flood events.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Killaranny	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area does occur on occasion.	Outfalls will become submerged when the water levels of the rivers into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the adjoining water courses if their levels ever rise during flood events. If this were to occur, based on the size and characteristics of the watercourses the duration would be relatively short.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelled flood levels also indicated that the Works Areas including the buildings would not be impacted by these flood events.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Carranstown	There are no historical records of any flooding events or any historical flooding of the site, however from local Bord na Móna knowledge flooding of the peat production area has occurred	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. There is no record of this having occurred previously on this site. The culverted outfalls from the bog to the local	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100year and 1000year rainfall depths for critical durations including a 100year climate change scenario. This modelling demonstrated that there is		• High Probability • Flood Zone A • Justification Test required

Bog Unit	Historical Flooding	Fluvial Flood Risk	Pluvial Flood Risk	Works Area Flood Risk	Peat Production Area Flood Risk
	locally only and is remedied by ongoing maintenance of drains.	drains reduce the potential for significant inflow from the river. If this were to occur, based on the size and characteristics of the watercourses the duration would be relatively short.	significant storage available on the bog to attenuate this flood water. The modelled flood levels indicated that flooding will not impact areas outside of the production areas.		
Bracklin	There are no historical records of any flooding events or any historical flooding of the site, however from local Bord na Móna knowledge flooding of the peat production area has occurred locally only and is remedied by ongoing maintenance of drains.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. There is no record of this having occurred previously on this site. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river. If this were to occur, based on the size and characteristics of the watercourses the duration would be relatively short.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100year and 1000year rainfall depths for critical durations including a 100year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelled flood levels indicated that flooding will not impact areas outside of the production areas.		• High Probability • Flood Zone A • Justification Test required
Ballivor	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area has occurred locally only and is remedied by ongoing maintenance of drains.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. There is no record of this having occurred previously on this site. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river. If this were to occur, based on the size and characteristics of the watercourses the duration would be relatively short.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100year and 1000year rainfall depths for critical durations including a 100year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelling carried out indicated that the maximum predicted 1 in 1000-year flood levels will be below the levels in the horticultural peat factory in the northern end of the site and will be limited to the production areas.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Kinnegad (Rossan)	There are no historical records of any flooding events or any historical flooding of the site,	Outfalls will become submerged when the water levels of the receiving waters into which they are	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk	• Northern end at risk for	• High Probability • Flood Zone A

Bog Unit	Historical Flooding	Fluvial Flood Risk	Pluvial Flood Risk	Works Area Flood Risk	Peat Production Area Flood Risk
	however from local knowledge flooding of the peat production area has occurred locally only and is remedied by ongoing maintenance of drains.	discharging are high. There is no record of this having occurred previously on this site. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river.	modelling was carried out using the estimated 100year and 1000year rainfall depths for critical durations including a 100year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelling carried out indicated that the estimated 1000-year flood event would cause flooding in the compound area in the northern end of the site but that the 100-year event would not cause flooding to occur.	1,000-year flood event. • Outside 100-year flood event extent. • Flood Zone B • No Justification Test required.	• Justification Test required
Ballybeg	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area has occurred where bog pumps have failed to operate or where pumps have not been able to meet the demands imposed by extreme rainfall events.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. There is no record of this having occurred previously on this site. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100year and 1000year rainfall depths for critical durations including a 100year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. Modelling also indicated that the works area on the eastern side of Ballybeg bog was not at risk of flooding in any of the scenarios modelled.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Ballaghurt	The 2009 and 2015 aerial imagery show some flooding in Ballaghurt Bog. And there is historical reference to flooding of Derryharney Bog (western section of Ballaghurt Bog) by the local authority. From local knowledge flooding of the peat production area does occur on occasion, however there is no record of	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the adjoining water courses if their levels ever rise during flood events. If this were to occur, based on the size and	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelled flood levels also indicated that the Works Areas including the	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required

Bog Unit	Historical Flooding	Fluvial Flood Risk	Pluvial Flood Risk	Works Area Flood Risk	Peat Production Area Flood Risk
	flooding of the works area or buildings.	characteristics of the watercourses the duration would be relatively short.	buildings area would not be impacted by these flood events.		
Daingean (Derries)	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area does occur on occasion.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river. If this were to occur, based on the size and characteristics of the watercourses the duration would be relatively short.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelled flood levels also indicated that the Works Areas including the buildings area would not be impacted by these flood events.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Daingean (Rathdrum)	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area does occur on occasion.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river. If this were to occur, based on the size and characteristics of the watercourses the duration would be relatively short .	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelled flood levels also indicated that the Works Areas including the buildings area would not be impacted by these flood events.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Clonad	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area does occur on occasion.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river. If this	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is	• Outside 1,000-year flood event extents. • Flood Zone C	• High Probability • Flood Zone A • Justification Test required

Bog Unit	Historical Flooding	Fluvial Flood Risk	Pluvial Flood Risk	Works Area Flood Risk	Peat Production Area Flood Risk
		were to occur, based on the size and characteristics of the watercourses the duration would be relatively short.	significant storage available on the bog to attenuate this flood water. The modelled flood levels also indicated that the Works Areas including the buildings area would not be impacted by these flood events.	• Appropriate for all types of development • No Justification Test required	
Ballykeane	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area does occur on occasion.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river. If this were to occur, based on the size and characteristics of the watercourses the duration would be relatively short.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelled flood levels also indicated that the Works Areas including the buildings area would not be impacted by these flood events.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Esker	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area does occur on occasion.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river. If this were to occur, based on the size and characteristics of the watercourses the duration would be relatively short.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelled flood levels also indicated that the Works Areas including the buildings area would not be impacted by these flood events.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Garrymore	There are no historical records of any flooding events or any	Outfalls will become submerged when the water levels of the	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up	• Outside 1,000-year	• High Probability

Bog Unit	Historical Flooding	Fluvial Flood Risk	Pluvial Flood Risk	Works Area Flood Risk	Peat Production Area Flood Risk
	historical flooding of the site, however from local knowledge flooding of the peat production area does occur on occasion.	receiving waters into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river. If this were to occur, based on the size and characteristics of the watercourses the duration would be relatively short.	within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelled flood levels also indicated that the Works Areas including the buildings area would not be impacted by these flood events.	flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• Flood Zone A • Justification Test required
Derrylea	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area does occur on occasion.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelled flood levels also indicated that the Works Areas including the buildings area would not be impacted by these flood events.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Ticknevin	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area has occurred in Ticknevin where existing surface water pumps have failed to operate, as well as more locally where drains have become blocked internally.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. There is no record of this having occurred previously on this site. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelling also demonstrated that under worst case flooding conditions, the works	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required

Bog Unit	Historical Flooding	Fluvial Flood Risk	Pluvial Flood Risk	Works Area Flood Risk	Peat Production Area Flood Risk
			compound at the southern end of Ticknevin bog is not at risk of pluvial flooding.		
Glashabaun North	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area has occurred in Glashabaun North where existing surface water pumps have failed to operate, as well as more locally where drains have become blocked internally.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. There is no record of this having occurred previously on this site. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Glashabaun South	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area has occurred locally where drains have become blocked internally.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. There is no record of this having occurred previously on this site. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Codd North	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area has occurred locally where	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. There is no record of this having occurred previously on this site. The culverted outfalls from the bog to the local	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development	• High Probability • Flood Zone A • Justification Test required

Bog Unit	Historical Flooding	Fluvial Flood Risk	Pluvial Flood Risk	Works Area Flood Risk	Peat Production Area Flood Risk
	drains have become blocked internally.	drains reduce the potential for significant inflow from the river.	significant storage available on the bog to attenuate this flood water.	• No Justification Test required	
Codd South	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area has occurred in Codd South and Ballydermot North and South where water in receiving water courses is high or where existing surface water pumps have failed to operate, as well as more locally where drains have become blocked internally.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Ballydermot North	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area has occurred in Codd South and Ballydermot North and South where water in receiving water courses is high or where existing surface water pumps have failed to operate, as well as more locally where drains have become blocked internally.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelling has shown that the welfare centre in Ballydermot North bog is not at risk of flooding under any scenario modelled.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Ballydermot South	There are no historical records of any flooding events or any historical flooding of the site,	Outfalls will become submerged when the water levels of the receiving waters into which they are	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk	• Outside 1,000-year	• High Probability • Flood Zone A

Bog Unit	Historical Flooding	Fluvial Flood Risk	Pluvial Flood Risk	Works Area Flood Risk	Peat Production Area Flood Risk
	however from local knowledge flooding of the peat production area has occurred in Codd South and Ballydermot North and South where water in receiving water courses is high or where existing surface water pumps have failed to operate, as well as more locally where drains have become blocked internally.	discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river.	modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelling has shown that the Ballydermot Works (Ballydermot South bog) are not at risk of flooding under any scenario modelled.	flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• Justification Test required
Blackriver	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area has occurred in Blackriver where existing surface water pumps have failed to operate, as well as more locally where drains have become blocked internally.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. There is no record of this having occurred previously on this site. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Barnaran	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area has occurred locally where drains have become blocked internally.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. There is no record of this having occurred previously on this site. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. Modelling has predicted that flooding will occur at the welfare centre area located on the western side of Barnaran bog at a frequency of less than 1 in 100 years.	• Welfare centre at the southern end of the bog is within the 1 in 100 year flood extents. • Flood Zone A • Justification Test required	• High Probability • Flood Zone A • Justification Test required

Bog Unit	Historical Flooding	Fluvial Flood Risk	Pluvial Flood Risk	Works Area Flood Risk	Peat Production Area Flood Risk
Lodge	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area has occurred in Lodge where water levels in receiving waters have risen to above the level of the outfall pipes and potentially created an inflow into the bog.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. OPW CFRAM mapping for the 1 in 1000year event associated with the High-End Future Scenario identifies areas within the southern end of Lodge bog which are at risk of flooding. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. There is no building or works area in Lodge Bog.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Cuil na Gun	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area has occurred locally where levels in the River Inny have risen above the outfall levels, where pumps have failed to operate in the past or where drains have become blocked internally	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100year and 1000year rainfall depths for critical durations including a 100year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelling carried out indicated that the estimated 1000 year flood event would not lead to flooding to the works area on the eastern side of the bog.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Milkernagh	There are records of local flooding having occurred within the peat production areas of the bog. However from local knowledge, flooding of the peat production area has occurred locally where levels in the River Inny have risen above the outfall levels, where pumps have failed to operate in	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100year and 1000year rainfall depths for critical durations including a 100year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelling carried out indicated	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development	• High Probability • Flood Zone A • Justification Test required

Bog Unit	Historical Flooding	Fluvial Flood Risk	Pluvial Flood Risk	Works Area Flood Risk	Peat Production Area Flood Risk
	the past or where drains have become blocked internally		that the estimated 1000 year flood event would not lead to flooding to the works area in the southern end of the bog	• No Justification Test required	
Coolcraff	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area has occurred locally where drains have become blocked internally.	Outfalls will become submerged when the water levels of the receiving waters into which they are discharging are high. There is no record of this having occurred previously on this site. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the river.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100year and 1000year rainfall depths for critical durations including a 100year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. Modelling carried out indicated that the estimated 1000 year flood event would not lead to flooding to the welfare centre of access points to the site.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Gilltown	There are no historical records of any flooding events or any historical flooding of the works area, however from local Bord na Móna operatives' knowledge, flooding of the peat production area does occur on occasion if the outfall pipes get blocked. A historical flooding issue north of SW7 appears to have been resolved through the diversion of drainage within the bog.	Outfalls may become submerged when the water levels of the rivers into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the adjoining water courses if their levels ever rise during flood events. If this were to occur, based on the size and characteristics of the watercourses the duration would be relatively short.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. Flooding of the production fields is predicted within the northern and north-eastern catchments of the bog, however this flood water will be retained by the elevated rail line and headlands situated between the peat production areas and the works area.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Allen	There are no historical records of any flooding events or any historical flooding of the works	Outfalls will become submerged when the water levels of the watercourses into which they are	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk	• Outside 1,000-year	• High Probability • Flood Zone A

Bog Unit	Historical Flooding	Fluvial Flood Risk	Pluvial Flood Risk	Works Area Flood Risk	Peat Production Area Flood Risk
	area, however from local knowledge flooding of the peat production area does occur on occasion if the outfall pipes get blocked or back up due to high water level in the receiving waters.	discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the adjoining water courses if their levels ever rise during flood events. If this were to occur, based on the size and characteristics of the watercourses the duration would be relatively short.	modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. Flooding in the catchment to the west of the works area is predicted to occur, however this flood water will be retained by the elevated rail line and headlands situated between the peat production areas and the works area.	flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• Justification Test required
Prosperous	There are no historical records of any flooding events or any historical flooding of the works site, however from local knowledge flooding of the peat production area does occur on occasion. OPW records indicate that recurring on the local road close to the works entrance has been an issue in the past.	Outfalls will become submerged when the water levels of the rivers into which they are discharging are high. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the adjoining water courses if their levels ever rise during flood events. If this were to occur, based on the size and characteristics of the watercourses the duration would be relatively short.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelled flood levels also indicated that the Works Areas including the buildings and peat lorry loading area would not be impacted by these flood events.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required
Kilberry	There are records of flooding having occurred within the yard areas of the existing horticultural peat factory on the western side of the site. Information from Bord na Móna operatives suggests that flooding of the peat production area has occurred locally where drains have become blocked internally.	OPW CFRAM mapping identifies flooding of a number of watercourses in the area including the River Barrow, Tully Stream and Kildoon watercourse. The extent of this flooding is predicted to extend into northern and eastern parts of Kilberry bog.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100-year and 1000-year rainfall depths for critical durations including a 100-year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. Flooding is identified with the western and eastern/central catchments of these bogs. Flooding to catchments to the rear of the horticultural peat factory is predicted to occur,		• High Probability • Flood Zone A • Justification Test required

Bog Unit	Historical Flooding	Fluvial Flood Risk	Pluvial Flood Risk	Works Area Flood Risk	Peat Production Area Flood Risk
			however this flood water will be retained by the elevated lands situated between the peat production areas and the horticulture factory.		
Cuil na Carton	There are no historical records of any flooding events or any historical flooding of the site, however from local knowledge flooding of the peat production area does occur on occasion.	There is no record of the outfalls in Coolnacartan bog backing up as a result of high water levels in the receiving waters. The culverted outfalls from the bog to the local drains reduce the potential for significant inflow from the adjoining water courses if their levels ever rise during flood events. If this were to occur, based on the size and characteristics of the watercourses the duration would be relatively short.	The principal flood risk to the development is from the pluvial ponding of direct rainfall building up within the peat production areas. Pluvial flood risk modelling was carried out using the estimated 100year and 1000year rainfall depths for critical durations including a 100year climate change scenario. This modelling demonstrated that there is significant storage available on the bog to attenuate this flood water. The modelled flood levels also indicated that the Works Areas including the buildings and peat lorry loading area would not be impacted by these flood events.	• Outside 1,000-year flood event extents. • Flood Zone C • Appropriate for all types of development • No Justification Test required	• High Probability • Flood Zone A • Justification Test required

13.4 Mitigation and Monitoring

Since 2000, mitigation and monitoring of surface water impacts have been carried out in accordance with the conditions of IPC Licences Registration No's. 0500 to 0506.

13.5 Residual Impacts

Pluvial flooding is considered the primary flood risk across the bogs, rather than flooding from groundwater or fluvial flooding. Historical fluvial flooding was not recorded across the bogs, with the only evidence of historical flooding coming from aerial photographs in 2007 and 2009 in some bogs, which is presumed to be pluvial. The majority of the bogs are within Flood Zone C and are appropriate for all types of development. Some areas of the 41 bogs, particularly near the bog drains are mapped as Flood Zone A, but all were deemed appropriate for peat extraction following Justification tests.

The FRA indicates that the downstream flooding, as a result of increased runoff from operational bogs is controlled by limiting bog discharges through the use of piped outfalls. Modelling indicates that there is adequate storage capacity in the bogs to attenuate flood waters when discharge is limited to greenfield runoff rates.

Table 13.1 provides a summary of the conclusions of the Flood Risk Assessment carried out by Bord na Móna (and Hydro-Environmental ltd.). Further detail is provided is included in Appendix 13 *Flood Risk.*

14 Land, Soils and Groundwater

14.1 Introduction

This chapter of the rEIAR provides a description and assessment of retrospective direct and indirect impacts of the peat extraction operations, including associated ancillary activities, at 41 bog sites on the groundwater (hydrogeological) and soils/geological environment, between 1985 and the present day.

Appendix 14 *Land, Soils and Groundwater* includes the following;

- 14.1 – Water Features Survey - Discharge Location Audit Sheets
- 14.2 – Peatland Hydrology Study Report
- 14.3 – Bog Discharge Flow Pathway Schematics
- 14.4 – Drawings

14.2 Methodology

14.2.1 Legislation Context

The rEIAR is prepared in accordance with the requirements of European Union Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive') as amended by Directive 2014/52/EU.

The requirements of the following legislation are complied with:

- S.I. No. 349 of 1989: European Communities (Environmental Impact Assessment) Regulations, and subsequent Amendments (S.I. No. 84 of 1994, S.I. No. 101 of 1996, S.I. No. 351 of 1998, S.I. No. 93 of 1999, S.I. No. 450 of 2000 and S.I. No. 538 of 2001, S.I. 134 of 2013 and the Minerals Development Act 2017), the Planning and Development Act, and S.I. 600 of 2001 Planning and Development Regulations and subsequent Amendments. These instruments implement EU Directive 2011/92/EU and subsequent amendments, on the assessment of the effects of certain public and private projects on the environment;
- Directives 2011/92/EU and 2014/52/EU on the assessment of the effects of certain public and private projects on the environment, including Circular Letter PL 1/2017: Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive);
- Planning and Development Act, 2000, as amended;
- S.I. No 296 of 2018: European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 which transposes the provisions of Directive 2014/52/EU into Irish law;
- S.I. No. 293 of 1988: European Communities (Quality of Salmonid Waters) Regulations;
- S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended by S.I. No. 296/2009; S.I. No. 386/2015; S.I. No. 327/2012; and S.I. No. 77/2019 and giving effect to Directive 2008/105/EC on environmental quality standards in the field of water policy and Directive 2000/60/EC establishing a framework for Community action in the field of water policy) and S.I. No. 722 of 2003 European Communities (Water Policy) Regulations which implement EU Water Framework Directive

(2000/60/EC) establishing a framework for the Community action in the field of water policy and provide for implementation of 'daughter' Groundwater Directive (2006/118/EC) on the protection of groundwater against pollution and deterioration. Since 2000 water management in the EU has been directed by the Water Framework Directive (2000/60/EC) (as amended by Decision No. 2455/2011/EC; Directive 2008/32/EC; Directive 2008/105/EC; Directive 2009/31/EC; Directive 2013/39/EU; Council Directive 2013/64/EU; and Commission Directive 2014/101/EU (WFD). The WFD was given legal effect in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003);

- S.I. No. 684 of 2007: Waste Water Discharge (Authorisation) Regulations 2017, resulting from EU Directive 80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances (the Groundwater Directive);S.I. No. 106 of 2007: European Communities (Drinking Water) Regulations 2007and S.I. No. 122 of 2014: European Communities (Drinking Water) Regulations 2014, arising from EU Directive 98/83/EC on the quality of water intended for human consumption (the Drinking Water Directive) and EU Directive 2000/60/EC;
- S.I. No. 9 of 2010: European Communities Environmental Objectives (Groundwater) Regulations 2010 (as amended by S.I. No. 389/2011; S.I. No. 149/2012; S.I. No. 366/2016; the Radiological Protection (Miscellaneous Provisions) Act 2014; and S.I. No. 366/2016); and,
- S.I. No. 296 of 2009: The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (as amended by S.I. No. 355 of 2018).

14.2.2 Relevant Guidelines

The assessment was carried out in accordance with the following guidance and tailored accordingly based on professional judgement and experience:

- Institute of Geologists Ireland (IGI) Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- Environmental Protection Agency (May 2017): Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports;
- Environmental Protection Agency (September 2015): Draft - Advice Notes on Current Practice (in the preparation of Environmental Impact Statements);
- Environmental Protection Agency (2003): Advice Notes on Current Practice (in the preparation of Environmental Impact Statements);
- Institute of Geologists Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- National Roads Authority (2008): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- CIRIA 2006: Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London, 2006; and,
- Environmental Protection Agency (2006): Environmental Management in the Extractive Industry (Non-Scheduled Minerals).

The Chapter also provides a high-level assessment of the compliance of the proposed development with the Water Framework Directive (WFD). WFD classification for groundwater bodies consists of quantitative status and groundwater chemical status. Each is assigned as having either good or poor status.

14.2.3 Study Area

The study area for the assessment includes the area of all 41 bogs, the pathway (along streams and rivers) of surface water flows from outfall points from each bog along downstream receiving waters, and also the groundwater (hydrogeological) environment within 4 km of each bog.

14.2.4 Desk Study

A desk study of the 41 sites and surrounding area was carried out to collate all available and relevant geological, hydrogeological, hydrological and meteorological data for the study area, using the following data sources:

- Hydrological features (drains, silt ponds, outfalls) provided by Bord na Móna.
- LiDAR data of 41 bog sites (Bord na Móna).
- Geological Survey of Ireland (GSI) online mapping;
- Environmental Protection Agency database (www.epa.ie);
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Met Eireann Meteorological Databases (www.met.ie);
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive Catchments Map Viewer (www.catchments.ie);
- Bedrock Geology 1:100,000 Scale Map Series, Sheets 12,15,16,18 and 19; Geological Survey of Ireland (GSI, 1995 - 2003);
- Geological Survey of Ireland - Groundwater Body Characterisation Reports;
- OPW Indicative Flood Maps (www.floodmaps.ie);
- Environmental Protection Agency – Hydrotool Map Viewer (www.watermaps.wfdireland.ie/HydroTool);
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.floodinfo.ie); and,
- Department of Environment, Community and Local Government on-line mapping viewer (www.myplan.ie).

14.2.5 Site Inspections and Piezometer Installations

Hydro-Environmental Services (HES) completed site inspections and walkover surveys at 14 of the 41 bogs. HES also installed piezometers transects at four Bord na Móna bogs to collect water level and hydrogeological data relevant to the hydrogeological assessment completed in this chapter.

Investigations and monitoring were completed at Garryduff, Blackwater, and Mongan bogs (Blackwater Group), and Derrycolumb bog (Mountdillon Group).

Bord na Móna collected water level data at these four sites between September/October 2018 and February 2020. While these study sites are not within the 41 bogs which is the subject of this rEIAR, the data collected at these study sites can be used to confirm likely Zones of Influence (ZoI) from bog drainage and pumping stations operation.

14.2.6 Impact Assessment Methodology

The importance / sensitivity of the geological, hydrogeological and hydrological receptors was assessed on completion of the desk study and baseline assessment.

Using the NRA Guidance, an estimation of the importance / sensitivity of the geological, hydrological and hydrogeological environments within the study area is set out in Table 14.1 to Table 14.3.

Table 14.1: Estimation of Importance of geological attributes

Importance	Criteria	Typical Example
Very High	Attribute has a high quality, significance or value on a regional or national scale. Degree or extent of soil contamination is significant on a national or regional scale. Volume of peat and / or soft organic soil underlying route is significant on a national or regional scale.	• Geological feature rare on a regional or national scale (NHA). • Large existing quarry or pit. • Proven economically extractable mineral resource.
High	Attribute has a high quality, significance or value on a local scale. Degree or extent of soil contamination is significant on a local scale. Volume of peat and / or soft organic soil underlying site is significant on a local scale.	• Contaminated soil on site with previous heavy industrial usage. • Large recent landfill site for mixed wastes. • Geologically feature of high value on a local scale (County Geological Site). • Well drained and / or high fertility soils. • Moderately sized existing quarry or pit. • Marginally economic extractable mineral resource.
Medium	Attribute has a medium quality, significance or value on a local scale. Degree or extent of soil contamination is moderate on a local scale. Volume of peat and / or soft organic soil underlying site is moderate on a local scale.	• Contaminated soil on site with previous light industrial usage. • Small recent landfill site for mixed wastes. • Moderately drained and / or moderate fertility soils. • Small existing quarry or pit. • Sub-economic extractable mineral resource.
Low	Attribute has a low quality, significance or value on a local scale. Degree or extent of soil contamination is minor on a local scale. Volume of peat and / or soft organic soil underlying site is small on a local scale.	• Large historical and / or recent site for construction and demolition wastes. • Small historical and / or recent site for construction and demolition wastes. • Poorly drained and / or low fertility soils. • Uneconomically extractable mineral resource.

Table 14.2: Estimation of Importance of Hydrology Attributes

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale	• River, wetland or surface water body ecosystem protected by EU legislation, e.g. 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	Attribute has a high quality or value on a regional or national scale	• River, wetland or surface water body ecosystem protected by national legislation – NHA status. • Regionally important potable water source supplying >2500 homes. • Quality Class A (Biotic Index Q4, Q5). • Flood plain protecting more than 50 residential or commercial properties from flooding. • Nationally important amenity site for wide range of leisure activities.

High	Attribute has a high quality or value on a local scale	• Salmon fishery locally important potable water source supplying >1000 homes. • Quality Class B (Biotic Index Q3-4). • Flood plain protecting between 5 and 50 residential or commercial properties from flooding.
Medium	Attribute has a medium quality or value on a local scale	• Coarse fishery. • Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2-3). • Flood plain protecting between 1 and 5 residential or commercial properties from flooding.
Low	Attribute has a low quality or value on a local scale	• Locally important amenity site for small range of leisure activities. • Local potable water source supplying <50 homes. • Quality Class D (Biotic Index Q2, Q1) Flood plain protecting 1 residential or commercial property from flooding. • Amenity site used by small numbers of local • people.

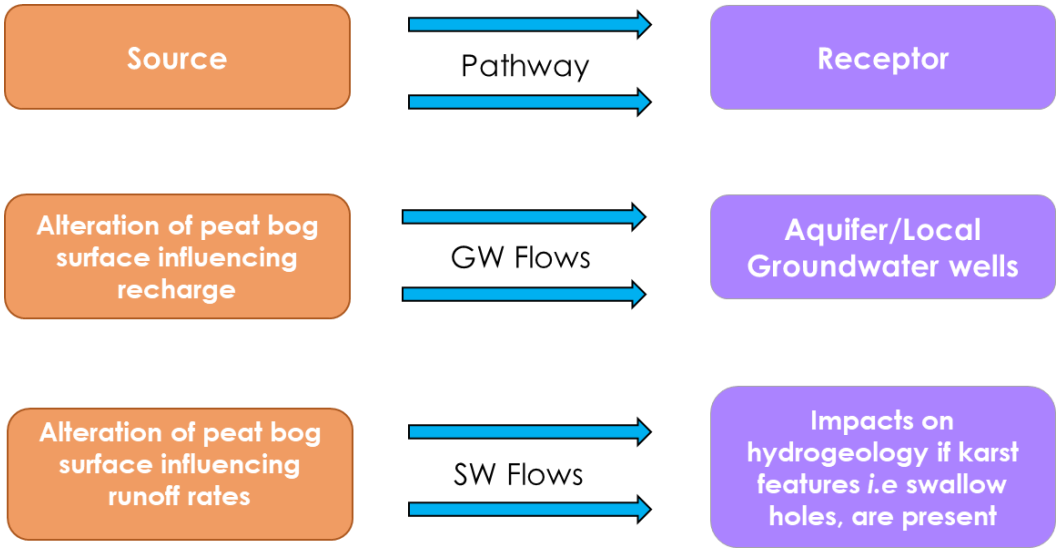
Table 14.3: Estimation of Importance of Hydrogeology Attributes

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale	• Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation, e.g. SAC or SPA status.
Very High	Attribute has a high quality or value on a regional or national scale	• Regionally Important Aquifer with multiple wellfields. • Groundwater supports river, wetland or surface water body ecosystem protected by national legislation - NHA status. • Regionally important potable water source supplying >2500 homes Inner source protection area for regionally important water source.
High	Attribute has a high quality or value on a local scale	• Regionally Important Aquifer Groundwater provides large proportion of baseflow to local rivers. • Locally important potable water source supplying >1000 homes. • Outer source protection area for regionally • important water source. • Inner source protection area for locally important water source.
Medium	Attribute has a medium quality or value on a local scale	• Locally Important Aquifer. • Potable water source supplying >50 homes. • Outer source protection area for locally important water source.
Low	Attribute has a low quality or value on a local scale	• Poor Bedrock Aquifer Potable water source supplying <50 homes

14.2.7 Overview of Impact Assessment process

The conventional source-pathway-receptor model (see graphic below) for groundwater / surface water protection was applied to assess impacts on groundwater and surface water specifically on downstream sensitive ecological receptors and local groundwater supplies. An example S-P-R model is shown in Figure 14.1.

Figure 14.1: SPR model example



14.3 Receiving Environment

14.3.1 Land and Land-use

Land-use changes within the bogs, which began production on or after 1985, has been investigated using available aerial photographs and also by comparing current LiDAR data to topographic information present on historical mapping. Ancillary activities and features were largely in place prior to 1985 including railway lines, machine passes, canteen structures, work sites, production centres, mobile fuel tanks, fixed fuel tanks, peat loading facilities, and end user sites.

General land-use changes observed from aerial photographs are minimal, as the first publicly available aerial photography took place in 1995. Broadly speaking, vegetation has increased slightly on the perimeters of the bogs and small areas have been afforested. Vegetation has increased along drainage channels within many of the bogs, suggesting a deterioration in their effectiveness. Observed changes in land-use from various data sources are summarised in Table 14.4.

The total land involved in the 41 bogs is 22,300 Ha. During 2019 approximately 35% or 7,886 ha was used for peat extraction.

Table 14.4: Land-use changes during historical lookback period.

Ref	Bog	Bog group	First Production (Year)	Changes observed through Aerial Photography 1995 - 2019
1	Bellair Nth	Boora	1976	No Change
2	Lemanaghan	Boora	1955	No Change
3	Noggusboy	Boora	1955	No Change
4	Boora	Boora	1959	No Change
5	Galros	Boora	**1988**	No obvious changes from 1995 – 2019 Mineral soil/light coloured peat observed within aerial photographs. No aerial photography 1985 – 1995.
6	Killaun	Boora	**2003**	Some additional drainage channels between 1995 – 2005 aerial photos, but no major alteration.
7	Derrinboy	Boora	**2003**	No significant changes between aerial photos.
8	Derryclure	Boora	**1992**	More drainage channels apparent from 1995 – 2000, particularly towards southwest of bog. Central and marginal uncut sections have become more afforested over time from 1995 – 2019.
9	Monettia	Boora	1982	No Change
10	Killaranny	Boora	**1989**	Aerial photos show progressive afforestation around bog from 1995 – 2019. No major changes in other land-use. Little change in bog drainage.
11	Bracklin	Derrygreenagh	**1985**	Drainage channels appear to have become overgrown with vegetation 1995 - 2019. Significant growth of forestry around bog perimeter through same period.
12	Carranstown	Derrygreenagh	**1985**	Drainage channels appear to have become overgrown with vegetation 1995 - 2019. Significant growth of forestry around bog perimeter through same period.
13	Ballivor	Derrygreenagh	1953	No Change
14	Kinnegad	Derrygreenagh	1982	No Change
15	Ballybeg	Derrygreenagh	1955	No Change
16	Ballaghurt	Blackwater	1980/ 1995	No major changes 1995 -2019
17	Daingean (Derries)	Allen	**1999**	No major changes 1995 -2019
18	Daingean Rathdrum	Allen	**2000**	No major changes 1995 -2019. Some minor vegetation and forestry growth around bog.
19	Clonad	Allen	1962	No Change
20	Ballykeane	Allen	1955	No Change
21	Esker	Allen	1965	No Change
22	Garrymore	Allen	**1999**	No apparent change in drainage channels from 1995 – 2019. Some vegetation growth around bog perimeter during this time.
23	Derrylea	Allen	1972	No Change
24	Ticknevin	Allen	**2000**	Bog went from (initial) drained state into production, with increase in drainage density, and removal of all vegetation.
25	Glashabaun Sth	Allen	1950	No Change
26	Glashabaun Nth	Allen	1950	No Change

27	Codd Nth (Codd 2)	Allen	**1989**	No major changes 1995 – 2019.More mineral soil can be seen over time.
28	Codd Sth (codd 1)	Allen	**1989**	No major changes 1995 – 2019.More mineral soil can be seen over time.
29	Ballydermot North	Allen	1950	No Change
30	Ballydermot South	Allen	1950	No Change
31	Blackriver	Allen	1950	No Change
32	Barnaran	Allen	1955	No Change
33	Lodge	Allen	1955	No Change
34	Cuil na Gun	Mountdillon	1953	No Change
35	Milkernagh	Mountdillon	1953	No Change
36	Coolcraff	Mountdillon	**1989**	Significant increase in vegetation across the bog from 1995 – 2019. No obvious land use changes.
37	Gilltown	Kilberry	1982	No Change
38	Allen	Kilberry	1972	No Change
39	Prosperous	Kilberry	**2003**	Larger arterial drains spaced approximately 150m apart added after 2000. These drains run north to south. Slight increase in vegetation from 1995 – 2019.
40	Kilberry	Kilberry	1948	No Change
41	Cuil na Carton	Cuil na Mona	1966	No Change

The present-day land and land-use surrounding the bogs comprise primarily of agriculture, with small areas of forestry around some bogs, and scattered rural settlements and farm buildings. Overall bog areas (within the IPPC boundary) range between 193 – 1848 Ha. The bogs referred to here are those that are subject of this Project. There are other bogs in all of the bog groups.

The Boora group (Bog Ref 1-10) of bogs in the Project are situated around the central large Boora bog (1848 Ha), with the overall group spread between Birr and Tullamore, Co. Offaly with 3 no. quarries to the south and east, within approximately 1 km of the Boora bog.

The Derrygreenagh Group of bogs in the Project are situated between the towns of Kinnegad and Delvin, Co. Westmeath. The bogs range in size from 305 – 837 Ha. Again, land-use is generally agricultural in the surrounding area, however the Kinnegad bog is located within approximately 0.6 km from the M4 motorway and approximately 1 km from the town of Kinnegad.

There is only 1 bog in Blackwater Group in the Project, namely Ballaghurt bog which has an area of 616 Ha. Surrounding land-use is typically agricultural.

The Allen Group of bogs in the Project consists of 17 no. individual bogs which range in size from 256 – 766 Ha. The bogs are spread over a wide geographical area (between Kilmeague, Edenderry, Portarlington, and Kilbeggan), but generally lands surrounding the bogs are agricultural or are adjacent bogs.

The Mountillon Group in the Project consist of 3 no. bogs which range in size from 412 - 670 Ha. The bogs are located between Lough Derravaragh and Lough Sheelin. Surrounding land-use includes agriculture, small areas of forestry, rural settlements and farm buildings.

The Kilberry Group in the Project consists of 4 no. bogs which range in size from 217 – 1001 Ha. The bogs are spread over a wide geographical area (between Ballyroan (County Laois) to

Johnstown Bridge (County Kildare)), Land-use near the bogs is generally agricultural and small forestry, with some rural settlements. A large quarry exists 2.8 km west of the Mounds bog.

The Cuil na Mona Group in the Project comprises one bog, namely Cuil na Carton Bog, situated just south of Portlaoise, Co Laois. Surrounding land use is generally agricultural, with residential areas of Portlaoise situated approximately 2.5 km northeast of the site.

Surrounding land-use and local topography is included within Table 14.5.

Table 14.5: Summary of land and land-use at the 41 sites

Ref	Bog	Bog group	Bog Area (Ha)	Production Area (Ha)	Surrounding Land-use	Local Bog Topography
1	Bellair Nth	Boora	570	404	Agriculture, small areas of forestry, rural settlements and farm buildings, railway to south	54-65 mOD
2	Lemanaghan	Boora	1259	593	Agriculture, small areas of forestry, rural settlements and farm buildings, national road N62 to west	47-57 mOD
3	Noggusboy	Boora	924	120	Agriculture, small areas of forestry, rural settlements and farm buildings	45-58 mOD
4	Boora	Boora	1848	118	Agriculture, small areas of forestry, rural settlements and farm buildings, 2no.quarries to east and one approximately 0.7 km to south of bog	48-57 mOD
5	Galros	Boora	193	109	Agriculture, small areas of forestry, rural settlements and farm buildings	47-55 mOD
6	Killaun	Boora	361	268	Agriculture, small areas of forestry, rural settlements and farm buildings, and quarry to the north of the bog	60-66 mOD
7	Derrinboy	Boora	308	203	Agriculture, small areas of forestry, rural settlements and farm buildings, and a quarry along western edge of bog	83-91 mOD
8	Derryclure	Boora	332	163	Agriculture, small areas of forestry, rural settlements and farm buildings	73-79 mOD
9	Monettia	Boora	711	454	Agriculture, small areas of forestry, rural settlements and farm buildings	80-84 mOD
10	Killaranny	Boora	244	112	Agriculture, small areas of forestry, rural settlements and farm buildings, and quarry to east of bog	52-58 mOD
11	Bracklin	Derrygreenagh	755	118	Agriculture, small areas of forestry, rural settlements and farm buildings	72-86 mOD
12	Carranstown	Derrygreenagh	305	136	Agriculture, small areas of forestry, rural settlements and farm buildings	69-75 mOD
13	Ballivor	Derrygreenagh	654	34	Agriculture, small areas of forestry, rural settlements and farm buildings	71-79 mOD

14	Kinnegad	Derrygreenagh	353	215	Agriculture, small areas of forestry to south, rural settlements and farm buildings, quarry to west, and motorway to north of the bog	73-83 mOD
15	Ballybeg	Derrygreenagh	837	281	Agriculture, small areas of forestry around bog, rural settlements and farm buildings, high bog to northeast of the bog	74-83 mOD
16	Ballaghurt	Blackwater	616	392	Agriculture, small areas of forestry, rural settlements and farm buildings, sand and gravel pit to west of the bog.	39-49 mOD
17	Daingean (Derries)	Allen	278	204	Agriculture, small areas of forestry, rural settlements and farm buildings	81-88 mOD
18	Daingean Rathdrum	Allen	368	202	Agriculture, small areas of forestry, rural settlements and farm buildings	81-91 mOD
19	Clonad	Allen	448	185	Agriculture, small areas of forestry, rural settlements and farm buildings, bog to east	76-90 mOD
20	Ballykeane	Allen	453	186	Agriculture, small areas of forestry, rural settlements and farm buildings	76-85 mOD
21	Esker	Allen	567	363	Agriculture, small areas of forestry, rural settlements and farm buildings, and a quarry approximately 1.4 km to southeast of the bog	69-76 mOD
22	Garrymore	Allen	308	174	Agriculture, small areas of forestry, rural settlements and farm buildings, bog to east	73-81 mOD
23	Derrylea	Allen	665	339	Agriculture, small areas of forestry, rural settlements and farm buildings, quarry to west of the bog	63-71 mOD
24	Ticknevin	Allen	458	240	Agriculture, small areas of forestry, rural settlements and farm buildings	73-77 mOD
25	Glashabaun Sth	Allen	561	31	Agriculture, small areas of forestry, rural settlements and farm buildings	69-77 mOD
26	Glashabaun Nth	Allen	506	79	Agriculture, small areas of forestry, rural settlements and farm buildings, sand and gravel quarry to north of the bog	68-79 mOD
27	Codd Nth (Codd 2)	Allen	312	180	Agriculture, small areas of forestry, rural settlements and farm buildings, and a quarry to northwest of the bog	68-76 mOD
28	Codd Sth (codd 1)	Allen	256	44	Agriculture, small areas of forestry, rural settlements and farm buildings	68-75 mOD
29	Ballydermot North	Allen	452	80	Agriculture, small areas of forestry, rural settlements and farm buildings	67-78 mOD

30	Ballydermot South	Allen	434	179	Agriculture, small areas of forestry, rural settlements and farm buildings	69-76 mOD
31	Blackriver	Allen	766	136	Agriculture, small areas of forestry, rural settlements and farm buildings	67-77 mOD
32	Barnaran	Allen	492	173	Agriculture, small areas of forestry, rural settlements and farm buildings	71-80 mOD
33	Lodge	Allen	430	84	Agriculture, small areas of forestry, rural settlements and farm buildings	74-81 mOD
34	Cuil na Gun	Mountdillon	670	252	Agriculture, small areas of forestry, rural settlements and farm buildings	61-70 mOD
35	Milkernagh	Mountdillon	629	38	Agriculture, small areas of forestry, rural settlements and farm buildings, and a quarry to east of the bog	61-73 mOD
36	Coolcraff	Mountdillon	412	270	Agriculture, small areas of forestry, rural settlements and farm buildings, quarry to south of the bog	64-72 mOD
37	Gilltown	Kilberry	345	113	Agriculture, small areas of forestry, rural settlements and farm buildings	76-84 mOD
38	Allen	Kilberry	434	148	Agriculture, small areas of forestry, rural settlements and farm buildings, big quarry approximately 2.8 km to west of the bog	80-93 mOD
39	Prosperous	Kilberry	217	133	Agriculture, small areas of forestry, rural settlements and farm buildings	86-91 mOD
40	Kilberry	Kilberry	1001	202	Agriculture, small areas of forestry, rural settlements and farm buildings, and a quarry approximately 3.6 km to north of the bog	58-66 mOD
41	Cuil na Carton	Cuil na Mona	568	131	Agriculture, small areas of forestry, rural settlements and farm buildings	113-122 mOD

14.3.2 Geological Environment

14.3.2.1 Soils and Geology

Soils, subsoils, bedrock geology and other geological features were investigated through a comprehensive desk study and field inspections. A summary of the geological environment is included within Table 14.6.

