Planning and Environmental Consultants

Environmental Impact Assessment Report Remedial

Derrybrien Wind Farm Development Decommissioning Project – Retained Development

Volume 2a: rEIAR Appendices 2-1 to 8-1

APPENDIX 2-1

SCOPING RESPONSES

From: Environmental Co-ordina on (Inbox)
Sent: Monday 4 November 2024 09:45
To: Morgan Valvik
Cc: Thomas Blackwell
Subject: FW: Scoping Request: 220437 & 240450 Derrybrien Windfarm Decommissioning Project
A achments: Derrybrien Windfarm Decommissioning Project.pdf

Some people who received this message don't often get email from environmental_co-ordination@agriculture.gov.ie. Learn why this is important

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Good morning

Please see comments/observations attached.

Regards,

Environmental Co-ordination Unit

From: Morgan Valvik <mvalvik@mkoireland.ie>
Sent: Tuesday, September 24, 2024 3:55 PM
To: Environmental Co-ordina on (Inbox) <Environmental_Co-ordina on@agriculture.gov.ie>
Cc: Thomas Blackwell <tblackwell@mkoireland.ie>
Subject: Scoping Request: 220437 & 240450 Derrybrien Windfarm Decommissioning Project

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Dear Sir/Madam,

Please find a ached to this email a cover le er, Environmental Impact Assessment (EIA) Scoping Document, and a remedial Environmental Impact Assessment (rEIA) Scoping Document for the "Derrybrien Windfarm Decommissioning Project."

The exis ng Derrybrien wind farm site is located in the northern part of the Slieve Aughty Mountains, Co. Galway and encompasses seventy (70 no.) Vestas V52-850kW wind turbines, an onsite wind farm substa on (Derrybrien Substa on), two met masts, a grid connec on comprising of a 110kV Overhead line (approximately 7.8km long) and an 110kV substa on at Agannygal connec ng the wind farm to the Na onal Grid.

Gort Windfarms Ltd intends to apply for planning permission for the "Derrybrien Windfarm Decommissioning Project" which comprises two elements:

1. the carrying out of physical works to decommission specific features of the exis ng Derrybrien Wind Farm (the Prospec ve Development); and
2. the proposed 'reten on' in situ of other specific features of the exis ng development (i.e. the Retained Development).

A planning applica on will be submi ed to An Bord Pleanála for consent for the Prospec ve Development under Sec on 37L of the Planning and Development Act, 2000 (as amended). The planning applica on will be accompanied by an Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) as required by the Board, in rela on to the Prospec ve Development. Furthermore, a subsequent applica on will be made to An Bord Pleanála for subs tute consent for the Retained Development under Sec on 177E of the Planning and Development Act, 2000 (as amended). The subs tute consent applica on will be accompanied by a Remedial EIAR and Remedial NIS.

As part of the scoping exercise for the Derrybrien Windfarm Decommissioning Project, we would welcome any comments in rela on to the Prospec ve Development and Retained Development.

If you have any queries, please do not hesitate to come back to me. Thank you for your me and a en on.

Kind regards,
Morgan.

Morgan Valvik
Graduate Environmental Scientist
MKO
9c Beckett Way, Park West Business Park,
Dublin 12, D12 XN9W

Offices in Galway and Dublin
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Department of Agriculture, Food and the Marine

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An Roinn Talmhaíochta, Bia agus Mara

Tá an t-eolas sa ríomhphost seo, agus in aon cheangaltáin leis, faoi rún agus tá sé dírithe ar an bhfaighteoir/na faighteoirí beartaithe amháin agus níor cheart ach dóibh siúd é a úsáid. D'fhéadfadh an t-eolas seo a bheith faoi réir pribhléid dhlíthiúil agus ghairmiúil. Mura tusa faighteoir beartaithe an ríomhphoist seo, níor

cheart duit an teachtaireacht seo, nó aon chuid di, a úsáid, a nochtadh, a chóipeáil, a dháileadh nó a choinneáil. Má fuair tú an ríomhphost seo go hearráideach, cuir an seoltóir ar an eolas láithreach agus scrios gach cóip den ríomhphost seo ó chóra(i)s do ríomhaire, le do thoil.

An Roinn Talmhaíochta,
Bia agus Mara
Department of Agriculture,
Food and the Marine

MKO
Tuam Road
Galway
H91VW84

01st November 2024

Re: Derrybrien Windfarm Decommissioning Project located in the northern part of the Slieve Aughty Mountains, Co. Galway.

Dear Sir/Madam,

The following are the comments from this Division in relation to the proposed development:

If the proposed development will involve the felling or removal of any trees, the developer must obtain a Felling License from this Department before trees are felled or removed. A Felling Licence application form can be obtained from the Department's website link here: gov.ie - Tree Felling Licences (www.gov.ie)

A Felling Licence granted by the Minister for Agriculture, Food and the Marine provides authority under the Forestry Act 2014 to fell or otherwise remove a tree or trees and/or to thin a forest for silvicultural reasons. The Act prescribes the functions of the Minister and details the requirements, rights and obligations in relation to felling licences. The principal set of regulations giving further effect to the Forestry Act 2014 are the Forestry Regulations 2017 (S.I. No. 191 of 2017).

The developer should take note of the contents of **Felling and Reforestation Policy** document which provide a consolidated source of information on the legal and regulatory framework relating to tree felling; gov.ie - Tree Felling Licences (www.gov.ie) As this development is within forest lands, particular attention should be paid to deforestation, turbulence felling and the requirement to afforest alternative lands.

In order to ensure regulated forestry operations in Ireland accord with the principles of sustainable forest management (SFM), as well fulfilling the requirements of other relevant environmental protection laws, the Department (acting through its Forest Service division) must undertake particular consultations, and give certain matters full consideration during the assessment of individual Felling Licence applications. This includes consultation with relevant bodies, the application of various protocols and procedures (e.g. Forest Service Appropriate Assessment Procedure), and the requirement for applicants on occasion to provide further information (e.g. a Natura Impact Statement).

Consequently, when the Forest Service is considering an application to fell trees, the following applies:

1. The interaction of these proposed works with the environment locally and more widely, in addition to potential direct and indirect impacts on designated sites and water, is assessed. Consultation with relevant environmental and planning authorities may be required where specific sensitivities arise (e.g. local authorities, National Parks & Wildlife Service, Inland Fisheries Ireland, and the National Monuments Service);

2. Where a tree Felling Licence application is received, the Department will publish a notice of the application before making a decision on the matter. The notice shall state that any person may make a submission to the Department within 30 days from the date of the notice. The notices are published online at: gov.ie - Felling Licence Applications (www.gov.ie)

3. Third parties that make a submission or observation will be informed of the decision to grant or refuse the licence, and on request, details of the conditions attached to the licence, the main reasons and considerations on which the decision to grant or refuse the licence was based, and where conditions are attached to any licence, the reasons for the conditions. Both third parties and applicants will be also informed of their right to appeal any decision within 14 days to the Forestry Appeals Committee. Felling Licence decision are published on the Departments Forestry Licence Viewer 9FLV) link here: Forestry Licence Viewer (agriculture.gov.ie)

It is important to note that when applying to **a Local Authority**, or **An Bord Pleanàla**, for planning permission where developments are:

a) subject to an EIA procedure (including screening in the case of a sub-threshold development) and any resulting requirement to produce an EIAR; and/or

b) subject to an Appropriate Assessment procedure (including screening) and any resulting requirement to a Natura Impact Statement (NIS); and

c) the proposed development in its construction or operational phases, or any works ancillary thereto, would directly or indirectly involve the felling and replanting of trees, deforestation for the purposes of conversion to another type of land use, or replacement of broadleaf high forest by conifer species,

1. that there is a requirement inter alia under the EIA Directive for an overall assessment of the effects of the project or the alteration thereof on the environment to be undertaken, including the direct and indirect environmental impact of the project;

and

2. pursuant to Article 2(3) of the EIA Directive, the Department of Agriculture, Food and the Marine strongly recommends that, notwithstanding the fact that a parallel consent in the form of felling licence may also have to be applied for, any EIAR and/or NIS produced in connection with the application for planning permission to the Local Planning Authority or An Bord Pleanàla, should include an assessment of the impact of and measures, as appropriate, to prevent, mitigate or compensate for any significant adverse effects direct or indirect identified on the environment arising from such felling and replanting of trees, deforestation for the purposes of conversion to another type of land use, or replacement of broadleaf high forest by conifer species.

3. Please note that there must be absolute spatial consistency between the felling licence areas submitted to DAFM (second authority) and all related planning documents submitted to the first authority in respect of the felling area(s)

_____

Neil O'Brien
Higher Executive Officer
Felling Section

From: Housing Manager DAU
Sent: Wednesday 6 November 2024 08:08
To: Morgan Valvik
Cc: Simon Dolan (Housing)
Subject: G Pre00318/2024 Gort Windfarms Ltd. Applica on for "Derrybrien Windfarm Decommissioning Project"
A achments: Derrybrien Wind Farm Decommissioning Pre Planning Response.pdf

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G Pre00318/2024

Good morning Morgan,

Please find a ached Heritage related observa ons/recommenda ons for the above men oned planning applica on.

Kind regards,
Cole e

Colette McCormack
Executive Officer

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

Aonad na nIarratas ar Fhorbairt
Development Applications Unit

Oifigí an Rialtais, Bóthar an Bhaile Nua, Loch Garman, Contae Loch Garman, Y35 AP90
Government Offices, Newtown Road, Wexford, Co Wexford, Y35 AP90
Telephone: 053 9117434

An Roinn Tithíochta,
Rialtais Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage

Our Ref: G Pre00318/2024
(Please quote in all related correspondence)

6 November 2024

MKO
Tuam Road
Galway
H91 VW84

Via email: mvalvik@mkoireland.ie

Re: The "Derrybrien Windfarm Decommissioning Project" at Derrybrien, County Galway.

A chara

I refer to correspondence received in connection with the above. Outlined below are heritage-related observations/recommendations of the Department co-ordinated by the Development Applications Unit under the stated headings.

Archaeology

The Department of Housing, Local Government and Heritage has reviewed the 'Environmental Impact Assessment Scoping Document' for the proposed Derrybrien Wind Farm Development Decommissioning Project, County Galway.

The information provided was not sufficiently detailed to allow for a full assessment of the archaeological implications of this proposal, however this Department notes that an Archaeological Impact Assessment (AIA) is scoped into the proposed Environmental Impact Assessment (EIA) process as part of the overall Cultural Heritage Impact Assessment of the proposed development and will be carried out by John Cronin & Associates. The supplied methodology indicates that this will incorporate a detailed desktop study and field inspection. In this regard, this Department awaits the results of the Cultural Heritage Impact Assessment (CHIA) and full Environmental Impact Assessment Report (EIAR) for the scheme before commenting further.

Further to the above, and by way of general archaeological advice, please note that, whilst the proposed development site (PDS) may or may not contain within it known or subsurface

Recorded Monuments and/or Archaeological sites that may require assessment as part of the overall CHIA, the PDS itself is located within a wider area of known archaeological settlement and activity (the Department's initial review of the Record of Monuments and Places, www.archaeology.ie and cartographic sources). All of these Recorded Monuments, both within and outside the PDS, are subject to statutory protection in the Record of Monuments and Places, established under section 12 of the National Monuments Act 1930-2014. Therefore the CHIA should include an assessment of the possible effects of the proposal on the wider archaeological landscape. It is of importance that the study area for the CHIA should be of sufficient size and extent to support this.

The Department further advises that the following are also carried out (as appropriate) as part of the overall CHIA to ensure a comprehensive assessment of the proposed development:

- The desk-study and field inspection regime should inform:
    - Targeted non-intrusive advance geophysical survey or prospection (such as Ground Penetrating Radar Surveys).
    - Targeted advance archaeological test excavation.

- Any and all intrusive advance investigations (such as, but not limited to, ground investigations for soils/geology/hydrogeology) carried out as part of the EIA or design process should be subject to a programme of archaeological monitoring by a suitably qualified archaeologist.

The results of these investigations should inform the EIA process and be incorporated within the EIA Report. This Department is happy to provide further advice and clarification as and if required in relation to the preparation of suitably comprehensive assessments as outlined above, with particular regard to the scope and locations for any advance non-intrusive prospection or advance test excavation that might be appropriate to inform the assessment of this proposed scheme.

Notwithstanding the above, this Department awaits the submission of this assessment before commenting further.

Nature Conservation

The following observations are made by the Department in its role as the authority with overarching responsibility for nature conservation and the nature Directives (i.e. the EU Birds and Habitats Directives) and as an environmental authority under SEA legislation. The observations are not exhaustive and are offered to assist the applicant in meeting its

obligations in relation to nature conservation, European sites, biodiversity and environmental protection in the preparation of the EIAR and the remedial EIAR for the proposed Derrybrien Wind Farm Development Decommissioning Project.
These comments are made to assist the applicant in determining the scope of the ecological data and the nature of the assessment that should be undertaken.

Introduction:
It is noted that the proposed applications will relate to the removal of specific elements of the existing wind energy which will be the subject of an application under Section 37L of the Planning and Development Act, 2000 as amended. This will then be followed by an application for substitute consent for retention of other aspects of the existing development under Section 177E of the Planning and Development Act, 2000 as amended.

It is noted in the rEIA Scoping Report that:
"*"For the purpose of assessments undertaken for the remedial EIAR, the baseline environment against which impacts have been assessed has been taken as that which existed prior to the original planning process. The baseline date for assessment of environmental effects in the rEIAR is the date when the environmental impact assessment should originally have been carried out and taken into account by the decision-maker.*
The planning consents were granted in the period 1998-2001. Therefore, for the purposes of the rEIAR, the baseline environment against which assessment of environmental effects is made is that which existed in 1998."

The rEIAR should clearly state the sources of information that are used to establish the baseline environment at that time and how this and other data is used to determine the impact of the development since it was commenced. The impact of the peat slide in 2003 and any impacts of measures that were constructed to mitigate the effects of the slide on biodiversity should be considered part of the effects of the elements of the development to be retained.

Specific comments are as follows:

- Natural recolonization of bare areas is preferred as opposed to replanting or reseeding. Seeding of any bare areas should only be considered where there are overriding slope stability issues and these should be identified in the application. It is recommended that monitoring of natural recolonization is included as a commitment in the application.

- The date of ecological surveys data should be recent so that the impact predictions are robust and relevant. Reference to the Chartered Institute of Ecology and Environmental Management (CIEEM) Advice Note on the Lifespan of Ecological

Reports & Surveys (https://cieem.net/wp-content/uploads/2019/04/Advice-Note.pdf) is helpful in this respect.

- In the event that this Department may be invited to comment on environmental management plans, method statements or similar documents after consent has been granted, it is advised that any agreements should only be made between the applicant and the competent authority. There is no statutory basis for which this Department can "agree" such plans or similar details after consent has been granted. This Department notes the advice in the Department's *Development Management: Guidelines for Planning Authorities* (Section 7.9), which states that
"*Conditions requiring matters to be the subject of consultation with, or to be agreed with, a named officer of the planning authority, or with a particular department or branch of the local authority, or with another public authority, should not be attached to a permission.*"

- The applications should be cognisant of policies and objectives contained within the current Galway County Development Plan and of any emergent County Biodiversity Plan that may be drafted during the application process. The applicant is also noted to be aware of obligations placed on local authorities in the National Biodiversity Action plans and to ensure that they are addressed in the application.

You are requested to send any further communications to this Department's Development Applications Unit (DAU) at manager.dau@npws.gov.ie, or to the following address:

The Manager
Development Applications Unit (DAU)
Government Offices
Newtown Road
Wexford
Y35 AP90

Is mise, le meas

Colette McCormack

Colette McCormack
Development Applications Unit
Administration

From: Transport GCU
Sent: Thursday 24 October 2024 16:43
To: Morgan Valvik; Transport GCU
Cc: Thomas Blackwell
Subject: RE: Scoping Request: 220437 & 240450 Derrybrien Windfarm Decommissioning Project

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Good a. ernoon,

Thank you for contac ng Department of Transport in rela on to the Derrybrien Windfarm Decommissioning Project.

The Department consider it important that the examina on of the proposal should include considera on of the following:

- When considering Waste and Turbine Removal all abnormal loads associated with the project should be kept to minimal dimensions and weights to minimise the impact on the public road network.

Kind regards
Jacqui

Jacqui Traynor
Central Policy, Coordination and Reform
An Roinn Iompair
Department of Transport
Lána Líosain, Baile Átha Cliath, D02 TR60
Leeson Lane, Dublin, D02 TR60
T +353 (0)1 604 1177
gcu@transport.gov.ie www.gov.ie/transport

From: Morgan Valvik <mvalvik@mkoireland.ie>
Sent: Tuesday, September 24, 2024 4:06 PM
To: Transport GCU <GeneralCo-Ordina onUnit@transport.gov.ie>
Cc: Thomas Blackwell <tblackwell@mkoireland.ie>
Subject: Scoping Request: 220437 & 240450 Derrybrien Windfarm Decommissioning Project

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As part of the scoping exercise for the Derrybrien Windfarm Decommissioning Project, we would welcome any comments in rela on to the Prospec ve Development and Retained Development.

If you have any queries, please do not hesitate to come back to me. Thank you for your me and a en on.

Kind regards,
Morgan.

Morgan Valvik
Graduate Environmental Scientist
MKO
9c Beckett Way, Park West Business Park,
Dublin 12, D12 XN9W

Offices in Galway and Dublin
mkoireland.ie | +353 (0)91 735 611

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Tá eolas sa teachtaireacht leictreonach seo a d'fhéadfadh bheith príobháideach nó faoi rún agus b'fhéidir go mbeadh ábhar rúnda nó pribhléideach ann. Is le h-aghaidh an duine/na ndaoine nó le h-aghaidh an aonáin atá ainmnithe thuas agus le haghaidh an duine/na ndaoine sin amháin atá an t-eolas. Tá cosc ar rochtain don teachtaireacht leictreonach seo do aon duine eile. Murab ionann tusa agus an té a bhfuil an teachtaireacht ceaptha dó bíodh a fhios agat nach gceadaítear nochtadh, cóipeáil, scaipeadh nó úsáid an eolais agus/nó an chomhaid seo agus b'fhéidir d'fhéadfadh bheith mídhleathach.

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From: planning applica ons
Sent: Tuesday 15 October 2024 12:25
To: Morgan Valvik
Cc: Thomas Blackwell
Subject: FW: Scoping Request: 220437 & 240450 Derrybrien Windfarm Decommissioning Project
A achments: Fáilte Ireland EIAR Guidelines 2023.pdf

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Hello Morgan,

Thank you for your email, cover le er and documents regarding the "Derrybrien Windfarm Decommissioning Project."

Please see a ached a copy of Fáilte Ireland's Guidelines for the Treatment of Tourism in an EIA, which you may find informa ve for the prepara on of the Environmental Impact Assessment for the proposed project. The purpose of this report is to provide guidance for those conduc ng Environmental Impact Assessment and compiling an Environmental Impact Assessment Reports (EIAR), or those assessing EIARs, where the project involves tourism or may have an impact upon tourism. These guidelines are non-statutory and act as supplementary advice to the EPA EIAR Guidelines outlined in sec on 2.

Regards,

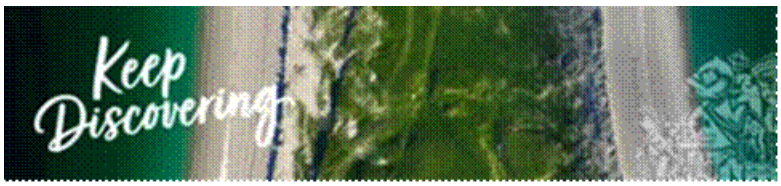
Yvonne

Yvonne Jackson
Product Development-Environment & Planning Support | Fáilte Ireland

88-95 Amiens Street, Dublin 1, D01 WR86
M +353 (0)86 0357590

Fáilte Ireland

LinkedIn | Twitter | YouTube | Facebook



From: Morgan Valvik <mvalvik@mkoireland.ie>
Sent: Tuesday 24 September 2024 16:21
To: planning applica ons <planning.applica ons@failteireland.ie>

Cc: Thomas Blackwell <tblackwell@mkoireland.ie>
Subject: Scoping Request: 220437 & 240450 Derrybrien Windfarm Decommissioning Project

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If you have any queries, please do not hesitate to come back to me. Thank you for your me and a en on.

Kind regards,
Morgan.

Morgan Valvik
Graduate Environmental Scientist
MKO
9c Beckett Way, Park West Business Park,
Dublin 12, D12 XN9W

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Fáilte Ireland
Turasóireacht Náisúnta
An tÚdara Eorbartha
National Tourism
Development Authority

EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects

July 2023

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1. Introduction

Tourism is a growing sector and substantial part of the Irish Economy. It contributes to both urban and rural economies in every part of the country. The impact and interaction of tourism with the environment is complex and the assessment of environmental impacts is of utmost importance to creating a sustainable tourism economy and protecting the natural resources that are so often a tourism attraction.

The purpose of this report is to provide guidance for those conducting Environmental Impact Assessment and compiling an Environmental Impact Assessment Reports (EIAR), or those assessing EIARs, where the project involves tourism or may have an impact upon tourism. These guidelines are non-statutory and act as supplementary advice to the EPA EIAR Guidelines outlined in section 2.

This guidance document has been prepared by Fáilte Ireland to update their EIA guidelines in line with changes in legislative and guidance requirements.

2. Background to this Document

Tourism is one of the largest and most important sectors of the economy, providing employment for approximately **260,000 people**, an economic contribution of **€9.5 billion**, and exchequer revenue of **€1.8 billion** in 2019, which helps fund other key public services.

In 2019 Ireland welcomed **9.7 million overseas visitors.**

Fáilte Ireland is the National Tourism Development Authority established by the Irish Government in May 2003. Fáilte Irelands role is to support the tourism industry and work to sustain Ireland as a high-quality and competitive tourism destination. They provide a range of practical business supports to help tourism businesses better manage and market their products and services.

Fáilte Ireland also work with other state agencies and representative bodies, at local and national levels, to implement and champion positive and practical strategies that will benefit Irish tourism and the Irish economy.

Fáilte Ireland promotes Ireland as a holiday destination through a domestic marketing campaign (DiscoverIreland.ie) and manage a network of nationwide tourist information centres that provide help and advice for visitors to Ireland.

Tourism related projects cover a broad range of plans, programmes and developments, from the Wild Atlantic Way to a single hotel conversion. These guidelines apply to projects involving or impacting upon tourism. A tourism plan, strategy or programme where it is part of the statutory plan making process under the Planning and Development Acts (as amended), may be more appropriately assessed by a Strategic Environmental Assessment (SEA) as discussed in the next section.

It should be borne in mind that EIA is required where there is anticipated to be a significant impact on the environment, where tourism projects are of a prescribed type or meet thresholds identified below.

Where Natura 2000 Designated Sites are potentially affected by tourism development Appropriate Assessment must be carried out by the appropriate authority in accordance with Article 6(3) of the EU Habitats Directive.

3. Legislation and Statutory Guidance

Environmental Impact Assessment is a procedure that ensures that the environmental implications of decisions are taken into account before planning based decisions are made. The assessment results in a report, called an Environmental Impact Assessment Report (EIAR).

Legislation

These guidelines are produced under current EIAR legislative requirements, having regard to Directive 2011/92/EU (known as 'Environmental Impact Assessment' – EIA Directive), as amended by Directive EU 2014/52 which came into effect in May of 2017. These requirements were transposed into Irish Law on 1 September 2018 as most of the provisions of the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018) came into effect. The principle of both Directives is to ensure that plans, programmes and projects likely to have significant effects on the environment are made subject to an environmental assessment, prior to their approval or authorisation.

Statutory Guidance

In response to the changes to the EIAR requirements under Directive EU 2014/52, the Environmental Protection Agency (EPA) developed Guidelines on the information to be contained in Environmental Impact Assessment Reports in May 2022. The Guidelines are a statutory document to be regarded by those preparing EIARs and the decision makers considering the EIARs.

Some of the key changes to the EIA Directive introduced by Directive 2014/52/EU are as follows:

- Additional information to be provided in the project description to describe the location of the project, the technologies and substances used, the construction of the project and required demolition;
- The requirement for consideration of alternatives has changed from a requirement to provide ‘An outline of the main alternatives studied by the developer and an indication of the main reasons for this choice, taking into account the environmental effects’ to ‘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’;
- A refinement of the environmental factors to be considered in the assessment with an increased focus on resource efficiency, climate change, biodiversity and disaster prevention;
- Changes to Prescribed Environmental Factors with ‘Land’ being added, ‘Human Beings’ replaced by ‘Population & Human Health’ and ‘Flora & Fauna’ replaced by ‘Biodiversity’;

- The developer is required to have competent experts to prepare the EIAR and the Board is required to have access to sufficient expertise to assess the EIAR;
- Requirement for the incorporation of mitigation and monitoring measures in consents and ensuring that developers deliver these measures;
- The requirements for the assessment of cumulative effects with existing and/or approved projects, taking into account existing environmental issues to be considered; and
- Reasoned decisions made with regard to the EIA outcomes must be provided.

In addition to the EPA statutory guidance, the Department of Housing has produced Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment in August 2018.

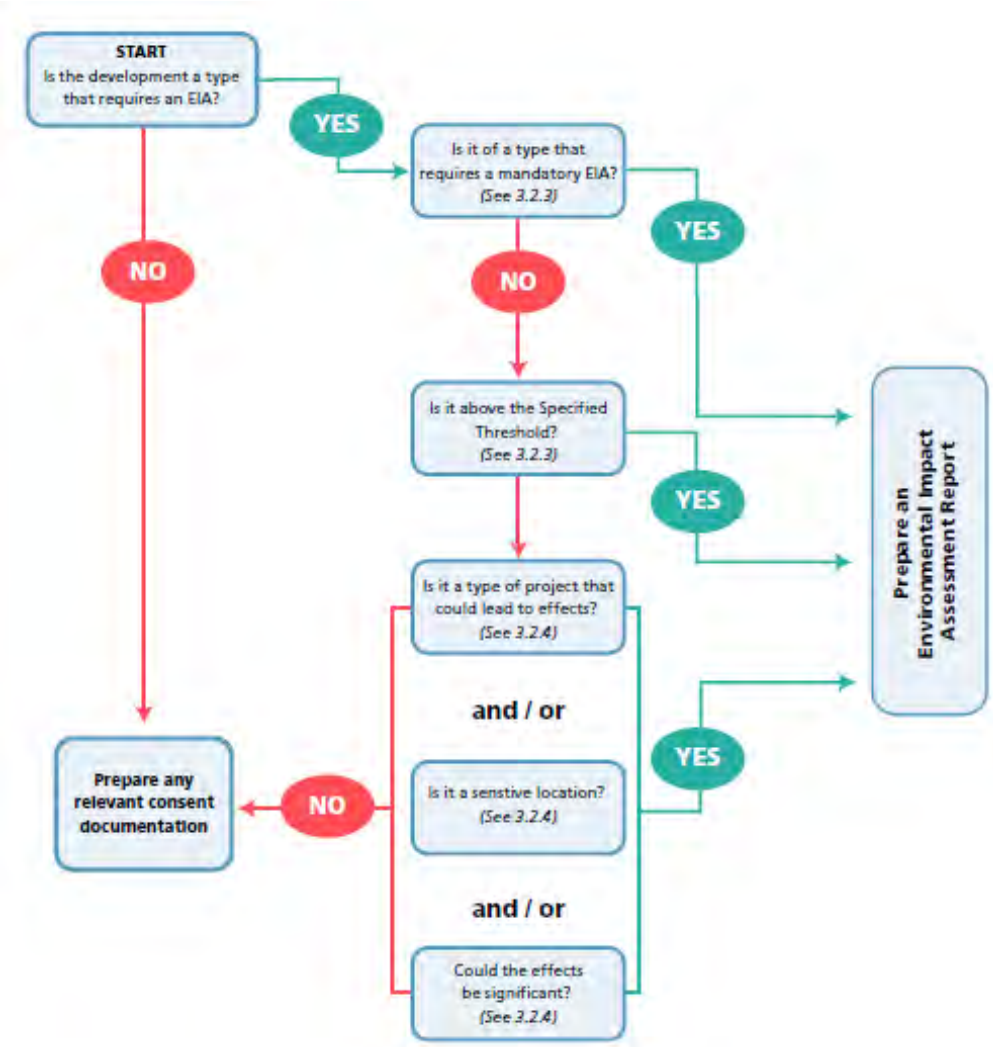
The process of EIA is set out in the EPA EIAR Guidelines, this document should be read in conjunction with and used as supplementary guidance to the EPA EIAR Guidelines. The process for ascertaining whether an EIAR is required is known as 'screening' and the process to determine the breath and scope of an EIAR is known as 'scoping'. Guidance on this can be found in Section 3.2 of the EPA Guidelines.

Screening

Through EIA Screening, developments are either considered as requiring an EIAR due to the project type or because they exceed a threshold level. The screening process begins by establishing whether the proposal is a 'project' as understood by the Directive (as amended).

The prescribed development types and thresholds are set out in Annex I and II of the EIA Directive as transposed into Schedule 5 of the Planning and Development Regulations 2010-2018 (as amended). Development which does not exceed these thresholds but may require an EIAR are called sub threshold. Sub-Threshold considerations are outlined in Schedule 7 of European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018) as transposed from Annex III of the Directive. The Guidelines on Environmental Impact Assessment Reports note that projects at first glance may not appear to come under the Schedule but on closer examination when the process is further examined, they may do so because of the sensitivity or significance of the receiving environment etc. Sub threshold developments require an EIAR if they are likely to have significant environmental impacts and must undergo assessment for likely significant impacts through an EIAR screening report. The contents of a screening report for subthreshold development are contained in Annex III of the EIA Directive.

Figure 1: EIAR Screening Process



(Taken from Fig 3.2 of the EPA Guidelines)

Tourism locations should be identified as sensitive receptors in screening assessments for particular impacts, depending on scale and sensitivity, as they would in a full EIAR. Section 6 below can act as guidance for Screening Reports as well as for full EIAR.

The screening process for considering where an EIAR is necessary, is summarised above in Figure 1 (excerpted from Figure 3.2 of the EPA Guidelines).

Strategic Environmental Assessment (SEA) is a more strategic level of environmental assessment that examines plans, policies, objectives and programmes specifically rather than projects. For some tourism developments it may be more appropriate that they be examined through SEA, while individual projects or specific proposals are likely to be more assessed through EIAR. If a project is part of a plan, programme or policy/objective assessed by SEA there may still be a requirement for an EIAR for that development (subject to EIA Screening assessment).

EIAR Scoping

Scoping an EIAR is an opportunity to look at the breadth of issues and ensure that any areas of possible significant impact are assessed. Identifying sensitivities and stakeholders should take account of tourism facilities and consider Fáilte Ireland in scoping requests where necessary.

4. Assessing Tourism

There is no legal definition of 'tourism' in Irish legislation. The UNWTO definition of sustainable tourism is *"Tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities"*. This is widely accepted as a key definition of tourism as we move to a more sustainable future.

Tourism assessments are frequently carried out by economic consultants and by specific tourism consultants. It is always advisable, particular for tourism projects, that suitably qualified and experienced personnel are used to determine the impact of tourism related projects or to assess the impact of more general proposals on a tourism asset identified in a particular location. There is a requirement for EIAR under current legislation to contain a statement of competency within all EIAR documents, including screening and scoping reports.

Projects which involve a tourism element

Tourism projects are wide ranging and diverse. While there are some projects which cater to tourism and are easily identified as such - Hotels, Museums, etc. there are other projects where tourism is a key service or element, but which may not be immediately obvious – walking/cycling/forest trails, greenways, blueways, community facilities and others. EIAR conducted for developments containing tourist elements should be completed in accordance with the current guidance from the EPA.

Projects which include a tourism element can have potential for particular environmental effects which differ from a non-tourism development. These impacts can be intermittent, event related, inconsistent, dependent on weather, temporal, temporary or seasonal. This is considered within the prescribed environmental topics for EIAR outlined in Section 7 below.

Projects which may have an impact upon tourism

While tourism projects may be diverse, the projects which can impact tourism are considerably more wide ranging, from large infrastructural developments to local energy developments. Disruption to or suppression of a tourist resource or amenity can have very local or more strategic impacts, directly or indirectly- for example energy projects in a rural area can have both a negative and positive impact in different regards. There can be temporary, periodic or even seasonal impacts occurring during construction or operational periods.

According to the Fáilte Ireland Tourism Facts 2019 Report, the most important factors in determining the attractiveness of tourism destinations for visitors to Ireland are;

- Beautiful Scenery and Unspoiled Environment
- Hospitality
- Safety
- Nature, Wildlife and Natural Attractions
- History and Culture

- Pace of Life

These factors used for the promotion of tourism in Ireland are also barometers of sensitivity to change in tourism sensitive or dominant locations where development may have an impact upon the tourism asset. The potential for development to impact these sensitivities, and the environmental criteria under which they can be considered, are identified in section 7 of the guidelines.

5. Guiding Principles of EIAR

As outlined in the EPA EIAR Guidelines, the fundamental principles to be followed when preparing an EIAR, including screening and scoping, are:

- Anticipating, avoiding and reducing significant effects
- Assessing and mitigating effects
- Maintaining objectivity
- Ensuring clarity and quality
- Providing relevant information to decision makers
- Facilitating better consultation.

Environmental assessment should be undertaken in accordance with the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018.

6. Consideration of Competency and Qualifications

As per Section 2.5 of the EPA Guidelines, EIAR is required to be completed by '*competent experts*'.

Contributors to the preparation of environmental impact assessment reports, including screening and scoping assessments, should be qualified and competent. Sufficient expertise, in the relevant field of the project concerned, is required for the purpose of its examination by the competent authorities in order to ensure that the information provided by the developer is complete and of a high level of quality so that a full and proper assessment can be undertaken.

For tourism related projects, or projects likely to affect tourism assets, competent experts in the area of tourism should be utilised in the environmental assessment.

The competency of all involved in the production of an EIAR or any related report (e.g. Screening and scoping) is required to be stated at the beginning of the EIAR report with further details as necessary in each following chapter.

Where tourism projects involve for example heritage or cultural components, input from heritage consultants, conservation architects, or historians may be required.

7. EIAR Requirements

The following are the key requirements for an EIAR under the current guidance. This is not a definitive list and should be read in conjunction with regulations.

- project description;
- assessment of alternatives considered;
- baseline assessment;
- assessment of effects;
- cumulative impact;
- interaction of impacts;
- mitigation & monitoring; and
- residual impacts

Project Description

Project descriptions are required to describe the whole project including site, scale, design and key factors. It is important that the EIAR and design team have a consistent understanding of the development description in full. The key requirements are outlined in section 3.5 of the EPA Guidelines however they identify the following;

- the location of the project
- the physical characteristics of the whole project
- the main characteristics of the operational phase of the project
- an estimate, by type and quantity, of the expected residues and emissions

The location of the project should include identifying key sensitive receptors (including tourism receptors). In the operational phase of the project any tourism based, or potentially tourism related activity, should be identified.

Assessment of Alternatives

The assessment of the various reasonable alternatives is an important requirement of the EIA process.

Where tourism projects are location dependent the assessment of reasonable alternatives should consider alternative methods, layouts, technologies and mitigations, detail the key considerations culminating in the selection of the option/design, the reasoning for these and the environmental effect of these decisions. This is particularly important for tourism projects which are often location tied. The EPA EIAR Guidelines indicate that it is generally sufficient to provide a broad description of each main alternatives and the key issues associated with each, showing how environmental considerations were taken into account in deciding on the selected option.

Baseline Assessment

Baseline descriptions are evidence based, current descriptions of environmental characteristics with consideration of likely changes to the baseline environment evidenced in planning histories, unimplemented permissions, and applications pending determination. Baseline assessments should identify any tourism sensitivities in the zone of influence of a development. This zone of influence of a development is highly dependent on its **Context, Character, Significance,** and **Sensitivity**, as outlined in the EPA EIAR Guidelines. These characteristics apply to both the development and the environment.

For example, in a tourism context;

The location of sensitive tourism resources that are likely to be directly affected should be highlighted, and other premises which although located elsewhere, may be the subject of in combination impacts such as alteration of traffic flows or increased urban development.

The character of an area from a tourism perspective should be described and the principal types of tourism in the area. Where relevant, the specific environmental resources or attributes in the existing environment which each group uses or values should be stated and where relevant, indicate the time, duration or seasonality of any of those activities.

The significance of the tourism assets or activities likely to be affected should be highlighted. Reference to any existing formal or published designation or recognition of such significance should be included. Where possible the value of the contribution of such tourism assets and activities to the local economy should also be provided.

If there are any significant concerns or opposition to the development known to exist among tourism stakeholders and interest groups, this should be highlighted. Identify, where possible, the particular aspect of the development which is of concern, together with the part of the existing tourism resource which may be threatened or impacted.

In addition, the baseline should include any methodologies employed in the study to obtain information, if particular databases are used to locate sensitive receptors they should be acknowledged. In relation to tourism information, the suggested information sources at the end of this document are a non-exhaustive list which may be of assistance in identifying tourism receptors.

Impact Assessment

The topics for consideration of impact are prescribed in the EIA Directive and transcribed into Irish law by the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018). Impact assessment should contain the likely significant effects of a development arising from both construction and operation of a development. Advice on describing the effects is contained within the EPA EIAR Guidelines and includes the **quality, significance, extent, probability, type** and **duration** of the effect, with particular descriptors for each. In describing effects upon tourism receptors these descriptors should take account of the particular aspects and sensitivities of tourism, for example a temporary annual effect from a development may have different impacts upon tourism if it falls at peak season rather than off-peak.

Impact assessment should be carried out as per EPA guidelines and the best practice for that prescribed topic. It may be considered appropriate to consider impact on tourism under the 'Population and Human Health' and / or 'Landscape' topics as suggested below.

Population and Human Health

The consideration of tourism projects within the Population and Human Health is extensive, with impacts ranging from rural employment population impacts of seasonal tourism, to the health impact of air pollution from increased traffic in urban areas.

The impact upon tourism can be considered within this section through the sensitivities of Hospitality, Safety and Pace of Life. Changes in population can impact the perception of pace of life or safety in a particular location. Impacts upon these issues in areas which rely heavily on tourism or have a particular sensitive tourism generator should be considered in this section. The EPA guidelines makes reference to amenity *"..which may be relevant under 'Population and Human Health' and 'Landscape'"*.

Biodiversity

Particular tourist activities can have a significant impact upon biodiversity. Landscapes which are 'unspoiled' can be attractors of tourism. However, the disturbance to ecology must be managed to minimise impacts.

Biodiversity is also a tourism asset and should be protected as such from other development and should be provided for in proposals where possible.

The assessment should also consider current Government policy on nature conservation as outlined in the National Biodiversity Action Plan 2017-2021 (NBAP) (and subsequent iterations (Including draft NBAP recently open for public consultation, to cover 2023 to 2027) which also includes Ireland's vision for biodiversity below.

'That biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally.'

Land, Soils and Geology

A link between tourism and this prescribed environmental factor, beyond the normal development impacts, is rare, however particular activities or facilities which use geological features may have an impact upon soils and geology, such as mountain biking trails, recreational uses of old quarries etc.

The impact upon Geotourism related to geoheritage within the natural environment, e.g., any impacts on UNESCO Global Geoparks, of which we currently have three on the island of Ireland; Copper Coast in Co. Waterford, Burren and Cliffs of Moher in Co. Clare, and Cuilcagh Lakelands in Cavan and Fermanagh should be considered (where applicable) in this section.

Indirect impacts such as material use for extensive landscaping and public realm should also be considered.

Water

Tourism uses can be water intense, depending on development type. Recreational use of a surface water feature, water-based leisure centres etc have different impacts to standard development.

Air Quality and Climate

Tourism impact upon air quality is dependent on the activity proposed and sensitivity of the location. If the tourism project includes a large increase in transportation services, collection of baseline air emission data is advised. Transportation emissions affect not only air quality, but also greenhouse gases. Changing climatic patterns due to climate change should be factored into this analysis.

Noise and Vibration

A link between tourism and this prescribed environmental factor, beyond the normal development impacts, is rare, however the impact upon tourism of issues of noise and vibration can be significant. Construction adjoining hotels for example should consider the sensitivity of the development and ensure mitigation is in place.

Material Assets; Traffic and Transport

The different transport patterns associated with tourism activities is a key impact of tourism and should be considered especially for tourism projects. These produce temporal and seasonal changes on the norm and specialist consideration and interpretation should be given. Tourism proposals should, where possible, be well served by public transport and should be accessible by modes other than the car. The impact of traffic on tourism assets can be substantial and can vary in severity according to season, the weather, etc. The impact of construction traffic can be a particular concern in tourism sensitive areas in terms of noise pollution and visual impact. The construction programme of developments should work to

avoid peak tourism periods in tourism areas and should consider planned or anticipated tourism events and festivals.

Cultural Heritage

Cultural heritage can be a key component of tourism projects and the impact of tourism on the maintenance of cultural heritage should be given the utmost consideration, whether positive or negative. As a tourism attraction, cultural heritage should be strongly considered in non-tourism developments and the impact upon tourism considered as a potential impact.

Archaeology

Archaeology can be of tourism interest and can be an attractive or key component of tourism projects. Archaeology can be a tourism attractor and given that national policy emphasis on the non-renewable nature of the archaeology and archaeological heritage, focus should be a presumption in favour of its preservation in-situ or where preservation in-situ is not the option chosen, there must be preservation by record (i.e. archaeological excavation and recording must take place) in line with statutory requirements.

Material Assets; Waste Management

Tourism is a resource heavy activity and can impact waste streams and waste segregation. Impacts here should be considered strongly and with knowledge of the variation that arises from the particular tourist activity. Waste and Waste disposal issues can also impact the perception of an unspoiled environment, effecting tourism, which should be considered.

Material Assets

Material assets outside of the material assets already referenced that should be considered are built services (utilities) and infrastructure. Tourism development should include impact assessment on built services (utilities) and infrastructure while non tourism related development should consider the effect on tourism, which should be considered.

Landscape

The visual impact of a tourism development, especially in locations which are visually sensitive or renowned for their scenic or landscape beauty, should be considered carefully. A development intended to utilise or enjoy a particular vista or environment should minimise impact upon that environment.

Major Accident and Natural Disaster

There is a requirement for tourist developments to describe expected significant effects on the environment of the proposed development's vulnerability to major accidents and/or natural disasters relevant to it. Where appropriate measures should be identified to prevent or mitigate the significant adverse effects of such accidents or disasters, including resulting from climate change, on the environment and detail the preparedness for the proposed response.

Interaction of Impacts

Where two or more environmental impacts combine or interact they should be considered under the prescribed topics. It is best practice to provide a table of interactions within an EIAR or EIA Screening Report.

Cumulative Impact

The cumulative impact is that of the project combined with any known likely project which will interact or compound an environmental impact.

Transboundary Impact

Transboundary impacts should be included in EIAR. In the case of tourism, especially international travel, the transboundary impacts may not be proximate to the EIAR site.

Mitigation & Monitoring

Mitigation should follow the hierarchy of minimisation in descending order of preference- Avoid, Reduce, Remedy.

Avoid sensitive tourism resources- such as views, access and amenity areas including habitats as well as historical or cultural sites and structures.

Reduce the exposure of sensitive resources to excessive environmental impact.

Reduce the adverse effects to tourism land uses and patterns of activities, especially through interactions arising from significant changes in the intensity of use or contrasts of character or appearance.

Remedy any unavoidable significant residual adverse effects on tourism resources or activities.

Mitigation measures must be measurable and achievable within the bounds of the project.

With regard to Monitoring, Article 8a of the EIA Directive requires that:

1. 'The decision to grant development consent shall incorporate at least the following information …
(b) any environmental conditions attached to the decision, a description of any features of the project and/or measures envisaged to avoid, prevent or reduce and, if possible, offset significant adverse effects on the environment as well as, where appropriate, monitoring measures. … 4 Member States shall ensure that the features of the project and/or measures envisaged to avoid, prevent or reduce and, if possible, offset significant adverse effects on the environment are implemented by the developer, and shall determine the procedures regarding the monitoring of significant adverse effects on the environment. The type of parameters to be monitored and the duration of the monitoring shall be proportionate to the nature, location and size of the project and the significance of its effects on the environment. Existing monitoring arrangements resulting from Union legislation other than this Directive and from national legislation may be used if appropriate, with a view to avoiding duplication of monitoring.'

Residual Impacts

The residual impacts are the final predicted or intended impacts which occur after the proposed mitigation measures have been implemented.

8. Sources of information on Tourism

Information available online

Fáilte Ireland

Fáilte Ireland offers detailed research analysis and insights into the Irish Tourism Industry. The National Tourism Development Authority has a portfolio of research across a number of areas including facts and figures, Environmental Surveying and Monitoring, briefing papers and reports and visitor feedback. The Fáilte Ireland website has a dedicated research library which can be accessed here

Fáilte Ireland also manages an environmental surveying and monitoring database as part of the Wild Atlantic Way Operational Programme which can be accessed here. The purpose of this is to work with and demonstrate to our stakeholders and partners that we are committed to the sustainable development of the Wild Atlantic Way, and to be able to pre-empt and avoid environmental effects in the future should they occur.

Discover Ireland:

Operated by Fáilte Ireland, the Discover Ireland website includes comprehensive information on tourist attractions in destinations all around Ireland, including listings for activities, accommodation, events and experiences for every county, major town and region in Ireland. The website features elements from the four destination brands – Wild Atlantic Way, Ireland's Ancient East, Ireland's Hidden Heartlands and Visit Dublin and can be accessed here.

Tourism Ireland

Tourism Ireland is responsible for marketing the island of Ireland overseas as a holiday and business tourism destination. Tourism Ireland publishes a range of research documents including; visitor facts and figures, seasonal updates and industry insights which are accessible here

Local Authorities

Local Authorities are an invaluable source of information. They produce tourism strategies and audits of tourism assets within their jurisdiction. Local authorities will also produce landscape and seascape studies. Protected views and prospects as well as the record of protected structures and other designated protected buildings are contained within the Statutory Development Plans.

Regional Assemblies

Regional Assemblies can also be consulted on high level strategic tourism and potential Regional Spatial and Economic Strategies (RSESs) should be consulted.

Central Statistics Office

The Central Statistics Office (CSO) is Ireland's national statistical office and their purpose is to impartially collect, analyse and make available statistics about Ireland's people, society and economy. The Tourism and Travel Section of the Central Statistics Office is the major source for tourism statistics in Ireland and is updated regularly.

From: DECC Planning No fica ons
Sent: Friday 11 October 2024 10:53
To: Morgan Valvik
Subject: RE: EIS 24/345 - Derrybrien Windfarm Decommissioning Project, Co Galway
A achments: 2024-10-11 GSI Submission.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Caution: This is an external email and may be malicious. Please take care when clicking links or opening attachments.

Dear Morgan,

Please see a ached a submission on behalf of Geological Survey Ireland (a division of the Department of the Environment, Climate and Communica ons) with regard to the subject en ty.

Please send an acknowledgement of receipt to PlanningNo fica ons@decc.gov.ie at your earliest convenience.

Many thanks,
Luke Thompson

Luke Thompson, Administrative Officer
Planning Advisory Division

An Roinn Comhshaoil, Aeráide agus Cumarsáide
Department of the Environment, Climate and Communications

Teach Tom Johnson, Bóthar Haddington, Baile Átha Cliath, D04 K7X4
Tom Johnson House, Haddington Road, Dublin, D04 K7X4

PlanningNotifications@decc.gov.ie

From: Morgan Valvik <mvalvik@mkoireland.ie>
Sent: Tuesday, September 24, 2024 4:37 PM
To: DECC GSI Planning <GSIPlanning@GSI.ie>
Cc: Thomas Blackwell <tblackwell@mkoireland.ie>; Patricia Smullen (DECC) <Trish.Smullen@gsi.ie>
Subject: Scoping Request: 220437 & 240450 Derrybrien Windfarm Decommissioning Project

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Dear Ms. Smullen,

Please find a ached to this email a cover le er, Environmental Impact Assessment (EIA) Scoping Document, and a remedial Environmental Impact Assessment (rEIA) Scoping Document for the "Derrybrien Windfarm Decommissioning Project."

The exis ng Derrybrien wind farm site is located in the northern part of the Slieve Aughty Mountains, Co. Galway and encompasses seventy (70 no.) Vestas V52-850kW wind turbines, an onsite wind farm substa on (Derrybrien Substa on), two met masts, a grid connec on comprising of a 110kV Overhead line (approximately 7.8km long) and an 110kV substa on at Agannygal connec ng the wind farm to the Na onal Grid.

Gort Windfarms Ltd intends to apply for planning permission for the "Derrybrien Windfarm Decommissioning Project" which comprises two elements:

1. the carrying out of physical works to decommission specific features of the exis ng Derrybrien Wind Farm (the Prospec ve Development); and
2. the proposed 'reten on' in situ of other specific features of the exis ng development (i.e. the Retained Development).

A planning applica on will be submi ed to An Bord Pleanála for consent for the Prospec ve Development under Sec on 37L of the Planning and Development Act, 2000 (as amended). The planning applica on will be accompanied by an Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) as required by the Board, in rela on to the Prospec ve Development. Furthermore, a subsequent applica on will be made to An Bord Pleanála for subs tute consent for the Retained Development under Sec on 177E of the Planning and Development Act, 2000 (as amended). The subs tute consent applica on will be accompanied by a Remedial EIAR and Remedial NIS.

As part of the scoping exercise for the Derrybrien Windfarm Decommissioning Project, we would welcome any comments in rela on to the Prospec ve Development and Retained Development.

If you have any queries, please do not hesitate to come back to me. Thank you for your me and a en on.

Kind regards,
Morgan.

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An Roinn Comhshaoil, Aeráide agus Cumarsáide
Department of the Environment, Climate and Communications

Geological Survey
Suirbhéireacht Gheolaíochta
Ireland | Éireann

Morgan Valvik
MKO
9c Beckett Way,
Park West Business Park,
Dublin 12, D12 XN9W

08 October 2024

Re: Scoping Document for Derrybrien Windfarm Decommissioning Project, Co. Galway
Your Ref: 220437 & 240450
Our Ref: 24/345

Dear Morgan,

Geological Survey Ireland is the national earth science agency and is a division of the Department of the Environment, Climate and Communications. We provide independent geological information and interpretation and gather various data for that purpose. Please see our website for data availability.

With reference to your email received on the 30 September 2024, concerning the Scoping Document for Derrybrien Windfarm Decommissioning Project, Co. Galway, we recommend using our various data sets when conducting the EIAR, SEA, planning and scoping processes for developments, plans and policies. For more detailed information on how to access this data please access 'Data and Maps' Data & Maps (gsi.ie) on our 'Geoscience for planning' webpage. Use of our data or maps should be attributed correctly (please refer to each individual dataset's metadata for correct attribution).

For specific data available for Environmental Assessment and Planning topics please follow this link [Data by Environmental Assessment and Planning Topic (gsi.ie)], where you will find our data arranged by environmental assessment topic as illustrated below:

Land and soils
Soil • Subsoils (Quaternary Geology) • Tellus Geochemistry • Geotechnical *Geology* • Bedrock • Geophysics • Bedrock & Quaternary 3D

Water
Groundwater • Aquifers GW vulnerability, GWPSs (GWPPs) *Surface water* • Tellus Geochemistry *Estuarine & marine waters* • Marine and coastal *Flooding* • GWClimate • Karst

Climate Change
Carbon accounting / Carbon balance • Geothermal • Carbon capture and storage *Climate change trends* • National coastal change assessment

Cultural Heritage
Archaeology • Cherish *Underwater Archaeology* • Shipwrecks

Material Assets
Built Services • Natural resources (Minerals & Aggregates) • Active quarries

The Landscape
Landscape Appearance & Character • Physiographic units *Historical landscapes* • Historic mines

Other Relevant Data		
Natural (Geo) hazards • Landslide Susceptibility Mapping • Groundwater flooding • Coastal vulnerability • Subsidence • Radon	*Natural heritage* • Geoheritage (County Geological Sites) • Dimension Stone/Stone Built Ireland	

Other Comments

Should development go ahead, all other factors considered, Geological Survey Ireland would much appreciate a copy of reports detailing any site investigations carried out. The data would be redacted for confidentiality and added to Geological Survey Ireland's national database of site investigation boreholes, implemented to provide a better service to the civil engineering sector. Data can be sent to the Geological Mapping Unit, at mailto:GeologicalMappingInfo@gsi.ie.