The Boora group bogs are generally underlain by Waulsortian Limestone and Ballysteen Limestone bedrock. Soils are mapped as raised peat at all bogs. The surrounding subsoils are generally tills derived from Limestone, with alluvial deposits mapped along river channel. Gravels are mapped in isolated pockets, along with eskers and some localised lacustrine sediments.

The Derrygreenagh Group bogs are underlain by Waulsortian Formation Limestone primarily, with some Lucan Formation Limestones in the area. Soils are mapped as raised peat. Subsoils

are generally tills derived from Limestone with some tills derived from chert. Alluvium is mapped along river channel and gravels are also mapped locally at some bogs.

The Blackwater Group (Ballaghurt) is underlain by Waulsortian Limestone, with some Lucan Formation Limestone mapped to the northwest. Soils are raised peat, while surrounding subsoils are mapped as tills derived from Limestone. An esker is mapped to the north and northwest of the bogs.

The Allen Group of bogs, the largest of the bog groups in this assessment, is underlain by a mixture of Waulsortian Limestone, Ballyadams Formations and Ballysteen Formation Limestone, as well as other minor calcareous formations. Soils are mapped as raised peat, while subsoils are mapped generally as cutover raised peat underlying the bogs, with the surrounding lands mapped as tills derived from Limestone with alluvium mapped along river channels. Gravels and eskers are also mapped within the region of the Bog of Allen.

The Mountdillon Group bogs are underlain by Lucan Formation Limestones. The soils are mapped as raised peat. Surrounding subsoils are mapped as tills derived from Cherts and Lower Palaeozoic sandstones, with some local gravels and eskers also mapped.

The Kilberry Group bogs are primarily underlain by Waulsortian Limestones and Boston Hill Formation Limestone. The soils are mapped as raised peat. Subsoils at the bogs are cutover raised peat, while surrounding subsoils are mapped as tills derived from Limestone, with some till derived from Chert and Palaeozoic sandstones and shales. Alluvium is mapped along river channels, with some localised gravel deposits.

The Cuil na Mona Group (Cuil na Carton bog) is underlain by Ballysteen Formation and Allenwood Formation calcareous rocks. Soils are mapped as raised peat, subsoils are mapped as cutover raised peat, with surrounding subsoils mapped as tills derived from Limestone.

Table 14.6: Summary of soils, subsoils and bedrock geology at the 41 sites

Ref	Bog	Bog group	Soils	Subsoils	Bedrock Geology
1	Bellair Nth	Boora	Raised peat	Surrounding Till derived from limestones, and alluvial deposits along river channel, and some local gravels mapped to north of bog	Calcareous, with bog underlain by Waulsortian Limestone and small area in east part of bog underlain by the Ballysteen Formation. Faulting in the area has a NE-SW orientation.
2	Lemanaghan	Boora	Raised peat	Surrounding Tills derived from limestones, with small pockets of Tills derived from limestones in northern area of bog, alluvial deposits along rivers to southeast, some local gravels mapped to north and south of bog, and eskers approximately 90m to north of the bog, and Lake marl to the east	Calcareous, with bog underlain by Waulsortian Limestone to northwest, Ballysteen Formation to west and southeast, Navan Beds and Old Red Sandstone in centre and eastern area of bog. Faulting in the area has a NE-SW orientation.
3	Noggusboy	Boora	Raised peat	Surrounding Till derived from limestones, and alluvial deposits along rivers to east, some local gravels mapped to north of the bog, lake marl approximately 1.4 km to southwest (but remote from bog boundaries)	Calcareous, with bog underlain by Waulsortian Limestone to east, Ballysteen Formation in centre area of bog, Navan Beds and Old Red Sandstone to northwest. Faulting in the area has a NW-SE orientation.

4	Boora	Boora	Raised peat	Small pockets of Tills derived from limestones in centre area of bog, surrounding Tills derived from limestones, and alluvial deposits along rivers to west, some local gravels mapped to southeast of the bog	Calcareous, with bog underlain by Waulsortian Limestone to east, and undifferentiated Visean Limestones to east. Faulting in the area has a NW-SE orientation.
5	Galros	Boora	Raised peat	Surrounding Tills derived from limestones to northwest, some local gravels mapped to north and south of the bog, and eskers along eastern edge of the bog	Calcareous, with bog underlain by Waulsortian Limestone to west, undifferentiated Visean Limestones mapped to the east. Faulting in the area has a NW-SE orientation.
6	Killaun	Boora	Raised peat	Surrounding Tills derived from limestones, some local gravels mapped to north and west of the bog, and alluvial deposits along rivers (but remote from bog boundaries)	Calcareous, with bog underlain by Waulsortian Limestone to north and south, Lucan Formation and undifferentiated Visean Limestones in centre area of the bog. Faulting in the area has a NW-SE orientation.
7	Derrinboy	Boora	Raised peat	Surrounding Tills derived from limestones, some local gravels mapped to west of the bog, alluvial deposits along rivers to south, and Lacustrine sediments approximately 0.7 km to north of the bog	Calcareous, with bog underlain by Waulsortian Limestone to west, and majority of bog underlain by Ballysteen Formation. Faulting in the area has a NE-SW orientation.
8	Derryclure	Boora	Raised peat	Surrounding Tills derived from limestones, some local gravels mapped to north of the bog, alluvial deposits along rivers to east of the bog	Bog underlain by Ballysteen Formation. No mapped faulting
9	Monettia	Boora	Raised peat	Surrounding Tills derived from limestones, some local gravels mapped to north and south of bog, alluvial deposits along rivers to east	Bog underlain by Ballysteen Formation. No mapped faulting
10	Killaranny	Boora	Raised peat	Surrounding Tills derived from limestones, some local gravels mapped to south of the bog, alluvial deposits along rivers to east and north, and Lacustrine sediments to north of the bog	Calcareous, with bog underlain by Waulsortian Limestone to east, Allenwood Formation to northwest, and small area of bog is underlain by undifferentiated Visean Limestones to southwest and northwest. Faulting in the area has a NW-SE orientation.
11	Bracklin	Derrygreenagh	Raised peat	Surrounding Limestone Derived Tills, with Tills derived from chert to the east, and alluvial deposits along rivers, and some local gravels mapped to southwest of the bog	Calcareous, with bog underlain by Waulsortian Limestone to south, and Tobercolleen Formation and Lucan Formation to north. Faulting in the area has a NW-SE orientation.
12	Carranstown	Derrygreenagh	Raised peat	Surrounding Limestone Derived Tills, alluvial deposits along rivers	Calcareous, with bog mainly underlain by Waulsortian Limestone. Faulting in the area has a NW-SE orientation.

13	Ballivor	Derrygreenagh	Raised peat	Surrounding Limestone Derived Tills, alluvial deposits along rivers, and some gravels mapped to southwest and southeast (but remote from bog boundaries)	Calcareous, with bog mainly underlain by Waulsortian Limestone. Faulting in the area has a NW-SE orientation.
14	Kinnegad	Derrygreenagh	Raised peat	Surrounding Limestone Derived Tills, alluvial deposits along rivers, and some gravels mapped to northeast (but remote from bog boundary)	Calcareous, with bog mainly underlain by Waulsortian Limestone to north and Ballysteen Formation to south
15	Ballybeg	Derrygreenagh	Raised peat	Surrounding Limestone Derived Tills, with some gravels mapped to west and northwest (but remote from bog boundary)	Calcareous, with bog mainly underlain by Lucan Formation, with Allenwood Formation to east
16	Ballaghurt	Blackwater	Raised peat	Surrounding Tills derived from limestones, and alluvial deposits along rivers, and some local gravels mapped to northwest of bog, eskers along north edge of the bog	Calcareous, with bog underlain by Waulsortian Limestone to southeast, Ballysteen Formation to northwest, and Navan Beds to west of the bog. Faulting in the area has a NW-SE orientation.
17	Daingean (Derries)	Allen	Raised peat	Surrounding Tills derived from limestones, with alluvial deposits along rivers, Bedrock outcrop or subcrop to east, some local gravels mapped to northwest of bog, and eskers mapped approximately 0.4 km to northwest of the bog (but remote from the bog boundaries)	Calcareous, with majority of bog underlain by the Lucan Formation, and small area of bog underlain by Waulsortian Limestones to northwest. Faulting in the area has a NE-SW orientation.
18	Daingean Rathdrum	Allen	Raised peat	Surrounding Tills derived from limestones, with alluvial deposits along rivers, and Lacustrine sediments to the southwest of the bog (but remote from bog boundaries)	Calcareous, with majority of bog underlain by the Lucan Formation, and small area of bog underlain by Volcanics to southeast. No mapped faulting in the area.
19	Clonad	Allen	Raised peat	Surrounding Tills derived from limestones, with alluvial deposits along rivers to southwest, and bedrock outcrop or subcrop to south of the bog (but remote from the bog boundaries)	Calcareous, with bog underlain by the Lucan Formation to west, centre area of bog underlain by the Allenwood Formation, and Edenderry Oolite Member to east. Faulting in the area has a NW-SE orientation.
20	Ballykeane	Allen	Raised peat	Surrounding Tills derived from limestones, with alluvial deposits along rivers, and some local gravels mapped to southwest of the bog	Calcareous, with bog underlain by Waulsortian Limestones, Ballysteen Formation to north and west. Faulting in the area has a NE-SW orientation.
21	Esker	Allen	Raised peat	Surrounding Tills derived from limestones, with some local gravels mapped to south and east, and esker along southern edge of the bog	Calcareous, with bog Edenderry Oolite Member, and small area of bog underlain by Waulsortian Limestones to west. No mapped faulting in the area.
22	Garrymore	Allen	Raised peat	Surrounding Tills derived from limestones, with alluvial deposits along rivers to west, some local gravels mapped to southwest, and	Calcareous, with bog underlain by the Ballysteen Formation. No mapped faulting in the area.

				esker approximately 0.4 km to west of the bog	
23	Derrylea	Allen	Raised peat	Surrounding Tills derived from limestones, with alluvial deposits along rivers to south, some local gravels mapped, Lake marl and Lacustrine sediments mapped to the east of the bog	Calcareous, with bog underlain by the Lucan Formation. No mapped faulting in the area.
24	Ticknevin	Allen	Raised peat	Surrounding Tills derived from limestones, with alluvial deposits along rivers to east, some local gravels mapped to south, and an esker along the southern edge of the bog	Calcareous, with bog underlain by the Lucan Formation. No mapped faulting in the area.
25	Glashabaun Sth	Allen	Raised peat	Surrounding Tills derived from limestones, with alluvial deposits along rivers to north, some local gravels mapped (but remote from bog boundaries)	Calcareous, with majority of bog underlain by the Ballyadams Formation, with the Lucan Formation to west, and the Allenwood Formation to east. Faulting in the area has a NE-SW orientation.
26	Glashabaun Nth	Allen	Raised peat	Surrounding Tills derived from limestones, with alluvial deposits along rivers to southeast, some local gravels mapped to northwest, and eskers along northern edge of the bog	Calcareous, with majority of bog underlain by the Lucan Formation, with the Ballyadams Formation mapped to the east. Faulting in the area has a NW-SE orientation.
27	Codd Nth (Codd 2)	Allen	Raised peat	Surrounding Tills derived from limestones, with some local gravels mapped to north, and eskers approximately 0.5 km to north of the bog	Calcareous, with bog underlain by the Lucan Formation. Faulting in the area has a NW-SE orientation.
28	Codd Sth (codd 1)	Allen	Raised peat	Surrounding Tills derived from limestones, alluvial deposits along rivers to west, and some local gravels mapped to west of the bog	Calcareous, with bog underlain by the Lucan Formation. Faulting in the area has a NW-SE orientation.
29	Ballydermot North	Allen	Raised peat	Surrounding Tills derived from limestones, alluvial deposits along rivers to west of the bog	Calcareous, with the majority of bog underlain by the Lucan Formation, and the Ballyadams Formation to southeast. Faulting in the area has a NW-SE orientation.
30	Ballydermot South	Allen	Raised peat	Surrounding Tills derived from limestones, alluvial deposits along rivers to south (but remote from bog boundaries)	Calcareous, with the majority of bog underlain by the Ballyadams Formation, and the Lucan Formation to northwest. No mapped faulting in the area.
31	Blackriver	Allen	Raised peat	Surrounding Tills derived from limestones, alluvial deposits along rivers to southeast, and some local gravels mapped to south of the bog	Calcareous, with the majority of bog underlain by the Ballyadams Formation, the Lucan Formation to northwest, and the Allenwood Formation to southeast. Faulting in the area has a NW-SE orientation.
32	Barnaran	Allen	Raised peat	Surrounding Tills derived from limestones, alluvial deposits along rivers to southeast, some local gravels mapped to	Calcareous, with bog underlain by the Ballyadams Formation to northwest, centre area of bog underlain by the Allenwood Formation, and the Waulsortian

				southeast, and esker approximately 0.4 km to southeast of the bog	Limestones to east. Faulting in the area has a NW-SE orientation.
33	Lodge	Allen	Raised peat	Surrounding Tills derived from limestones, alluvial deposits along rivers to south, some local gravels mapped to southwest, esker approximately 0.5 km to southwest of the bog, and Lacustrine sediments to northeast of the bog	Calcareous, with the bog underlain by Waulsortian Limestones, and Boston Hill Formation to north and southeast. Faulting in the area has a NW-SE orientation.
34	Cuil na Gun	Mountdillon	Raised peat	Surrounding Tills derived from cherts to northwest, Tills derived from limestones to east, alluvial deposits along rivers to northwest, some local gravels mapped to east of the bog, and Till derived from Lower Palaeozoic and Carboniferous sandstones and shales to the southwest of bog (but remote from bog boundaries)	Calcareous, with the bog underlain by the Lucan Formation. Faulting in the area has a NE-SW orientation.
35	Milkernagh	Mountdillon	Raised peat	Surrounding Tills derived from cherts, with alluvial deposits along rivers to northeast, Tills derived from Lower Palaeozoic sandstones and shales to the east and north, and eskers mapped along northeast edge of the bog	Calcareous, with bog underlain by the Lucan Formation. No mapped faulting in the area.
36	Coolcraff	Mountdillon	Raised peat	Surrounding Tills derived from Lower Palaeozoic sandstones and shales, alluvial deposits along rivers along east edge of bog, some local gravels mapped to east and south of the bog, Lacustrine sediments mapped to the north, and an esker is mapped along the northwestern edge of the bog	Calcareous, with the bog underlain by the Lucan Formation. No mapped faulting in the area.
37	Gilltown	Kilberry	Raised peat	Surrounding Tills derived from cherts, Tills derived from limestones to east, alluvial deposits along rivers to the northwest, some local gravels mapped to the east of bog, and Tills derived from Lower Palaeozoic and Carboniferous sandstones and shales to the southwest of the bog	Calcareous, with majority of bog underlain by the Lucan Formation, and the Allenwood Formation to south. No mapped faulting in the area.
38	Allen	Kilberry	Raised peat	Surrounding Tills derived from limestones, Lacustrine sediments to southeast and west, alluvial deposits along rivers to southeast, and some local gravels mapped to north of the bog (but	Calcareous, with small area of the bog underlain by Waulsortian Limestones to east, majority of bog underlain by the Boston Hill Formation and the Feighcullen Formation to west. No mapped faulting in the area.

				remote from bog boundaries)	
39	Prosperous	Kilberry	Raised peat	Surrounding Tills derived from limestones, small western area of bog underlain by Tills derived from limestones, and some local gravels mapped to the south of the bog	Calcareous, with bog underlain by Waulsortian Limestones to north, and the Boston Hill Formation to south. Faulting in the area has a NE-SW orientation.
40	Kilberry	Kilberry	Raised peat	Surrounding Tills derived from limestones, Lacustrine sediments to south, alluvial deposits along rivers to the west, and some local gravels mapped to north of the bog, and eskers along southern edge of the bog	Calcareous, with the bog underlain by the Milford Formation to the west, and the Ballysteen Formation to the east. No mapped faulting in the area.
41	Cuil na Carton	Cuil na Mona	Raised peat	Surrounding Tills derived from limestones, with alluvial deposits along rivers to the west, and Lacustrine sediments mapped to the east of the bog	Calcareous, with the majority of the bog underlain by the Ballysteen Formation and the Allenwood Formation to the northeast. Faulting in the area has a NW-SE orientation.

14.3.2.2 Peat Extraction 2012-2019

Based on figures supplied by Bord na Móna relating to peat tonnage extracted, Table 14.7 presents a summary of the weight of peat extracted (in tonnes), calculated volumes of peat extracted and an estimate of the overall removed depth of peat. A bulk estimate of 1.2 m^3/tonne was used to calculate volumes of peat removed, and a conservative bulking factor of 1.5 was also applied. The volume of peat extracted was then divided by the area of the production fields (at each of the bogs) to give an approximation of the depth of peat removed. These depth [removed] data were also compared with Lidar data from 2008 and 2015 to determine likely accuracy.

In some cases, the total weight (tonnes) from bogs is grouped with others outside of the 41 bogs named in this rEIAR, such as Killaranny, which is grouped with a further 3 no. bogs. We have used these grouped data with caution and been conservative as possible in our analysis.

Average depths of peat extracted between 2012 and 2019 is approximately 0.35m, with a range of between 0.003 and 0.897m. Using overlapping Lidar data, available from surveys competed in 2008 and 2015, indicates an average depth of peat removal of approximately 0.56m across 26 bogs. Therefore, the estimates made from the tonnages extracted between 2012 and 2019 appear correct.

Using this average depth (approximately 0.56m over 7 years) and applying it across the period 1985 to 2019 (34 years), indicates that peat depth removal between 1985 and 2019 could be in the order of approximately 2.5 to 3.5m.

Table 14.7: Weight (tonnes) and estimated volumes/depths of peat removed 2012 – 2019.Insert Table Caption - Update fields via ribbon

Name/Identifier	Peat Weight 2012-2019 (Tonnes)	Estimated Volume (m^3)	Actual Production Area (m^2)	Estimated Depth of Peat Removed (m)
Bellair North (Combined with Bellair South)	506,359	911,446	4,040,000	0.226
Lemanagahan	858,728	1,545,710	5,930,000	0.261
Kilaranny (combined with 3 other bogs)	487,288	877,118	1,120,000	0.783*
Boora & Noggusboy (combined with 2 other bogs)	678,266	1,220,879	3,380,000	0.361
Galros (& Clongawney)	543,287	977,917	1,090,000	0.897*
Derrinboy	335,893	604,607	2,030,000	0.298
Derryclure	178,638	321,548	1,630,000	0.197
Monettia	505,757	910,363	4,540,000	0.201
Bracklin, Carranstown & Ballivor	472,368	850,262	2,880,000	0.295
Kinnegad	294,390	529,902	2,150,000	0.246
Ballybeg	420,768	757,382	2,810,000	0.270
Ballaghurt	564,569	1,016,224	3,920,000	0.259
Daingean Derries & Daingean Rathdrum	363,742	654,736	4,060,000	0.161
Clonad (& Mountlucas)	563,358	1,014,044	1,850,000	0.548*
Ballykeane	569,436	1,024,985	1,860,000	0.551
Esker	616,167	1,109,101	3,630,000	0.306
Garrymore	50,744	91,339	1,740,000	0.052
Derrylea	273,543	492,377	3,390,000	0.145
Ticknevin, Glashabaun North & South	785,097	1,413,175	3,500,000	0.404
Ballydermot North, Codd North & South	850,335	1,530,603	3,040,000	0.503
Ballydermot South	-	-	-	-
Blackriver, Barnaran (& Lullymore)	860,347	1,548,625	3,090,000	0.501
Lodge	-	-	-	-
Cuil na Gun	174,074	313,333	2,520,000	0.124
Milkernagh	153,691	276,644	380,000	0.728
Coolcraff	4,866	8,759	2,700,000	0.003
Gilltown	277,914	500,245	1,130,000	0.443
Mouds/Allen	210,581	379,046	1,480,000	0.256
Prosperous	255,978	460,760	1,330,000	0.346
Kilberry	372,397	670,315	2,020,000	0.332
Cuil na Carton (& 2 other bogs)	292,083	525,749	1,310,000	0.401*
Total		27,545,460		

** The estimated depth of peat removed at Galros is 0.89m, however it is likely skewed by the total tonnage figure which includes Galros and Clongawney bog and is likely lower.*

14.3.2.3 Geological Resource Importance & Geological Heritage Sites

Geological Resource potential and Geological heritage sites (as defined on https://dcenr.maps.arcgis.com/apps/MapSeries/index.html) were investigated through a comprehensive desk study. A summary of the geological environment is included within Table 14.8.

The Boora Group is classified as generally Low-Medium geological resource potential, with some isolated high potential areas in surrounding lands, which generally relate to gravel deposits. Surrounding the Boora Group bogs there are several geological heritage sites which generally relate to eskers or other post glacial geological deposits.

The Derrygreenagh Group is classified as Low-Medium in terms of geological resource potential. There are 2 no. geological heritage sites near (application) bogs within this group. A Waulsortian Limestone quarry exists northeast of Kinnegad bog. Croghan Hill (OY014) is situated west of Ballybeg bog.

A geological heritage site, Clonmacnoise Esker (OY008) is located northwest of Ballaghurt bog within the Blackwater group. Geological resource potential locally is Low-Medium, apart from along the esker, where gravel potential is high, and a sand and gravel pit exists approximately 1 km north of Ballaghurt bog.

The geological resource importance of the Allen Group bogs and surrounding area is generally Low-Medium, with isolated high potential areas. There are some geological heritage sites, in the form of eskers near Clonad, Daingean (Derries) and Ballykeane bogs, while the Hill of Allen (KE003) is situated approximately 3.5 km southeast of the Lodge bog.

Geological resource potential near the Mountdillon Group is generally Low-Medium. Lead and zinc potential is mapped approximately 1.9 km southwest of Cuil na Gun bog, while the Rock of Curry and Hill of Mael geological heritage site (WH023) is situated approximately 4.7 km east of Milkernagh.

At the Kilberry group, geological resource potential is mapped (by the GSI) as Low-Medium, except near the Mouds/Allen bog where it is mapped as High. The Hill of Allen (KE003) is mapped approximately 2.6 km west of the Mouds/Allen bog.

Resource potential at the Cuil na Carton bog is Low-Medium. The Ridge of Portlaoise (LS029) is mapped approximately 3.1 km northeast of the bog.

Table 14.8: Summary of Geological Resources and Geological Heritage Sites at the 41 sites

Ref	Bog	Bog group	Geological Resource Potential	Geological Heritage Sites
1	Bellair Nth	Boora	Low to medium	OY008 - Clonmacnoise Esker to south of bog
2	Lemanaghan	Boora	Low to medium	OY008 - Clonmacnoise Esker to north of bog
3	Noggusboy	Boora	Low to medium	OY021 - Lough Boora Parklands approximately 2.2 km to southeast
4	Boora	Boora	High	OY021 - Bog underlain by Lough Boora Parklands
5	Galros	Boora	Low to medium	OY018 - Kilcormac Esker along east edge of bog
6	Killaun	Boora	High	OY018 - Kilcormac Esker to north
7	Derrinboy	Boora	High	OY027 - Silver River approximately 1 km to east and OY019 - Kinnitty Eskers approximately 0.9 km to west
8	Derryclure	Boora	Low to medium	OY018 - Kilcormac Esker approximately 400m to north
9	Monettia	Boora	Low to medium	None Locally
10	Killaranny	Boora	High	OY025 - Screggan Fan approximately 2.2 km to southeast
11	Bracklin	Derrygreenagh	Low to Medium	None Locally
12	Carranstown	Derrygreenagh	Low to Medium	None Locally
13	Ballivor	Derrygreenagh	Low to Medium	None Locally
14	Kinnegad	Derrygreenagh	Low to Medium (Quarry to west of the site is high)	Waulsortion Quarry to north east (1.67 km), Kinnegad, IGH 8 Lower Carboniferous
15	Ballybeg	Derrygreenagh	Low to Medium	OY014 - Croghan Hill to west of bog
16	Ballaghurt	Blackwater	High (Sand/gravel pit to west of bog)	OY008 - Clonmacnoise Esker to west, Ballinasloe-Split Hills (Rosc)-Clonmacnoise Esker system
17	Daingean (Derries)	Allen	Low to Medium	WH021 - Rahugh Ridge and OY001 - Ballyduff Esker to northwest
18	Daingean Rathdrum	Allen	Low to Medium	None Locally
19	Clonad	Allen	Low to Medium	OY018 - Kilcormac Esker approximately 1.3 km to southwest
20	Ballykeane	Allen	Low to Medium	OY018 - Kilcormac Esker approximately 2.4 km to west
21	Esker	Allen		None Locally
22	Garrymore	Allen	Low to Medium	None Locally
23	Derrylea	Allen		None Locally
24	Ticknevin	Allen	Low to Medium	None Locally
25	Glashabaun Sth	Allen	Low to Medium	None Locally
26	Glashabaun Nth	Allen	Low to Medium	None Locally
27	Codd Nth (Codd 2)	Allen	High	None Locally
28	Codd Sth (codd 1)	Allen	Low to Medium	None Locally
29	Ballydermot North	Allen	Low to Medium	None Locally

30	Ballydermot South	Allen	Low to Medium	None Locally
31	Blackriver	Allen	Low to Medium	None Locally
32	Barnaran	Allen	Low to Medium	None Locally
33	Lodge	Allen	Low to Medium	KE003 - Hill of Allen approximately 3.5 km to southeast
34	Cuil na Gun	Mountdillon	Low to Medium	Ballinalack [Zn, Pb] approximately 1.9 km to southwest of bog
35	Milkernagh	Mountdillon	Low to Medium	WH023 - Rock of Curry and Hill of Mael approximately 4.7 km to east
36	Coolcraff	Mountdillon	High	None Locally
37	Gilltown	Kilberry	Low to Medium	KE021 - St. Peter's Well 1.2 km to east of bog
38	Allen	Kilberry	High	KE003 - Hill of Allen approximately 2.6 km to west
39	Prosperous	Kilberry	Low to Medium	None Locally
40	Kilberry	Kilberry	Low to Medium	None Locally
41	Cuil na Carton	Cuil na Mona	Low to Medium	LS029 - Ridge of Portlaoise approximately 3.1 km to northeast

14.3.2.4 Geohazards

Recorded geohazard events, primarily landslides, were queried in areas at and surrounding the 41 bogs. five recorded events were identified within 5 km of the 41 bogs (refer to Table 14.9), with one of those events, the Derrylea bog slide, occurring within the bog site boundary of Derrylea bog.

The Derrylea slide occurred in 1954 and is reported as occurring during the early stages of drainage of the bog and all the displaced peat was contained within the basin of the bog.

Two peat slides occurred in 1916 and 1989 approximately 1.5 north of Tickevin bog, along the banks of the Grand Canal. There is no evidence that there is any link between these slides and Ticknevin bog.

A further land slide is mapped approximately 1.7 km south of Lemanaghan bog, near Derries bridge on Pollagh bog. This land slide occurred in 1954. As the surrounding Lemanaghan, Boora and Noggusboy bog were drained between 1951 – 1954, it is presumed that that slide was linked to the initial stages of drainage on Pollagh bog, similar to the slide at Derrylea in the same year.

Table 14.9: Historic recorded geohazard events

Event	Nearest Bog	Year	Geohazard Type	Description
Daingean1975 GSI_LS03-0066	Daingean (Rathdrum) – 4 km	1975	Land Slide	Mapped approximately 4 km east of Daingean (Rathdrum) 400m rupture length
Edenderry1916 GSI_LS03-0064	Ticknevin – 1.5 km	1916	Land Slide	Mapped 1.5 km north of Ticknevin. Breach occurred at this site again in 1989. North bank of the Grand Canal Edenderry. 270m rupture length. Heavy rain caused a raise in water levels
GSI_LS03-0064	Ticknevin – 1.5 km	1989	Land Slide	No additional info – presumably same as 1916
Pollagh1954 GSI_LS03-0065	Lemanaghan – 1.7 km	1954	Land Slide	Near Derries Bridge on Pollagh Bog. 1.7 km south of Lemanaghan bog and 4 km north of Boora bog.

Derrylea1954 GSI_LS03-0027	Derrylea Bog – on the bog	1954	Land Slide	Recorded in Feehan: The Bogs of Ireland. Occurred during early stages of drainage of bog. All displaced peat was contained within bog basin.

A qualitative assessment of geohazards at each of the 41 bog sites has been completed and is presented in Table 14.10. The assessment reviews any local historical failures, residual slopes within each bog, and residual peat depths at each bog. The assessment presents an evaluation of slope failure risks associated with each bog unit. It is noted note that all of the bogs are drained, and peat extraction and drainage works are ongoing. Many of the bogs have very low ground slope levels within the production areas, and this, in combination with the historical and continued drainage reduces the peat failure risks significantly.

Table 14.10: Summary of Geohazards data at the 41 sites

Ref	Bog	Bog group	Local Geohazards	Ground Slopes (°) (50%ile/80%ile)	Average Residual Peat Depths (m)*	Slope Failure Risks
1	Bellair Nth	Boora	None recorded	3.3 / 7.1	4.48**	Negligible
2	Lemanaghan	Boora	Pollagh land slide (1954) 1.7 km south of bog	3.3 / 7.0	2.31	Negligible
3	Noggusboy	Boora	None recorded	2.03 / 3.6	0.73	Negligible
4	Boora	Boora	None recorded	2.05 / 4.2	1.86	Negligible
5	Galros	Boora	None recorded	2.9 / 4.3	3.35	Negligible
6	Killaun	Boora	None recorded	4.1 / 8.3	3.44	Negligible
7	Derrinboy	Boora	None recorded	3.8 / 8.93	3.51	Negligible
8	Derryclure	Boora	None recorded	2.87 / 6.2	2.18	Negligible
9	Monettia	Boora	None recorded	3.0 / 7.2	2.89	Negligible
10	Killaranny	Boora	None recorded	2.49 / 4.87	2.59	Negligible
11	Bracklin	Derrygreenagh	None recorded	0 / 11.21	4.19**	Negligible
12	Carranstown	Derrygreenagh	None recorded	0 / 11.1	3.99**	Negligible
13	Ballivor	Derrygreenagh	None recorded	0 / 8.11	3.02**	Negligible
14	Kinnegad	Derrygreenagh	None recorded	0 / 9.25	4.32**	Negligible
15	Ballybeg	Derrygreenagh	None recorded	0 / 11.76	2.21	Negligible
16	Ballaghurt	Blackwater	None recorded	0 / 10.66	2.56	Negligible
17	Daingean (Derries)	Allen	None recorded	1.76 / 11.0	4.61**	Negligible
18	Daingean Rathdrum	Allen	None recorded	0 / 11.4	**	Negligible
19	Clonad	Allen	None recorded	0.02 / 14.0	1.69	Negligible
20	Ballykeane	Allen	None recorded	0.43 / 13.92	1.31	Negligible
21	Esker	Allen	None recorded	0 / 11.0	2.15	Negligible
22	Garrymore	Allen	None recorded	0 / 8.94	4.88**	Negligible
23	Derrylea	Allen	Derrylea landslide (1954, on the bog)	0 / 10.97	2.18	Negligible
24	Ticknevin	Allen	Edenderry Canal (1916,	0 / 12.71	3.49**	Negligible

			and 1989) 1.5 km from bog			
25	Glashabaun Sth	Allen	None recorded	0 7.73	3.0	Negligible
26	Glashabaun Nth	Allen	None recorded	0 / 9.5	1.27	Negligible
27	Codd Nth (Codd 2)	Allen	None recorded	0 / 13.8	2.61	Negligible
28	Codd Sth (codd 1)	Allen	None recorded	0 / 10.62	1.46	Negligible
29	Ballydermot North	Allen	None recorded	0 / 9.2	1.16	Negligible
30	Ballydermot South	Allen	None recorded	0 / 13.6	2.13	Negligible
31	Blackriver	Allen	None recorded	0 / 9.23	1.34	Negligible
32	Barnaran	Allen	None recorded	0 / 11.6	1.96	Negligible
33	Lodge	Allen	None recorded	0 / 11.33	1.90	Negligible
34	Cuil na Gun	Mountdillon	None recorded	0 / 13.06	1.44	Negligible
35	Milkernagh	Mountdillon	None recorded	0 / 12.65	1.69	Negligible
36	Coolcraff	Mountdillon	None recorded	0 / 11.5	No data	Negligible
37	Gilltown	Kilberry	None recorded	0 / 12.18	3.83**	Negligible
38	Allen	Kilberry	None recorded	0 / 9.13	3.66**	Negligible
39	Prosperous	Kilberry	None recorded	1.79 / 12.25	No data**	Negligible
40	Kilberry	Kilberry	None recorded	0 / 8.94	3.38**	Negligible
41	Cuil na Carton	Cuil na Mona	None recorded	2.43 / 5.06	2.59**	Negligible

** Average residual peats depths remaining in surveyed production areas from 2015 lidar data (unless stated otherwise)*
*** Average residual peats depths remaining in surveyed production areas from 2008 lidar data*

14.3.3 Hydrological Overview

14.3.3.1 Initial Bog Drainage

Table 14.11 summarises the bog areas, production field sizes, year of first drainage and the year that production first began in all 41 sites.

There are 34 bogs where first drainage, and 26 bogs where first production, began before 1985. There are 16 bogs where first production began after 1985. These include Galros, Killaun, Derrinboy, Derryclure and Killarann of the Boora Group, Bracklin and Carranstown bogs within the Derrygreenagh group, Daingean (Derries), Daingean (Rathdrum), Garrymore, Ticknevin, Codd North and Codd South from the Allen group, Coolcraff bog from the Mountdillon Group, Ballaghurt from the Blackwater Group and Prosperous from the Kilberry Group.

Of these 16 there are eight bogs which were drained in or after 1985. These bogs include Killaun, Derrinboy and Derryclure bog from the Boora group, Daingean (Derries), Daingean (Rathdrum) and Garrymore from the Boora Group and Prosperous from the Kilberry group.

In essence, the major changes from a hydrological perspective occurred within these eight bogs that were drained between the period of approximately 1985 – 1996. The other 34 bogs had previously been drained, and as such there were no major hydrological changes within these bogs after 1985, apart from alteration of drainage ditches as production progressed.

Table 14.11: Production Areas, Year of first drainage and year of first production within the 41 bogs.

Ref	Bog Unit	Bog Group	Bog Area	Production Area	First Drained (Year)	First Production (Year)
1	Bellair Nth	Boora	570	404	1970	1976
2	Lemanaghan	Boora	1259	593	1951	1955
3	Noggusboy	Boora	924	120	1951	1955
4	Boora	Boora	1848	118	1954	1959
5	Galros	Boora	193	109	1983	**1988***
6	Killaun	Boora	361	268	**1996***	**2003**
7	Derrinboy	Boora	308	203	**1988**	**2003**
8	Derryclure	Boora	332	163	**1987**	**1992**
9	Monettia	Boora	711	454	1976	1982
10	Killaranny	Boora	244	112	1983	**1989**
11	Bracklin	Derrygreenagh	755	118	1979	**1985**
12	Carranstown	Derrygreenagh	305	136	1979	**1985**
13	Ballivor	Derrygreenagh	654	34	1948	1953
14	Kinnegad	Derrygreenagh	353	215	1977	1982
15	Ballybeg	Derrygreenagh	837	281	1951	1955
16	Ballaghurt	Blackwater	616	392	1975/ 1990	1980/ 1995
17	Daingean (Derries)	Allen	278	204	**1995**	**1999**
18	Daingean Rathdrum	Allen	368	202	**1996**	**2000**
19	Clonad	Allen	44	185	1956	1962
20	Ballykeane	Allen	453	186	1951	1955
21	Esker	Allen	567	363	1959	1965
22	Garrymore	Allen	308	174	**1992**	**1999**
23	Derrylea	Allen	665	339	1968	1972
24	Ticknevin	Allen	458	240	1976	**2000**
25	Glashabaun Sth	Allen	561	31	1946	1950
26	Glashabaun Nth	Allen	506	79	1946	1950
27	Codd Nth (Codd 2)	Allen	312	180	1983	**1989**
28	Codd Sth (codd 1)	Allen	256	44	1983	**1989**
29	Ballydermot North	Allen	452	80	1946	1950
30	Ballydermot South	Allen	434	179	1946	1950
31	Blackriver	Allen	766	136	1946	1950
32	Barnaran	Allen	492	173	1951	1955
33	Lodge	Allen	430	84	1951	1955
34	Cuil na Gun	Mountdillon	670	252	1947	1953
35	Milkernagh	Mountdillon	629	38	1947	1953
36	Coolcraff	Mountdillon	412	270	1981	**1989**
37	Gilltown	Kilberry	345	113	1977	1982
38	Allen	Kilberry	434	148	1966	1972
39	Prosperous	Kilberry	217	133	**1991**	**2003**
40	Kilberry	Kilberry	1001	202	1945	1948

41	Cuil na Carton	Cuil na Mona	568	131	1962	1966

** Note, bog units that were drained or went into production, after 1985 are identified by bold and underlined text.*

14.3.3.2 Hydrology – Regional Context

The 41 bogs are located within eight regional catchments listed below. These regional catchments are spatially extensive enough to broadly group the bog groups into general drainage directions, included below as Table 14.12.

Table 14.12: Primary bog groups within Regional Catchments

Regional Catchment	Catchment size (km^2)	Bog Group	No of Bogs Drained	General Drainage direction
Barrow_014	3015	Mainly Allen Group	22	South
Boyne_07	2689	Mainly Derrygreenagh Group, some Kilberry Group	6	East
Liffey and Dublin Bay	1624	Mounds Bog in Kilberry Group	1	East
Lower Shannon_25A	1248	Mainly Boora Group, some Allen Group	10	Southwest
Lower Shannon_25B	982	Western Boora Group and Blackwater Group	4	Southwest
Upper Shannon_26F	1229	Mountdillon Group	3	Southwest
Upper Shannon_26G	383	Northern Boora Group	1	Southwest
Nore_15	2585	Cuil na Mona Group	1	Southeast

Data on volumetric flow exceedance was acquired from OPW gauging stations (www.waterlevel.ie) within various river channels within these regional catchments (as listed in Table 14.12). The locations of these gauging stations are shown on Figure 14.8 in Appendix 14.4. The Lower and Upper Shannon sub-catchments have been combined into an overall Shannon catchment.

Data from a total of 38 gauging stations was used to create flow (volume/time) duration curves for the rivers at their various points along the length of their river catchment. The data was acquired for the main channels within the regional catchment such as the Shannon or Boyne River, as well as in smaller tributaries of those rivers, such as the River Ballivor near Ballivor bog. These data from the OPW include observed flows and are displayed as exceedance flows. A 95%ile flow relates to the flow which will be exceeded within the river 95% of the time *i.e.* a 95%ile flow of 1 m^3/s would indicate that 95% of the time, the flow in that river is at or above 1 m^3/s.

These data were plotted for the Shannon, Boyne, Barrow, Nore and Liffey catchments and are displayed graphically as Figure 14.2 to Figure 14.5. At some gauging stations, only 50% and 95% exceedance flows are available.

Figure 14.2: Flow duration curves (full and partial) for rivers within the Shannon Catchment

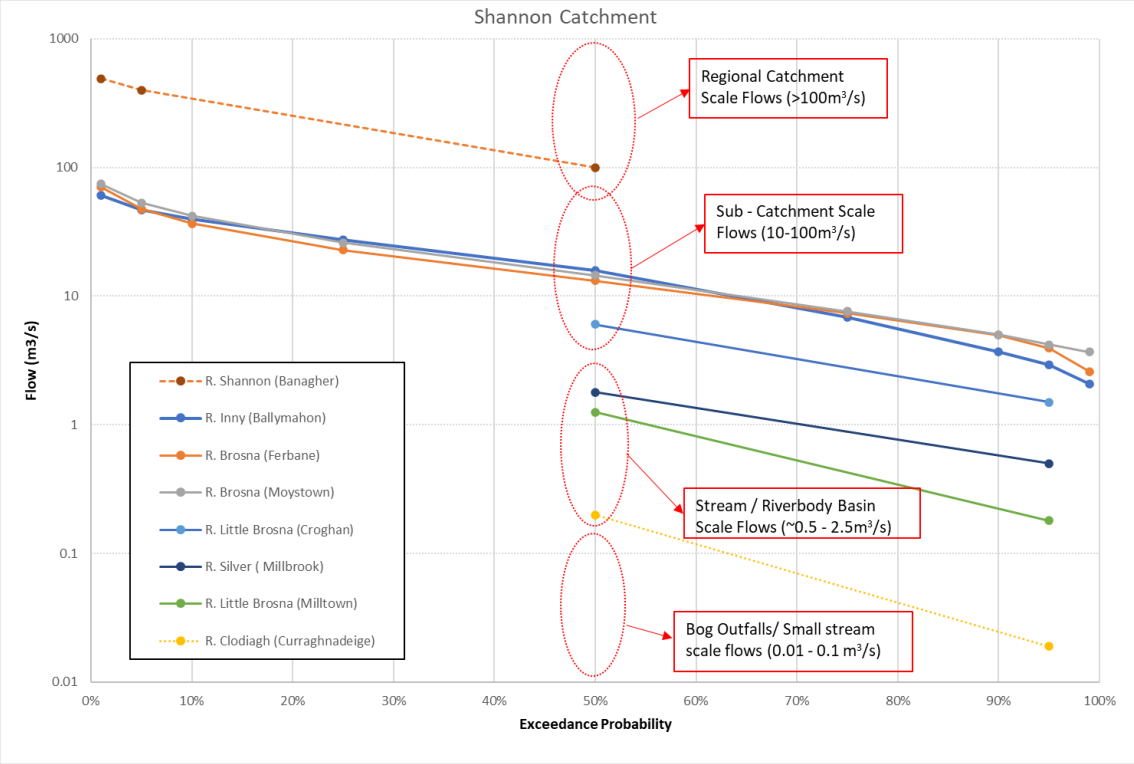


Figure 14.3: Flow duration curves (full and partial) for rivers within the Boyne Catchment

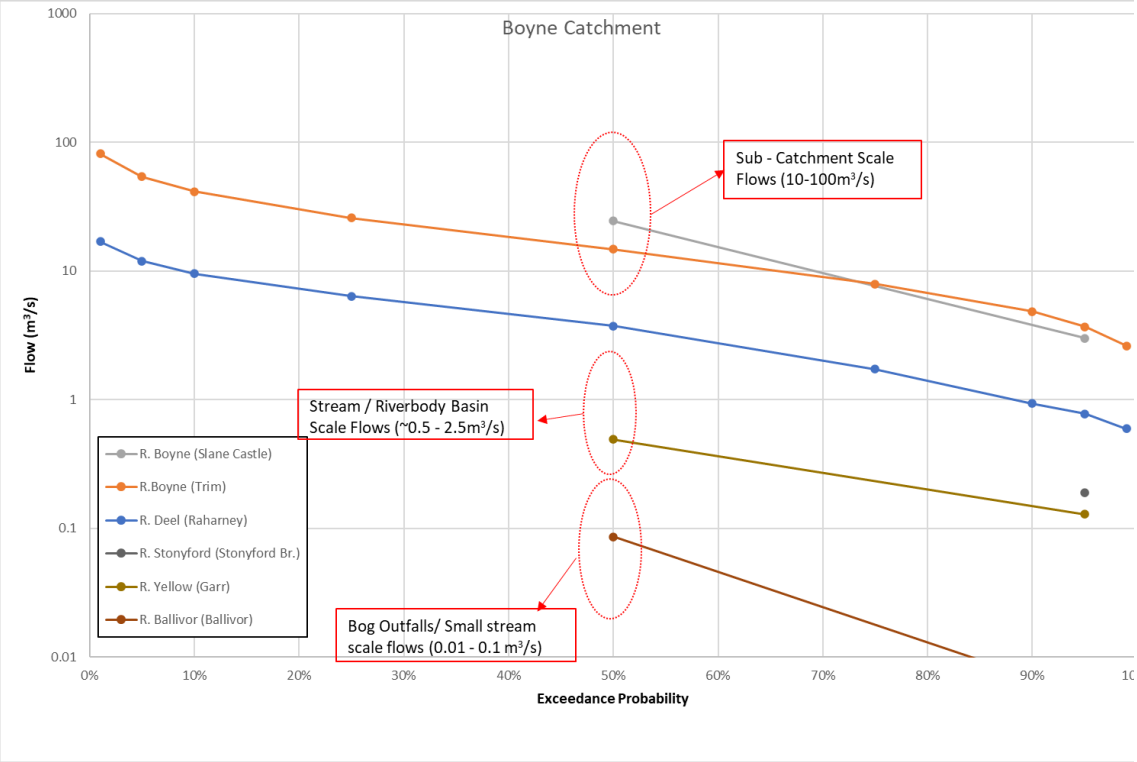


Figure 14.4: Flow duration curves (full and partial) for rivers within the Barrow Catchment

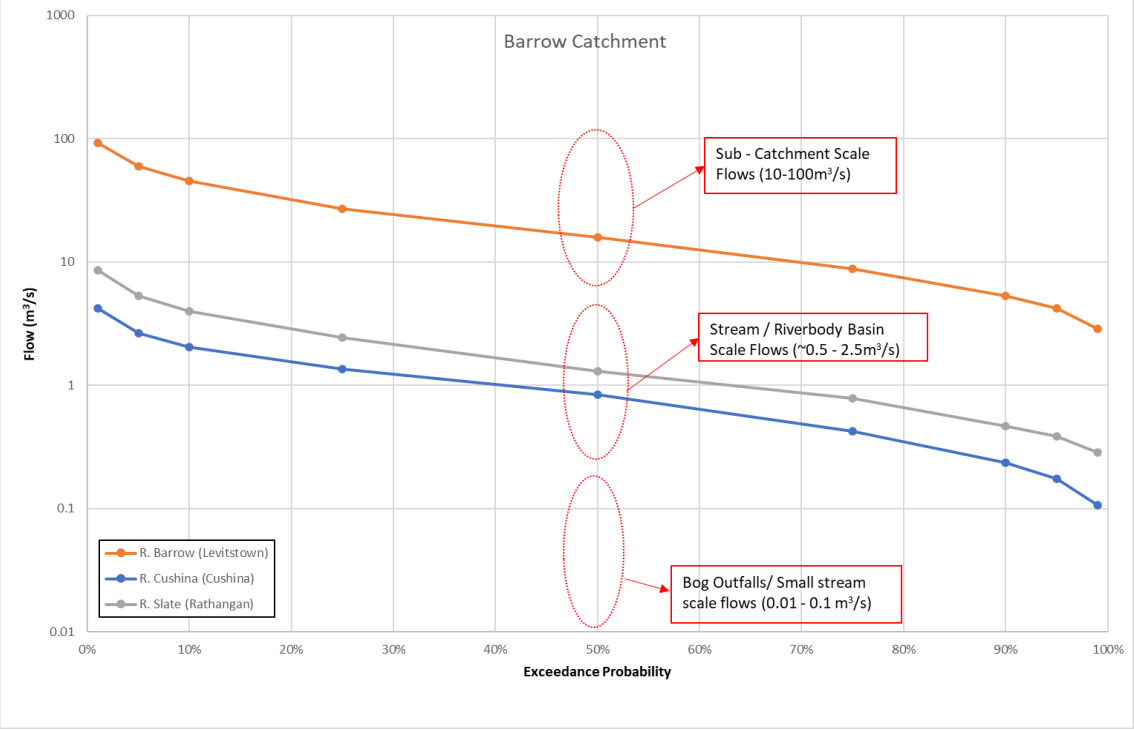
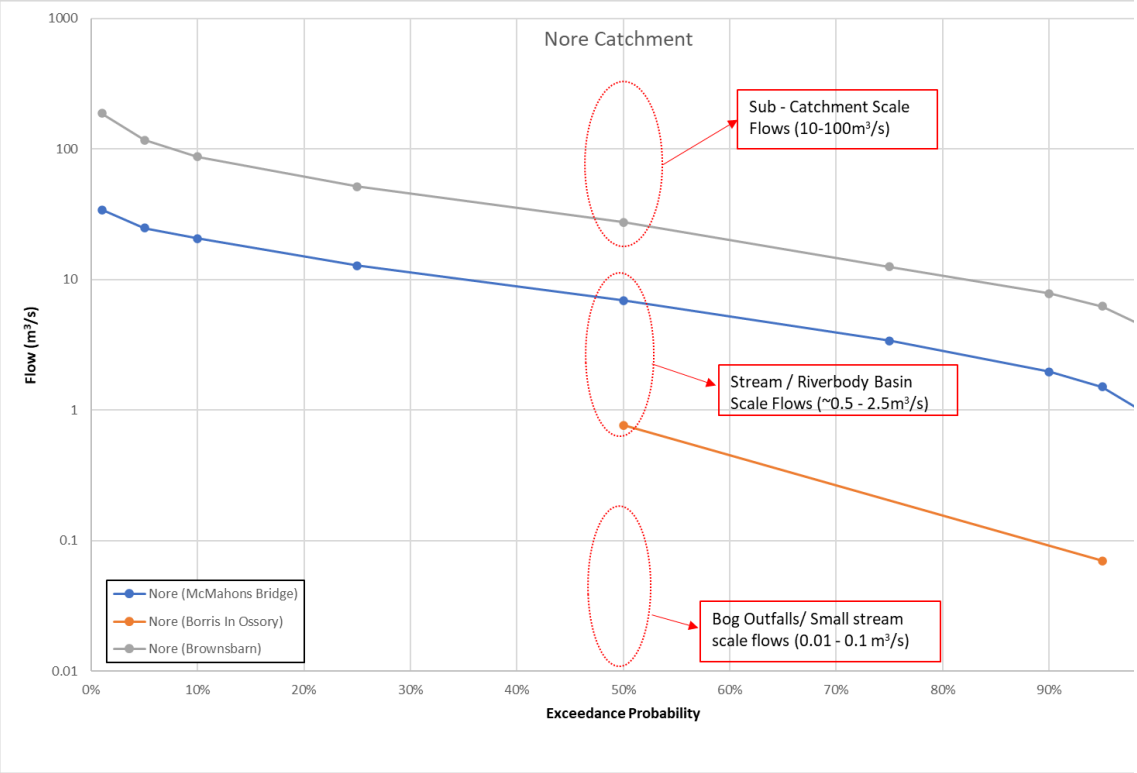


Figure 14.5: Flow duration curves (full and partial) for rivers within the Nore Catchment



The graphs are annotated with zones whch relate to the scale of the river flows within the overall channel. For example, Figure 14.2 shows the regional catchment scale flows within the Shannon catchment at Banagher. The 50%ile flow at this point is approximately 100 m³/s. Within smaller tributary rivers, such as the River Brosna and River Inny, the 50%ile flows are approximately 20 m³/s are grouped within the Sub-catchment scale flow (10-100 m³/s). As the scale of the rivers gets smaller, the flows naturally reduce to Stream/ River body basin scale flows such as in the River Cushina (Figure 14.4, Barrow Catchment) . Flows within the range 0.01 – 0.1 m³/s are grouped within Bog outfalls/ Small stream scale flows, and includes waterbodies such as the River Ballivor (Figure 14.3, Boyne Catchment) which drains the Ballivor bog.

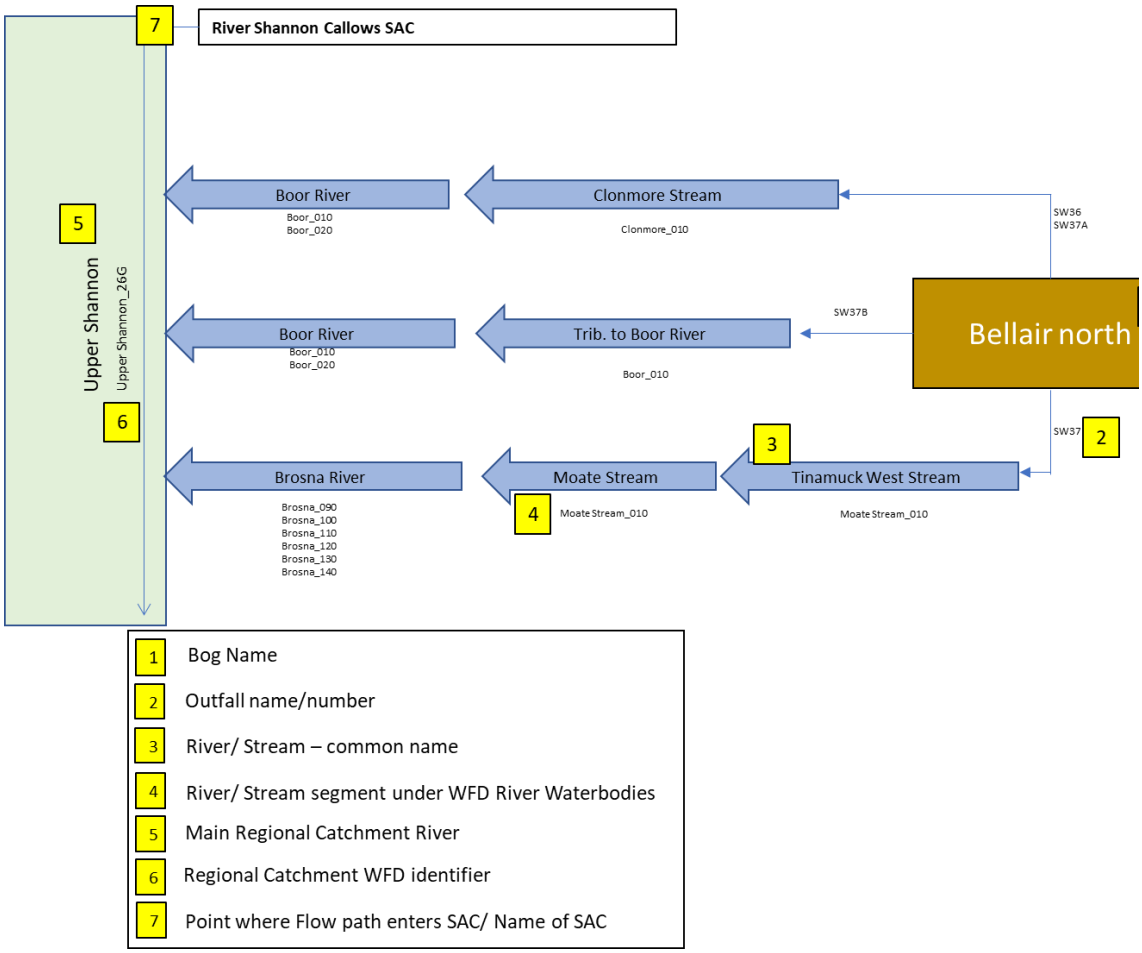
14.3.3.3 Bog Unit Scale Hydrology

A detailed hydrological audit of flow paths from each bog to its eventual discharge point at the regional catchment scale was conducted for the 41 bogs. The flow paths have been traced using the River Waterbodies classification as outlined by the WFD. An example flowpath is shown below in Figure 14.6.

Drainage from the Bellair North bog discharges through 4 no. outfalls (SW36 – SW37B). The SW37 (**2**) outfall discharges to the Tinamuck West Stream (**3**), which then discharges to the Moate stream. Both of these streams are mapped within the Moate Stream_010 (**4**) river waterbody. The Moate stream then reaches a confluence with the River Brosna. The River Brosna continues through segments Brosna_090 to Brosna_140 before discharging to the

Upper Shannon (**5**). The Bellair North bog is within the regional catchment Upper Shannon_26G (**6**). If a flow path intersects/interacts with an SAC from a hydrological perspective, this is indicated with a green box (**7**). In the Bellair bog example (Figure 14.6), the flow path reaches an SAC, the River Shannon Callows SAC, after the Boor_020 and Brosna_140 waterbodies. A detailed flow chart of each of the 41. bogs are included within Appendix 14 *Land, Soils and Groundwater*.

Figure 14.6: Flow route of water from Bellair north bog with explanatory notes



These 41 flow paths identified were used in the assessment of any impacts between the surface water hydrological regime and the bog hydrogeological regime. It is assumed that there is a connection between the near surface groundwater at the bogs, which likely discharges to surface waterbodies local to the bogs.

14.3.3.4 Drainage/Silt Ponds

A network of silt ponds exists across all 41 bogs. They are typically approximately 50 – 300m in length and 8m or 12m wide. There is approximately 269 silt ponds across the 41 bogs. The silt ponds are all located hydraulically upgradient or before the outfall points. Silt ponds are

generally excavated to a depth of 1.5 metres below the pipe invert level and they are cleaned twice a year.

Field drains have been installed at approximately 15 metre intervals across the bogs, the drains generally fall towards the headland which is located at both ends of each production field. This headland allows for the plant such as harrowers, millers or ridgers to turn from one field into the next field. The open drains are generally piped across the end of each production field to facilitate production plant and machinery to travel from field to field. The drainage network continues by either open channel or pipe to a silt pond or ponds prior to discharging to a local watercourse. Drainage is by gravity flow where possible, however there are a number of pumping stations in some bogs (refer to Section 14.3.3.5), where required (due to low or absent flow gradients, i.e. water levels in surrounding watercourses are higher than those on the bogs), to drain the bogs.

In accordance with the existing Integrated Pollution Control licences, all drainage water from bog units in the licensed area is discharged via an appropriately designed silt pond treatment arrangement. The silt ponds serving operation bogs have been sized in accordance with a condition in the existing Integrated Pollution Control Licences which states:

Within three years of date of grant of this licence all existing silt ponds serving operational bogs shall achieve the following minimum performance criteria (flood periods excepted):

Maximum flow velocity < 10 cms-1

Silt design capacity of lagoons, minimum 50m³ per nett ha of bog serviced

Silt ponds were generally designed and constructed with a width of 8 metres, however in some cases silt ponds are up to 12 metres in width. Silt ponds of 12m width are only provided in areas where access is available to both sides of the silt ponds for cleaning. The length of the silt pond will vary depending on the capacity required (i.e. proportional to the area of catchment being drained). In some locations, baffles have been provided within the ponds to reduce the energy in the flow and elongate the pond thereby increasing residence time and aiding settlement. Silt ponds are generally excavated to a depth of 1.5 metres below the pipe invert level, however in some locations, due to restricted space the silt pond depth is greater than this.

low velocity through the silt pond is generally controlled by inlet and outlet pipes at the silt ponds or up-stream of the silt pond. These pipes control the velocity of the flow into and out of the silt ponds so that the velocity within the silt pond itself is less than 0.1 m/sec.

Pipelines and pump capacities are assessed based on a run-off rate of 1.7 litres per second per hectare. This run-off rate is based on a report prepared by Bord na Móna in the 1980's and the run-off equates to approximately 60% of 25mm of rainfall falling in 24 hours (these details are taken directly from Bord na Móna SWMPs for each Bog Group).

14.3.3.5 Pumping Stations

As bogs have been developed and the draining of areas of bog by gravity is no longer feasible, pumps have been installed to drain part or all of the catchment. Bord na Móna have used Archimedean screw pumps for many years throughout their bogs and in recent years, submersible pumps have become more common. Table 14.13 lists the pumping stations across the 41 bogs. Pumps are usually installed on a duty/ standby basis with level sensors.

Table 14.13: List of Pumping Stations on Bogs

Bog Unit	Pump Station Reference No.
Bellair North	P15/001
Lemanaghan	P15/003
Lemanaghan	P15/004
Monettia	P15/005
Noggusboy (no longer in use)	P15/002
Coolnagun	P05/048
Coolnagun	P05/049
Milkernagh	P05/050
Ballybeg	P37/001
Ballydermot South & North	P37/011
Ballydermot South & North	P37/012
Codd South	P37/014
Blackriver	P37/007
Lodge	P37/013
Glashabaun North	P37/008
Ticknevin	P37/010
Derrinboy	P15/008

14.3.3.6 WFD Surface Water Status

Local Surface water Body status and risk result are available from (www.catchments.ie). A summary of the current status of downstream surface water bodies (SWBs, downstream from the various bog units) are listed in Table 14.14.

Table 14.14: WDF SWB Status 2013-2018

Bog Group	River Waterbody	WFD Status 2013-2018
Boora	Clonmore_010	Unassigned
Boora	Boor_010	Good
Boora	Boor_020	Moderate
Boora	Moate Stream_010	Poor
Boora	Brosna_090	Good
Boora	Brosna_100	Moderate
Boora	Brosna_110	Good
Boora	Brosna_120	Good
Boora	Brosna_130	Moderate
Boora	Brosna_140	Moderate
Boora	Shannon (Lower)_010	Unassigned
Boora	Silver (Kilcormac)_050	Moderate
Boora	Rapemills_010	Moderate
Boora	Rapemills_020	Unassigned
Boora	Camcor_050	Good
Boora	Little Brosna_050	Good
Boora	Little Brosna_060	Good
Boora	Tullamore_020	Poor

Bog Group	River Waterbody	WFD Status 2013-2018
Boora	Tullamore_040	Moderate
Boora	Killeenmore_010	Unassigned
Boora	Clodiagh (Tullamore)_020	Good
Boora	Clodiagh (Tullamore)_030	Good
Boora	Clodiagh (Tullamore)_040	Unassigned
Boora	Clodiagh (Tullamore)_050	Poor
Boora	Derrycooley Stream_010	Unassigned
Boora	Pigeonhouse_010	Unassigned
Boora	Barrow_030	Good
Boora	Barrow_040	Moderate
Boora	Barrow_050	Unassigned
Derrinlough	Deel(Raharney)_030	Moderate
Derrinlough	Deel(Raharney)_050	Moderate
Derrinlough	Deel(Raharney)_060	Good
Derrinlough	Stonyford_040	Moderate
Derrinlough	Boyne_030	Moderate
Derrinlough	Boyne_040	Moderate
Derrinlough	Boyne_050	Good
Derrinlough	Boyne_060	Good
Derrinlough	Boyne_070	Moderate
Derrinlough	KInnegad_020	Moderate
Derrinlough	Kinnegad_030	Moderate
Derrinlough	Yellow (Castlejordan)_020	Good
Derrinlough	Yellow (Castlejordan)_030	Good
Derrinlough	Castletown Tara Stream_010	Unassigned
Derrinlough	Blackwater (Shannonbridge)_010	Good
Derrinlough	Blackwater (Shannonbridge)_020	Good
Allen	Silver (Tullamore)_010	Unassigned
Allen	Silver (Tullamore)_020	Good
Allen	Silver (Tullamore)_030	Good
Allen	Silver (Tullamore)_040	Moderate
Allen	Daingean_010	Poor
Allen	Daingean_020	Poor
Allen	Daingean_030	Poor
Allen	Figile_040	Moderate
Allen	Figile_050	Good
Allen	Figile_060	Good
Allen	Figile_070	Unassigned
Allen	Figile_080	Unassigned
Allen	Enaghan Stream_010	High
Allen	Cushina_030	Good
Allen	Esker Stream_020	Good
Allen	Cottoners Brook_010	Unassigned
Allen	Slate_050	Moderate
Allen	Slate_060	Moderate
Allen	Slate_070	Moderate

Bog Group	River Waterbody	WFD Status 2013-2018
Mountdillon	Inny_070	Good
Mountdillon	Inny_080	Good
Mountdillon	Inny_090	Good
Mountdillon	Inny_100	Moderate
Mountdillon	Inny_110	Unassigned
Mountdillon	Coolnagun Stream_010	Unassigned
Mountdillon	Ferskil_010	Unassigned
Kilberry	Blackwater(Longwood)_010	Poor
Kilberry	Blackwater(Longwood)_020	Moderate
Kilberry	Blackwater(Longwood)_030	Unassigned
Kilberry	Blackwater(Longwood)_040	Moderate
Kilberry	Blackwater(Longwood)_050	Moderate
Kilberry	Slate_010	Unassigned
Kilberry	Slate_020	Poor
Kilberry	Slate_030	Unassigned
Kilberry	Slate_040	Poor
Kilberry	Awillyinish Stream_010	Unassigned
Kilberry	Liffey_090	Good
Kilberry	Kildoon_010	Unassigned
Kilberry	Athy Stream_030	Unassigned
Kilberry	Tully_040	Moderate
Kilberry	Barrow_120	Good
Kilberry	Barrow_130	Good
Cuil na Mona	Triogue_010	Good
Cuil na Mona	Triogue_020	Poor
Cuil na Mona	Triogue_030	Poor
Cuil na Mona	Triogue_040	Poor
Cuil na Mona	Cappancloghy_020	Good
Cuil na Mona	Cappancloghy_030	Unassigned
Cuil na Mona	Clonawoolan Stream_010	Poor
Cuil na Mona	Nore_090	High

14.3.3.7 Flood Risk Summary

The Flood Risk Assessment (FRA) Report completed by Bord na Móna for the 41 bog units is provided in Appendix 13 *Flood Risk*. HES have summarised the general findings of the FRA Report by bog group within Table 14.15.

Table 14.15: Summary of findings of Flood Risk Assessment

Bog group	Key Findings & Conclusions
Boora	Flood Risk Assessment indicates that the majority of works areas in the Boora group bogs is not at risk of flooding from a 1000-year event and therefore can be considered to be in the Low risk Flood Zone C. This Flood zone is appropriate for all types of development. In some instances, such as at Lemanaghan, Killaun and Noggusboy bogs, the peat production fields and drains are mapped within Flood Zone A, however all bogs which are located within these Zone A areas have undergone a Justification test and have been deemed appropriate for peat extraction works.
Derrygreenagh	Flood Risk Assessment indicates that the peat production fields and drains in Bracklin Bog, Carranstown and Kinnegad bog can be classified as Zone A as this area of the bog has a high probability of flooding, however it satisfies the Justification test and is considered appropriate for peat extraction works. Flood Risk Assessment indicates that the compound in the northern end of Kinnegad bog is at risk of flooding from a 1000-year event but is not at risk of flooding from a 100-year event and therefore can be considered to be in a Flood Zone B and as such is appropriate for peat extraction works. The remaining works areas are within Flood Zone C and are deemed appropriate for peat extraction works.
Blackwater	This Flood Risk Assessment indicates that the Works Area in Ballaghurt Bog is not at risk of flooding from a 1000-year event and therefore can be considered to be in the Low Risk Flood Zone C. This Flood zone is appropriate for all types of development. Flood Risk Assessment indicates that the peat production fields and drains in Ballaghurt Bog can be classified as Zone A as this area of the bog has a high probability of flooding, but the location satisfies the Justification test completed.
Allen	This Flood Risk Assessment indicates that the Works Area in the bogs within the Allen group are not at risk of flooding from a 1000-year event and therefore can be considered to be in the Low risk Flood Zone C. This Flood zone is appropriate for all types of development. The FRA indicates that the peat production fields and drains in the Allen Group bogs are located in Zone A and that these areas of the bogs have a high probability of flooding. A Justification test was applied to all these areas mapped within Zone A, and all were deemed appropriate for peat extraction works.
Mountdillon	The Flood Risk Assessment indicates that the works areas in the Cuil na Gun and Milkernagh are not at risk of flooding from a 1000-year event and therefore can be considered to be in a Low Risk Flood Zone C. This Flood zone is appropriate for all types of development. The FRA indicates that the peat production fields and drains in the bogs of the Mountdillon Group can be classified as Zone A as this area of the bog has a high probability of flooding. A Justification test was applied to these areas and the development was deemed appropriate in all cases for peat extraction work.
Kilberry	The Flood Risk Assessment indicates that the Works Area in Prosperous Bog is not at risk of flooding from a 1000-year event and therefore can be considered to be in the Low Risk Flood Zone C. This Flood zone is appropriate for all types of development. This Flood Risk Assessment indicates that the peat production fields and drains in Prosperous and Kilberry Bog can be classified as Zone A. The peat extraction works is considered appropriate in these areas following a Justification test.
Cuil na Mona	This Flood Risk Assessment indicates that the Cul na Mona Works in Coolnacartan Bog is not at risk of flooding from a 1000-year event and therefore can be considered to be in the Low Risk Flood Zone C. The FRA indicates that the peat production fields and drains in Coolnacartan Bog can be classified as Zone A as this area of the bog has a high probability of flooding. This area passed the Justification test for peat extraction works.

Pluvial flooding is considered the primary flood risk across the bogs, rather than flooding from groundwater or fluvial flooding. Historical fluvial flooding was not recorded across the bogs, with the only evidence of historical flooding coming from aerial photographs in 2007 and 2009 in some bogs, which is presumed to be pluvial. The majority of the bogs are within Flood Zone C and are appropriate for all types of development. Some areas of the 41 bogs, particularly near

the bog drains are mapped as Flood Zone A, but all were deemed appropriate for peat extraction following Justification tests.

The FRA indicates that the downstream flooding, as a result of increased runoff from operational bogs is controlled by limiting bog discharges to greenfield runoff rates.

14.3.4 Hydrogeological Environment

14.3.4.1 Hydrogeological Context

There has been little alteration of the hydrogeological (groundwater) environment at the 41 bogs between the period of 1985 – 2019. As the underlying baseline, *e.g.* underlying bedrock and aquifer type, does not change over time, the primary method of change is the alteration of the hydrological (surface water) regime.

Drainage of the bogs can alter the hydrogeological regime slightly, by increasing the ratio of runoff to recharge, therefore the bogs which are most likely to have been changed from a hydrogeological perspective between 1985 – 2019 are the eight bogs which were drained between this period.

In general, peat bogs are typically characterised by low recharge, with the GSI generally mapping the bogs with recharge rate of approximately 4% of effective rainfall, so the scale of any change has to be understood in this context. Bogs have a high natural runoff rate. The bogs are broadly underlain by an impermeable layer such as Lacustrine Clay or a Shelly Marl, which limit the infiltration of water downwards into the underlying aquifer. Rainfall is therefore stored within the peat and slowly infiltrates to ground or discharges to streams surrounding the bogs.

Following the drainage of the bog, the hydrology changes and storage is reduced within the peat by creating drainage channels to channel rainwater off the bogs and directly to streams/waterbodies.

A summary of the key hydrogeological characteristics and classifications at the 41. sites are presented in

Table 14.16: Summary of hydrogeological characteristics/classification at the 41 bog sites.

Ref	Bog	Aquifer Type	Groundwater Vulnerability	Groundwater Hydrochemistry	GWB Underlying Bog	Local Karst features
1	Bellair Nth	Ll, LG mapped north and south of bog	Moderate	Generally: Ca-HCO_3, with Very Hard water (380-450 mg/l $CaCO_3$)	Clara GWB	Holywell Spring 1 km south of site (2023SEK002)
2	Lemanaghan	Ll. Centre of bog mapped as Lm, Lg mapped north and southwest of bog	Low	Generally: Ca-HCO_3, with Very Hard water (380-450 mg/l $CaCO_3$)	Clara GWB with Ferbane GWB mapped towards east/southeast of bog	1 no. swallow hole 2021NEK006 and 2 no. springs 2023SEK002 and 2023SEK003 near Parkaree/Springpark (approximately 100-200m north of the bog)
3	Noggusboy	Ll	Moderate	Generally: Ca-HCO_3, with Very Hard water (380-450 mg/l $CaCO_3$)	Clara GWB	None within 3 km of site
4	Boora	Majority of site mapped as LI. Small area of the bog towards south mapped within Rkd	Moderate	Generally: Ca-HCO3, with Very Hard water (380-450 mg/l CaCO3)	Clara GWB	Spring (2021SEK002) mapped in townland of Frankford approximately 1.3 km south of the bog.
5	Galros	Western section mapped as LI, Eastern section of bog mapped as Rkd. Lg to north and east of the bog.	Moderate	Generally: Ca-HCO_3, with Very Hard water (>350 mg/l $CaCO_3$)	LI Aquifer mapped within the Banagher GWB. Rkd aquifer mapped within the Birr GWB. Lg mapped within the Birr Gravels Aquifer	Spring (Tobernapoula) mapped 1 km south of the bog.
6	Killaun	LI.	Low	Groundwaters have a $CaCO_3$ signature. Limited data on Shinrone GWB. Nearby Slieve Phelim GWB has hard to slightly hard water	Shinrone GWB	Spring (Tobernapoula) mapped 2 km north of the bog.
7	Derrinboy	LI	Low	Generally: Ca-HCO_3, with Very Hard water (>350 mg/l $CaCO_3$)	Geashill GWB	Several springs mapped approximately 2.5 km southwest of the bog in Knockbarron townland.

8	Derryclure	LI	Moderate	Generally: Ca-HCO_3, with Very Hard water (>350 mg/l $CaCO_3$)	Geashill GWB	Spring (2321NWK004) mapped 400m of the bog. Spring (2321NWK014) located 2 km east of the bog, linked to swallow hole (2321NWK013)
9	Monettia	LI	Low	Generally: Ca-HCO3, with Very Hard water (>350 mg/l $CaCO_3$)	NW mapped as Geashill GWB. SE mapped as Portlaoise GWB	Dissolved limestone outcrop with karst mapped 3 km northwest of the site.
10	Killaranny	Centre and south of bog mapped as LI, North of bog mapped as a Rkd.	Low	Generally: Ca-HCO3, with Very Hard water (>350 mg/l $CaCO_3$)	Tullamore GWB	Agall Spring (2021NEK004) mapped 0.7 km east of the bog.
11	Bracklin	LI	Low to Moderate	Generally: Ca-HCO_3, with hard water	Athboy GWB	None within 2 km of the bog
12	Carranstown	LI	Low to High	Generally: Ca-HCO_3, with hard water	Athboy GWB	None within 2 km of the bog
13	Ballivor	LI	Low to Moderate	Generally: Ca-HCO_3, with hard water	Athboy GWB	None within 2 km of the bog
14	Kinnegad	LI	Moderate	Generally: Ca-HCO_3, with hard water	Athboy GWB	None within 2 km of the bog
15	Ballybeg	LI	Low	Generally: Ca-HCO_3, with hard water	Athboy GWB	Toberdaly Spring 1 km to south of Ballybeg Bog
16	Ballaghurt	LI	Moderate - Low	Generally: Ca-HCO_3, with Very Hard water (380-450 mg/l $CaCO_3$)	Clara GWB	Endrim Mushroom rock (OY017) located approximately 750m south of bog area.
17	Daingean (Derries)	LI	Moderate	Generally: Ca-HCO_3, with Very Hard water (>350 mg/l $CaCO_3$)	Daingean GWB	Nothing within 2.5 km of site
18	Daingean Rathdrum	LI	Moderate	Generally: Ca-HCO_3, with Very Hard water (>350 mg/l $CaCO_3$)	Geashill GWB	Several springs mapped near Daingean, approximately 2.2 km east of site.

19	Clonad	Western section of bog within LI. East of bog mapped between Lm and Lk	Low	Generally: Ca-HCO_3, with Very Hard water (>350 mg/l $CaCO_3$)	Daingean/Geashill/Rhodes GWB's split from west to east.	Spring mapped at site of Geashill PWS
20	Ballykeane	Primarily within RKd	Moderate	GWB hydrochemistry only noted as Calcareous - Likely hard to very hard water similar to other GWBs in the area	Bagenalstown Upper GWB	Spring (TOBERABRIN) mapped 1.3 km west of site.
21	Esker	LI	Moderate	Generally: Ca-HCO_3, with Very Hard water (>350 mg/l $CaCO_3$)	Rhode GWB	Mount Briscoe Cave situated approximately 4 km west of bog.
22	Garrymore	LI	Low - Moderate	Calcareous with high electrical conductivity values.	Portlaoise GWB	None within 2.5 km of bog
23	Derrylea	LI	Low	The groundwater samples from the Lough PWS indicate a hard (350-400 mg/l $CaCO_3$) water with a calcium bicarbonate hydrochemical signature.	Cushina GWB	None within 2.5 km of the bog
24	Ticknevin	LI	Low - Moderate	Calcium Bicarbonate signature. Moderately hard to very hard waters with alkalinities between 150 to 350mg/l. Conductivity 500 - 800 µS/cm.	Trim GWB	None within 2.5 km of the bog
25	Glashabaun Sth	Rkd	Moderate	Calcium Bicarbonate Signature, Hard to very Hard Water (>350 mg/l $CaCO_3$)	Upper Bagenalstown GWB	None within 2.5 km of the bog
26	Glashabaun Nth	LI	Moderate	Calcium Bicarbonate Signature, Hard to very Hard Water (>350 mg/l $CaCO_3$)	Cushina GWB	None within 2.5 km of the bog
27	Codd Nth (Codd 2)	LI	Low	Calcium Bicarbonate Signature, Hard to very Hard Water (>350 mg/l $CaCO_3$)	Cushina GWB	None within 2.5 km of the bog

28	Codd Sth (codd 1)	LI	Low	Calcium Bicarbonate Signature, Hard to very Hard Water (>350 mg/l CaCO3)	Cushina GWB	None within 2.5 km of the bog
29	Ballydermot North	LI	Low	Calcium Bicarbonate Signature, Hard to very Hard Water (>350 mg/l $CaCO_3$)	Cushina GWB	Clonbulloge Spring 2.6 km west of the bog
30	Ballydermot South	LI	Low	Calcium Bicarbonate Signature, Hard to very Hard Water (>350 mg/l $CaCO_3$)	Upper Bagenalstown GWB	None within 2.5 km of the bog
31	Blackriver	Rkd	Low	Calcium Bicarbonate Signature, Hard to very Hard Water (>350 mg/l $CaCO_3$)	Upper Bagenalstown GWB	None within 2.5 km of the bog
32	Barnaran	Rkd	Low	Calcium Bicarbonate Signature, Hard to very Hard Water (>350 mg/l $CaCO_3$)	Kildare/Bagenalstown Upper GWB	None within 2.5 km of the bog
33	Lodge	LI	Low	Calcium Bicarbonate Signature, Hard to very Hard Water (>350 mg/l $CaCO_3$)	Kildare GWB	None within 2.5 km of the bog
34	Cuil na Gun	LI	Low	Little data, but typically slightly hard to hard (90 - 360 mg/l $CaCO_3$), conductivities of approximately 260 - 600 µS/cm	Inny	None within 2.5 km of the bog
35	Milkernagh	LI	Low	Little data, but typically slightly hard to hard (90 - 360 mg/l $CaCO_3$), conductivities of approximately 260 - 600 µS/cm	Inny	None within 2.5 km of the bog
36	Coolcraff	LI	Low	Little data, but typically slightly hard to hard (90 - 360 mg/l $CaCO_3$), conductivities of approximately 260 - 600 µS/cm	Inny	None within 2.5 km of the bog

37	Gilltown	Lm	Low	Moderately hard to very hard waters with alkalinities between 150 to 350mg/l	Trim GWB	None within 2.5 km of the bog
38	Mouds/Allen	LI	Low	Very hard water (350-480 mg/l ($CaCO_3$)), with a high alkalinity (300 - 350 mg/l ($CaCO_3$)). Conductivities are also very high, ranging 550-900 µS/cm	Dublin GWB	None within 2.5 km of the bog
39	Prosperous	LI	Low	Moderately hard to very hard waters with alkalinities between 150 to 350mg/l	Trim GWB	None within 2.5 km of the bog
40	Kilberry	Western half of bog mapped as Rkd, eastern side mapped as LI	Low	Bicarbonate signature, Typically hard to very hard water (90 - 360 mg/l $CaCO_3$)	Bagenalstown GWB	None within 2.5 km of the bog
41	Cuil na Carton	LI	Low	Typically, very hard and have a calcium bicarbonate signature. The groundwaters have typical electrical conductivity of approximately 700 µS/cm.	Rathdowney GWB	Several enclosed depressions mapped approximately 3.2 km northeast of the bog.

. The GWB (Groundwater Body) classification is assigned by the WFD. There are 18 GWB's which underlie the 41 bog sites in total.

The Aquifer type is assigned by the GSI and relates to the aquifers productivity in terms of well yields. There are 5 no. aquifer types underlying the bog sites, which include;

- Ll - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Lm - Bedrock which is Generally Moderately Productive
- Lk – Locally Important Aquifer – Karstified to a limited degree or area
- Rkd - Regionally Important Aquifer-Karstified (diffuse)
- Lg – Locally Important Aquifer- Sand and gravel

The Boora Group (Ref 1-10) of bogs within the project are underlain by a combination of the Clara, Banagher, Ferbane, Birr, Shinrone, Geashill and Tullamore GWB. These are all calcareous groundwater bodies. Groundwater vulnerability is mapped as Low-Moderate (www.gsi.ie). The aquifer types are generally locally important bedrock aquifers (LI) with some Limestone gravel aquifers (LG) mapped nearby, which are generally confined to isolated pockets. There are some karst features near Lemanaghan bog and Derryclure bog (within 500m), but generally springs/swallow holes are mapped >1 km from the bogs.

The Derrygreenagh Group (Ref 11-15) of bogs within the project are underlain by the Athboy GWB. Groundwater chemistry is generally hard within this GWB. Groundwater vulnerability is Low-Medium across the numerous bogs and surrounding area. The aquifer underlying this bog group is classified as a locally important aquifer (LI).