If we can be of any further help, please do not hesitate to contact me Clare Glanville, or my colleague Trish Smullen at GSIPlanning@gsi.ie.

Yours sincerely,

Dr. Clare Glanville
Senior Geologist
Geoheritage and Planning Programme
Geological Survey Ireland

Trish Smullen
Geologist
Geoheritage and Planning Programme
Geological Survey Ireland

The publicly available data referenced/presented here, should in no way be construed as Geological Survey Ireland support for or objection to the proposed development or plan. The data are made freely available to all and can be used as independent scientific data in assessments, plans or policies. It should be noted that in many cases these data are a baseline or starting point for further site specific assessments.

From: Eve Smith
Sent: Monday 14 October 2024 11:59
To: Morgan Valvik
Cc: Niamh Kelly; Peho Galway
Subject: FW: Scoping Request: 220437 & 240450 Derrybrien Windfarm Decommissioning Project

---

You don't often get email from eve.smith@hse.ie. Learn why this is important

Caution: This is an external email and may be malicious. Please take care when clicking links or opening attachments.

Dear Morgan

I have reviewed the submi ed scoping documents for decommissioning and have nothing further to add.

NEHS will assess the EIAR when it comes in in accordance to the protec on of public health.

Kind regards
Eve

Eve Smith
Oifigeach Sláinte Comhshaoil | Environmental Health Officer
Environment/Climate Change, Network Support Unit (NSU)

Seirbhís Sláinte Comhshaoil, Ospidéal Pobail an Chloic Liath, Bóthar Ghaoth Dobhair IAn Clochán Liath,Leitir Ceanainn, Co.Dhún Na NGall F94 Y326

Environmental Health Officer, Environmental Health Service, Dungloe Community Hospital, Letterkenny Co. Donegal. F94 Y326

087 2671962 | 074 9561206 | Eve.smith@hse.ie

From: Morgan Valvik <mvalvik@mkoireland.ie>
Sent: Tuesday 24 September 2024 16:45
To: Environmental Health <environmental.health@hse.ie>; Peho Galway <PEHO.Galway@hse.ie>
Cc: Thomas Blackwell <tblackwell@mkoireland.ie>
Subject: Scoping Request: 220437 & 240450 Derrybrien Windfarm Decommissioning Project

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Dear Sir/Madam,

Please find a ached to this email a cover le er, Environmental Impact Assessment (EIA) Scoping Document, and a remedial Environmental Impact Assessment (rEIA) Scoping Document for the "Derrybrien Windfarm Decommissioning Project."

The exis ng Derrybrien wind farm site is located in the northern part of the Slieve Aughty Mountains, Co. Galway and encompasses seventy (70 no.) Vestas V52-850kW wind turbines, an onsite wind farm substa on (Derrybrien Substa on), two met masts, a grid connec on comprising of a 110kV Overhead line (approximately 7.8km long) and an 110kV substa on at Agannygal connec ng the wind farm to the Na onal Grid.

Gort Windfarms Ltd intends to apply for planning permission for the "Derrybrien Windfarm Decommissioning Project" which comprises two elements:

1. the carrying out of physical works to decommission specific features of the exis ng Derrybrien Wind Farm (the Prospec ve Development); and
2. the proposed 'reten on' in situ of other specific features of the exis ng development (i.e. the Retained Development).

A planning applica on will be submi ed to An Bord Pleanála for consent for the Prospec ve Development under Sec on 37L of the Planning and Development Act, 2000 (as amended). The planning applica on will be accompanied by an Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) as required by the Board, in rela on to the Prospec ve Development. Furthermore, a subsequent applica on will be made to An Bord Pleanála for subs tute consent for the Retained Development under Sec on 177E of the Planning and Development Act, 2000 (as amended). The subs tute consent applica on will be accompanied by a Remedial EIAR and Remedial NIS.

As part of the scoping exercise for the Derrybrien Windfarm Decommissioning Project, we would welcome any comments in rela on to the Prospec ve Development and Retained Development.

If you have any queries, please do not hesitate to come back to me. Thank you for your me and a en on.

Kind regards,
Morgan.

Morgan Valvik
Graduate Environmental Scientist
MKO
9c Beckett Way, Park West Business Park,
Dublin 12, D12 XN9W

Offices in Galway and Dublin
mkoireland.ie | +353 (0)91 735 611

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"Tá an fhaisnéis sa ríomhphost seo (ceangaltáin san áireamh) faoi rún. Baineann sé leis an té ar seoladh chuige amháin agus tá sé ar intinn go bhfaighfidh siadsan amháin é agus gurb iadsan amháin a dhéanfaidh breithniú air. Más rud é nach tusa an duine ar leis

é, tá cosc iomlán ar aon fhaisnéis atá ann, a úsáid, a chraobhscaoileadh, a scaipeadh, a nochtadh, a fhoilsiú, ná a chóipeáil . Seains gurb iad tuairimí pearsanta an údar atá san ríomhphost agus nach tuairimí FSS iad.

Má fuair tú an ríomhphost seo trí dhearmad, bheadh muid buíoch dá gcuirfeá in iúil don Deasc Seirbhísí ECT ar an nguthán ag +353 818 300300 nó ar an ríomhphost chuig service.desk@hse.ie agus ansin glan an ríomhphost seo ded' chóras."

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If this email has been received by you in error we would be grateful if you could immediately notify the ICT Service Desk by telephone at +353 818 300300 or by email to service.desk@hse.ie and thereafter delete this e-mail from your system"

From: Colin Hedderly
Sent: Wednesday 25 September 2024 12:25
To: Morgan Valvik
Cc: Thomas Blackwell
Subject: RE: Scoping Request: 220437 & 240450 Derrybrien Windfarm Decommissioning Project

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Hi Morgan,
I have reviewed the attached documents. The windfarm is remote from the railway so the proposals have no effect on the railway.

Should there be any movement of abnormal loads in the vicinity of the railway during the decommissioning please make contact with me again.

Regards,

Colin Hedderly
Senior Track & Structures Engineer, Iarnród Éireann/Irish Rail, CCE Dept,
Old Railway Station, Grace Road, Athlone, Co. Westmeath, N37 C573.

Mobile: 087 9681735 E-mail: colin.hedderly@irishrail.ie

From: Morgan Valvik <mvalvik@mkoireland.ie>
Sent: Tuesday, September 24, 2024 4:47 PM
To: Colin Hedderly <Colin.Hedderly@irishrail.ie>
Cc: Thomas Blackwell <tblackwell@mkoireland.ie>
Subject: Scoping Request: 220437 & 240450 Derrybrien Windfarm Decommissioning Project

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Dear Mr Hedderly,

Please find a ached to this email a cover le er, Environmental Impact Assessment (EIA) Scoping Document, and a remedial Environmental Impact Assessment (rEIA) Scoping Document for the "Derrybrien Windfarm Decommissioning Project."

The exis ng Derrybrien wind farm site is located in the northern part of the Slieve Aughty Mountains, Co. Galway and encompasses seventy (70 no.) Vestas V52-850kW wind turbines, an onsite wind farm substa on (Derrybrien Substa on), two met masts, a grid connec on comprising of a 110kV Overhead line (approximately 7.8km long) and an 110kV substa on at Agannygal connec ng the wind farm to the Na onal Grid.

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1. the carrying out of physical works to decommission specific features of the exis ng Derrybrien Wind Farm (the Prospec ve Development); and
2. the proposed 'reten on' in situ of other specific features of the exis ng development (i.e. the Retained Development).

A planning applica on will be submi ed to An Bord Pleanála for consent for the Prospec ve Development under Sec on 37L of the Planning and Development Act, 2000 (as amended). The planning applica on will be accompanied by an Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) as required by the Board, in rela on to the Prospec ve Development. Furthermore, a subsequent applica on will be made to An Bord Pleanála for subs tute consent for the Retained Development under Sec on 177E of the Planning and Development Act, 2000 (as amended). The subs tute consent applica on will be accompanied by a Remedial EIAR and Remedial NIS.

As part of the scoping exercise for the Derrybrien Windfarm Decommissioning Project, we would welcome any comments in rela on to the Prospec ve Development and Retained Development.

If you have any queries, please do not hesitate to come back to me. Thank you for your me and a en on.

Kind regards,
Morgan.

Morgan Valvik
Graduate Environmental Scientist

MKO
9c Beckett Way, Park West Business Park,
Dublin 12, D12 XN9W

Offices in Galway and Dublin
mkoireland.ie | +353 (0)91 735 611

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From: Christophe O'BRIEN
Sent: Friday 4 October 2024 12:28
To: Morgan Valvik
Cc: Thomas Blackwell; Planning
Subject: RE: Scoping Request: 220437 & 240450 Derrybrien Windfarm Decommissioning Project

---

Follow Up Flag: Follow up
Flag Status: Flagged

Some people who received this message don't often get email from christophe.obrien@iaa.ie. Learn why this is important

Caution: This is an external email and may be malicious. Please take care when clicking links or opening attachments.

Good a. ernoon Morgan,

Thank you for your email in rela□on to the scoping exercise for the Derrybrien Windfarm Decommissioning Project.

The Authority has no specific requirements for incorpora□on into the scoping.

When the formal planning applica□on is submi□ed to ABP, the Authority will provide the general observa□ons in rela□on to no□fica□on with at least 30 days of any proposed cranes for the decommissioning of the wind farm.

When the process of decommissioning is complete, we would request that the developer advise the Authority which will allow for the steps to be taken to remove the decommissioned wind farm from the aeronau□cal datasets and charts in due course.

Best Regards,

Christophe

Christophe O'Brien
Aerodromes Inspector
M: +353 (0) 86 33 22022|
E: obrienc@iaa.ie | www.iaa.ie
The Times Building, 11-12 D'Olier Street, Dublin 2, D02 T449

IAA ÚDARÁS EITILTÍOCHTA NA hÉIREANN
IRISH AVIATION AUTHORITY

From: Morgan Valvik <mvalvik@mkoireland.ie>
Sent: Tuesday 24 September 2024 16:50
To: Planning <planning@iaa.ie>
Cc: Thomas Blackwell <tblackwell@mkoireland.ie>; Christophe O'BRIEN <Christophe.OBRIEN@IAA.ie>

Subject: Scoping Request: 220437 & 240450 Derrybrien Windfarm Decommissioning Project

*** This message originated from outside the Irish Avia on Authority. Please treat hyperlinks, a achments and instruc ons in this email with cau on. ***

Dear Mr. O'Brien,

Please find a ached to this email a cover le er, Environmental Impact Assessment (EIA) Scoping Document, and a remedial Environmental Impact Assessment (rEIA) Scoping Document for the "Derrybrien Windfarm Decommissioning Project."

The exis ng Derrybrien wind farm site is located in the northern part of the Slieve Aughty Mountains, Co. Galway and encompasses seventy (70 no.) Vestas V52-850kW wind turbines, an onsite wind farm substa on (Derrybrien Substa on), two met masts, a grid connec on comprising of a 110kV Overhead line (approximately 7.8km long) and an 110kV substa on at Agannygal connec ng the wind farm to the Na onal Grid.

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As part of the scoping exercise for the Derrybrien Windfarm Decommissioning Project, we would welcome any comments in rela on to the Prospec ve Development and Retained Development.

If you have any queries, please do not hesitate to come back to me. Thank you for your me and a en on.

Kind regards,
Morgan.

Morgan Valvik
Graduate Environmental Scientist
MKO
9c Beckett Way, Park West Business Park,
Dublin 12, D12 XN9W

Offices in Galway and Dublin
mkoireland.ie | +353 (0)91 735 611

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From: IWT Info
Sent: Tuesday 1 October 2024 09:41
To: Morgan Valvik
Subject: Re: Scoping Request: 220437 & 240450 Derrybrien Windfarm Decommissioning Project

---

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Dear Morgan,

Thank you for contacting us. We do not have the staff capacity to respond to this consultation at the moment but we will endeavour to respond if possible.

Kind regards,
Fabiola Vieira

On Tue, 24 Sept 2024 at 16:58, Morgan Valvik <mvalvik@mkoireland.ie> wrote:

> Dear Ms Vieira,
>
> Please find attached to this email a cover letter, Environmental Impact Assessment (EIA) Scoping Document, and a remedial Environmental Impact Assessment (rEIA) Scoping Document for the “Derrybrien Windfarm Decommissioning Project.”
>
> The existing Derrybrien wind farm site is located in the northern part of the Slieve Aughty Mountains, Co. Galway and encompasses seventy (70 no.) Vestas V52-850kW wind turbines, an onsite wind farm substation (Derrybrien Substation), two met masts, a grid connection comprising of a 110kV Overhead line (approximately 7.8km long) and an 110kV substation at Agannygal connecting the wind farm to the National Grid.
>
> Gort Windfarms Ltd intends to apply for planning permission for the “Derrybrien Windfarm Decommissioning Project” which comprises two elements:
>
> 1. the carrying out of physical works to decommission specific features of the existing Derrybrien Wind Farm (the Prospective Development); and
> 2. the proposed 'retention' in situ of other specific features of the existing development (i.e. the Retained Development).
>
> A planning application will be submitted to An Bord Pleanála for consent for the Prospective Development under Section 37L of the Planning and Development Act, 2000 (as amended). The planning application will be accompanied by an Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) as required by the Board, in relation to the Prospective Development. Furthermore, a subsequent application will be made to An Bord Pleanála for substitute consent for the Retained Development under Section 177E of the Planning and Development Act, 2000 (as amended). The substitute consent application will be accompanied by a Remedial EIAR and Remedial NIS.

As part of the scoping exercise for the Derrybrien Windfarm Decommissioning Project, we would welcome any comments in relation to the Prospective Development and Retained Development.

If you have any queries, please do not hesitate to come back to me. Thank you for your time and attention.

Kind regards,
Morgan.

Morgan Valvik
Graduate Environmental Scientist
MKO
9c Beckett Way, Park West Business Park,
Dublin 12, D12 XN9W

Offices in Galway and Dublin
mkoireland.ie | +353 (0)91 735 611

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Irish Wildlife Trust, 8 Cabra Road, Dublin 7, D07T1W2
Registered Charity (CRA) Number: 20010966
Facebook: IrishWildlifeTrust
Twitter: @irishwildlife
Phone: 01 445 7259 (landline available Wednesday-Thursday 9:30 to 5pm)

From: Datarequests
Sent: Monday 21 October 2024 16:06
To: Morgan Valvik
Subject: RE: Scoping Request: 220437 & 240450 Derrybrien Windfarm Decommissioning Project

---

Caution: This is an external email and may be malicious. Please take care when clicking links or opening attachments.

Hi Morgan,

I am sorry to inform you that we have no water and sewer data in the requested area.

Please note: As we receive our data from the Local Authority, they may have informa on that we have not received. You should contact them directly for more informa on.

Kind regards,
Raoni Gouveia

GIS Officer
Asset Intelligence – Data Request Team

Uisce Éireann
Teach Colvill, 24-26 Sráid Thalbóid, Baile Átha Cliath, Éire
Irish Water
Colvill House, 24-26 Talbot Street, Dublin, Ireland

Datarequests@water.ie

From: Morgan Valvik <mvalvik@mkoireland.ie>
Sent: Friday, October 18, 2024 10:26 AM
To: Datarequests <Datarequests@water.ie>
Subject: RE: Scoping Request: 220437 & 240450 Derrybrien Windfarm Decommissioning Project

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Hi,

Apologies, can I just get maps of Water Distribu on and Sewer Network in PDF format?

Kind regards,
Morgan.

Morgan Valvik
Environmental Scientist
MKO
9c Beckett Way, Park West Business Park,
Dublin 12, D12 XN9W

Offices in Galway and Dublin

Hi,

I'd like to request Water Distribu on **and** Sewer Network in .shp format. I've a ached the red line boundary for the project above and the Non-disclosure agreement.

Kind regards,
Morgan.

Morgan Valvik
Environmental Scientist
MKO
9c Beckett Way, Park West Business Park,
Dublin 12, D12 XN9W

Offices in Galway and Dublin
mkoireland.ie | +353 (0)91 735 611

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From: Datarequests <Datarequests@water.ie>
Sent: Thursday 26 September 2024 13:51
To: Morgan Valvik <mvalvik@mkoireland.ie>
Subject: RE: Scoping Request: 220437 & 240450 Derrybrien Windfarm Decommissioning Project

Caution: This is an external email and may be malicious. Please take care when clicking links or opening attachments.

Dear Morgan Valvik,

Thank you for contac ng Data Requests.

Data Requests supply records of Uisce Eireann infrastructure in GIS format (i.e. **shp**, .**gdb**, .**tab**, or .**dwg**). If you only need to visualise the network we can also supply **PDF** maps.

Due a large number of new requests every day, we can provide only 1 format of data.

Uisce Eireann have no informa on on pipes within a private property, it should be shown on the deeds of a property or should have been provided by the purchasers surveyor at me of purchase.

Uisce Eireann have responsibility for the Water Distribu on and Sewer Network, the Local Authority have responsibility for the storm water drains (Surface Water), you should check with them if you need this informa on.

For maps of Water Distribu on and/or Sewer Network in **PDF** format please ignore the NDA form and reply sta ng you only require **PDF** maps for your loca on.

If you wish to proceed to acquire GIS digital data, we ask that you complete a Non Disclosure Agreement Form (1b - a ached). In Appendix (Page 4) Sec ons a-h of this form can you please ensure that all sec ons are completed as per the outline shown in the a ached guide. If a sec on is not relevant indicate this. Can you also ensure that you detail the nature of the data that you require, for example Water Distribu on **and/or** Sewer Network in .dwg, .tab or .shp format (please refer to the a ached guide 1a to assist you).

To speed up the process we ask that you send us a **digital GIS polygon(s) (.dwg - 2013 or lower versions or .shp in ING) that outlines the extent and loca on of the area(s) that you require data.** This is used to extract the GIS Digital data that you require.

Please Note:

1. Uisce Eireann is responsible for issuing Water & Wastewater **digital** data and will issue the data in **one format only** (.shp, .gdb, .tab, .dwg or .pdf).
2. Local Authori es are responsible for maintaining and issuing Stormwater data. Uisce Eireann does not issue Stormwater data.

A ached **1b. Non-Disclosure Agreement Form** must be **signed by hand.** Please complete all required sec ons, namely **a to h, Descrip on of Data, and Appendix A**. This is a legally binding document, therefore all sec ons must be completed, please refer to a ached 1a) Guide to comple ng Non-Disclosure Agreement.

Disclaimers: Any maps produced using Uisce Eireann data require the appropriate disclaimer as outlined in the relevant a achment (1a).

Please Note: The average turnaround me for processing requests is 2 weeks or 10 working days, provided you have adhered to the requirements set out above.

Due to the large volume of data requests received daily, incomplete or inaccurately completed forms will result in delays to issuing data. Consequently, the sole responsibility lies with the requestor to ensure that the above guidelines are adhered to and relevant documenta on is submi ed.

Should you have any ques ons in rela on to the above please do not hesitate to get in contact.

Kind regards,
Raoni Gouveia

GIS Officer
Asset Intelligence – Data Request Team

Uisce Éireann
Teach Colvill, 24-26 Sráid Thalbóid, Baile Átha Cliath, Éire
Irish Water
Colvill House, 24-26 Talbot Street, Dublin, Ireland

Datarequests@water.ie

From: Morgan Valvik <mvalvik@mkoireland.ie>
Sent: Tuesday, September 24, 2024 5:10 PM
To: Planning <Planning@water.ie>; Datarequests <Datarequests@water.ie>
Cc: Thomas Blackwell <tblackwell@mkoireland.ie>
Subject: Scoping Request: 220437 & 240450 Derrybrien Windfarm Decommissioning Project

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Dear Sir/Madam,

Please find a ached to this email a cover le er, Environmental Impact Assessment (EIA) Scoping Document, and a remedial Environmental Impact Assessment (rEIA) Scoping Document for the "Derrybrien Windfarm Decommissioning Project."

The exis ng Derrybrien wind farm site is located in the northern part of the Slieve Aughty Mountains, Co. Galway and encompasses seventy (70 no.) Vestas V52-850kW wind turbines, an onsite wind farm substa on (Derrybrien Substa on), two met masts, a grid connec on comprising of a 110kV Overhead line (approximately 7.8km long) and an 110kV substa on at Agannygal connec ng the wind farm to the Na onal Grid.

Gort Windfarms Ltd intends to apply for planning permission for the "Derrybrien Windfarm Decommissioning Project" which comprises two elements:

1. the carrying out of physical works to decommission specific features of the exis ng Derrybrien Wind Farm (the Prospec ve Development); and
2. the proposed 'reten on' in situ of other specific features of the exis ng development (i.e. the Retained Development).

A planning applica on will be submi ed to An Bord Pleanála for consent for the Prospec ve Development under Sec on 37L of the Planning and Development Act, 2000 (as amended). The planning applica on will be accompanied by an Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) as required by the Board, in rela on to the Prospec ve Development. Furthermore, a subsequent applica on will be made to An Bord Pleanála for subs tute consent for the Retained Development under Sec on 177E of the Planning and Development Act, 2000 (as amended). The subs tute consent applica on will be accompanied by a Remedial EIAR and Remedial NIS.

As part of the scoping exercise for the Derrybrien Windfarm Decommissioning Project, we would welcome any comments in rela on to the Prospec ve Development and Retained Development.

If you have any queries, please do not hesitate to come back to me. Thank you for your me and a en on.

Kind regards,
Morgan.

Morgan Valvik
Graduate Environmental Scientist
MKO
9c Beckett Way, Park West Business Park,
Dublin 12, D12 XN9W

Offices in Galway and Dublin
mkoireland.ie | +353 (0)91 735 611

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Thank you for your attention.

From: Sabine Browne
Sent: Friday 27 September 2024 09:27
To: Morgan Valvik
Cc: Thomas Blackwell
Subject: RE: Scoping Request: 220437 & 240450 Derrybrien Windfarm Decommissioning Project

---

Caution: This is an external email and may be malicious. Please take care when clicking links or opening attachments.

Good morning Morgan,

This is not within any Zone of Influence of our waterways so we will not be commenting.

Kind regards,

Sabine Browne

From: Morgan Valvik <mvalvik@mkoireland.ie>
Sent: Tuesday, September 24, 2024 5:11 PM
To: Sabine Browne <Sabine.Browne@waterwaysireland.org>
Cc: Thomas Blackwell <tblackwell@mkoireland.ie>
Subject: Scoping Request: 220437 & 240450 Derrybrien Windfarm Decommissioning Project

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Gort Windfarms Ltd intends to apply for planning permission for the "Derrybrien Windfarm Decommissioning Project" which comprises two elements:

1. the carrying out of physical works to decommission specific features of the exis ng Derrybrien Wind Farm (the Prospec ve Development); and
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As part of the scoping exercise for the Derrybrien Windfarm Decommissioning Project, we would welcome any comments in rela on to the Prospec ve Development and Retained Development.

If you have any queries, please do not hesitate to come back to me. Thank you for your me and a en on.

Kind regards,
Morgan.

Morgan Valvik
Graduate Environmental Scientist
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APPENDIX 2-2

INFORMATION LEAFLET

Gort Windfarms Limited a wholly owned subsidiary of ESB

Public Information Event:

DECOMMISSIONING OF THE DERRYBRIEN WIND FARM

Gort Windfarms Limited, a wholly owned subsidiary of ESB, plan to decommission the Derrybrien Wind Farm, in consultation with the relevant planning authorities and in accordance with planning laws and regulations.

Gort Windfarms Limited will host a Public Information Event where you can find out more information on the decommissioning plans.

The Public Information Event will be attended by the project developers and environmental experts. Join us to understand the scope and timeline of the decommissioning process, learn about measures to mitigate the environmental impact during and after decommissioning, and engage with project team leads to address any concerns and queries.

Date: 16th September 2024

Time: 3- 8pm

Location: Gort Community Centre

Address: Ennis Rd, Lavally, Gort, Co. Galway, H91 K7YA

We look forward to discussing the project with you.

If you have any questions in advance of the Public Information Event, please contact the project's Community Liaison Officer David Linnane at david.linnane@esb.ie

CONTACT US :
Email: david.linnane@esb.ie
Website: www.derrybrienwindfarm.ie

APPENDIX 2-3

PUBLIC CONSULTATION NOTICE BOARDS

PROJECT HISTORY

Where is the Derrybrien Wind Farm Located?

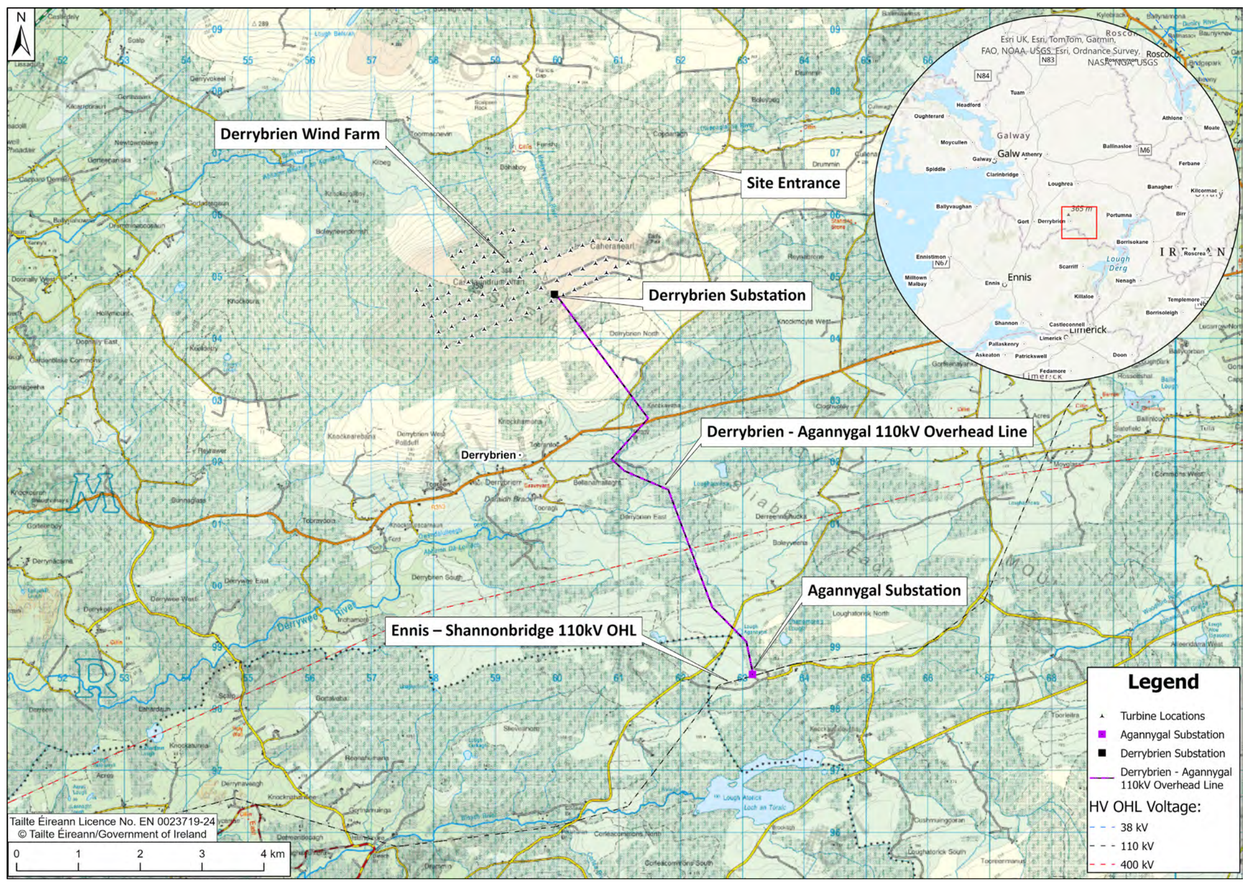
Derrybrien Wind Farm is located in County Galway in the northern part of the Slieve Aughty Mountains Special Protection Area [004168] approximately 11 km due south of Loughrea, 12.7 km north northeast of Gort and 24 km west of Portumna. Galway City lies some 35 km to the northwest of the wind farm site. The wind farm site is in the south of the county approximately 4.6 km from the border with County Clare and 21 km from the border with County Tipperary in the southeast.

What is the Derrybrien Wind Farm?

The Derrybrien Wind Farm, which ceased commercial operation in 2022, consists of 70 turbines and associated infrastructure, including: access roads, hardstands, peat repositories, an on-site substation, an overhead power line, and the Agannygal substation which connects the wind farm to the national electricity transmission system. Derrybrien Wind Farm has three distinct elements.

They are:

- The Derrybrien Wind Farm Site (including the Derrybrien 110kV Substation)
- Derrybrien to Agannygal 110kV Overhead Line (OHL)
- Agannygal Substation.



WHAT IS THE HISTORY OF THE DERRYBRIEN WIND FARM?

1998-2001
Planning Permission was obtained.

June 2003
Construction of the Windfarm commenced.

October 2003
A peatslide event occured. Engineering response implemented. Construction work was halted.

End of 2005
Construction work on the Wind Farm recommenced.

2006-2022
The windfarm was operational and producing renewable energy.

3rd July 2008
1st Ruling: CJEU (European Union court of Justice) found that Ireland failed to comply with the Environmental Impact assessment (EIA) directive.

12th November 2019
2nd Ruling: The CJEU found that Ireland had failed to take all measures to comply with 2008 decision.

23rd July 2020
On foot of the CJEU judgement and the legislative provisions set out under section 177B of the 2000 Act, Galway City Council directed Gort Windfarms Ltd. to seek substitute consent for the development.

21st August 2020
Application for Substitute Consent made to An Bord Pleanála.

4th February 2022
An Bord Pleanála refuses the Substitute Consent Application, meaning that the development is unauthorised. Commercial operation was paused.

March 2022
ESB announced that it was ceasing commercial electricity production at the Derrybrien Wind Farm site.

June 2024
Galway County Council issued ESB with an enforcement notice.

WHAT IS PROPOSED FOR THE DERRYBRIEN WIND FARM NOW?

Decommissioning of the Derrybrien Wind Farm is necessary following the decision by An Bord Pleanála to refuse substitute consent for the wind farm in February 2022, making the wind farm an unauthorised development. The Derrybrien Windfarm Decommissioning Project' comprises two types of "development" which are set out as follows:

- the carrying out of physical works to decommission specific features of the existing Derrybrien Wind Farm Project (the "Prospective Development"); and
- the retention in situ of other specific features of the existing development (the "Retained Development").

What will be removed from the site?

The Prospective Development is summarised as follows:

- Enabling works to facilitate the decommissioning of the Derrybrien Windfarm.
- Decommissioning and removal of the Derrybrien Wind Farm and associated ancillary components. The decommissioning works include the removal of the above-ground structures only leaving certain features in situ.
- Decommissioning and removal of the Derrybrien Wind Farm grid connection comprising Derrybrien-Agannygal 110 kV Overhead Line (7.8 km) and Agannygal Substation connecting into the Ennis-Shannonbridge 110 kV Overhead Line.
- Reinstatement of the Ennis-Shannonbridge 110kV Line.

The decommissioning works will include:

- De-energising of the site, which will involve initial disconnection of turbines, low voltage (LV) components followed by disconnection of high voltage (HV) elements;
- Temporary widening of the Turbary Road and certain sections of turning heads;
- Controlled dismantling of 70 no. turbines (blades, nacelle, and tower) and 2no. anemometer lattice masts;
- Controlled removal of electrical equipment from Derrybrien substation and demolition of substation building.
- Destringing of the overhead line conductor.
- Removal of the overhead line infrastructure (34 no. double wood pole structures and 8 no. masts).
- Controlled removal of Agannygal substation and demolition of control building.
- Controlled removal of standby generator (bunded) and diesel tank, external lighting poles, lightning mast.
- Removal of palisade fencing surrounding the Agannygal substation.
- Reinstatement of the Ennis-Shannonbridge 110kV Line.

What will be retained at the site?

The features of the Retained Development, to remain in situ in perpetuity after the Prospective Development has been completed are listed below:

Derrybrien Windfarm including the Derrybrien 110kV Substation

- Reinforced concrete foundations for 70no. wind turbines.
- Reinforced concrete foundations of structures within the Derrybrien Substation compound.
- Reinforced concrete foundations of 2no. Anemometer masts.
- Approx. 17.5km of access tracks and 70no. hardstand areas
- Underground Electrical and communications cabling.
- 3no. Borrow Pits / Quarries
- Naturalised Peat Repository areas
- Onsite Drainage Infrastructure.

Derrybrien to Agannygal 110 kV OHL and Agannygal 110kV Substation

- Concrete foundations for 34no. double wooden pole sets.
- Reinforced concrete foundations for 2no. end masts.
- Reinforced concrete foundations for 5no. angle masts.
- Reinforced concrete foundations for 1no. intermediate mast.
- Reinforced concrete foundations of structures within the Agannygal Substation compound.

Off-site Features constructed in response to the peat slide

- Barrage 1 and Coillte Access Track:
- Barrage 2 and Repository Area:
- Barrage 3 and Repository Area
- Barrage 4
- Repository Area at the Black Road Bridge
- Minor repairs work to instream structures/bridges - at Black Road Bridge, Flaggy Bridge, the Farmer's Track / Culvert, Crooked Bridge and Stepping Stones.
- Minor borrow pits used to source material,
- Drainage works.

WHAT IS INCLUDED IN AN ENVIRONMENTAL IMPACT ASSESSMENT REPORT?

An Environmental Impact Assessment Report (EIAR) will be prepared for this project as part of the prospective application. The EIAR contains an assessment of potential effects on the environment associated with the proposed decommissioning works. The EIAR provides technical information to An Bord Pleanála to support it in carrying out its Environmental Impact Assessment as part of the prospective element of the Derrybrien Windfarm Decommissioning Project.

A Remedial Environmental Impact Assessment Report (rEIAR) will also be prepared to assess effects on the environment that have already taken place as a result of the elements of the wind farm that will be retained. The rEIAR will accompany the application for the Retained Development. The rEIAR is to provide technical information to An Bord Pleanála to support it in carrying out its remedial Environmental Impact Assessment as part of the retained element of the Derrybrien Windfarm Decommissioning Project.

Structure of the EIAR and rEIAR Reports

The EIAR and rEIAR will be publicly accessible and will address the following environmental headings:

1. Introduction
2. Background to the Proposed Development
3. Consideration of Reasonable Alternatives
4. Description of the Proposed Development
5. Population and Human Health
6. Biodiversity (Terrestrial and Avian Ecology)
7. Biodiversity (Aquatic Ecology and Fisheries)
8. Land, Soils and Geology
9. Water (Hydrology and Hydrogeology)
10. Air and Climate
11. Noise and Vibration
12. Cultural Heritage
13. Landscape and Visua l
14. Material Assets (including Traffic and Transport, Telecommunications and Aviation)
15. Risk of Major Accidents and Natural Disasters
16. Resource and Waste Management
17. Interactions of the Foregoing
18. Schedule of Mitigation Measures

WHAT HAPPENS NEXT?

Detailed environmental studies are continuing across the site including ecology, hydrology, noise, and landscape and visual assessments. These studies will be compiled into an Environmental Impact Assessment Report (EIAR) and Remedial Environmental Impact Assessment Report (rEIAR) which will accompany the respective planning applications. The Derrybrien Windfarm Decommissioning Project will also undergo the process of Appropriate Assessment; thus, the respective planning applications will also be accompanied by a Natura Impact Statement (NIS) and remedial NIS.

The results of these studies, along with feedback gathered through consultation with local communities and stakeholders, will be considered as part of the assessment process and in the preparation of the EIAR and rEIAR.

Consultations with An Bord Pleanála as part of pre-planning meetings

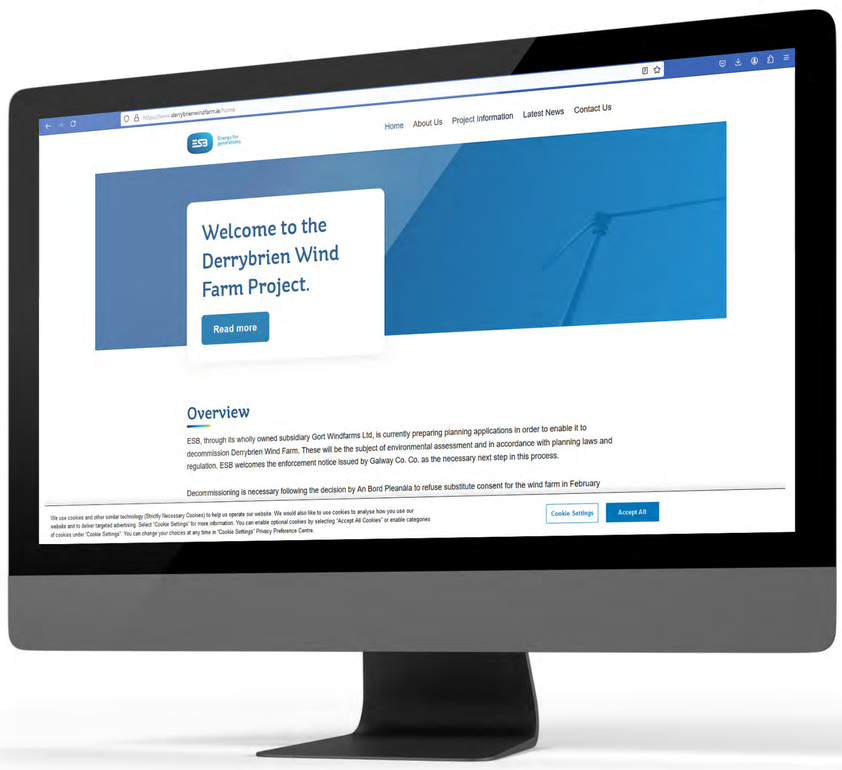
Gort Windfarms Limited plans to submit planning applications for the Derrybrien Windfarm Decommissioning Project.

Contact details:

Please visit our project website which we are keeping updated as the project progresses
www.derrybrienwindfarm.ie

We welcome your feedback on our proposals and encourage you to contact us with any questions, concerns or comments through our dedicated Community Liaison Officer through the details provided below:

Email: david.linnane@esb.ie
Address: Gort Windfarms Ltd,
27 Fitzwilliam Street,
Dublin 2,
D02 KT92
Ireland



APPENDIX 3-1

ASSESSMENT OF ALTERNATIVES SUB-OBJECTIVES

No	Topic	Sub-Objective	Score	Score Description	Example
1A	Population & Human Health	Provide employment for the local community	+3	Very Significant / Profound (+)	Potential for creation of new industry in the locality creating direct and indirect employment opportunities (>500) as a result of the proposed development.
			+2	Significant (+)	Potential for permanent increases in direct and indirect employment opportunities (>100) as a result of the proposed development
			+1	Slight/ Moderate (+)	Potential for temporary increases in employment opportunities
			0	Neutral / Imperceptible	No change in employment opportunities for the local community
			-1	Slight/ Moderate (-)	Potential for short term, disruption, disturbance and nuisance impacts on the local community workforce.
			-2	Significant (-)	Potential for medium to long term reduction in employment opportunities.
			-3	Very Significant / Profound (-)	Potential for permanent loss of industry in the locality.
1B	Population & Human Health	Minimise Risk to human health and risk to life within the local community	+3	Very Significant / Profound (+)	Very Significant Improvement in human health and a reduction of risk to life within the local community
			+2	Significant (+)	Significant Improvement in human health and a reduction of risk to life within the local community
			+1	Slight/ Moderate (+)	Slight / Moderate improvement in the human health and risks to the local community
			0	Neutral / Imperceptible	No change in the human health and risks to life the local community
			-1	Slight/ Moderate (-)	Potential for very temporary disturbance and nuisance impacts to the local community including impacts on human health.
			-2	Significant (-)	Potential for short to medium term disturbance and nuisance impacts to the local community including impacts on human health.
			-3	Very Significant / Profound (-)	Potential for permanent disturbance and nuisance impacts to the local community including impacts on human health. Potential for short, medium or long term increase in risk to life.
2A	Biodiversity (Terrestrial Ecology and Avian)	Preserve, protect, maintain and where possible enhance nature conservation and protected species or	+3	Very Significant / Profound (+)	Potential for very significant / profound increase in the area of and abundance of natural fauna, flora and habitats
			+2	Significant (+)	Potential for significant increase in the area of and abundance of natural fauna, flora and habitats
			+1	Slight/ Moderate (+)	Potential for slight / moderate enhancement of, or restoration of, existing natural fauna, flora and habitats.
			0	Neutral / Imperceptible	No impacts on any natural fauna, flora or habitats at any geographical scale of importance.
			-1	Slight/ Moderate (-)	Potential for impacts to natural fauna, flora and habitats at a site-level geographical scale of importance. Temporary loss of species and habitats that may re-establish in the short term.

No	Topic	Sub-Objective	Score	Score Description	Example
		other known species of conservation concern.	-2	Significant (-)	Potential for impacts to natural fauna, flora and habitats at a site-level geographical scale of importance. Temporary loss of species and habitats that may re-establish in the long term.
			-3	Very Significant / Profound (-)	Potential for impacts to natural fauna, flora and habitats at geographical scale of importance. Permanent loss of species and habitats.
2B	Biodiversity (Aquatic Ecology & Fisheries)	Minimise impacts on the surface water quality/ fisheries.	+3	Very Significant / Profound (+)	Potential for very significant / profound increases to surface water quality and abundance of fisheries in nearby water courses
			+2	Significant (+)	Potential for significant increases to surface water quality and abundance of fisheries in nearby water courses
			+1	Slight/ Moderate (+)	Potential for slight/moderate increases to surface water quality and abundance of fisheries in nearby water courses
			0	Neutral / Imperceptible	No impact to surface water quality/fish populations in nearby watercourse
			-1	Slight/ Moderate (-)	Potential for slight/moderate decreases in surface water quality and abundance of fisheries in nearby water courses. Temporary displacement of species and habitats that may re-establish in the medium term.
			-2	Significant (-)	Potential for significant decreases in surface water quality and abundance of fisheries in nearby water courses.
			-3	Very Significant / Profound (-)	Potential for very significant/profound decreases in surface water quality and abundance of fisheries in nearby water courses.
3A	Land, Soils Geology	Minimise impacts to local land use practices	+3	Very Significant / Profound (+)	Very significant/profound positive improvements on land use and site conditions such as improved access, drainage, public amenity, or site improvement to facilitate new agricultural or commercial activity
			+2	Significant (+)	Significant positive improvements on land use and site conditions such as improved access, drainage, public amenity, or site improvement to facilitate new agricultural or commercial activity.
			+1	Slight/ Moderate (+)	Slight/moderate positive improvements on land use and site conditions.
			0	Neutral / Imperceptible	No change to existing land use or site conditions
			-1	Slight/ Moderate (-)	Slight /moderate negative changes to land use and site conditions.
			-2	Significant (-)	Significant changes to site conditions that restrict land use potential such as restricted access, poor drainage, loss of public amenity, or site degradation to restrict new or existing agricultural or commercial activity.
			-3	Very Significant / Profound (-)	Very significant/profound changes to site conditions that restrict land use potential such as restricted access, poor drainage, loss of public amenity, or site degradation to restrict new or existing agricultural or commercial activity.

No	Topic	Sub-Objective	Score	Score Description	Example
3B	Land, Soils Geology	Minimise impacts to Soils and Geology	+3	Very Significant / Profound (+)	Very Significant / Profound improvements to peat stability such as rockfill barrages or drainage to reduce the risk of a large scale peat slide. Moderate to significant reduction in volume of peat excavation or loss of peat habitat (e.g. by covering or by oxidisation due to exposure or groundwater lowering).
			+2	Significant (+)	Significant improvements to peat stability such as rockfill barrages or drainage to reduce the risk of a large scale peat slide. Moderate to significant reduction in volume of peat excavation or loss of peat habitat (e.g. by covering or by oxidisation due to exposure or groundwater lowering).
			+1	Slight/ Moderate (+)	Slight / Moderate improvements to peat stability to reduce the risk of localised peat failures or slightly reduce the risk of a large-scale peat slide. Slight reduction in volume of peat excavation or loss of peat habitat.
			0	Neutral / Imperceptible	Preserve existing stable ground and groundwater conditions. No reduction or increase in volume of peat excavation or loss of peat habitat.
			-1	Slight/ Moderate (-)	Slight / Moderate impacts that increase the risk of localised peat instability or slightly increase the risk of a large-scale peat slide. Slight / Moderate increase in volume of peat excavation or loss of peat habitat.
			-2	Significant (-)	Significant impacts that increase the risk of a large peat slide – typically involving temporary or permanent surcharge loading on virgin peat or adverse drainage conditions in medium to high risk areas. Significant increase in volume of peat excavation or loss of peat habitat (e.g. by covering or by oxidisation due to exposure or groundwater lowering).
			-3	Very Significant / Profound (-)	Very Significant – Profound significant impacts that increase the risk of a large scale peat slide – typically involving temporary or permanent surcharge loading on virgin peat or adverse drainage conditions in medium to high risk areas. Very significant / profound increase in volume of peat excavation or loss of peat habitat (e.g. by covering or by oxidisation due to exposure or groundwater lowering).
4A	Hydrology and Hydrogeology	No negative impacts on flood risk management activity	+3	Very Significant / Profound (+)	Potential for project to very significantly/ profoundly contribute to regional flood risk management
			+2	Significant (+)	Potential for project to contribute significantly to regional flood risk management.
			+1	Slight/ Moderate (+)	Potential for project to contribute slight to moderately to localised flood risk management.
			0	Neutral / Imperceptible	No change in flood risk.
			-1	Slight/ Moderate (-)	Potential for slight to moderated increased flood risk to localised areas
			-2	Significant (-)	Potential for significant increase in flood risk regionally
			-3	Very Significant / Profound (-)	Potential for very significant / profound increase in flood risk regionally
4B	Hydrology and	No negative impacts on	+3	Very Significant / Profound (+)	Potential for regional improvement of groundwater quality.
			+2	Significant (+)	Potential for localised improvement of groundwater quality.

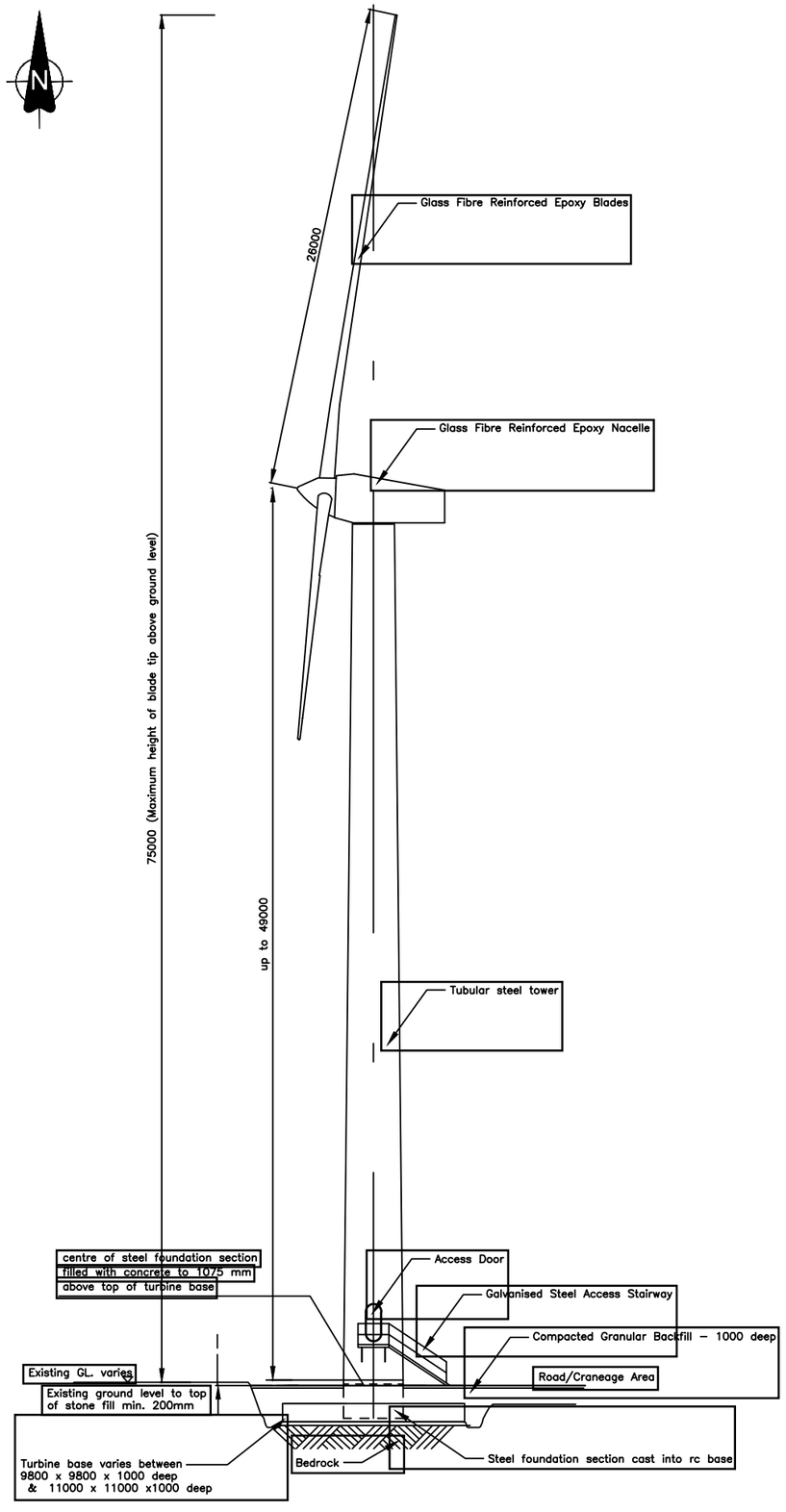
No	Topic	Sub-Objective	Score	Score Description	Example
	Hydrogeology	groundwater.	+1	Slight/ Moderate (+)	Potential for very localised improvement of groundwater quality.
			0	Neutral / Imperceptible	No impacts to groundwater quality
			-1	Slight/ Moderate (-)	Potential for localised, short term or infrequent negative impacts on groundwater quality
			-2	Significant (-)	Increased potential for frequent negative impacts on groundwater quality
			-3	Very Significant / Profound (-)	Increased potential for permanent negative impacts on groundwater quality
5A	Air Quality,	Minimise impact on air quality in the area	+3	Very Significant / Profound (+)	Potential for very significant / profound reduction in the air pollution to the area
			+2	Significant (+)	Potential for significant reduction in the air pollution to the area
			+1	Slight/ Moderate (+)	Potential for slight/moderate reductions to air pollution to the area
			0	Neutral / Imperceptible	No change in air quality in the area
			-1	Slight/ Moderate (-)	Potential for temporary or infrequent breaches of air quality thresholds, not impacting the local community
			-2	Significant (-)	Potential for temporary or infrequent breaches of air quality thresholds, potentially impacting the local community
			-3	Very Significant / Profound (-)	Potential for regular breaches of air quality thresholds, impacting the local community
6A	Noise & Vibration	Minimise noise and vibration impact in the area	+3	Very Significant / Profound (+)	Potential for very significant / profound reductions in noise and vibration impacts to the area.
			+2	Significant (+)	Potential for significant reductions in noise and vibration impacts to the area.
			+1	Slight/ Moderate (+)	Potential for slight/moderate reductions in noise and vibration impacts to the area
			0	Neutral / Imperceptible	No change in noise and vibration impacts in the area
			-1	Slight/ Moderate (-)	Potential for temporary or infrequent breaches of noise and vibration thresholds, not impacting the local community
			-2	Significant (-)	Potential for temporary or infrequent breaches of noise and vibration thresholds, potentially impacting the local community.
			-3	Very Significant / Profound (-)	Potential for regular breaches of noise and vibration thresholds, impacting the local community.
7A	Cultural Heritage	Avoid loss of or damage to heritage features	+3	Very Significant / Profound (+)	Potential for increased protection / preservation of several heritage features.
			+2	Significant (+)	Potential for significant improvement on the setting of several heritage features through the uncovering of heritage features of international or national significance.
			+1	Slight/ Moderate (+)	Potential for slight / moderate improvement on the setting of heritage features through the uncovering of heritage features of regional significance.
			0	Neutral / Imperceptible	No loss or damage to known heritage features.
			-1	Slight/ Moderate (-)	Potential for the loss of or damage to important heritage features of local significance.
			-2	Significant (-)	Potential for the loss of or damage to important heritage features of regional significance.