The Blackwater Group (Ref 16) bog within the project is underlain by the Clara GWB, with groundwater chemistry described as being generally very hard, with hardness of approximately 380–450 mg/l $CaCO_3$. Groundwater vulnerability is mapped as low, while the aquifer is mapped as a locally important aquifer (LI).

The central body of the Allen Group (Ref 17-33) of bogs within the project are underlain mainly by the Cushina and Upper Bagenalstown GWB. The Cushina and Upper Bagenalstown GWBs are characterised by hard to very hard waters, generally >350 mg/l as $CaCO_3$. This group also contains isolated bogs, west of the central group which are underlain by a variety of mapped GWBs, including the Daingean, Geashill and Trim GWBs. These groundwater bodies are all broadly characterised by hard-very hard water, reflecting the calcareous bedrock underlying the region. Groundwater vulnerability is Low- Medium across the bog group. There are some karst features mapped regionally, but none mapped near or adjacent to the bogs. The closest mapped karst feature is a spring (Toberabrin) mapped approximately 1.3km west of Ballykeane bog.

The Mountdillon Group (Ref 34-36) of bogs within the project are underlain by the Inny GWB. The aquifer is mapped as a locally important aquifer (LI), with groundwater chemistry characterised by hard to very hard waters with conductivities ranging between 260 – 600 µS/cm. Groundwater vulnerability is mapped as Low. There are no karst features mapped near this bog group.

The Kilberry Group (Ref 37-40) of bogs within the project are underlain by the Trim, Dublin and Bagenalstown GWBs. Groundwater vulnerability is mapped as Low. The groundwater aquifers underlying the bogs are mapped by the GSI as LI at the Mouds/Allen and Prosperous bogs, Lm at the Gilltown bog and as a regionally important Rkd aquifer at Kilberry bog. Ground water chemistry is likely to vary between moderately hard to very hard.

The Cuil na Carton bog (Ref 41) is underlain by the Rathdowney GWB under the Water Framework Directive 2013 – 2018. This aquifer is mapped as a locally important aquifer, LI, by the GSI and groundwater vulnerability is mapped as Low. Groundwater is described as typically very hard, with conductivities of approximately 700 µS/cm.

Table 14.16: Summary of hydrogeological characteristics/classification at the 41 bog sites.

Ref	Bog	Aquifer Type	Groundwater Vulnerability	Groundwater Hydrochemistry	GWB Underlying Bog	Local Karst features
1	Bellair Nth	Ll, LG mapped north and south of bog	Moderate	Generally: Ca-HCO_3, with Very Hard water (380-450 mg/l $CaCO_3$)	Clara GWB	Holywell Spring 1 km south of site (2023SEK002)
2	Lemanaghan	Ll. Centre of bog mapped as Lm, Lg mapped north and southwest of bog	Low	Generally: Ca-HCO_3, with Very Hard water (380-450 mg/l $CaCO_3$)	Clara GWB with Ferbane GWB mapped towards east/southeast of bog	1 no. swallow hole 2021NEK006 and 2 no. springs 2023SEK002 and 2023SEK003 near Parkaree/Springpark (approximately 100-200m north of the bog)
3	Noggusboy	Ll	Moderate	Generally: Ca-HCO_3, with Very Hard water (380-450 mg/l $CaCO_3$)	Clara GWB	None within 3 km of site
4	Boora	Majority of site mapped as Ll. Small area of the bog towards south mapped within Rkd	Moderate	Generally: Ca-HCO3, with Very Hard water (380-450 mg/l CaCO3)	Clara GWB	Spring (2021SEK002) mapped in townland of Frankford approximately 1.3 km south of the bog.
5	Galros	Western section mapped as Ll, Eastern section of bog mapped as Rkd. Lg to north and east of the bog.	Moderate	Generally: Ca-HCO_3, with Very Hard water (>350 mg/l $CaCO_3$)	Ll Aquifer mapped within the Banagher GWB. Rkd aquifer mapped within the Birr GWB. Lg mapped within the Birr Gravels Aquifer	Spring (Tobernapoula) mapped 1 km south of the bog.
6	Killaun	Ll.	Low	Groundwaters have a $CaCO_3$ signature. Limited data on Shinrone GWB. Nearby Slieve Phelim GWB has hard to slightly hard water	Shinrone GWB	Spring (Tobernapoula) mapped 2 km north of the bog.
7	Derrinboy	Ll	Low	Generally: Ca-HCO_3, with Very Hard water (>350 mg/l $CaCO_3$)	Geashill GWB	Several springs mapped approximately 2.5 km southwest of the bog in Knockbarron townland.

8	Derryclure	LI	Moderate	Generally: Ca-HCO_3, with Very Hard water (>350 mg/l $CaCO_3$)	Geashill GWB	Spring (2321NWK004) mapped 400m of the bog. Spring (2321NWK014) located 2 km east of the bog, linked to swallow hole (2321NWK013)
9	Monettia	LI	Low	Generally: Ca-HCO3, with Very Hard water (>350 mg/l $CaCO_3$)	NW mapped as Geashill GWB. SE mapped as Portlaoise GWB	Dissolved limestone outcrop with karst mapped 3 km northwest of the site.
10	Killaranny	Centre and south of bog mapped as LI, North of bog mapped as a Rkd.	Low	Generally: Ca-HCO3, with Very Hard water (>350 mg/l $CaCO_3$)	Tullamore GWB	Agall Spring (2021NEK004) mapped 0.7 km east of the bog.
11	Bracklin	LI	Low to Moderate	Generally: Ca-HCO_3, with hard water	Athboy GWB	None within 2 km of the bog
12	Carranstown	LI	Low to High	Generally: Ca-HCO_3, with hard water	Athboy GWB	None within 2 km of the bog
13	Ballivor	LI	Low to Moderate	Generally: Ca-HCO_3, with hard water	Athboy GWB	None within 2 km of the bog
14	Kinnegad	LI	Moderate	Generally: Ca-HCO_3, with hard water	Athboy GWB	None within 2 km of the bog
15	Ballybeg	LI	Low	Generally: Ca-HCO_3, with hard water	Athboy GWB	Toberdaly Spring 1 km to south of Ballybeg Bog
16	Ballaghurt	LI	Moderate - Low	Generally: Ca-HCO_3, with Very Hard water (380-450 mg/l $CaCO_3$)	Clara GWB	Endrim Mushroom rock (OY017) located approximately 750m south of bog area.
17	Daingean (Derries)	LI	Moderate	Generally: Ca-HCO_3, with Very Hard water (>350 mg/l $CaCO_3$)	Daingean GWB	Nothing within 2.5 km of site
18	Daingean Rathdrum	LI	Moderate	Generally: Ca-HCO_3, with Very Hard water (>350 mg/l $CaCO_3$)	Geashill GWB	Several springs mapped near Daingean, approximately 2.2 km east of site.

19	Clonad	Western section of bog within LI. East of bog mapped between Lm and Lk	Low	Generally: Ca-HCO_3, with Very Hard water (>350 mg/l $CaCO_3$)	Daingean/Geashill/Rhodes GWB's split from west to east.	Spring mapped at site of Geashill PWS
20	Ballykeane	Primarily within RKd	Moderate	GWB hydrochemistry only noted as Calcareous - Likely hard to very hard water similar to other GWBs in the area	Bagenalstown Upper GWB	Spring (TOBERABRIN) mapped 1.3 km west of site.
21	Esker	LI	Moderate	Generally: Ca-HCO_3, with Very Hard water (>350 mg/l $CaCO_3$)	Rhode GWB	Mount Briscoe Cave situated approximately 4 km west of bog.
22	Garrymore	LI	Low - Moderate	Calcareous with high electrical conductivity values.	Portlaoise GWB	None within 2.5 km of bog
23	Derrylea	LI	Low	The groundwater samples from the Lough PWS indicate a hard (350-400 mg/l $CaCO_3$) water with a calcium bicarbonate hydrochemical signature.	Cushina GWB	None within 2.5 km of the bog
24	Ticknevin	LI	Low - Moderate	Calcium Bicarbonate signature. Moderately hard to very hard waters with alkalinities between 150 to 350mg/l. Conductivity 500 - 800 µS/cm.	Trim GWB	None within 2.5 km of the bog
25	Glashabaun Sth	Rkd	Moderate	Calcium Bicarbonate Signature, Hard to very Hard Water (>350 mg/l $CaCO_3$)	Upper Bagenalstown GWB	None within 2.5 km of the bog
26	Glashabaun Nth	LI	Moderate	Calcium Bicarbonate Signature, Hard to very Hard Water (>350 mg/l $CaCO_3$)	Cushina GWB	None within 2.5 km of the bog
27	Codd Nth (Codd 2)	LI	Low	Calcium Bicarbonate Signature, Hard to very Hard Water (>350 mg/l $CaCO_3$)	Cushina GWB	None within 2.5 km of the bog

28	Codd Sth (codd 1)	LI	Low	Calcium Bicarbonate Signature, Hard to very Hard Water (>350 mg/l CaCO3)	Cushina GWB	None within 2.5 km of the bog
29	Ballydermot North	LI	Low	Calcium Bicarbonate Signature, Hard to very Hard Water (>350 mg/l $CaCO_3$)	Cushina GWB	Clonbulloge Spring 2.6 km west of the bog
30	Ballydermot South	LI	Low	Calcium Bicarbonate Signature, Hard to very Hard Water (>350 mg/l $CaCO_3$)	Upper Bagenalstown GWB	None within 2.5 km of the bog
31	Blackriver	Rkd	Low	Calcium Bicarbonate Signature, Hard to very Hard Water (>350 mg/l $CaCO_3$)	Upper Bagenalstown GWB	None within 2.5 km of the bog
32	Barnaran	Rkd	Low	Calcium Bicarbonate Signature, Hard to very Hard Water (>350 mg/l $CaCO_3$)	Kildare/Bagenalstown Upper GWB	None within 2.5 km of the bog
33	Lodge	LI	Low	Calcium Bicarbonate Signature, Hard to very Hard Water (>350 mg/l $CaCO_3$)	Kildare GWB	None within 2.5 km of the bog
34	Cuil na Gun	LI	Low	Little data, but typically slightly hard to hard (90 - 360 mg/l $CaCO_3$), conductivities of approximately 260 - 600 µS/cm	Inny	None within 2.5 km of the bog
35	Milkernagh	LI	Low	Little data, but typically slightly hard to hard (90 - 360 mg/l $CaCO_3$), conductivities of approximately 260 - 600 µS/cm	Inny	None within 2.5 km of the bog
36	Coolcraff	LI	Low	Little data, but typically slightly hard to hard (90 - 360 mg/l $CaCO_3$), conductivities of approximately 260 - 600 µS/cm	Inny	None within 2.5 km of the bog

37	Gilltown	Lm	Low	Moderately hard to very hard waters with alkalinities between 150 to 350mg/l	Trim GWB	None within 2.5 km of the bog
38	Mouds/Allen	LI	Low	Very hard water (350-480 mg/l ($CaCO_3$)), with a high alkalinity (300 - 350 mg/l ($CaCO_3$)). Conductivities are also very high, ranging 550-900 µS/cm	Dublin GWB	None within 2.5 km of the bog
39	Prosperous	LI	Low	Moderately hard to very hard waters with alkalinities between 150 to 350mg/l	Trim GWB	None within 2.5 km of the bog
40	Kilberry	Western half of bog mapped as Rkd, eastern side mapped as LI	Low	Bicarbonate signature, Typically hard to very hard water (90 - 360 mg/l $CaCO_3$)	Bagenalstown GWB	None within 2.5 km of the bog
41	Cuil na Carton	LI	Low	Typically, very hard and have a calcium bicarbonate signature. The groundwaters have typical electrical conductivity of approximately 700 µS/cm.	Rathdowney GWB	Several enclosed depressions mapped approximately 3.2 km northeast of the bog.

14.3.4.2 Groundwater Resources

There are a number of surface water abstractions from streams and rivers mapped near the bog 41 sites. Groundwater abstractions from Public Supply Schemes, Group Water Schemes and local domestic/agricultural wells (with varying degrees of location accuracy) are mapped by the GSI. Surface water and groundwater abstractions near the 41 bog sites are summarised below in Table 14.17.

There are several abstractions located near the bogs within the Boora Group. The closest abstraction to a bog site is the Castlearmstrong spring (Boher Lemanaghan GWS) abstraction located approximately 300m north of Lemanaghan bog. A source protection zone is assigned to this source, which does not intersect with the Lemanaghan bog boundary. The Lemanaghan stream is situated between the bog and the SPZ and likely acts as a hydraulic boundary to flow from the bog.

There are 2 no. public supply boreholes located approximately 600m north of Noggusboy bog belonging to the Ferbane/Gallen WSS. The closest surface water abstraction to the Boora group bogs is SH_ABS00933, an intake at Camcor River, approximately 1.3 km southwest of Killaun bog near Birr, Co. Offaly. The Agall Spring PWS is situated approximately 0.7 km east of the Kilaranny bog.

There are no surface water abstractions mapped near the Derrygreenagh Group (Ref 11-15). The closest groundwater abstraction is the Toberdaly PWS at Toberdaly spring, approximately 1 km south of Ballybeg bog. The Ballivor PWS located approximately 3.2 km east of Ballivor bog. The known extent of the Ballivor PWS consists of the Robinstown borehole (2300PUB1089) and Cloneycavan borehole (2300PUB1050).

The Clonfinlough GWS is mapped 1 km north of Ballaghurt bog (Blackwater Group). The closest mapped local well (50m accuracy) to this bog is 400m north of the bog.

There are a large number of groundwater wells in the areas surrounding the bogs of the Allen Group, due to its large geographical extent. To the west of the group, the Daingean (Derries), Daingean (Rathdrum), Clonad and Ballykeane bogs are located approximately 3 km east of a private abstraction (SH_ABS0595). There are several other water scheme boreholes and springs mapped within 1-3 km of these bogs, as well as domestic/farm wells mapped by the GSI. There are no surface water abstractions mapped near these bogs.

There is 1 surface water abstraction (SE_ABS0078 – River Barrow) mapped approximately 3.3 km southwest of Derrylea bog.

Within the main body of the Allen Group bogs (Ref 24 – 33) there are a number of Public Water Supply boreholes mapped locally, although no surface water abstractions are mapped near these bogs. The Edenderry PWS is located approximately 2.6 km north of Ticknevin bog, the most northernly bog within this central group. There are 3 no. water schemes (boreholes); Bracknagh scheme, Rathangan PWS and Cloncreen Bridge well, situated 2.5–4 km southwest of Ballydermot North and South. There are some local farm and domestic wells mapped in the areas surrounding the bogs.There is a GWS mapped approximately 3.2 km north of the Coolcraff bog in the Milkernagh group. A surface water abstraction is also mapped at the northeast edge of Lough Kinale, approximately 2.5 km north of the bog.There are a number of groundwater abstractions near the bogs of the Kilberry Group, while there are no mapped surface water abstractions close. The Johnstown PWS boreholes are mapped 2.5 km north of the Mouds/Allen bog. The Kilberry PWS is located 1.6 km west of the Kilberry bog.The Portlaoise (Meelick borehole) is located 3.5 km northeast of the Cuil na Carton bog.

Table 14.17: Summary of surface water and groundwater abstractions at the 41 bog sites

Ref	Bog	Public Water Supplies	Nearby Surface Water Abstractions	Domestic farms/ Wells
1	Bellair Nth	Cloncullen GWS mapped 1.7 km north of the bog. SH_ABS0851 mapped 1.8 km south of the bog, near Boher school. Offaly GWPS gives value of 373 m^3/day for abstraction.	Gageborough River (SH_ABS0928) 4.5 km east	Local farm and domestic wells. Boher National school borehole (2023SEW003) 1.5 km south of the bog.
2	Lemanaghan	SH_ABS0851 (Castlearmstrong) spring mapped approximately 300m north of the bog.	None known	Local farm and domestic wells. Boher National school borehole (2023SEW003) 1.1 km north of the bog.
3	Noggusboy	SH_ABS0869 1.2 km northwest of the bog. Mapped as GW abstraction along River Brosna. GSI have mapped this as a borehole for the Ferbane (Moyclare) WSS. Further 2 no. public supply boreholes approximately 600m north of the bog in townland of Gallen (Ferbane/Gallen WSS). Yielding 750 m^3/day each.	None known	None within 2.5 km of the bog
4	Boora	Kilcormac PWS (2 boreholes) located 3.2 km southeast of southern site boundary. Ballyboy GWS located approximately 3.5 km southeast of southern bog boundary.	None known	Local farm and domestic wells. Kilcormac PWS (SH_ABS0827) - 2 Wells, Ballyboy GWS
5	Galros	Rath GWS situated 2.5 km southeast of the bog.	None known	Local farm and domestic wells.
6	Killaun	Rath GWS situated 2.5 km northeast of the bog	SH_ABS0933- Intake at Camcor River (Offaly Co. Co) approximately 1.3 km southwest of bog near Birr.	Local farm and domestic wells. Well located at Midland concrete approximately 2 km west of the bog.
7	Derrinboy	None within 5 km	None known	Local farm and domestic wells.
8	Derryclure	Coneygowan GWS mapped 0.9 km east of the bog. Killeigh Meelaghans GWS mapped 2.5 km east of the bog.	None known	Local farm and domestic wells. Nothing mapped (50m accuracy) within 2.5 km of the bog.
9	Monettia	Tullamore PWS mapped south of site. 4 boreholes mapped at this location with Source Protection Zone assigned. PWS is upgradient of bog.	None known	Local farm and domestic wells.
10	Killaranny	Agall Spring PWS mapped 0.7 km east of the bog.	None known	Local farm and domestic wells.

11	Bracklin	Ballivor PWS approximately 8.0 km to east (from production area)	None known	Local farm and domestic wells
12	Carranstown	Ballivor PWS approximately 3.2 km to east	None known	Local farm and domestic wells
13	Ballivor	Ballivor PWS approximately 4.0 km to northeast	None known	2300PUB1089, Robinstown Ballivor, 2300PUB1050, Cloneycavan Ballivor, Local farm and domestic wells
14	Kinnegad	None Locally	None known	Local farm and domestic wells
15	Ballybeg	Toberdaly PWS abstracted from Toberdaly spring 1 km to south of Ballybeg Bog ZoC for the spring lies to the east of the bog	None known	Bord na Móna (BnM) well at Derrygreenagh Works (to north), Local farm and domestic wells
16	Ballaghurt	Clonfinlough GWS approximately 1.5 km west of the bog	None known	Local farm and domestic wells. Closest well (2023SWW011) mapped (by GSI) 400m north of eastern bog area.
17	Daingean (Derries)	Tullamore Ardan PWS mapped 2.2 km southwest of the bog	None known	Private abstraction- Geraghty (SH_ABS0157) 3 km SW of the bog. Private abstraction- Offaly Health Board (SH_ABS0595) approximately 3.7 km SW of site. Local farms and domestic wells.
18	Daingean Rathdrum	Daingean WSS (Springs) located 3.5 km east of the bog.	None known	Private abstraction- Geraghty (SH_ABS0157) 3 km SW of the bog. Private abstraction- Offaly Health Board (SH_ABS0595) approximately 3.7 km SW of site. Local farms and domestic wells.
19	Clonad	Ballinagar GWS AND Geashill PWS situated approximately 1.5 km south of the bog. Mountlucas GWS situated approximately 2.7 km northeast of the bog	None known	GWS/PWS mentioned pervious, Local farms and domestic wells.
20	Ballykeane	Walsh island PWS (Coolagarry borehole) situated 900m east of the bog. Ballinagar GWS AND Geashill PWS situated 4 km west of the bog.	None known	GWS/PWS mentioned pervious, Local farms and domestic wells.
21	Esker	Closest is Toberdaly PWS situated 3.3 km NW of the bog.	None known	Local farms and domestic wells
22	Garrymore	Bordereen, Garryhinch GWS (Springs) 3.6 km east of the bog	None known	Local farms and domestic wells
23	Derrylea	None within 5 km	SE_ABS0078 (River Barrow (Ballymorris) abstraction located 3.3 km southwest of the bog	Local farms and domestic wells
24	Ticknevin	Edenderry PWS (Borehole) approximately 2.6 km north of the bog. Ballyfore / Ballykilleen GWS (borehole) situated 3 km west of the bog	None known	Local farms and domestic wells

25	Glashabaun Sth	None within 5 km	None known	Some local wells northeast of the bog
26	Glashabaun Nth	None within 5 km	None known	Some wells east and west of the bog
27	Codd Nth (Codd 2)	None within 5 km	None known	Some wells west of the bog
28	Codd Sth (Codd 1)	None within 5 km	None known	Some wells west of the bog
29	Ballydermot North	Clonbulloge PWS – 2.6 km west of the bog	None known	Local farms, domestic wells and abstractions west of bog.
30	Ballydermot South	Bracknagh GWS (3 wells) located 3 km south of the bog. Rathangan PWS wells located approximately 3.8 km south of the bog.	None known	Local farms, domestic wells and abstractions south and west of the bog.
31	Blackriver	Rathangan PWS situated approximately 3.8 km south of the bog. Bracknagh GWS located 3 km south of the bog.	None known	Local farms, domestic wells and abstractions south and west of the bog.
32	Barnaran	None within 5 km	None known	Local farms and domestic wells located south, east and northeast of the bog.
33	Lodge	None within 5 km	None known	Local farms and domestic wells northwest and northeast of the bog.
34	Cuil na Gun	None mapped near the bog	None mapped near the bog	Some local farms and domestic wells
35	Milkernagh	None mapped near site	None mapped near site	Some local farms and domestic wells
36	Coolcraff	Ballymachugh PWS located 3.9 km north of the bog.	Abstraction (SH_ABS0921) at northeast edge of Lough Kinale approximately 2.5 km north of the bog.	Some local farms and domestic wells
37	Gilltown	Johnstown PWS boreholes mapped 2.5 km north of the bog.	None mapped near site	Local farms and dwellings mapped around perimeter of the bog.
38	Mouds/Allen	Robertstown PWS located 2.2 km north of the bog	None mapped near site	Local farms and dwellings mapped around perimeter of the bog.
39	Prosperous	None within 5 km	None mapped near site	Local farms and dwellings mapped around perimeter of the bog.
40	Kilberry	Athy UDC WSS located 4.5 km south of the bog	None mapped near site	Local farms and dwellings mapped around perimeter of the bog.
41	Cuil na Carton	Portlaoise WSS SE_ABS0079 (Meelick borehole) located 3.5 km northeast of the bog.	None mapped near site	Local houses and farm wells nearby

14.3.4.3 Groundwater WFD Status

Groundwater body status, as defined under the WFD 2013 – 2018 is universally Good across all the GWBs which underlie the 41 bog sites. GWB status is Good in terms of both quantitative and qualitative status. A summary of the GWBs and their assigned WFD status is included in Table 14.18.

Table 14.18: Summary of GWB status across 41 bogs

Ref	Bog	GWB Name	GWB Status 2013 – 2018 (Quantity)	GWB Status (Quality-Chemical)
1	Bellair Nth	Clara GWB	Good (2013-2018)	Good (2013-2018)
2	Lemanaghan	Clara GWB with Ferbane GWB mapped towards east/southeast of the bog	Good (2013-2018)	Good (2013-2018)
3	Noggusboy	Clara GWB	Good (2013-2018)	Good (2013-2018)
4	Boora	Clara GWB	Good (2013-2018)	Good (2013-2018)
5	Galros	LI Aquifer mapped within the Banagher GWB. Rkd aquifer mapped within the Birr GWB. Lg mapped within the Birr Gravesl Aquifer	Good (2013-2018)	Good (2013-2018)
6	Killaun	Shinrone GWB	Good (2013-2018)	Good (2013-2018)
7	Derrinboy	Geashill GWB	Good (2013-2018)	Good (2013-2018)
8	Derryclure	Geashill GWB	Good (2013-2018)	Good (2013-2018)
9	Monettia	NW mapped as Geashill GWB. SE mapped as Portlaoise GWB	Good (2013-2018)	Good (2013-2018)
10	Killaranny	Tullamore GWB	Good (2013-2018)	Good (2013-2018)
11	Bracklin	Athboy GWB	Good (2013-2018)	Good (2013-2018)
12	Carranstown	Athboy GWB	Good (2013-2018)	Good (2013-2018)
13	Ballivor	Athboy GWB	Good (2013-2018)	Good (2013-2018)
14	Kinnegad	Athboy GWB	Good (2013-2018)	Good (2013-2018)
15	Ballybeg	Athboy GWB	Good (2013-2018)	Good (2013-2018)
16	Ballaghurt	Clara GWB	Good (2013-2018)	Good (2013-2018)
17	Daingean (Derries)	Daingean GWB	Good (2013-2018)	Good (2013-2018)
18	Daingean Rathdrum	Geashill GWB	Good (2013-2018)	Good (2013-2018)
19	Clonad	Daingean/Geashill/Rhodes GWB's split from west to east.	Good (2013-2018)	Good (2013-2018)
20	Ballykeane	Bagenalstown Upper GWB	Good (2013-2018)	Good (2013-2018)
21	Esker	Rhode GWB	Good (2013-2018)	Good (2013-2018)
22	Garrymore	Portlaoise GWB	Good (2013-2018)	Good (2013-2018)
23	Derrylea	Cushina GWB	Good (2013-2018)	Good (2013-2018)
24	Ticknevin	Trim GWB	Good (2013-2018)	Good (2013-2018)
25	Glashabaun Sth	Upper Bagenalstown GWB	Good (2013-2018)	Good (2013-2018)
26	Glashabaun Nth	Cushina GWB	Good (2013-2018)	Good (2013-2018)
27	Codd Nth (Codd 2)	Cushina GWB	Good (2013-2018)	Good (2013-2018)
28	Codd Sth (codd 1)	Cushina GWB	Good (2013-2018)	Good (2013-2018)
29	Ballydermot North	Cushina GWB	Good (2013-2018)	Good (2013-2018)

30	Ballydermot South	Upper Bagenalstown GWB	Good (2013-2018)	Good (2013-2018)
31	Blackriver	Upper Bagenalstown GWB	Good (2013-2018)	Good (2013-2018)
32	Barnaran	Kildare/Bagenalstown Upper GWB	Good (2013-2018)	Good (2013-2018)
33	Lodge	Kildare GWB	Good (2013-2018)	Good (2013-2018)
34	Cuil na Gun	Inny	Good (2013-2018)	Good (2013-2018)
35	Milkernagh	Inny	Good (2013-2018)	Good (2013-2018)
36	Coolcraff	Inny	Good (2013-2018)	Good (2013-2018)
37	Gilltown	Trim GWB	Good (2013-2018)	Good (2013-2018)
38	Allen	Dublin GWB	Good (2013-2018)	Good (2013-2018)
39	Prosperous	Trim GWB	Good (2013-2018)	Good (2013-2018)
40	Kilberry	Bagenalstown GWB	Good (2013-2018)	Good (2013-2018)
41	Cuil na Carton	Rathdowney GWB	Good (2013-2018)	Good (2013-2018)

14.3.5 Designated Sites

Designated sites that are hydrologically or hydrogeologically connected to any of the 41 bog units are identified within Section 14.3.3.3. Some SAC/SPA sites are groundwater dependent (GWDTE)[22], and others are surface water dependent. The Natura 2000 designated sites, and their relevant water dependencies, are listed below in Table 14.19.

Table 14.19: Designated sites near and downstream of the 41 bog units

SAC/SPA	Site Code	Nearest Bog	GW/SW Pathway	Distance to nearest BnM bog
River Shannon Callows SAC Middle Shannon Callows SPA Fin Lough (Offaly)	000216 004096 000576	Ballaghurt	Surface water Groundwater	3 km
All Saints Bog and Esker SAC All Saints Bog SPA	000566 004103	Galros	Surface Water	5.5 km
Charleville Wood	000571	Monettia	Surface Water	6.5 km
Raheenmore Bog	000582	Daingean (Rathdrum)	Upgradient – no pathway	0.75 km
River Barrow and River Nore River Nore SPA	002162 004233	Monettia Coolnacartan	Surface Water/Groundwater	0.5 km
River Boyne and River Blackwater SAC River Boyne and River Blackwater SPA	002299 004232	Bracklin	Surface Water/Groundwater	0.9 km
Mount Hevey Bog SAC	002342	Kinnegad	Surface Water	3.5 km
The Long Derries, Edenderry SAC	000925	Ticknevin	Surface Water/Groundwater	<0.1 km
Garriskil Bog SAC Garriskil Bog SPA	000679 004102	Coolnagun	Surface Water	<0.1 km
Lough Ree SAC Lough Ree SPA	000440 004064	Coolnagun	Surface Water	29 km
North Dublin Bay SAC	000206	Mouds/Allen	Surface Water	42 km
Mouds Bog SAC	002331	Mouds/Allen	Groundwater	<0.7 km

[22] Groundwater Dependent Terrestrial Ecosystems

Ballynafagh Bog SAC	000391	Prosperous	Surface Water/Groundwater	1 km
Mongan Bog SAC Mongan Bog SPA	000580 004017	Ballaghurt	Groundwater	2.1 km
Slieve Bloom Mountains SAC Slieve Bloom Mountains SPA	000412 004160	Derrinboy	Surface Water	4.4 km 1.7 km
Lough Derravaragh SPA	004043	Coolnagun	Surface Water/Groundwater	0.7 km
Lough Iron SPA	004046	Coolnagun	Surface Water	4.5 km
Glen Lough SPA	004045	Coolnagun	Surface Water	7.5 km

14.4 Remedial Impact Assessment

This section presents an assessment of remedial impacts on the soils/geological and hydrogeological environment.

14.4.1 Remedial Impacts on Land & Land-use

Land and land-use changes were investigated between 1985-2019 and as far back as possible. The primary land-use changes across the bogs occurred at many bogs before 1985, *i.e.* the bogs were drained and topography and land-use was altered including the development of all ancillary structures and features associated with peat extraction (e.g. railway lines, machine passes, canteen structures, work sites, production centres, mobile fuel tanks, fixed fuel tanks, peat loading facilities, and end user sites). As mentioned previously, only 8 of the 41. bogs were drained after 1985, and 16 of the 41 went into production after 1985. The potential impacts on land and land-use, for the bogs altered (drained and put into production) after 1985, are outlined individually below, and collectively for the remaining 25 bogs. At the remaining bogs the drainage and established production was the baseline in 1985, and that baseline has continued through to 2019 by small annual changes in topography (ground levels reducing) as peat was extracted during summer months.

Bog Units	**Allen, Ballaghurt, Ballivor, Ballybeg, Ballydermot Nth, Ballydermot Sth, Ballykeane, Barnaran, Bellair Nth, Blackriver, Boora, Clonad, Cuil na Carton, Cuil na Gun, Derrylea, Esker, Gilltown, Glashabaun Nth, Glashabaun Sth, Kilberry, Kinnegad, Lemanaghan, Lodge, Milkernagh, Monettia, Noggusboy**
Land	16577 Ha
Land-use activity after 1985	Drained pre 1985, began production pre 1985, continued production post 1985
Receptor	Bog lands within site boundaries
Source/Pathway	Removal of acrotelm, removal of vegetative surface, extraction of peat, and ongoing drainage
Impact on Receptor - pre 2012	Negative, significant, direct, long term impact on land and land-use from date of original drainage (pre 1985)
Impact on Receptor 2012 - 2019	Negative, slight, direct, medium term impact on land use

Bog Unit	Galros Bog
Land	193 Ha
Land-use activity after 1985	Drained pre 1985, peat extraction from 1992 to 2019
Receptor	Bog lands within site boundary
Source/Pathway	Removal of acrotelm, removal of vegetative surface, extraction of peat, and ongoing drainage
Impact on Receptor - pre 2012	Negative, significant, direct, long term impact on land and land-use from date of original drainage (pre 1985)
Impact on Receptor 2012 - 2019	Negative, slight, direct, medium term impact on land use

Bog Unit	Killaun Bog
Land	361 Ha
Land-use activity after 1985	Drained 1996, peat extraction from 2003 to 2019
Receptor	Bog lands within site boundary
Source/Pathway	Drainage of the bog, removal of acrotelm, removal of vegetative surface, extraction of peat, and ongoing drainage
Impact on Receptor - pre 2012	Negative, significant, direct, long term impact on land and land-use from date of original drainage (1996)
Impact on Receptor 2012 - 2019	Negative, slight, direct, medium term impact on land and land-use

Bog Unit	Derrinboy Bog
Land	308 Ha
Land-use activity after 1985	Drained 1988, peat extraction from 2003 to 2019
Receptor	Bog lands within site boundary
Source/Pathway	Drainage of the bog, removal of acrotelm, removal of vegetative surface, extraction of peat, and ongoing drainage
Impact on Receptor - pre 2012	Negative, significant, direct, long term impact on land and land-use from date of original drainage (1988)
Impact on Receptor 2012 - 2019	Negative, slight, direct, medium term impact on land and land-use

Bog Unit	Derryclure Bog
Land	332 Ha
Land-use activity after 1985	Drained 1987, peat extraction from 2003 to 2019
Receptor	Bog lands within site boundary
Source/Pathway	Drainage of the bog, Removal of acrotelm, removal of vegetative surface, extraction of peat, and ongoing drainage
Impact on Receptor - pre 2012	Negative, significant, direct, long term impact on land and land-use from date of original drainage (1987)
Impact on Receptor 2012 - 2019	Negative, slight, direct, medium term impact on land and land-use

Bog Unit	Kilaranny Bog
Land	244 Ha
Land-use activity after 1985	Drained pre 1985, peat extraction from 1989 to 2019

Bog Unit	Kilaranny Bog
Receptor	Bog lands within site boundary
Source/Pathway	Removal of acrotelm, removal of vegetative surface, extraction of peat, and ongoing drainage
Impact on Receptor - pre 2012	Negative, significant, direct, long term impact on land and land-use from date of original drainage (pre 1985)
Impact on Receptor 2012 - 2019	Negative, slight, direct, medium term impact on land and land-use

Bog Unit	Bracklin Bog
Land	755 Ha
Land-use activity after 1985	Drained pre 1985, peat extraction from 1985 to 2019
Receptor	Bog lands within site boundary
Source/Pathway	Removal of acrotelm, removal of vegetative surface, extraction of peat, and ongoing drainage
Impact on Receptor - pre 2012	Negative, significant, direct, long term impact on land and land-use from date of original drainage (pre 1985)
Impact on Receptor 2012 - 2019	Negative, slight, direct, medium term impact on land and land-use

Bog Unit	Carranstown Bog
Land	305 Ha
Land-use activity after 1985	Drained pre 1985, peat extraction from 1985 to 2019
Receptor	Bog lands within site boundary
Source/Pathway	Removal of acrotelm, removal of vegetative surface, extraction of peat, and ongoing drainage (pre 1985)
Impact on Receptor - pre 2012	Negative, significant, direct, long term impact on land and land-use from date of original drainage.
Impact on Receptor 2012 - 2019	Negative, slight, direct, medium term impact on land use.

Bog Unit	Ballaghurt Bog
Land	616 Ha
Land-use activity after 1985	Part drained 1990, part peat extraction from 1995 to 2019
Receptor	Bog lands within site boundary
Source/Pathway	Drainage of the bog, removal of acrotelm, removal of vegetative surface, extraction of peat, and ongoing drainage
Impact on Receptor - pre 2012	Negative, significant, direct, long term impact on land and land-use from date of original drainage (1990)
Impact on Receptor 2012 - 2019	Negative, slight, direct, medium term impact on land and land-use.

Bog Unit	Daingean (Derries)
Land	278 Ha
Land-use activity after 1985	Drained 1995, peat extraction from 1999 to 2019
Receptor	Bog lands within site boundary
Source/Pathway	Drainage of the bog, removal of acrotelm, removal of vegetative surface, extraction of peat, and ongoing drainage

Bog Unit	Daingean (Derries)
Impact on Receptor - pre 2012	Negative, significant, direct, long term impact on land and land-use from date of original drainage (1995)
Impact on Receptor 2012 - 2019	Negative, slight, direct, medium term impact on land and land-use

Bog Unit	Daingean (Rathdrum)
Land	368 Ha
Land-use activity after 1985	Drained 1996, peat extraction from 2000 to 2019
Receptor	Bog lands within site boundary
Source/Pathway	Drainage of the bog, removal of acrotelm, removal of vegetative surface, extraction of peat, and ongoing drainage
Impact on Receptor - pre 2012	Negative, significant, direct, long term impact on land and land-use from date of original drainage (1996)
Impact on Receptor 2012 - 2019	Negative, slight, direct, medium term impact on land and land-use.

Bog Unit	Garrymore Bog
Land	308 Ha
Land-use activity after 1985	Drained 1992, peat extraction from 1999 to 2019
Receptor	Bog lands within site boundary
Source/Pathway	Drainage of the bog, removal of acrotelm, removal of vegetative surface, extraction of peat, and ongoing drainage
Impact on Receptor - pre 2012	Negative, significant, direct, long term impact on land and land-use from date of original drainage (1992)
Impact on Receptor 2012 - 2019	Negative, slight, direct, medium term impact on land on land-use

Bog Unit	Ticknevin
Land	458 Ha
Land-use activity after 1985	Drained pre 1985, peat extraction from 2000 to 2019
Receptor	Bog lands within site boundary
Source/Pathway	Removal of acrotelm, removal of vegetative surface, extraction of peat, and ongoing drainage
Impact on Receptor - pre 2012	Negative, significant, direct, long term impact on land and land-use from date of original drainage (pre 1985)
Impact on Receptor 2012 - 2019	Negative, slight, direct, medium term impact on land and land-use

Bog Unit	Codd North
Land	312 Ha
Land-use activity after 1985	Drained pre 1985, peat extraction from 1989 to 2019
Receptor	Bog lands within site boundary
Source/Pathway	Removal of acrotelm, removal of vegetative surface, extraction of peat, and ongoing drainage
Impact on Receptor - pre 2012	Negative, significant, direct, long term impact on land and land-use from date of original drainage (pre 1985)

Bog Unit	Codd North
Impact on Receptor 2012 - 2019	Negative, slight, direct, medium term impact on land and land-use

Bog Unit	Codd South
Land	256 Ha
Land-use activity after 1985	Drained pre 1985, peat extraction from 1989 to 2019
Receptor	Bog lands within site boundary
Source/Pathway	Removal of acrotelm, removal of vegetative surface, extraction of peat, and ongoing drainage
Impact on Receptor - pre 2012	Negative, significant, direct, long term impact on land and land-use from date of original drainage (pre 1985)
Impact on Receptor 2012 - 2019	Negative, slight, direct, medium term impact on land and land-use

Bog Unit	Coolcraff
Land	412 Ha
Land-use activity after 1985	Drained pre 1985, peat extraction from 1989 to 2019
Receptor	Bog lands within site boundary
Source/Pathway	removal of acrotelm, removal of vegetative surface, extraction of peat, and ongoing drainage
Impact on Receptor - pre 2012	Negative, significant, direct, long term impact on land and land-use from date of original drainage (pre 1985)
Impact on Receptor 2012 - 2019	Negative, slight, direct, medium term impact on land and land-use

Bog Unit	Prosperous
Land	217 Ha
Land-use activity after 1985	Drained 1991, peat extraction from 2003 to 2019
Receptor	Bog lands within site boundary.
Source/Pathway	Drainage of bog, removal of acrotelm, removal of vegetative surface, extraction of peat, and ongoing drainage
Impact on Receptor - pre 2012	Negative, significant, direct, long term impact on land and land-use and land-use from date of original drainage (1991)
Impact on Receptor 2012 - 2019	Negative, slight, direct, medium term impact on land and land-use.

14.4.2 Remedial Impacts of Drainage on Bog Hydrogeology and Downstream Surface Water Hydrology

Volumes of peat extracted, and depths of peat removed have been estimated using bulk quantities (tonnes) of extracted peat provided by Bord na Móna. The estimated depths of peat removed during the period 2012 – 2019 range between 0.004 – 0.89m, with a mean value of approximately 0.43m. As peat can act as a hydraulic sponge providing storage of water, the removal of peat potentially acts to reduce the [water] storage capacity of the bogs. However, when groundwater levels within the bogs were reduced historically through initial bog drainage,

the [water] storage capacity of the top approximately 0.5 – 1m of peat (dependent on depth of drains) was essentially eliminated.

As such, hydrological and hydrogeological changes at each of the bogs commenced when their initial drainage occurred and the development of ancillary activities were installed (e.g. railway lines, machine passes, canteen structures, work sites, production centres, mobile fuel tanks, fixed fuel tanks, peat loading facilities, and end user sites). The implementation of same was at that time a significant change to the local hydrology and hydrogeology at each bog unit. However, only eight of the 41 bogs were drained after 1985. The impacts on drainage (hydrology) and bog hydrogeology after 1985, are outlined below. At the remaining bogs the drainage and established production and ancillary works was the baseline in 1985, and that baseline has continued through to 2019 by small annual changes in topography (ground levels reducing) as peat was extracted during summer months, with minimal additional changes in hydrology or hydrogeology.

As outlined in the FRA, drainage from the bogs is regulated by limiting bog discharges to greenfield runoff rates, and by routing all bog drainage via field drains, main drains, headland drains, then from settlement ponds to outfalls, with final discharge to [surrounding each bog unit] natural watercourses.

Bog Units	**Allen, Ballaghurt, Ballivor, Ballybeg, Ballydermot Nth, Ballydermot Sth, Ballykeane, Barnaran, Bellair Nth, Blackriver, Boora, Bracklin, Carranstown, Clonad, Codd Nth, Codd Sth, Coolcraff, Cuil na Carton, Cuil na Gun, Derrylea, Esker, Galros, Gilltown, Glashabaun Nth, Glashabaun Sth, Kilberry, Killaranny, Kinnegad, Lemanaghan, Lodge, Milkernagh, Monettia, Noggusboy, Ticknevin**
Receptors	Bog hydrogeological regime; Local downstream surface water bodies
Source/Pathway	All bogs above drained before 1985. As such, hydrological and hydrogeological changes at each bog unit (listed above) commenced when their initial drainage occurred and the development of ancillary activities were installed (e.g. railway lines, machine passes, canteen structures, work sites, production centres, mobile fuel tanks, fixed fuel tanks, peat loading facilities, and end user sites). The implementation of same was at that time a significant change to local hydrology and hydrogeology.
Impact on Receptors	Peat Bog Hydrogeology: Negative, profound, direct, impact on bog hydrogeology. Local Hydrogeology: Negative, moderate, indirect, impact on underlying local hydrogeology. Surface Water Hydrology: Negative, significant, indirect, impact on surface water flows (quantity).

Name	Killaun
Receptors	Bog hydrogeological regime; Local downstream surface water bodies
Source/Pathway	The Killaun bog was drained in 1996. Drainage of this bog would have led to a reduction in bog storage and increased runoff to the River Camcor_050 and North Rathlure stream. The available water storage within the bog basin would have provided a buffer for downstream flooding and following drainage the downstream rivers/streams would likely have become slightly flashier (faster and higher flood peaks) in their response to extreme rainfall events.
Impact on Receptors	Peat Bog Hydrogeology: Negative, profound, direct, impact on hydrogeology. Local Hydrogeology: Negative, moderate, indirect, impact on underlying local hydrogeology. Surface Water Hydrology: Negative, significant, indirect, impact on surface water flows (quantity).

Name	Derrinboy
Receptors	Bog hydrogeological regime; Local downstream surface water bodies
Source/Pathway	The Derrinboy bog was drained in 1988. Drainage of this bog would have led to a reduction in bog water storage and increased runoff to the Knockhill Stream. The storage within the bog would have provided a buffer for downstream high flows during extreme rainfall events. No flood zones are mapped locally to the bog.
Impact on Receptors	Bog Hydrogeology: Negative, profound, direct, impact on hydrogeology. Local Hydrogeology: Negative, moderate, indirect, impact on underlying local hydrogeology. Surface Water Hydrology: Negative, significant, indirect, impact on surface water flows (quantity).

Name	Derryclure
Receptors	Bog hydrogeological regime; Local downstream surface water bodies
Source/Pathway	The Derryclure bog was drained in 1987. Drainage of this bog would have led to a reduction in bog storage and increased runoff to the Killeenmore and Cloncollog Stream (discharging to the downstream Tullamore River). The storage within the bog would have provided a buffer for downstream high flows during extreme rainfall events. No flood zones are mapped (by the OPW) directly downstream of the bog.
Impact on Receptors	Bog Hydrogeology: Negative, profound, direct, impact on hydrogeology. Local Hydrogeology: Negative, moderate, indirect, impact on underlying local hydrogeology. Surface Water hydrology: Negative, significant, indirect, impact on surface water flows (quantity).

Name	Ballaghurt
Receptors	Bog hydrogeological regime; Local downstream surface water bodies
Source/Pathway	The Ballaghurt was drained between 1975 and 1990 (there are 3 areas within the bog that were drained separately during this period). Drainage of this bog unit would have led to a reduction in bog storage and increased runoff to the small streams which are tributaries of the River Blackwater. The storage within the bog would have provided a buffer for downstream high flows during extreme rainfall events. No flood zones are mapped (by the OPW) directly downstream of the bog.
Impact on Receptors	Bog Hydrogeology: Negative, profound, direct, impact on hydrogeology.

Name	Ballaghurt
	Local Hydrogeology: Negative, moderate, indirect, impact on underlying local hydrogeology. Surface Water Hydrology: Negative, significant, indirect, impact on surface water flows (quantity).

Name	Daingean (Derries)
Receptors	Bog hydrogeological regime; Local downstream surface water bodies
Source/Pathway	The Daingean (Derries) bog was drained in 1995. Drainage of this bog would have led to a reduction in bog storage and increased runoff to the Puttigan stream and Silver River. The storage within the bog would have provided a buffer for downstream high flows during extreme rainfall events. No flood zones are mapped (by the OPW) directly downstream of the bog.
Impact on Receptors	Bog Hydrogeology: Negative, profound, direct, impact on hydrogeology. Local Hydrogeology: Negative, moderate, indirect, impact on underlying local hydrogeology. Surface Water Hydrology: Negative, significant, indirect, impact on surface water flows (quantity).

Name	Daingean (Rathdrum)
Receptors	Bog hydrogeological regime; Local downstream surface water bodies
Source/Pathway	The Daingean (Rathdrum) bog was drained in 1996. Drainage of this bog would have led to a reduction in bog storage and increased runoff to the Puttigan stream which leads to the Silver River, as well as the Cappanageeragh stream which discharges to the River Daingean. The storage within the bog would have provided a buffer for downstream high flows during extreme rainfall events. The OPW have mapped a flood zone along the banks of the River Daingean, within the village of Daingean.
Impact on Receptors	Bog Hydrogeology: Negative, profound, direct, impact on hydrogeology. Local Hydrogeology: Negative, moderate, indirect, impact on underlying local hydrogeology. Surface Water Hydrology: Negative, significant, indirect, impact on surface water flows (quantity).

Name	Garrymore
Receptors	Bog hydrogeological regime; Local downstream surface water bodies
Source/Pathway	The Garrymore bog was drained in 1992. Drainage of this bog would have led to a reduction in bog storage and increased runoff to the Cottoners Brook and Forest Upper streams, which discharge to the River Barrow. The storage within the bog would have provided a buffer for downstream high flows during extreme rainfall events. There is a flood zone mapped approximately 1.5 km southeast of Garrymore bog, along the banks of the River Barrow.
Impact on Receptors	Bog Hydrogeology: Negative, profound, direct, impact on hydrogeology. Local Hydrogeology: Negative, moderate, indirect, impact on underlying local hydrogeology. Surface Water Hydrology: Negative, significant, indirect, impact on surface water flows (quantity).

Name	Prosperous
Receptors	Bog hydrogeological regime; Local downstream surface water bodies
Source/Pathway	The Prosperous bog was drained in 1991. Drainage of this bog would have led to a reduction in bog storage and increased runoff to the Slate River and Derrycrib stream. The storage within the bog would have provided a buffer for downstream high flows during extreme rainfall events. The OPW have mapped a flood zone approximately 3 km downstream of the River Slate, near Robertstown which may be influenced to a minor degree by the reduction in storage of the Prosperous bog.
Impact on Receptors	Bog Hydrogeology: Negative, profound, direct, impact on hydrogeology. Local Hydrogeology: Negative, moderate, indirect, impact on underlying local hydrogeology. Surface Water Hydrology: Negative, significant, indirect, impact on surface water flows (quantity).

14.4.3 Remedial Impacts on Designated Sites

As previously identified, there is a conceptual link between groundwater and surface water across the bogs, whereby groundwater within the bogs primarily drains to surface water bodies situated around the bogs. Pathways (flow routes) with nearby and regionally located (downstream) SAC/SPA's (Natura 2000 sites) were identified by tracing hydrological flowpaths between the bogs and their eventual discharge points on a regional scale (refer to Section 14.3.3.3 and Appendix 14). The SAC/SPA's were primarily situated towards the end of the identified flowpaths, *e.g.* the majority of the Boora Group drain to the River Shannon, and the River Shannon Callows SAC/ Middle Shannon Callows SPA is located along the River Shannon.

Flow volumes along the hydrological flowpaths were separated into groups. Surface water flows between 0.01 – 0.1 m^3/s were classified within bog scale flows while subcatchment to catchment scale flows were classified as being within 10 – 100+ m^3/s. The majority of the connections between bogs and SAC/SPA's are >5 km in length and transition from bog scale flows near the bogs to subcatchment and catchment scale of flows at the SAC/SPA boundaries (i.e. the downstream river flows have a much higher volumetric flow).

Individual SAC/SPA's are assessed as outlined below:

Name of Receptor	River Shannon Callows SAC Middle Shannon Callows SPA
Source/Pathway	As defined within Section 14.3.3.3, flow pathways were identified between 18 of the bogs and the River Shannon Callows SAC/ Middle Shannon Callows SPA. These pathways are at the scale of approximately 3 – 15 km. Drainage from the bogs discharges to outfall points and streams, which eventually follow the defined flowpaths to the River Shannon Callows SAC/ Middle Shannon Callows SPA. Alteration of surface water discharges following drainage of the upstream bogs probably impacted the volumetric flows to the SAC/SPA. Although a pathway exists, the scale of flows from the bogs is small relative to the scale of flows in the River Shannon. In addition, all of the 18 bogs were drained, and were in production in advance of the designation of the River Shannon Callows SAC and Middle Shannon Callows SPA.
Impact on Receptor	Negative, imperceptible, indirect, impact on the hydrology of SAC/SPA.

Name of Receptor	Fin Lough SAC
Source/Pathway	The Fin Lough SAC exists approximately 1 km upgradient of Ballaghurt bog. A hydraulic pathway does not exist either by groundwater or by surface water connection.
Impact on Receptor	No Impact

Name of Receptor	All Saints Bog and Esker SAC All Saints Bog SPA
Source/Pathway	The All Saints Bog and Esker exists 5.5 km downstream of Galros bog. As the SAC/SPA is also a raised bog and drains to the Rapemills_020 it is therefore at a higher hydraulic elevation to the river and a flow path/hydraulic connection from Galros bog to the SAC/SPA does not exist. There is a significant separation distance and elevation changes in intervening ground between Galros bog and the SAC/SPA
Impact on Receptor	No Impact

Name of Receptor	Charleville Wood SAC
Source/Pathway	The Charleville Wood SAC exists 5.5 km downstream of Monettia bog. The Annex I & II designations for this SAC are 91A0 (*Old sessile oak woods with Ilex and Blechnum in the British Isles)* and 1016 (*Desmoulin's Whorl Snail*). A hydraulic connection exists to the SAC as the banks of the River Tullamore are mapped within the boundaries of this SAC. Alteration of the hydrological regime at the upstream bog may have altered flows from the bog which ultimately discharges to the River Tullamore and the SAC boundary. The Monettia bog was drained in 1976, circa 20 years before the Charleville Wood was designated as a SAC. The local baseline environment for this SAC therefore included the bog in its drained state. Furthermore, very small changes to surface water flows will not have impacted on the qualifying interests for this SAC.
Impact on Receptor	Negative, imperceptible, indirect, impact on hydrology of SAC.

Name of Receptor	Raheenmore Bog SAC
Source/Pathway	The Raheenmore Bog SAC exists 0.75 km east of Daingean (Rathdrum). This SAC is located hydraulically upgradient of the Daingean bog and therefore is disconnected hydrologically from Daingean (Rathdrum) bog, and as such no impact has occurred.

Name of Receptor	Raheenmore Bog SAC
Impact on Receptor	No Impact
Name of Receptor	**River Barrow and River Nore SAC** **River Nore SPA**
Source/Pathway	The SAC/SPA consists of the freshwater stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains. The SAC has the following priority habitats: [7220] Petrifying Springs* and [91E0] Alluvial Forests*. The primary pathway from the majority of bogs to the River Barrow and River Nore SAC/River Nore SPA is surface water. Monettia bog has been drained/operational since 1976/1982, therefore any drainage and hydrological impacts associated with the development of that bog had occurred many years in advance of the River Barrow and River Nore SAC designation in 2002/ River Nore SPA designation in 2012. There is a pumping station located at the southeast of Monettia bog (P15/005). The pumps only raise the water from the bog by about 1m so discharge is primarily surface water. Water from the pumping station has to travel 1.7 km before entering the River Barrow to the south-southeast of Monettia Bog. During this journey, the pumped bog water passes (by gravity flow (after the pumping station)) through two large settlement ponds. The pumping station is approximately 600m from the SAC (as the crow flies), but across this line there are a number of deep drains that effectively separate/isolate the effects of the pumping station (in terms of shallow drawdown) from the SAC. The shallow nature of the pumping and the predominance of peat soils in the area with high water table means that there is limited pumping of underlying groundwater occurring. The pumping station transfers surface water to an outfall where no drainage gradients can be established, and as such there is no impact on local groundwater levels or base flow contributions to the River Barrow. In any event all water being pumped from Monettia bog ends up in the River Barrow, so there is no net loss of water to the river as a result of the pumping. Based on the historical information provided above and also based on the physical separation and shallow ongoing surface water drainage and pumping, it is our opinion that the ongoing drainage of Monettia Bog and operation of pumping station P15/005 has not impacted on the prevailing hydrology of the River Barrow And River Nore SAC/River Nore SPA. The remaining bogs which discharge to this SAC/SPA were drained between 1946 - 1996, with all but one being drained prior to 1990. The local baseline environment for this SAC/SPA therefore included those bogs in their drained state. In addition, and although pathways exist, the scale of flows from the bogs is small relative to the scale of flows in the River Barrow and River Nore.
Impact on Receptor	No Impact

Name of Receptor	Mouds Bog SAC
Source/Pathway	Mouds Bog is located about 3 km north-west of Newbridge in Co. Kildare, close to the Hill of Allen, and includes amongst others, the townlands of Grangehiggin, Barretstown and Hawkfield. The site comprises a raised bog that includes both areas of high bog and cutover bog. Much of the margins of the site are bounded by trackways, drainage and cutover bog. Turbary cutting has occurred along the northern, eastern and southern edges of the bog. The SAC has the following priority habitat: [7110] Raised Bog (Active)* and other non-priority habits: [7120] Degraded Raised Bog and [7150] Rhynchosporion Vegetation.

Name of Receptor	Mouds Bog SAC
	Mouds (Allen) bog has been drained/operational since 1966/1972, therefore any drainage and hydrological impacts associated with the development of that bog had occurred many years in advance of Mouds Bog SACs designation in 2003. All drainage at Mouds (Allen) bog is by gravity. There are no pumping stations or pumped dewatering. Mouds (Allen) bog is separated from the Mouds Bog SAC by a wide spread of cutover bog, several drains, and two main drains/streams. The shortest distance between the SAC boundary and BnM land is approximately 700m. However, the facebank (edge of the high bog on the SAC) is approximately 1.5 km from the edge of the peat fields on Mouds (Allen) bog. At this distance, the effects of drainage at the BnM (Allen) bog are negligible, considering the intermediate drains and streams. The BnM (Allen) bog and the SAC are also on opposite sides of the Naas to Allen road, and there are deep drains on both sides of this road. Based on the historical information provided above and also based on the physical separation and nature of the intermediate drainage, it is our opinion that the drainage of Mouds (Allen) bog has not impacted on the prevailing hydrology of Mouds Bog SAC.
Impact on Receptor	Negative, imperceptible, indirect, impact on hydrology of SAC.

Name of Receptor	River Boyne and River Blackwater SAC River Boyne and River Blackwater SPA
Source/Pathway	The primary pathway to the River Boyne and River Blackwater SAC/SPA is surface water. Drainage from the bogs discharges to outfall points and streams, which eventually follow the defined flow paths to the River Boyne and River Blackwater SAC/SPA. Alteration of the hydrological regime at the upstream bogs may have altered flows from the bogs which ultimately discharges to the River Boyne. The bogs which discharge to this SAC/SPA were drained between 1951 – 1979 before the SAC was designated. The local baseline environment for this SAC/SPA therefore included the bogs in their drained state. In addition, and although pathways exist, the scale of flows from the bogs is small relative to the scale of flows in the River Boyne and River Blackwater.
Impact on Receptor	Negative, imperceptible, indirect, impact on hydrology of SAC/SPA.

Name of Receptor	Mount Hevey Bog SAC
Source/Pathway	The Mount Hevey bog SAC is situated 3.5 km north of Kinnegad bog. The Mount Hevey bog and Kinnegad bog are both connected hydraulically to the Kinnegad river (Kinnegad_020 and Kinnegad_030), however both of these bogs are upgradient of the river channel, therefore there is no direct or indirect pathway between them. The Kinnegad River also acts as a hydraulic boundary to groundwater flow between them.
Impact on Receptor	No Impact.

Name of Receptor	The Long Derries, Edenderry SAC
Source/Pathway	The Long Derries, Edenderry SAC is situated between Ticknevin and Glashabaun North bogs. The SAC intercepts the license boundary for Glashabaun North bog, however the bog itself ends at the boundary to the SAC. This SAC is designated for 6210 (*Semi-natural dry grasslands and scrubland facies on calcareous substrates – important orchid sites*).

Name of Receptor	The Long Derries, Edenderry SAC
	The Glashabaun North and Ticknevin bogs were first drained in 1946 and 1976 respectively, therefore any drainage and hydrological impacts associated with the development of those bog had occurred many years in advance of the SAC designation in 1997, and despite this adjacent peat workings and its long established drainage the The Long Derries, Edenderry SAC was still worthy of designation in 1997. There is a deep drain between the SAC and Glashabaun North bog. There is also old sand and gravel workings within the western section of the SAC. These appear to be dry workings with no dewatering required. There is a pumping station located between Glashabaun North bog And Ticknevin bog to the north. This pumping station (P37/010) has been in operation for many years. It was original an archimedes screw auger pumping station, but this was replaced by a submersible pump. The pump sump is approximately 4.5m deep and has dimensions of 10m x 10m. the pumping station is approximately 250m from the SAC boundary of its nearest point. The pumping station is set up using a high-low float system to remove surface water when required, and as such has limited impact on local groundwater levels. Based on the historical information provided above and also based on the physical separation and shallow ongoing surface water drainage and pumping, it is our opinion that drainage of Glashabaun North bog and operation of pumping station P37/010 has not impacted on the prevailing hydrology of the Long Derries, Edenderry SAC. The combination (cumulative effect) of ongoing drainage and pumping at Glashabaun North and Ticknevin bog has not altered the hydrology of the SAC in any way.
Impact on Receptor	No Impact.

Name of Receptor	Garriskil Bog SAC/SPA
Source/Pathwa	The Garriskil Bog SAC/SPA exists approximately 40-50m southwest of Coolnagun bog. Garriskil bog and Coolnagun bog are both connected hydraulically to the River Inny, however both of these bogs are upgradient of the river channel, therefore there is no direct or indirect pathway between them. The same applies for the further upstream Milkernagh and Coolcraff bogs. Qualifying interests for the Garriskil Bog SAC are *Active raised bog*, *Degraded raised bog still capable of natural regeneration* and *Depressions on peat substrates of the Rhynchosporion.* Increased runoff following drainage may have impacted on the QI's of this SAC/SPA, however, as the Coolnagun, Coolcraff and Milkernagh bogs were all drained before 1981, and the SAC/SPA came into existence in 1996, therefore the local baseline environment for this SAC/SPA included these bogs in their drained state.
Impact on Receptor	No Impact.

Name of Receptor	Lough Ree SAC/SPA
Source/Pathway	The Lough Ree SAC/SPA is located 29 km downstream of the Mountdillon group of bogs. The Mountdillon bogs were drained between 1947 and 1981 and have been in production from between 1953 and 1989. The downstream Lough Ree SAC became a designated site in 2002, and the SPA was designated in 2010. The primary changes in the hydrology of the bogs occurred prior to the existence of the SAC/SPA designations. The primary pathway to the Lough Ree SAC/SPA is surface water drainage via the River Inny. Drainage from the bogs discharges to outfall points and streams, which eventually follow the defined flowpaths to the River Inny and ultimately to Lough Ree. Any upstream alteration of flows on the bog discharge scale has not had any measurable impact on a body of water the size of Lough Ree.
Impact on Receptor	Negative, imperceptible, indirect, impact on hydrology of SAC/SPA.

Name of Receptor	North Dublin Bay SAC
Source/Pathway	The North Dublin Bay SAC is located approximately 42 km downstream of the Mouds/Allen bog. The Mouds bog was drained in 1966, with first production in 1972. The SAC became a designated site in 2019 (S.I 524/2019). The primary changes in the hydrology of the bog occurred more than 40 years prior to the existence of the SAC. The pathway to the SAC is via surface water. Drainage from the bog discharges to outfall points and streams, which eventually follow the defined flowpaths to the River Liffey and ultimately to the SAC boundary. Alteration of the hydrological regime at the upstream bogs may have altered flows from the bogs which ultimately discharges to the River Liffey. The Mouds bog discharges towards this SAC. The regional catchment is 1624 km^2, while the bog drained area is 4.2 km^2 and therefore represents approximately 0.25% of the overall catchment size. A pathway exists but the flow volumes are negligible in the scale of the catchment to the SAC.
Impact on Receptor	No Impact.

Name of Receptor	Ballynafagh SAC
Source/Pathway	The Ballynafagh SAC is located 1 km west of Prosperous bog. Both these bogs are located along the northern edge of the River Slate (Slate_010) and both bogs are hydraulically upgradient of the main river channel and drain towards the River Slate. Qualifying interests for the Ballynafagh bog are *Active raised bog*, *Degraded raised bog still capable of natural regeneration* and *Depressions on peat substrates of the Rhynchosporion.* The Prosperous bog was drained in 1991, before the designation of Ballynafagh bog as a SAC. There is no identified pathway for impacts on the SAC as the upstream drained Prosperous bog was part of the baseline local environment at the time of designation of the SAC.
Impact on Receptor	No Impact

Name of Receptor	Mongan Bog SAC/SPA
Source/Pathway	Mongan Bog SAC/SPA is located about approximately 2.05 km north-west of Ballaghurt Bog in County Offaly. Mongan Bog is a midland raised bog of medium size situated immediately east of the monastic site of Clonmacnoise, Co. Offaly, and 12 km south of Athlone. It is situated in a basin, surrounded on 95% of its perimeter by high ground on mineral soil. At two points in the north it shares a common boundary with Pilgrim's Road Esker SAC. Most of the bog is a Statutory Nature Reserve, established in 1987. The bog has been the subject of ongoing intensive research since 1972. The SAC has the following priority habitat: [7110] Raised Bog (Active)* and other non-priority habits: [7120] Degraded Raised Bog and [7150] Rhynchosporion Vegetation. Ballaghurt Bog was first drained/operational since 1975/1980, therefore any drainage and hydrological impacts associated with the development of that bog had occurred many years in advance of Mongan Bog SAC/SPA designations, or its designation as a nature reserve in 1987. All drainage at Ballaghurt is by gravity. There are no pumping stations or pumped dewatering. Ballaghurt bog is separated from Mongan Bog SAC/SPA by a wide spread of agricultural land and some cutover bog, an active quarry, and an esker ridge. Drainage from Ballaghurt bog is towards the southwest into the Blackwater River. Based on the historical information provided above and also based on the physical separation, the intermediate esker ridge and active sand and gravel pit, and the fact that drainage conditions at Ballaghurt bog are towards the southwest (away from the SAC/SPA), it is our opinion that the drainage of Ballaghurt Bog has not impacted on the prevailing hydrology of Mongan Bog SAC/SPA.
Impact on Receptor	No Impact.

Name of Receptor	Lough Derravaragh SPA
Source/Pathway	Lough Derravaragh is located approximately 12 km north of Mullingar town in Co. Westmeath. It is a medium- to large-sized lake of relatively shallow water (maximum depth 23 m). The lake extends along a south-east/north-west axis for approximately 8 km. The Inny River, a tributary of the River Shannon, is the main inflowing and outflowing river. It is a typical limestone lake with water of high hardness and alkaline pH, and is classified as a mesotrophic system. The Lough Derravaragh SPA is located approximately 1.5 km downstream of the Coolnagun bog which is part of the Mountdillon group of bogs. The Mountdillon bogs (Coolnagun, Milkernagh, and Coolcraff) were drained between 1947 and 1981 and have been in production from between 1953 and 1989. The downstream Lough Derravaragh SPA became a designated site in 2011. The primary changes in the hydrology of the bogs occurred prior to the existence of the SPA designation. Any upstream alteration of runoff/flows from bog discharge scale (at Coolnagun, Milkernagh, and Coolcraff) is unlikely to have had any measurable impact on a body of water the size of Lough Derravaragh.
Impact on Receptor	Negative, imperceptible, indirect, impact on hydrology of Lough Derravaragh SPA.

Name of Receptor	Lough Iron SPA
Source/Pathway	Lough Iron is a small to moderately sized midland lake, located some 12 km northwest of Mullingar. It is situated on the Inny River, which flows from Lough Derravaragh approximately 5 km to the north-east. Lough Owel occurs a few kilometres to the south-east and is connected to Lough Iron by a small stream. The underlying geology is limestone and the lake is mesotrophic in character. The Lough Iron SPA is located approximately 6.5 km downstream of the Coolnagun bog which is part of the Mountdillon group of bogs. The Mountdillon bogs (Coolnagun, Milkernagh, and Coolcraff) were drained between 1947 and 1981 and have been in production from between 1953 and 1989. The downstream Lough Iron SPA became a designated site in 2011. The primary changes in the hydrology of the bogs occurred prior to the existence of the SPA designation. Any upstream alteration of runoff/flows from bog discharge scale (at Coolnagun, Milkernagh, and Coolcraff bogs) is unlikely to have had any measurable impact on lough Iron SPA as runoff water from the Mountdillon bogs has to pass through Lough Derravaragh and approximately 6.5 km of the River Inny before it reaches Lough Iron SPA.
Impact on Receptor	Negative, imperceptible, indirect, impact on hydrology of Lough Iron SPA.

Name of Receptor	Glen Lough SPA
Source/Pathway	Glen Lough is situated about 5 km north-west of Lough Iron on the border of Co. Westmeath and Co. Longford. Extensive drainage in the 1960s has resulted in a dramatic drop in the watertable here, with the result that there is now little open water, except during flooding in the winter months. Sedge-dominated freshwater marsh now occupies the majority of what was once open water. Glen Lough SPA does not have any surface water connections to the River Inny or the Mountdillon bogs (Coolnagun, Milkernagh, and Coolcraff bogs). Glen Lough SPA is approximately 7.45 km from the western edge of Cool na Gun bog and at this distance the potential for a groundwater pathway to exist is negligible.

Name of Receptor	Glen Lough SPA
Impact on Receptor	No Impact

14.4.4 Remedial Contamination of Soil by Leakages and Spillages and Alteration of Peat/Soil Geochemistry

Accidental spillage during refuelling of machinery and plant (static and mobile) with petroleum hydrocarbons is a pollution risk. The accumulation of small spills of fuels and lubricants during routine plant use can also be a significant pollution risk over time. Hydrocarbon has a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. Large spills or leaks have the potential to result in significant effects (i.e. contamination of peat, subsoils and pollution of the underlying aquifer) on the geological and water environment.

Discharges from wastewater systems (septic tanks) at office buildings, and at productions centres and workshops could potentially have caused surface water and groundwater contamination. Activities and features associated with peat production include railway lines, machine passes, canteen structures, work sites, production centres, mobile fuel tanks, fixed fuel tanks, peat loading facilities, and end user sites. These potential impacts existed for all 41 bogs and their associated production centres and workshops, but we understand from review of available AER (Annual Environmental Reports submitted to the EPA under the IPC licences) reports that no significant pollution events/spills to groundwater have occurred since 2000.

Bog Units	All bog units and ancillary works
Receptor	Peat, subsoil and bedrock
Source/Pathway	Infiltration through pore space in peat, subsoil and bedrock
Impact on Receptor	No Impact. From review of the available AER reports we understand no significant fuel spills or wastewater discharges have occurred to groundwater since 2000, from any of the 41 bog units or associated ancillary activities.

14.4.5 Remedial Impacts from Peat Instability and Failure

Peat instability or failure refers to a significant mass movement of a body of peat that would have a negative impact on individual bogs sites and potentially the surrounding environment. Peat instability could have occurred during development of bog drainage or ancillary activities associated with peat production, including e.g. railway lines, machine passes, canteen structures, work sites, production centres, mobile fuel tanks, fixed fuel tanks, peat loading facilities, and end user sites. The significant effects of peat failure at the 41 sites could have resulted in:

- Death or injury to personnel;
- Damage to machinery;
- Damage or loss of infrastructure;
- Drainage disruption by blockage of drainage pathway by relocated peat;
- Contamination of watercourses, water supplies by particulates; and,
- Degradation of the peat environment by relocation of peat.

14.4.6 Remedial Impacts on Nearby Groundwater/Surface water abstractions

Historic impact on nearby GWS/PWS are assessed on the basis of impacts relating to water quality and water quantity (the volume of water available). There are 35 no. abstractions in total which were identified as being <4 km to the 41 bogs. 4 km is considered to be a very conservative screening distance considering the shallow nature (3-6m deep) of the historic bog drainage works, ancillary activities, and associated pumping stations (where they exist).

The majority of the known water supplies close to the 41 bogs are springs which appear are reliant on local groundwater flows from sand and gravel deposits or are situated at the base of hills/slopes and essentially capture the shallow groundwater flow coming from those hills. The majority of the groundwater drainage and seepage in the bogs would have a lateral flow direction, discharging into the perimeter drains and streams around the bogs.

Deep groundwater recharge to the underlying bedrock aquifer will have been minimal. The restriction of recharge relates to the generally impermeable layers which underlie much of Irelands bogs leading to a 4% recharge coefficient for the bogs (refer to Section 14.3.4.1). The majority of the boreholes/springs mapped are located hydraulically upgradient of the bogs. There are no GWS/PWS mapped directly downgradient of any of the 41 bogs.

As outlined in Section 14.3.3 *Hydrological Overview*, only eight of the 41. bogs were drained after 1985. From a hydrological perspective, any major changes on the hydrology/hydrogeology, and subsequently the hydrogeology of the bogs, occurred before 1985. Most of the PWS and GWS were built/developed after 1985, therefore the drained hydrology/hydrogeology of nearby bogs was the baseline condition at the time of development of the water supplies. An assessment of historic impacts on water supplies surround the 41 bogs is outlined below.

Name/Identifier	Cloncullen GWS
Type	Borehole
Location	218500, 237000
Closest Bog/Distance	Bellair North – 1.7 km
Source/Pathway	No pathway – hydraulically upgradient of the bog. Separation distance is also large.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Ballinahowan (Boor River) (SH_ABS0482)
Type	Surface Water
Location	E 210047, N 233554
Closest Bog/Distance	Bellair north – 4.5 km
Source/Pathway	Abstraction is along section of Boor_020. No pathway – Boor_010 acts as hydraulic boundary. Separation distance is also large.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Boher Lemanaghan GWS (SH_ABS0851)
Type	Borehole & Spring
Location	E 217420, N 229770
Closest Bog/Distance	Bellair North – 1.8 km
Source/Pathway	No direct/indirect pathway – hydraulically upgradient of bog. SPZ mapped which does not interact with the bog. Lemanaghan stream also likely acts as a hydraulic boundary to flow in the direction towards this source. Separation distance is also large.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Ferbane/Gallen WSS (SH_ABS0869)
Type	Borehole
Location	E209030, N223490
Closest Bog/Distance	Noggusboy – 1.2 km
Source/Pathway	Borehole is on northern banks of Brosna_130. Boreholes are upgradient of surface water flow within the Brosna. Due to hydraulic gradient, no pathway exists. Separation distance is also large.
Impact on Receptor – GW Quality	No impact
Impact on Receptor – GW Quantity	No impact

Name/Identifier	Ferbane/Gallen WSS (SH_ABS0827)
Type	2 no. Boreholes
Location	E211700, N223250
Closest Bog/Distance	Noggusboy – 0.6 km
Source/Pathway	Zone of influence of these boreholes is likely on high ground directly west of the source and does not interact with bog. Grand canal also exists as a hydraulic boundary between the borehole and the bog.
Impact on Receptor – GW Quality	No impact
Impact on Receptor – GW Quantity	No impact

Name/Identifier	Kilcormac PWS (SH_ABS0827)
Type	2 no. boreholes
Location	E218740, N214140
Closest Bog/Distance	Boora – 2.6 km south of the bog
Source/Pathway	Source Protection Zone has been delineated for this source. SPZ boundary is approximately 1 km south of bog boundary. No pathway between the bog and this source. Separation distance is also large.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Ballyboy GWS
Type	Dug Well/s
Location	619800, 715735
Closest Bog/Distance	Boora – 1.7 km south of the bog
Source/Pathway	Source Protection Zone has been delineated for this source. SPZ boundary is approximately 1.5 km south of bog boundary. No pathway between the bog and this source. Separation distance is also large.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Rath GWS
Type	2 no. boreholes
Location	E 211370, N 209640
Closest Bog/Distance	Boora – 1.7 km south of the bog
Source/Pathway	Source Protection Zone has been delineated for this source. SPZ boundary is approximately 1.5 km north of bog boundary. Groundwater flow to this source is from high ground to the northeast of the boreholes. The SPZ boundary shows no interaction or pathway between the bog and this source. Separation distance is also large.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Coneygowan GWS
Type	2 no. boreholes
Location	E 237700, N 220500
Closest Bog/Distance	Derryclure – 0.7 km east of the bog
Source/Pathway	Lidar data suggests GWS source location is topographically higher than bog, therefore there is likely no hydraulic pathway (surface water or groundwater) from the bog to this source.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Meelaghans GWS
Type	Borehole/s
Location	E 239300, N 221600
Closest Bog/Distance	Derryclure – 2.5 km east of the bog
Source/Pathway	Source protection Zone (SPZ) mapped for this source. The SPZ does not intersect the bog boundary and is 1.6 km from the bog at its closest point. Groundwater flow to this source is also primarily from the south. Separation distance is also large.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Killeigh (Offaly County Council)
Type	Borehole
Location	E 236500, N 218050
Closest Bog/Distance	Derryclure – 2.5 km south of the bog
Source/Pathway	Borehole is mapped in an area that is generally 100 – 110 mOD. The ground slopes away from this source towards Derryclure and Monettia bogs and is therefore upgradient of these bogs. Separation distance is also large.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Tullamore PWS
Type	4 no. Boreholes/Springs
Location	E 234170, N 210330
Closest Bog/Distance	Monettia – 3.7 km from the bog
Source/Pathway	This PWS source is situated along the northern slope of Clarahinch mountain. A SPZ has been mapped for this source by WYG, which encompasses the majority of the mountain slope to the south of the wells. There is no pathway between groundwater at this source and Monettia bog. Separation distance is also large.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Adams Villas GWS (SH_ABS0602)
Type	1 no. Borehole
Location	E 232660, N 222540
Closest Bog/Distance	Monettia – 3.7 km from the bog
Source/Pathway	High ground directly west of Derryclure bog, combined with the topography at the Adams Villas GWS borehole means that there will be no hydraulic connection between these two locations. Separation distance is also large.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Rahan (Agall) WSS
Type	Spring
Location	E226730, N223320
Closest Bog/Distance	Kilaranny – 0.7 km from the bog
Source/Pathway	Source Protection Zone mapped for this bog which is located south of the borehole. The Kilaranny GWS is located 0.7 km west of the source, therefore there is no hydraulic connection between these two locations.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Ballivor PWS
Type	Spring
Location	E251760, N231690
Closest Bog/Distance	Ballybeg – 0.6 km
Source/Pathway	SPZ is mapped for the Ballivor PWS source. The western boundary of this SPZ is mapped as bordering the southeastern edge of Balybeg bog.
Impact on Receptor – GW Quality	No impact on water quality.
Impact on Receptor – GW Quantity	Negative, imperceptible, indirect, impact on groundwater quantity due to increased shallow drainage.

Name/Identifier	Toberdaly PWS
Type	Spring
Location	E251760, N231690
Closest Bog/Distance	Ballybeg – 0.6 km
Source/Pathway	SPZ is mapped for the Toberdaly PWS source. The western boundary of this SPZ is mapped as bordering the southeastern edge of Balybeg bog. As the topography of the Ballybeg bog is bowl shaped and drainage channels from the southwestern edge of the bog flow north to the outfalls, it is unlikely that there is any flow or seepage from the bog towards the SPZ or Toberdaly source. The delineation of the SPZ will have taken into account the topography of the area. A pathway between the bog and the Toberdaly source is unlikely but not impossible.
Impact on Receptor – GW Quality	No impact on groundwater quality.
Impact on Receptor – GW Quantity	Negative, imperceptible, indirect, impact on groundwater quantity due to increased shallow drainage around the bog.