No	Topic	Sub-Objective	Score	Score Description	Example
			-3	Very Significant / Profound (-)	Potential for the loss of or damage to important heritage features of international or national significance.
8A	Landscape & Visual	Protect, and where possible enhance, the landscape character and visual amenity in the vicinity of the development .	+3	Very Significant / Profound (+)	Potential enhancement of designated landscapes and scenic views, the landscape and visual amenity. Many receptors
			+2	Significant (+)	Potential localised improvement of landscape and visual amenity. Several receptors.
			+1	Slight/ Moderate (+)	Very localised improvement of landscape and visual amenity. Small number of receptors.
			0	Neutral / Imperceptible	No impacts on the landscape quality and visual amenity
			-1	Slight/ Moderate (-)	Potential short term / disturbance impacts on local views and the local landscape. Small number of receptors.
			-2	Significant (-)	Potential localised negative impacts on and deterioration of the landscape and visual amenity. Several receptors
			-3	Very Significant / Profound (-)	Potential negative impacts on and deterioration of the landscape and visual amenity. Many receptors
9A	Material Assets	Protect existing material assets and infrastructure	+3	Very Significant / Profound (+)	Potential for very significant / profound development of new material assets and infrastructure of national importance
			+2	Significant (+)	Potential for significant development of new material assets and infrastructure of regional importance.
			+1	Slight/ Moderate (+)	Potential for minor improvements to existing material assets and infrastructure of local importance
			0	Neutral / Imperceptible	No impacts to existing material assets and infrastructure.
			-1	Slight/ Moderate (-)	Short term disturbance impacts during decommissioning work to existing material assets and infrastructure. Loss of existing material assets and infrastructure of local importance.
			-2	Significant (-)	Loss of existing material assets and infrastructure of regional importance
			-3	Very Significant / Profound (-)	Loss of existing material assets and infrastructure of national importance
9B	Material Assets (Traffic)	Minimise disruption to traffic	+3	Very Significant / Profound (+)	Potential for very significant improvement to traffic movements and a very significant reduction in traffic congestion in the local area
			+2	Significant (+)	Potential for significant improvement to traffic movements and a significant reduction in traffic congestion in the local area
			+1	Slight/ Moderate (+)	Potential for slight improvement to traffic movements and a reduction in traffic congestion in the local area
			0	Neutral / Imperceptible	No change in Traffic movements in the area
			-1	Slight/ Moderate (-)	Potential for temporary or infrequent delays, not likely to impact the local community
			-2	Significant (-)	Potential for temporary or infrequent delays, potentially impacting the local community

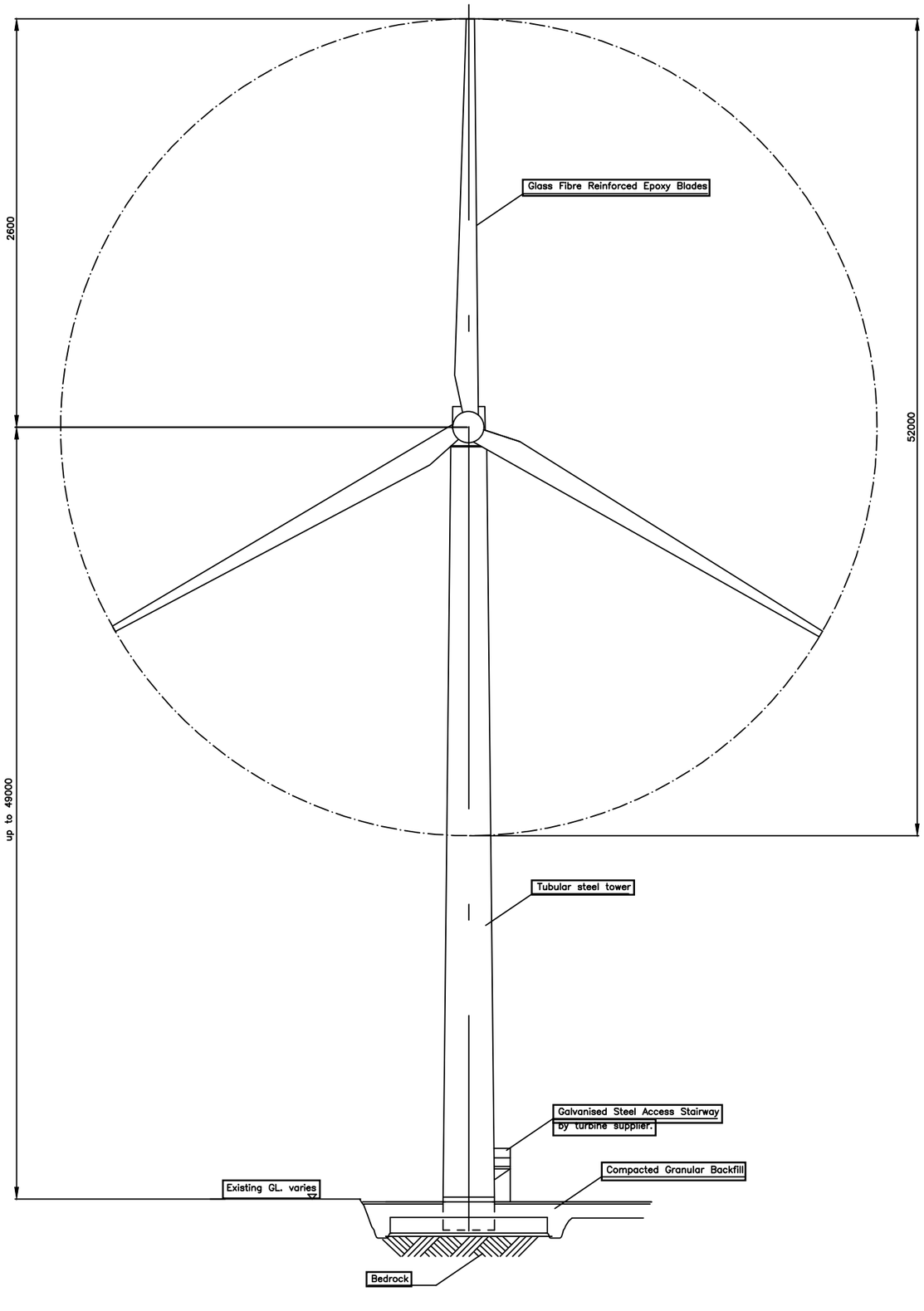
No	Topic	Sub-Objective	Score	Score Description	Example
			-3	Very Significant / Profound (-)	Potential for temporary and frequent delays impacting the local community
10A	Waste & Resource Management	Minimise the generation of waste	+3	Very Significant / Profound (+)	Waste arisings from the project are predominantly reused elsewhere.
			+2	Significant (+)	Waste arisings from the project re predominantly segregated and sent for composting, recycling or for further segregation and sorting at a materials recovery facility.
			+1	Slight/ Moderate (+)	Waste arisings from the project are predominantly reused on site or at an appropriately licensed or registered exempt site elsewhere
			0	Neutral / Imperceptible	No generation of waste. All inert materials reused onsite.
			-1	Slight/ Moderate (-)	Generation of small/ moderated quantities of inert waste which is managed for disposal using methods lower down the Waste Hierarchy (e.g. landfill)
			-2	Significant (-)	Generation of large quantities inert waste which are managed for disposal using methods lower down the waste hierarchy (e.g. landfill)
			-3	Very Significant / Profound (-)	Generation of large quantities of hazardous and inert waste which are managed for disposal using methods lower down the waste hierarchy (e.g. landfill)

APPENDIX 4-1

DRAWINGS ASSOCIATED WITH DERRYBRIEN WIND FARM



Side Sectional Elevation
Scale 1:200



Front Sectional Elevation
Scale 1:200

NOTES:

1. All dimensions are in millimetres - figured dimensions to be taken in preference to scaled dimensions.

REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP
0	04.08.20	Issued for substitute consent	E.O'S	E.O'S	P.K	J.McL

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PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

CLIENT APPROVAL ☐ PLANNING ☒ TENDER ☐ CONSTRUCTION ☐ AS-BUILT ☐

CLIENT: Gort Wind Farms Ltd

PROJECT: Derrybrien Wind Farm Project

CONTRACT:

DRAWING TITLE: Standard Wind Turbine Details for 49m turbines on Deryrbrien Wind Farm Site

PRODUCTION UNIT: Civil & Environmental Engineering

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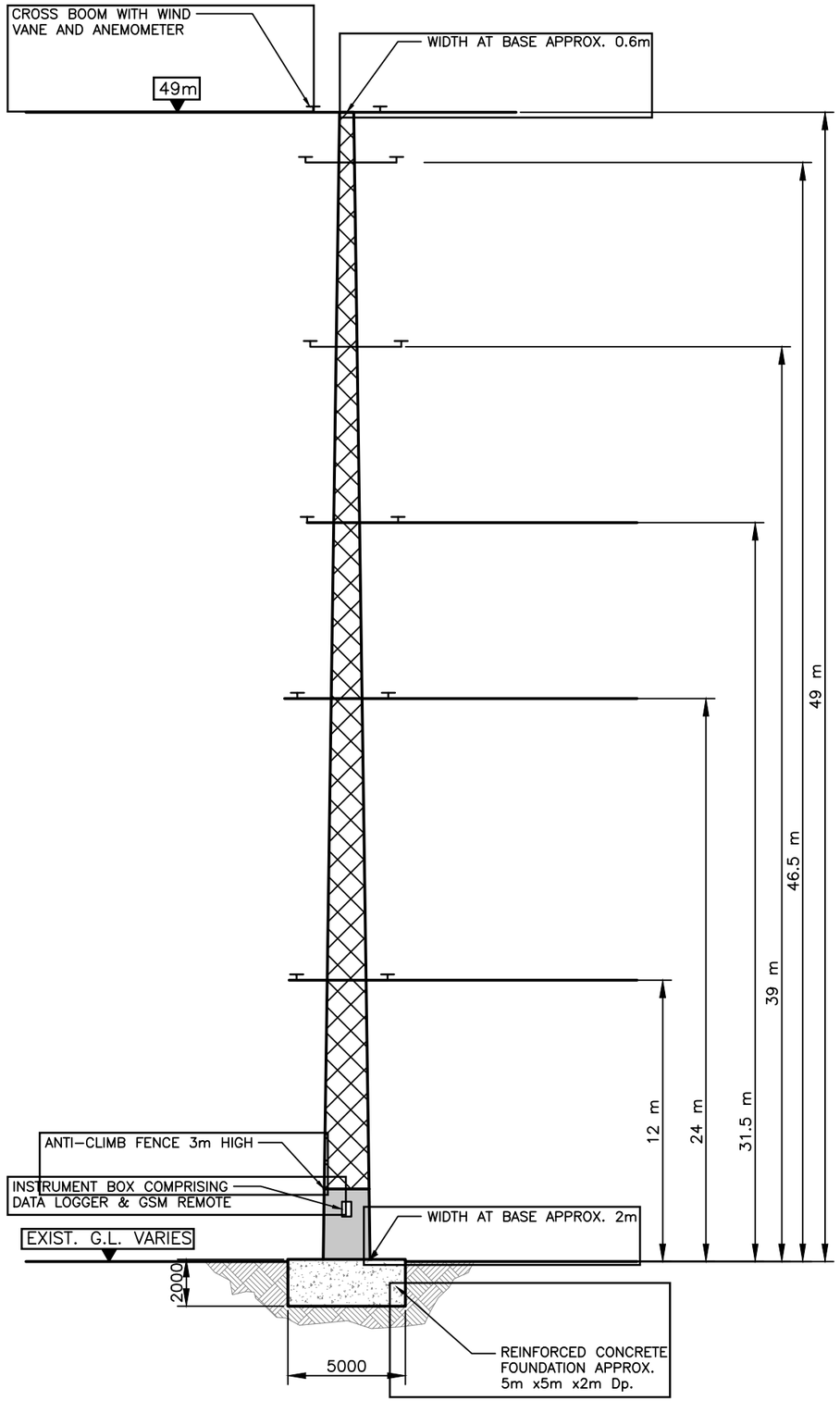
DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	P.Kavanagh	J.McLoughlin	08.07.2020
CLIENT REF		NO. OF SHTS: 1	SIZE: A1	SCALE: N.T.S

DRAWING NUMBER: QS-000280-01-D460-003-036-000 | SHEET | REV

NOTES:

1. All dimensions are in millimetres - figured dimensions to be taken in preference to scaled dimensions.



ELEVATION OF MET MASTS 1 & 2

Scale 1:150

PLAN VIEW

SCALE 1:200

REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP
0	04.08.20	Issued for substitute consent	E.O'S	E.O'S	P.K	J.McL

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PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

CLIENT APPROVAL ☐ PLANNING [X] TENDER ☐ CONSTRUCTION ☐ AS-BUILT ☐

CLIENT: Gort Wind Farms Ltd

PROJECT: Derrybrien Wind Farm Project

CONTRACT:

DRAWING TITLE: Met Masts1 & 2 Details

PRODUCTION UNIT: Civil & Environmental Engineering

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DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	P.Kavanagh	J.McLoughlin	08.07.2020

CLIENT REF	NO. OF SHTS	SIZE	SCALE
	1	A1	NTS

DRAWING NUMBER: QS-000280-01-D460-003-037-000 | SHEET | REV

APPENDIX 4-2

OVERVIEW OF PROJECT LIFECYCLE REPORT

Derrybrien Wind Farm Development

Gort Windfarms Ltd.

Overview of Project Life Cycle Report

Document No.: QS-000280-01-R460-007-000

Date: 28/11/2024

Engineering and Major Projects, One Dublin Airport Central, Dublin Airport, Cloghran, Co. Dublin, K67 XF72, Ireland.

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Client / Recipient:	Gort Wind Farms Ltd	
Project Title:	Derrybrien Wind Farm Development	
Report Title:	Overview of Project Life Cycle Report	
Report No.:	QS-000280-01-R460-007-000	
Revision No.:	00	
Prepared by:	Daniel Hogan	Date: 27/11/2024
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Verified by:	John McLoughlin	Date: 13/03/2025
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Approved by:	Deirdre Newell	Date: 08/04/2025
Title:	Manager	

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Change History of Report

Date	New Revision	Author	Summary of Change

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1 Introduction

The Derrybrien Wind Farm Development is owned and operated by Gort Windfarms Ltd, a wholly owned subsidiary company of ESB.

Derrybrien Wind Farm is in County Galway in the northern part of the Slieve Aughty Mountains approximately 11 km due south of Loughrea, 12.7 km north northeast of Gort and 24 km west of Portumna. Galway City lies some 35 km to the northwest of the wind farm site. The wind farm site is in the south of the county approximately 4.6 km from the border with County Clare and 21 km from the border with County Tipperary in the southeast.

The wind farm site is located within the townlands of Coppanagh, Boleyneendorrish, Kilbeg, Toormacnevin, Funshadaun, Bohaboy, Derrybrien North and Derrybrien West. The postal address is Derrybrien North, Kylebrack, Loughrea, County Galway, Eircode H62 PE08. The approximate centre of the wind farm site is at Irish Transverse Mercator (ITM) co-ordinates 559572E, 705010N

The main components associated with the Derrybrien Wind Farm Development:

- The existing Derrybrien Wind Farm and associated ancillary works.
- The existing Derrybrien-Agannygal 110kV Overhead Line.
- The existing Agannygal Substation connecting into the Ennis-Shannonbridge 110kV Overhead Line and associated ancillary works.
- Works undertaken in response to peat slide which occurred during construction of wind farm and associated ancillary works.

This report provides an overview of the full project lifecycle for the Derrybrien Wind Farm Development and includes the following:

- Derrybrien Wind Farm Development Chronology (Section 2);
- a description of the main features within the existing Derrybrien Wind Farm Development (Section 3);
- an overview of the construction phase activities that occurred between 2003 and 2006 (Section 4);
- an overview of operation and maintenance phase activities that occurred between 2006 and 2022 (Section 5);
- an overview of the ceased operation phase between 2022 and Present Day (Section 6); and
- an overview of the decommissioning that is proposed for the Derrybrien Wind Farm Development (Section 7).

2 Project Chronology

The main phases associated with the project lifecycle, as follows:

- Pre-Development Phase (January 1998-June 2003)
- Construction Phase 1 (June -October 2003)
- Peat Slide and Response Phase (October 2003-June 2004)
- Construction Phase 2 (June 2004-March 2006)
- Operational Phase (March 2006-2022)
- Ceased Operation Phase (2022 – Present Day)
- Proposed Decommissioning Phase (TBC)

The activities and scope of works associated with each phase is outlined in the following sub-sections.

2.1 Pre-Development Phase (January 1998-June 2003)

This phase ran from the date of the first application for planning permission (January 1998) to the commencement of construction (June 2003). There were four key consents, three associated with the Derrybrien Wind Farm Development (which was consented in three phases) and one with the grid connection.

- Wind Farm Phase 1: The planning application was made to Galway County Council (GCC) on 15th January 1998 (GCC Reg. Ref. 97/3470) and granted on appeal by An Bórd Pleanála (ABP) (ABP PL. 07.106290) on 12th October 1998.
- Wind Farm Phase 2: The planning application was made to Galway County Council on 27th January 1998 (GCC Reg. Ref. 97/5642) and granted on appeal by An Bórd Pleanála (ABP PL. 07.106292) on 12th October 1998.
- Wind Farm Phase 3: The planning application was made to Galway County Council on 5th October 2000 (GCC Reg. Ref. 00/4581) and granted on appeal by An Bórd Pleanála (ABP PL.07 122803) on 15th November 2001.
- Grid Connection: The planning application was made to Galway County Council (GCC) on 11th June 1999 (GCC Reg. Ref. 99/2377) and granted on 20th September 1999.

During this pre-development phase, the majority of the project site was in use as managed commercial forestry (which had been planted between 1963 and 1994). The remainder of the site comprised turbary land.

2.2 Construction Phase 1 (June -October 2003)

This phase comprised construction works completed between June 2003 up to the peat slide in October 2003. The works included the development of temporary construction compounds and access roads to the wind farm site from the Black Road, initial tree felling to facilitate the construction of wind farm site access roads, construction of site access tracks, construction of 37 reinforced concrete bases across the south, east and western side of the site and partial construction of hardstands.

2.3 Peat Slide and Response Works Phase (October 2003-June 2004)

The Peat Slide and Response work phase covers the period from the occurrence of the peat slide to the resumption of construction activity on the Project during which works were carried out in response to the peat slide. Following the peat slide on 16th October, construction work was halted on the Wind Farm site for seven months.

The wind farm construction site resources, plant and personnel, were re-directed to carry out the emergency measures to contain the movement of debris downstream. Additional resources were mobilised to site by Gort Windfarms Ltd., including geotechnical specialists, engineers and works supervisors.

A timeline of works undertaken in response to the peat slide is set out in Table 2-1.

Table 2-1: Sequence of works undertaken following 2003 peat slide

Date	Event/Works
Peat Slide and Response Phase (October 2003-June 2004)	
16 Oct 2003	Excavation works underway at foundation for turbine 68 (T68). At 4.00pm workers at this location notified Gort Windfarms Ltd. agents of the occurrence of the peat slide. All works suspended immediately. All personnel confirmed accounted for. Galway County Council (GCC) and Gardaí notified. Investigations into extent of peat slide and its possible further development commenced immediately. On the evening of 16th October, the downslope extremity of the disturbed peat had reached approximately 250m upstream of Black Road Bridge.
18 Oct 2003	Gort Windfarms Ltd provided plant (that had been in use for the wind farm construction) to GCC for the construction of Barrage A upstream of Black Road Bridge. This barrage was formed using locally sourced earthen material.
19 Oct 2003	Peat began to overtop Barrage A. GCC directed Gort Windfarms Ltd and its sub-contractor to construct a second barrage (Barrage B) downstream of Barrage A (still upstream of Black Road Bridge). Second barrage formed using rock.
20, 21 Oct 2003	Construction of Barrage B continued.
30 Oct 2003	The disturbed peat began to flow downhill again following very heavy rain. Based on review of hourly data for Shannon synoptic station (nearest then-active station with hourly data) and daily data for Derrybrien II daily station. In the month prior to the 16th October slide a daily average of 1.6mm rain fell at Derrybrien met station, well below the long-term average (1982-2019) of 3.9mm. No rainfall was recorded on the 16th October for either station. The 39.3mm rainfall on 30th October was the highest daily rainfall at the station since 1999 when 64mm fell. Peat was observed flowing across the Black Road and at Flaggy Bridge on the R353. Construction plant was mobilised from the wind farm site, and other external sources, to work on creating barrages across the disturbed peat included. These works were co-ordinated with GCC.

Date	Event/Works
	Routes for diverting drainage flowing into the main slide area were investigated and diversions completed over the next few days.
1 Nov 2003	After constructing an access track to the location of Barrage 2, commenced construction of Barrage 2 (using rock boulders). Rock used for building the access track was sourced from Borrow Pit/Quarry 3 on the wind farm site. Rock used for building Barrage 2 was sourced from a borrow pit on adjacent Coillte lands.
4 Nov 2003	Commenced excavation works for the diversion stream around peat deposited on lands upstream of Black Road Bridge, including peat built up behind Barrage A and Barrage B. Some tree felling was carried out by Coillte in advance of these excavation works. The construction of Barrages 3 & 4 was completed, located between Black Rd and R353.
8 Nov 2003	Parapet reinstated on Flaggy Bridge.
Nov 2003	Roads in vicinity of Black Rd Bridge and Flaggy cleaned off and resurfaced under GCC supervision; bridge parapets reconstructed.
28 Nov 2003	By this date (a) the access track within the wind farm site at T68 had been reconstructed (b) access track T23-T70 had been reconstructed and barrages had been constructed
Dec 2003	Temporary Barrages A, C and D no longer in place
Construction Phase 2-works associated with peat slide	
5 Oct 2004	Peat overflowed Barrage 1 following heavy rains. Excavator mobilised to alleviate build-up behind the barrage.
12 Oct 2004	Carried out drainage works over three days at Black Road Bridge.
4 Nov 2004	Clearing out of peat blockages at Black Road Bridge carried out, using JCB. Co-ordinated with GCC.
9 Dec 2004	Upgrade works commenced at Barrage 1 using rock from Borrow Pit/Quarry adjacent to Barrage 1
19 Jan 2005	Works to remove excess peat build up at bridge.
2 Aug 2005	Commenced works in creating peat repository adjacent to Black Rd Bridge to store peat from stream bed and adjacent land (1 month's work).
August 2005	In August 2005, further works commenced to aid drainage from the site of the peat slide and restore the pre-existing river bed. Peat that was side cast from the river bed was stored in the adjacent peat repository.
29 Aug 2005	Prepared area for removal of more peat from behind Barrage 2.
29 Aug 2005	Between Black Rd and R353 – works commenced in creating peat repository area.
2 Sept 2005	Temporary Barrage B removed

2.4 Construction Phase 2 (June 2004-March 2006)

This phase covers all construction works post-peat slide to commercial operation of the project, which included the bulk of felling, civil and electrical works associated with the wind farm site and grid connection, some works associated with the peat slide and wind farm commissioning.

During this phase, there were two extensions of duration of planning permission for both Wind Farm Phases 1 and 2, an application in relation change of turbine type for Wind Farm Phase 3 and an extension of duration of planning permission in relation to the grid connection.

- Wind Farm Phase 1: An extension of duration of permission to 31st March 2005 was granted on by Galway County Council on 24th November 2003 (GCC Reg. Ref. - 03/5642); A second extension of duration of permission to 31st June 2006 was granted on by Galway County Council on 24th November 2003 (GCC – 05/317)
- Wind Farm Phase 2: An extension of duration of permission to 31st March 2005 was granted on by Galway County Council on 24th November 2003 (GCC Reg. Ref. - 03/5637); A second extension of duration of permission to 31st June 2006 was granted on by Galway County Council on 24th November 2003 (GCC – 05/316)
- Wind Farm Phase 3: A planning application was made to Galway County Council on 9th September 2002 (GCC Reg. Ref. 02/3560) to change turbine type and granted on 6th January 2003
- Grid Connection: An extension of duration of permission to 31st December 2005 was granted on by Galway County Council on 5th November 2004 (GCC Reg. Ref. - 03/5642)

2.5 Operational Phase (March 2006-2022)

The operational phase from the start of commercial operations (March 2006) to date of refusal from An Bord Pleanála (ABP) for application for substitute consent (reg. ref. ABP-308019-20) relating to the retention and continued operation of the subject development, until its eventual decommissioning (February 2022).

2.6 Ceased Operation Phase (2022 – Present)

Following the decision by ABP, commercial electricity generation at the site was ceased by ESB and it was confirmed that the Project would be decommissioned.

The turbines have been maintained by the turbine supplier to ensure the site remains safe, while in a prolonged non-operational state. Gort Windfarms Ltd have monitored and maintained the site in the interim, having regard to all safety standards. No development or use is on-going.

2.7 Decommissioning Phase

The proposed 'Derrybrien Windfarm Development Decommissioning Project' comprises two types of "development" for which separate Prospective Development Consent and Retrospective Development Consent is sought from An Bord Pleanála:

- "*Prospective Development*" - the carrying out of decommissioning works to remove the majority of above-ground features from the site – including all turbines, masts, electrical plant,

overhead lines etc; and enable the final decommissioning of the site (the “prospective development” and “prospective works”); and

- *“Retained Development”* - the 'retention' in situ and in perpetuity of part of the existing development – including at-ground and below-ground structures such as turbine and other foundations; and development associated with historic peat slide events that occurred during construction such as barrages, peat repositories, on-site borrow pits / quarries etc.

An Environmental Impact Assessment Report (EIAR) has been prepared to accompany an application to An Bord Pleanála, under section 37L of the Planning and Development Act 2000, as amended (“the 2000 Act”) for permission to decommission the Derrybrien Wind Farm development (‘the Prospective Development’). In addition, the Derrybrien Windfarm Development Decommissioning Project also comprises the retention in situ of specific features of the existing development (“the Retained Development”) and an application has been made simultaneously, under section 177E of the 2000 Act, for substitute consent (which application is accompanied by, inter alia, a remedial Environmental Impact Assessment Report [rEIAR]).Both applications will be lodged to An Bord Pleanála in 2025

3 Description of Derrybrien Wind Farm Development Project Features

3.1 Overview of Project Works/Components

This section identifies the main components and work elements of the Derrybrien Wind Farm Project and their current status. The main components of the Project are listed in **Table 3-1** and shown on Figure 3-1 – Figure 3-3.

Table 3-1: Project components and associated works

Wind Farm and associated ancillary works
Provision of hardstanding associated with temporary contractor compound and laydown area on access road to wind farm site-approximate dimensions 77 x 38m.
Wind Farm Access Road: Upgrade of Coillte access road connecting the local road (Black Road) to wind farm site entrance-approximate length 3.1km; approximate widened width 4m, approximate width at bends 4.5m. Upgrading of Coillte access track linking turbary access track within the wind farm site to the Black Road - total length-approximately 1.6km
Works to improve and maintain sections of local roads and bridges including: • Minor widening works and resurfacing of sections of the Black Road used for construction and operational access-approximate length 5km • Upgrade works to three bridges (Unnamed Bridge A, Unnamed Bridge B, Black Road Bridge) on Black Road involving strengthening of the bridges, surfacing works and the replacement of the bridge parapets. • road widening for a distance of approximately 30m on either side of the Crooked Bridge on the R353 to facilitate the delivery of equipment to the wind farm site
Felling of approximately 222 ha of forestry
Access roads/tracks within site (approximately 17.5km in total) for the construction, operation and maintenance of the wind farm comprising: • New floating roads-approximately 14.6 km of access track • New non-floating roads-approximately 0.9 km, (including access tracks rebuilt within the wind farm site at T68 and between T23 and T70 to replace sections of on-site floating roads damaged by the 2003 peat slide) • Upgrade of pre-existing floating roads-approximately 2.0km
Seventy (70) crane hard standing areas adjacent to turbines.
Seventy (70 no.) Vestas V52-850 kW wind turbines (with hub height and blade length of 49m and 26m respectively) on reinforced concrete bases. The turbines are numbered T1 to T15 & T17 to T71. It is noted that a permitted turbine T16 and the connecting access tracks were not constructed as a peat stability risk mitigation measure. Wind Farm contains the necessary lighting to meet aeronautical requirements
Two (2) anemometer (met) masts
Communication cabling: • Direct buried copper communication cables for Supervisory Control and Data Acquisition (SCADA) system laid alongside electrical cables from substation to each turbine • 7.6km of fibre optic cable run in approximately 2.6km of ducting from the substation to the first turbine on communications cable run which connects into the existing copper communication cables at Turbine T25, T10, T26, T29, T24, T63 and T67 Electrical cabling: • Approximately 22.5km of direct buried (no ducts) underground 20kV (3 core) electrical cables

On-site 110kV/20kV Substation (including end mast) with control building in palisade fenced compound and associated services. Temporary containers (number varies) for equipment and parts located on hardstanding adjacent to Derrybrien Substation- currently three 40ft x 8ft, one 30 ft and one 20ft container.
Drainage: (a) Improvement works were undertaken on the 27km (approx.) of pre-existing drainage within wind farm site and (b) 12km (approx.) of new drainage channels were constructed.
Wind Farm – Spoil Management / Peat Repositories: Peat repository areas (up to 1m in height) in areas of flat or gently sloping ground (less than 3°) across the site, for the storage of peat/spoil excavated from the turbine hard standing areas and substation locations.
3 no. borrow pits / quarries for the sourcing of a total of approximately 232,000m^3 of rock and clay; with works to manage these areas following the cessation of extraction activities (Fencing): • Borrow Pit/Quarry 1: Area 0.46ha (approx.); estimated volume 40,000cum (approx.) • Borrow Pit/Quarry 2: Area 0.42ha (approx.); estimated volume 12,000cum (approx.) • Borrow Pit/Quarry 3: Area1.72ha (approx.); estimated volume 180,000cum (approx.)
Grid connection and associated ancillary works
Felling of approximately 33.1 ha of forestry along OHL route
Lowering of ground below 400kV overhead line to facilitate required ground clearance to Derrybrien-Agannygal 110kV line crossing underneath
An overhead line, approximate length 7.8 km connecting the wind farm from Derrybrien Substation to the National Grid on the Agannygal-Shannonbridge (Galway West) 110kV line via Agannygal Substation comprising: • 34 double wood pole structures; • 2 end masts (1 within Derrybrien Substation); • 6 angle masts; and • 1 intermediate mast.
Agannygal 110kV Substation
Felling of approximately 1.6 ha of forestry at site of Agannygal Substation
Access to Agannygal Substation: • upgrading of pre-existing Coillte track (approx. length 2.9km, approx. width 3.5m) including removal of bend. • construction of new access road (approx. length 0.14km, approx. width 3.5m) from public road to Agannygal Substation.
Agannygal Substation with control room in palisade fenced compound and all associated works and services connecting into National Grid on the Ennis-Shannonbridge (Galway West) 110kV line, including removal of approximately 1.3km of pre-existing conductor on the pre-existing Ennis-Shannonbridge line and replacement with 2 spans emanating from Agannygal Substation comprising: • End mast and Agannygal-Shannonbridge line span (approximate length 0.7km) • End mast and Agannygal-Ennis line span (approximate length 0.6km)
Works as result of peat slide
Felling and site preparation works
Access tracks rebuilt within the wind farm site at T68 and between T23 and T70 to replace sections of on-site floating roads damaged by the peat slide

Construction of Borrow pit adjacent to Barrage 1 for sourcing material for barrages. Approximate plan area 2314m^2 (0.23ha), estimated volume 1371 cum.
Barrage 1-approximate max length 94m, max width 8m, estimated volume 900cum rock/boulders
Replacement of forestry access road across area of peat slide and Barrage 1 -approximate length 830m, width 4.5m (approx.)
New access track to Barrage 2 -approximate length 284m, approximate width 4.5m
Barrage 2: approximate max length 17m, max width 20m, estimated volume 650 cum rock/boulders
Peat repository area at Barrage 2 -approximate max length 34m, max width 108m, estimated area 3498m^2
Barrage 3: approximate max length 41m, max width 9m; estimated volume 350cum rock/boulders
Peat repository area at Barrage 3 -approximate max length 41.5m, max width 16m; estimated area 597m^2
Barrage 4: approximate max length 25m, max width 10m; estimated volume 300cum rock/boulders
Peat repository area at Black Road Bridge- repository in two sections -north west section and south east section: • North west section: approximate max length 130m and width 73m; estimated area 5322m^2. • South east section: approximate max length 68m and width 51m; estimated area 2898m^2.
Drainage works within and in the vicinity of the site of the peat slide area and peat repository areas
Fencing to offsite peat repository areas
Repairs to bridges on public roads (Black Rd Bridge and Flaggy Bridge)
Repair to Bridge repairs on private land (Unnamed Bridge C)
Replacement of stepping stones across Owendalulleegh River

The plan area occupied by the works within the wind farm site, the peat slide and associated works and Agannygal Substation together with the area of peat excavated for the works is set out in **Table 3-2**. Small areas of peat were excavated for the grid connection infrastructure.

Table 3-2: Area occupied by Project Works and excavated areas

Category	Item	Area (ha)	Area of peat excavation (ha)
WF site	Area of turbine bases (included in hardstanding area figure)		
WF site	Area of turbine hardstanding's	4.87	4.87
WF site	Derrybrien Substation	0.26	0.26
WF site	Derrybrien Substation (adjacent hardstanding)	0.15	0.15
WF site	Borrow Pit/Quarry 1	0.46	0.46
WF site	Borrow Pit/Quarry 2	0.42	0.42

Category	Item	Area (ha)	Area of peat excavation (ha)
WF site	Borrow Pit/Quarry 3	1.72	1.72
WF site	Floating roads	7.72	0
WF site	Non floating roads	0.56	0.56
WF site	Anemometer Mast 1-Hardstanding Area	0.01	0.01
WF site	Anemometer Mast 2-Hardstanding Area	0.01	0.01
WF site	On-site peat repositories (located over peat) total area	14.89	0
Offsite	Construction compound hardstanding	0.29	0.29
Offsite	Site Access Road (pre-existing route)	0	0
Grid connection	Overhead Line structure bases	0.006	0.005
Grid connection	Agannygal Substation	0.30	0.30
WF site	Site of peat slide within WF site	2.17	2.17
Offsite	Site of peat slide outside WF site	23.11	23.11
Peat slide related works	Borrow pit adjacent to Barrage 1	0.23	0.23
Peat slide related works	Barrage 1	0.16	0
Peat slide related works	Replacement (forestry) access road across peat slide	3.74	2
Peat slide related works	New access road to Barrage 2	0.10	0.1
Peat slide related works	Barrage 2	0.02	0
Peat slide related works	Peat repository area at Barrage 2	0.42	0
Peat slide related works	Barrage 3	0.02	
Peat slide related works	Peat repository area at Barrage 3	0.06	0
Peat slide related works	Barrage 4	0.02	
Peat slide related works	Peat repository area at Black Road Bridge	0.82	0

The area of peat extracted for the turbine bases, hardstandings, floating roads and borrow pits was approximately 8.46ha in total within the wind farm site.

It is noted that most of the peat extracted was in areas that had been previously forested and drained.

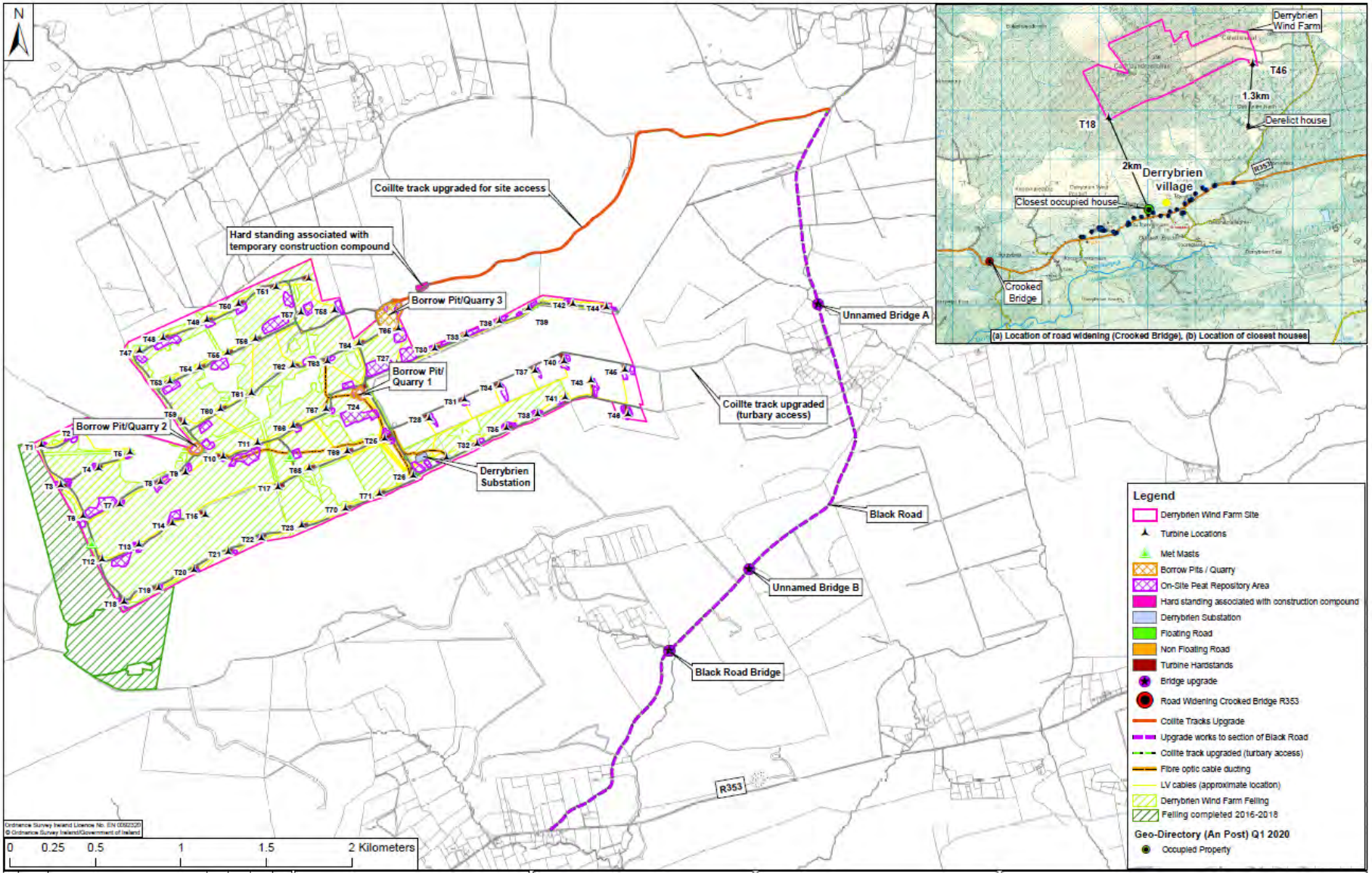

Figure 3-1 Location of Derrybrien Wind Farm Development and ancillary works

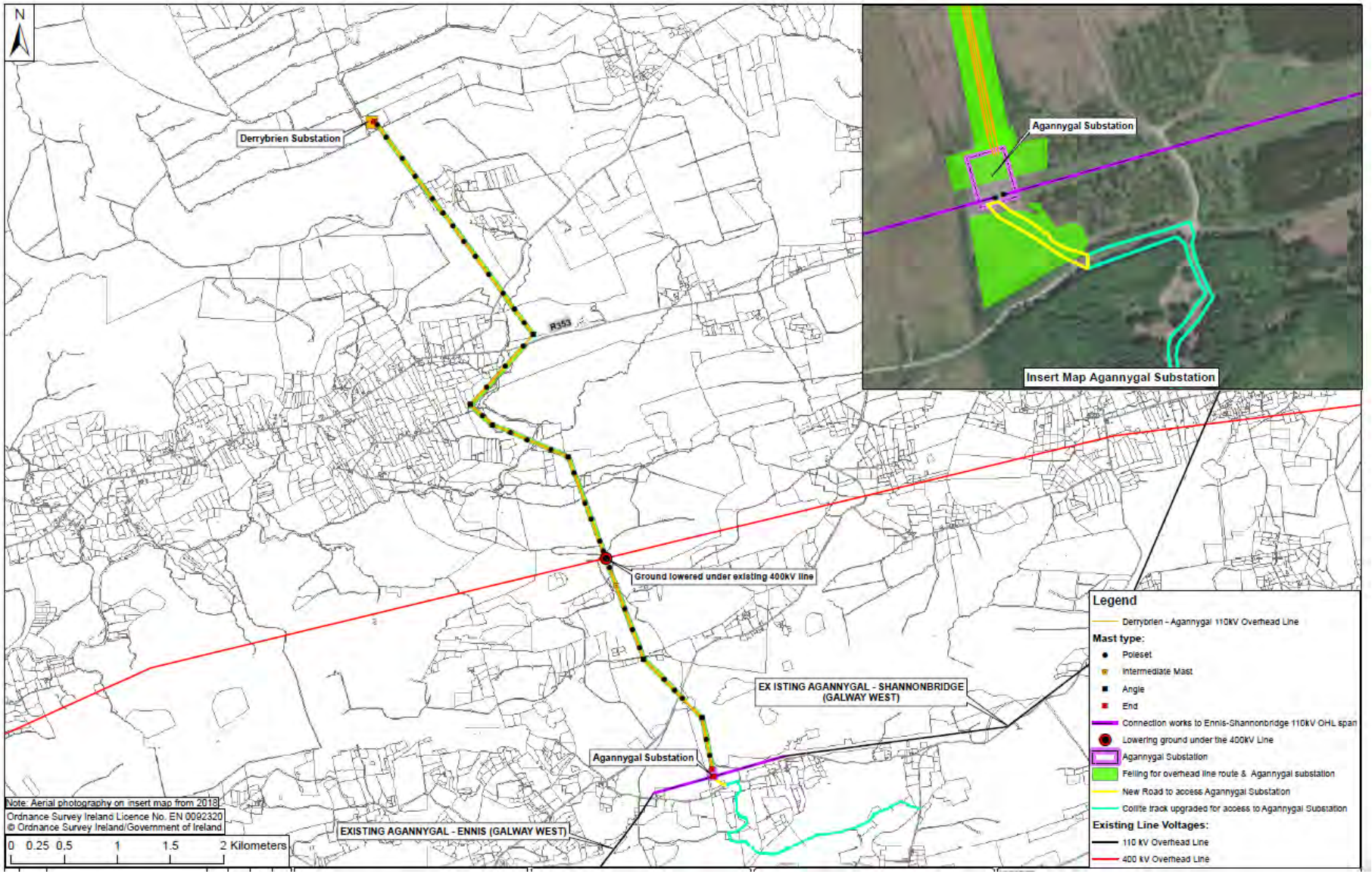

Figure 3-2 Location of Grid Connection and ancillary works

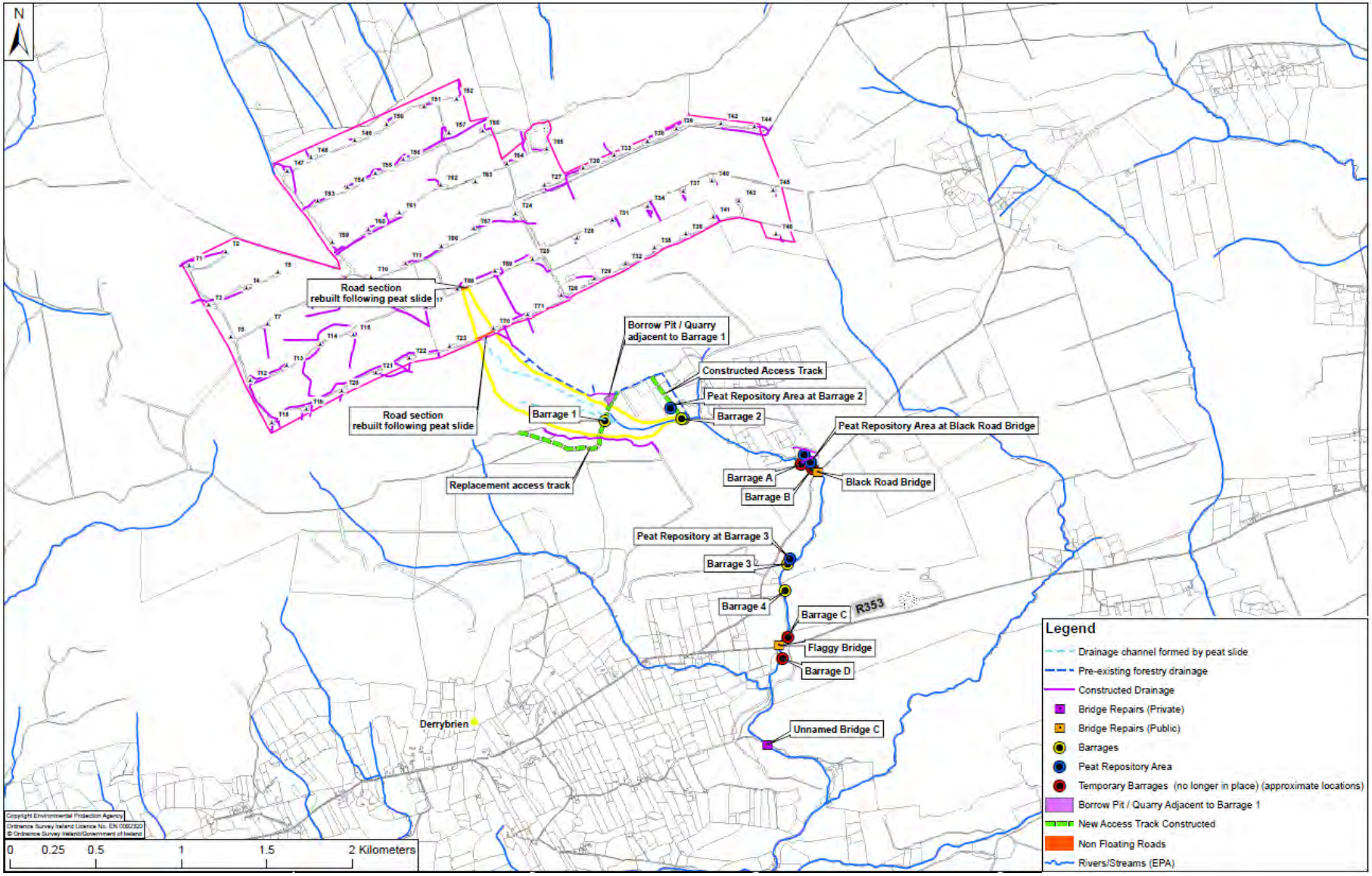

Figure 3-3 Location of work associated with peat slide

3.2 Ancillary Works: Wind Farm

3.2.1 Contractor Compound-Wind Farm site

The granular hardstanding area on which the contractor compound was located during construction of the wind farm remains in place on the access road to the wind farm site. The dimensions of hardcore area are approximately 77m x 38m.

3.2.2 Road upgrades for wind farm

Upgrade works to the Coillte road from Black Road to the wind farm site comprised widening, strengthening, construction of lay-bys and remedial works to drainage along the road as well as the placement of geogrid, rock material and regrading and surfacing works.

The length of the road upgraded was approximately 3.1 km and the road was generally widened to 4 m; 4.5 m at bends. There is a hinged Coillte barrier at the public road with a double lock that both Gort Windfarms Ltd. and Coillte can access.

The bell mouth entrance at the intersection of the Black Road and the Coillte track providing access to the Wind Farm was widened.

Localised road widening was undertaken at Crooked Bridge on the R353, for a distance of approximately 30m on either side of the bridge.

3.2.3 Works to Bridges -Black Road

In order to facilitate the project, works were undertaken to three bridges on Black Road involving strengthening of the bridges, surfacing works and the replacement of the bridge parapets. The bridge locations are as follows:

Table 3-3: Bridge Locations

Unnamed Bridge A (Easting*)	Unnamed Bridge A (Northing*)	Unnamed Bridge B (Easting*)	Unnamed Bridge B (Northing*)	Black Rd Bridge (Easting*)	Black Rd Bridge (Northing*)
562240.08	705630.69	561836.70	704082.82	561367.28	703601.72

* Irish Transverse Mercator (ITM) coordinate reference system

3.2.4 Coillte Track-Black Rd-Turbary Road

An existing Coillte owned track running in an east west direction from Black Road provides access to turbary lands located within the wind farm site boundary. The track was upgraded during construction of the project and provided access for some haulage during construction in addition to access for turbary land users. The road is typically less than 3 m in width.

3.3 Ancillary Works: Grid Connection

3.3.1 Access to Agannygal Substation

Upgrade works were undertaken on approximately 2.9km of an existing Coillte track which formed the haul route to Agannygal Substation including widening of the track, removal of bend and resurfacing.

A new permanent section of road (approximately 0.14km long) was constructed from the local public road (Unnamed Local Rd A) to access Agannygal Substation.

3.3.2 Ground lowering below 400kV OHL

In order to provide the required clearances between pre-existing 400kV line and Derrybrien - Agannygal 110kV line passing underneath and between the ground and the 110kV line, the ground was lowered by 3.5m below the crossing point of the two lines.

3.4 Tree Felling Undertaken for Project

Based on OSI aerial photography, the estimated area of felling undertaken for the project together with the estimated area of forestry removed by the moving peat during the peat slide and associated works is set out in Table 3-4.

Table 3-4: Extent of Project felling and forestry removed as a result of peat slide

Location	Estimated Area (ha)
Wind farm and grid connection during construction 2003-2005	
Wind Farm site	221.9
Grid connection -overhead line (assuming overhead line corridor width of 45m)	33.1
Grid connection –Agannygal Substation	1.6
Works associated with peat slide during construction 2003-2005	
Newly constructed access track to south west of Barrage 1	3.7
Coillte borrow pit	0.0
Newly constructed access track to north west of Barrage 2	0.2
Peat repository area at Black Road Bridge	0.8
Rerouting of drainage around peat scar	1.2
Forestry removed as a result of peat slide 2003	
From site of peat slide	25
Operational Phase-Offsite 2018	
Offsite to west of wind farm (2016 -2018)	46.2

Wind Farm site: On 20th May 2003, Coillte was granted a two-year felling licence to fell 263ha of forestry on the wind farm site. Approximately 222 ha of forestry was felled for construction of the wind farm for which replacement planting was carried out by Coillte at locations in Counties Tipperary and Roscommon. A further Felling Licence (Ref FL4890) was issued on the 1st August 2007 for the felling of the remaining forestry on the wind farm site, however the felling was not undertaken.

Grid connection: Approximately 34.7 ha of forestry in all was felled for the grid connection.

Offsite felling 2018: Offsite phased tree felling (53.4 ha in total) was undertaken by Coillte under felling licence immediately to the west of the wind farm site in 2016, 2017 and 2018 to optimise productivity of the wind farm. It is noted that these areas had been scheduled for felling in 2015 as part of Coillte's tree routine felling programme and that the felled areas are being replanted.

3.5 Development on the Wind Farm Site

As set out in in **Table 3-1**, the main wind farm infrastructure comprises turbines, crane hard standings, access tracks, drainage channels, borrow pits/quarries, on site material storage, 110kV substation, direct buried electric cables and anemometer masts. These infrastructure elements are described in the following subsections. The wind farm layout is presented in Figure 3-4.