Name/Identifier	Clonfinlough GWS
Type	Spring
Location	E204650, N229780
Closest Bog/Distance	Ballaghurt – 1.0 km
Source/Pathway	The Clonfinlough GWS is located approximately 1.0 km northwest of Ballaghurt, and just south of a sand and gravel pit in the townland of Clonfinlough. The Clonfinlough Esker exists approximately 100m north of the GWS and recharge to the GWS is most likely derived from rainfall percolating through this deposit of sand and gravel. Based on the local topography there is unlikely to be any hydraulic connection between the Ballaghurt bog and the GWS.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Tullamore Ardan PWS
Type	Borehole
Location	E204650, N229780
Closest Bog/Distance	Daingean (Derries) – 5 km
Source/Pathway	SPZ has been delineated for the Tullarmore Ardan PWS. The closest boundary of the SPZ to the bog is 2.6 km from Daingean (Derries) bog. Separation distance is also large.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Daingean WSS (Springs)
Type	3 no. Springs
Location	E246820, N227720
Closest Bog/Distance	Daingean (Rathdrum) – 3.5 km
Source/Pathway	SPZ mapped for this spring. SPZ is approximately 2.2 km from the bog at its closest point. Springs are also hydraulically upgradient of the bog. No pathway identified. Separation distance is also large.
Impact on Receptor – GW Quality	No impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Ballinagar GWS and Geashill PWS
Type	3 no. dug wells.
Location	E245050, N221700
Closest Bog/Distance	Clonad – 1.5 km
Source/Pathway	SPZ mapped for these sources. SPZ is 1.3 km from the bog at its closest point. GW flow towards these sources is also from the south. Clonad bog is situated to the north. No pathway identified.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Walsh Island (Coolgarry) WS
Type	Borehole
Location	E252170, E221080
Closest Bog/Distance	Ballykeane – 1 km
Source/Pathway	SPZ mapped for this source. SPZ is 0.6 km from the bog at its closest point. GW flow to the inner source protection zone is from the north. Ballykeane bog is situated to the east. No pathway identified.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Bordereen, Garryhinch GWS
Type	Springs
Location	E248850, N211700
Closest Bog/Distance	Garrymore – 3.6 km
Source/Pathway	No SPZ mapped for this location. The topography rises to the southeast of this spring and groundwater flow to the springs will be from this direction. As the bog is situated 3.6 km west of the source no pathway was identified. Separation distance is also large.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Edenderry PWS
Type	Borehole
Location	E264550, N233350
Closest Bog/Distance	Ticknevin – 2.6 km
Source/Pathway	SPZ mapped for this borehole. SPZ is 2.2 km from Ticknevin bog at its closest point. The borehole is hydraulically upgradient of the bog. No pathway was identified. Separation distance is also large.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Ballykillen GWS
Type	Borehole
Location	E262540, N230730
Closest Bog/Distance	Ticknevin – 1.5 km
Source/Pathway	SPZ mapped for this borehole. SPZ is 0.8 km from Ticknevin bog at its closest point. The borehole is hydraulically upgradient of the bog. No pathway was identified.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Clonbulloge WSS
Type	Spring
Location	E260700, N223690
Closest Bog/Distance	Ballydermot North – 2.5 km
Source/Pathway	SPZ mapped for this spring. SPZ mapped as a narrow band north of the spring. The very northern edge of the SPZ is located approximately 0.6 km from Codd South bog. Separation distance is also large.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Bracknagh GWS
Type	Spring/Borehole
Location	665049, 719387
Closest Bog/Distance	Ballydermot South – 1.8 km
Source/Pathway	SPZ mapped for this source. The SPZ extends to the north and is approximately 0.7 km from the southern edge of the bog at its closest point. No pathway identified. Separation distance is also large.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Rathangan PWS
Type	6 no. Boreholes – Well Field
Location	E267000, N218200
Closest Bog/Distance	Ballydermot South – 3.6 km
Source/Pathway	SPZ mapped for this source. The SPZ extends to the south of the boreholes and is approximately 3.5 km from the southern edge of the bog at its closest point. No pathway identified. Separation distance is also large.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Ballymachugh PWS
Type	Boreholes
Location	E238730, N282770
Closest Bog/Distance	Coolcraff 3.8 km
Source/Pathway	SPZ mapped for this PWS. SPZ mapped >3.5 km north of the site. Lough Kinale situated between the bog and the PWS, which acts as a hydraulic boundary. No pathway identified.
Impact on Receptor – GW Quality	No Impact
Impact on Receptor – GW Quantity	No Impact

Name/Identifier	Lough Kinale (SH_ABS0921)
Type	Surface Water
Location	E238730
Closest Bog/Distance	Coolcraff 3.8 km
Source/Pathway	The general local surface water drainage direction is south flowing. Lough Kinale is located north and hydraulically upgradient of the bog. No pathway was identified.
Impact on Receptor – SW Quality	No Impact
Impact on Receptor – SW Quantity	No Impact

Name/Identifier	Johnstown PWS
Type	7 no. Boreholes
Location	E280210, N236550
Closest Bog/Distance	Gilltown – 2.5 km
Source/Pathway	SPZ mapped. No pathway identified. Boreholes situated on topographically high ground. Separation distance is also large.
Impact on Receptor – SW Quality	No Impact
Impact on Receptor – SW Quantity	No Impact

Name/Identifier	Robertstown PWS
Type	Boreholes – Well Field
Location	E279870, N225310
Closest Bog/Distance	Mouds – 2.2 km
Source/Pathway	SPZ is mapped for this well field. SPZ extends to within 50m of bog. Groundwater drainage within the bog is likely to the west and not in the direction of the borehole or source protection zone. Separation distance is also large.
Impact on Receptor – SW Quality	No Impact
Impact on Receptor – SW Quantity	No Impact

Name/Identifier	Athy UDWSS
Type	Well Field
Location	E267770, N194580
Closest Bog/Distance	Kilberry 4.8 km
Source/Pathway	SPZ mapped for this regional supply. SPZ is approximately 4.7 km from the bog at its closest point. Separation distance is also large.
Impact on Receptor – SW Quality	No Impact
Impact on Receptor – SW Quantity	No Impact

Name/Identifier	Meelick Borehole (Portlaoise WS)
Type	Borehole
Location	E244898 N197078
Closest Bog/Distance	Cuil na Carton – 3.3 km
Source/Pathway	SPZ delineated and is located approximately 3 km from the bog at its closest point. No pathway identified. Separation distance is also large.
Impact on Receptor – SW Quality	No Impact
Impact on Receptor – SW Quantity	No Impact

Name/Identifier	Camcor River (SH_ABS0933)
Type	Surface Water
Location	E208050, N204600
Closest Bog/Distance	Killaun – 1.2 km
Source/Pathway	The outfalls from the Killaun bog (SW29 & SW29A) reach a confluence with the River Camcor on the eastern outskirts of Birr, Co. Offaly. The intake on the River Camcor is located approximately 1 km south and hydraulically upgradient of this confluence. The bog surface water does not interact with this water supply intake.
Impact on Receptor – SW Quality	No Impact
Impact on Receptor – SW Quantity	No Impact

Name/Identifier	Ballymorris (River Barrow) SE_ABS0078
Type	Surface Water
Location	E252837, N211473
Closest Bog/Distance	Derrylea -3.3 km
Source/Pathway	Intake is hydraulically upgradient of the bog. No surface water pathway identified.
Impact on Receptor – SW Quality	No Impact
Impact on Receptor – SW Quantity	No Impact

14.4.7 Remedial Impacts on Local Groundwater Wells/Supplies

Potential impacts on local groundwater wells include impacts on groundwater quantity, where the volume of water recharging into a particular aquifer has been altered by historic changes in

bog drainage and recharge. As per previous hydrogeology/hydrology sections, the primary bogs of interest are those drained after 1985. Impacts on groundwater from the perspective of quantity would have also been limited by the Low – Moderate groundwater vulnerability mapped near the bogs (refer to Section 14.3.4.1) and the low recharge coefficient (approximately 4%) of the bogs themselves. Historically (and currently), the majority of recharge to the bedrock aquifers was from surrounding grassland and forestry areas.

In terms of groundwater quality, the potential impacts included contamination of groundwater via the sources and pathways identified in Section 14.4.4. Any spillage of petrol/hydrocarbons on the bogs or at production centres/workshop areas which infiltrated to groundwater, was likely to discharge to surrounding surface watercourses rather than reaching the underlying bedrock aquifer. This again was/is linked to low recharge and low groundwater vulnerability.

The potential for increased turbidity in groundwater wells linked by karst features to surface waters arising from the bogs was also identified as a possible pathway.

During the desk study investigation of groundwater sources, local wells, which are mapped by the GSI with 50m accuracy were investigated. Local topography and drainage direction, as well as mapped karst features were identified. No karst features, such as swallow holes were mapped within the boundaries on any of the 41 bogs. The closest karst feature, a swallow hole, was mapped approximately 100m north of Lemanaghan bog but no pathway exists between the that bog drainage system and the identified swallow hole.

Receptor	Local groundwater wells/supplies
Source/Pathway	GW Quantity: Pathway of alteration to groundwater recharge identified but is limited in magnitude (peat cover and low recharge potential). GW Quality: Pathway linked to groundwater contamination (*i.e.* hydrocarbon spillage on bogs) but was limited in potential magnitude. GW Quality: No pathways between karst features and local wells have been identified.
Impact on Receptor – GW Quality	Negative, imperceptible, indirect, impact on local groundwater quality
Impact on Receptor – GW Quantity	Negative, imperceptible, indirect, impact on local groundwater wells

14.4.8 Remedial Impacts on County Geological Sites

Potential impacts on the county geological sites identified in Section 14.3.2.3 were assessed based on their distance to the closest bog and any geological/hydrological pathways which may exist.

Receptor	County geological sites
Source/Pathway	The closest county geological site is St. Peters Well located 1.2 km east of Gilltown bog. No pathway could be identified between this geological site and the Gilltown bog. The same applies for all other county geological sites listed in Section 14.4.2.3. The separation distances, and the occurring nature of the peat extraction works, means that impacts on County Geological has not occurred.
Impact on Receptor	No Impact

14.4.9 Cumulative Impacts Assessment

The assessment of cumulative impacts is divided as follows:

- Cumulative effects assessment of third party and private peat sod peat cutting;
- Cumulative effects of ancillary works/features completed on Bord na Móna bog units; and,

14.4.9.1 Cumulative effects assessment of third party and private peat sod peat cutting

Third party and private sod peat cutting (turbary plots) is generally a much smaller area of bog compared to the Bord na Móna (BnM) production areas. Cumulative effects for each identified impact has been assessed as follows:

Source of Impact	Cumulative effects of BnM peat extraction and ancillary activities and third party and private sod peat cutting
Pathway	Removal of peat, ongoing drainage
Receptor	Land & land-use
Impact Assessment	Third party and private sod peat cutting is generally a much smaller area of bog compared to the BnM production areas.
Cumulative Impact on Receptor(s)	No significant cumulative effects on land and land-use

Source of Impact	Cumulative effects of BnM peat extraction and ancillary activities and third party and private sod peat cutting
Pathway	Local hydrogeology and groundwater aquifers, downstream surface water receptors
Receptor	Drainage on Bog Hydrogeology and Downstream Surface Water Hydrology
Impact Assessment	The additional commercial and private peat extraction (sod peat) and drainage are small compared to BnM operations, and as such the cumulative impacts are imperceptible.
Cumulative Impact on Receptor(s)	No significant cumulative effects on drainage, on bog Hydrogeology, and downstream surface water hydrology

Source of Impact	Cumulative effects of BnM peat extraction and ancillary activities and third party and private sod peat cutting
Pathway	Surface water drainage and groundwater drainage pathways
Receptor	Designated Sites
Impact Assessment	The additional commercial and private peat extraction (sod peat) and drainage are small compared to BnM operations, and as such the cumulative impacts are imperceptible.
Cumulative Impact on Receptor(s)	No significant cumulative effects

Source of Impact	Cumulative effects of BnM peat extraction and ancillary activities and third party and private sod peat cutting
Pathway	Infiltration through pore space in peat, subsoil and bedrock
Receptor	Soil by Leakages and Spillages and Alteration of Peat/Soil Geochemistry
Impact Assessment	BnM sites have operated under IPC licence since 2000. The additional commercial and private peat extraction (sod peat) are small compared to BnM operations, and as such the cumulative impacts are imperceptible.

Source of Impact	Cumulative effects of BnM peat extraction and ancillary activities and third party and private sod peat cutting
Cumulative Impact on Receptor(s)	No significant cumulative effects

Source of Impact	Cumulative effects of BnM peat extraction and ancillary activities and third party and private sod peat cutting
Pathway	Peat soils and geology
Receptor	Peat Instability and Failure
Impact Assessment	Residual peat depths on BnM sites are small, and all bogs are drained, with small slopes. No slope failures have occurred since the 1950's. The additional commercial and private peat extraction (sod peat) are small compared to BnM operations, and as such the cumulative impacts are imperceptible.
Cumulative Impact on Receptor(s)	No significant cumulative effects

Source of Impact	Cumulative effects of BnM peat extraction and ancillary activities and third party and private sod peat cutting
Pathway	Surface water and groundwater flows
Receptor	Nearby Groundwater/Surface water abstractions
Impact Assessment	The lack of connecting pathway, or significant separation distances to water supplies/abstractions means that impacts are negligible. The additional commercial and private peat extraction (sod peat) are small compared to BnM operations, and as such the cumulative impacts are imperceptible.
Cumulative Impact on Receptor(s)	No significant cumulative effects

Source of Impact	Cumulative effects of BnM peat extraction and ancillary activities and third party and private sod peat cutting
Pathway	Surface water and groundwater flows
Receptor	Local Groundwater Wells/Supplies
Impact Assessment	The lack of connecting pathway, or significant separation distances to water supplies/abstractions means that impacts are negligible. The additional commercial and private peat extraction (sod peat) are small compared to BnM operations, and as such the cumulative impacts are imperceptible.
Cumulative Impact on Receptor(s)	No significant cumulative effects

Source of Impact	Cumulative effects of BnM peat extraction and ancillary activities and third party and private sod peat cutting
Pathway	Removal or damage to CGS
Receptor	County Geological Sites
Impact Assessment	All BnM and other commercial and private peat extraction works are remote from CGSs.
Cumulative Impact on Receptor(s)	No cumulative effects

14.4.9.2 Cumulative effects of ancillary works/features completed on Bord na Móna bog units

Ancillary structures and features associated with peat extraction include railway lines, machine passes, canteen structures, work sites, production centres, mobile fuel tanks, fixed fuel tanks, peat loading facilities, and end user sites.

Impacts from these features and structures and end user sites have been included in the assessment completed at Sections 14.4.1 to 14.4.8.

14.5 Mitigation & Monitoring

14.5.1 Land and Land-use

The land and land-use changes have been established through past peat extraction works and associated activities.

The extraction works have been completed under licence from the EPA since 2000, and Bord na Móna have an Environmental Management System specific to the peat extraction works. Past operation to the EMS and IPC licence conditions has ensured that impacts to land and land-use have been minimised.

14.5.2 Bog Hydrogeology and Downstream Surface Water Hydrology

The Bord na Móna bogs have been regulated by the EPA under IPC Licences Registration No's. 500 – 507 since early 2000. No additional mitigation measures, other than compliance with the control measures regulated by the EPA, are considered necessary in terms of protecting groundwater quality. The list below outlines control measures conditioned under the IPC licencing regime, as regulated by the EPA:

- Effective spill/leak management of mobile fuelling units.
- Replacement (and remediation where necessary) of all underground fuel tanks.
- There shall be no other emissions to water of environmental significance.
- All tank and drum storage areas shall be rendered impervious to the materials stored therein. In addition, tank and drum storage areas shall, as a minimum be bunded.
- Drainage from bunded areas shall be diverted for collection and safe disposal.
- The integrity and water tightness of all the bunding structures and their resistance to penetration by water or other materials stored therein shall be tested and demonstrated by the licensee to the satisfaction of the Agency and shall be reported to the Agency within eighteen months from the date of grant of this licence and every two years thereafter.
- 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.
- With the exception of roof water, all surface water discharges from workshop areas shall, be fitted with oil interceptors.
- An inspection for leaks on all flanges and valves on over-ground pipes used to transport materials other than water shall be carried out weekly.

- The licensee (Bord na Móna) shall undertake a programme of testing and inspection of underground fuel pipelines to ensure that all underground fuel lines are tested at least every three years.
- The licensee shall have in storage an adequate supply of containment booms and/or suitable absorbent material to contain and absorb any spillage.

In terms of groundwater quantity and hydrology (surface water runoff), or volumetric flows to surface water impacted by groundwater drainage of the bogs, mitigation measures that were in place included:

- Field drains with low gradients.
- Silt ponds, as well as being a control measure for sediment from the bogs, also acted as attenuation measures for higher flows during peak rainfall events. Each metre length of silt pond provides approximately 12m^3 of water storage, which aided in slowing down the discharge from the bog units.
- Silt ponds were cleaned at least twice a year to maintain adequate storage and treatment (sedimentation/settlement) capacity.
- Pipelines and pump capacities at pumping stations were designed based on a runoff rate of 1.7 l/s/Ha, which is equivalent the greenfield runoff rates.

14.5.3 Designated Sites

No significant impact on SACs/SPAs local to or downstream of the 41 bog units were identified within the assessment of impacts on designated sites (Section 14.4.3). The only identified impacts related to minor alterations of surface water flow patterns from the bog units to surface water bodies, which ultimately discharge/connect to downstream SACs/SPAs. Existing mitigation/control measures that were implemented under the IPC licences limited runoff rates from the bog units included:

- Pumping rates were limited to 1.7 l/s/Ha
- Silt ponds providing attenuation limited runoff during periods of intense rainfall.
- Continuous mitigation included maintaining the schedule of cleaning the silt ponds at a minimum of twice per year.

14.5.4 Contamination of Soil/Groundwater by Leakages and Spillages and Alteration of Peat/Subsoil/Bedrock Geochemistry

Measures that mitigated against contamination of peat, subsoil and bedrock are outlined above (Section 14.5.2) and presented again below. These measures/controls have been implemented as part of compliance with IPC licence conditions across the 41 bog units and associated production centres and workshops:

- Effective spill/leak management of mobile fuelling units.
- Replacement (and remediation where necessary) of all underground fuel tanks.
- There shall be no other emissions to water of environmental significance.
- All tank and drum storage areas shall be rendered impervious to the materials stored therein. In addition, tank and drum storage areas shall, as a minimum be bunded.
- Drainage from bunded areas shall be diverted for collection and safe disposal.

- The integrity and water tightness of all the bunding structures and their resistance to penetration by water or other materials stored therein shall be tested and demonstrated by the licensee to the satisfaction of the Agency and shall be reported to the Agency within eighteen months from the date of grant of this licence and every two years thereafter.
- 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.
- With the exception of roof water, all surface water discharges from workshop areas shall, be fitted with oil interceptors.
- An inspection for leaks on all flanges and valves on over-ground pipes used to transport materials other than water shall be carried out weekly.
- Inspections and monitoring of wastewater systems and associated discharges.

14.5.5 Peat Instability and Failure

Historically, the only recorded landslides related to peat instability on raised bogs have occurred during the initial stages of bog drainage, generally during the 1950's. All bogs have active and extensive drainage systems. The residual peat depths remaining on many of the 41 bogs are shallow, and slopes are small, so the risk of large-scale peat failure on the 41 bogs is negligible. Mitigation/control and management measures that have been implemented relating to peat stability include:

- All drainage works were completed by experienced and competent operatives;
- All works were designed and overseen by experienced and qualified Bord na Móna personnel; and,
- The drainage systems around the 41 bog units were maintained and managed by Bord na Móna.

14.5.6 Nearby Groundwater/Surface water abstractions

Potential impacts on GWS/PWS have been assessed based on a reasonable radius of approximately 4 km from each bog unit. No impacts were identified for the majority of these water supplies, as they are generally upgradient of the bogs and no pathways could be identified. Minor pathways may exist for sources such as the Ferbane/Gallen WSS, located 0.6 km from Noggusboy. The mitigation measures that have protected these water sources are the same as those outlined in Sections 14.5.2 and 14.5.4, relating to spills/leakages on the bog units, ancillary activities and at end user sites. The implementation of these measures has protected groundwater quality and eliminated any impacts on water quality in the underlying aquifer and at downstream water supply source locations.

14.5.7 Local groundwater wells/supplies

The mitigation measures that have protected these local groundwater wells/supplies are the same as those outlined in Section 14.5.2 and 14.5.4, relating to spills/leakages on the bog units. The implementation of those measures has protected groundwater quality and eliminated any impacts on water quality in the underlying aquifer and at downstream local groundwater wells/supplies.

14.5.8 County Geological Sites

No mitigation measures were necessary as all CGS have been avoided by all peat extraction and associated ancillary activities.

14.6 Residual Impacts

The following Residual Impacts are presented. These are a summary of remedial impacts assessed in Section 0.

Impact Type	Residual Impacts
Land and land-use	Negative, slight, direct, likely, high probability medium term impact on land by progression removal of peat during each year of production
Drainage on Bog Hydrogeology and Downstream Surface Water Hydrology	Peat Bog Hydrogeology: Negative, imperceptible, direct, impact on bog hydrogeology. Local Hydrogeology: Negative, imperceptible, indirect, impact on underlying local hydrogeology. Surface Water Hydrology: Negative, imperceptible, indirect, impact on surface water flows (quantity).
Designated Sites	No impact: Fin Lough SAC, All Saints Bog and Esker SAC, All Saints Bog SPA, Raheenmore Bog SAC, River Barrow and River Nore SAC, River Nore SPA, Mount Hevey Bog SAC, The Long Derries, Edenderry SAC, Garriskil Bog SAC/SPA, North Dublin Bay SAC, Ballynafagh SAC, Mongan Bog SAC/SPA, and Glen Lough SPA. Negative, imperceptible, indirect, unlikely, short term, impact on the hydrology of SAC/SPA: River Shannon Callows SAC, Middle Shannon Callows SPA, Charleville Wood SAC, Mouds Bog SAC, River Boyne and River Blackwater SAC, River Boyne and River Blackwater SPA, Lough Derravaragh SPA, Lough Iron SPA, and Lough Ree SAC/SPA.
Soil/Groundwater by Leakages and Spillages and Alteration of Peat/Subsoil/Bedrock Geochemistry	Negative, imperceptible, indirect, short term, unlikely impact to local geology and groundwater quality.
Peat Instability and Failure	No Impact.
Nearby Groundwater/Surface water abstractions	Negative, indirect, imperceptible, short term, unlikely impact to hydrology (surface water flows) and groundwater flows.
Local groundwater wells/supplies	Negative, imperceptible, indirect, unlikely, short term impact on local groundwater quality/quantity
County Geological Sites	No impact, due to separation distances, and no new production areas.

15 Cultural Heritage

15.1 Introduction

This chapter of the rEIAR assesses the cultural heritage impacts of historic peat extraction activity in the identified bog units. Cultural Heritage is defined by UNESCO as *"the legacy of physical artefacts and intangible attributes of a group or society that are inherited from past generations, maintained in the present and bestowed for the benefit of future generations"*.[23]

In terms of the present project, Cultural Heritage, which would normally include all humanly created features on the landscape which might reflect the prehistoric, historic, architectural and engineering history of the area, has, due to the limited geographical areas of historic peat extraction, being confined to the sphere of archaeology within the bog units themselves.

Accordingly, the Cultural Heritage assessed in this Chapter relates mainly to the archaeological cultural heritage of the bogs and the historic impact on the archaeological heritage value of the peat extraction areas and immediate environs, together with ancillary aspects of the peat extraction activities in the past has been assessed.

15.2 Methodology

Irish Archaeological Consultancy Ltd. has carried out desk-based surveys of Bord na Móna bogs, including the 41 bogs that are the subject of this assessment. Copies of these assessments are provided in Appendix 15. The assessments involved a detailed study of the archaeological and historical background of each site and the surrounding area including information from the Record of Monuments and Places, the topographical files within the National Museum and available cartographic and documentary sources for the areas.

The Irish Archaeological Consultancy Ltd. report is in several volumes covering the six counties within which the 41 bogs are located. The reports comprised a paper survey of all available archaeological, historical and cartographic sources as follows:

- Record of Monuments and Places for Counties Meath, Westmeath, Offaly, Laois, Longford and Kildare;
- Sites and Monuments Record for Counties Meath, Westmeath, Offaly, Laois, Longford and Kildare;
- National Monuments in State Care Database;
- Preservation Orders List;
- Cartographic and written sources relating to the study area;
- Meath County Development Plan 2013–2019 (extended);
- Westmeath County Development Plan 2014–2020;
- Offaly County Development Plan 2014–2020;
- Laois County Development Plan 2017-2023;
- Longford County Development Plan 2015-2021;
- Kildare County Development Plan 2017-2023;

[23] www.unesco.org/new/en/cairo/culture/tangible-cultural-heritage

- Aerial photographs;
- Excavations Bulletin (1970−2018); and
- National Inventory of Architectural Heritage.

15.3 Receiving Environment

Table 15.1 presents a summary of the Archaeological finds associated with the 41 bogs and their immediate environs.

Appendix 15 *Cultural Heritage*, presents the reports prepared by Irish Archaeological Consultancy Ltd. which provide further detail on the cultural heritage associated with the 41 bogs that are the subject of this rEIAR.

Table 15.1: Archaeological Finds

Ref	Bog	Bog Group	Archaeological Finds
1	Bellair Nth	Boora	While the nine previously recorded sites within Bellair North Bog were relatively fragmentary, they indicate archaeological activity and human presence in the immediate area.
2	Lemanaghan	Boora	The numerous archaeological sites and stray finds from the Lemanaghan Bogs, which date from the Neolithic to the late medieval period, show continuous archaeological activity in the area.
3	Noggusboy	Boora	While no archaeological sites were recorded during a survey in 1993, there are stray finds from the general area and archaeological sites in the vicinity.
4	Boora	Boora	While Boora Bog now includes cutaway and the site of the Lough Boora Parklands, this area contains the earliest early Mesolithic site in the Midlands (OF023-005). Two prehistoric sites were also recorded in 1998 in the eastern extent of the bog (OF023-025 and OF023-026) and there are numerous stray finds from the area.
5	Galros	Boora	Four sites were identified in Galros bog during the first round of archaeological survey in 1997 (OF030-080 to OF030-083). While these sites were no longer extant by the time of the re-assessment survey in 2009 a further two brushwood structures were recorded. There are also four stray finds recorded in the Topographical Files of the National Museum from the bog and its immediate area.
6	Killaun	Boora	While no sites were recorded in the most recent survey of Killaun Bog the 30 previously identified sites in the eastern extent of the bog confirm archaeological activity in the area.
7	Derrinboy	Boora	The recent archaeological survey of Derrinboy Bog identified two small brushwood structures. The late Bronze Age gold hoard discovered in 1959 is a significant find.
8	Derryclure	Boora	Derryclure Bog has not been systematically archaeologically surveyed to date.

Ref	Bog	Bog Group	Archaeological Finds
9	Monettia	Boora	There are two previously recorded and excavated sites (OF025-022 and OF025-023) and a stray find of a leather shoe from Derryguinnigan townland.
10	Killaranny	Boora	While no archaeological finds were recorded during the most recent survey in 2009 the previously recorded sites from Derrinvullig and Roscore Demesne townlands demonstrate human activity in the area.
11	Bracklin	Derrygreenagh	While no archaeological monuments were recorded during the 2005 Peatland Survey, stray finds from the area and monuments in the dryland surrounding the bog have been recorded.
12	Carranstown	Derrygreenagh	No archaeological finds were recorded during the 2005 Peatland Survey.
13	Ballivor	Derrygreenagh	While no archaeological finds were recorded during the 2005 Peatland Survey human remains (‘Clonycavan Man’) was discovered in 2003 along with recorded stray finds from the area and the recorded monuments in the dryland surrounding the bog
14	Kinnegad (Rossan)	Derrygreenagh	Partial human remains were discovered in early 2013 in Knockersally townland along with sites previously identified during the 2005 & 2013 Peatland Surveys in the southern extent of Rossan Bog.
15	Ballybeg	Derrygreenagh	The 105 sites and 25 artefacts recorded during the course of the 2001 Peatland Survey in Ballybeg bog combined with the numerous monuments in the surrounding dryland, particularly those centred around Croghan Hill demonstrate that Ballybeg Bog was a focus of concentrated archaeological activity in prehistory. Some of the sites and artefacts recorded within the bog are unusual in form and composition compared with other bogs in the vicinity.
16	Ballaghurt	Blackwater	While the most recent round of archaeological survey in Ballaghurt Bog, carried out in 2009, only identified a single structure and a find of a wooden vessel lid the previous survey identified 29 sites one of which was dated to the middle Bronze Age.
17	Daingean (Derries)	Allen	While no sites were identified in Daingean North (Derries) during either the 2001 or 2013 Peatland Surveys Daingean South has demonstrated a high potential for archaeological sites and finds. There are also a large number of recorded monuments in the surrounding dryland .
18	Daingean Rathdrum	Allen	The 2001 and 2013 Peatland Surveys and subsequent excavations in 2005 and 2014 have demonstrated a high potential for archaeological sites and finds in Daingean South Bog. There are also a large number of recorded monuments in the surrounding dryland.
19	Clonad	Allen	The number of sites in Clonad Bog has significantly reduced in the 12 years between the initial IAWU survey and the more recent ADS re-assessment survey.

Ref	Bog	Bog Group	Archaeological Finds
20	Ballykean	Allen	When combined, the Site and Monuments Record, Topographical File information, Peatland Survey results and subsequent ADS excavations display a continuous archaeological presence in the area of Ballykean Bog from the prehistoric to late medieval and modern times. Forty-three sites were identified during the Peatland Survey, including a thus far unique habitation site and the recovery of stray finds including gold `Y' shaped objects and a carved wooden anthropormorphic figurine similar to those recovered from Cloncreen Bog
21	Esker	Allen	A single archaeological site was discovered during the Peatland Survey 1.03m below the field surface and there are several finds recorded in the Topographical Files of the National Museum.
22	Garrymore	Allen	Garrymore Bog was systematically surveyed in 2004 at which time no archaeological sites were recorded. While there are no records of stray finds from the area the presence of 'dryland' monuments in the vicinity demonstrates the presence of human activity in the immediate hinterland.
23	Derrylea	Allen	Derrylea Bog was systematically surveyed in 2004 at which time no archaeological sites were recorded. While the stray finds from the area don't have a definite find spot within the bog their presence, when combined with the number of dryland monuments in the vicinity, demonstrates the presence of human activity in the immediate hinterland.
24	Ticknevin	Allen	Five sites were recorded in Ticknevin bog during the course of the 2004 Peatland Survey. An enclosure site (OF012-009) was recorded nearby, in addition to a stray find of the wooden beetle from the vicinity.
25	Glashabaun Sth	Allen	No sites were recorded in Glashabaun South bog during the 2004 Peatland Survey and there are RMP sites in immediate proximity to Glashabaun South. The exact location of the stray finds recorded in the Topographical Files of the National Museum from Ticknevin townland (which also extends into Derrybrennan Bog to the east) is unknown.
26	Glashabaun Nth	Allen	Sites were recorded during the course of the 2004 Peatland Survey in addition to a stray find of a wooden beetle and RMP sites in the environs of Glashabaun bog.
27	Codd Nth (Codd 2)	Allen	Two sites were recorded during the 2004 Peatland Survey and three sites are recorded in the RMP in the area surrounding this bog.
28	Codd Sth (codd 1)	Allen	Two archaeological sites were recorded during the course of the 2004 Peatland Survey along with the RMP site to the west (OF020-006).
29	Ballydermot North	Allen	There are no records of stray finds from Ballydermot North Bog and there are no monuments in the immediate vicinity.

Ref	Bog	Bog Group	Archaeological Finds
			The 36 sites recorded during the course of the Peatland Survey mainly consisted of single pieces of worked wood and dated from the late medieval to possibly more recent dates.
30	Ballydermot South	Allen	There are no records of stray finds from Ballydermot South bog and there are no monuments in the immediate vicinity. The seven sites recorded during the course of the Peatland Survey mainly consisted of single pieces of ex situ worked wood that were not dated but believed to be relatively modern in origin.
31	Blackriver	Allen	Sites recorded during the 2004 Peatland Survey were believed by the survey team to be modern in origin. Stray finds have been recorded from Killyguire townland and several sites have been recorded in the nearby dryland
32	Barnaran	Allen	Previously recorded and partially mitigated trackway sites (KD012014, KD012- 014001 and KD012-014002) in Lullymore East townland, trackway (KD012-007) in private turbary along the southeastern extent, nearby RMP sites on Lullymore island and two dryland islands of Lullymore and Lullybeg either side of theis bog.
33	Lodge	Allen	Sites recorded during the course of the 2004 Peatland Survey. Stray finds from Lullymore East townland. RMP sites in the environs of Lodge bog.
34	Cuil na Gun	Mountdillon	No archaeological features were recorded in Coolnagun Bog during the 2007 Peatland Survey; however, the stray finds recorded, along with the Road-Class 1 Togher from Coolnagun (WM002-032) and Corralanna (WM002-042).
35	Milkernagh	Mountdillon	No archaeological features were recorded in Milkernagh Bog during the 2007 Peatland Survey. However, there is a recorded lithic scatter (WM002-035) located just beyond the limit of Bord na Mona production fields.
36	Coolcraff	Mountdillon	No archaeological features recorded in Coolcraff Bog during the 2016 Peatland Survey. No production had taken place at that time as the bog was in the early stages of preparatory groundworks. While the drains were clean and visually inspected the recorded peat profiles suggested that the upper surfaces consisted mainly of redeposited sphagnum peat and it was recommended by the author that the bog be re-assessed following a number of production seasons (Whitaker 2016).
37	Gilltown	Kilberry	Two sites recorded in 2005 and partially excavated in 2007 were both traced for over 100m and both had sightings that were very deep in the peat in places and may continue below the current depth of the drains. They may also continue into uncut bog to the east.
38	Allen	Kilberry	The area possessed archaeological potential due to the presence of the bog itself.

Ref	Bog	Bog Group	Archaeological Finds
39	Prosperous	Kilberry	Two sites were recorded in the 2005 Peatland Survey in Prosperous Bog dating to the Bronze Age and early medieval periods. While there were no stray finds from within the bog a polished stone axe-head was recovered from a nearby ploughed field in the townland of Ballynafagh.
40	Kilberry	Kilberry	While no archaeological sites were recorded during the 2005 Survey the enclosure site (KD031-013) on the dryland island of Derryvullagh in the centre of the bog and the monuments in the dryland vicinity clearly demonstrate human activity in the area.
41	Cuil na Carton	Cuil na Mona	Two sites were recorded in the 2005 Peatland Survey in Coolnacartan Bog one of which was later discounted as the date returned was modern. Several finds are noted in the topographical files of the National Museum of Ireland from Clonaddoran townland which spans Coolnacartan and Cashel bogs.

15.4 Remedial Impact Assessment

Bog landscape features were often utilised throughout all periods of history and the anaerobic conditions preserve organic matter, such as wood and leather, which does not often survive in more usual terrestrial archaeological conditions.

Objects can be preserved in peatlands because of the acidity of peat and the anaerobic environment which exists within peatland deposits.

Without the implementation of mitigation measures it is likely that the drainage, shrinkage, compression and the extraction of peat would have had permanent and profound adverse cultural heritage impacts.

Given the location of these bogs and the limited geographical areas of historic peat extraction, it is not likely that there have been significant cumulative cultural heritage impacts.

15.5 Mitigation and Monitoring

Bord na Móna has a statutory duty under the Turf Development Act 1998 (section 56) to afford appropriate protection for the environment and archaeological heritage. Bord na Móna's peat extraction operations and impact on archaeology is also governed under the 2012 Code of Practice agreed between the Department of Arts, Heritage and the Gaeltacht, the National Museum of Ireland and Bord na Móna. The code includes a commitment by Bord na Móna to finance a balanced and cost-effective approach to archaeological investigation, excavation, post excavation and mitigation and details the procedure to be followed if a suspected object is discovered. The Code of Practice has been implemented on all bogs operated by Bord na Móna and its contents are integrated into staff induction training. Prior to 2012 Agreed Principles for the Protection of Wetland Archaeology in Bord na Móna bogs were in place before they were updated and codified into the current Code of Practice.

15.6 Residual Impacts

Compliance with the statutory duties prescribed under the Turf Development Act 1998 (section 56) and the implementation of the 2012 Code of Practice affords protection to the cultural heritage associated with peatlands/bogs where peat extraction activities have been carried out by Bord na Móna. However, given that the bogs have been drained since the 1940s and peat production has taken place on all of the bogs prior to the implementation of the Code of Practice it is likely that permanent and profound adverse cultural heritage impacts have occurred.

16 Landscape and Visual

16.1 Introduction

This chapter of the rEIAR assesses retrospective landscape and visual impacts associated with Bord na Móna's peat extraction, and ancillary, activities at the 41 bog units, located across six local authority functional areas. Descriptions of the bog units and their locations are provided in Chapter 5 of this rEIAR.

16.2 Methodology

A desktop review of the relevant, county development plans which are available online for each functional area has been undertaken, with particular reference to landscape characters and context and protected viewpoints. This chapter has also considered land-use change further to a review of aerial imagery (from 1995) and mapping, such as GeoHive and Corine map data.

The following documents were reviewed to inform this assessment;

- Kildare County Development Plan 1999;
- Kildare County Development Plan 2005-2011;
- Kildare County Development Plan 2011-2017;
- Kildare County Development Plan 2017-2023.
- Offaly County Development Plan 2014-2020.
- Meath County Development Plan 2007-2013;
- Meath County Development Plan 2013-2019.
- Westmeath County Development Plan 2008-2014;
- Westmeath County Development Plan 2014-2020.
- Laois County Development Plan 2011-2017;
- Laois County Development Plan 2017-2023.
- Longford County Development Plan 2009-2015; and
- Longford County Development Plan 2015 -2021.

16.3 Receiving Environment

The bogs themselves can be characterised as evenly exposed surfaces of peat. The surrounding areas can, in general, be characterised as agricultural with small areas of forestry, rural settlements and farm buildings.

16.3.1 Land-use Change

A review of land-use change associated with the 41 bogs was carried out to inform this rEIAR and is presented in Table 16.2.

Table 16.1: Land-Use Change, Surrounding Land-Use, and Functional Area

Ref	Bog	Bog group	Functional Area	First Production (Year)	Changes observed through Aerial Photography of bog units (1995 – 2019)	Surrounding Land-use
1	Bellair Nth	Boora	Offaly and Westmeath	1976	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings, railway to south
2	Lemanaghan	Boora	Offaly	1955	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings, national road N62 to west
3	Noggusboy	Boora	Offaly	1955	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings
4	Boora	Boora	Offaly	1959	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings, 2 quarries to east and one ca. 0.7km to south of bog
5	Galros	Boora	Offaly	1988	No obvious changes from 1995 – 2019 Mineral soil/light coloured peat observed within aerial photographs. No aerial photography 1985 – 1995.	Agriculture, small areas of forestry, rural settlements and farm buildings
6	Killaun	Boora	Offaly	2003	Some additional drainage channels between 1995 – 2005 aerial photos, but no major alteration.	Agriculture, small areas of forestry, rural settlements and farm buildings, and quarry to the north of the bog
7	Derrinboy	Boora	Offaly	2003	No significant changes between aerial photos.	Agriculture, small areas of forestry, rural settlements and farm buildings, and a quarry along western edge of bog
8	Derryclure	Boora	Offaly	1992	More drainage channels apparent from 1995 – 2000, particularly towards southwest of bog. Central and marginal uncut sections have become more afforested over time from 1995 – 2019.	Agriculture, small areas of forestry, rural settlements and farm buildings
9	Monettia	Boora	Offaly and Laois	1982	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings
10	Killaranny	Boora	Offaly	1989	Aerial photos show progressive afforestation around bog from 1995 – 2019. No major changes in other land-use. Little change in bog drainage.	Agriculture, small areas of forestry, rural settlements and farm buildings, and quarry to east of bog

Ref	Bog	Bog group	Functional Area	First Production (Year)	Changes observed through Aerial Photography of bog units (1995 – 2019)	Surrounding Land-use
11	Bracklin	Derrygreenagh	Westmeath	1985	Drainage channels appear to have become overgrown with vegetation 1995 - 2019. Significant growth of forestry around bog perimeter through same period.	Agriculture, small areas of forestry, rural settlements and farm buildings
12	Carranstown	Derrygreenagh	Meath and Westmeath	1985	Drainage channels appear to have become overgrown with vegetation 1995 - 2019. Significant growth of forestry around bog perimeter through same period.	Agriculture, small areas of forestry, rural settlements and farm buildings
13	Ballivor	Derrygreenagh	Meath and Westmeath	1953	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings
14	Kinnegad	Derrygreenagh	Meath	1982	No Change	Agriculture, small areas of forestry to south, rural settlements and farm buildings, quarry to west, and motorway to north of the bog
15	Ballybeg	Derrygreenagh	Offaly	1955	No Change	Agriculture, small areas of forestry around bog, rural settlements and farm buildings, high bog to northeast of the bog
16	Ballaghurt	Blackwater	Offaly	1980/ 1995	No major changes 1995 -2019	Agriculture, small areas of forestry, rural settlements and farm buildings, sand and gravel pit to west of the bog.
17	Daingean (Derries)	Allen	Offaly and Westmeath	1999	No major changes 1995 -2019	Agriculture, small areas of forestry, rural settlements and farm buildings
18	Daingean Rathdrum	Allen	Offaly	2000	No major changes 1995 -2019. Some minor vegetation and forestry growth around bog.	Agriculture, small areas of forestry, rural settlements and farm buildings
19	Clonad	Allen	Offaly	1962	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings, bog to east
20	Ballykeane	Allen	Offaly	1955	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings
21	Esker	Allen	Offaly	1965	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings, and a quarry ~1.4km to southeast of the bog

Ref	Bog	Bog group	Functional Area	First Production (Year)	Changes observed through Aerial Photography of bog units (1995 – 2019)	Surrounding Land-use
22	Garrymore	Allen	Laois	1999	No apparent change in drainage channels from 1995 – 2019. Some vegetation growth around bog perimeter during this time.	Agriculture, small areas of forestry, rural settlements and farm buildings, bog to east
23	Derrylea	Allen	Offaly and Kildare	1972	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings, quarry to west of the bog
24	Ticknevin	Allen	Offaly and Kildare	2000	Bog went from (initial) drained state into production, with increase in drainage density, and removal of all vegetation.	Agriculture, small areas of forestry, rural settlements and farm buildings
25	Glashabaun Sth	Allen	Offaly and Kildare	1950	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings
26	Glashabaun Nth	Allen	Offaly and Kildare	1950	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings, sand and gravel quarry to north of the bog
27	Codd Nth (Codd 2)	Allen	Offaly	1989	No major changes 1995 – 2019.More mineral soil can be seen over time.	Agriculture, small areas of forestry, rural settlements and farm buildings, and a quarry to northwest of the bog
28	Codd Sth (codd 1)	Allen	Offaly	1989	No major changes 1995 – 2019.More mineral soil can be seen over time.	Agriculture, small areas of forestry, rural settlements and farm buildings
29	Ballydermot North	Allen	Offaly and Kildare	1950	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings
30	Ballydermot South	Allen	Offaly and Kildare	1950	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings
31	Blackriver	Allen	Kildare	1950	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings
32	Barnaran	Allen	Kildare	1955	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings
33	Lodge	Allen	Kildare	1955	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings

Ref	Bog	Bog group	Functional Area	First Production (Year)	Changes observed through Aerial Photography of bog units (1995 – 2019)	Surrounding Land-use
34	Cuil na Gun	Mountdillon	Westmeath	1953	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings
35	Milkernagh	Mountdillon	Westmeath and Longford	1953	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings, and a quarry to east of the bog
36	Coolcraff	Mountdillon	Longford	1989	Significant increase in vegetation across the bog from 1995 – 2019. No obvious land use changes.	Agriculture, small areas of forestry, rural settlements and farm buildings, quarry to south of the bog
37	Gilltown	Kilberry	Kildare	1982	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings
38	Allen	Kilberry	Kildare	1972	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings, big quarry ca. 2.8km to west of the bog
39	Prosperous	Kilberry	Kildare	2003	Larger arterial drains spaced ~150m apart added after 2000. These drains run north south. Slight increase in vegetation from 1995 – 2019.	Agriculture, small areas of forestry, rural settlements and farm buildings
40	Kilberry	Kilberry	Kildare	1948	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings, and a quarry ~3.6km to north of the bog
41	Cuil na Carton	Cuil na Mona	Laois	1966	No Change	Agriculture, small areas of forestry, rural settlements and farm buildings

16.3.2 Landscape Character Areas, Scenic Routes and Viewpoints

This section presents a review of County Development Plans (CDP) by functional area as they relate to Landscape Character Areas (LCAs), scenic routes and viewpoints. Further detail is provided in Table 17.2 Landscape Character Areas, Scenic Routes and Viewpoints.