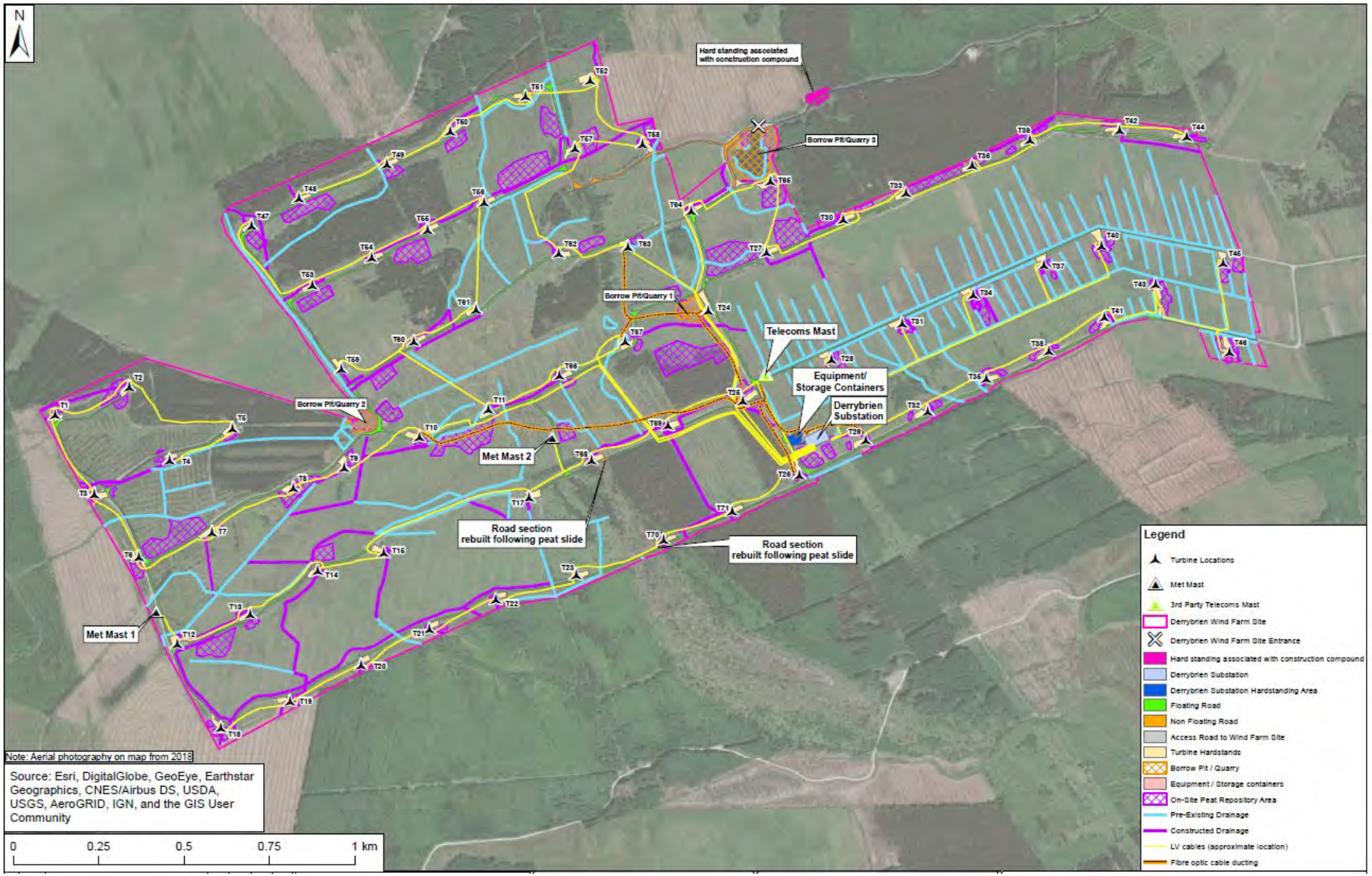

Figure 3-4 Wind Farm Site Layout

3.5.1 Wind Farm Access Tracks

The access tracks are utilised for on-going access to the wind turbines and anemometer masts for operation and maintenance.

The total length of access tracks within the site boundary is 17.5 km. These comprise:

- Approximately 2.0km of pre-existing floating roads were upgraded through the turbary plots on the east side of the site.
- Approximately 14.6 km of new floating roads
- Approximately 0.9 km of new non-floating roads

The floating turbary roads which had been in place prior to the construction of the wind farm on the east side of the site were upgraded with a capping layer of crushed rock granular fill reinforced with a layer of geogrid on the surface of the existing road. The width of these roads was not increased so they are narrower than the other site access tracks/roads at 3-4 m wide.

The floating roads built for the project are typically 4.5 m wide and comprise 600-1000 mm of crushed rock granular fill reinforced with 1-2 layers of geogrids, as necessary, over a regulating layer of granular fill on a layer of logs, branches and brash from trees that were felled on the site.

The non-floating roads were constructed of granular rockfill on the glacial till below the peat. After the peat slide in 2003, the sections of floating road that had originally been constructed as floating roads across the slide area at Turbines T68 and T70 were replaced with rock fill embankments supported on the glacial till below the peat. The floating roads to either side of the slide area remain in place.

3.5.2 Hard standing areas

A hardstanding area adjacent to each wind turbine were provided to support the mobile cranes used to erect the turbines during construction and to facilitate maintenance activity involving the use of cranes and machinery that arise over the lifetime of the wind farm. These were constructed of crushed rock granular fill supported on the glacial till below the peat. The individual hardstandings typically cover an area of approximately 47m x 18m.

3.5.3 Turbine Foundations

The construction of the wind farm required local excavation to bearing strata (such as bedrock or suitable glacial till) for turbine foundations. Excavations were carried out in peat depths generally ranging from 1.0-4.0m, but locally between 4-5m.

The turbine foundations are reinforced concrete pad design that are founded onto stratum with suitable bearing capacity, predominantly rock.

The dimensions of the foundations used were either 9.8m x 9.8m (type-1) or 11m x 11m (type-2) in plan, with the main section of the foundation being 1m in depth. There are 64 bases of type-1 dimensions and 6 bases of type-2 dimensions. The majority of the foundations comprised foundation type 1, however, 6 No. of the 70 foundations were foundation type 2 (i.e. T11, T60-T62, T66, T67).

3.5.4 Wind Turbines

There are seventy (70) Vestas V52-850 kW turbines on site. The wind turbines have a rotor diameter of 52m and a hub height of 49m. It is noted that these turbines are small compared to modern turbines. The co-ordinates of turbine locations are presented in **Table 3-5**.

Table 3-5: Turbine Locations and ground elevations

Ref.	Easting*	Northing*	Elevation (mOD)	Ref.	Easting*	Northing*	Elevation mOD
T1	557684.44	704807.66	327.0	**T37**	560579.81	705246.09	325.7
T2	557901.50	704889.41	341.1	**T38**	560594.72	704993.50	307.2
T3	557800.08	704576.83	328.9	**T39**	560539.28	705611.05	332.1
T4	558020.31	704675.22	341.1	**T40**	560748.93	705302.81	319.3
T5	558204.40	704769.25	349.7	**T41**	560756.82	705092.47	307.3
T6	557929.72	704392.44	337.6	**T42**	560801.59	705640.07	320.7
T7	558144.84	704464.80	344.4	**T43**	560907.14	705189.27	302.2
T8	558382.51	704594.16	352.4	**T44**	560997.77	705620.30	311.0
T9	558531.55	704652.57	354.7	**T45**	561105.63	705250.63	296.2
T10	558752.33	704742.00	359.1	**T46**	561123.24	704991.92	288.5
T11	558953.07	704823.21	360.6	**T47**	558260.50	705361.54	343.2
T12	558042.57	704138.18	334.6	**T48**	558398.97	705440.01	343.4
T13	558256.15	704224.75	341.6	**T49**	558656.21	705541.58	338.5
T14	558454.10	704350.30	346.0	**T50**	558842.15	705635.86	338.4
T15	558647.71	704403.14	347.7	**T51**	559062.63	705737.70	331.6
T17	559072.97	704565.96	356.4	**T52**	559252.09	705785.55	325.9
T18	558170.19	703891.34	327.7	**T53**	558438.49	705185.46	353.2
T19	558372.66	703970.04	331.3	**T54**	558612.25	705266.28	357.5
T20	558580.80	704076.23	335.5	**T55**	558775.72	705349.66	352.3
T21	558781.12	704180.30	336.9	**T56**	558940.55	705429.08	344.1
T22	558975.69	704266.49	336.0	**T57**	559206.87	705587.37	337.0
T23	559210.42	704338.25	334.3	**T58**	559404.20	705600.77	336.2
T24	559596.49	705113.61	351.0	**T59**	558523.13	704942.53	359.3
T25	559698.55	704847.33	347.0	**T60**	558735.36	705021.98	359.3
T26	559864.82	704632.81	330.3	**T61**	558917.29	705116.69	363.0
T27	559768.05	705282.20	344.5	**T62**	559160.00	705279.03	358.6
T28	559957.91	704968.91	335.5	**T63**	559362.72	705299.64	353.1
T29	560059.26	704733.69	323.0	**T64**	559547.33	705405.46	348.4
T30	559992.61	705377.97	341.5	**T65**	559779.66	705491.23	341.5
T31	560164.92	705074.65	330.5	**T66**	559161.69	704921.66	358.8
T32	560240.44	704818.44	315.6	**T67**	559353.43	705023.39	356.8
T33	560176.23	705455.09	340.8	**T68**	559255.71	704674.53	353.5
T34	560372.88	705157.60	330.9	**T69**	559478.96	704775.35	348.0
T35	560411.73	704913.02	310.1	**T70**	559466.66	704440.65	333.5
T36	560370.57	705536.69	337.4	**T71**	559667.06	704525.34	333.9

* Irish Transverse Mercator (ITM) coordinate reference system

There are two prevailing wind directions-to the west and south west. The approximate spacing between turbines is between 150m to 260m in a west/south west direction.

The main turbine components comprise:

- 2 x cylindrical towers sections

- 1 x nacelle, which encapsulated the mechanical machinery of the wind turbine and was placed on top of the tower sections
- 3 x blades connecting to the hub of the nacelle

The turbine towers are of tubular steel tapering from about 3.3 m diameter at the base to 2.1 m diameter at the top where the nacelle is mounted. Access to the tower is via a staircase located outside on the hardstand and a secure hinged door into the tower. The nacelle is accessed from the tower using an internal ladder with landing/rest positions. The tower and nacelle incorporate internal and emergency lighting.

The nacelle contains the generator and control unit, which is designed for computer controlled monitoring of all major functions of the turbine. The glass-fibre reinforced nacelle cover protects all the components inside the nacelle against the elements.

A three-blade rotor is attached to the nacelle. The blades are made of fibreglass-reinforced epoxy material with each blade consisting of two blade shells, bonded to a supporting beam.

The wind turbines are painted light grey with a matt finish.

The wind turbines are geared to ensure the blades rotate in the same direction. Transformers are located internally within the turbine tower.

The equipment is protected from lightning strike by deep earthing and from corrosion by multiple coatings. The turbine tower and nacelle are equipped with optical smoke sensors.

Aviation lights are provided on nine turbines, specifically T1, T18, T26, T44, T46, T47, T52, T61 and T65.

Transformers: A separate transformer is located internally within each wind turbine to uprate the generation voltage of the turbines from 380 – 660 V to a higher voltage for connection via underground cables to the Derrybrien Substation. The hermetically sealed wind turbine transformers can be considered as leak free and largely maintenance free. They are dispatched from the factory leak free and can primarily only be damaged during transport or installation. Once in service, they remain closed for their lifetime.

Method of Turbine Operation: The basis of wind turbine operation is as follows:

- Sensors are used to monitor wind direction and a yaw mechanism turns the turbines to keep the blades facing into the wind.
- The blades of the turbine, which are bolted onto a hub rotate at a rate of once every 3 – 5 seconds (s), depending on wind conditions.
- Inside the nacelle (housing) located at the turbine hub, the rotor drives a large shaft into a gearbox, which steps up the revolutions per minute to a speed suitable for the electrical generator. The rotor speed range is 14.0-31.4 revs per minute (rpm).
- The electricity generated at each turbine is fed via underground cables to a step-up electrical transformer in Derrybrien Substation where it is transformed to a higher voltage for supply to the national electricity network.

The turbines commence operation at a wind speed of 4 m per second (m/s) (the cut-in speed) and shut down when the wind speed reaches about 25 m/s (the cut-out speed). Power is controlled automatically as wind speed varies.

At wind speeds greater than 25 m/s (80 km/hr) the turbines automatically cut-out, stop rotating and "feather" or point into the wind to reduce the surface area exposed to the wind to prevent unnecessary strain on the turbine tower, nacelle and rotor.

3.5.5 Anemometer Masts

There are two anemometer lattice masts with a height (49m) corresponding to that of the turbines on the site which monitor wind speeds and validate the performance of the wind turbines. Each leg of the mast sits on a concrete plinth of plan dimension 1m x 1m x 1.5 (depth to top of foundation). The base of the mast is triangular in plan 2m x 2m x 2m. The mast is supported on reinforced concrete foundations. Location details are provided in **Table 3-6**.

The masts are steel lattice masts, comprising a free-standing galvanised lattice type meteorological tower, being approximately 2 m wide at its base x 0.6 m wide at its top. Equipment on each mast comprises anemometers, wind direction vanes, a barometric pressure sensor and a data logger. Anti-climb screening (3m high) is provided to masts.

A mobile phone network operator has a cell on the wind farm anemometer mast beside turbine T68 to facilitate phone coverage on site.

Table 3-6: Locations of Anemometer Masts

Location	Easting*	Northing*	Elevation (mOD)
Adjacent to T68	559140.81	704741.63	356.00
Between T6 and T12	557981.21	704230.59	338.48

* Irish Transverse Mercator (ITM) coordinate reference system

There is a broadband service from a 70m high third-party service provider mast (beside turbine T25) which has been present on the site since the 1980s and does not form part of the Derrybrien Wind Farm Development. The mast is located at easting 559757/northing 704928.

3.5.6 LV and communication cables

Throughout the site there is an installed buried cable network of LV electrical cables and copper SCADA communication cables. The LV cables connect each wind turbine to the sub-station on the south side of the site between Turbines T26 and T29. They feed the electrical output from each turbine generator to the sub-station at a rating of 20kV, for export onto the electrical transmission network. The cables are buried within a trench to an approximate depth of 1.1m.

In September 2017, as part of an upgrade to the turbine control systems, approximately 7.6km of new 12 core single-mode fibre-optic cable was installed on the site which was run in 2.6km of ducts to improve the response of communication signals between the turbine controllers and the central control system. The cable routes are shown on Figure 3-4.

3.5.7 Derrybrien Substation

The purpose of Derrybrien Substation which is located within the wind farm site is to transform the 20 kV output from the wind turbine generators to 110kV for export out to the national grid at 110 kV.

See **Figure 3.5: Derrybrien 110kV Substation - Layout Plan**.

See **Figure 3.6: Derrybrien 110kV Substation - Sectional Elevation**.

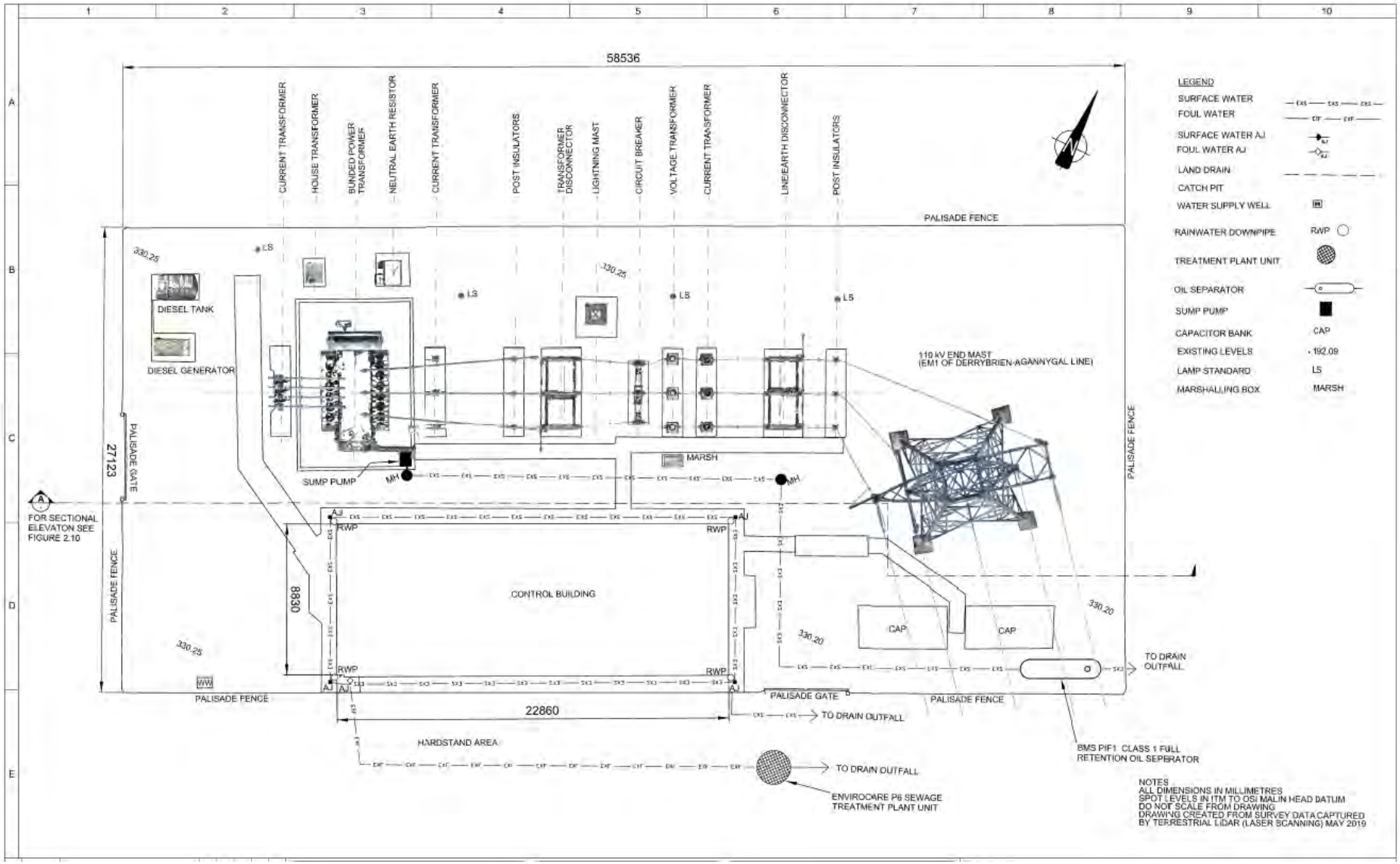

Figure 3-5 Derrybrien 110kV Substation Layout Plan

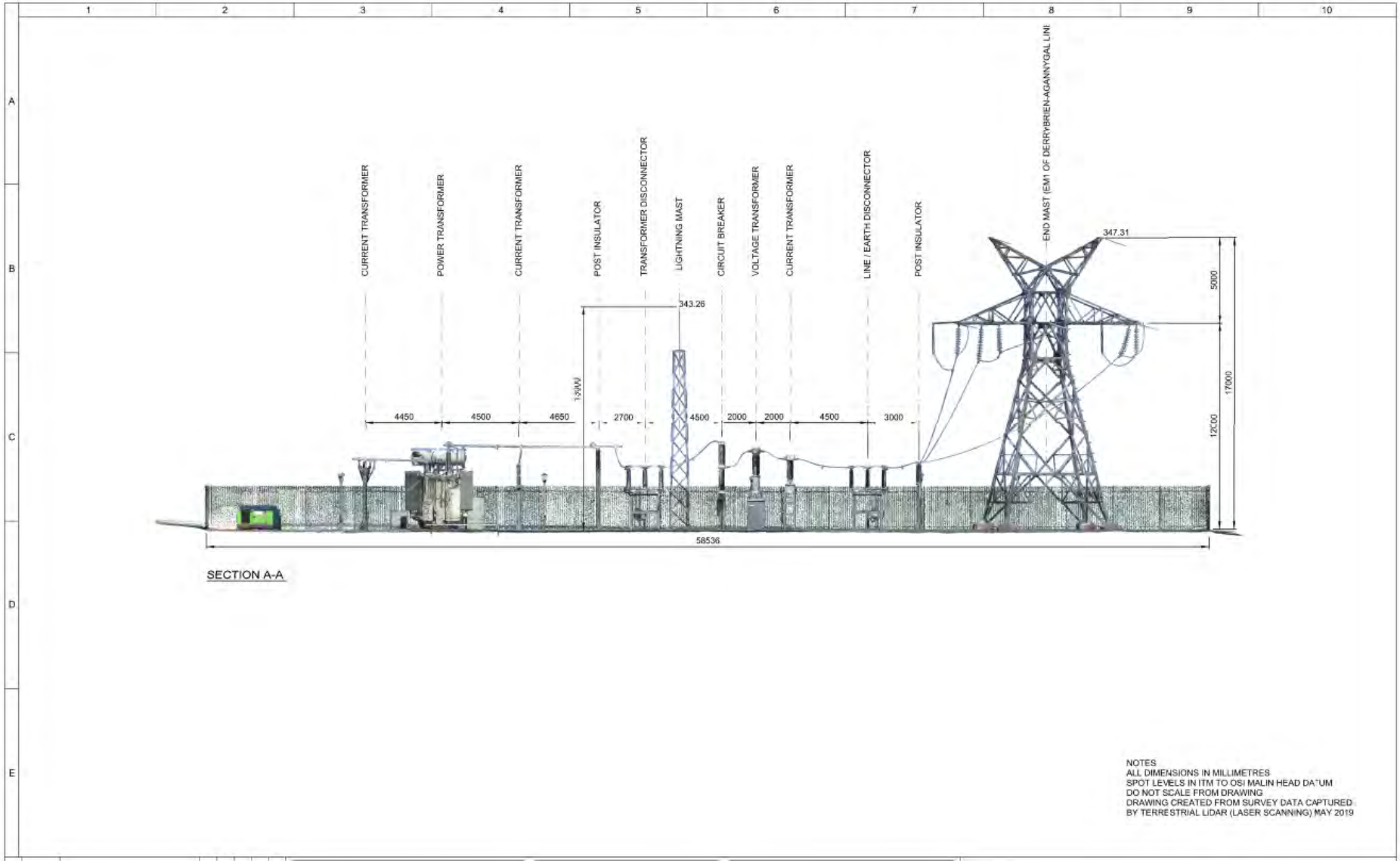

Figure 3-6 Derrybrien 110 kV Substation Sectional Elevation

Compound Size and Construction: The 110kV/20kV Substation consists of a compound (approximately 58.5m x 27.1m) containing outdoor electrical equipment and a Control Building.

The foundations for the control building, the electrical equipment steelwork and transformer within the compound comprise reinforced concrete pads or plinths supported on the granular rockfill or the underlying firm or stiff glacial till. The compound hardstanding is capped with hardcore surfacing.

Other features include a reinforced concrete water-retaining transformer bund support, external cable trenching, standby generator and bunded diesel tank, external lighting poles, lightning mast, palisade fencing and a well supplying non drinking water.

There is a 4m wide hardcore surfaced access track around the external perimeter of the substation.

Control Building: The Control Building is a single storey building (22.86m x 8.83m) with pitched roof, double leaf cavity blockwork walls, pre-cast concrete ceiling slabs with wooden roof trusses overlain with felt and slates. The internal floor is a reinforced concrete slab, cast in-situ, which has a raised floor feature in places to allow cable laying below the floor to electrical equipment within the building.

Equipment contained in the control building includes a Supervisory Control and Data Acquisition (SCADA) system, which allows for off-site monitoring via a telephone connection. The following is located within the control building-control room, MV switchgear room, relay room (protection relays) battery room, toilet, workshop and office area.

Substation Drainage: The substation site is finished with 50 mm single size clean compound stone. The permeable compound stone provides a means of attenuation of runoff and allows rainwater to infiltrate to ground. Rainwater from the roof of the control building connects via downpipes away from the compound into the wind farm drainage system. There is a proprietary pump that directs drainage to an oil separator ((Butler Manufacturing Services) Ltd. PIF Class 1 Full Retention Oil Separator) when oil is detected to prevent discharge of oil to the site drainage network.

The welfare facilities in the control building of Derrybrien Substation consists of one toilet and two sinks. An Envirocare P6 sewage treatment plant unit caters for the wastewater generated in these facilities. It is regularly serviced under a maintenance contract with a private service company.

The grid transformer is located within an impermeable bund capable of oil retention of 110% of oil volume in the event of a leakage from the transformer.

Electrical Equipment: The station contains outdoor and indoor electrical equipment.

The outdoor electrical equipment within the substation compound comprises

- 1 70 MVA Transformer 110 kV/MV
- Cable chair
- 3 surge arresters
- 1 NER (Neutral Earth Resistor)
- 1 Busbar Disconnect
- 1 Circuit Breaker
- 3 Current Transformers
- 3 Voltage Transformers
- 1 Line/Earth Disconnector
- 2 capacitor banks
- 6 Post Insulators

- 1 End Mast
- 1 house transformer

The indoor electrical equipment within the substation control room comprises

- Control and protection panels
- Batteries
- MV metal enclosed switchgear

Electrical insulating material: SF6 is used as insulating material in the substation switchgear - specifically the outdoor Siemens 110 kV circuit breaker (8.10kg SF6), the two capacitor bank units (2 x0.34kg SF6) and in the ten 20 kV radial circuit breakers within the control building. The equipment containing SF6 is labelled and sealed. There is an alarm system in the switch room to alert operator to any loss of SF6.

3.5.8 Drainage

Prior to construction of the wind farm, the site had already been subjected to a programme of drainage to facilitate forestry (in the 1960s and 1970s) and turbary. The majority (27km out of 39 km) of drainage channels on site were in place prior to the wind farm development. During construction of the wind farm the majority of the pre-existing channels were left unchanged except where there was a conflict with new infrastructure. In areas of high concentrations of flow upstream of access tracks and / or close to turbine foundations, sections of drainage were re-aligned or deepened to reduce the risk of localised surface ponding and flooding and some minor cleaning out and maintenance work took place as required"

The remaining 12 km of drainage channels were newly constructed for the wind farm project. These drain the site access tracks and connect the turbine foundation drainage to the drainage network.

The constructed channels are narrow open drains, typically 0.5 to 1.5 m deep, with culverts under the site access tracks.

Culverts of either 450mm or 600 mm in diameter have been inserted at various wind farm access road crossings as necessary to maintain the conveyance path of the existing drains crossed.

The on-site drainage network connects to the natural regional network of streams and rivers downslope from the site.

3.5.9 Wind Farm- Spoil management/Peat Repositories

It is estimated that approximately 160,000m3 of peat was excavated for the wind farm infrastructure (turbine foundations and crane hard-standings, borrow pits, site compound, substation and anemometers). Prior to the peat slide, spoil which arose from construction excavations was side cast. Following the peat slide, the spoil was placed up to a height of 1.0m in designated locations in areas of flat or gently sloping ground (<3°) across the site.

Following the peat slide, some of the previously side cast material was also transferred to the peat repositories. The peat repositories are identified by the adjacent turbine reference number, the suffix R signifies repository area. It is noted that there is more than one repository adjacent to certain turbine locations. The relevant co-ordinates are provided in Table 3-7 The peat repository areas are shown on Figure 3-4.

Table 3-7: Approximate centre point of Peat/spoil repository areas on wind farm site

Location	Easting*	Northing*	Area (Ha) (approx.)	Location	Easting*	Northing*	Area (Ha) (approx.)
T2R	557859.80	704871.77	0.21	T32R	560261.60	704835.38	0.07
T2R	557878.76	704842.10	0.09	T33R & T36R	560262.94	705492.71	0.39
T3R	557840.07	704602.65	0.04	T34R	560402.07	705114.95	0.20
T3R	557854.49	704579.57	0.03	T35R	560425.92	704922.40	0.12
T3R	557782.83	704573.05	0.07	T36R	560399.69	705551.47	0.07
T4R	557992.94	704696.69	0.01	T37R	560605.21	705230.15	0.07
T4R	557989.56	704674.31	0.03	T38R	560576.73	704990.32	0.10
T5R	558202.16	704742.03	0.05	T39R	560485.11	705578.53	0.04
T6R	557926.45	704348.27	0.13	T39R	560570.49	705635.92	0.06
T6R & T7R	558035.41	704447.37	0.93	T40R	560772.53	705318.09	0.07
T7R	558165.68	704473.83	0.03	T40R	560751.00	705274.46	0.12
T8R	558397.93	704581.58	0.35	T41R	560730.96	705062.96	0.07
T9R	558553.79	704677.82	0.08	T42R	560776.62	705657.84	0.07
T10R	558753.70	704718.90	0.03	T43R	560936.96	705144.21	0.17
T10R & T11R	558887.97	704743.24	0.98	T44R	561034.18	705610.51	0.04
T12R	558157.97	704134.70	0.53	T45R	561150.03	705245.09	0.12
T13R	558262.85	704192.86	0.07	T45R	561105.77	705216.14	0.11
T13R	558227.85	704228.86	0.03	T46R	561123.03	704965.97	0.03
T14R	558466.34	704394.51	0.28	T46R	561094.08	705015.12	0.06
T18R	558139.06	703900.46	0.03	T46R	561139.16	705006.04	0.05
T18R	558157.26	703875.64	0.03	T47R	558275.70	705317.57	0.20
T18R	558184.42	703870.85	0.06	T47R	557705.75	704817.99	0.02
T19R	558387.90	703978.09	0.03	T48R	558427.45	705409.99	0.50
T20R	558603.42	704071.31	0.02	T49R	558675.28	705515.06	0.13
T21R	558821.40	704183.16	0.03	T50RB	558859.74	705605.55	0.19
T22R	558958.95	704262.78	0.01	T51R & T51RB	559134.99	705659.83	0.35
T24R	559484.20	705159.95	0.19	T53R	558447.81	705144.30	0.34
T24R & T25R	559545.80	704972.91	1.24	T54R & T55R	558733.57	705282.73	0.49
T25R	559735.28	704834.37	0.10	T56R & T57R	559058.08	705519.17	0.92
T25R	559705.89	704885.30	0.11	T57R	559250.26	705608.52	0.28
T27R	559666.17	705264.55	1.04	T58R	559433.67	705618.26	0.21
T27R	559834.76	705337.00	0.61	T59R & T60R	558647.22	704916.08	0.28
T28R	559986.02	704954.98	0.13	T62R	559256.64	705305.22	0.19
T29R	560009.95	704714.44	0.03	T63R	559388.05	705316.00	0.07
T30R	559948.71	705369.43	0.13	T65R	559790.88	705450.64	0.43
T30R	560055.22	705410.10	0.09	T66R	559191.56	704897.45	0.06
T31R	560175.95	705055.18	0.08	T67R	559393.52	705008.42	0.05
T32R	560190.34	704800.91	0.02	T68R	559182.83	704757.62	0.21

Location	Easting*	Northing*	Area (Ha) (approx.)	Location	Easting*	Northing*	Area (Ha) (approx.)
Derry-brien Sub-station	559895.76	704679.64	0.27	Derry-brien Sub-station	559950.97	704698.73	0.11

* Irish Transverse Mercator (ITM) coordinate reference system

As of 2025, blanket bog vegetation has re-established on the surface of almost all of the repository/storage areas, in most cases making them difficult to distinguish from the surrounding ground.

3.5.10 Borrow Pits/Quarries

There are 3 borrow pits/quarries on site. These were used during construction as a source of bedrock to be processed into crushed rock granular fill for use in the construction of the access tracks and hard standing areas. Some clay was also extracted. Borrow Pit/Quarry No. 3 adjacent to Turbine T65 at the site entrance, was the main source of rock fill for the works.

The estimated volume rock/clay extracted from each borrow pit is:

- BP1 = 40,000 m3 (primarily rock)
- BP2 = 12,000 m3 (primarily clay)
- BP3 = 180,000 m3 (primarily rock)

The exact depth of the borrow pits is unknown but it is understood that Borrow Pits 1 and 2 were up to 10 m deep relative to ground level and Borrow Pit 3 is deeper.

The borrow pits have been closed since the end of the construction phase in 2006.

The three borrow pits/quarries have also been partially rehabilitated by backfilling with excavated peat. The location and approximate area of the peat repository/storage areas is set out in **Table 3-8**.

Table 3-8: Approximate centre point of Peat/spoil repository areas within borrow pits/quarries

Location	Easting*	Northing*	Approx. Area (ha)
PR at Borrow Pit 1	559545.38	705110.38	0.395
PR at Borrow Pit 2	558593.02	704787.87	0.32
PR at Borrow Pit 2	558663.48	704813.97	0.27
PR at Borrow Pit 3	559779.12	705599.00	0.25
PR at Borrow Pit 3	559704.75	705609.63	0.06

* Irish Transverse Mercator (ITM) coordinate reference system

Borrow Pit/Quarry 1: Borrow Pit/Quarry1 is located in an area of shallow peat adjacent to Turbine T24. Peat was removed from the site and the underlying glacial till and weathered rock was excavated for re-use as backfill material over the turbine foundations. The borrow pit/quarry was rehabilitated by backfilling with excess excavated peat/soil prior to completion of the works on site and blanket bog vegetation and some small trees have become established at the surface.

Borrow Pit/Quarry 2: Borrow Pit/Quarry 2 is located in an area of shallow and outcropping rock on the west side of the site between Turbines T9 and T10. Shallow peat was initially removed from the site and mineral soil and rock were extracted for use as backfill material for the turbines and for road

construction. The borrow pit/quarry was rehabilitated by backfilling with excess excavated peat/soil from the excavations for the turbine foundations and crane hard-standings prior to completion of the works on site. Bunds of mineral soil were constructed around the perimeter of the borrow pit so that the remoulded peat was fully contained within the pit. The borrow pit/quarry area is fenced off as a safety measure.

Borrow Pit/Quarry 3: Borrow/Quarry 3 located near the site entrance on the north side of Turbine T65 was the main source of rock on the site for the construction of the site access tracks and hardstanding areas. Borrow Pit/Quarry 3 has been partially rehabilitated by backfilling sections of the borrow pit which are fully contained within rock fill and mineral soil bunds. A portion of the borrow pit/quarry is flooded to the natural water table level 1.0-1.5 m below the level of site access road at the entrance to the borrow pit/quarry. There is a drain along the edge of the road to divert any rising water from the borrow pit to the offsite drainage network. The area is fenced off with timber fencing to restrict access as a safety measure.

3.5.11 Signage

There are a number of information signs throughout the site as follows:

- Panel signs at the wind farm entrance indicating the presence of the wind farm
- Signage on each turbine indicating the turbine number, potential hazards and an emergency contact telephone number.
- Other operational signage as required (Buried HV Cables, warning sign beside Borrow Pit/Quarry 3 etc.).

3.5.12 Water supply

Non drinking water supplies are sourced from wells at two locations for the project-Derrybrien Substation and Agannygal Substation. Otherwise there is no water supply requirement associated with the project.

3.6 Grid connection

3.6.1 Overview

The electricity generated at Derrybrien Wind Farm was transmitted from the 20kV/110kV Derrybrien Substation via a 7.8km overhead line to the national grid at Agannygal 110kV Substation on the Ennis-Shannonbridge 110kV Line.

3.6.2 Overhead Line

The 7.8km Derrybrien –Agannygal 110kV overhead line (with earth wires) is supported on double pole sets and mast structures, 42 structures in total. Of these 34 are double wood polesets (PS), 2 are end masts (EM) (1 end mast within Derrybrien Substation), 6 angle masts (AM) and 1 intermediate mast (IM). The end masts, intermediate mast and angle masts are galvanised steel lattice tower structures. The location of the overhead line structures is set out in Table 2-11 and mapped on Figure 3-7 and Figure 3-8.

The following mast types were used:

- Type 61 -Structure Nos 1, 14,30, 34, 41
- Type 60-Structure Nos 18, 20, 24

- Type 149E-Structure No 38.

The height of the masts above ground ranges between approximately 13.4 and 20.1m.

The following foundation types were used for the 9 mast structures:

- Type B-Structure Nos 14, 18, 30
- Type C-Structure Nos 1, 20, 24, 34, 41
- Type D-Structure No 38

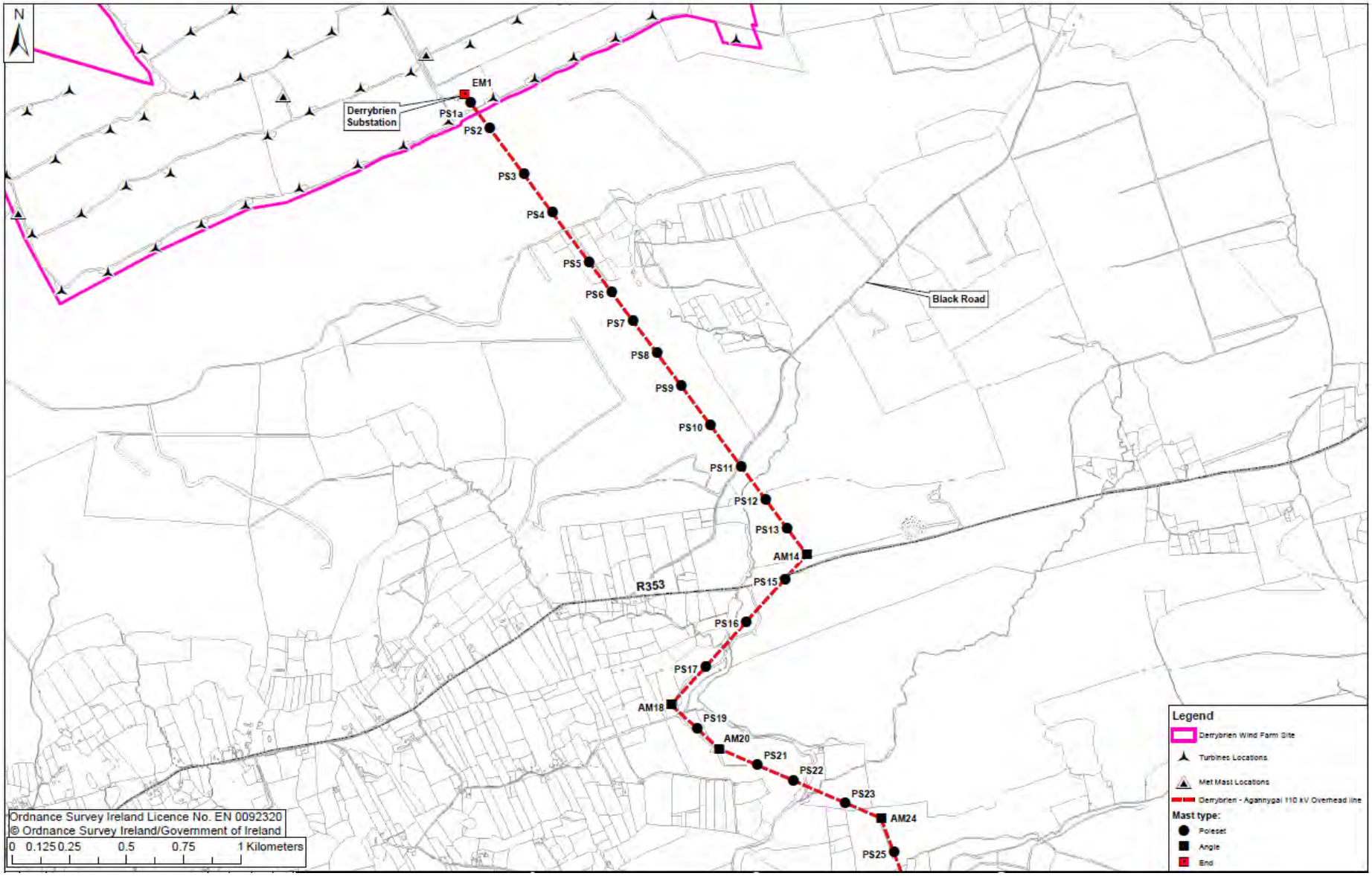

Figure 3-7 Derrybrien - Agannygal 110kV Overhead Line Route (Sheet 1 of 2)

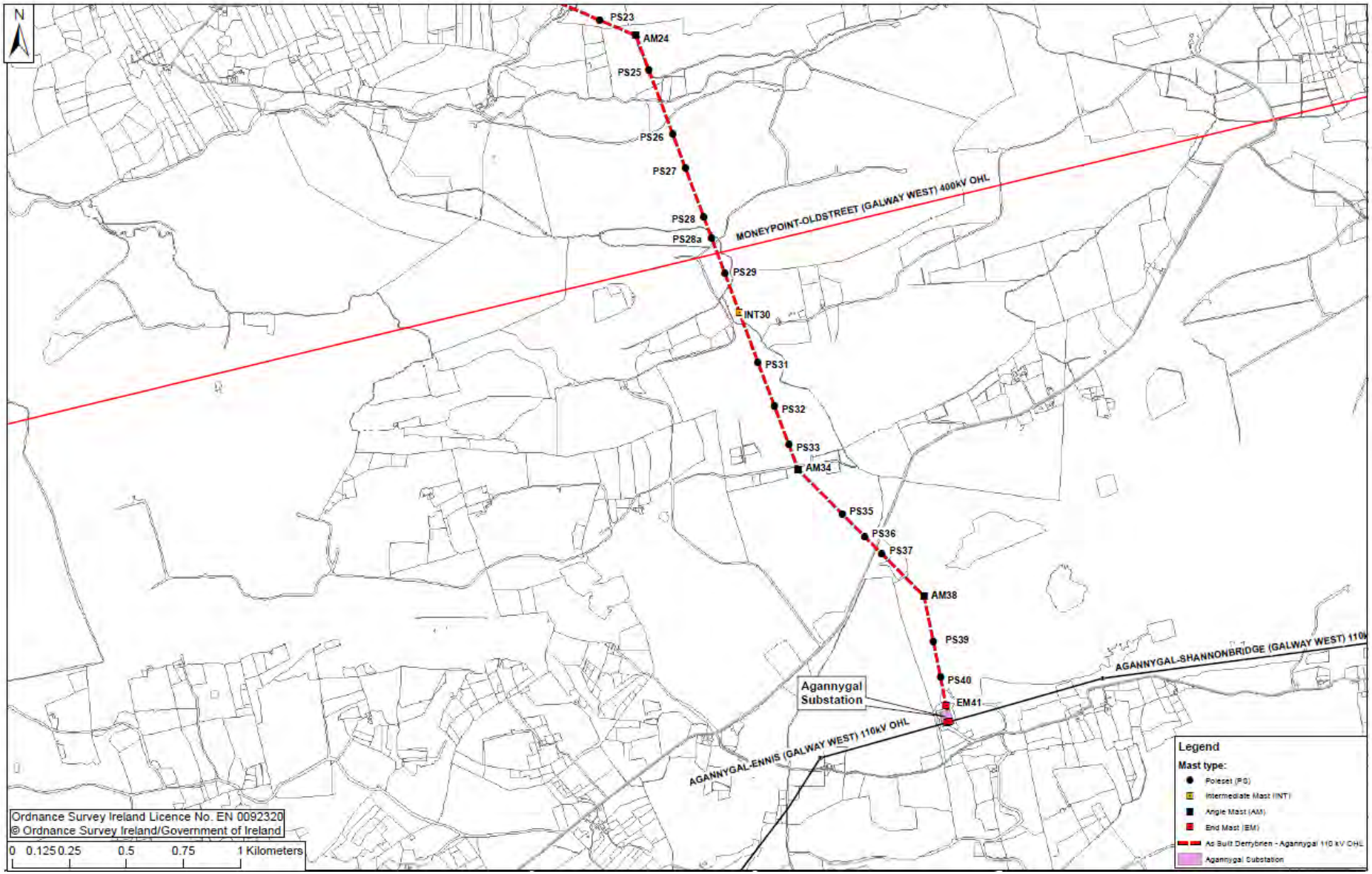

Figure 3-8 Derrybrien - Agannygal 110kV Overhead Line Route (Sheet 2 of 2)

Table 2-9: Centre point of Overhead Line Structure

No	Easting*	Northing*	Ground Level (mOD)	Length of pole above ground (m)	No	Easting*	Northing*	Ground Level (mOD)	Length of pole above ground (m)
EM1 Station	559934.04	704741.58	330.26	17.12	PS22	561372.68	701743.16	118.94	19.01
PS1a	559961.53	704706.78	328.75	15.54	PS23	561599.15	701645.84	126.26	19.88
PS2	560045.41	704595.58	319.87	19.51	AM24	561757.79	701577.10	129.75	13.88
PS3	560195.40	704393.69	298.54	16.75	PS25	561814.19	701427.78	125.95	19.21
PS4	560319.37	704225.98	277.02	18.39	PS26	561919.46	701145.45	128.46	19.08
PS5	560479.71	704011.01	247.47	17.92	PS27	561975.45	700996.26	122.88	22.34
PS6	560577.93	703878.83	242.55	16.82	PS28	562055.24	700783.63	118.37	17.03
PS7	560670.98	703753.84	236.15	17.55	PS28a	562089.91	700690.27	119.36	12.07
PS8	560777.10	703611.60	226.76	19.96	PS29	562148.20	700535.23	122.74	11.86
PS9	560883.06	703469.23	224.16	19.12	IM 30	562211.01	700366.37	128.93	20.07
PS10	561011.01	703297.56	205.91	19.32	PS31	562293.13	700146.48	151.96	18.96
PS11	561144.76	703117.28	184.01	19.81	PS32	562365.75	699953.11	155.55	20.10
PS12	561252.23	702972.36	186.66	15.24	PS33	562429.02	699785.00	169.67	18.41
PS13	561345.24	702846.96	175.30	18.36	AM34	562469.56	699675.65	171.66	19.84
AM14	561432.13	702731.13	170.34	16.85	PS35	562663.58	699480.89	188.20	17.73
PS15	561336.59	702623.64	158.76	19.78	PS36	562761.47	699382.55	191.74	16.33
PS16	561167.40	702436.88	146.87	19.30	PS37	562835.54	699307.95	191.47	18.73
PS17	560989.98	702239.48	146.68	20.20	AM38	563021.65	699120.57	199.00	15.97
AM18	560839.63	702073.68	143.27	15.35	PS39	563062.31	698922.65	199.78	18.30
PS19	560951.34	701971.82	138.64	16.86	PS40	563093.73	698765.62	197.89	15.57
AM20	561048.92	701882.62	137.62	13.42	EM41	563118.26	698642.70	193.60	15.44
PS21	561215.66	701810.46	131.75	19.52					

* Irish Transverse Mercator (ITM) coordinate reference system

3.6.3 Agannygal Substation

Compound Size and Construction: The 110kV Substation consists of a compound (approximately 63m x 47.5m) containing outdoor electrical equipment and a Control Building.

The foundations for the control building and the electrical equipment steelwork within the compound comprise reinforced concrete pads or plinths supported on the granular rockfill or the underlying firm or stiff glacial till. The compound hardstanding is capped with hardcore surfacing.

Other features include external cable trenching, standby generator (bunded) and diesel tank, external lighting poles, lightning mast, palisade fencing and a well supplying non drinking water.

There is a wide hardcore surfaced access track around the external perimeter of the substation.

Control Building: The Control Building is a single storey building (14.5m x 8.9m) with pitched roof, double leaf cavity blockwork walls, pre-cast concrete ceiling slabs and wooden roof trusses overlain with felt and slates. The internal floor is a cast in-situ reinforced concrete slab with raised flooring detail in parts to allow underfloor cable runs. The control building comprises the control room, battery room, storeroom and toilet.

Compound Drainage: Clean surface water drainage from the control building roof is collected by guttering and downpipes and directed to the substation drainage system. Land drains surrounding the substation compound collect surface water runoff which drains downhill offsite along the edge of the access road constructed to the substation. The wastewater from the control room is treated by a Biocycle wastewater treatment system.

Electrical Equipment: The station contains outdoor and indoor electrical equipment. The outdoor electrical equipment within the substation compound comprises:

- 3 end masts (note that one is denoted as a line bay gantry on the drawing)
- 4 line traps (Telecoms Equipment)
- 1 busbar
- 5 post insulators
- 3 line/earth disconnects
- 9 current transformers
- 9 voltage transformers
- 3 circuit breakers
- 5 busbar disconnectors

The location and height of masts is detailed in **Table 3-10**.

Table 3-10: Agannygal Substation mast locations

Easting*	Northing*	Ground Level (mOD)	Height of mast above ground (m)
563122.99	698567.78	192.47	12.68
563132.88	698570.57	192.72	12.70

* Irish Transverse Mercator (ITM) coordinate reference system

The indoor electrical equipment within the substation control room comprises

- Control and protection panels
- Batteries

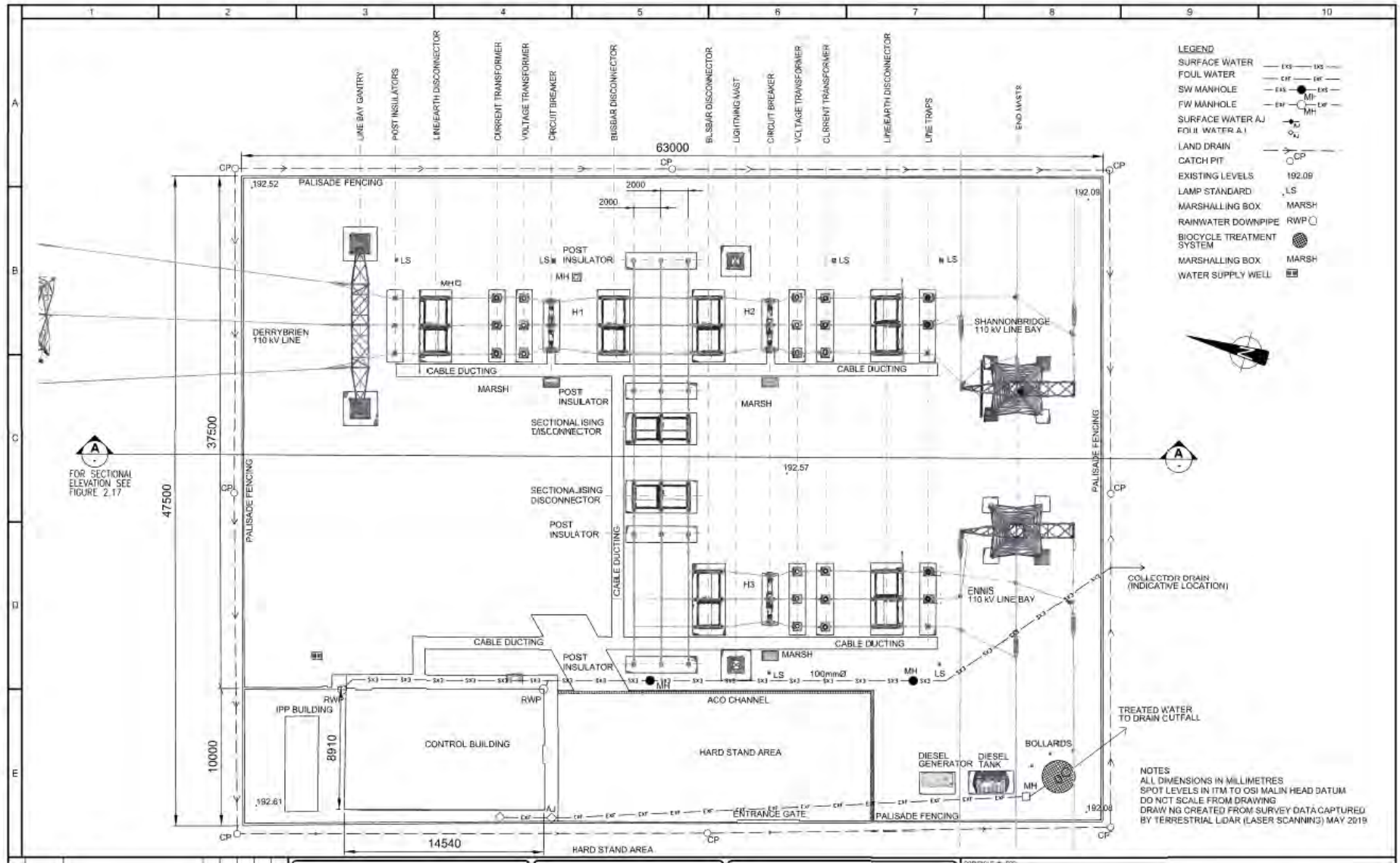

Figure 3-9 Agannygal 110kV Substation Layout Plan

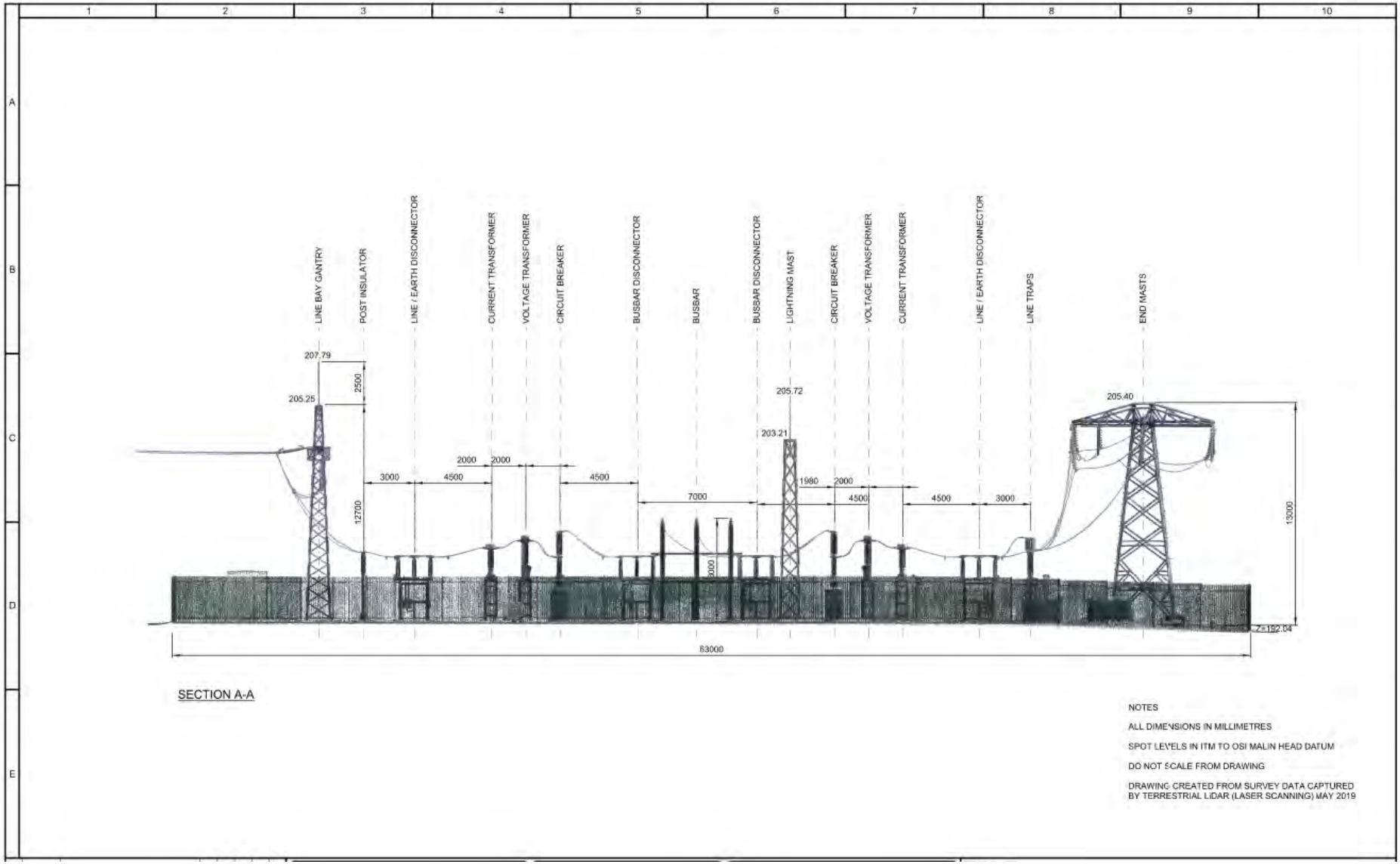

Figure 3-10 Agannygal 110 kV Substation Sectional Elevation

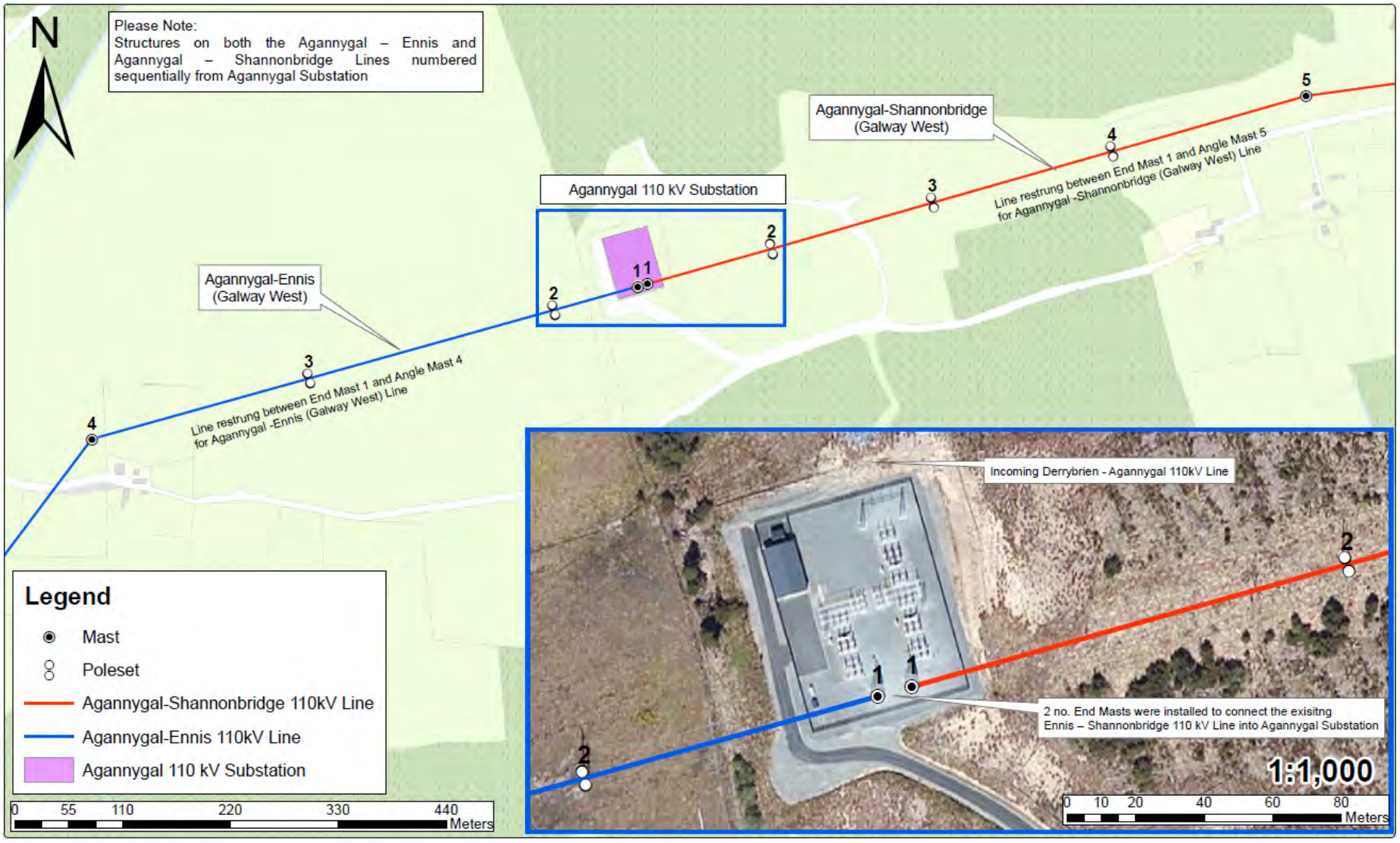

Figure 3-11 Grid connection works undertaken to Ennis-Shannonbridge OHL span

3.6.4 Connection to Agannygal-Ennis 110kV Line

The Derrybrien-Agannygal overhead line was connected to the National Grid on the Ennis-Shannonbridge (Galway West) 110kV line (Figure 3-11). The connection entailed the removal of an approximately 1.3km long line span, of on the pre-existing Ennis-Shannonbridge overhead line and replacement with 2 spans emanating from Agannygal Substation comprising:

- End mast and Agannygal-Shannonbridge line span (approximate length 0.7km)
- End mast and Agannygal-Ennis line span (approximate length 0.6km)

3.7 Works associated with peat slide

3.7.1 Overview

A peat slide occurred during Project construction on the 16th October 2003.

In the response to the peat slide, works were undertaken to minimise effects on lands and receiving watercourses. The works remaining in place today associated with the peat slide comprise:

- Borrow Pit adjacent to Barrage 1
- Rebuilt access track/embankment at T68 - (within wind farm site)
- Rebuilt access track/embankment between T23 and T70 – (within wind farm site)
- Barrage 1
- Barrage 2, Access Track and associated repository area
- Barrage 3 and associated repository area
- Barrage 4
- Repository area at the Black Bridge
- Repairs to instream structures/bridges

The access tracks at turbine 68 (T68) and between T23 and T70 are located within the wind farm site and Barrages 1,2,3 and 4 together with associated peat/soil repository areas are outside the wind farm site.

It is noted that the temporary earthen barrages constructed following the peat slide (called barrages-A, B, C and D elsewhere in this document) are no longer in place and that dimensions of these structures are not available.

3.7.2 Borrow Pit/Quarry adjacent to Barrage 1

The borrow pit/quarry was opened up adjacent to Barrage 1 as a source of rock for the barrages built in response to the peat slide (approximate area 2314m^2). Borrow pit adjacent to Barrage 1 is illustrated in Figure 3-12.

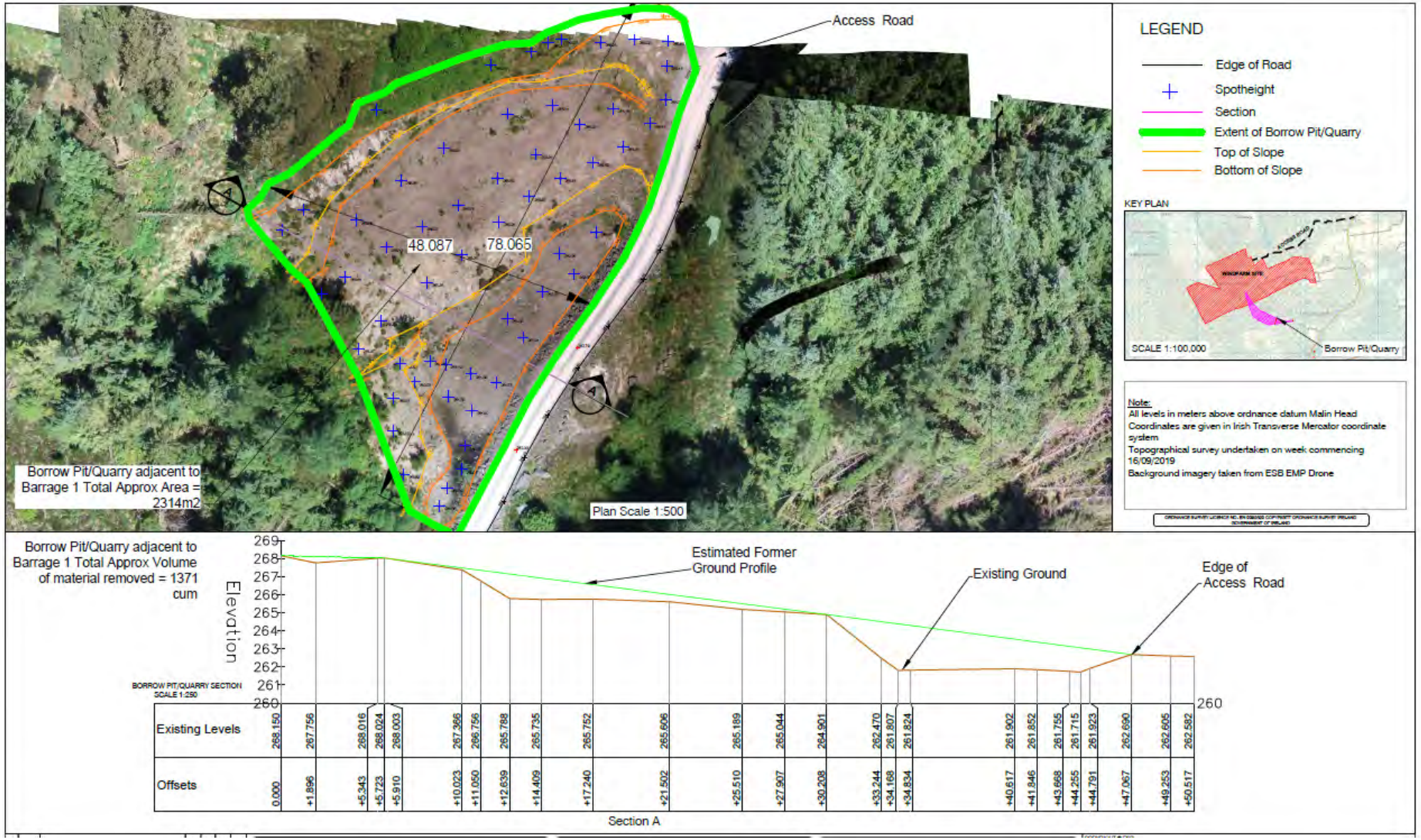

Figure 3-12 Borrow Pit / Quarry adjacent to Barrage 1 (Plan and Section)

3.7.3 Wind Farm Access Track at T68

The original access track at T68 within the wind farm site is located in the vicinity of the head of the peat slide.

The track was rendered effectively unusable following the peat slide in 2003 and was reinstated along its original route by removing all peat below the track and re-constructing the track on mineral soil using coarse fill. The reconstructed access track varies in width due to the hardstand at turbine T68.

The reconstructed access track acted as a containment measure following the peat slide. The reconstructed road was made utilising rock fill material from the on-site borrow pits and is founded on the mineral soil below the pre-existing peat layer at the location.

3.7.4 Wind Farm Access Track T23-T70

Following the 2003 peat slide, part of the access track between T23-T70 was reinstated along its original route by removing all peat below the track and re-constructing the track on mineral soil using coarse fill. As with the access track at T68, the access track acted as a containment measure following the peat slide.

The width of the access track varies from 3.5 to 5m wide at its surface. A small berm approximately 300mm high carrying services buried in concrete is located on the upslope side of the access track.

3.7.5 Barrage 1

The barrage was constructed as a containment measure shortly after the peat slide occurred. The barrage was built close to the line of the pre-existing Coillte track located upstream of the main gorge (Figure 3-13). A Coillte access track was rebuilt over the barrage.

This is a low embankment constructed using boulders and crushed rock.

The barrage is a porous structure constructed of rock boulders. A sump on the upslope side of the barrage is provided for drainage purposes.

The barrage functioned as a containment/stability measure for a number of years after the peat slide.

Although Barrage 1 is no longer required as a containment/stability measure, as the access track over the barrage forms part of the Coillte forestry access track network, it is envisaged that it will remain in place in the long term.

Figure 3-13 Barrage 1 (Plan and Sections)

3.7.6 Barrage 2, Access Track and Repository Area

Barrage 2 and Access Track: The barrage was constructed as a containment measure shortly after the peat slide occurred. An access track was constructed from an existing Coillte access track in order to access this location (Figure 3-14). The barrage was functioned as a containment/stability measure for a number of years after the peat slide. Although Barrage 2 is no longer required as a containment/stability measure, because the access track over the barrage and the access track constructed to it are suitable for use by Coillte, it will remain in place in the long term.

Repository adjacent to Barrage 2: The repository area associated with Barrage 2 contain peat, silt and sand which was removed during construction of the barrage from behind the barrage in the years following the peat slide (Figure 3-15).

Probing indicates that the placed arisings depth ranges from 0.6 to 1.9m with an average of about 1.6m.

The repository area has become re-vegetated and partially fenced with post and wire fencing.

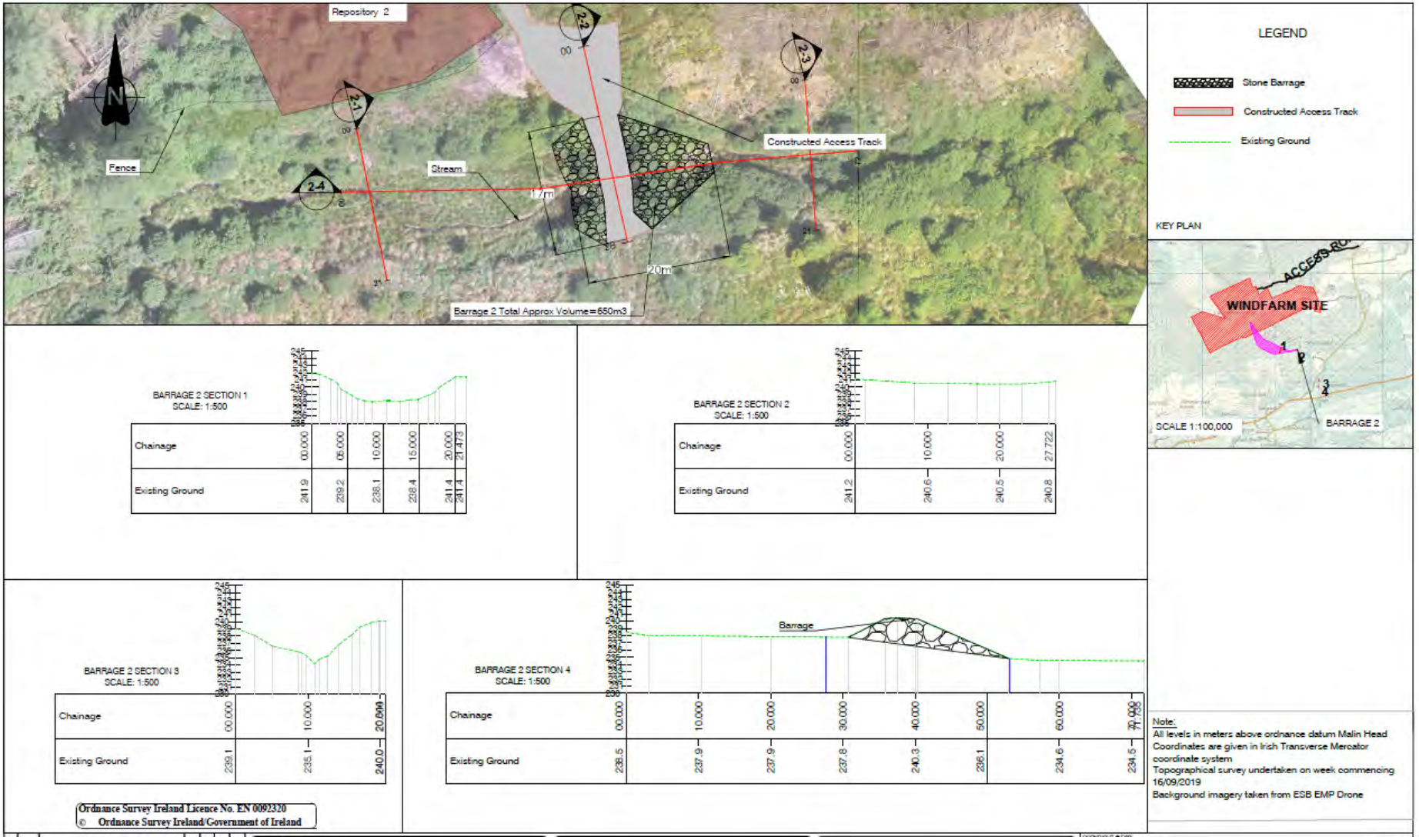

Figure 3-14 Barrage 2 Plan and Sections

Figure 3-15 Peat Repository at Barrage 2 (Plan)

3.7.7 Barrage 3 and Repository Area

Barrage: Barrage 3 was constructed as a containment measure shortly after the peat slide. The barrage is a porous structure comprised of boulders within a section of an incised stream which forms a tributary of the Owendalulleegh River and is located over 1km downstream of the site of the peat slide. As of 2024, the barrage is covered by heavy vegetation. Plan and Section drawings for Barrage 3 are shown in Figure 3-16 and Figure 3-17.

Repository: The repository area adjacent to Barrage 3 contains silt, sand and peat which were removed from the area following the peat slide. Probing indicates the placed arisings depth ranges from 1.0 to 1.6m. The repository area has become re-vegetated. The repository area adjacent to Barrage 3 is fenced with post and wire fencing.

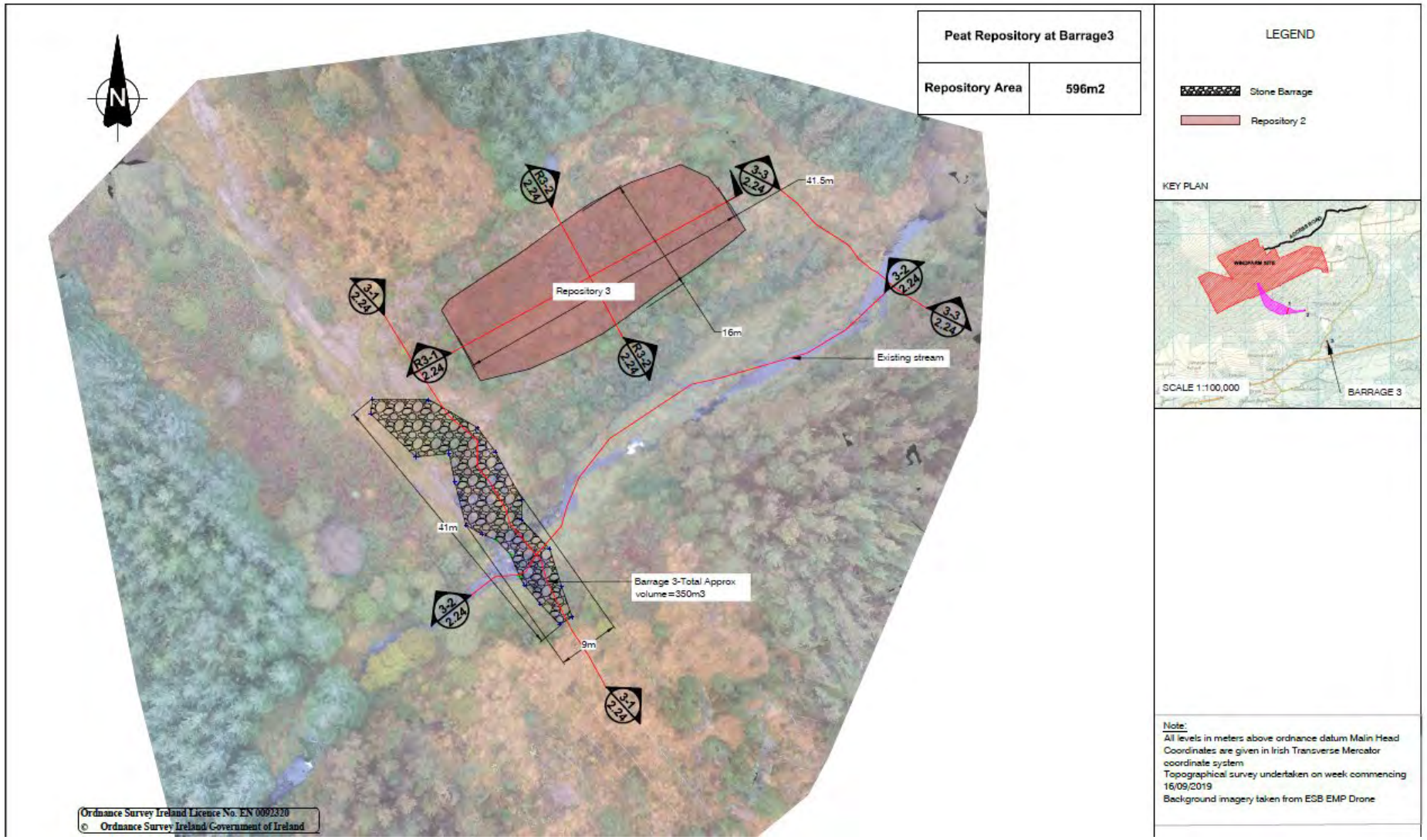

Figure 3-16 Barrage 3 and associated Repository Area (Plan)

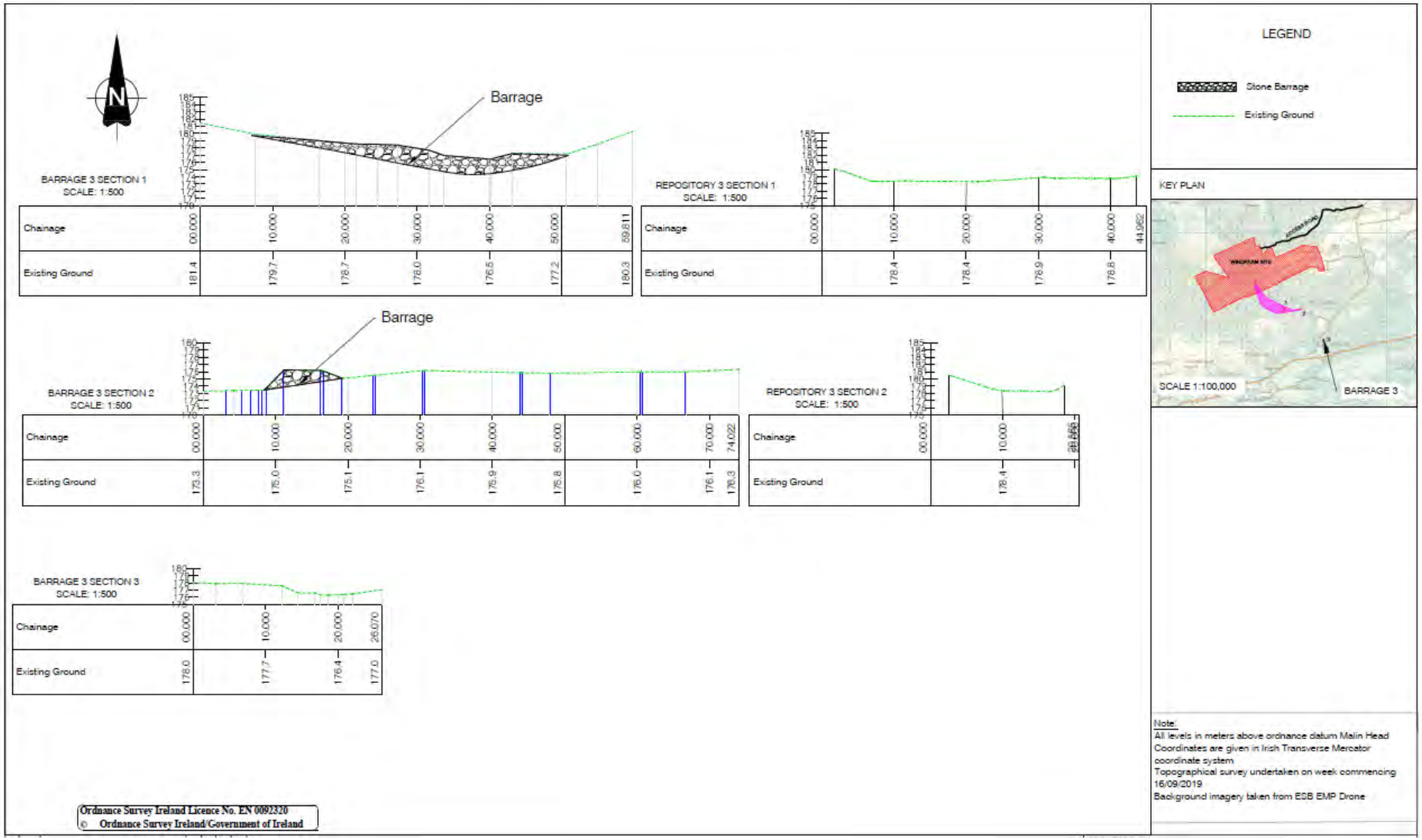

Figure 3-17 Barrage 3 and associated repository area sections

3.7.8 Barrage 4

Barrage 4 was constructed as a containment measure shortly after the peat slide. The barrage is a porous structure comprised of boulders placed within a section of stream which forms a tributary of the Owendalulleegh River. The containment barrage is approximately 20m long and 3m wide at the surface (Figure 3-18).

3.7.9 Repository Area at Black Road Bridge

The repository area at Black Road Bridge comprises two separate sections with a total area of 8,220m^2 (Figure 3-19). The repository area at Black Road Bridge contains stored peat (up to about 2m high), together with some soil/rock debris from the site of the peat slide. Both sections are heavily vegetated and are bunded. The repository area is fenced with post and wire fencing.

3.7.10 Drainage diversion works

As part of the works to stabilise the peat debris contained within the site of the peat slide a series of drains were constructed to allow excess water to effectively drain away. In addition, since the peat slide occurred, a number of natural flow paths have formed within the site of the peat slide as a result of the development of preferential flow paths following rainfall events.

3.7.11 Repairs to bridges

The peat slide resulted in damage to a number of bridges downstream of the wind farm See Figure 3-3 Location of work associated with peat slide). Repairs were carried out to address structural stability and capacity concerns. These individual structures are identified below in order from upstream to downstream.

Black Road Bridge: At Black Road Bridge structural repairs consisted of replacing the parapets of the bridge.

Flaggy Bridge: At Flaggy Bridge on the R353, damaged parapets were repaired and replaced after the peat slide.

Unnamed Bridge C: Damage to Unnamed Bridge C (privately owned) by the peat slide necessitated removal of the existing structure and re-construction of the entire bridge span.

Crooked Bridge: Localised road widening was undertaken at Crooked Bridge on the R353, for a distance of approximately 30m on either side of the bridge

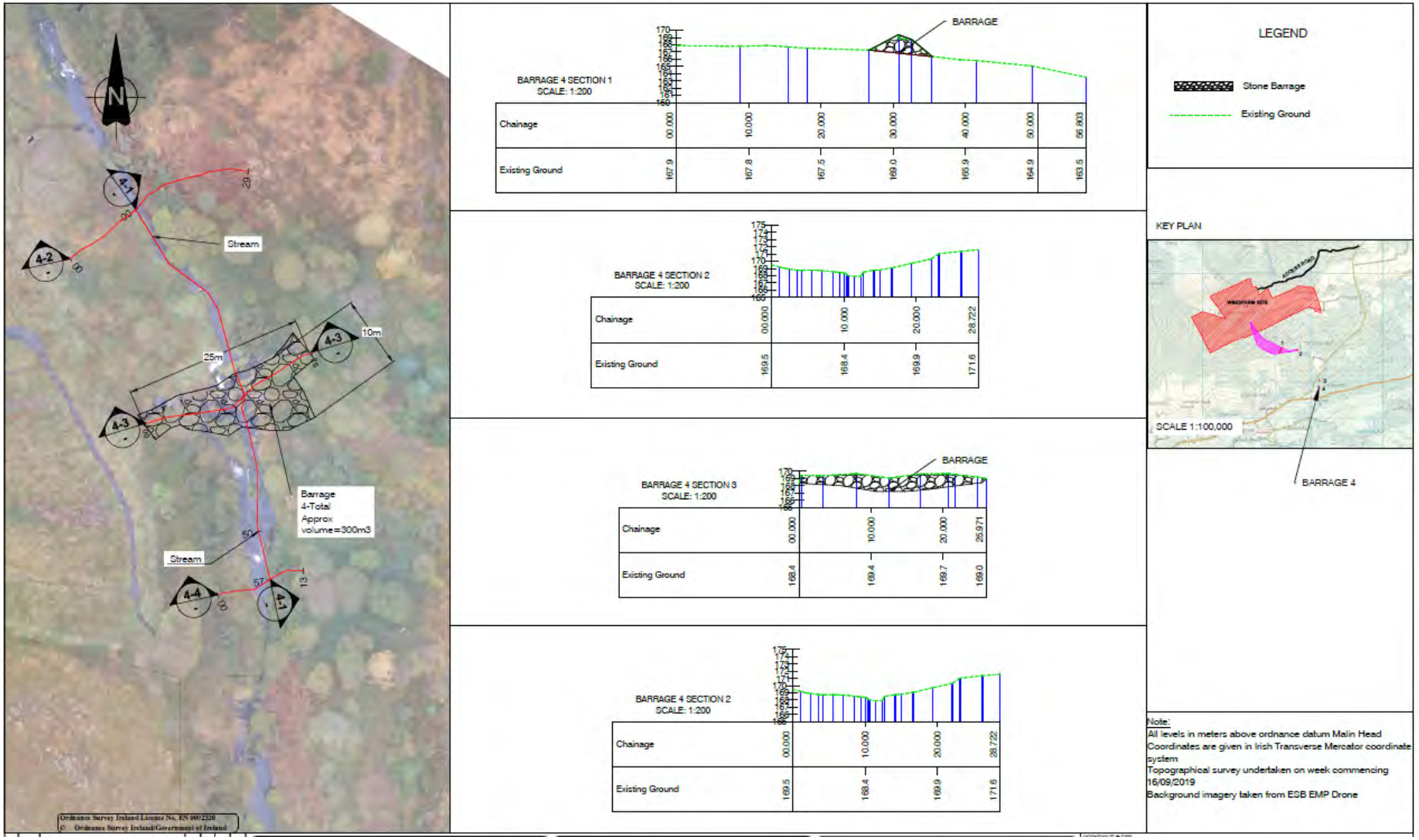

Figure 3-18 Barrage 4 Plan and Sections

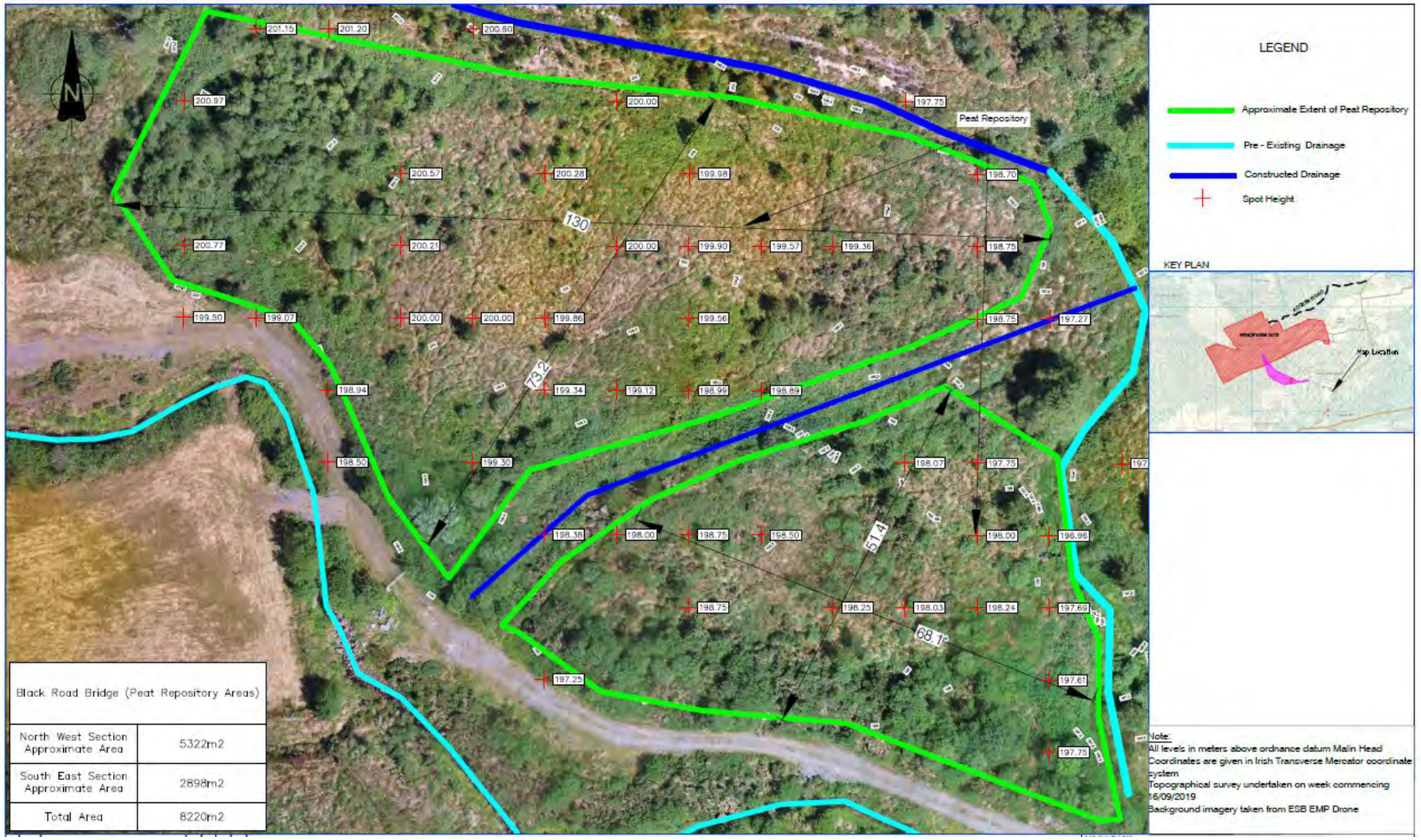

Figure 3-19 Peat Repository Area at Black Road Bridge Plan

4 Overview of Construction Phase Activities (2003 -2006)

4.1 Overview

4.1.1 Construction Contracts

There were four main contracts associated with the construction of the Derrybrien Wind Farm Project, as follows:

- The main civil works contract for the wind farm construction was an Engineer, Procure and Construct (EPC) contract. In addition to the main construction works, the main civil contractor also undertook the road upgrade works on the Black Road.
- The Electrical Balance of Plant (EBOP) works were carried out under a separate Design and Build contract and consisted of (1) installation of electrical cabling from wind turbines to Derrybrien Substation, (2) electrical works for the two 110 kV substations (Derrybrien Substation and Agannygal Substation) and (3) installation of overhead line from Derrybrien Substation to Agannygal Substation.
- The wind turbines were supplied and installed under a separate Turbine Supply Agreement (TSA).
- All tree felling activities were managed by Coillte who employed their own specialist tree felling sub-contractors to carry out the felling activities. These felling activities included tree felling within the main site, along the overhead line route and for the construction of Agannygal Substation. Some tree felling works were also required as part of the response to the peat slide to allow emergency works to be carried out.
- Some works to public roads and to Coillte access tracks were undertaken in the aftermath of the peat slide by Galway County Council and Coillte respectively. The installation of temporary barrages was undertaken by Galway County Council.

4.1.2 Construction working hours

The normal working hours for the construction activities was 7am to 7pm, up to 6 days a week. Due to the nature of the works, there were occasions during construction of the project where extended working hours were required. In particular, works were carried out up to 24 hours/day in response to peat slide.

4.1.3 Employment

The Gort Windfarms Ltd. team on the Project site varied in size through the construction phase; it typically consisted of between 4-10 representatives on site.

The main civil contractor had a team of up to approximately 60 staff on site during the peak construction activities. It is noted that on cessation of construction activities in the aftermath of the peat slide, the wind farm construction contractor staff were redeployed to undertake works in response to peat slide.

The EBOP Contractor had up to approximately 30 personnel on site and the Wind Turbine Generator (WTG) supplier had up to approximately 50 staff on site at peak workload.

Coillte had approximately 10 personnel on site at peak periods to carry out felling activities.

4.1.4 Site Compounds/Facilities

Wind Farm site: A site compound was established to the north east corner of the site, adjacent to the pre-existing Coillte track. The compound provided parking for workers at the wind farm site and a location for temporary construction offices/facilities.

Temporary portacabin accommodation was located within the construction compound and consisted of offices, welfare facilities, meeting room and toilet facilities for use by construction contractors and owner's representatives.

The temporary accommodation consisted of:

- 6 x office containers
- 2 x canteen containers
- 1 x drying room container
- 1 x toilet block
- 2 x storage containers
- Electrical Power Generator + diesel bowser

The toilet facilities at the compound were formed by a self-contained toilet block with a temporary holding tank for managing the sewage and waste water. These toilet facilities were removed upon completion of the works.

Container units were placed in the compound area for the storage of tools and materials during the construction works.

In addition, approximately 10 self-contained Portaloo's were provided across the site, which were serviced and maintained on a regular basis during the construction activities.

All portacabins, containers and Portaloo's were removed upon completion of the works.

Overhead Line: Materials for the overhead line were generally stored at locations on the Coillte tracks close to the works and at a yard location adjacent to the R353. However, the precise location of these sites is not known.

Agannygal Substation: A small contractors' compound of approximately 20m x 50m was established adjacent to the sub-station site. This provided space for all temporary facilities and construction worker parking.

4.1.5 Fencing

Temporary: Excavations on site were fenced off during construction. This fencing was formed from lightweight components for ease of reuse around the site and were all removed upon completion of the works.

Fencing was also erected at the interface between the construction site and the publicly accessible turbary area.

Permanent: Wooden post and wire mesh fencing was erected around Borrow Pit 3 at the end of the construction activities. Palisade fencing was installed around Derrybrien Substation.

4.1.6 Construction Plant

Wind Farm site: During project construction a wide range of mechanical plant was mobilised to the wind farm site. This plant was generally kept on the site (except for the mobilisation of plant for use in response to peat slide) and not removed from the site until it had fulfilled its purpose.

The amount and type of plant on site varied in accordance with the level and type of activity on site over the period of construction.

The type and number of heavy civil works plant on the site during the peak construction period typically comprised:

- Excavators (20)
- Crusher (1)
- Front loaders (3)
- Dumpers (5)
- Dozers (4)
- Roller (10)
- Tractor and diesel bowser (1)
- Tractor and trailer (1)
- JCB (1)
- 3 & 4 axle lorries (17)
- Personnel 4- wheel drive vehicles (15-20)
- Mobile task lighting generator (3)
- Mobile pumps (5)
- Air compressor (1)
- Water bowser (1)
- Mobile Concrete Pump (not based on the site, mobilised for specific concrete pours only)
- Mobile Crane (50ton, 100ton, not based on the site, mobilised for specific concrete pours)
- Mobile Crane (60ton, 300ton, not based on the site, mobilised for erection of wind turbines)

Tree Felling: Typical plant associated with tree felling comprised 3 x Harvesters (e.g. Daewoo 3600 excavator with Silvatec 555 Harvesting Head), 3 x Forwarders (e.g. Timberjack 1210 or 810) and lorries for transporting timber offsite.

Overhead Line: The main types of plant and equipment used for the installation of the overhead line comprised:

- Excavators
- All-terrain crane
- Tracked dumpers to transport concrete
- All-terrain vehicles
- Flat-bed trucks to transport masts and poles.

Works related to peat slide: Plant was mobilised from the wind farm site and other external sources for use in undertaking the works related to the peat slide. These comprised mainly excavators, bulldozers, JCBs and tracked dumpers.

4.1.7 Drainage/Silt Management

Wind Farm site: The main locations (11) where pre-existing drains crossed the site boundary were identified and silt traps comprising straw bales were installed at these locations to manage and control any silt generated by the construction activities.

In cases where water ponded in the turbine base excavations, this was removed using 4" mobile pumps and pumped to a nearby existing drain, often over ground on existing vegetation. Any silt resulting from this pumped water was captured by both existing vegetative matter and constructed straw silt traps which connected into the local existing drainage network.

Concrete wash-out areas were also established for the purpose of capturing wash-out water from ready mix concrete lorries.

At specific turbine excavation locations, existing drains were rerouted around the excavation area as deemed necessary.

No wheel wash was installed during the construction period.

Overhead Line (OHL): In general silt traps in the form of instream sumps and straw bales were installed in pre-existing drains where there was potential for pollution to watercourses from works associated with construction of masts. It is understood that bog mats were used to bridge drains at some locations.

4.1.8 Water Requirements

Drinking water at the wind farm site compound was supplied by a proprietary bottled water supplier. Non-potable water supply for toilet blocks etc. was initially supplied by 3rd party suppliers, but later sourced from a well installed at the compound. At the demobilisation stage the well was decommissioned and capped.

4.1.9 Dust Suppression

The primary source of dust was from the borrow pit/quarry activities and vehicle movements on site along the access tracks. Dust suppression measures implemented on site entailed using water bowsers to suppress dust in these areas. Water for dust suppression was sourced from excavations or the borrow pits/quarries.

4.1.10 Energy supply

There was no rural electricity network in the immediate vicinity of the wind farm site. Temporary electrical generators were used to supply power at the wind farm site construction compound and at Agannygal Substation.

4.1.11 Materials - Sourcing

The main materials required for construction of the wind farm project comprised:

- Crushed Rock Material
- Imported Rock Material
- Concrete
- Reinforcement Steel
- Drainage Pipes

- Building materials for substation

Crushed Rock Material: The majority of the rock used for the construction of the wind farm access tracks, crane hard-standings and for backfilling activities was sourced from the borrow pits/quarries opened up on the wind farm site for the project. Rock that was extracted was processed in a Nordberg L7105 Crusher located inside the area of Borrow Pit 3. Refer to 3.5.10 for volumes of rock excavated.

The processed stone was temporarily stockpiled within the confines of the borrow pit prior to being loaded onto dumper vehicles for transporting to its location of use within the site.

It is noted that, there was additional localised extraction of material (rock) for emergency works in response to the peat slide.

Imported Rock Material: There was a requirement to import some stone material, including Cl804 for access track and crane hardstanding surfacing and 50mm single sized crushed limestone for surfacing inside the sub-station compound.

Concrete-Wind Farm: The concrete for the wind farm was sourced from local ready-mix concrete suppliers (e.g. in Ennis, Ardrahan). The concrete used was ready mix concrete which was batched at supplier batching plants and transported (using standard ready-mix concrete lorries, typically in the range of 7-8 m^3 per lorry) by road to the wind farm site. The concrete was delivered to the site via N18, R353 and the Black Road. The estimated total volume of ready mixed concrete used for the works was approximately 7,100m^3. There was no concrete batching plant installed at the site and no concrete batching was carried out within the wind farm site.

Concrete-OHL mast foundations: The concrete for the overhead line mast foundations was sourced from ready-mix concrete suppliers in Loughrea and Birr. The total volume of ready mixed concrete used for the works was approximately 780m^3.

Reinforcement Steel: All reinforcement steel for the reinforced concrete structures was sourced from a supplier in Galway. This steel was pre-formed to specific lengths and shapes at the supplier's facility and delivered to site for assembly.

Drainage Pipes: The drainage pipes used were mostly ‘Rigidrain’ plastic pipes, with some steel tube and some concrete pipes.

Geo-Grid & Geotextile Membrane: Geo-grid of specification Tensar SS20 and SS40 were predominantly used for constructing the floating site access tracks. In some instances, two layers were placed on sections of road. These products were supplied in rolls from proprietary suppliers and delivered to the site on articulated lorries.

Building materials: General building materials for the substation construction included concrete, reinforcement, bricks/blocks, stone, pre-cast concrete, structural steelwork, ready mix concrete, timber trusses, slates, felt, windows, doors and internal building fit out materials were supplied as and when required during the sub-station construction.

The materials used for substation compound included external stoning, steel supports, palisade fencing and electrical equipment.

4.1.12 Spoil Management on wind farm site

In construction Phase 1, excavated spoil was generally side cast adjacent to excavation locations. In construction Phase 2, following the peat slide, controlled designated peat repository locations were utilised for storage of excavated peat and mineral soil. (Refer subsection 3.5.9).

4.1.13 Construction Waste

The types of construction waste which arose during the project construction comprised

- Domestic waste from the construction compound
- Building material waste from substation
- Other sources of packaging waste

Construction waste was placed in dedicated skips in the substation compounds and disposed of through authorised waste management companies to licenced facilities. Construction waste records could not be sourced during a search undertaken for this rEIAR.

4.1.14 Control of Oils & Fuels

Wind Farm Site: Oils were stored in enclosed containers within the wind farm construction site compound. The diesel supply tank to the temporary electrical generator supplying the site compound was double skinned.

Agannygal Substation: During construction a small temporary compound was established at the site where a temporary electrical generator and a double skinned diesel supply tank were located.

Fuel was stored in a double skinned diesel bowser which was moved around the site to re-fuel plant and machinery at its point of use.

Spill kits were available and used to deal with minor oil/fuel spills on site. Drip trays were used during refuelling of machinery.

4.1.15 Residues and Emissions

The residues and emissions which arose from project construction comprised the following:

- **Water**: Surface water drainage emanating from the wind farm site (refer to subsection 4.1.7); drainage from peat slide area (refer to subsection 4.3.11).
- **Air and Climate:** Dust generated by excavation works and vehicle movements across the site (refer to subsection 4.1.9); Carbon losses associated with felling, peat extraction and peat slide.
- **Noise:** Noise from construction plant and activities,
- **Lighting:** Task lighting.
- **Excavation Spoil**: Refer to sub-section 4.1.12 and 4.4.8.
- **Waste:** Refer to subsection 4.1.13.
- **Spoil related to peat slide measures:** Refer to subsection 4.3.10.

4.1.16 Safety Management and Risk of Accidents

During the construction phase there was a Safety Management Plan in place. This set out the procedures and practices for health and safety on the construction site.

There was an emergency plan which

- Identified the hazards on site
- Listed contact numbers of emergency services
- Defined the roles and responsibilities of key personnel on site
- Detailed emergency procedures in the event of specific major accidents

Site emergency procedures were updated following the 2003 peat slide during construction.

In construction phase 2 (June 2004-March 2006), following the peat slide, a significant increased level of site investigation was carried out and assessments of each activity separately and in combination (using current risk assessment methodologies) were undertaken. Mitigation measures were implemented to prevent any further peat instability on the site.

4.2 Construction Phase 1 Activities

4.2.1 Access Track to Wind Farm site

An existing Coillte access track approximately 3.1km long was upgraded for use as an access route from the “Black Road” to the wind farm site. These upgrading works included installation of passing bays, some drainage and the re-surfacing of the road with a layer of Cl804 material and a surface dressing of tar spray and chip.

4.2.2 Set up of construction compound

A site compound was established to the north east corner of the wind farm site, on the existing Coillte track extended turning circle hardstanding. It was formed either side of the pre-existing Coillte access track. The compound was expanded by the stripping of the peat layer at this location and the placement of stone material, mostly sourced from the borrow pits at the site. A layer of imported crushed rock granular fill was placed on top and surfaced with a Clause 804 material. The compound provided parking for workers at the wind farm site and a location for temporary construction offices/facilities.

Temporary portacabin structures were transported to the construction compound complete on flatbed lorries and lifted into position.

4.2.3 Construction Phase 1-Felling of Forestry

Wind Farm Site: From June 2003 to the date of the peat slide in October 2003, the felling on the site comprised felling of a 15-40m wide corridor along the location of all of the site tracks, extended areas around many of the turbine bases, felling around borrow pits and at the site of Derrybrien Substation.

The tree felling involved the use of harvesting and forwarding machinery including tracked mechanical machines with specialist tree harvesting grabs mounted onto their hydraulic arm.

Trees were cut as low as possible to the ground. Trees were de-branched, cut into logs of approximately 3m in length and placed on the ground beside the harvester. A forwarding machine followed behind the harvester; collected the cleaned logs and transported these to a temporary stockpiling location within the wind farm which was located beside a site access track. On a regular basis Coillte would remove the stockpiled logs by loading them onto an articulated trailer for processing offsite.

Not all of the harvested trees were exported from the site by Coillte, some of the felled trees were used to provide a support mat for many of the wind farm floating roads. In areas of soft ground some

of the trees and/or branches were placed in front of the harvester to provide a support mat for the harvester to position itself on in this area of soft ground.

Felling by hand was also carried out on the parts of the site where the trees were too small for excavator mounted harvesting equipment. These trees were felled manually using chain saws. These trees were left on site.

Overhead Line: The tree felling works required for the overhead line were also carried out by Coillte using the same techniques as on the wind farm site. A corridor of approximately 45m width was felled along the forested areas on the OHL route.

Prior to the peat slide on 16th October 2003, a significant proportion of the OHL route which passed through forestry had been felled. Felling stopped on the OHL due to the peat slide and only re-commenced in July 2004.

4.2.4 Construction Phase 1-Borrow Pits/Quarries

In order to extract the rock, rock breakers (utilising 50ton excavator with rock breaker attachment) and rock drill and blast techniques were used.

For rock blasting, a specialist expert sub-contractor prepared and conducted the blasts. These involved creating a sequence of drill holes parallel to the rock face. Explosives were inserted into these drilled holes in the rock, the holes were plugged, and a controlled explosion was conducted by the specialist expert to fracture the rock.

Once the fracturing of the rock was completed, mechanical excavators handled the fractured rock, to sort it and pass it through a mechanical crusher and screening equipment to create aggregate suitable for use for the works. This prepared aggregate was temporarily stockpiled at the location of the borrow pit until being loaded onto dumper trucks and transported within the site to its point of use at the works. This rock was used for access track building, crane hardstanding construction, backfilling at turbine bases and for the creation of barrages following the peat slide of 16th October 2003.

Once all the extracted rock had been used, the process of fracturing further rock on the borrow pit was repeated on the new rock face within the pit as required to continue the provision of aggregate during the progression of the works.

4.2.5 Construction Phase 1-Wind Farm Access Roads

The construction of the tracks was carried out in a linear manner, where a previously installed section of track was used as the route for the on-site lorries to deliver new stone to the next section of the track that was under construction.