16.3.2.1 County Kildare

Kildare Development Plan 1999

There are no records available online before 1999 for the functional area of County Kildare apart from the Kildare Development Plan 1999. Associated mapping was not available online.

The CDP identified a number of viewpoints throughout the county and in terms of landscapes, the CDP identified three distinct character areas which included, the East Kildare uplands, the Plainlands of Kildare and the Chair and Newton Hills.

Kildare County Development Plan 2005-2011

The next available CDP was the Kildare County Development Plan 2005-2011.

In terms of landscape, the CDP identified a number of landscape character areas (LCA), including 'Western Boglands'.

The CDP also quantified the impact and sensitivity of these areas based on land use, including Bog /Peat extraction (extraction) as detailed in Figure 16.1

Figure 16.1: Likely Perception of Landscape Impacts - Perception of Landscape Visual/Landscape Impacts versus Sensitivity of Landscape Character Area- Kildare County Development Plan 2005-2011

Impact / Sensitivity	Perception Landscape Impact	Northern Lowlands	Western Boglands	North-Western Lowlands	Northern Hills	Chair of Kildare Lands	Southern Lowlands	Central Undulating	Transition Lands	Eastern Uplands	South-Eastern Uplands	Water Corrido
Landscape Sensitivity		10	14	11	17	20	12	14	16	20	18	18
Wind Farms	17	H / L	H / M	H / L	H / H	H / H	H / M	H / L	H / M	H / H	H / H	H
Bog/Peat Extraction	12	NA / L	L / M	L / L	NA / H	NA / H	L / L	L / M	L / M	NA / L	NA / L	L
Forestry	14-20	MH / L	MH / M	MH / L	MH / H	MH / H	MH / L	MH / M	MH / M	MH / H	MH / H	MH
Telecom. Structures	16	M / L	M / M	M / L	M / H	M / H	M / L	M / M	M / M	M / H	M / H	M
Extractive Industry	17	H / L	H / M	H / L	H / H	H / H	H / L	H / M	H / M	H / H	H / H	H
Roads	13	L / L	L / M	L / L	L / H	L / H	L / L	L / M	L / M	L / H	L / H	L
Rural Housing	10-14	LM / L	LM / M	LM / L	LM / H	LM / H	LM / L	LM / M	LM / M	LM / H	LM / H	LM

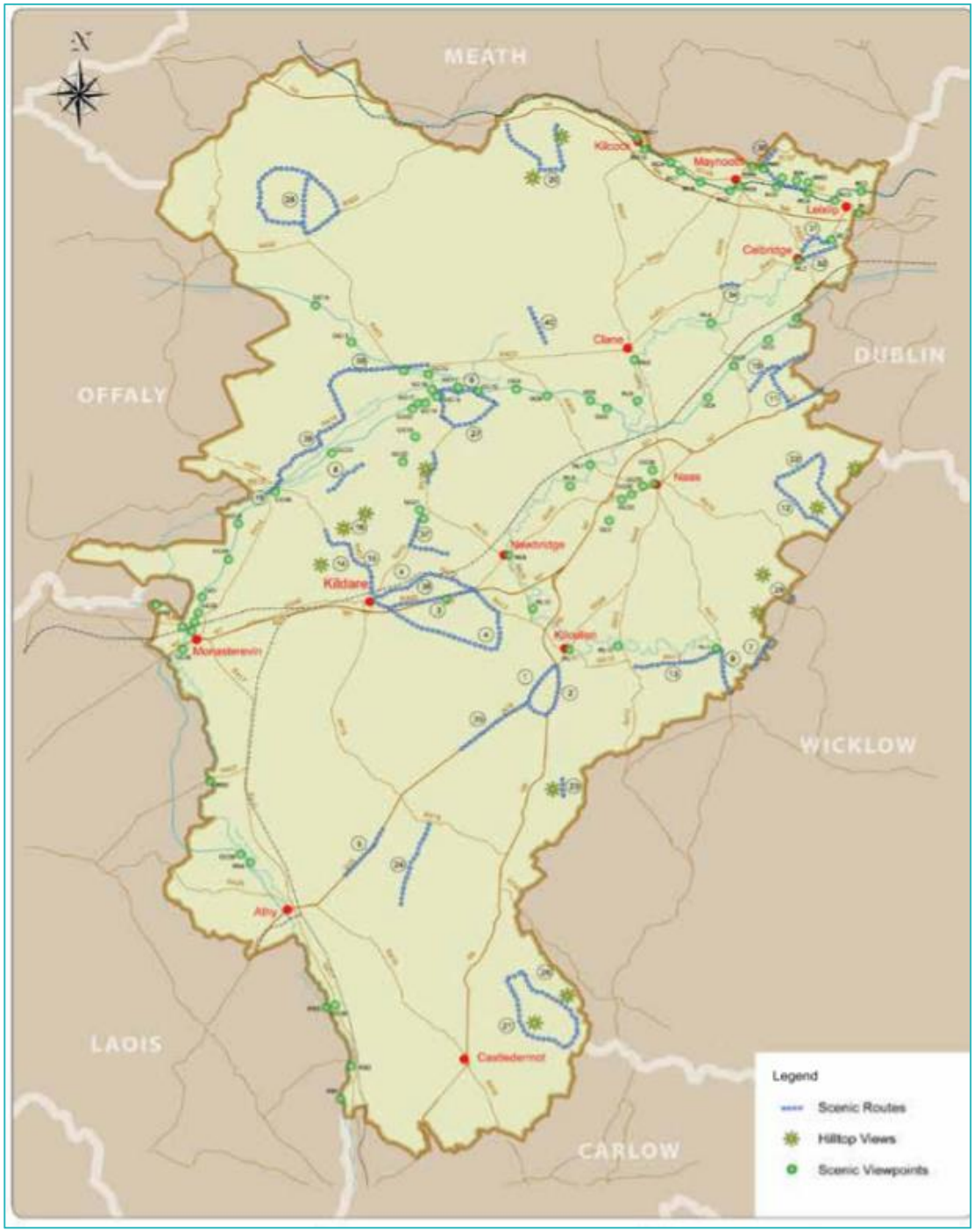
Kildare County Development Plan 2011-2017

The Kildare County Development Plan 2011 – 2017 built on the designations contained within the previous CDP, including the landscape character areas.

Kildare County Development Plan 2017-2023

The current Kildare County Development Plan 2017-2023 continues the designations of the historic development plans outlined above. The CDP identifies a number of protected viewpoints, these follow on from the previous development plans and are presented in Figure 16.2.

Figure 16.2: Viewpoints – Kildare County Development Plan 2017-2023



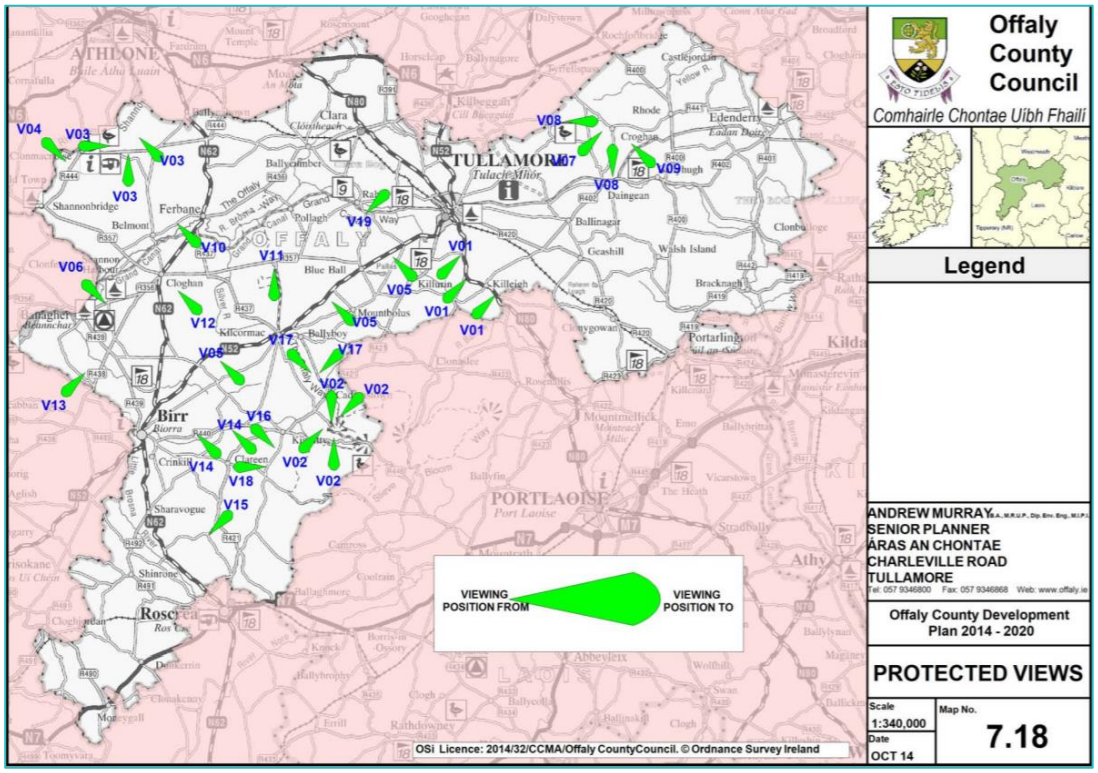
16.3.2.2 County Offaly

Offaly County Development Plan 2014-2020

There are no County Development Plans for Offaly available online prior to the Offaly County Development Plan 2014-2020.

In terms of visual amenity, Offaly County Development Plan 2014-2020 outlines a number of areas of high amenity and scenic amenity routes which formed the basis of protected views. These are presented in Figure 16.3

Figure 16.3: Protected Views – Offaly County Development Plan 2014-2020



16.3.2.3 County Meath

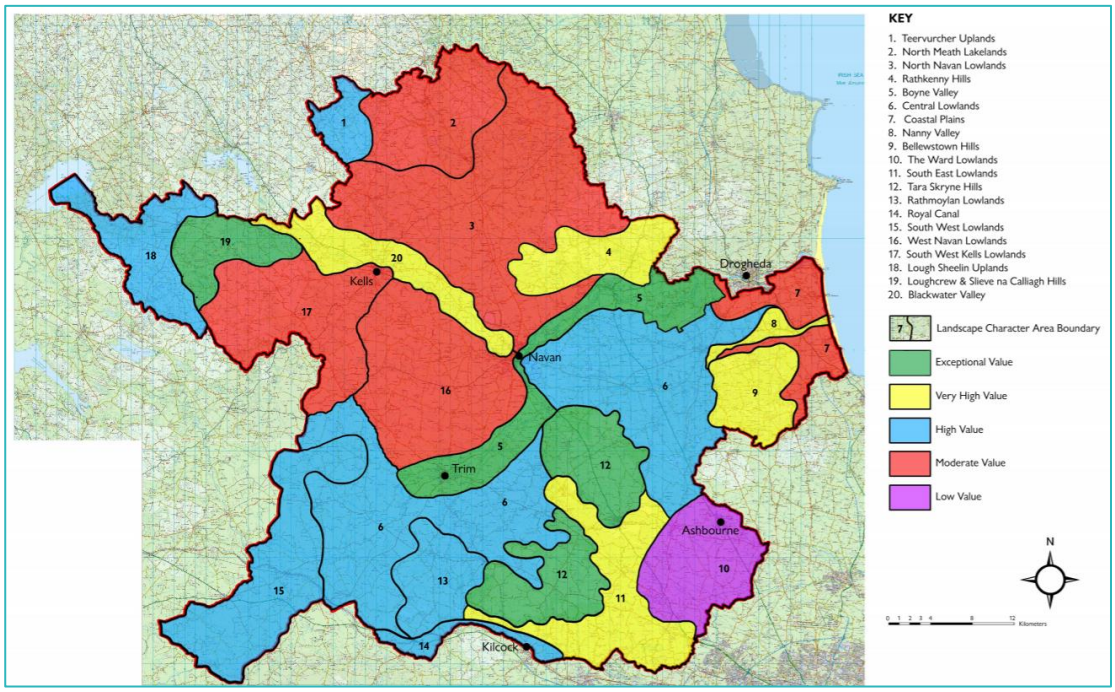
Meath County Development Plan 2007-2013

There are no County Development Plans for Meath available online prior to the Meath County Development Plan 2007-2013.

The landscape character assessment divided the county into four distinct landscape character types (LCT): These were then given a rating in terms of value, Importance and Sensitivity. A designation of value and sensitivity was then assigned to each of the landscape character areas, as presented in Figure 16.4 below.

- River Corridors and Estuaries
- Lowland Landscapes
- Hills and Uplands Areas; and
- Coastal Landscape.

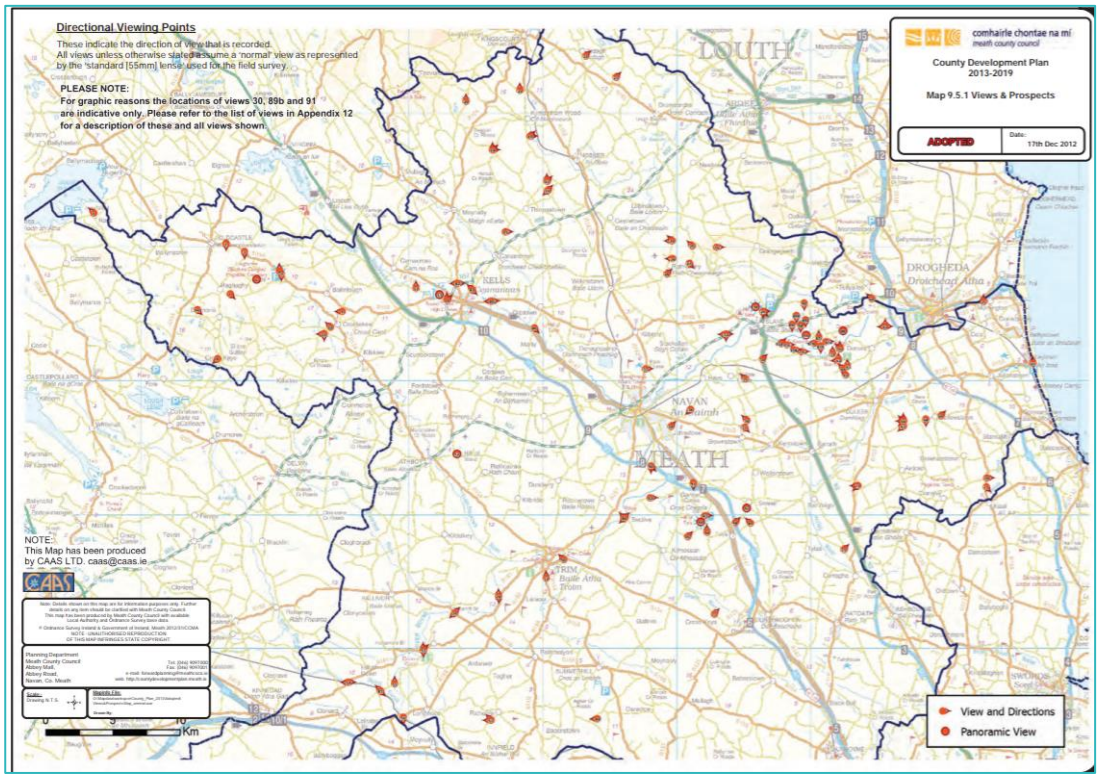
Figure 16.4: Landscape Character Values - Meath County Development Plan 2007 - 2013



Meath County Development Plan 2013-2019

The current Meath County Development Plan 2013-2019 continues the previous landscape designations set out above. The designations of landscape and viewpoints remain unchanged. Updated protected views are presented in Figure 16.5.

Figure 16.5: Viewpoints - Meath County Development Plan 2013-2019



16.3.2.4 County Westmeath

Westmeath County Development Plan 2008-2014

There are no County Development Plans for Westmeath available online prior to the Westmeath County Development Plan 2008-2014.

The Landscape Character Areas identified are presented in Figure 16.6. Designated viewpoints outlined in the CDP are presented in Figure 16.7.

Figure 16.6: Landscape Character Areas - Westmeath County Development Plan 2008-2014

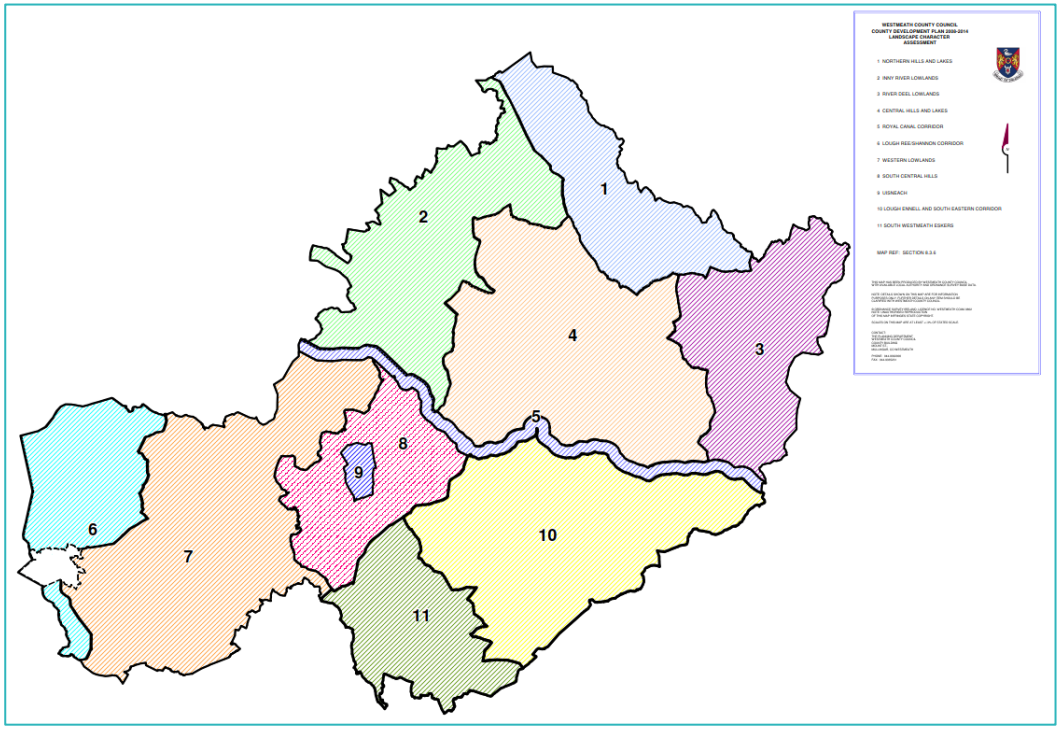
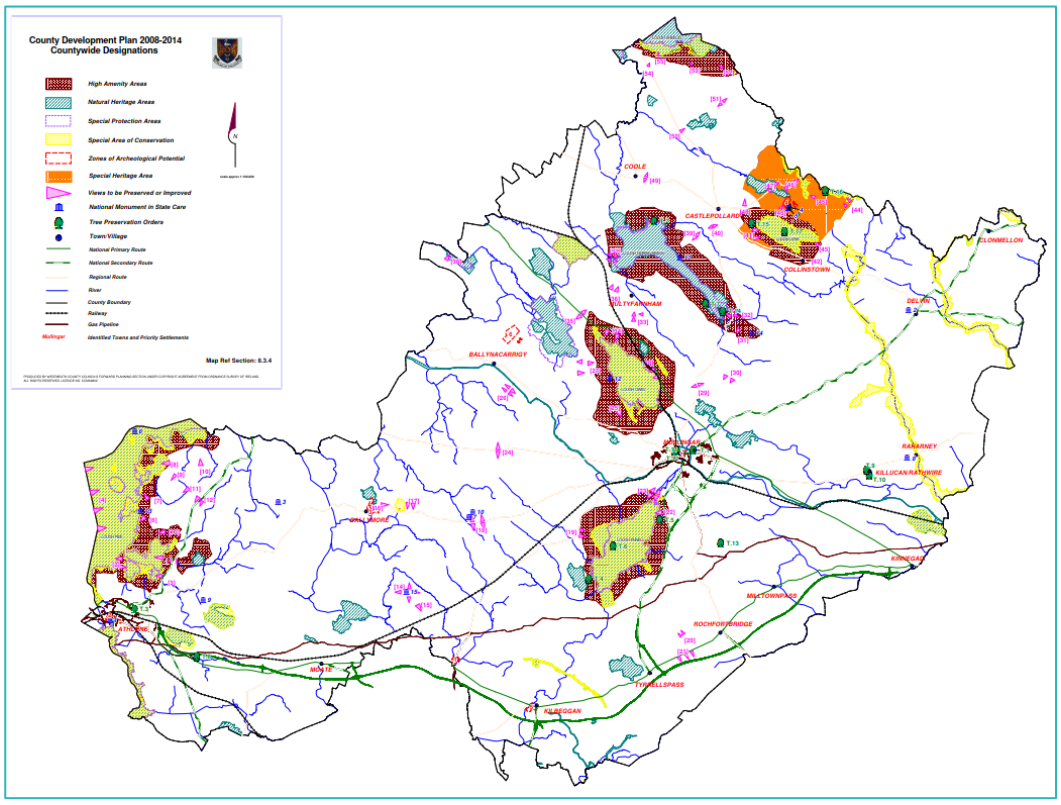


Figure 16.7: Designated viewpoints - Westmeath County Development Plan 2008-2014



Westmeath County Development Plan 2014-2020

The Westmeath County Development Plan 2014-2020 references the previous landscape character assessment with no new designations in terms of landscape character or viewpoints.

16.3.2.5 County Laois

Laois County Development Plan 2011-2017

There are no County Development Plans for County Laois available online prior to the Laois County Development Plan 2011-2017.

Landscape Character Areas are presented in Figure 16.8. Viewpoints outlined in the CDP are presented in Figure 16.9.

Figure 16.8: Landscape Character Areas - Laois County Development Plan 2011-2017

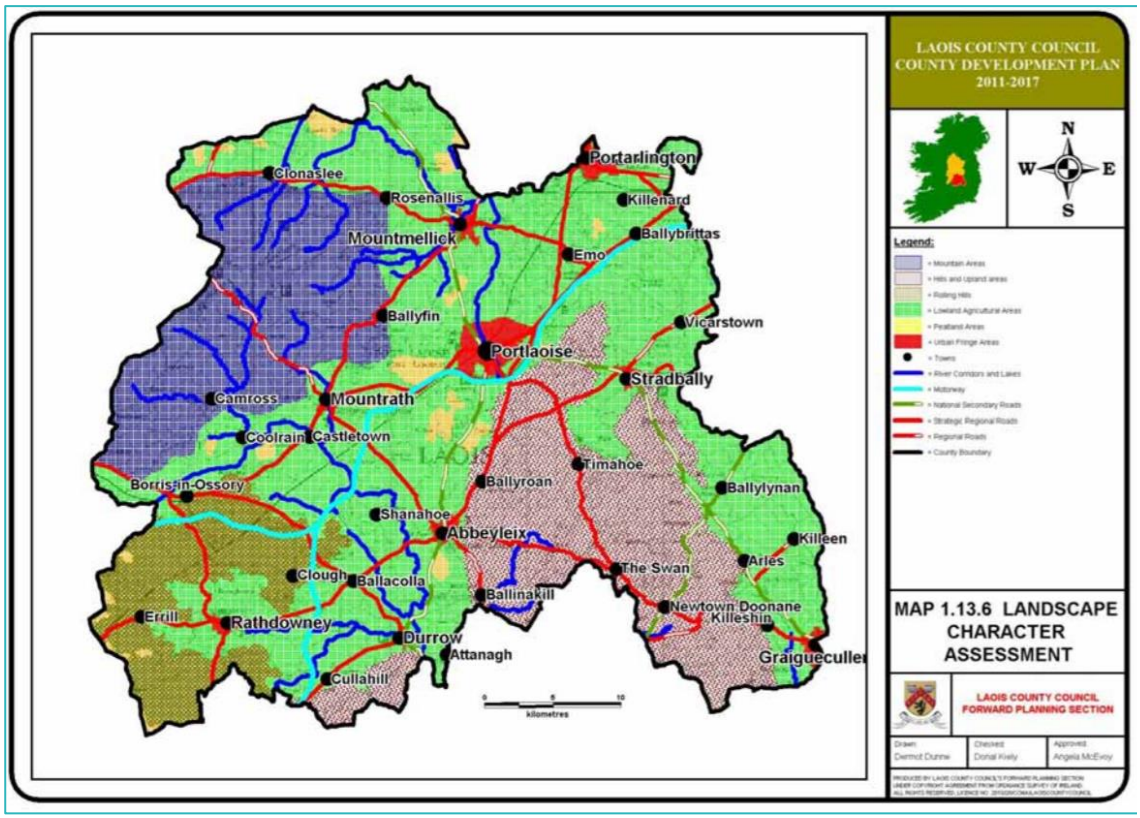
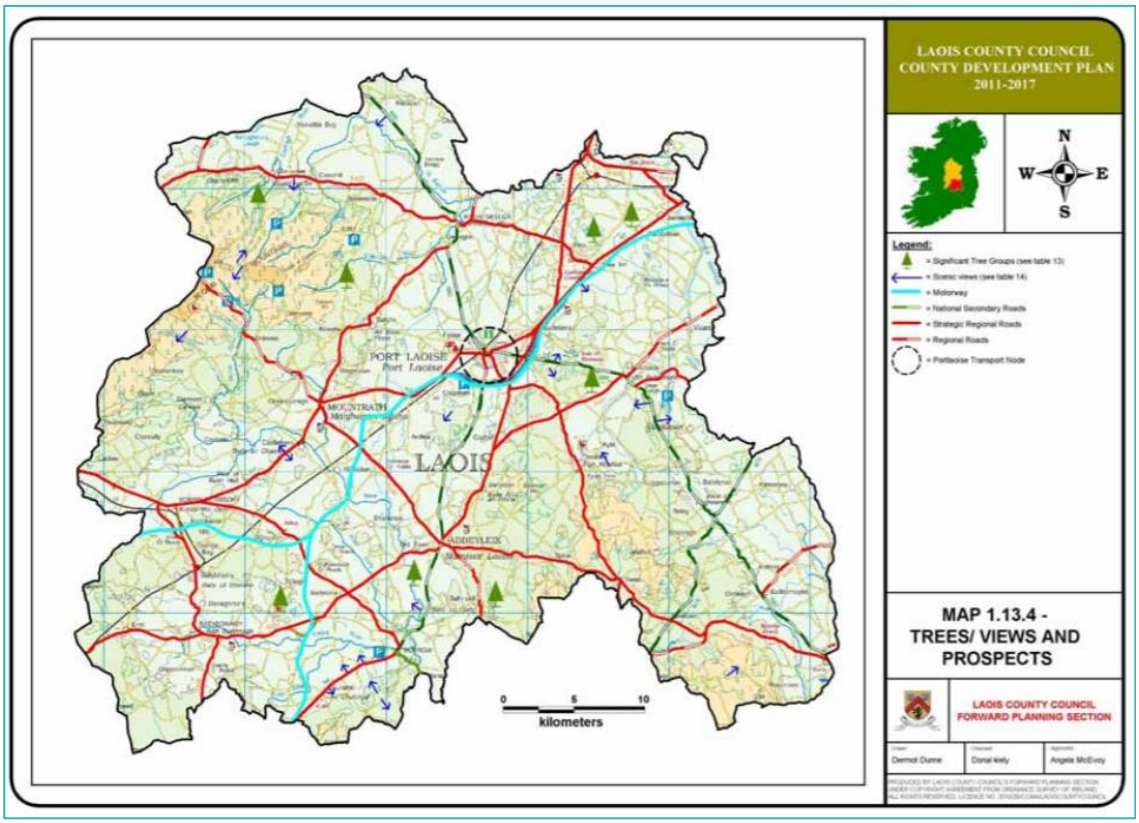


Figure 16.9: Landscape Character Areas - Laois County Development Plan 2011-2017



Laois County Development Plan 2017-2023

The current CDP, Laois County Development Plan 2017-2023, includes landscape character assessments and designated viewpoints which are a continuation of the previous landscape character assessment detailed above

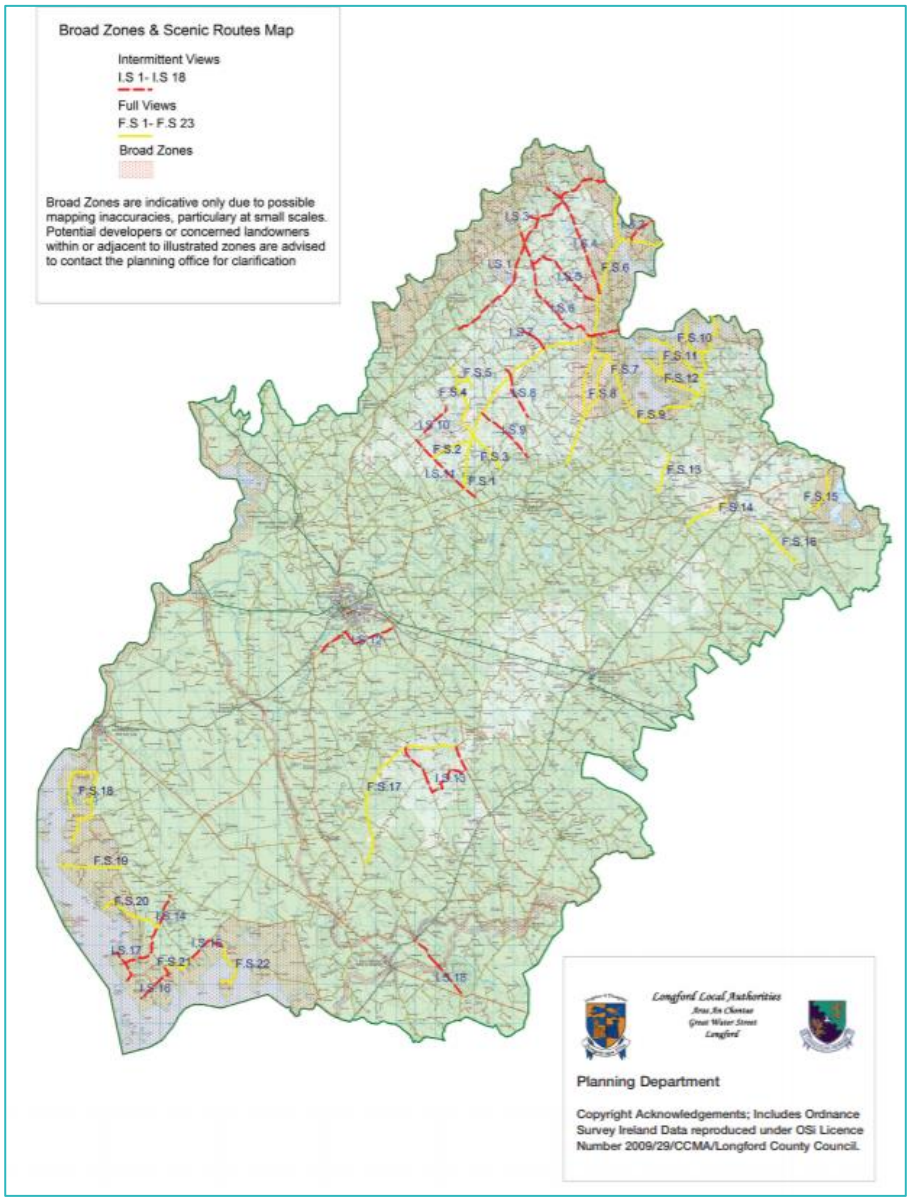
16.3.2.6 County Longford

Longford County Development 2009-2015

Longford County Development Plan 2009-2015 includes a landscape character assessment; however, the Annex section of the Longford 2009 Plan was not available to view online.

The CDP designates a number of viewpoints for protection, which are presented in Figure 16.10.

Figure 16.10: Viewpoints - Longford County Development Plan 2009 - 2015



Longford County Development Plan 2015-2021

The views identified within the previous Longford 2009 CDP are continued within the current Longford County Development Plan 2015-2021.

Landscape Character Areas are presented in Figure 16.11.

Figure 16.11: Landscape Character Areas - Longford County Development Plan 2015-2021

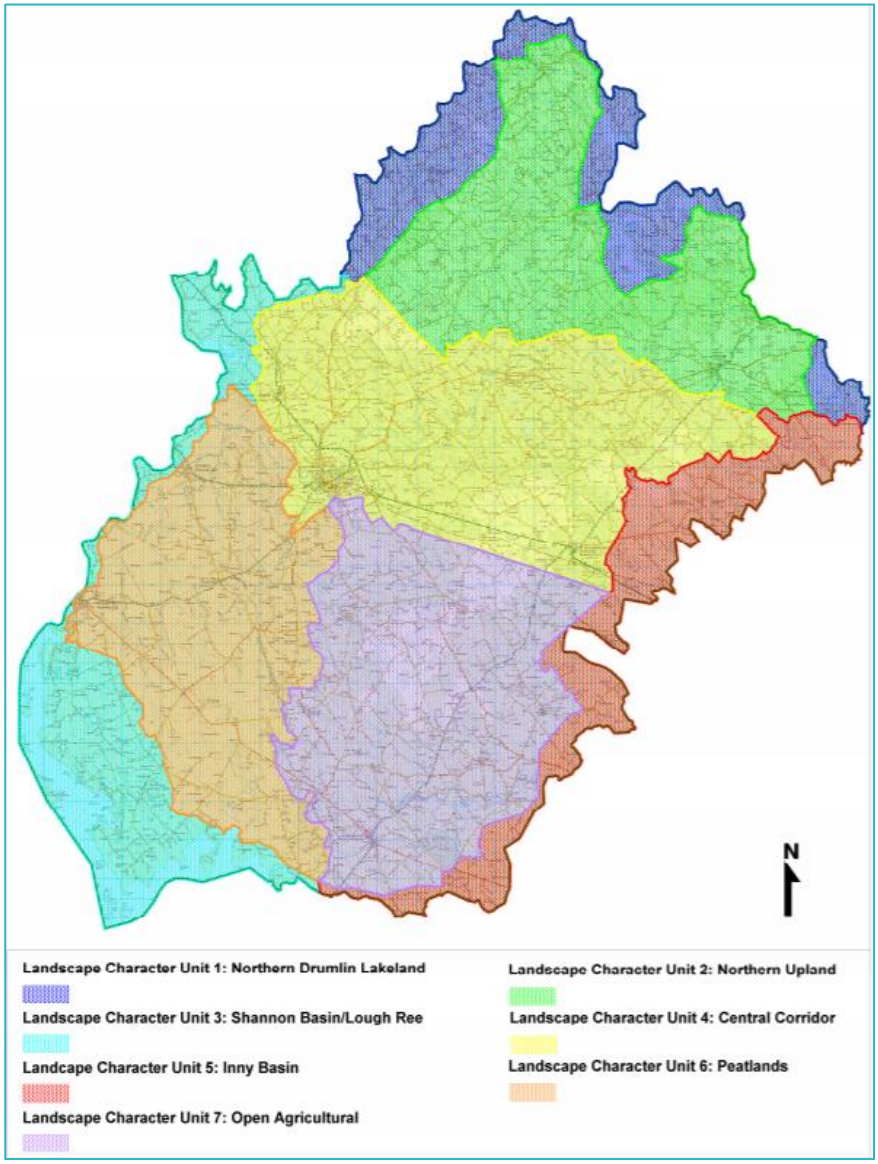


Table 16.2 overleaf presents an overview of the above referenced landscape characterisations, scenic routes and viewpoints as they relate to the 41 bogs.

Table 16.2: Landscape Characterisation, Scenic Routes and Viewpoints

Ref	Bog	Landscape Characterisation
1	Bellair Nth	The Bellair Nth Bog within County Offaly is designated as being of moderate landscape sensitivity, with no protected viewpoints within the area of the bog. In Westmeath, the bog is within the Western Lowlands landscape designation with no protected viewpoints within the area of the bog.
2	Lemanaghan	The Lemanaghan Bog is designated as being of moderate landscape sensitivity, with no protected viewpoints within the area of the bog.
3	Noggusboy	The Noggusboy Bog is designated as being of high landscape sensitivity, with a protected viewpoint within the area of the bog.
4	Boora	The Boora Bog is designated as being of high landscape sensitivity, with a protected viewpoint within the area of the bog.
5	Galros	The Galros Bog is designated as being of moderate sensitivity, with no protected viewpoints within the area of the bog.
6	Killaun	The Killaun Bog is designated as being of moderate landscape sensitivity, with no protected viewpoints within the area of the bog.
7	Derrinboy	The Derrinboy Bog is designated as being of moderate landscape sensitivity, with no protected viewpoints within the area of the bog.
8	Derryclure	The Derryclure Bog is designated as being of moderate landscape sensitivity, with no protected viewpoints within the area of the bog.
9	Monettia	The Monettia Bog within Offaly is designated as being of moderate landscape sensitivity, with a protected viewpoint within the area of the bog. In Laois the bog is within the Lowland Agricultural Area landscape designation with no protected viewpoints.
10	Killaranny	The Killaranny Bog is designated as being of moderate landscape sensitivity, with no protected viewpoints within the area of the bog.
11	Bracklin	The Bracklin Bog is designated within the River Deel Lowlands landscape with no protected viewpoints within the area of the bog.
12	Carranstown	The Carranstown bog within Meath is designated within a lowland landscape, of high sensitivity and of high value with no protected viewpoints within the area of the bog. In Westmeath, the bog is within the River Deel Lowlands designation with no protected viewpoints.
13	Ballivor	The Ballivor bog within Meath is designated within a lowland landscape, of high sensitivity and of high value with no protected viewpoints within the area of the bog. In Westmeath, the bog is within the River Deel Lowlands landscape designation with no protected viewpoints.
14	Kinnegad	The Kinnegad bog is designated within a lowland landscape, of high sensitivity and of high value with no protected viewpoints within the area of the bog.
15	Ballybeg	The Ballybeg bog is designated as being of moderate landscape sensitivity, with no protected viewpoints within the area of the bog.
16	Ballaghurt	The Ballaghurt bog is designated as being of moderate landscape sensitivity, with two protected viewpoints within the area of the bog.
17	Daingean (Derries)	The Daingean (Derries) bog within Offaly is designated as being of moderate landscape sensitivity, with no protected viewpoints within the area of the bog. In Westmeath the bog is within the South Westmeath Eskers landscape designation with no protected viewpoints within the area of the bog..
18	Daingean Rathdrum	The Daingean Rathdrum bog is designated as being of moderate landscape sensitivity, with no protected viewpoints within the area of the bog.
19	Clonad	The Clonad bog is designated as being of moderate landscape sensitivity, with no protected viewpoints within the area of the bog.
20	Ballykeane	The Ballykeane bog is designated as being of moderate landscape sensitivity, with no protected viewpoints within the area of the bog.
21	Esker	The Esker bog is designated as being of moderate landscape sensitivity, with no protected viewpoints within the area of the bog.
22	Garrymore	The Garrymore bog is within the Lowland Agricultural Area landscape designation with no protected viewpoints within the area of the bog.