Floating Road construction: The main sequence of floating road construction was as follows:

1) Following tree felling, the route was set out by a surveyor
2) In some areas, felled trees were placed on the undisturbed peat surface, along the route of the track to form an initial support base prior to the laying of any stone. In cases where trees were not used, an initial layer of geogrid was used in-lieu of the trees.
3) A regulation layer of crushed rock from a site borrow pit was placed onto the geogrid or trees; this was transported within the site using 3 or 4-axle lorries.
4) A layer of geogrid was placed on top of the regulation surface, followed by a 500mm layer of crushed rock from the site borrow pits.

The roads were surfaced with 100-150mm of Clause 804 granular sub-base material, which was imported to site from nearby quarries. Existing drainage channels were maintained.

Non-Floating Road construction:

In the locations where the peat was very shallow and suitable ground was near the surface, a non-floating track was constructed by:

1. Removing the thin layer peat layer and side casting, trimming the underlying boulder clay to the formation level of the track.
2. Placing a regulation layer of coarse crushed rock onto the formation level. Rock was sourced from the site borrow pits.
3. Laying Terram 1000 gauge filter membrane and place 225mm layer of crushed rock from the site borrow pits on top.
4. Finishing with a c50mm layer of imported crushed stone.
5. Existing drainage channels were maintained as part of this construction methodology.

4.2.6 Construction Phase 1-Turbine Foundations

The process of turbine foundation construction was as follows:

1. Following tree felling, the route was set out by a surveyor
2. The peat layer at the location of the turbine foundation base was removed by mechanical excavators (utilising long reach machines and excavators with wide tracks or bog mats underneath to provide support for the excavators on the peat surface). The arisings were side cast. Excavation continued into the boulder clay layer below the peat until the rock surface or a suitable bearing stratum was reached.
3. De-watering of the excavation was undertaken where there was water ponding.
4. Placement of the layers of rock and lean mix concrete to achieve the required bearing level for the bottom of the foundation
5. A lean mix concrete blinding layer (C20 concrete) was placed onto the bearing level in preparation for steel reinforcement placement. The concrete for this blinding layer was provided by an off-site concrete supplier.
6. Reinforcement steel was placed onto the blinding concrete surface and steel fixers formed the steel reinforcement cage in situ at the foundation location that was to be cast within the concrete. Further to the reinforcement steel, lightning protection earthing and cast-in base elements of the turbine towers were also placed at this time within the steel reinforcement cage.
7. When the steel reinforcement cage, earthing, cast-in base elements for the turbine towers and shuttering were complete, concreting of the turbine base was carried out.
8. After completion of the concreting works and removal of all temporary works including the shuttering, backfilling was carried out around the edges and on top of the turbine pad. The material used for this was the excavated boulder clay which was placed and compacted in 300mm layers. This was carried out using excavators. A layer of 300mm depth of crushed stone was placed at the top to provide a finish for suitable future access around the turbine. The top layer of crushed stone was sourced from the site borrow pits.
9. During the backfilling process, a land drain was also placed around the turbine base with a local discharge into the site drainage network.

At the time of the slide in October 2003 a total of 37 reinforced concrete bases had been constructed across the south, east and western side of the site (T1-T5, T9-T13, T17- T29, T32, T34, T35, T37, T38, T40-T46, T66 & T67). Excavations had been completed at T63 and T69, excavations were underway at T62 and T68 (location of peat slide) and excavations had just commenced at T6 and T31.for

4.2.7 Construction Phase 1-Hardstanding Areas

The crane hardstanding areas were generally completed after the construction of the turbine base adjacent to each turbine.

The sequence of excavation for the crane hardstanding area was similar to that used for the turbine base excavation. In this process, the peat was removed from the surface using mechanical excavators and side cast. While the turbine foundation excavations continued down to rock surface, for the crane hardstanding's the excavations only proceeded to a suitable depth into the boulder clay until a suitable bearing for the hardstanding had been reached. Backfilling was carried out by placing crushed rock from the site borrow pits into the excavation in layers. This rock was transported to the location of the works from the borrow pits using 3 and 4-axle lorries within the site and placed using 360^0 excavators. At specific locations, precautionary peat stabilising rock reinforcement lines were used around the perimeter of the excavations in deep peat prior to excavation commencing.

In some instances, a layer of imported clause 804 granular material was placed on the top of the hardstanding or on sections of the hardstanding to level the finished surfaces.

At the time of the slide in October 2003, the crane hardstandings for the turbines for which reinforced concrete bases had been constructed had been partially constructed to provide a working area for the concrete trucks and steel fixers.

4.3 Works associated with Peat Slide

4.3.1 Scope of peat slide related works

As previously detailed, a peat slide occurred on 16th October 2003 during the excavation work for turbine base T68 within the wind farm site. Stabilisation and containment works were installed both within and outside the wind farm site immediately following the peat slide to prevent further propagation of the peat slide and to prevent further release of debris into watercourses downstream.

The works comprised the replacement of two sections of access track within the wind farm site (access track at T68 and access track at T23-T70) (as described in Sub-sections 3.7.3 and 3.7.4), four rock barrages (Barrages 1, 2, 3 and 4) which are still in-situ (as described in Subsection 3.7.5 – 3.7.8) and four temporary barrages which were removed within a few months of the peat slide (Barrages A, B, C & D). As noted in Subsection 3.7.1 details in relation to Barrages A, B, C and D were not available.

Where required, debris arising from the 2003 peat slide that had accumulated behind the barrages was removed and stored in repository areas located adjacent to the containment barrages. Repository areas were constructed adjacent to barrages 2 and 3.

In 2005, a further repository area was located in an area upstream of the Black Road Bridge to contain material displaced from the peat slide area and the run-out zone.

In total three repository areas were constructed as part of works related to the peat slide, as described in subsections 3.7.6, 3.7.7 and 3.7.9.

A number of measures were also carried out on the wind farm site as a direct consequence of the peat slide. These measures included a full and thorough geotechnical stability assessment of the site, precautionary removal of some of the previously side cast excavated material to geotechnically assessed peat repository areas; increased maintenance of drains throughout the site and activities to ensure no water logging at open excavations on the site.

The construction activities associated with the peat slide are described in the following subsections.

4.3.2 Temporary Barrages

The temporary barrages were constructed in October 2003. Barrages A and B were earthen barrages located close together just upstream of Black Rd Bridge. Barrage C was an earthen barrage located immediately upstream of Flaggy Bridge (on R353). Barrage D was constructed with rock boulders immediately downstream of Flaggy Bridge (on the R353).

Barrages A, B and C were constructed by the wind farm civil contractor under the instruction of Galway County Council (GCC) engineers and co-operation of ESB. Gort Windfarms Ltd. directed the construction of Barrage D.

Barrages A, C and D were no longer in place by early December 2003. Barrage B was removed in September 2005.

4.3.3 Access Track at T68

The boulders utilised for the reconstruction of the access track were sourced from Borrow Pit No 3 within the wind farm site. The dimensions of the sandstone boulders used in the construction varied from 0.3 to 1.0m. Pipes were installed at various points along the access track section for drainage purposes.

4.3.4 Access Track betweenT23-T70

The boulders for construction of the access track were sourced from Borrow Pit 3 within the wind farm site. The dimension of the sandstone boulders used in the construction of the containment barrage varied from 0.3 to 1.2m. As noted in 3.7.4 a small berm approximately 300mm high carrying services buried in concrete was provided on the upslope side of the access track.

Pipes were installed at various points along the access track for drainage purposes.

4.3.5 Access Track to Barrage 1

A new section of unpaved, hardcore surfaced track was constructed to link the reinstated road which is located on top of Barrage 1 back to the pre-existing Coillte track on the western side of the slide.

Tree felling was completed along the route of this road to allow its construction.

4.3.6 Barrage 1

The boulders for construction of the access Barrage 1 were sourced from a borrow pit opened up adjacent to the barrage location. The barrage was constructed of coarse fill founded on mineral soil. The maximum dimension of the sandstone/conglomerate boulders used in the construction of the barrage varied from 0.6 to 1.3m. The boulders used in the parapet wall on the barrage are up to 2.0m

long. A sump approximately 3m deep was excavated on the upslope side of the barrage for drainage purposes.

4.3.7 Barrage 2

An access track approximately 300m long was constructed from an existing Coillte access track to the location for Barrage 2 using rock sourced from Borrow Pit/Quarry 3 on the wind farm site. Rock used for constructing Barrage 2 was sourced from the borrow pit adjacent to Barrage 1. Drainage pipes were installed in the upper part of this embankment.

4.3.8 Barrage 3

The barrage comprised competent boulders placed within a stream section. The maximum dimension of the boulders used in the construction of the containment barrage range from 0.9 to 2.5m. The boulders for Barrage 3 were sourced from the Coillte borrow pit /Quarry adjacent to Barrage 1.

4.3.9 Barrage 4

The barrage comprised competent boulders placed within a stream section. The maximum dimension of the boulders used in the construction of the containment barrage ranged from 1.0 to 2.1m.

4.3.10 Repository Areas related to Peat Slide

There were three repository areas developed as a result of the peat slide- at Barrage 2, at Barrage 3 and the Black Road Bridge to contain the peat, silt and sand arisings from within the vicinity of the constructed barrages and from behind these barrages. The arisings were transferred to the repository locations and earthen bunds formed in instances around sections of the repositories to contain the placed peat.

4.3.11 Drainage Diversions

Drains were diverted away from both sides of the site of the peat slide and upstream of it on the wind farm site. This was achieved by digging new drains in the weeks following the initial slide. These diverted drains ultimately join up within the same river sub-catchment a short distance downstream of the peat slide area. The work was carried out over a few days from the 30th October 2003. Where new drainage was constructed in a wooded area, minor tree felling was carried out to create a corridor of sufficient width to allow an excavator to excavate the drain. A watercourse downstream of the peat slide area was also re-routed just upstream of the Black Road bridge around displaced peat on private land. Approximately 1.2ha of tree felling was required in order to gain access for the diversion drain.

Silt traps were provided whilst the works were being undertaken.

4.4 Construction Phase 2 Activities

At the outset, it is noted that the construction methodologies were modified to ensure that no further instability occurred on the wind farm site. Further detailed site investigations were undertaken and a detailed geotechnical design and certification process was put in place for the Phase 2 construction works. Details of the site investigations and geotechnical measures are described in Chapter 8-Lands, Soils and Geology.

4.4.1 Construction Phase 2-Felling of Forestry

Wind Farm Site: Clear felling recommenced in the second half of 2004 and continued until mid-2005.

Overhead Line: Felling re-commenced in July 2004 and continued until mid-2005.

Agannygal Substation: There was localised felling at the sub-station and along the route of the upgraded forestry road. The first activities at this site included the felling of forestry by Coillte. This process was carried out in a similar manner to that described for the main wind farm site.

4.4.2 Construction Phase 2-Wind Farm Access Roads

Additional geotechnical investigations were undertaken along the routes of the remaining tracks in advance of construction activity.

In terms of the method of track construction, the placement of felled trees (obtained from the tree felling activities on the site) along the length of the new track onto the undisturbed peat surface was specified by geotechnical specialists as a requirement for the remaining floating roads. The regulation layer of crushed rock was placed on top of the mat of placed trees, then the geogrid and then a top layer of approximately 500mm depth of crushed rock. The crushed rock used was sourced from the on-site borrow pits. These roads were capped with imported fine material similarly to the other constructed roads.

It is noted that as a precautionary measure, it was decided to omit Turbine 16 and the access tracks at T16 and from T15 and T17 towards T16 due to unsuitable ground conditions at these locations.

4.4.3 Construction Phase 2-Turbine Foundations

As previously noted, following the peat slide, parts of the construction methodology were modified for Phase II construction.

Modifications to the methodology of construction included:

- Additional geotechnical investigations of the soil, visual walkover inspections and studies of existing drainage at each base were completed in advance of construction activity.
- Where necessary new localised drains were formed prior to commencement of excavation.
- All the excavated material was transferred to designated peat repositories within the site as it was excavated. These on-site peat repository areas were specifically selected following extensive geotechnical investigations as areas where excavated material could be permanently placed to a depth of up to 1m deep.

4.4.4 Construction Phase 2-Hardstanding Areas

Following recommencement of construction after the peat slide, the excavation for hardstanding was completed at the same time as the excavation for the remaining turbine bases. All arisings were transported directly to specified peat repositories within the site and precautionary peat stabilising rock reinforcement lines continued to be placed on the up slope sides of excavations in deep peat prior to excavation commencing.

4.4.5 Anemometer Masts

The two anemometer masts are steel lattice structures supported on reinforced concrete foundations of dimensions 5.7m x 5.7m x 0.5m.

The foundations were constructed to a min depth of 1.8m below the proposed ground level with an upstand detail to ground level, and the foundations were backfilled with Boulder Clay to provide a minimum cover of 1.3m on the top of the foundations. The excavation works were carried out using

long-reach tracked excavators operating on the floating road adjacent to the excavation. The excavated peat was transported to a designated repository area within the wind farm site.

4.4.6 Construction Phase 2-Borrow Pits/Quarries

Pre-works assessments were undertaken prior to rock blasting. As a precautionary measure, during periods of rock blasting after the peat slide, vibration monitoring was carried out at a number of locations remote to the borrow pit, inside the site, to monitor any vibrations in the surrounding area.

4.4.7 Reinstatement of Borrow Pits

Borrow Pits 1 and 2 were fully backfilled with peat arisings from construction activities elsewhere on the site.

Borrow Pit 3 has been partially backfilled with peat and mineral soil. This borrow pit has been permanently fenced off.

4.4.8 Spoil Management-Wind Farm site

For the second phase of construction in 2004/2005 significant risk mitigation measures were implemented for the management and disposal of material excavated from the remaining turbine excavations and from the crane hardstanding areas. The glacial till was placed in the on-site Borrow Pits/Quarries and all of the peat and some mineral soil was placed in designated peat repositories on the site and the borrow pits. The peat repositories were located on flat or gently sloping ground (<3°) away from any areas of elevated risk with regard to peat instability.

4.4.9 Wind Farm Underground Services

Cables: Electrical cables were installed by excavating open trenches in the peat adjacent to the site roads. The excavated material was temporarily side cast and then the excavated material was used to backfill the trenches after cables were laid.

The machinery used for these works included:

- 2 x 13.5ton 360^0 excavators with wide tracks
- 1 x telescopic front loader
- Tractor & cable drum holder

Where cables crossed drains, crossing points were designed to ensure the undisrupted flow of the drain, while adequately protecting the cables. Safety warning tape was placed within the trench during backfilling and a series of marker posts were installed on the surface along the trench routes.

For trenches in peat the cables were direct buried with sand surround placed in the trench for the final sections runs to the substation.

Site Drainage: As part of the foundation design drainage was installed at turbine bases. This consisted of a buried land drain around the perimeter of the turbine base. The outlet of this land drain was constructed to an open drainage channel, directed to one of the existing main drains within the site. Some new drainage was installed alongside site access tracks.

4.4.10 Turbine Assembly and Installation

Mobile cranes were used to lift the heavy components of the turbines into place. A 300ton and 60ton mobile crane were typically used for turbine erection activities.

Erection of the turbines involved transporting all of the turbine components to the turbine sites, including the steel tower sections, the hub, the rotor blades and the nacelle. The components were transported along the floating roads using standard trucks and low-loader articulated lorries and temporarily stored on the hardstands prior to erection. The mobile cranes that were used to erect the turbines also travelled along the floating roads to the turbine locations. The mobile cranes were set-up and operated lifting operations on the granular hardstanding areas for all the heavy lifting work required to erect the turbines.

4.4.11 Derrybrien Substation

Construction of the Derrybrien Substation compound commenced on 13th October 2003 with the initial stripping of the overlying peat. After 3 days this work ceased in parallel with the overall work suspension that was put in place following the peat slide. Works recommenced in December 2004 after the construction works had resumed at the wind farm site.

Peat was excavated from the compound location and transferred directly by on-site dumper trucks to a peat repository area, which had been designated and approved by the geotechnical specialists on behalf of the EPC contractor. This repository was located within the site on the west side of the road between T24 and T25.

The level hardstanding for the substation was constructed by excavating into the gently sloping ground on the north side of the substation site and by placing engineered fill material on the downslope side. The entire compound was then capped with crushed rock granular fill material from Borrow Pit No.3, with a hardcore surfacing imported from nearby quarries.

The foundations for the control building, the electrical equipment steelwork and transformer within the compound comprise reinforced concrete pads or plinths supported on the granular rockfill or the underlying firm or stiff glacial till. The compound hardstanding is capped with hardcore surfacing.

During the construction of the control building and electrical transmission and transformer components on the site, construction traffic generally comprised standard concrete trucks, small mobile cranes, and trucks with loader cranes for transporting materials, equipment, cherry pickers and mobile elevated work platforms (MEWP) to the site. The largest load was from the 80-tonne step-up transformer, which was transported to the site on a specialised 28.5 m long multi-axle articulated truck and low-loader transporter. The transformer was transported to the site in a single supervised and scheduled trip along a defined access route. All of the construction traffic was mobilised to the substation via the floating road network.

The main support posts for palisade fencing were set in concrete and the dividing uprights were set in a concrete plinth.

Remaining surfaces around the substation were graded.

4.4.12 Overhead Line

Construction Access: Access was via local roads and the existing network of forestry tracks. Where required, temporary access was provided from these routes to the mast/poleset locations. In general access to timber polesets was along the OHL corridor from mast locations or existing road/track locations that intersected the OHL corridor. Construction for access to masts consisted of removal of tree stumps/brush peat (less than 1m typically) to competent material to allow access for tracked excavators, dumpers and a rough terrain crane.

Two mast locations further away from pre-existing access tracks were accessed as follows:

- AM24, located north of the Owendalulleegh River in Coillte forestry in Derrybrien East was accessed from the existing Coillte track to the south which entailed crossing the Owendalulleegh River at an existing ford crossing. Consultation was undertaken with Shannon Regional Fisheries Board (SRFB) in advance of the crossing.
- AM38 was accessed along the OHL corridor from the Agannygal Substation side. Peat depths were up to 5m along the route. In order to provide access in this area existing trees were felled and placed to form a 'floating road' mat of timber on the OHL corridor. No excavation took place to form the access.

Excavation under 400kV line: The 110kV line route crossed under an existing 400kV line. Earthworks were necessary at this location to lower the ground below the 110kV line to maintain required clearances (**Figure 2.9: Location of Grid Connection and Ancillary Works**).

Mast Construction: Mast construction consisted of the excavation to competent material at each of the 4 No tower legs. Large diameter concrete pipes were used as permanent form work and the base portion of the steel mast was assembled and its 4 legs placed into these concrete pipes which were then filled with concrete to form the permanent foundation. Once the concrete gained strength the foundation was backfilled, the remainder of the two mast sections were assembled and lifted into place using an all-terrain crane and bolted to the previous installed section.

Poleset Installation: Poles were transported to location by truck and then excavator to final installation point. Foundations varied according to ground conditions, in some locations where the depth of competent material was deeper than the embedment of the pole, stone and/or timber sleepers were used to strengthen the foundation and timber sleepers were used to fill to the correct level and support poles for stability. A greater number of timber sleepers were used to support polesets in deep peat.

Stringing of Overhead Line Conductor: Conductor stringing was carried out once the steel masts and polesets had been installed. All-terrain vehicles were used to access the OHL locations and to pull lines to allow the conductor to be pulled from mast to mast. Where the OHL crossed public roads, temporary goalpost or H frames were used to support the conductor etc. over the road so that safe access could be maintained on the public roads.

4.4.13 Agannygal Substation

Construction works commenced in Autumn 2004.

Felling of Forestry: The first activities at the site included the felling of forestry by Coillte. This process was carried out in a similar manner to that described for the wind farm site.

Access and Haul Routes: Access to Agannygal Substation was via an existing Coillte forestry road, which connected a local public road (Unnamed Local Road A) and a new access road to the substation. Access entailed the following:

a) Existing Coillte Track: This section of pre-existing unstoned track (approximately 2900 m in length) was already constructed down to mineral soil. The track was widened to 3.5 m and stoned with Cl. 804 road material to bring it up to the necessary load bearing capacity. A bend

along the track was eliminated in order to facilitate construction traffic. A small amount of felling was required to allow this construction.

b) Substation Access Road: This section of new road construction (approx.138m long, 3.5m wide) runs from the public roadway up to the Agannygal Substation compound. This roadway was constructed on an area of newly felled forestry. The surface was finished with Cl 804 stone material.

Earthworks: Following tree felling, earthworks were completed to form a level site in advance of the construction activities. A 72m x 52m levelled earth platform was constructed by cutting into the existing ground by up to 2.5m. Excess excavated material from this cutting activity was used to create an earth embankment around the external perimeter of the sub-station on three sides (approximately 2m high).

Once the earthworks were complete, the construction activities for the sub-station building and compound were carried out.

4.4.14 Wind Farm Project Commissioning

The commissioning phase included the local testing and inspection of each turbine and its ancillary devices, the cabling between each turbine and Derrybrien Substation. This commissioning followed a strict safety process where firstly “cold” commissioning checks were tested (with no live parts), followed by “hot” commissioning checks (with live plant and equipment).

At the end of the commissioning process there was a reliability run for the wind farm, which consisted of a 240 hour test period to prove the correct operation of the installation.

5 Overview of Operation & Maintenance Phase Activities (2006-2022)

5.1 Overview

The operation and maintenance of the wind farm in the period between March 2006 and April 2020 comprised the following:

- Power generation
- Maintenance/repair of the turbines
- Maintenance/repair of the substation and control building
- Maintenance/repair of the access tracks
- Cables and Ducting
- Drainage
- Miscellaneous

5.2 Staffing

The Operation and Maintenance (O&M) sub-contractor, Vestas, has a maintenance crew of 4-6 technicians stationed full-time on the site for operation and maintenance of the turbines.

5.3 Power Generation

Up until 2022, the wind farm has been operating continuously since it was commissioned in early 2006. The theoretical output of the wind farm is 59.5MW. The theoretical availability is 98%. The output of the wind turbines is determined by the wind regime. Since operation commenced the average annual capacity factor has been approximately 25%.

Once decommissioned, the annual capacity factor of each turbine is expected to be approximately 25%-26% for the remainder of its operation life. This means that over the course of a year each turbine could produces 25% of the amount it could theoretically produce if it was working at maximum output at all times throughout the year.

5.4 Existing Development at Derrybrien Wind Farm

5.4.1 Maintenance/Repair of Turbines

Routine maintenance works and repair works was carried out on the turbine mechanical and electrical systems, which typically involved:

- Cleaning/maintenance of the clutch, gear box and mechanical systems in the turbine nacelle.
- Repairs to the electrical equipment.
- Cleaning/repairs to the turbine blades and rotor systems.
- Sealing the earth wire hole through the flange of the turbine base to prevent groundwater ingress.
- Sealing the internal joint between concrete base and steel tower (e.g. T9, T10, T35)

The maintenance work was carried out on-site at the turbine. The technicians travel to and from the turbines along the site access tracks in standard commercial vehicles. Elevated access for personnel

to the external elements of the nacelle and rotor systems is via a winch system or a mobile elevated work platform (MEWP) such as a cherry picker operating from the adjacent crane hard standing area. Internal access for personnel to the nacelle is via an in-built ladder system within each tower.

Occasionally more substantial works were required to replace broken or malfunctioning mechanical or electrical components in the nacelle and rotor hub such as the gearbox, bearings, electricity generation systems or turbine blades. Between 2005 and 2018 based on the site maintenance records, the majority of the major repairs were related to the gearbox and generator systems, which needed to be replaced a total of 84 times at 55 turbines. At 15 of the turbines the gearbox or generator had to be replaced on more than one occasion. A further 14 major repairs or replacements have been recorded at 12 turbines.

Cranes are utilised for certain maintenance activities.

5.4.2 Derrybrien Substation

Routine cleaning, maintenance and repair works were carried out annually on the electrical components of the substation and control building, including the transformers, capacitors, and circuit control systems. These works were carried out directly on the granular hard-standing area of the substation by specialist sub-contractors.

5.4.3 Site Access Tracks

General maintenance: Throughout the operation of the wind farm routine access track maintenance and repair works have been undertaken.

Remedial works: In 2014, improvement works were carried out on the floating roads (over approximately 6km) which comprised the placing of geogrid reinforcement followed by approximately 150mm crushed rock capping material and 10mm granular blinding along road surface.

Minor works to repair large potholes were also carried out at selected locations along sections of the road network. The potholes were filled with Class 6F2 granular capping material using an 18-tonne rubber-tyred excavator. The fill material imported to the site was stockpiled on the crane hard standings and brought to the locations of the localised repairs using the 9-tonne dumper.

The 2014 road improvement works included remedial works to improve and widen the existing floating road over culverts at Turbines T10, T24, T35, T50, T66 where the existing road was too narrow and where the side slope down into the drainage channel was too steep, which posed a health and safety risk to vehicles using the road.

5.4.4 Drainage

Periodic inspections of the site between 2005 and 2020 were undertaken to assess maintenance requirements for short and long-term stability. The resultant drainage works undertaken related to maintenance of drainage around turbines and general site drainage.

Minor drainage works were carried out by hand. More substantial works were carried out by mechanical excavation with a wide-tracked 13-tonne low ground bearing pressure excavator suitable for working directly on the peat.

The majority of the drainage improvement works were carried out within 6 years of completion of the wind farm (i.e. up to 2011). A major drainage maintenance programme was completed on the site in 2011.

Since 2011, inspections have only resulted in only minor repair works to the drainage network, which indicates that maintenance requirements for the site drainage is at a residual level.

5.4.5 Cables and Ducting

General Maintenance: Between September 2005 and 2020 the only maintenance work that was carried out on the installed cables was the maintenance of adequate backfill cover to cables in cable trenches.

Upgrade Works 2017: In September 2017, as part of an upgrade to the turbine control systems, approximately 7.6km of new 12 core single-mode fibre-optic cable was installed on the site to improve the response of communication signals between the turbine controllers and the central control system. The total length of ducting was approximately 2.55km. A mole plough was used to bury the ducts directly in the peat at a depth of 0.5-0.6m with a warning tape placed above the cable without having to open up a trench. At the 5 road crossings the 50mm ducting was fed through a 75mm diameter galvanized pipe that was pushed horizontally through the peat under the floating roads to avoid having to open up a trench in the roads

5.4.6 Cutting back of tree regrowth

As previously noted, some small trees have begun to re-establish naturally on the site where the trees were felled during construction. Therefore, cutting back of tree regrowth was carried out in 2018 using specialist low ground bearing pressure forestry machine suitable for operating directly on the peat. The cut trees were left in place on the site.

The methodology adopted for the cutting back of tree growth was as follows:

1) Cutting works were undertaken using a 10-tonne low ground pressure machinery so as to be minimally invasive.
2) The excavator had a saw head attachment rather than a digging bucket.
3) All of the trimmed vegetation was cut and left in place on the peat slopes with no additional handling, which minimises machine movements and loading on the peat.

In 2018 cutting back of tree regrowth was carried out for a distance of 10 metres either side of the site access track along the top turbary road from Turbines T27 to T44, Turbines T26 to T70, Turbine T3 to T5 and Turbine T1 to T2.

5.4.7 Energy demand/usage

There is no rural electricity network in the immediate vicinity of the wind farm. The 20kV/415volt electricity supply to the wind farm is from the house transformer in Derrybrien Substation. There is a back-up diesel generator at Derrybrien Substation. The substation is not metered, so electricity usage information is not available.

5.4.8 Waste Management

The nature of wind farm operations is such that it does not have significant potential for generating large amounts of waste. Only small amounts of waste are generated on site. Waste is managed by the turbine contractor Vestas.

The main items of waste and their sources are set out in **Table 5-1**.

Table 5-1: Typical waste arisings-operational phase

Waste	EWC Code	Source	Typical Quantities
Commercial waste	20 03 01	General waste	One to four 12 cubic yard (cy) collections /month
Dry recyclables	15 01	Packaging	One to four 12 cubic yard (cy) collections /month
Oil contaminated material	15 02 02*	Oily rags, filter materials etc.	500 kg/year
Waste Oil	13 02 08*	Gearboxes	2500 litres/year
Oil filters	16 01 07*	Replacement of oil filters	700 kg/year

* indicates hazardous waste

All wastes have been and are managed in accordance with applicable legislation.

The sampling, testing and replacement of oil from the main gearbox is undertaken as required. Oil filters are replaced at regular intervals.

5.5 Existing Development at Derrybrien to Agannygal 110kV OHL

5.5.1 Routine Inspection

Routine inspection and maintenance of the overhead line components are undertaken as required.

5.5.2 Cutting back tree regrowth

Cutting back of tree regrowth along the OHL was carried out along the OHL route in 2018 and 2019. Access was via existing forestry tracks. The works were carried out using a 10 tonne wide-tracked excavator with a saw head attachment. The trees were cut but not extracted and cut material was left in place on the ground.

5.6 Existing Agannygal 110kV Substation

Scheduled inspections in Agannygal substation are undertaken by ESB Networks and maintenance/works are undertaken as required.

Examples of scheduled maintenance activities undertaken include:

- Inspection and maintenance of electrical equipment
- Statutory servicing of fire extinguishers
- Grass cutting and weed treatments
- Clearing of gutters and drains

Examples of unscheduled maintenance include:

- Rust/corrosion works
- Repairs to fence and compound
- Repairs to burglar alarms
- Adjustments to line earth disconnects

5.7 Offsite features constructed in response to the peat slide (2003)

5.7.1 Barrages

Maintenance activities undertaken in relation to offsite measures were limited to the clearance of debris from behind barrages.

Barrages 1 and 2 were last cleared of debris in June 2007 and the cleared debris essentially comprised silt. A small quantity of silt i.e. less than $2m^3$ was removed from a silt trap behind Barrage 1 in February 2009. Since the commencement of wind farm operations, the lower two barrages namely Barrages 3 and 4 have not needed to be cleared as accumulated debris was not evident. All barrages were inspected in 2024 and no silt clearance was required.

5.7.2 Peat Repositories

Inspections of the peat repositories were undertaken in the period 2006-2020. There has been no maintenance required in relation to the peat repositories.

5.7.3 Road/Bridge Works

There has been no maintenance required in relation to offside roads and bridges.

Galway County Council undertook limited maintenance on the Black Road in 2012 as the request of Gort Windfarms Ltd. The road condition had deteriorated due to usage unconnected to wind farm activities. The works required were carried out over a couple of days.

5.8 Residues and Emissions

5.8.1 Overview

The residues and emissions associated with Project during operation are divided into the following categories:

- **Water**: Surface water and wastewater discharges from Derrybrien and Agannygal Substations as set out above in subsections 3.5.8 and 3.6.3.
- **Waste:** The main items of waste generated onsite during operation is set out previously in subsection 5.4.8.
- **Air:** Refer to subsection 5.8.2.
- **Noise:** Refer to subsection 5.8.3.
- **Lighting:** Refer to subsection 5.8.4.

5.8.2 Air and Greenhouse Gas Emissions

Carbon Saved: The operation of Derrybrien Wind Farm reduces adverse climate change effects by offsetting the production of carbon dioxide through use of renewable sources for generating electricity.

SF6: Switchgear is designed to be leak free. However, there was an accidental release of SF6 from the outdoor switchgear at Derrybrien Substation in 2015. This comprised the initial loss of 8.1kg SF6 from the switchgear pipework. Repair of the switchgear was undertaken, and the switchgear was refilled with SF6. The initial repair to the switchgear failed and there was a further 8.1kg of SF6 lost. Thereafter the switchgear was replaced. There has been no further loss of SF6.

Electromagnetic Radiation (EMF):

In common with all electrical equipment, the turbines and other equipment associated with a wind farm emit electromagnetic radiation. Such emissions for the type of machine in use is very low in the immediate vicinity of the machine and almost non-existent at any distance from it.

The turbine generators at Derrybrien Wind Farm are located inside the turbine nacelle, which are situated at 49m above ground and result in little or no EMF at ground level.

The transformers located within Derrybrien Substation are the main EMF generation sources within the wind farm site.

All electrical connections from the turbines to Derrybrien Substation are by underground cables, which generate negligible EMF.

5.8.3 Noise Emissions

Operating windfarms generate noise from the wind turbine generators and from the transformer associated with the substation. Wind turbine generator noise occurs mainly from the movement of the turbine blades passing through the air and producing a swishing sound which varies with the rotational speed of the blades. It can also occur from the turbine machinery.

Guidance in relation to acceptable levels of noise from wind farms is contained in the documents Department of the Environment, Heritage and Local Government “Wind Energy Development Guidelines” and Department of Trade & Industry (UK) Energy Technology Support Unit (ETSU) publication “The Assessment and Rating of Noise from Wind Farms” (1996). turbine noise is too low to allow a recommendation.

5.8.4 Lighting

Wind Turbines: Aviation lights are provided on nine turbines, specifically T1, T18, T26, T44, T46, T47, T52, T61 and T65.

There are 4 light standards within the Derrybrien Substation compound.

There are 6 light standards within the Agannygal Substation compound.

5.9 Risk of Accidents

The wind turbine model used at Derrybrien Wind Farm has a proven track record of safe operation. According to Vestas, the company has erected more V52 wind turbines than any other turbine on its portfolio-approximately 1500 turbines worldwide.

Peat stability risk assessments have been undertaken for the project operation phase. The probability of a peat slide occurring at the wind farm site ranges from negligible to low for operational and maintenance phase activities. Geotechnical inspections of the site are undertaken to monitor site as part of maintenance activities.

As previously described, the wind farm site is located within an area in which there are large concentrations of forestry and therefore forest fires are a potential risk in the wider area.

5.10 Safety Management

Derrybrien Wind Farm operates a Safety Management System (SMS) which is certified in accordance with OHSAS 18001. An Emergency Plan is in place to deal with incidents and emergencies, which identifies hazards associated with the project and sets out procedures in the event of accidents.

There are procedures in relation to accidents, lone working, persons falling into water, forest/gorse fire, fire in wind turbine towers and procedure in the event of a landslide. Contact details are provided for emergency services, including the local authority and An Gárda Siochána.

5.11 Environmental Management

Derrybrien Wind Farm operates an Environmental Management System (EMS) for the wind farm site which is certified in accordance with ISO 14001.

6 Overview of Ceased Operation Phase (2022-Present)

In February 2022, An Bord Pleanála, refused an application for substitute consent made by Gort Windfarms Ltd in relation to the Derrybrien Wind Farm Project. Following the decision, commercial electricity generation at the site was ceased by ESB and it was confirmed that the Project would be decommissioned.

The turbines have been maintained by the turbine supplier to ensure the site remains safe, while in a prolonged non-operational state. Gort Windfarms Ltd have monitored and maintained the site in the interim, having regard to all safety standards. No development or use is on-going.

7 Overview of Proposed Decommissioning Phase

The proposed 'Derrybrien Windfarm Development Decommissioning Project' comprises two types of "development" for which separate Prospective Development Consent and Retrospective Development Consent is sought from An Bord Pleanála Board:

- "*Prospective Development"* - the carrying out of decommissioning works to remove the majority of above-ground features from the site – including all turbines, masts, electrical plant, overhead lines etc; and enable the final decommissioning of the site (the "prospective development" and "prospective works"); and
- *"Retained Development"* - the 'retention' in situ and in perpetuity of part of the existing development – including at-ground and below-ground structures such as turbine and other foundations; and development associated with historic peat slide events that occurred during construction such as barrages, peat repositories, on-site borrow pits / quarries etc.

A summary of the decommissioning activities associated with the "Prospective Development" and the "Retained Development" has been set out in Section 7.1 and Section 7.2 below

7.1 Prospective Development

The Decommissioning activities associated with the "Prospective Development" include:

- enabling works to facilitate the decommissioning of the Derrybrien Wind Farm Development
- decommissioning and removal of the Derrybrien Wind Farm Development and their associated ancillary components.
- decommissioning and removal of the Derrybrien Wind Farm Development grid connection comprising: Derrybrien-Agannygal 110 kV Overhead Line (7.8 km) and Agannygal Substation connecting into the Ennis-Shannonbridge 110 kV Overhead Line. Reinstatement of the Ennis-Shannonbridge 110kV Line.

7.1.1 Enabling Works

Enabling works will be undertaken at the Derrybrien Wind Farm site to facilitate the decommissioning, dismantling and removal of the Derrybrien Wind Farm. The enabling works will include the following:

- establishment of temporary compounds – 3 no. temporary site compounds and hardstand areas will be re-established at the Derrybrien Wind Farm site and the Agannygal Substation.
- minimal vegetation/scrub clearance and minor levelling works at the existing hardstand areas and access tracks. Waste arising from these enabling works is expected to comprise of

vegetation, rubble and gravel. Any clean material that cannot be reused on site will be removed by licensed waste carriers for disposal at appropriately licensed facilities.

- improvements to existing access roads and forestry tracks. The existing access road and forestry tracks typically comprise a 3m wide running track constructed of crushed rock which has been founded on the mineral soil underlying the peat and floating road construction. Minor permanent upgrades to some sections of the access roads may be required to facilitate heavy plant accessing the wind farm. It is envisaged that the improvement works would include filling potholes and localised widening where necessary. Temporary widening of the turbary road and certain sections of turning heads may also be required to provide safe access to the mobile crane that will be used to dismantle the turbines.

7.1.2 Decommissioning Derrybrien Wind Farm (including the Derrybrien 110kV substation)

The decommissioning works will include the the removal of the above ground structures only, leaving the access tracks, hard stands, wind turbine foundations, underground LV cables, meteorological mast foundations and substation foundations in situ. Any protruding foundations or structures would be cut to below ground level and infilled and levelled to match adjoining areas. These proposed decommissioning works are confined to areas within the control of Gort Windfarms Ltd and are considered typical of the industry norm in respect of windfarm decommissioning.

No bog rehabilitation or active drain blocking would occur and the existing drainage network would be left to naturally rehabilitate. No replanting of forest would occur although some natural regeneration would be likely. The decommissioning works associated will include the following:

- de-energising of the site, which will involve initial disconnection of turbines, low voltage (LV) components followed by disconnection of high voltage (HV) elements;
- temporary widening of the Turbary Road and certain sections of turning heads;
- controlled dismantling of 70 no. turbines (blades, nacelle, and tower) and 2no. anemometer lattice masts;
- controlled removal of electrical equipment from Derrybrien substation and demolition of substation building.

7.1.2.1 Access to wind farm:

It is proposed that the wind farm site will be accessed from a Coillte access road in the townlands of Bohaboy, Funshadaun and Coppanagh, via the Black Road (approximately 3.1 km from wind farm to the Black Road/Coillte junction). Black Road generally runs in a north south direction between the R353 at its southernend and Killeenadeema village (south of Loughrea) at its northern end. Access to the Black Road is via the R353 Regional Road, which originates near Portumna, passes over Flaggy Bridge before passing through the village of Derrybrien to join the N66 Loughrea - Gort National Secondary Road near Gort. From Gort the Black Road is accessed via the N66 for a distance of 1.7 km and the R353 for a distance of 14km.Alternatively, the Black Road /Coillte access road can be accessed via minor public roads from Loughrea a distance of approximately 10km.

7.1.2.2 Controlled dismantling of 70 no. turbines and 2 no. anemometer lattice masts:

The 70 no. turbines and 2 no anemometer masts will be dismantled by mobile cranes operating on the adjacent granular hardstand areas,which are designed to support the crane loads on the glacial till or rock below the peat.

It is not proposed to carry out any remedial works on any of the elements of the wind farm that will be left in place after decommissioning. However, it may be necessary to carry out temporary road widening works along the narrow (approx. 3 metres) turbary road between Turbines T31 and T45 to provide safe access for the mobile crane that will be used to dismantle the turbines. The proposed temporary widening will utilize a combination of timber bog mats, wrapped geo-grid layers and aggregates, as necessary to provide adequate edge support to the wheels of the crane without significantly increasing the loads on the peat.

Specialist trucks and low-loader transporters will be required to remove the heavy and oversize components of the turbines from the site. The mass and length of the main turbine components are as follows for the Vestas V52/850 turbine: Nacelle (22 tonnes), 26m Rotor Blades (1.9 tonnes), Tower sections (base tower 29.9 tonnes, top tower 20.5 tonnes)) and 49m Mast (55 tonnes).

The 2 no. anemometer lattice masts will be split into sections so that the mass of each load will be less than 30 tonnes, and the axle load on the transporters will be limited to a maximum of 12 tonnes/axle so that they can travel on the national road network in Ireland. Wind turbines and components will be reused or recycled where possible.

7.1.2.3 Controlled removal of electrical equipment from Derrybrien substation and demolition of substation building

The Derrybrien substation and control building will be dismantled. Before demolition, the building will be inspected for the presence of bats by a suitably qualified and experienced bat ecologist. The demolition works will be carried out under licence from NPWS during the appropriate time of year (as per the steps specified in the bat mitigation strategy) and under supervision by a bat ecologist. There will be no blastingon the site for this demolition activity. The 80-tonne step-up transformer will be removed from site on a specialised 28.5 m long multi-axle articulated truck and low-loader transporter. All demolition waste will be removed from the site. Sulphur hexafluoride (SF_6) switchgear from the substation and any oil-containing equipment will be carefully removed in compliance with applicable legislation. All waste generated will be managed in accordance with applicable legislative requirements.

On completion of the works, all above-ground structures will have been removed from the windfarm site. All sub-surface infrastructure, hardstand areas and the internal road network would remain *in situ* but would not be visible in the context of the surrounding landscape. Locations of works will be levelled and reinstated to match adjoining areas of ground. It is not proposed to replant the wind farm site with trees although natural regrowth of previously felled areas is likely.

7.1.3 Decommissioning and Removal of Derrybrien to Agannygal 110 OHL

The decommissioning works will include:

- Destringing of the overhead Line conductor

- Removal of the overhead line infrastructure (34 no. double wood pole structures and 8 no. masts)
- Controlled removal of Agannygal substation and demolition of control building
- Controlled removal of standby generator (bunded) and diesel tank, external lighting poles, lightning mast
- Removal of palisade fencing surrounding the Agannygal substation
- Reinstatement of the Ennis-Shannonbridge 110kV Line.

7.1.3.1 Destringing of Overhead Line Conductor

Access routes for decommissioning the OHL have been identified in the Decommissioning Management Plan subject to detailed design. The Decommissioning Management Plan has been included in Appendix 4.1 of the remedial EIAR. All-terrain vehicles including low ground pressure excavators will be used to access the Overhead Line (OHL) locations. Conductor destringing will be carried out and all-terrain vehicles will be used to pull lines to allow the conductor to be pulled from mast to mast. Where the OHL crossed public roads, temporary goalpost or H frameswill be used to support the conductor etc. over the road so that safe access can be maintained on the public roads.

7.1.3.2 Removal of Overhead Line infrastructure

The overhead line (OHL) will be decommissioned and will entail the removal of the OHL infrastructure between the Derrybrien substation and Agannygal substation. During the removal of the overhead line, all polesets and masts will be cut at 300mm below ground. The OHL poles and mast elements will be removed from site for reuse and if necessary, disposal in accordance with the relevant legislation. On completion of the works, all above-ground structures will have been removed from the route of the overhead line. Any disturbed areas shall be reinstated and the below-ground features will be imperceptible.

7.1.4 Decommissioning of Agannygal Substation

The decommissioning of Agannygal Substation will involve the removal of the above-ground elements of the substation. These works will entail the de-energising of the electrical equipment and the removal of sub-station from site. The substation equipment will be reused or recycled where possible. All waste will be managed in accordance with applicable legislation. On completion of the works, all structures will be removed from the Agannygal substation site. The palisade fencing surrounding the substation will be dismantled and removed from site. The reinforced concrete base for the substation will be left *in situ* as will the access road to the site.

7.1.4.1 Reinstatement of the Ennis-Shannonbridge 110 kV Line

Following the decommissioning of the wind farm grid connection the Ennis-Shannonbridge 110kV Overhead Line will be reinstated. These works will involve the re-conductoring of the OHL span at Agannygal Substation. Stringing equipment will comprise 4x4 vehicles, puller – tensioners, teleporters, stringing wheels, conductor drums, compressor & head, transit vans, chains and other small tools, drum stands and drum carriers. It is estimated that the work would take 6 weeks to undertake.

On completion of the works, all above-ground structures will have been removed from the route of the overhead line and the Agannygal substation site. Any disturbed areas shall be reinstated and below

ground features rendered imperceptible. The OHL poles and mast elements will be removed from site in accordance with the relevant legislation. The reinforced concrete bases will remain in situ. Tree replanting is not proposed although natural regrowth of previously felled areas is likely.

7.2 Retained Development

This section describes the "Retained Development" associated with the Derrybrien Wind Farm Decommissioning Project. The features of the Retained Development, to remain *in situ in* perpetuity after the Prospective Development has been completed are listed below:

Derrybrien Windfarm including the Derrybrien 110kV Substation

- Reinforced concrete foundations for 70no. wind turbines.
- Reinforced concrete foundations of structures within the Derrybrien Substation compound.
- Reinforced concrete foundations of 2no. Anemometer masts.
- Approx. 17.5km of access tracks and 70no. hardstand areas
- Underground Electrical and communications cabling.
- 3no. Borrow Pits / Quarries
- Naturalised Peat Repository areas
- Onsite Drainage Infrastructure.

Derrybrien to Agannygal 110 kV OHL and Agannygal 110kV Substation

- Foundations for 34no. double wooden pole sets.
- Reinforced concrete foundations for 2no. end masts.
- Reinforced concrete foundations for 5no. angle masts.
- Reinforced concrete foundations for 1no. intermediate mast.
- Reinforced concrete foundations of structures within the Agannygal Substation compound.

Off-site Features constructed in response to the peat slide

- Barrage 1 and Coillte Access Track
- Barrage 2, Access Track and Repository Area
- Barrage 3 and Repository Area
- Barrage 4
- Repository Area at the Black Road Bridge
- Minor repairs work to instream structures/bridges – at Black Road Bridge, Flaggy Bridge, Unnamed Bridge C, Crooked Bridge and Stepping Stones.
- Minor borrow pits used to source material,
- Drainage works.

APPENDIX 6-1

HISTORIC ECOLOGICAL REPORTS.

APPENDIX 6-1

HISTORIC ECOLOGICAL REPORTS

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This report on

Bats

Summer assessment of the lesser horseshoe bat roost at Lough Cutra demesne

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Inis Environmental Services, Edenvale, Ennis, County Clare.

September 2004

Introduction

A late winter assessment of the lesser horseshoe bat population of the Lough Cutra demesne was undertaken to identify the feeding activity of the bats and to confirm that the winter hibernaculum was still viable along the lake shore.

It became apparent from research on the bat fauna of the estate that no recent evidence was available relating to the summertime presence of the bats and that this was a major gap in the knowledge of the lesser horseshoe bats here.

The basis of this follow-up assessment is to examine the demesne for evidence of lesser horseshoe bats during the summer and if present to determine whether there is feeding associated with the lake.

Further to this, it is an aim of the study to examine all other bat activity upon the demesne and around the lake to provide evidence of any obvious disparity in bat feeding activity here in comparison with other water bodies and woodland examined formerly and in the current year by the author.

The presence of a number of bat species and of feeding activity especially close to the lake would assist in evaluating whether there is an unusually suppressed level of bat utilisation of the site.

This in turn would assist in interpreting whether there is reduced insect abundance of species of benefit to bat fauna associated with the land slide at Derrybrien.

This study deals only with the presence and activity of bats and does not address insect fauna directly.

Materials and Methods

Field equipment

QMC Mini3 ultrasonic heterodyne detector

Tranquility Transect Time expansion and heterodyne bat detector

Sony MiniDisc Recorder MZ-R700 and cable

Samsung Digimax 230 Digital Camera

Analysis equipment and editing software

Toshiba S2410-304 laptop computer

"Batsound" sound analysis software

Microsoft Picture It! Photo 7

An assessment to provide information on the summer bat fauna on the shores of Lough Cutra was carried out in August 2004. This is a period when bat activity is intense and bat numbers are high due to the recruitment of the year's offspring.

This is an ideal period to identify any severely negative effects upon the breeding success of bats in the immediate area of Lough Cutra.

A bat detector assessment of the Lough Cutra demesne was undertaken between August 8th and August 10th 2004. This involved a nighttime examination of all buildings upon the estate with special emphasis on the castle as this is the known site of the winter hibernaculum of the lesser horseshoe bat that is a central feature of the SAC.

Bat activity was monitored around the courtyard, stables, lodges and castle at a period when bats emerge from the roost (i.e. from approximately thirty minutes after sunset).

The farther shore of the lake was also examined for bat activity where access was possible to determine whether there was activity here also.

The whereabouts of the lesser horseshoe bat population in the summer period (i.e. the breeding site) was not known for several years prior to this study and one of the central investigations for this study was to determine if the bats were availing of the demesne throughout the year.

The castle was examined during the daytime and at night to check the basement, wine cellar, clock tower and all other accessible sites for evidence of or the presence of bats.

Residents and staff were questioned regarding any knowledge of bat roosts upon the estate.

Bat activity along the lakeshore and along paths through the woodland and forestry was assessed using bat detectors. All bats encountered were identified to species level and roosts were sought both by following the bats towards roosts and by examining buildings in the period prior to sunrise (a period of one and a half hours).

Roosts were not directly counted but an estimate of numbers of bats present was made for some of the roosts.

A final visit to count the lesser horseshoe bats present was undertaken on Saturday September 4th 2004.

Results

Species of bat present in Lough Cutra demesne

Lesser horseshoe bat	*Rhinolophus hipposideros*
Soprano pipistrelle	*Pipistrellus pygmaeus*
Common pipistrelle	*P. pipistrellus*
Leisler's bat	*Nyctalus leisleri*
Natterer's bat	*Myotis nattereri*
Daubenton's bat	*Myotis daubentoni*
Whiskered bat	*Myotis mystacinus*
Brown long-eared bat	*Plecotus auritus*

A spectrogram depicting ultrasonic signals of some of the species present upon the demesne is shown in Figure 1.

Lesser horseshoe bats were noted to be present upon the estate during the period of study. The bats were present in the boiler room up a chimney close to the boiler (see Figure 2). An attempt to count the bats at emergence time proved impossible as the bats repeatedly flew in and out of the windows, doorway and into the clock tower. It is probable that bats also emerged through a small gap surrounding the pipes where they entered from the clock tower (see Figure 3) as they were seen to return through this gap.

A visual examination of the chimney during daytime yielded an estimate of fifty bats approximately including a number of juvenile bats (offspring from this summer). At least fifteen young bats were present. A further eleven bats were present in the basement, one of the winter sites for this species. This brings an estimated total of sixty bats in summer. This population is most probably predominantly females and their young (a single offspring for each reproductive female that successfully bred).

A subsequent count on September 4th revealed that 46 lesser horseshoe bats were hanging up in the boiler house itself. None were in the chimney. The basement was not checked as it was too intrusive a procedure at this time for the residents.

Lesser horseshoe bats were noted feeding along the lakeshore in vegetation to the southeast and southwest of the castle and along an inlet of the lake to the southwest. Earlier studies in March 2004 also indicated that bats feed along the woodland paths and in the woods themselves. No lesser horseshoe bats were seen or heard feeding from two hours after emergence until a period one hour from return to the roost when bats were seen and heard along the northern side of the pheasantry and flying along vegetation lines towards the walled garden area prior to return.

Activity along the lakeshore and over the lake was most intense on the night of August 8th 2004. During observations in the area of the lake behind the castle, soprano pipistrelles, common pipistrelles, Daubenton's bats and Leisler's bats were all active at the same time over the lake.

Natterer's bats were heard and seen in the boiler room, emerging later than the lesser horseshoe bats and flying around outside the boiler room. Brown long-eared bats also flew in the same area of the boiler house in the area where the windows are absent (see the bottom of the tower as shown in Figure 3).

Natterer's bats were heard and seen returning before dawn towards a roost in the vicinity of the southern gate lodge (a café cum guest house). An examination of this building prior to sunrise on August 10th provided evidence that the lodge tower was the site of a Natterer's roost (of more than ten bats) and of a soprano pipistrelle roost (within the same tower, see Figure 4). Natterer's bats had returned to the roost before 5.35 am while some lesser horseshoe bats were still flying and perching in the boiler house at 6.00 am.

An approximate figure for Natterer's bats in the gate lodge would be between ten and twenty individuals. Bat squeaks were heard occasionally from the tower from bats that had already returned. Soprano pipistrelles were not counted as it was intended to note any other gate lodge with bats before bat activity ceased and observations at this gate lodge were interrupted prior to all bats having re-entered. It is likely that in excess of twenty soprano pipistrelles returned to this roost.