Ref	Bog	Landscape Characterisation
23	Derrylea	The Derrylea bog within Offaly is designated within a moderate sensitivity landscape, with no protected viewpoints within the area of the bog. In Kildare the bog is within the Southern Lowlands landscape designation and is of low landscape sensitivity with no protected viewpoints.
24	Ticknevin	The Ticknevin bog within Offaly is designated within a moderate sensitivity landscape, with no protected viewpoints within the area of the bog. In Kildare the bog is within the Western Boglands landscape designation and is of medium landscape sensitivity with no protected viewpoints.
25	Glashabaun Sth	The Glashabaun Sth bog within Offaly is designated within a moderate sensitivity landscape, with no protected viewpoints within the area of the bog. In Kildare the bog is within the Western Boglands landscape designation and is of medium landscape sensitivity with no protected viewpoints.
26	Glashabaun Nth	The Glashabaun Nth within Offaly is designated within a moderate sensitivity landscape, with no protected viewpoints within the area of the bog. In Kildare the bog is within the Western Boglands landscape designation and is of medium landscape sensitivity with no protected viewpoints.
27	Codd Nth (Codd 2)	The Codd Nth (Codd 2) bog is designated as being of moderate landscape sensitivity, with no protected viewpoints within the area of the bog.
28	Codd Sth (Codd 1)	The Codd Sth (Codd 1) bog is designated as being of moderate landscape sensitivity, with no protected viewpoints within the area of the bog.
29	Ballydermot North	The Ballydermot North bog within Offaly is designated within a moderate sensitivity landscape, with no protected viewpoints within the area of the bog. In Kildare the bog is within the Western Boglands landscape designation and is of medium landscape sensitivity with no protected viewpoints.
30	Ballydermot South	The Ballydermot South bog within Offaly is designated within a moderate sensitivity landscape, with no protected viewpoints within the area of the bog. In Kildare the bog is within the Western Boglands landscape designation and is of medium landscape sensitivity with no protected viewpoints.
31	Blackriver	The Blackriver bog is within the Western Boglands landscape designation and is of medium landscape sensitivity with no protected viewpoints.
32	Barnaran	The Barnaran bog is within the Western Boglands landscape designation and is of medium landscape sensitivity with no protected viewpoints.
33	Lodge	The Lodge bog is within the Western Boglands landscape designation and is of medium landscape sensitivity with no protected viewpoints.
34	Cuil na Gun	The Cuil na Gun bog is designated within the Inny River Lowlands landscape with no protected viewpoints within the area of the bog.
35	Milkernagh	The Milkernagh bog within Westmeath is designated within the Inny River Lowlands landscape, with no protected viewpoints within the area of the bog. In Longford the bog is within the Inny Basin landscape designation with no protected viewpoints.
36	Coolcraff	The Coolcraff bog is within both the Inny Basin and Northern Drumlin Lakeland landscape designations. There are no protected viewpoints within the area of the bog.
37	Gilltown	The Gilltown bog is within the Western Boglands landscape designation and is of medium landscape sensitivity with no protected viewpoints.
38	Allen	The Allen bog is within the Western Boglands landscape designation and is of medium landscape sensitivity with no protected viewpoints.
39	Prosperous	The Prosperous bog is within the Western Boglands landscape designation and is of medium landscape sensitivity with no protected viewpoints.
40	Kilberry	The Kilberry bog is within the Western Boglands landscape designation and is of medium landscape sensitivity with no protected viewpoints.
41	Cuil na Carton	The Cuil na Carton bog is within the Lowland Agricultural Area landscape designation with no protected viewpoints.

16.4 Residual Impact Assessment

Bord na Móna's peat extraction, and ancillary, activities have had significant adverse landscape and visual impacts.

The bogs included in this application have been drained, developed and have been in production for many years, some as far back as the 1940s. The majority of the permanent rail system was constructed in the 1950's and 1960's. It is therefore not likely that peat extraction carried out on the 41 bogs between 1985 and 2020 has resulted in a significant change to the overall landscape character and visual impacts associated with the receiving environment.

Significant adverse cumulative landscape and visual impacts associated with peat extraction activities outside of the 41 bog units are likely to have occurred.

16.5 Mitigation and Monitoring

Bord na Móna's peat extraction activities are confined to the bog units and internal rail network themselves and public roads. Over time the spatial area of peat extracted has reduced and some natural processes of colonisation, re-vegetation and vegetation succession have occurred which may have reduced visual impacts at a localised level.

16.6 Residual Impacts

In the context of landscape and visual impacts, residual impacts will be the same as the Remedial Impact Assessments which are detailed in Section 16.4.

17 Population and Human Health

17.1 Introduction

This Chapter of the rEIAR identifies, describes, and assesses the retrospective impacts of Bord na Móna's peat extraction activities and ancillary activities at the 41 bog units on population and human health. The assessment has been completed in accordance with the EIA guidance and legislation set out in Chapter 3. The full description of the Project is provided in Chapter 5 of this EIAR.

In relation to population, the assessment assesses historical demographics, land use, economic activity, tourism and recreation, community and amenities. The analysis of human health assesses those impacts associated with relevant environmental disciplines which have been addressed in relevant chapters of this report:

- Noise and Vibration (Chapter 7);
- Air Quality (Chapter 8);
- Water Quality (Chapter 11);
- Traffic and Transportation (Chapter 12);
- Land, Soils and Groundwater (Chapter 14); and
- Landscape and Visual (Chapter 16).

17.2 Methodology

A baseline condition was established using a desktop study which reviewed national guidance documents, publicly available data sets, and resources to assess the past and potential impacts of the Project and to provide mitigation and monitoring measures where required. The EPA guidelines state that:

> *'in an EIAR, the assessment of impacts on population and human health should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in this EIAR e.g. under the environmental factors of air, water, soil etc'*

Due to the large spatial area of the 41 bog units, the baseline environment is assessed on a regional and county level. Counties Meath, Offaly, Longford, Laois, Kildare and Westmeath form the study area and the CSO data has been examined on a county by county basis and then in agglomerated figures to assess the cumulative impact of the project on the population and human health indicators for the area. Publications and other data sources that guided the preparation of this Chapter are listed hereunder:

- EIA Directive 2011/92/EU on the assessment of the effect of certain public and private projects on the environment (codification), as amended by EIA Directive 2014/52/EU (the EIA Directive);
- Regional Spatial and Economic Strategy for Eastern and Midland Region;
- Draft Guidelines on the Information to be Contained in Environmental Impact Statements Environmental Protection Agency 2002 (and revised draft guidelines 2017);

- Advice Notes for Preparing Environmental Impact Statements (Environmental Protection Agency, 2015);
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (2018);
- Offaly County Development Plan 2014-2020;
- Westmeath County Development Plan 2014-2020;
- Meath County Development Plan 2013-2019;
- Laois County Development Plan 2017-2023;
- Kildare County Development Plan 2017-2023;
- Longford County Development Plan 2015 -20121;
- Labour Force Survey, Central Statistics Office www.cso.ie ;
- Census 2016, Central Statistics Office www.cso.ie ;
- Census 2011, Central Statistics Office www.cso.ie ; and
- Central Statistics Office Live Register (February 2020).
- Bord na Móna socio-economic report 2017/2018.
- Fitzpatrick Associates, 2011 Energy Crop-Socio-economic Study, Bord na Móna

17.3 Receiving Environment

The Project (41no. bogs) is situated over the functional area of the Eastern and Midland Regional Assembly (EMRA) and spans over County Kildare, County Offaly, County Laois, County Meath, County Westmeath, and County Longford. The immediate environment of the 41 bogs is predominately rural, agricultural or peat extraction related.

The EMRA has established a Regional Spatial and Economic Strategy (RSES) for the area. It is a regional policy objective of the RSES to support the rural economy and initiatives in relation to diversification, agricultural business, rural tourism and renewable energy so as to sustain the employment opportunities in rural areas. In keeping with the NPF, the Eastern and Midland Regional Assembly will support the long-term strategic planning for industrial peatland areas. This may include support for the preparation of a comprehensive after-use framework plan for the peatlands and related infrastructure, which addresses environmental, economic and social issues, including employment and replacement enterprise reflecting the current transition from employment based around peat extraction to other streams as described below:

- Replacing peat with renewable, greenhouse-gas neutral, biomass, and to build a national biomass industry.
- Bord na Móna's strategy is to grow their power generation business by developing renewable energy infrastructure which is consistent with government policy.
- In addition, Bord na Móna intend expanding their resource recovery capabilities supporting Government policy and the circular economy and is accelerating investment in higher-value recycling and resource recovery business.
- Bord na Móna have implemented a new business unit aimed at supporting the development of new business opportunities to deliver a commercial return for the company and or the socio-economic benefit of the Midlands.

17.3.1 Demographic Profile

Demographics are used to study the characteristics of a population at a specific point in time. In this assessment, demographics such as population dynamics, migration and housing have been examined across the administrative boundaries of six local authorities:

- Kildare County Council;
- Offaly County Council;
- Laois County Council;
- Meath County Council;
- Westmeath County Council; and
- Longford County Council.

The information has been sourced from the most recent census in 2016 and compared to census data taken in 2011.

17.3.1.1 Population

The Project is situated within the administrative boundaries of six separate counties as stated above. According to Census 2016, population growth in the Republic of Ireland increased from 4,588,252 in 2011 to 4,757,976 in 2016 (3.7%). Population increases by county from 2011 to 2016 are listed in Table 17.1. The increase in population was above the national average in Kildare, Meath, Laois and Longford and below the national average in Westmeath and Offaly, with Offaly having a significant lower percentage at 1.4%.

Table 17.1: Population increase by County from 2011 to 2016

County	Population 2011	Population 2016	% Increase
Kildare	210,312 persons comprised 104,658 males and 105,654 females	222,504 persons comprised 110,546 males and 111,958 females	5.8%
Offaly	76,687 persons comprised 38,430 males and 38,257 females	77,961 persons comprised 38,838 males and 39,123 females	1.4%
Laois	80,559 persons comprised 40,587 males and 39,972 females	84,697 persons comprised 42,811 males and 41,886 females	5.1%
Meath	184,135 persons comprised 91,910 males and 92,225 females	195,044 persons comprised 96,776 males and 70,649 females	5.9%
Westmeath	86,164 persons comprised 42,783 males and 43,381 females	88,770 persons comprised 44,082 males and 44,688 females	3%
Longford	39,000 persons comprised 19,649 males and 19,351 females	40,873 persons comprised 20,587 males and 18,591 females	4.8%
Total	637,857 persons comprised 338,017 males and 299,840 females	709,849 persons comprised 353,640 males and 356,209 females	11.2%

Source: www.cso.ie

17.3.1.2 Housing

According to the Census 2016, there are 241,215 private households within the six counties with approximately 92% of these comprising houses/bungalows. The majority of private households comprise houses / bungalows. Table 17.2 illustrates the private households within each of the six counties.

Table 17.2: Private Households by County (2016)

County	% Household Types	Total
Kildare	89.2% are houses / bungalows	73,596 private households
	9.5% are flats / apartments	
	0.1% are bed-sits	
	0.3% are caravan / mobile home	
	0.9% are not stated	
Offaly	94.2% are houses / bungalows	27,343 private households
	3.5% are flats / apartments	
	0.1% are bed-sits	
	0.6% are caravan / mobile home	
	1.5% are not stated	
Laois	93.6% are houses / bungalows	29,107 private households
	4.4% are flats / apartments	
	0.1% are bed-sits	
	0.4% are caravan / mobile home	
	1.6% are not stated	
Meath	90.6% are houses / bungalows	64,234 private households
	7.6% are flats / apartments	
	0.1% are bed-sits	
	0.6% are caravan / mobile home	
	1.1% are not stated	
Westmeath	90.0% are houses / bungalows	31,813 private households
	8.4% are flats / apartments	
	0.1% are bed-sits	
	0.4% are caravan / mobile home	
	1.2% are not stated	
Longford	94.0% are houses / bungalows	15,122 private households
	4.1% are flats / apartments	
	0.1% are bed-sits	
	0.2% are caravan / mobile home	
	1.7% are not stated	

Source: www.cso.ie

17.3.2 Economic Profile

Given the fact that this rEIAR was written at the time of the Covid-19 pandemic (May 2020), when unemployment figures may not be representative, 2019 figures have been referenced in this report.

17.3.2.1 Employment

According to the CSO Labour Force Survey, the total number of persons in the labour force in Ireland in the fourth quarter of 2019 was approximately 2,471,700, representing an increase of 61,600 (2.6%) over the year. This compares with an annual labour force increase of 35,300 (1.5%) in Q4 2018.

According to Census 2016, the total Labour Force at work in EMRA was 1,017,722 and accounted for 87.6% of the total Labour Force within the region, marginally above the State average (87.1%). Trends show that the dominant occupations overall are professional occupations and skilled workers.

17.3.2.2 Unemployment

The CSO Live Register was accessed in February 2020 and stated that national unemployment decreased by 18,300 (-14.2%) in the year to Q4 2019 bringing the total number of persons unemployed to 110,600.The Labour Force Unemployment Rate in EMRA (12.4%) is below both the North Western Regional Assembly (14.1%) average and the Southern Regional Assembly (13.0%) average. At the SPA level there are clear differences with the Midland SPA with the highest rate at 16.3% - higher than the Eastern SPA (12.6%) and the Dublin SPA (11.6%).

It is of importance to note that the live register is not the official measure of unemployment, as it includes persons in receipt of benefits who are in part time or casual employment. However, the live register is the most up to date information available and is indicative of the current unemployment situation in Ireland.

17.3.2.3 Occupation and Industry

According to Census 2016, the trends show that the majority of persons are employed in commerce and trade in all six counties.

Table 17.3: Employment by Industry (2016)

County	Industry	Total Persons
Kildare	5.7% Agriculture, forestry and fishing 4.5% Building and construction 16.3% Manufacturing industries 20.9% Commerce and trade 5.2% Transport and communications 4.3% Public administration 25.3% Professional services 17.8% Other	Total 45,595 persons
Offaly	4.5% Agriculture, forestry and fishing 7.4% Building and construction	Total 83,259 persons

County	Industry	Total Persons
	11.5% Manufacturing industries	
	24.4% Commerce and trade	
	9.6% Transport and communications	
	5.7% Public administration	
	21.5% Professional services	
	15.4% Other	
Laois	0.2% Agriculture, forestry and fishing	Total 50,483 persons
	3.6% Building and construction	
	13.9% Manufacturing industries	
	22.4% Commerce and trade	
	9.5% Transport and communications	
	4.1% Public administration	
	20.1% Professional services	
	21.2% Other	
Meath	10.6% Agriculture, forestry and fishing	Total persons 63,472
	5.3% Building and construction	
	15.2% Manufacturing industries	
	20.2% Commerce and trade	
	4.7% Transport and communications	
	5.5% Public administration	
	22.9% Professional services	
	15.6% Other	
Westmeath	0.9% Agriculture, forestry and fishing	Total persons 133,971
	4.4% Building and construction	
	6.9% Manufacturing industries	
	27.6% Commerce and trade	
	14.2% Transport and communications	
	5.8% Public administration	
	22.7% Professional services	
	17.5% Other	
Longford	7.5% Agriculture, forestry and fishing	Total persons 57,759
	6.9% Building and construction	
	12.0% Manufacturing industries	
	22.7% Commerce and trade	
	6.0% Transport and communications	
	5.0% Public administration	
	22.2% Professional services	
	17.6% Other	

Source: www.cso.ie

Table 17.4: Persons at Work or Unemployed by Occupation (2016)

County	Occupation	Total Persons
Kildare	8.9% Manager, Directors and Senior Officials	Total 106,849
	17.7% Professional	
	13.1% Associate Professional and technical	
	10.9% Administrative and Secretarial	
	12.6% Skilled Trades	
	6.8% Caring, leisure and other service	
	6.7% Sales and Customer service	
	6.7% Process, Plant and Machine operatives	
	8.6% Elementary	
	7.8% Not stated	
Offaly	6.2% Manager, Directors and Senior Officials	Total 35,478
	12.3% Professional	
	8.5% Associate Professional and technical	
	9.0% Administrative and Secretarial	
	18.5% Skilled Trades	
	8.0% Caring, leisure and other service	
	6.3% Sales and Customer service	
	9.8% Process, Plant and Machine operatives	
	9.3% Elementary	
	12.0% Not stated	
Laois	6.7% Manager, Directors and Senior Officials	Total 38,993
	13.2% Professional	
	9.7% Associate Professional and technical	
	9.6% Administrative and Secretarial	
	16.5% Skilled Trades	
	8.2% Caring, leisure and other service	
	6.9% Sales and Customer service	
	7.5% Process, Plant and Machine operatives	
	9.5% Elementary	
	12.1% Not stated	
Meath	8.6% Manager, Directors and Senior Officials	Total 92,690
	15.4% Professional	
	11.2% Associate Professional and technical	
	11.2% Administrative and Secretarial	
	15.3% Skilled Trades	
	7.5% Caring, leisure and other service	

County	Occupation	Total Persons
	6.4% Sales and Customer service	
	8.0% Process, Plant and Machine operatives	
	8.5% Elementary	
	7.9% Not stated	
Westmeath	7.0% Manager, Directors and Senior Officials	Total 41,255
	15.9% Professional	
	9.6% Associate Professional and technical	
	8.8% Administrative and Secretarial	
	15.5% Skilled Trades	
	7.9% Caring, leisure and other service	
	6.9% Sales and Customer service	
	7.6% Process, Plant and Machine operatives	
	8.8% Elementary	
	12.0% Not stated	
Longford	6.0% Manager, Directors and Senior Officials	Total 18,499
	11.7% Professional	
	7.2% Associate Professional and technical	
	8.8% Administrative and Secretarial	
	16.9% Skilled Trades	
	8.2% Caring, leisure and other service	
	6.6% Sales and Customer service	
	10.3% Process, Plant and Machine operatives	
	8.8% Elementary	
	15.3% Not stated	

Source: www.cso.ie

17.3.2.4 Bord na Móna

According to the Irish Farmer's Association Labour Review of Horticulture in Ireland (2016), the Irish commercial horticultural industry was valued at €437 million in 2018. Within the industry an estimated 6,600 were employed full time in primary production activity with a further 11,000 employed in value added and downstream businesses (not including the wholesale trade) with an employment value of €497m.[24]

Bord na Móna is the largest producer of horticultural peat in Ireland with six other medium sized companies and up to 30 small producers. Small semi-agricultural producers also supply fuel sod peat and sod and milled horticultural peat to amateur and professional gardeners, professional growers and to the mushroom industry (National Peatlands Strategy 2015).[25]

[24] https://www.ifa.ie/wp-content/uploads/2020/03/Labour-Review-of-Horticulture-in-Ireland-2016.pdf
[25] https://www.npws.ie/sites/default/files/general/peat-horticultural-industry-consultation-paper-en.pdf

Approximately 635 full time equivalents, including both permanent and seasonal employees, are engaged by Bord na Móna Energy Limited in peat production and supply in the 41 bogs as seen in Table 17.5.

Table 17.5: Bord na Móna Employment – Peat Production

	Fuels (including Derrinlough briquette factory)	Horticulture	Edenderry Power Station	Total
Peat Harvesting	82	122	60	264
Peat Supply	45	14	97	156
Operations and Selling, General and Administrative	84	67	64	215
Total	211	203	221	635

There are approximately an additional 90 third party hauliers employed in road haulage of peat to power stations, briquette factory and horticultural plants and in deliveries of finished horticulture and fuel products to customers.

An additional 183 persons were employed for peat supply to West Offaly and Lough Ree Power Stations.

17.3.3 Community Facilities

The predominant land use within the 41 bog units consist of peat production, Coillte forest, cutover, bog remnant, access tracks and peat extraction areas.

Land and land-use surrounding the bog units comprise primarily of agriculture, with small areas of forestry around some bogs, and scattered rural settlements and farm buildings. There are no hospitals or care homes within 500m of the IPC licence boundaries. There are two schools within 500m of Boora Bog and one each within 500m of Daingean (Derries) and Daingean Rathdrum the IPC licence boundaries.

17.3.4 Tourism, Community and Recreation

Tourism is one of Ireland's most important economic sectors. In 2017, revenue gained from tourism was €8.4 billion to the economy[3].

According to the RSES, peatlands form unique landscapes which can act as amenity areas for locals and visitors and support a variety of outdoor activities such as hill-walking, wildlife watching and fishing which bring economic benefits in remote areas. Increasing areas of Bord na Móna peatlands are becoming cutaway and have potential for beneficial uses including renewable energy, biodiversity, amenity uses, water storage and other infrastructure.

Lough Boora Discovery Park is an example of a cutaway area that has been developed as an amenity with high biodiversity value, with restored wetland and woodland habitats. This is described in more detail below.

Bord na Móna have restored a number of bogs as part of their Raised Bog Restoration Programme. The ownership and management of the majority of these sites was transferred to the National Parks and Wildlife Service, with several sites also being transferred to An Taisce, The Irish Wildlife Trust and the Irish Peatland Conservation Council. The majority of the sites now in ownership by the state are protected areas (SACs and NHAs) and form the core of the states raised bog restoration protected area network.

17.3.4.1 County Kildare

According to the Kildare CDP, many of the county's peatland resources are designated Special Areas of Conservation and Natural Heritage Areas. The potential for the utilisation of protected peatland areas for tourist, amenity, educational and research purposes is acknowledged and promoted. The potential for eco-tourism based on the unique characteristics of the peatlands and the biodiversity habitats they provide is also being investigated.

The Irish Peatland Conservation Council (IPPC) Bog of Allen Nature Centre is situated in Lullymore, Co. Kildare and is one of the top natural tourist attractions in Co. Kildare. It is an international centre for peatland education, conservation and research run by the IPPC that operates numerous amenities and provides accommodation for those who wish to stay on the bog.[26] The park encompasses 60 acres of meandering trails and exhibitions through peatlands, lakes and ancient woodland.

The Drehid Community Gain Fund was established in 2008 following the development of the Drehid Waste Management Facility. The grant scheme is administered by Kildare County Council, and a community liaison committee assess the grant applications and makes recommendations in respect of funding. Since 2009, over 300 grants have been awarded with a total of approximately 2 million euro in the general vicinity to community groups, residents associations, youth centres etc. The committee comprises equal representation from the local elected representatives, the local authority, Bord na Móna and the local community.

17.3.4.2 County Offaly

The Lough Boora Discovery Park in County Offaly is a Bord na Móna cutaway bog, which has been developed, in co-operation with Offaly County Council, as an outdoor amenity area with restored wetland and woodland habitats. It is a prime outdoor recreation attraction with an extensive network of off-road walkways and cycle paths, including the Mesolithic Route, one of the most important historic sites in Ireland. Lough Boora now attracts over 100,000 visitors a year. It includes a sculpture park, angling and bird watching facilities and extensive walking routes.

Bord na Móna are also contributing to strategic projects such as the National Outdoor Recreation Plan, Lough Ree and Mid Shannon project and the Midlands Cycling Destination project as well as supporting the work of the Offaly Tourism Forum and many projects in partnership with local communities. The Bord na Móna Biodiversity Action Plan was updated in 2016 and now sets out specific objectives and actions for the period 2016-2021 and these are currently being progressed.[27]

Mountlucas Cycle and Walkways amenity area is also located in County Offaly. Bord na Móna have created a 10 km public walkway-cycleway around the Mountlucas Wind Farm. The wind farm receives approximately 30,000 visits per year. The wind farm hosts over 5,000 visitors on guided tours that highlight the operation of the farm and its history as well as the archaeology and biodiversity of the area. The Community Gain Funds at Mountlucas were setup in 2014 and have benefitted many community facilities within the area. Examples include Mount Lucas Community Development Group and the hand-ball alley in Walsh Island.[28]

According to the Offaly CDP 2013-2020:

[26] http://www.ipcc.ie/visitor-attraction/bog-of-allen-nature-centre/

[27] http://www.ipcc.ie/wp/wp-content/uploads/2014/01/psig-progress-report-2017-english.pdf

[28] https://www.bordnamona.ie/community/working-with-community/community-gain-funds/

'TO–05 It is an objective of the Council to facilitate the development of a tourism resource using cutaway peatlands in conjunction with Bord na Móna and Fáilte Ireland, subject to environmental considerations and nature designations.' and 'TO–06 It is an objective of Offaly County Council to encourage the development of water-based recreation activities on flooded cutaway bog where the opportunity arises, including possibly in Noggus Boy Bog and in Garryhinch, subject to environmental considerations and nature designations.'

17.3.4.3 County Laois

The Laois CDP 2017-2023 also recognises the importance of peatland areas for recreation and tourism. It is a policy of the Council for Peatland Areas to:

'Support the identification of projects that have the potential to achieve commercial value such as Industrial developments, renewable energy, tourism developments etc. while at the same time promoting high environmental standards and supporting Biodiversity objectives.'

Brukana Community Gain Funds were established by Bord na Móna in 2014 at the Brukana wind farm which is partially situated in County Laois. These funds have benefited schools, sports clubs, general amenity, social initiatives, as well as community facilities in the area.

17.3.4.4 County Meath

County Meath represents the eastern limit of raised bogs in Ireland and Meath County Council recognises the potential for utilisation of protected areas for tourist, amenity, educational and research purposes.

17.3.4.5 County Westmeath

As stated in the Westmeath CDP, Athlone is a major tourist destination in the Midlands and capitalises on the rich natural and cultural heritage amenities that exist in the surrounding hinterlands, making it an ideal base to begin exploration of Ireland's 'Hidden Heartlands', which is being promoted as part of Fáilte Ireland's new tourism experience brand. Its central location coupled with its excellent levels of connectivity ensure that Athlone is easily accessible for tourists and recreational visitors.

Derryarkin Motocross is an 'Arrive and Ride' motocross track built on a plot of land in Westmeath under lease by Bord na Móna. The track is 1,800 metres long and varies between six and ten metres wide, incorporating a series of turns, jumps and straights, all designed in accordance with Motocross Ireland rules and regulations.

Lough Derravargh in Co. Westmeath is a popular recreational area. The lake is used for a range of water sports and is an important amenity for anglers due to the population of brown trout.

17.3.4.6 County Longford

The Longford County Development Plan recognises that the Shannon/Erne River system the Rivers Camlin and Inny, and the network of bogs and wetlands throughout the County provide an excellent base for the development of niche leisure and activity breaks, walking, cycling, fishing and ecotourism. The Plan states that 'it is intended to encourage the use of Ecotourism principles in the development of tourism products in Longford. Bord na Mona, as part of its Biodiversity Action Plan (2015 – 2019) developed the Corlea community wetland in Co. Longford.

17.3.5 Human Health

The receiving environment as it relates to Air Quality, Noise and Vibration, Water, Land and Soils and Traffic is presented in the relative chapters in the report as follows:

- Noise and Vibration (Chapter 7);
- Air Quality (Chapter 8);
- Water Quality (Chapter 11);
- Traffic and Transportation (Chapter 12);
- Land, Soils and Groundwater (Chapter 14); and
- Landscape and Visual (Chapter 16).

17.4 Remedial Impact Assessment

17.4.1 Demographic Profile

17.4.1.1 Housing

Bord na Móna has a long history of providing housing for its employees, which began with the provision of hostel accommodation for migrant male workers who were housed during the 'Emergency Years' to produce fuel supplies from the Allen Bogs. These hostels housed over 100 men in some locations. As well as accommodation and meals, the hostels provided 'wet' and 'dry' canteens, film showings and recreation halls. This was followed by the Cottage Schemes, around 1950, when seasonal work was replaced by more permanent opportunities. The first housing schemes were designed by Frank Gibney and were built at Clonast, Mount Dillon, Littletown, Timahoe South and North, Boora, Ballivor and Derrygreenagh.

From the 1950's onwards, Bord na Móna continued to supply housing to its employees. All of these houses have since been transferred into private ownership.

17.4.2 Economic Profile

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 (included in Appendix 1) 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.

Between 1989 and 1993, the company embarked on a programme to reduce high production costs and to increase productivity. A series of initiatives were implemented in all areas of company activity. For the financial year 1988/89, of a total operating cost of £100m, staff costs accounted for £59.1m. This reflects substantial reductions in the numbers employed and the introduction of work teams (refer to Bord na Móna report in Appendix 1).

In April 1989, the Board confirmed its decision to divide Bord na Móna into separate divisions, each of which would be self-sufficient and autonomous. Initially, three divisions were established:

- Peat Energy (production and sale of milled peat);

- Horticultural Division (production and sale of moss peat and composts and to develop the horticultural and garden market business);
- Solid Fuels Division (production and sale of briquettes and sod turf and to develop domestic fuels sales generally)

On 30th December 1998, Bord na Móna, the statutory corporation was dissolved and Bord na Móna Plc. (which was incorporated on 3rd December 1998) took over its employees, trade, assets and liabilities.

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, 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) which lie within the study area of the 41 bog units. 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. According to this study the annual average full-time equivalent jobs to extract and deliver peat to the three power stations between 2006 – 2010 was just under 800.

17.4.3 Community Facilities

As the primary employer in many Midland counties, Bord na Móna played a central role in building communities through a number of initiatives. These are the following:

- Education – bursaries and other supports;
- Supporting sports clubs
- Supporting music: for example, sponsorship of the project: Composing the Island: A century of music in Ireland 1916 – 2016.
- Providing and building amenity areas often in partnership with local authorities and community groups: Lough Boora Discovery Park, Lullymore, Abbeyleix and Mount Lucas Cycle and Walkway path, Corlea Community Walk Project, Ballydangan Community Conservation Project.
- AES Bord na Móna's charity programme: organisations and issues supported in the past include homelessness, healthcare, sporting and social causes for example Jack and Jill Children's Foundation, Peter McVerry House, Barretstown, St Vincent's Cancer Ward, CMRF Crumlin, Our Lady's Children's Hospital, Crumlim, Temple Street Children's University Hospital, and the Irish Equine Centre. over €440,000 has been raised for national charities and local organisations since 2014.
- Community Gain Funds: These schemes were established in collaboration with adjacent communities to business developments, such as the Drehid Waste Management facility, and the Mountlucas and Bruckana wind farms:
  - The Drehid Community Gain Fund was established in 2008, and its purpose is to identify and contribute towards the cost and provision of appropriate environmental improvement and recreational or community amenities, facilities and projects in the locality which will mitigate the impact of the landfill facility on the local community in accordance with Government policy. Since 2009, over 300 grants with a total value of approximately two million euro have been awarded to a variety of applicants in the general vicinity of the facility, including community groups, residents associations, youth and scout groups, sporting organisations, charities, tidy town committees, schools, environmental and heritage groups, etc.

– Mountlucas and Bruckana Community Gain Funds: these were established in 2014 and an annual fund, based on the installed capacity of each wind farm, is established and applications are sought from clubs, associations, and other such groups in the locality for support for various community-based initiatives and improvement projects. The combined funds amount to €125,000 per annum. The funding has benefited schools, sports clubs, general amenity, social initiatives, as well as community facilities.

17.4.4 Tourism, Community and Recreation

Lough Boora Discovery Park is a cutaway bog area extending to over 2,000 ha that has been developed as a community amenity with high biodiversity value. Lough Boora Discovery Park comprises a collection of natural and manmade lakes, wetlands and woodland areas, and contains approximately 50 km of trails. The development of Lough Boora started in 1994 when Bord na Móna staff and representatives of the local community formed the Lough Boora Group. Developed with the support of Offaly County Council, Lough Boora Discovery Park now has a network of off-road walking and cycle routes within a perimeter of approximately 20 km. Lough Boora hosts a number of community events such as fun runs and half marathons.

Bord na Móna has a Land and Property team that was initially developed to manage the acquisition of peatland and associated assets. This team has evolved into a resource to develop and apply best practice standards to land management and planning. In this way the Bord na Móna's land bank has been classified in the context of current and potential use, with a strong emphasis on rehabilitation, conservation and alternative future uses where appropriate. This has allowed Bord na Móna to identify areas within the land holding where local interest groups can develop facilities and utilise areas in agreement with Bord na Móna.

17.4.5 Major Accidents and Hazards

Condition 13 of the IPC Licences states that it is the responsibility of the license holder (Bord na Móna) to ensure that a documented Emergency Response Procedure is in place which shall address any emergency situation which may originate on-site. This Procedure shall include provision for minimising the effects of any emergency on the environment.

Sources of pollution with the potential to cause significant environmental pollution and associated negative effects on health such as bulk storage of hydrocarbons or chemicals, storage of wastes etc are subject to the conditions of the IPC licences.

Historically, there has been limited potential for significant natural disasters to occur within the project. The potential natural disasters that may occur are limited to flooding or fire. Bog fires are described in section 17.5.1 below. The risk of flooding is addressed in Chapter 13: *Flood Risk*.

The sites are not regulated or connected to or close to any site regulated under the Control of Major Accident Hazards Involving Dangerous Substances Regulations i.e. SEVESO sites, and so there is no potential effects from this source.

Bog fires have occurred during dry summer periods and, as a condition of the IPC licenses, are reported to the EPA in the Annual Environmental Reports.

A Bord na Móna Fire Prevention and Fire Fight Policy for Production Bogs is in place for internal and external fires. The main focus is the prevention and management of bog fires for members of the public, employees, habitats and biodiversity and external property and property within ownership of the company. Fire safety and awareness is provided as part of Bord na Móna's general safety induction with reoccurring refresher training every three years.

The Bord na Móna Energy Management team act as the committee to discuss and deliberate on matters relating to fire prevention and firefighting within the business. Further details on emergency procedures in relation to bog fires are listed in Appendix 17.

The policy states that:

- Management will ensure the provision of adequate and appropriate resources, such as Personnel, Training, Equipment, Personal Protective Equipment and Communications, to implement and maintain the Fire Plan.
- Additional welfare facilities will be provided in the event of significant fires.
- Communication channels with relevant emergency services will be maintained and appropriate maps provided.
- Fire prevention and firefighting will take precedence over all other operations.
- All significant fires will be reported to the business unit manager in addition to health and safety and environmental personnel,
- Management will ensure that the appropriate fire warning signs are in place and maintained as necessary.
- All areas will be provided with maps and aerial photographs.

17.4.6 Conclusion

Large scale peat production undertaken by Bórd na Móna, has contributed significantly to the local economy by supporting employment both directly and indirectly as well as providing a secure source of indigenous energy.

Historically therefore, the impact of peat extraction activity by Bord na Móna has had a significant positive impact in terms of population by means of providing economic stability and continuity of employment in an area that traditionally has not had a wide economic base in terms of employment. The purchasing power of Bord na Móna employees has filtered into local businesses and in general terms has had a significant positive impact on the receiving environment.

17.5 Mitigation and Monitoring

There were no specific mitigation measures that were implemented to ameliorate the impacts on population and human health in addition to the measures specified in this rEIAR and outside of the conditions specified in IPC Licences.

17.6 Residual Impacts

Having regard to the above, the large-scale peat production undertaken by Bórd na Móna, has contributed significantly to the local economy by supporting employment both directly and indirectly as well as providing a secure source of indigenous energy. In addition, Bord na Móna has developed many community initiatives and amenities which have contributed to a significant positive impact on population and human health.

18 Material Assets

18.1 Introduction

This chapter of the rEIAR assesses the retrospective material asset impacts of Bord na Móna's peat extraction and ancillary activities at the 41 bog units.

The EPA EIAR Draft Guidance (2017), with reference to material assets, states the following:

The meaning of this factor is less clear than others. In Directive 2011/92/EU it included architectural and archaeological heritage. Directive 2014/52/EU includes those heritage aspects as components of cultural heritage. Material assets can now be taken to mean built services and infrastructure. Traffic is included because in effect traffic consumes roads infrastructure. Sealing of agricultural land and effects on mining or quarrying potential come under the factors of land and soils.

Traffic is assessed in Chapter 12 Traffic and Transportation and Cultural Heritage is addressed in Chapter 15 of this rEIAR. This Material Assets Chapter is concerned with historic impacts associated with peat extraction activities on telecoms and other services.

18.2 Methodology

The methodology applied comprised a review of geospatial mapping and aerial imagery, given the fact that the peat extraction and ancillary activities have generally been confined to the bogs themselves and to the transport of peat by internal rail and by public road.

18.3 Receiving Environment

Telecommunications infrastructure comprises fixed position masts or fibre optic lines. In the case of telecommunication masts, there are no known masts in the proximity to the 41 bogs.

There are no overhead electricity lines or underground cables within the zone of impact of Bord na Móna's peat extraction and ancillary activities.

There are no gas pipelines laid within the peat extraction areas.

There are no underground water or sewerage networks within the peat extraction areas.

18.4 Remedial Impact Assessment

The bogs included in this application have been drained, developed and have been in production for many years, some as far back as the 1940s. The majority of the permanent rail system was constructed in the 1950's and 1960's.

The network of telecoms and other services in the vicinity of the bogs has in general evolved since the 1980s in a piecemeal fashion on a sector by sector basis with very little integration in terms of shared services (primarily the road network accommodating water and sewerage

infrastructure with electricity and linear telecommunications networks adjacent to the public road networks).

Bord na Móna's peat extraction and ancillary activities are not likely to have had significant impacts on telecoms and other services for the following reasons.

- The geographical areas of historic peat extraction are generally limited and confined to the bog units and internal rail network themselves and public roads.
- Bord na Móna' s peat extraction and ancillary activities pre-date many telecoms and other services.

As Bord na Móna's peat extraction and ancillary activities are not likely to have had significant impacts on telecoms and other services, cumulative impacts are not likely to have occurred.

18.5 Mitigation and Monitoring

As Bord na Móna's peat extraction and ancillary activities have not had significant impacts on telecoms and other services mitigation measures are not required.

18.6 Residual Impacts

Bord na Móna's peat extraction and ancillary activities are not likely to have had significant impacts on telecoms and other services.

19 Interactions of the Foregoing

The preceding Chapters 7 to 18 of this rEIAR identify the potential significant retrospective impacts that may have occurred due to Bord na Móna's peat extraction and ancillary activities at the 41 bog units.

Where there is potential for significant environmental effects, there is also potential for interactions between these effects which may exacerbate the magnitude of the effects.

Impact interactions have been considered throughout the environmental impact assessment process and are described in each of the individual impact chapters. Potential interactions are presented in Table 19.1 below (in dark teal;). A brief description of the interactions is presented in Table 19.2.

Table 19.1: Interactions Matrix

	Noise	Air Quality	Climate	Biodiversity	Surface Water: & Flood Risk	Land, Soils & Groundwater	Cultural Heritage	Traffic & Transportation	Landscape & Visual	Population & Human Health	Material Assets
Noise				■				■		■	
Air Quality			■	■				■		■	
Climate		■			■	■	■	■		■	
Biodiversity:	■	■			■	■					
Surface Water: & Flood Risk			■	■		■	■			■	■
Land, Soils & Groundwater			■	■	■		■		■	■	■
Cultural Heritage			■		■	■				■	
Traffic & Transportation	■	■	■							■	■
Landscape & Visual						■				■	
Population & Human Health	■	■	■		■	■	■	■	■		■
Material Assets					■	■		■		■	

Table 19.2: Potential Interactions

Interaction	Potential Impact Interaction
Noise and Biodiversity	The noise associated with peat extraction activities was generated through the use of mobile plant which is similar to agricultural type machinery. As the activities have been ongoing for many decades, and mammals and birds have been recorded on a number of the bogs it is not likely that significant noise impacts have occurred on biodiversity as a result of noise.
Noise and Traffic and Transportation and Population & Human Health	Transportation of extracted peat by road is not expected to have had a discernible impact on road traffic noise
Noise, Air Quality and Population & Human Health	There are a number of properties in close to the IPC licence boundaries of the bogs and the historic peat production area and peat extraction activities have most likely resulted in both noise and dust nuisance impacts
Air Quality and Climate and Traffic and Transportation	The extraction of peat has resulted in on-site GHG emissions associated with the drainage and exposure of the peat surface, methane emissions from drained organic soils and drainage ditches, losses from uncovered peat stockpiles and from machinery and transport use. Off-site GHG emissions are released from the combustion of peat to produce electricity, losses from horticultural products and as part of the peat briquette manufacturing process.
Air Quality and Biodiversity	Dust deposition from the continued harvesting of peat could have had an adverse impact on biodiversity
Climate and Surface Water and Flood Risk and Land, Soils and Groundwater	Undisturbed peat bogs offer climate resilience benefits locally, primarily through storage of flood water, ecological capacity for species adaptation, and delivery of improved water quality. The drainage of the bogs has significantly reduced the capacity for the bog units to provide the climate resilience benefits offered by undisturbed peat bogs
Climate and Surface Water and Flood Risk and Cultural Heritage and Land, Soils and Groundwater	Changes in hydrology, including drainage and flooding, could have impacted on cultural heritage
Climate and Surface Water and Flood Risk and Population and Human Health and and Land, Soils and Groundwater and Material Assets	A Flood Risk Assessment of the 41 bogs indicates that pluvial flooding is the primary flood risk across the bogs, rather than flooding from groundwater or fluvial flooding and that downstream flooding, as a result of increased runoff from operational bogs is controlled by limiting bog discharges to greenfield runoff rates.
Biodiversity and Surface Water and Land, Soils and Groundwater	Examination of water quality data in the receiving water bodies shows that it is likely that peat extraction activities have had an adverse impact on water quality in receiving water bodies. The removal of peat has had a significant impact on biodiversity but in many cases the bog habitat was removed by 1985.

Interaction	Potential Impact Interaction
Land, Soils and Groundwater and Landscape and Visual and Population and Human Health	Bord na Móna's peat extraction, and ancillary, activities have had significant adverse landscape and visual impacts. However, the bogs included in this application have been drained, developed and have been in production for many years, some as far back as the 1940s. It is therefore not likely that peat extraction carried out on the 41 bogs between 1985 and 2020 has resulted in a significant change to the overall landscape character and visual impacts associated with the receiving environment.
Traffic and Transportation and Materials Assets	Traffic generated due to historic peat extraction activities have a minimal impact on road users, as a large proportion of the product is transported via the private rail network. Where road transport is utilised, the facilities are in close proximity to the national primary road network, which they do not saturate. A significant effect on materials assets is therefore not expected to have occurred.

Appendices

1. Introduction

4. Planning and Policy Context

6. Consultation

7. Noise and Vibration

8. Air Quality

13. Flood Risk

14.Land, Soils and Groundwater

15.Cultural Heritage

17. Population and Human Health