One soprano pipistrelle was seen to return to the northern gate close to sunrise (see Figure 5 (b)). This may have been the last of a number of bats and it is likely that there is a greater number present.

A bat was seen to emerge from the lodge late on the first night of observations. This was despite the tenant's assertion that bats had never been seen or heard in the lodge.

Soprano and common pipistrelle activity was present in and around the courtyard and stable yard and sustained social calls were heard here throughout the night.
Feeding was also noted in the stable yard by pipistrelles, Natterer's and by one whiskered bat. The majority of activity was of pipistrelles.

Pipistrelles were very active in the path leading from the southern gate lodge (on the Scariff Road) and were seen feeding in woodland around mature broadleaves (including a Spanish chestnut). Activity around this tree suggested that the bat was returning to a crevice in one branch but the bat did not land, either because it is not a roost or due to the disturbance caused by the observer. A Leisler's bat availed of a mature tree close to the courtyard as a mating roost and calls were audible (both to the unaided ear and to the bat detector) here for up to two hours on each night.

Leisler's bats were heard feeding over the lake, feeding over pasture and along woodland edge. No roosts of this species were found around the castle but this species may commute over a considerable distance and may also use trees more frequently than species like the pipistrelles.

Daubenton's bats could be seen and heard feeding directly over the lake surface. Activity levels were typical of a lake of the size and shelter of Lough Cutra. While watching bats, it was very clear that insects were abundant in the vicinity of the lake especially where there was vegetation to provide shelter towards the lakeshore.

Bat activity on the farther shores of the lake (to the east) was not observed over as long a period and thus only two species were noted here (pipistrelles).

There was an abundance of these species and it is unlikely that there was any difference in activity levels between the two shorelines examined. Bat activity (pipistrelle) was noted at a bridge over the River Owendalulleegh close to where it enters into Lough Cutra).

In summary, bat activity, diversity and abundance was high in the Lough Cutra estate and on Lough Cutra in August 2004.

Discussion

The Lough Cutra demesne provides a summer breeding site and winter hibernation site for lesser horseshoe bats and is thus one of the most significant sites for bats in Ireland. The actual number of the summer population of this species remains unclear due to the difficulty in counting the bats as they emerge or counting them within the roost without creating considerable disturbance. However, the number is likely to be greater than or equal to sixty bats (including offspring).

These bats benefit from the heat available in the boiler house during the summer period to rear their young and from the constant temperature of the basement and wine cellar to enter the deep winter torpor, termed hibernation. This is a highly desirable set of features within one site for a species of bat that has undergone worldwide decline up until very recently. Thus it would be of great concern if the feeding potential for this area were affected by the land slippage attributed to operations to establish a wind farm at Derrybrien.

The difficulty in identifying impacts upon the bats lies in the absence of previous data on the bats here in the summer period and on bat activity in the winter period.

What is clear from this study is that lesser horseshoe bats do avail of the site year-round, are present in 2004 and have bred successfully in 2004. This would imply that the bats have reached an appropriate body condition to allow pregnancy to occur and to progress to the birth of young and furthermore for young to advance to a stage when they can fly and feed for themselves.

Reproduction has thus not been prevented by any effects upon the lake by the accidental introduction of peat. It is unclear as to whether any diminution in reproductive success, population size (or mean body mass etc.) has taken place.

An earlier concern relating to the absence of Daubenton's bat was allayed by repeated observations of this species on the main body of the lake and on a small inlet southwest of the castle. As has been noted in the **Results** section, bat activity on the lake was especially noteworthy on the night of August 8th.

It is clear from this second short examination of the site that bats are abundant upon the demesne. It is probable that most of the species for which roosts have been identified have bred here. The lesser horseshoe bats had certainly bred.

Given that any waterborne peat entered into the lake at the opposite side via the River Owendalulleegh, it is improbable that there has been any significant impact upon the invertebrate fauna that would constitute the prey items of the bat species of the castle and lodges.

All of the indications from this examination would suggest that the bat fauna is in a healthy state in the area where the lesser horseshoe bats roost. The bats may feed over a wide area (as far away as 7 kilometres but more likely in the range of 3 to 5 kilometres). Feeding activity for the lesser horseshoe bats will encompass both the lakeshore and woodland interior and woodland paths.

One of the residents of the castle noted the presence of a barn owl (referred to as an "owl that screeched rather than hooted") in the clock tower in the days leading up to the study. The presence of this predator may provide an explanation for the lesser horseshoe bats' avoidance of the more exposed shoreline in favour of vegetation that would interfere both with their visibility to predators and with efforts catch them in flight.

It is concluded by the author that there is no measurable impact upon the bat fauna of Lough Cutra but that any effort to quantify potential impacts is hampered by lack of data for bats in the years prior to the land slippage.

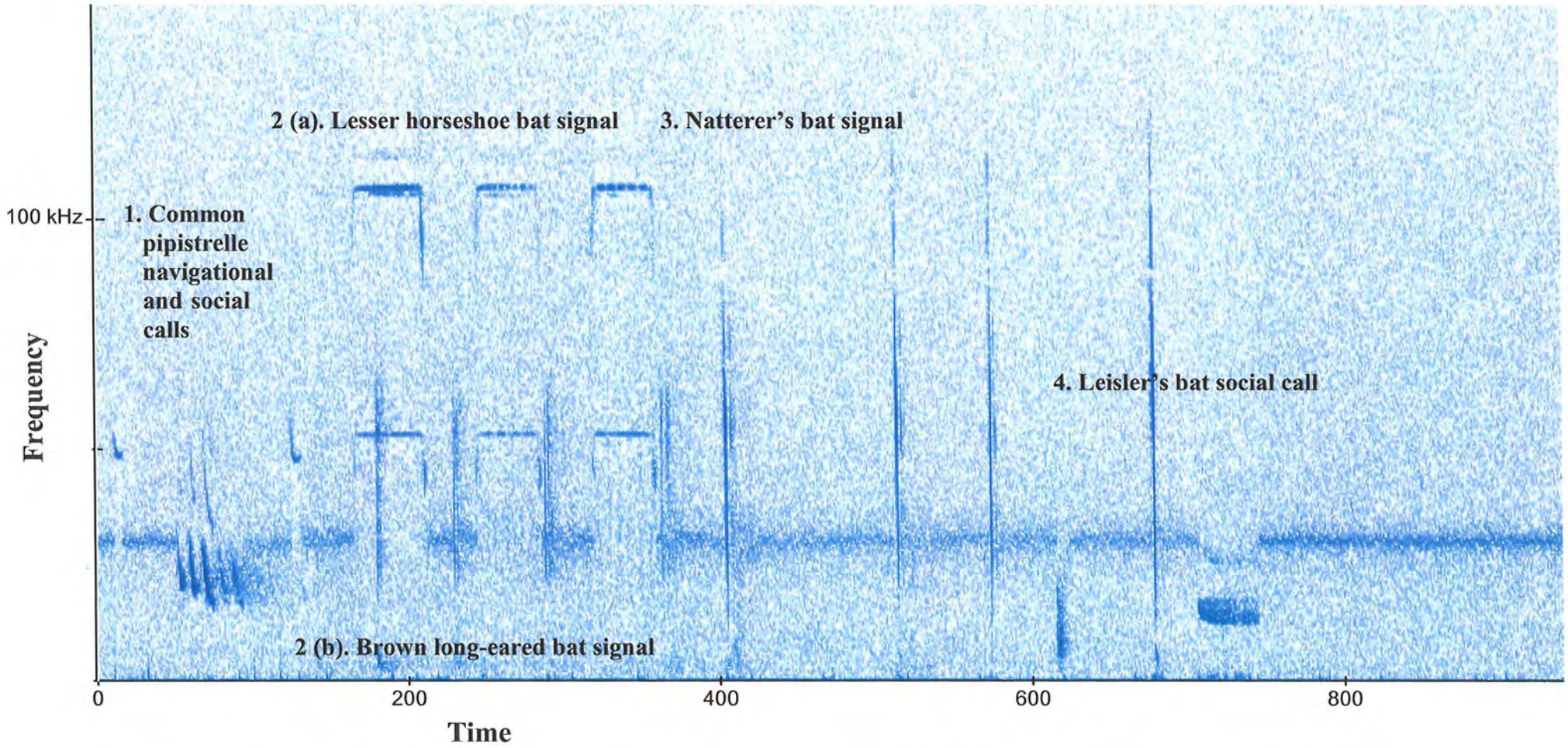

Figure 1: Spectrogram of some of the bat fauna of the Lough Cutra estate including common pipistrelle (1), lesser horseshoe bat and brown long-eared bat (2), Natterer's bat (3) and Leisler's bat (4).

Figure 2: Site of the lesser horseshoe bat maternity roost.
The bats are within the hot boiler room up the chimney. The bats fly in and out of the windows and door on emergence. The pile of droppings can be seen in the fireplace.

Figure 3: Exit and entry point used by bats in the boiler house.
At least one lesser horseshoe bat was seen to return through the hole around the pipe and two Natterer's bats exited through the aperture. The lesser horseshoe bat in the photo is one of two bats that flew around in the clock tower at emergence time.

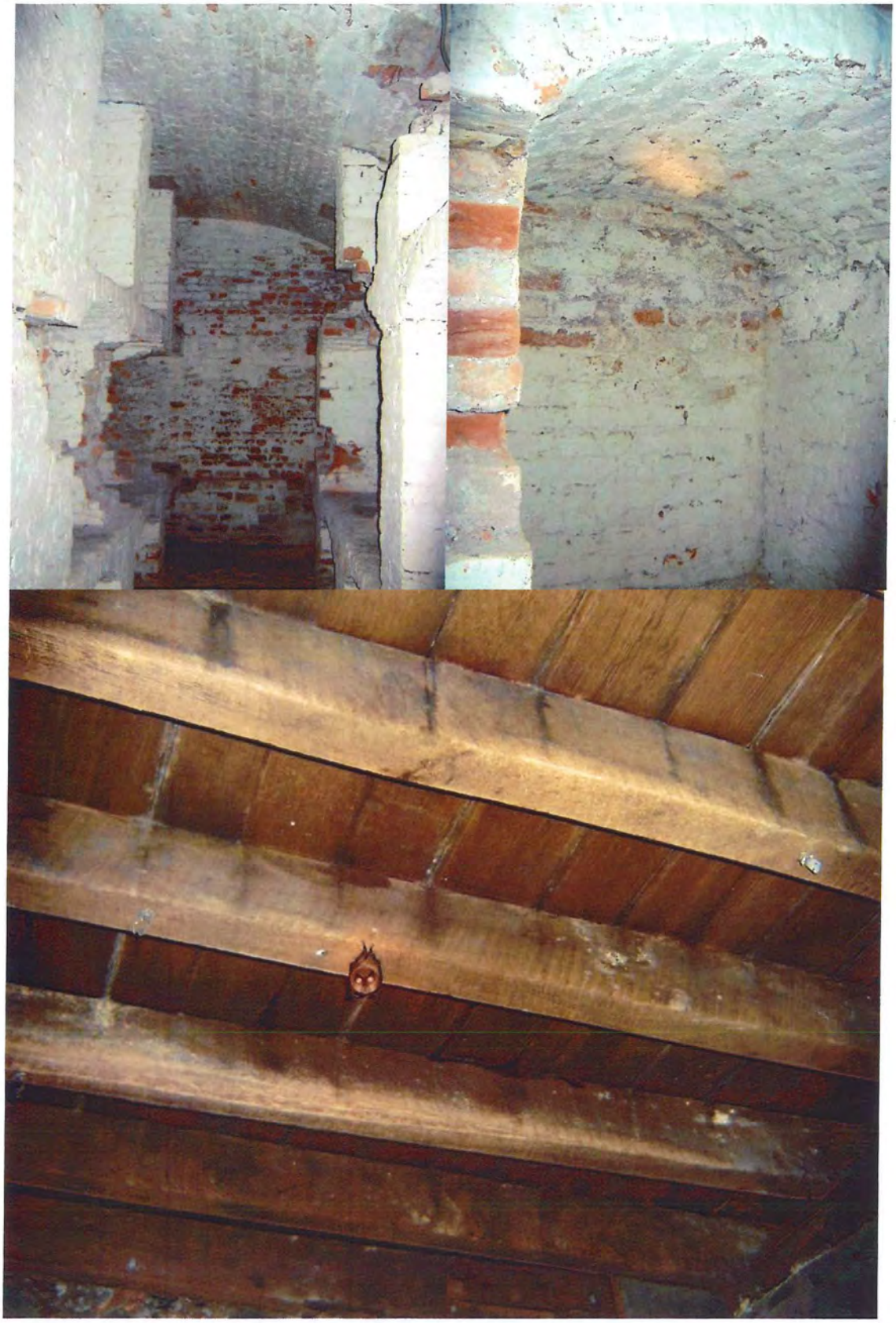

Figure 4: Wine cellar whereat lesser horseshoe bats roost in winter.
The lower picture shows the basement wherein bats roost both in winter and summer. A lesser horseshoe bat is shown in the centre of the picture.

Figure 5: Site of Natterer's bat roost (a) and soprano pipistrelle (a and b) roosts.
(a) is the gate lodge along the Scarriff Road and is open to guests.
(b) is the entrance gateway to the Lough Cutra demesne.
(c) Yard whereat soprano pipistrelles were active and emitting social calls.

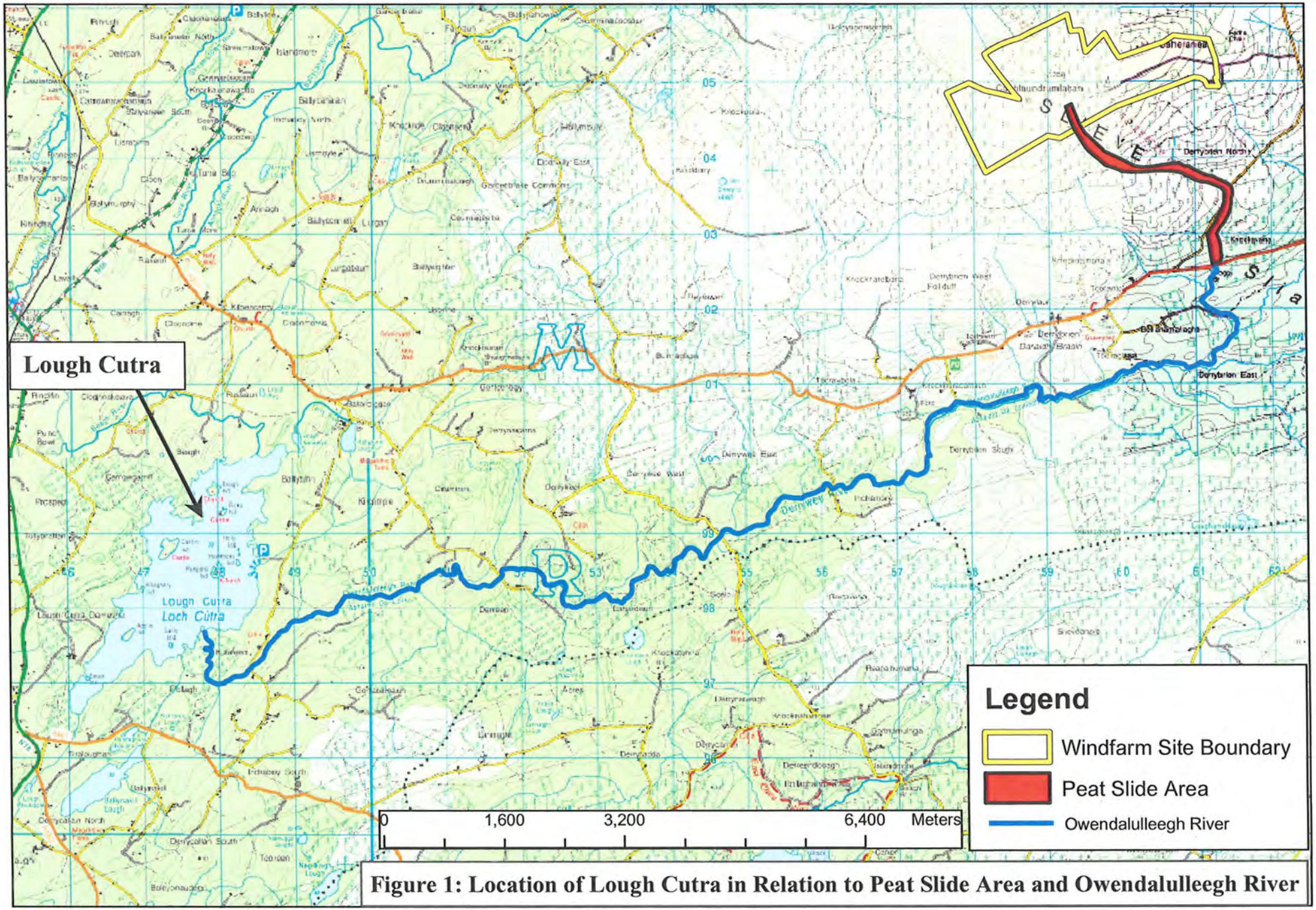

Figure 1: Location of Lough Cutra in Relation to Peat Slide Area and Owendalulleegh River

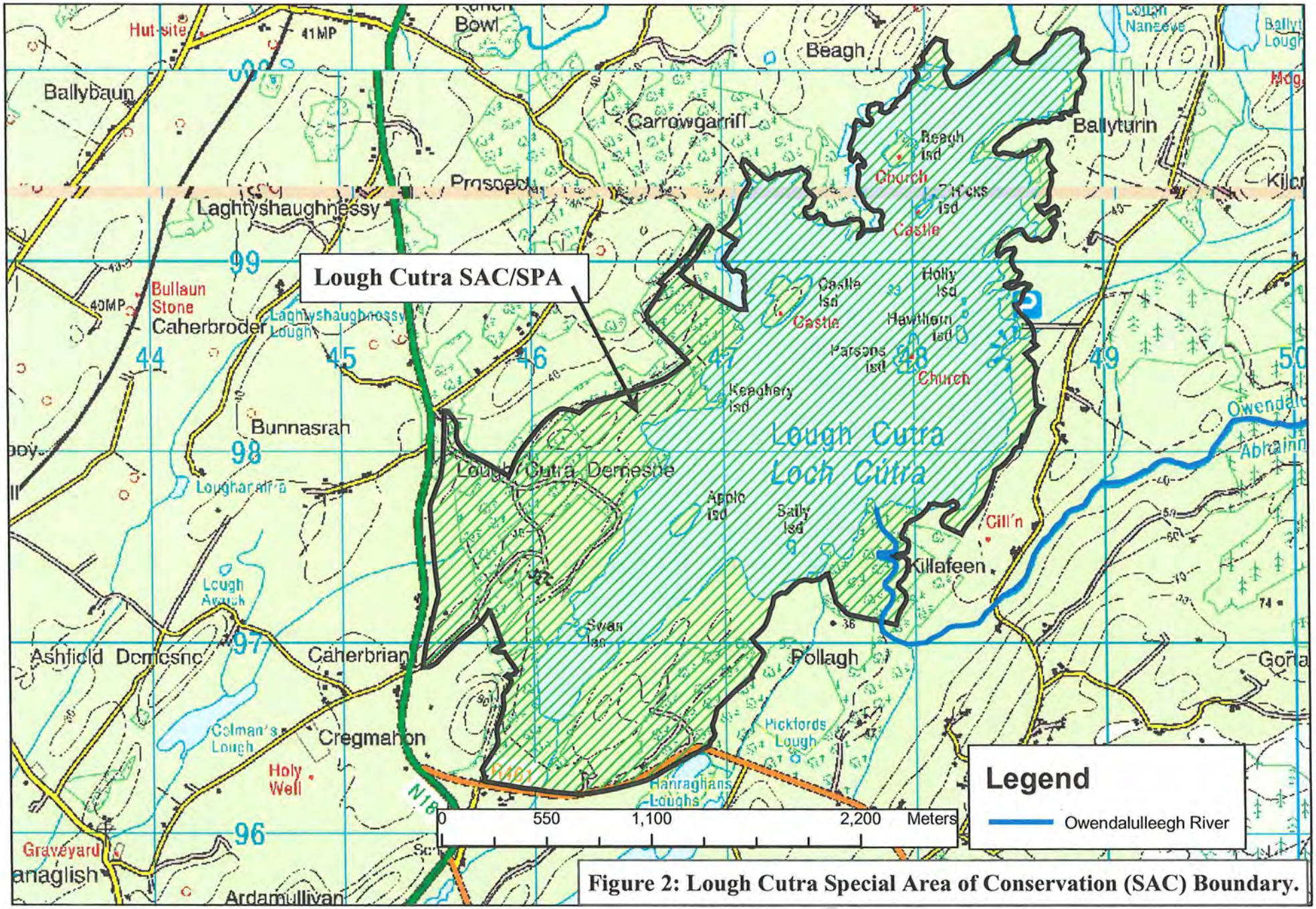

Figure 2: Lough Cutra Special Area of Conservation (SAC) Boundary.

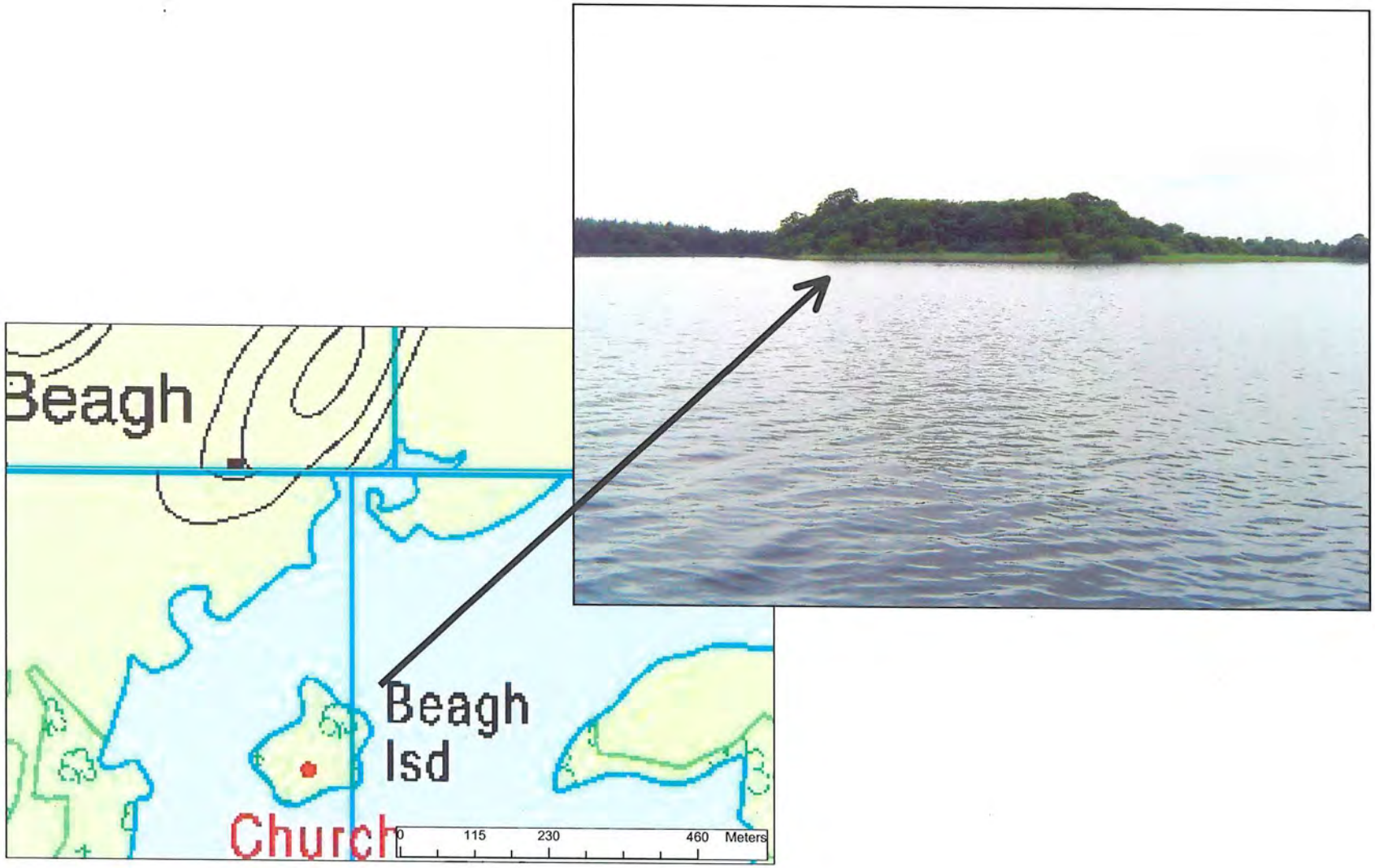

Figure 3(a) and 3(b): Beagh Island, the former Cormorant colony used to breed at this site.

Figure 4: Location of bats within the Lough Cutra demesne showing the cellars within the bats roost in winter. The entrance/ exits (yellow oval and close-up) used by the bats open out towards the lake.

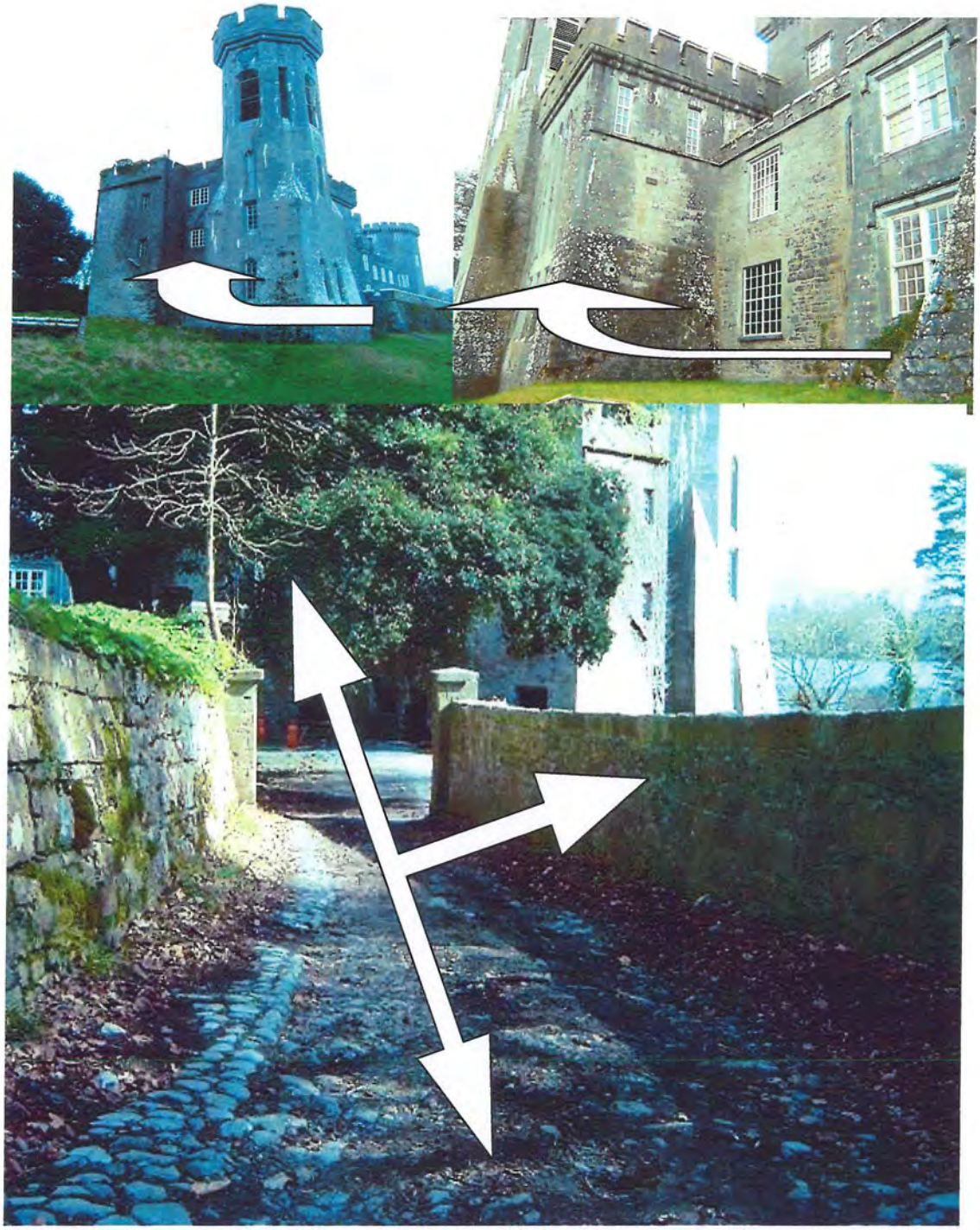

Figure 5: Movements of lesser horseshoe bats on emergence from the cellar roost. Bats flew along the edge of the castle to the clock tower prior to dispersal along the avenue and along either side of the pheasantry.

Figure 6(a): Bats flew along the edge of the pheasantry towards woodland.

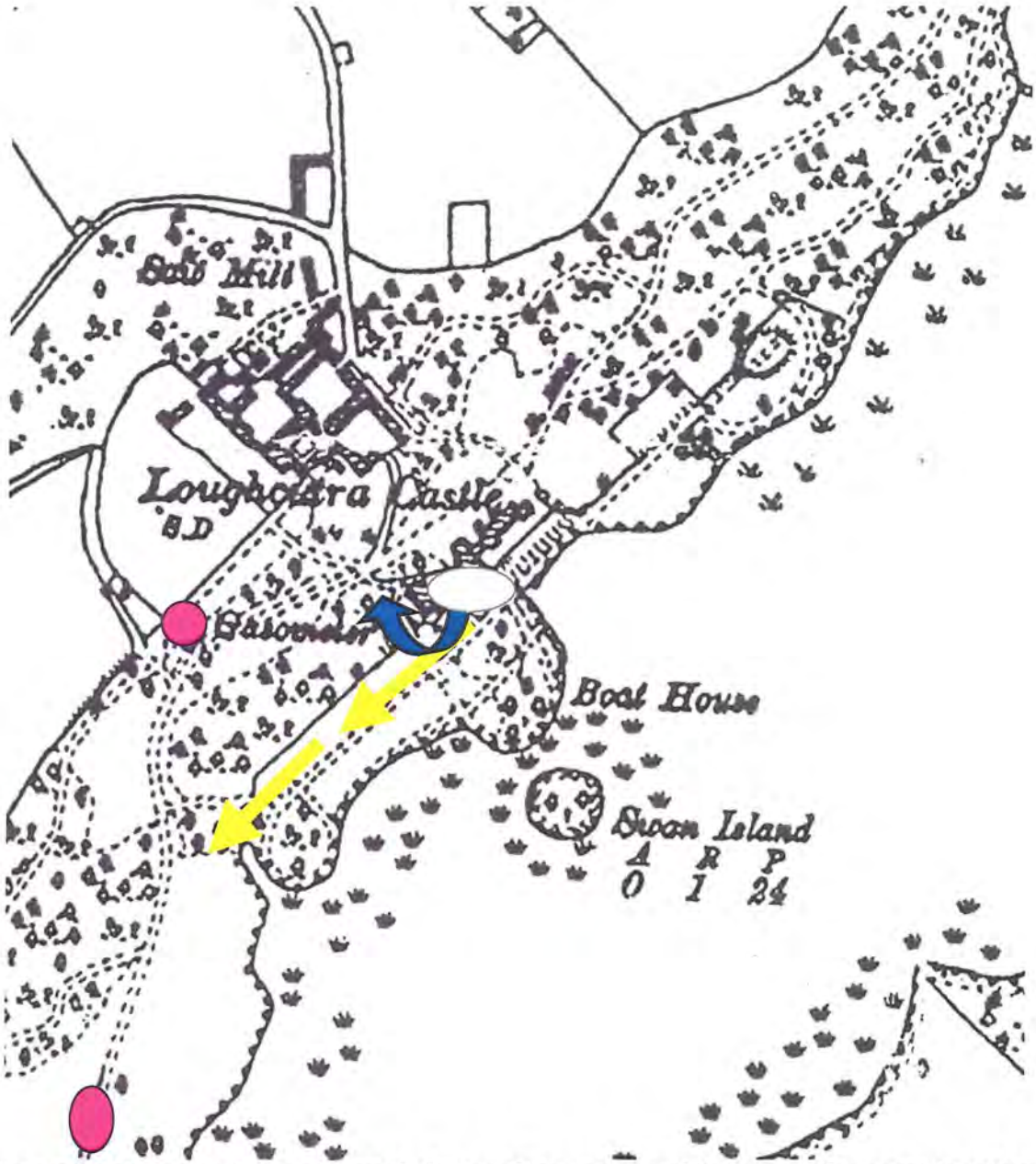

Figure 6 (b) Bat activity at Lough Cutra. The grey oval indicates the roost location. The yellow and blue lines indicate the movements of bats from the castle towards feeding areas. The pink ovals denote sites at which lesser horseshoe bats were noted during the night assessment.

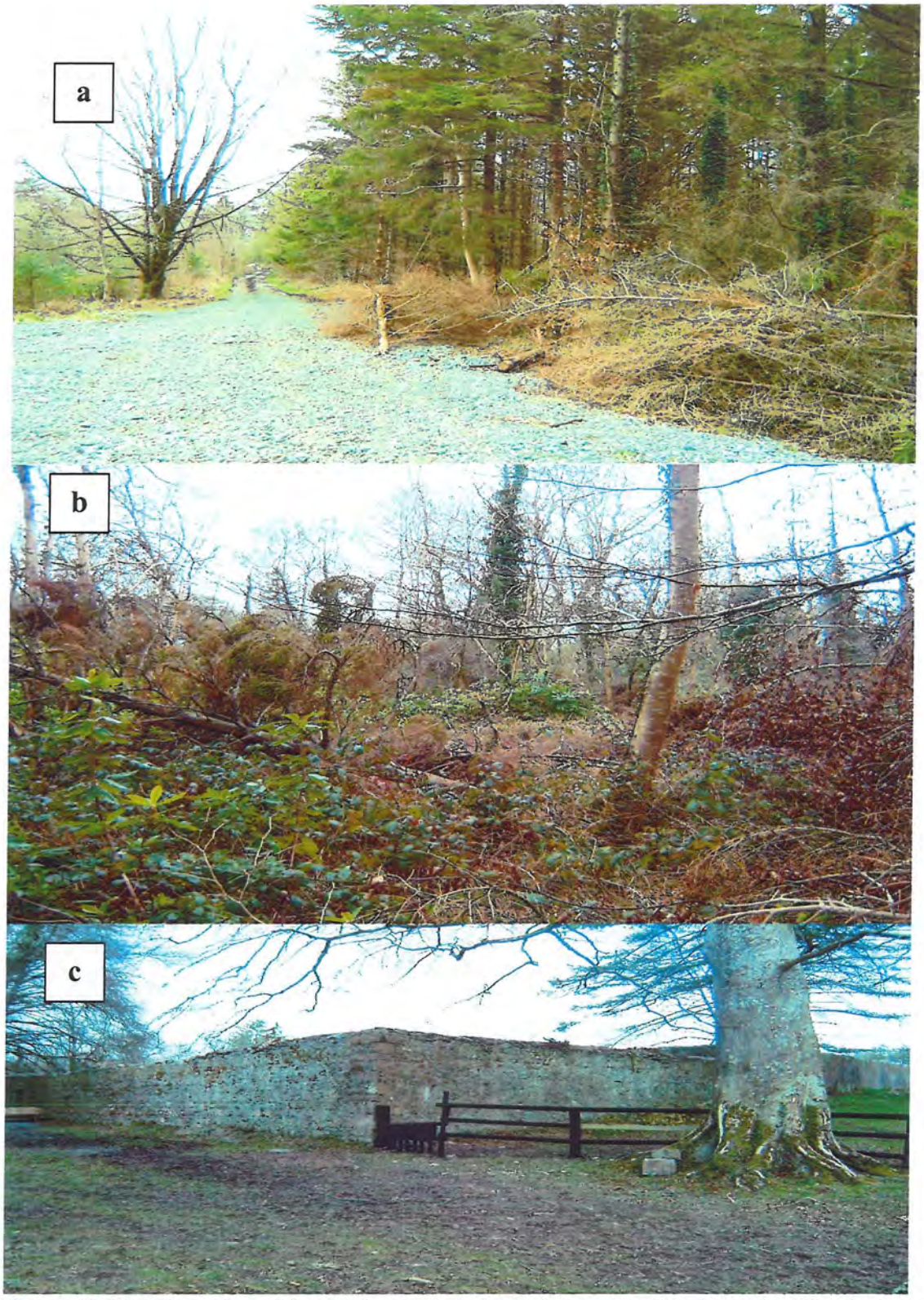

Figure 7: Feeding site of lesser horseshoe bat along woodland track. The bat was noted both on the track (a) and within the woodland (b).
(c) Feeding site of lesser horseshoe bat at walled garden.

Figure 8: Likely feeding sites for bats. A lesser horseshoe bat was noted at the stagnant water in the first photograph.

Figure 9: Potential feeding areas along woodland tracks and along the shoreline of Lough Cutra.

Figure 10: Trees with high potential as bat roosts. Such sites are only occasionally used by species such as the lesser horseshoe bat but are important for other species.

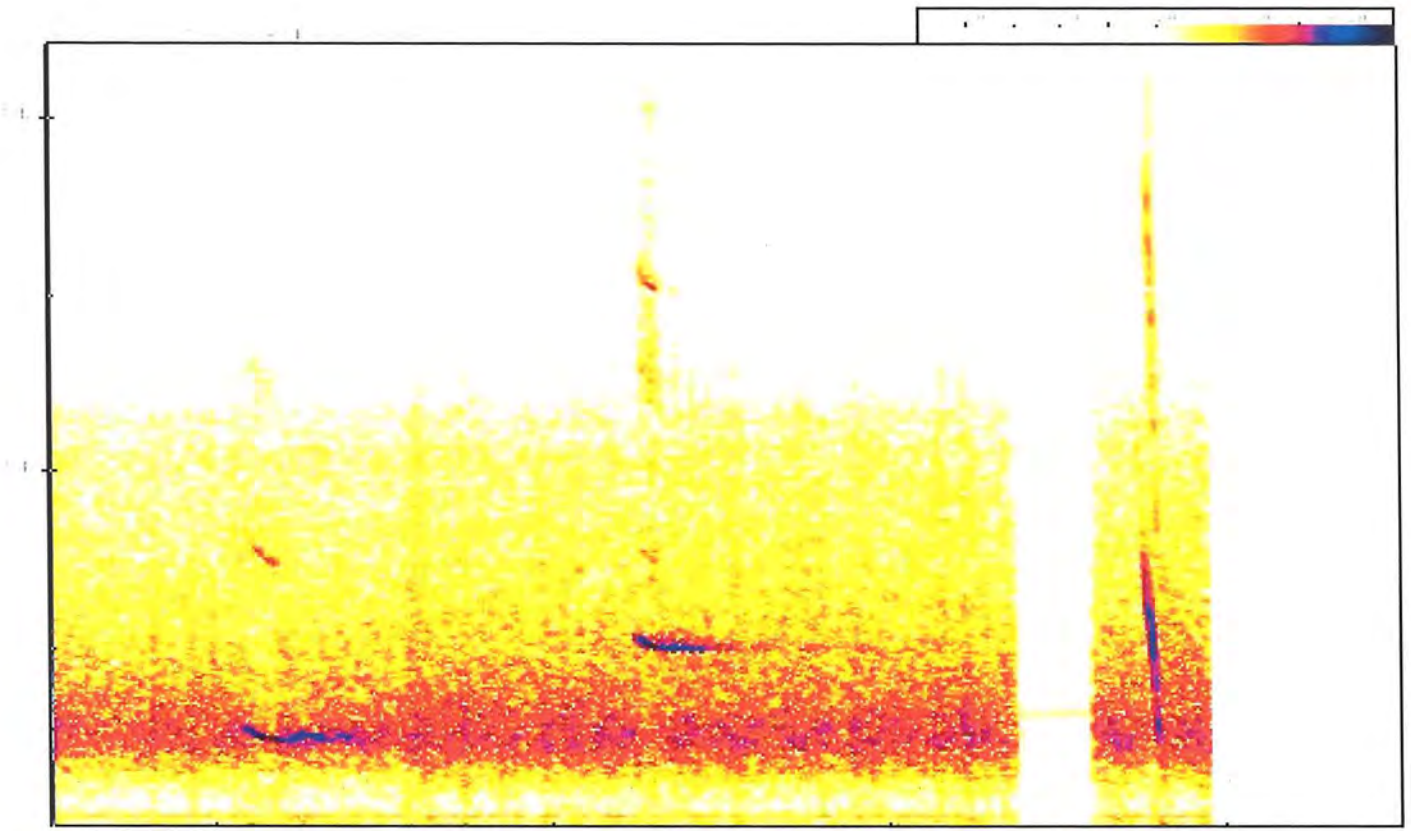

Figure 11: Sonogram showing three of the bat species present along the shoreline of Lough Cutra. From left Leisler's bat, soprano pipistrelle and Natterer's bat respectively.

Figure 12: River Owendalulleegh. The water of this river would be subjected to increased peat levels whenever the level is raised by heavy rainfall.

IMPACT ASSESSMENT OF DERRYBRIEN PEAT SLIDE ON HABITATS, CORMORANTS AND BAT FAUNA OF LOUGH CUTRA, CO. GALWAY

AUGUST 2004

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LIST OF APPENDICES

Appendix 1: National Parks and Wildlife Service Site Description

1 INTRODUCTION

Inis Environmental Services have been commissioned by Hibernian Wind Energy Ltd. to assess the impacts of a peat slide on the ecology of Lough Cutra, County Galway. The peat slide occurred upstream of Lough Cutra on an area of mainly afforested blanket peat in the Slieve Aughty Mountains during Autumn 2003. There is currently a windfarm being constructed in the area adjacent to where the peat slide occurred.

As a result of the peat slide, an estimated 6000 m^3 of peat entered the upper reaches of the Owendallulleegh River (ESBI, unpublished data) and flowed along its length to Lough Cutra (approximately 21km upstream). A visible plume was observed at the confluence of the Owendallulleegh River with Lough Cutra.Concerns over the possible impacts of the peat slide on the ecology of Lough Cutra have led to this study being carried out.

Lough Cutra is a large freshwater lake that occurs on an area of limestone but the water quality is influenced mainly by the sediment washed into the lake from the sandstone mountains nearby. This lake is situated about 4 km southeast of Gort, Co. Galway.

The lake is recognized as being of international ecological importance based on the quality of wildlife habitats present, the presence of Lesser Horseshoe Bats and the occurrence of a regionally important population of cormorants (in the past). This site has been designated as a candidate Special Area of Conservation (SAC) because of the presence of Lesser Horseshoe Bats, a species listed on Annex II of the EU Habitats Directive. The site is also designated as a Special Protection Area because of the population of breeding Cormorants.

This aim of the study was to determine whether there have been significant impacts on the ecology of Lough Cutra in particular on the internationally important population of Lesser Horseshoe Bats, on the internationally important Fen Habitats that occur around the lake and on the regionally important population of Cormorants that have been recorded at the site in the past.

Unfortunately there was not a similar study carried out prior to the occurrence of the peat slide and therefore it is difficult to compare the results of this study to the situation prior to the peat slide. There have been, however, some surveys carried out in the past including:

- NHA survey of the site.
- An Environmental Impact Statement on the Abstraction of Water from Lough Cutra (2003).

Reports of these studies have been referred to in an attempt to determine possible impacts resulting from the peat slide. The report has been prepared in accordance with the published EPA guidelines (EPA 2002). Scientific names of plants and animals are included in the text.

1.1 Site Location

Figure 1 shows the location of Lough Cutra in relation to Peat Slide Area. The Owendalulleegh River is also highlighted, it can be seen that the river enters Lough Cutra on the Eastern shore and rises in the area where the peat slide occurred.

2 LEGISLATION AND STATUTORY CONTEXT

2.1 Habitats

The Habitats Directive was transposed into national law through the European Communities (Natural Habitats) Regulations 1997 (S.I. 94/97). There are a number of habitats listed in Annex I of the Habitats Directive that are rare in Western Europe and are listed for protection throughout the European Union. Sites selected for protection under the EU Habitats Directive in Ireland are known as Special Areas of Conservation and form part of a European network of sites. Lough Cutra is now designated as a candidate Special Area of Conservation (cSAC).

2.2 Birds

All birds are protected under Irish law and the Wildlife Act of 1976. The Third Schedule to the Wildlife Act 1976, was amended on the 6th December 1985, when the minister, in compliance with the European Communities Council Directive of 2 April, 1979 (No. 79/409/EEC), made regulations entitled the European Communities (Wildlife Act, 1976)(Amendment) Regulations, 1985 (No. 397 of 1985) removing the remaining twelve unprotected species from that schedule. As a consequence all wild birds are now protected throughout the state.

Under Article 4 of the Birds Directive it is required that the State must *strive to 'avoid pollution or deterioration of habitats'* of all wild birds, including species listed in Annex I of the Directive. Lough Cutra is designated as a Special Protection Area for Birds (SPA) on the basis of the population of breeding Cormorants.

2.3 Bats

Legal protection is given to almost all Irish mammal species under national (Wildlife Act, 1976 and Wildlife (Amendment) Act, 2000) and European (Habitats Directive via S.I. 94 of 1997) legislation. Of Ireland's mammals, greatest protection is afforded to species included in Annex II of the Habitat's Directive. This includes lesser horseshoe bats, *Rhinolophus hipposideros*. This species has a very restricted distribution on the island and is confined to the six western and southern counties of Mayo, Galway, Clare, Limerick, Cork and Kerry. The population of bats within this range is calculated to be in the region of 9,000 to 10,000 individuals, making this the second-most important population of this species in the world after Wales and England.

2.4 Designated Conservation Areas

Sites of national importance in the Republic of Ireland are termed proposed Natural Heritage Areas (pNHA's). While the Wildlife (Amendment) Act 2000 has been passed into law, pNHA's will not have legal backing until consultative process with landowners

has been completed; this process is currently underway for many proposed sites. To date the only sites that have gone through the designation process are a number of Raised Bogs, mainly in the midlands.

Special Areas of Conservation (SAC's) are sites of international importance because of the presence of listed habitats or species that are of European importance.

Special Protection Areas (SPA's) for Birds, are designated based on the presence of internationally significant populations of listed bird species.

Legal backing for the protection of candidate SPA's and SAC's in Ireland is provided by the EU Directive on the Conservation of Natural Habitats and of Wild Flora and Fauna (92/43/EEC; commonly known as the 'Habitats Directive').

Table 1 gives details of the designations relevant to Lough Cutra. Figure 2 shows the boundary of the designated site.

TABLE 1 Lough Cutra NHA/SAC/SPA (Source: Dúchas, 2003).

Name	Site Code	Designation	Notes	Distance and direction from river survey area
Lough Cutra	000299	pNHA SAC SPA	Lough Cutra is an oligo/mesotrophic freshwater lake lying on limestone. The main habitats of this site are; aquatic lake vegetation, reed beds confined to sheltered bays and mixed woodland. The site is internationally important for it's breeding and wintering population of Cormorants (166 pairs in 1985 and max 300 individuals in winter) (Information compiled in 1987). The Cormorants use the offshore islands for breeding purposes. The internationally important populations of Cormorants and Lesser Horseshoe Bats should be especially protected. Lough Cutra is an important site with its diverse habitat types and the presence of both calcicole and calcifuge floras.	0km Includes and adjacent to river mouth

3 METHODOLOGY

3.1 Desktop Review

A desktop review was carried out to identify features of ecological importance within the study area. Literature sources consulted are included in the text and listed at the rear of the document.

3.2 Field Survey Work

3.2.1 Flora and Habitat Survey

The aims of the habitat survey were:

- To describe the various habitats that occur at Lough Cutra.
- To record any areas where peat deposits may have affected the ecology of the particular habitat in question.

Lough Cutra and adjacent habitats were surveyed using Phase 1 habitat survey methodology (JNCC, 1993). A walk-about and boat survey of the area was conducted on 15 July 2004. Habitats were identified and target notes were made on all semi-natural habitats encountered during the survey including notes on dominant vegetation, qualitative assessment of plant species diversity, vegetation structure, topography, disturbance and management. The habitats encountered on the site visit were classified in accordance with Fossitt 2000 as recommended by the Heritage Council.

3.2.2 Bird Survey

The aims of the Bird Survey were:

- To assess the breeding Cormorant, *Phalacrocorax carbo*, colony.
- To determine if any peat deposition took place on the breeding island.
- To assess impacts, if any, on the colony as a result of peat deposition.

The survey area consisted of only one island, Beagh Island, at the northern tip of Lough Cutra (see Figure 3(a) and 3(b)). This is a small island approximately 40 metres in length and 25 metres in width.

The survey was carried out on 15th July 2004. A boat was used to access Beagh Island. Three personnel, including a boatman, were needed to carry out this assessment. Weather conditions were fair but water levels were extremely low due to low precipitation in the area over a long period. Bathymetry charts were used to navigate the lake.

The following bodies provided information for this report (via publicly available documents):

- ESB International (ESBI)
- Environmental Protection Agency (EPA)
- Galway County Council
- National Parks and Wildlife Service (NPWS)
- Geological Survey of Ireland (GSI)

Cormorant Survey Techniques

Cormorants nest high up in mature trees when nesting on islands within freshwater lakes. They construct a large rough nest made of sticks and twigs and lined with grass and sometimes moss. These nests are easily discernible from a long distance as they are added to each year by the returning pair of Cormorants.

The foliage around the nests is denuded due to the acidic nature of the Cormorants faeces. This denudation of the foliage further assists the observer when counting nests and assessing numbers of breeding pairs.

3.2.3 Bat Survey

The aims of the Bat survey:

- To record the presence and activity of bats in and around Lough Cutra Demesne paying particular attention to Lesser Horseshoe Bats.

Equipment

QMC Mini 3 heterodyne bat detector
Eco Tranquillity time expansion and heterodyne bat detector
Sony Recording Minidisc Walkman MZ-R700 and cable
"Batsound" sound analysis software and Toshiba Satellite laptop computer
Exide handlamp and Petzl headlamp

Survey Methodology

The Lough Cutra demesne was examined for the presence and activity of bats on March 22nd, March 25th, 26th and 27th, 2004. This assessment concentrated on lesser horseshoe bats but any incidental bat species were also recorded where present.

The number of bats hibernating within the basement of Lough Cutra castle was counted in the initial visit of March 22nd to determine the level of usage of the site within the winter of 2003-2004. Advice on the location of the roosting bats was provided by the estate manager, Mr. Edward Somerville as the Conservation Ranger, Ms. Ciara O' Mahony was unavailable during this period for consultation. It is possible following discussions with Ms. O' Mahony that this count is an underestimate as the wine cellars were not checked on the guidance of Mr. Somerville. Bats are also known to roost within the wine cellars. (Two lesser horseshoe bats were noted by the author on April 11th 2000).

Bat activity within the area was low on the night of March 22nd and the observations on feeding are taken from subsequent examination of March 25th to March 27th.

Emergence activity was observed from 7.00 pm and the direction of emerging bats was noted. The second night of study provided a better viewing point for determining the general routes of emergence of the bats and the likely feeding areas accessed from these commuting corridors.

Feeding activity was sought and observed until bat activity ceased during the night. A second phase of observation was then initiated prior to final return at or near to sunrise. This second bout of feeding was restricted to a small number of the original emerging population. The demesne was walked during the daytime on March 26th and 27th to identify potentially good feeding areas, roost sites and any potential commuting routes for bats through the estate and in and around Lough Cutra lake.

Staff on the estate was questioned in relation to any observations of bats in buildings or other built structures. Trees were not considered in this assessment as it is rare for lesser horseshoe bats to avail of trees as hibernation sites.

The area within which the landslide occurred at Derrybrien was visited to determine whether there were any visible effects to the suitability of the River Owendalulleegh for macro-invertebrates that would form a component of the lesser horseshoe bat diet and to appreciate the historical alterations to the river prior to the assessment by the incursion of the considerable quantity of peaty soil.

4 EXISTING ENVIRONMENT

4.1 Designated Sites

As detailed above Lough Cutra is designated as a Natural Heritage Area, Special Area of Conservation and a Special Protection Area for birds. The boundaries of the designated sites are illustrated in Figure 2.

4.2 Habitats and Vegetation

Following the Phase 1 habitat survey of the site and surrounding area the different habitat types (as classified according to Fossitt 2000) were identified. The following is a description of the various habitats found in and around Lough Cutra The habitat code according to Fossitt is in brackets after the habitat name. Habitats that are likely to have been affected by the peat slide were surveyed and are described, agricultural land that may occur within the designated site were not surveyed nor were other habitats that occur above the high water level.

4.2.1 Limestone Lake (FL3)

The site is difficult to classify in accordance with Fossitt although the site occurs on Limestone and has a number of calcicole elements the source of much of the water is from the surrounding sandstone mountains and Blanket Bog areas. As a result the water is acidic and brown in colour, as a result there is an abundance of plants that are usually recorded from acid base-poor conditions. Much of the lake is fringed with reed and tall sedge vegetation (described 4.2.2 below). Bulbous Rush (*Juncus Bulbosus*), Shoreweed (*Littorella uniflora*) and Alternate Water-milfoil (*Myriophyllum alternifolium*) are abundant in the shallow shore waters. Stoneworts (*Chara spp.*) were recorded occasionally. Pondweeds (*Potamogeton spp.*) are abundant in the deeper areas. This unusually diverse habitat could correspond to either of the Annex I habitat types '*Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.*' or '*oligo- to mesotrophic standing waters with Littorella uniflora*' depending on the area of lake in

question. From areas that were surveyed it there was no evidence of damage caused to this habitat type as a result of the additional peat sediment in the lake resulting from the slide. It was no possible to carry out a comprehensive survey of this habitat type and it is recommended because of the conservation importance of the habitat type that a more comprehensive survey be carried out to determine whether this habitat type has been impacted upon.

4.2.2 Reed and Large Sedge Swamp (FS1)

Reed and sedge habitats are common around the shores of the lake and are distributed throughout in shallow water. The stands are typically dominated by single species, either Common Reed (*Phragmites australis*) or Common Club-rush (*Schoenoplectus lacustris*). There is no evidence of the peat slide having damaged this habitat in any discernable way.

4.2.3 Rich Fen (PF1) and Freshwater Marsh (GM1)

There are small pockets of fen and marsh habitat distributed around the lake shore. On wet peaty areas fen vegetation includes Black Bog-rush (*Schoenus nigricans*), Saw *Sedge (Cladium mariscus*) and a range of associated sedges (*Carex* spp.) and fen mosses. Other Species present included Jointed Rush (*Juncus articulatus*) and Soft Rush (*J. effuses*), Devil's-bit Scabious (*Succisa pratensis*), Water Mint (*Mentha aquatica*), Marsh Cinquefoil (*Potentilla palustris*), Horsetail (*Equisetum fluviatile*), Marsh Willowherb (*Epilobium palustre*), Bogbean (*Menyanthes trifoliate*), Tormentil (*Potentilla erecta*).

Other areas around the lake support a fen vegetation. Other areas where the substrate is mineral soil and there is a more fluctuating water table the species are more typical of freshwater marsh with species such as Common Spike-rush (*Eleocharis palustris*), Common Marsh-bedstraw (*Galium palustre*), Purple-loosestrife (*Lythrum salicaria*).

While the winter water levels were almost certainly above some of these areas no significant areas of peat deposit were located and no discernable damage was recorded as a result of the peat slide.

4.2.4 Wet Woodland (WN 6)

There are a few restricted areas where this habitat is present. The woodland is dominated by Willow (*Salix spp.*) with an abundance of Alder and Holly present. Species in the understory include Creeping Buttercup (*Ranunculus repens*), Meadowsweet (*Filipendula ulmaria*) and Creeping Bent (*Agrostis stolonifera*). An area adjacent to the mouth of the Owendalulleegh River was surveyed and there was no discernable impacts recorded as a result of the peat slide, there was no evidence of peat deposits within the wooded area. There was evidence of deer using the area.

4.2.5 Exposed calcareous rock (ER2) and Exposed sand

Much of the lake shore comprises areas of either exposed calcareous rock or sand, the habitats are species poor.

There was no evidence of peat deposits along the shoreline although during the winter much of the area was covered in a peat deposit (E. Somerville, *pers. comm.*).

4.3 Cormorants

Historical Data

In 1986, 166 pairs of Cormorants were recorded breeding on Beagh Island at the northern tip of Lough Cutra. These numbers were internationally important. However these numbers have been declining over time and only 21 pairs were recorded in 1997.

Numbers of Cormorant do not over winter at the site but single birds may be seen from time to time.

Cormorant Survey Results

The results of this investigation show that there are no longer any breeding Cormorant, *Phalacrocorax carbo*, present at Lough Cutra. No nests were recorded on Beagh Island nor were any Cormorants seen. No peat deposition was recorded at Beagh Island or any of the other islands on the lake.

It is clear that the absence of Cormorants is not due to the peat slip event as NPWS staff have indicated that there was little to no breeding activity at this location for the past few years.

A further survey of lakes in the general area of south Galway/North Clare shows a large colony of breeding Cormorant has established itself on Illaunmore at Muckanagh Lough, ten kilometres southwest of Lough Cutra. It is felt that these birds have relocated to this area from Lough Cutra.

4.4 Bats

Population in National Context

The lesser horseshoe bat has been in decline for a considerable period and its numbers in Ireland may also be less than historically and the above figure is at least 2,000 lower than a figure estimated for this species by the National Parks and Wildlife Service in the 1990's.

The species has a more restricted choice of roost as it requires a space through which it may fly to reach a hanging perch. Unlike all other Irish species, it does not avail of gaps or crevices in stone or wood or between slate/ tile and felt as many house-dwelling bat species may. Nor are there many trees of suitable girth to provide roosting opportunities for this bat.

The restricted distribution for this species is not fully understood and it is presumed that winter conditions on the southern and western region are the limiting factors. This species is the most typically recorded cave-dweller of all of our bat species. Limestone caves account for most winter records of this species.

Lesser horseshoe bats may also be found in cellars of houses, castles or abbeys and it is just such a case for the bat population of the Lough Cutra demesne.

Bats have been recorded annually within the basement of the castle and this population affords the status of Special Area of Conservation for this species.

Roosting bats at Lough Cutra

There was only one site shown to the author within the castle where bats over-winter and hence the number is incomplete but indicative of the number of bats utilising the particular site at this time of year.

45 bats were noted within the cellars of the castle on March 22nd 2004. This is similar to a count by Dúchas Conservation Ranger, Ciara O' Mahony in January 1999 in this section (46 on 17th January 1999). The farm manager had asserted that no other sites were used and the wine cellar and other sites were not accessed.

Counts for the estate have reached a total of 93 in January 2001 (17th January 2001) and have been as low as 75 in January 2002 (24th January 2002).

The bats were predominantly in a relatively deep torpor during the initial observation and bat activity within the area was low on the night of the study. Little or no flying insects were apparent during observations by the author.

The bats roost within the castle basement/ cellar and wine cellar and emerge from the castle on the side facing towards Lough Cutra. Access is readily available to the under-floor space via four barred windows (see Figure 4).

Commuting route from Lough Cutra Castle (see Figure 5, 6(a), 6(b))

All bats that emerged from the castle flew along the edge of the castle to the tower. Most bats then flew up the path leading from the castle towards the pasture to the southwest and west with some possible movements to the north following on the edge of the castle. One or two bats flew along a line of yew trees flanking the pheasantry close to the house.

Clearly the number of bats emerging was less than the total population present and it is reasonable to estimate that as few as twenty emerged on any night of observations.

The majority of bats either flew along the pathway to a midway point whereat they flew over the wall and down along the line of the pheasantry on the western side.

No bats flew in the opposite direction away to the northeast of the castle directly from the roost. This may be due to a greater exposure (i.e. less vegetation) in the initial section of the lake flanking the house.

Feeding bats (see Figure 7, 8, 9)

Feeding activity was difficult to fully assess within a short assessment as bats may commute over a considerable distance. Lesser horseshoe bats emit a weak, highly directional ultrasonic signal that may be undetected even within close range.

Observations on feeding can only provide a very basic evaluation of the likely feeding territory of these bats as a full study based on the radiotracking of a number of individual bats was not deemed necessary in the current examination.

Lesser horseshoe bats were noted to feed along woodland tracks and within the vegetation adjoining the tracks and along the walled garden. Bat activity was not restricted to the lakeshore. Indeed lesser horseshoe bats were only noted at one site at the lakeside; a still water body that lies close to the pheasantry. Bats did not remain to feed here and it served only as a feeding site during commuting.

Feeding by lesser horseshoe bats is very often associated with broadleaf woodland but this species has also been observed by the author to feed on the shoreline of lakes and turloughs in the Gort area. While this bat is typically associated with lines of good vegetation cover, they may also cross small open areas either commuting or feeding.

Thus, lesser horseshoe bats may feed over lake sites and potentially even commute to and from roosts across open water as has been reported from radio-tracking studies of lesser horseshoe bats roosting on an island in Bavaria, Germany.

Feeding may be spread over a number of kilometres and has been reported to be concentrated within approximately 3 kilometres of maternity roosts within areas of good feeding potential (e.g. Dromore Wood, Ruan, county Clare, Sinéad Biggane NUIG *pers. comm.*) up to a distance of 9 kilometres in Wales at the largest roost sites (Maurice Webber, Robert Stebbings Consultancy, *pers. comm.*).

Within such a distance from the roost, there is considerable variety of habitat types. However, bat species are most associated with riparian and other watery habitats with good vegetation cover.

Lesser horseshoe bats are known to feed within each fortnightly period throughout winter and have been reported to commute several kilometres even during this the least active part of the year for bats (Carol Williams, Irish Bat Conference, May 2003).

Species of bat noted in Lough Cutra demesne (see Figure 10, 11)

Lesser horseshoe bat	*Rhinolophus hipposideros*
Soprano pipistrelle	*Pipistrellus pygmaeus*
Common pipistrelle	*P. pipistrellus*
Leisler's bat	*Nyctalus leisleri*
Natterer's bat	*Myotis nattereri*

It was not intended that a full assessment of the bat fauna of this site be undertaken and the above list is an incidental rather than an exhaustive list of the bat species present. It is likely that most Irish bat species are present within this site. Suitable roost sites for these species are included in the figures simply to illustrate that this demesne has great potential for a wide range of bats.

There are a number of buildings on the estate that would offer roosting opportunities for lesser horseshoe bats. These range from the various areas of the castle itself to the stable yard and gate lodges. A considerable pile of lesser horseshoe bat droppings in the cellar around an old boiler indicates that bats roost here in large numbers. No bats were in this area during this assessment.

Buildings such as the icehouse would also have high potential as bat roosts given some greater cover from disturbance.

5 IMPACTS

5.1 Habitats

There was no evidence of damage caused to habitats in or around Lough Cutra as a result of the peat slide.

5.2 Cormorants

There has been no impact on breeding Cormorant at Lough Cutra as they no longer breed at this location.

5.3 Bats

Potential Loss of feeding from the peat slide at Derrybrien (see Figure 12)

The importance of aquatic invertebrates to most bat species is indisputable whether through the direct ingestion of such prey while hatching over water or through the consumption of prey that had hatched previously from the water but were flying in woodland, wetland or were perched on a plant or other substrate.

Lesser horseshoe bats consume a variety of prey including crane fly, caddis flies, moths, lacewings and even small midges. Waterside vegetation is one of the most likely sites to encounter this bat.

Observations upon the bats during this assessment have shown that the bats returned to their winter site in 2003-2004 and were still present here in late March (towards the end of the hibernatory period). Feeding activity was noted during this period in the woodland and vegetation close to but not at the lakeside.

No sustained feeding was noted at the lakeshore. However, it would be inappropriate to draw conclusions on any negative effects on the foraging potential of the lake for bats based on such a small window of observation. Feeding activity over the lake would have

been indicative that food was available to bats. The absence of bats may simply indicate that bats have identified more fruitful feeding areas.

To fully appreciate the feeding activity at Lough Cutra, it would be necessary to follow the entire feeding activity of a number of bats over a large distance for a number of nights. Avoidance of the lake (typically a good feeding site for bats) by the resident bats may offer an indication that insect availability is considerably less than would be expected for such a site.

The absence of any information on the feeding and commuting routes of the bats prior to the landslide impairs the ability to compare the "before" and "after" situations. For example, if it could be shown that bats emerging from the castle had formerly flown towards the lake in both directions and now only approached the lake where vegetation was dense, it may indicate that the lake is less beneficial as a feeding site than formerly (or there may be a need to examine other possibilities, e.g. predation in the more open terrain).

The population of bats within Lough Cutra are possibly resident throughout the year although this has not been the subject of assessment to date. Lesser horseshoe bats may use the same building for summer and winter roosting once the requirements of the two roost types is met.

Should the bats be present in summer, there would also be a potential for impact upon these bats and their offspring. There is clearly a gap in the knowledge regarding the bats upon the demesne that may have great significance in interpreting the effects of the landslide.

6 RECOMMENDATIONS

- Due to access difficulties it was not possible to carry out a comprehensive survey of the sub-littoral plant communities of Lough Cutra. It is recommended that the Eastern Shore of the Lough be walked and the habitat and vegetation communities described to determine whether the habitat has been impacted upon from the deposition of peat. Preliminary surveying undertaken to date indicate that there is no evidence of major peat deposition within this habitat.
- The invertebrate fauna of Lough Cutra and the River Owendallulleegh should be examined to provide a more accurate evaluation of the potential effects of the landslide upon this aspect and the consequent potential for feeding reduction for insectivorous vertebrates including the Lesser Horshoe Bat population at Lough Cutra.
- Where there is evidence that the water quality is incapable of supporting invertebrate diversity, immediate measures should be taken to improve the quality.
- A visit to the Lough Cutra demesne to determine whether lesser horseshoe bats are present in summer and breeding here should be undertaken.

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NPWS SITE DESCRIPTION

SITE NAME: LOUGH CUTRA

SITE CODE: 000299

Lough Cutra is a large oligo/mesotrophic freshwater lake lying on limestone but with much sediment washed down from the sandstone hills above. This lake is situated about 4 km south-east of Gort, Co. Galway.

This site is a candidate SAC selected for alkaline fen, a habitat listed on Annex I of the EU Habitats Directive, and for Lesser Horseshoe Bats, a species listed on Annex II of the EU Habitats Directive.

The vegetation around the lake is diverse, with reedbeds confined to sheltered bays, marshes and fens on sandy and peaty ground and natural and planted woodlands. Shallow water communities include species such as Jointed Rush (*Juncus articulatus*), Bulbous Rush (*J. bulbosus*), Alternate Water-milfoil (*Myriophyllum alternifolium*), Water-plantain (*Alisma plantago-aquatica*), Floating Club-rush (*Scirpus fluitans*), Lesser Water-plantain (*Baldellia ranunculoides*), Water Lobelia (*Lobelia dortmanna*) and Shoreweed (*Littorella uniflora*). Winter flooded areas support marsh vegetation with Common Spike-rush (*Eleocharis palustris*), Common Marsh-bedstraw (*Galium palustre*), Purple-loosestrife (*Lythrum salicaria*), amongst others, and with notable species such as Lesser Meadow-rue (*Thalictrum minus*), Northern Bedstraw (*Galium boreale*) and Blue-eyed-grass (*Sisyrinchium bermudiana*). On wet peaty areas fen vegetation includes Black Bog-rush (*Schoenus nigricans*), Saw *Sedge (Cladium mariscus*) and a range of associated sedges (*Carex* spp.) and fen mosses.

Woodland occurs around much of the lakeshore, as well as on a number of islands in the lake. Wet woodland on peat is dominated by Willow (*Salix cinerea*) and Alder (*Alnus glutinosa*). An old record of Irish Spurge (*Euphorbia hybernica*) probably comes from drier woodland which occurs in the Lough Cutra Demesne.

These woodlands provide feeding grounds for a summer roost of Lesser Horseshoe Bats. Between 1999 and 2001 up to 93 bats have been recorded in hibernation at Lough Cutra Castle and it is thought likely that a summer nursery roost also occurs here.

The lake is a regionally/locally important site for waterfowl. Monthly counts between November 1995 and March 1996, as part of an intensive study on flooding in the catchment, gave the following numbers: Whooper Swan (18), Mallard (101), Teal (69), Tufted Duck (83) and Goldeneye (58). The latter also use the nearly Ballynakill Lough. The lake has a long-established breeding colony of cormorants, with 34 nests in 1996. Higher numbers (166 pairs, 1985) have been recorded in the past. Small numbers also winter on the lake. In recent years there have been no records of Greenland White-fronted Geese from the lake, although in the past flocks of 60-80 birds were regular and were considered to be birds from the Rahasane or Creganna population.

The lake is used for fishing and tourism. Precautions should be taken to ensure the lake and its surrounding area is protected from damaging operations such as application of artificial fertilisers, development close to the lakeshore, drainage and felling of woodland areas.

Lough Cutra is of conservation interest for the range of wetland habitat types it contains, particularly alkaline fen, a habitat listed on Annex I of the E.U. Habitats Directive. The presence of an internationally important colony of Lesser Horseshoe Bats, a species listed on Annex II of the Habitats Directive, and a regionally important population of Cormorants add further interest to the site.

20.03.2003

Inis
ENVIRONMENTAL SERVICES

DERRYBRIEN WINDFARM

PEAT SLIP

ENVIRONMENTAL IMPACT ASSESSMENT

ON

THE OWENDALLULEEGH RIVER

MARCH 2004

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1.0 INTRODUCTION

A landslide occurred near the southern boundary of the Derrybrien Wind Farm on the evening of 16th October 2003. The slide involved disturbance and partial displacement of approximately 450,000m^3 of peat. On 17th October, the limit of the displaced peat was measured at approximately 100m from the Black Road Bridge, a distance of approximately 2.45 km from the head of the slide. On 29th/30th October, following heavy rain, the slip mass re-mobilised before the emergency stabilisation measures were substantially underway, and solid peat entered the watercourse downstream of Black Road Bridge. The flow of solid peat continued for approximately 24 hours.

As a result of the landslide, an estimated 6000 m^3 of peat entered the upper reaches of the Owendallulleegh River (ESBI, unpublished data) and flowed along its length to Lough Cutra. This watercourse is of ecological and fisheries importance. A visible plume was observed at the confluence of the Owendallulleegh River with Lough Cutra (aerial photo and observations made by Shannon Regional Fisheries Board – Preliminary Assessment Report)

Inis Environmental Services was appointed by ESBI to undertake a joint survey with ESBI and the Shannon Regional Fisheries Board to assess the extent of impact of the peat slip on the Owendallulleegh river system.

The current report provides an assessment of the integrity of aquatic habitats in the river and provides information of the extent of peat deposition in the main stem corridor. It reports the results of a walkover type survey, carried out in December 2003, and a desk appraisal. The key aims of the study were as follows: -

- To assess the extent of peat deposition along the river;
- to determine the habitat integrity of aquatic and riparian areas;
- to provide a preliminary assessment of the potential impact of the land slide on the river;
- to suggest mitigation measures to assist the rehabilitation of the river, and,
- to recommend further survey work, where necessary, to assess fish stocks and other ecological indicators.

This study was undertaken by Inis Environmental Services on behalf of ESB International (ESBI). Field work was carried out by Inis Environmental Services in association with ESBI and the Shannon Regional Fisheries Board (ShRFB).

2.0 METHODOLOGY

2.1 Survey area

The survey area comprised of the entire length of the main stem Owendallulleegh River from Flaggy Bridge (NOS Grid Reference M61161 62512) to the mouth of the river, where it enters Lough Cutra, (NOS Grid Reference R47811 97721). This represents a study length of approximately 22 kilometres. The study area was divided into eleven sections. The overall area is shown in figure 1 and the eleven sections of river assessed are shown in figures A1.1 to A1.11 in appendix 1.

The survey was carried out over a two-week period comprising a team of

- Inis Environmental - (two persons);
- Shannon Regional Fisheries Board – (Three to five persons).
- ESBI (three persons).

Weather conditions were good and water level was low facilitating the survey. The survey comprised a walk down of the entire river main stem with recording of observations. A Health and Safety Induction course was held on the first morning of the survey to advise all survey members of the potential hazards and work methodology to be followed.

The survey was completed within a two-week period (9th – 22nd December 2003). The following maps, provided by ESBI under Licence from GSI, were utilised for the assessment:

- Ordnance Survey of Ireland, Discovery Series 1:50,000. Sheets 52.
- Ordinance Survey of Ireland, local 1:5000 sheets.

2.2 Aquatic Habitat Assessment

The aquatic habitats present in the eleven study sections were defined with reference to the habitat classification scheme published by the Heritage Council in *A Guide to Habitats in Ireland* (Fossitt, 2000). Codes such as FW1, refers to habitat types of eroding upland rivers, as defined in this publication. The diversity (species richness) of aquatic/riparian fauna is primarily a function of the integrity and physical diversity of the aquatic habitats. The more diverse the aquatic habitat is in terms of substrate, depth, riparian vegetation, etc. the richer the biological community is likely to be. Salmonid fish (trout and salmon) in particular have specific habitat requirements and the presence and abundance of these fish has been shown to be strongly correlated with key physical habitat variables (Haury, 1999). Habitat considerations for juvenile salmonids in streams and rivers include stream size and flow (Hatfield & Bruce 2000), depth and gradient (Kennedy & Strange 1986), substrate (Greenberg & Dahl 1998), and canopy (O'Grady, 1993). Physical habitat assessments were undertaken at intervals along the river. These sites were assessed in terms of: -

- Wetted width (m)
- Depth (m)
- Bank height (m)
- Riffle (%)
- Glide (%)
- Pool (%)
- Bedrock (%)
- Cobble (%)
- Gravel (%)
- Boulder (%)
- Sand/Silt (%)

Aquatic Flora Assessment

Qualitative assessments of instream vegetation were undertaken during the habitat assessment study. The species present were identified and the percentage cover of riparian and instream vegetation was

estimated visually. An impact on vegetation was recorded where vegetation had been eroded, or covered by peat to a depth likely to affect growth. As the survey was carried out mid-winter, plants were identified from overwintering parts and were not always identifiable to species level. Similarly, cover of emergent aquatic species is lower in winter than at the peak of the growing season (summer). A list of aquatic and riparian plant species for the 10km grid squares containing the Owendallulleegh River was also extracted from the CD ROM of Preston, C. D., Pearman, D. A. and Dines, T. D., eds (2002). *New Atlas of the British and Irish Flora*. Oxford University Press, Oxford.

3.0 EXISTING ENVIRONMENT

3.1 General

The Owendallulleegh River within the study area is described and evaluated on the basis of aquatic and riparian habitats. The presence of protected aquatic species is also considered. The areas investigated are described below.

3.2 Designated Areas

The National Parks and Wildlife Service (NPWS) is responsible for natural heritage conservation in Ireland. It is responsible for the designation of the following areas of statutory protection:

- *Special Areas of Conservation (SACs)* - These were established under the 1992 Habitats Directive of the Council of the EU for the conservation of natural and semi-natural habitats and species of flora and fauna.

- *Special Protection Areas (SPAs)* – These areas are designated for the protection of birds, and were established under the Birds Directive of the EU in 1979.

- *Natural Heritage Areas (NHAs)* – These are nationally important protection areas and were established under Irish law.

- *Statutory Nature Reserves* - These are relatively small land areas, very often forest or previously afforested areas that are maintained as protected nature reserves.

The Owendallulleegh River is not on or within a site designated or being considered for designation for statutory nature conservation. However, it flows into Lough Cutra, which is a candidate Special Area of Conservation (cSAC) and a designated Special Protection Area (SPA) under the EU Birds Directive. Gortacarnaun Wood, a designated SAC, is also adjacent to the river. In table 1, these and other designated areas adjacent to the study area are described. The location of these sites in relation to the Owendallulleegh River is shown in figures 2 and 3. Additional information on Lough Cutra (Site code 00299) and Lough Coy (002117) are provided in appendix 2. No information on the Newhall site (002293) was available at the time of preparing this report. Under Article 6 of the Habitats Directive the onus is on the developer to assess the indirect impacts on any designated sites (Special Areas of Conservation –SACs or Special Protected Areas SPAs) as a result of a plan or project.

3.3 Hydrology of the area

The study area is located in the Owendallulleegh River (or Derrywee River) river system (EPA code 29/O/01). This is an undrained river system located in EPA hydrometric area 29. The Owendallulleegh is an upland spate river that rises in the Slieve Aughty Mountains in south County Galway. It flows west through the townlands of Derrybrien, Inchamore, Lahardaun, Derreen, and Kilafeen to enter the southern end of Lough Cutra. It has a main channel length of 22.5km (McGarrigle *et al*, 2002). The catchment area is approximately 40km^2 and includes extensive areas of cutover bog and coniferous forestry. Lough Cutra is an oligo/mesotrophic landlocked lake, which has a surface area of 3.9km^2. Catchment details and selected physical characteristics of the Owendallulleegh River (from source to Lough Cutra) are provided in tables 2 and 3 respectively.

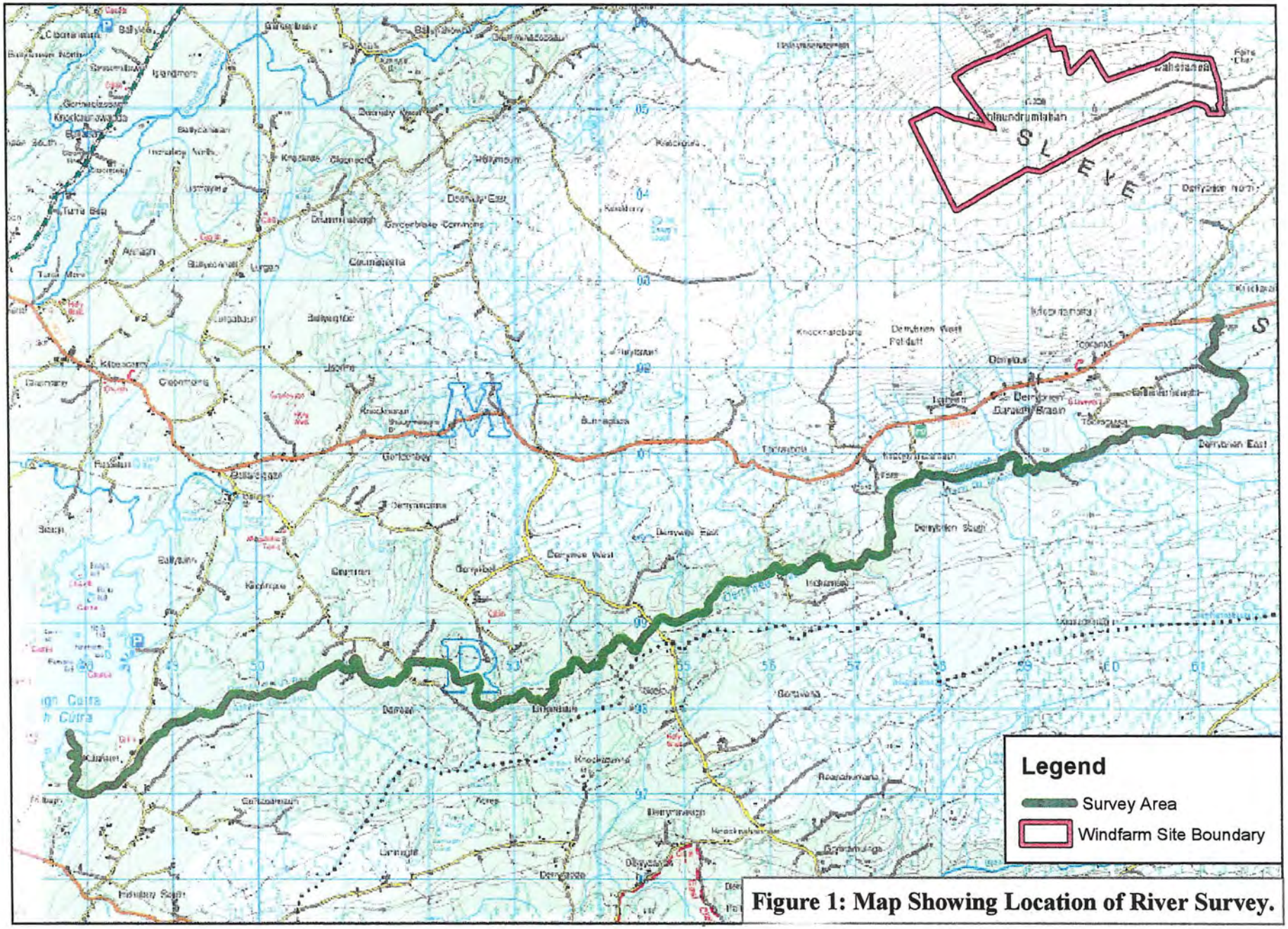

Figure 1: Map Showing Location of River Survey.

The Owendallulleegh River flows for a distance of approximately 22 km and flows into Lough Cutra. The outlet of Lough Cutra forms the Beagh river, which sinks at the Punch Bowl and remerges as the Cannahowna river (Gort River and Castletown river), where water is abstracted for the Gort Water supply. It then disappears underground again and re-emerges into Lough Coole and feeding into the turlough system at Coole – Garryland. Ultimately it is thought to discharge to the sea at Kinvarra.

Table 1 Designated sites surrounding river survey area (Source: NPWS).

Name	Site Code	Designation	Notes	Distance and direction from river survey area
Lough Cutra	000299	pNHA SAC SPA	Lough Cutra is an oligo/mesotrophic freshwater lake lying on limestone. The main habitats of this site are; aquatic lake vegetation, reedbeds confined to sheltered bays and mixed woodland. The site is internationally important for its breeding and wintering population of Cormorants (166 pairs in 1985 and max 300 individuals in winter) (Information compiled in 1987). The Cormorants use the off-shore islands for breeding purposes. The internationally important populations of Cormorants and Lesser Horseshoe Bats should be especially protected. Lough Cutra is an important site with its diverse habitat types and the presence of both calcicole and calcifuge floras.	0km Includes and adjacent to river mouth
Gortacarnaun Wood	002180	SAC	Old oak woodlands are scarce in Ireland and the habitat is of particular conservation importance as it is listed on Annex I of the EU Habitats Directive.	0km Adjacent to south bank river
Drummin Wood	002181	SAC	Drummin Wood is of considerable conservation significance as it conforms to a woodland habitat type that is scarce in Ireland and one that is listed on Annex I of the EU Habitats Directive. The occurrence of Red Data Book plant and animal species adds to the importance of the site.	0.2km North
Lough Coy	002117	SAC	The site consists of a small permanent lake in the middle of an almost circular turlough basin. Lough Coy is an excellent example of a 'riverine' type of turlough, and is in essence the floodplain of an underground river. The entire site consists of turlough habitat, an EU Habitats Directive Annex I priority habitat. Of particular note is the occurrence of three Red Data Book plant species at this site - these are Mudwort (*Limosella aquatica*), Fen Violet (*Viola persicifolia*) and Northern Yellow-cress (*Rorippa islandica*). Lough Coy is an excellent example of a eutrophic (nutrient-rich) turlough. The extreme water fluctuation supports a distinctive zonation of vegetation and provides many niches for specialist plants. It is an important site for wintering waterfowl.	7.7km North
Newhall	002293	SAC	No synopsis available	7.8km North North-west
Coole-Garryland	000252	SAC	Turloughs and protected bird species are the qualifying interests of this designated area.	6km south

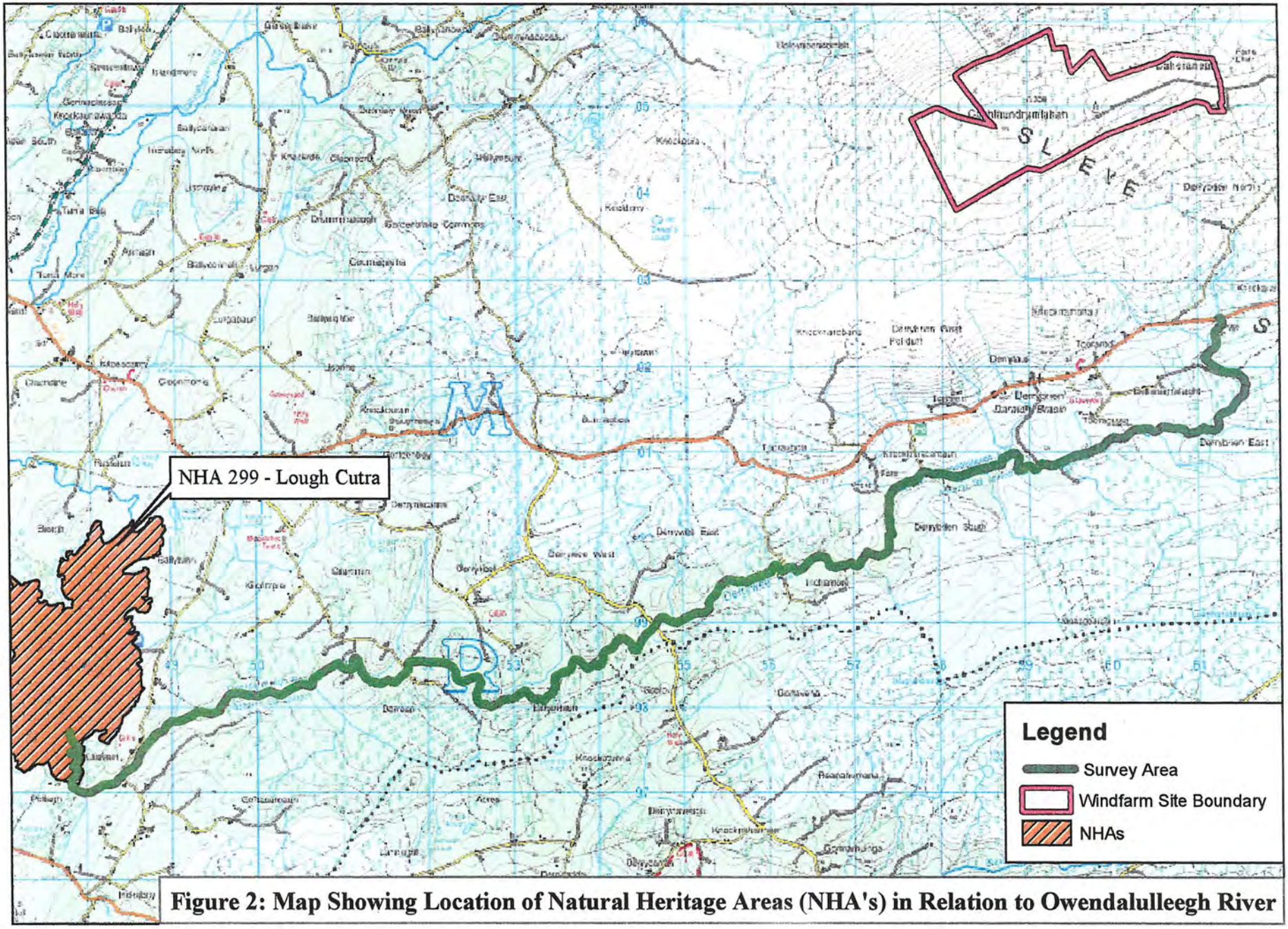

Figure 2: Map Showing Location of Natural Heritage Areas (NHA's) in Relation to Owendalulleegh River

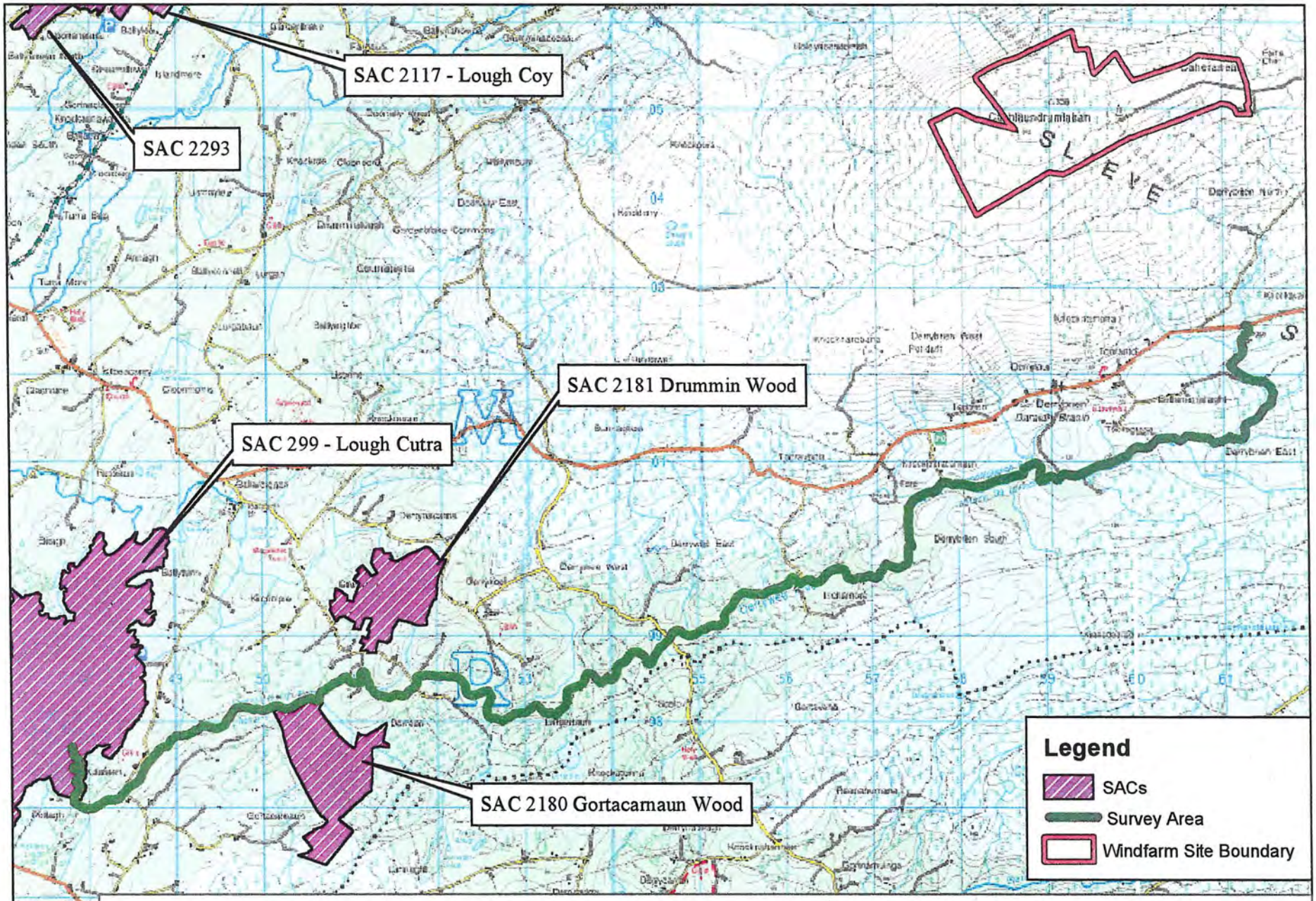

Figure 3: Map Showing Location of Special Areas of Conservation (SAC's) in Relation to Owendalulleegh River

Table 2 Catchment details of the Owendallulleegh River (from source to Lough Cutra). Adapted from McGarrigle *et al* (2002).

Detail	Value
EPA Code	29/O/01
OS Catchment number	146
NOS Grid Reference	R 478 976
Hydrometric area	29
Tributary of	Lough Cutra

Table 3 Physical characteristics of the Owendallulleegh River (from source to Lough Cutra). Calculated from the features shown on the NOS Discovery Series Map 52 and information provided in McGarrigle *et al*, 2002).

Characteristic	Value
Catchment area (km^2)	40
Length (km)	22.5
Basin length (km) [1]	17.2
Basin surface storage (%) [2]	0.005
Drainage density [3]	1.09
Stream order	3rd
Beneficial uses	General amenity and angling
Status	Tributary of designated SAC

Stream order was calculated using the Strahler method (Strahler, 1964).

3.4 Previous studies

3.4.1 Fish and fisheries of the Lough Cutra catchment

The fish fauna of Ireland is not as diverse as other European countries due to the impact of glaciation. Most of the fish species present in Irish river catchments have colonized from the sea or have been artificially introduced. The fact that the Lough Cutra catchment is landlocked will further reduce the number of fish species present. Native fish species in the Lough Cutra catchment include brown trout *Salmo trutta* and one out of the three Irish lamprey species (brook lamprey *Lampetra planeri*). Brook lamprey are listed under the European Union Directive on the Conservation of Natural and Semi-Natural Habitats and of Wild Fauna and Flora (Habitats Directive, 92:43:EEC). The catadromous[4] European eel *Anguilla anguilla* is thought to access Lough Cutra via underground river channels. Introduced fish species in the catchment include northern pike *Esox lucius*, stone loach *Barbatula barbatula*, perch *Perca fluviatilis*, and gudgeon *Gobio gobio*. There have been reports that carp *Cyprimus carpio* has been introduced to the lake but the ShRFB has not confirmed this. A list of the fish species, which are known to occur in the Lough Cutra catchment, and the Owendallulleegh River, along with their distribution and conservation status, is given in table 4. Lough Cutra is a privately owned lake and coarse/mixed fishery.

[1] Basin length is the straight-line distance between the mouth of the basin (in this case the confluence with the Lough Cutra) and the drainage divide nearest the source of the main stream.
[2] Basin surface storage (%) is the percentage of the basin covered in lentic water bodies (i.e. lakes).
[3] Drainage density is an index of the length of stream per unit area of basin. It is calculated by dividing the catchment area by the total length of perennial streams in the catchment.
[4] A fish species which spends most of its life in freshwater but migrates to the sea to spawn.

Table 4 A list of fish species recorded from the Lough Cutra catchment, and Owendallulleegh River, indicating their distribution, protection status, and utilisation (compiled from a number of unpublished sources).

				Protection			*Exploitation*		
Common name	**Scientific name**	**Origin**	**Distribution**	**EU HD**	**Berne**	**RDB**	**Recreational**	**Commercial**	**Present in Owendallulleegh River**
Brown Trout	*Salmo trutta*	N	W				•		•
European Eel	*Anguilla anguilla*	N	W				•	•	•
Carp*	*Cyprinus carpio*	I	L				•		
Gudgeon	*Gobio gobio*	I	L						•
Northern Pike	*Esox lucius*	I	W				•		
Perch	*Perca fluviatilis*	I	W				•		•
Brook lamprey	*Lampetra planeri*	N	L	II	Annex III	I			•
Stone Loach	*Barbatula barbatula*	I	L						•

*Not confirmed.

N=Native, I=Indigenous, W=Widespread, L=Local, E=Extinct.
EU Habitats Directive (EU HD) - Annex II (Species whose conservation requires the designation of SACs), Annex V (Exploitation subject to management)
Berne Convention (Berne) - Annex II (Strictly Protected fauna species), Annex III (Protected fauna species).
Red Data Book (RDB) - Ex – Extinct, E - Endangered, V - Vulnerable, R - Rare, I – Indeterminate, II – Internationally Important

3.4.2 Plant records

The following rare species are recorded for the 10km squares between Flaggy Bridge and L. Cutra. As this data was recorded on a 10km-square basis, it is not possible to state definitively whether the plant record is from the Owendallulleegh River, or from other wetland/streams in the 10km square.
As can be seen from the descriptions of the species' preferred habitats, most of these species prefer slow-moving or standing water or damp ground, and may have been recorded from L. Cutra or other areas of standing water within the relevant 10km squares and thus are less likely to have been affected by the peat slip event. These are marked +.

Orange foxtail *Alopecurus aequalis* – grows in muddy, marshy areas,

Slender tufted-sedge *Carex acuta* – grows along rivers and in ditches and marshes

Water sedge *Carex aquatilis* – grows in swampy areas by rivers and marshes

+Rigid hornwort *Ceratophyllum demersum* – grows in ponds, ditches and slow rivers

+Mudwort *Limosella aquatica* – grows in wet sandy mud by ponds

+Lesser pondweed *Potamogeton pusillus* – grows in lakes, streams and ponds usually in base-rich water

+Northern yellow-cress *Rorippa islandica* – grows on pond sides and other damp places

+Marsh yellow-cress *Rorippa palustris* – grows in open damp ground

+Blue-eyed grass *Sisyrinchium bermudiana* – grows in wet meadows and stony ground by lakes

+Greater bladderwort *Utricularia vulgaris sens. lat.* – grows in base-rich still or slow-moving water

+Fen violet *Viola persicifolia* – grows in fens

3.4.3 Protected aquatic fauna

The status of fauna listed in the European Union Directive on the Conservation of Natural and Semi-Natural Habitats and of Wild Fauna and Flora (Habitats Directive, 92:43:EEC) in the Owendallulleegh catchment is presented as follows;

Common name	Scientific name	Lough Cutra	Owendallulleegh River
Brook lamprey	*Lampetra planeri*	Not known	Present
Eurasian Otter	*Lutra lutra*	Common	Common

3.4.3.1 Brook lamprey

The brook lamprey is the smallest of the three lamprey species native to Ireland and it is the only one of the three species that is non-parasitic and spends all its life in freshwater. Brook lamprey is listed in Annex II of the Habitats Directive (92:43:EEC) and Appendix III of the Bern Convention. The Shannon Regional Fisheries Board has recently recorded Brook lamprey in the Owendallulleegh catchment.

3.4.3.2 Eurasian Otter

The otter is a legally protected species under the Wildlife Act, 1976 (and Wildlife (Amendment) Act, 2000). It is listed under Annex II of the EU Habitats Directive and under Annex II[5] of the Berne Convention. It is found throughout Ireland where it has apparently avoided the population declines that have occurred in many other countries. During the survey, the signs of otters (spraints and tracks) were recorded from many areas in the study area and up as far as chainage 182.

3.5 On-site Investigations

3.5.1 Aquatic habitats

The principal habitat type surveyed is categorised as eroding/upland river (FW1, Fossit 2000). For the purposes of this study, this was subdivided into in-stream areas and riparian, or riverbank, areas. A full aquatic and riparian habitat evaluation is presented in tables 5, 6, 7 and 8. The results of the physical habitat survey are given in table 9. The river length has been divided into 100m chainage lengths for the purpose of assessment, commencing at chainage zero at the Lough Cutra confluence.

3.5.2 Vegetation

A list of plant species recorded during the walkover study is given in Appendix 3. Very little vegetation was recorded from the deeper pools. Pondweed *Potamogeton* sp. was recorded at a few locations. Shallow areas were found to support a limited number of species. These areas were dominated by aquatic mosses such as *Fontinalis* and *Racomitrium* spp. Alternate water-milfoil *Myriophyllum alterniflorum* was recorded as being locally abundant. Emergent, marginal-type vegetation was found along the banks, particularly where these were shelved rather than steep-sided, and on islands and elevated cobble/gravel areas in the channel. The principal species recorded were watercress *Rorippa nasturtium-aquaticum*, water dropwort *Oenanthe* sp., fool's water-cress *Apium nodiflorum* and bulbous rush *Juncus bulbosus*. Willowherbs *Epilobium* spp., floating sweet-grass *Glyceria fluitans*, lesser spearwort *Ranunculus flammula* and brooklime *Veronica beccabunga* were locally frequent. Liverworts were locally dominant or abundant on steep-sided, shaded or overhanging banks, where they were constantly damp but rarely submerged. The dominant riparian species recorded were willows *Salix* spp., ash *Fraxinus excelsior*, hazel *Corylus avellana* and rowan *Sorbus aucuparia*, with an abundant great wood-rush *Luzula sylvatica* ground layer. Gorse *Ulex europaeus*, blackthorn *Prunus spinosa*, hawthorn *Crataegus monogyna* and bramble *Rubus fruticosus* were locally dominant, while bilberry *Vaccinium myrtillus* and soft rush *Juncus effusus* were locally abundant. Sedges *Carex* spp. were locally frequent. Some sections were dominated by planted evergreens such as sitka spruce *Picea sitchensis*. Most of the riverbank above the influence of flood events was dominated by either woodland or heath/bog flora, with unimproved grassland found in a few areas.

3.5.3 Peat Deposition

Estimates of peat deposition were made on the basis of bank side surface area and depth of peat. In general depths of peat at some locations ranged form 0.1 m thickness up to 0.5 m thickness. Larger deposits tended to occur at river bends where peat mounding was observed and at fords used on the river by local farming communities. Areas where larger depths of peat were observed tended to be small in area and could easily be removed if required.

[5] Annex II Berne Convention: Strictly protected fauna species.

Table 5 Aquatic, riparian and fisheries habitat evaluation chainage section 169-200.

Chainage section	Description	Map number	Aquatic habitat appraisal	Fisheries habitat appraisal	Level of instream impact	Level of riparian impact	Comment	Mitigation
200 - 189	From Flaggy Bridge downstream. The start point of the survey. Steep banks and a narrow channel characterize this section. There are hillocks on the eastern edge of the river that rise to 140m asl. Liverworts grow where moisture seeps down to the river.	1	One of the most heavily impacted areas of the river – strong scouring and removal of all instream vegetation. Degree to which instream habitats were affected depended on their relative exposure to the flow of moving peat i.e. whether they were on the inside or outside of a bend. Marginal species are showing good recovery three weeks after the peat slip where peat cover is light.	Here there are large amounts of peat deposited on the margins of the river. Sand banks are evident at bends in the river. These should dissipate with precipitation over time. Instream the riverbed has been scoured gravels and rocks transported downstream. All fish would have been displaced or killed by this flow of material.	Profound Negative	Profound Negative	Physical nature of river has been significantly altered here.	Large areas of peat on the margins may require removal. Alternatively could be planted and stabilized. Damage directly above and around culvert at M 61137 02304. This dam (005) should be removed. The culvert size and gauge should be changed. Instream physical enhancements may be required.
189 – 169	The section from chainage 189 – 182 is still fast moving and narrow until it meets a distributary at 182. From 182 – 169 the river widens and slows.	2	Aquatic vegetation is minimal from 189 – 182. Large amounts of siltation evident. Again there is recovery evident where peat cover is light. From 182 – 169 not as much impact due to the increasing river width.	Area between chainages 189 – 182 has been severely impacted. However, not much scouring has occurred in this section. From 182 – 169 there is good habitat available with good pools and glides - but siltation is evident. The banks have not been eroded as in chainage 200 – 189.	Substantial - Profound Negative	Substantial - Profound Negative	Fish were seen moving upstream within chainage 183. Because the fractions of peat are now small the pools seem clear enough but silt is present. Otter activity was observed at chainage 177.	Areas of peat need to be removed from the margins. Trees and shrubs instream should be left, as removal would be deleterious to habitats and fish.

Table 6 Aquatic, riparian and fisheries habitat evaluation chainage section 169-111.

Chainage section	Description	Map number	Aquatic habitat appraisal	Fisheries habitat appraisal	Level of instream impact	Level of riparian impact	Comment	Mitigation
169 151	River structure consists of long pools with alternating glide/run habitat. River widths up to 12m	3	This section is less severely impacted. Deposition on the river margins is reduced and vegetation is intact at most locations. Cover is much reduced where cobbles and boulders have been turned and scoured. Sheltered areas in the bends of the river have more moderate cover.	Despite some physical impacts, much of the instream habitat along this stretch has been left intact. Areas suitable for salmonid spawning, nursery, rearing and foraging continue to occur.	Moderate – Substantial Negative	Moderate – Substantial Negative	Impacts predicted to be short-tem at this section. Banks are still intact and good habitat is evident in the majority of the length of this section.	No action needed here. Natural recovery processes would suffice.
151 – 129	Long wide sections of slow water with some extensive riffles. Some very wide sections here (up to 19m). Substrate consists of cobble and gravel.	4	Fluctuation in instream vegetation cover reflects variations in streambed disturbance. Cover is much reduced where cobbles and boulders have been turned and scoured. However this damage was not recorded frequently in this section.	No scouring evident. No serious instream damage evident. No peat deposits. There are good areas of gravel evident. Periphyton present on gravels. The majority of larger peat material has been 'sieved out' by the narrow nature and overhanging shrubs from 200-182 of the river	Slight Negative	Slight Negative	This section is physically unchanged from its original form. Banks are still intact and good habitat is evident in the majority of the length of this section. Impacts negligible. Otter activity evident in this section.	No action needed here
129 – 111	Some large pools along this stretch, three small distributaries and three fords characterize this section. Bank height rises here along this section. Fish (salmonids) were noted moving in the pools here. This section is for the most part slow moving with some good riffles evident at the fords.	5	Cover of peat on the margins here is very light except for small pockets. Liverwort flora, the most abundant riparian-type marginal vegetation, is undamaged. Instream vegetation is low and scouring damage is not evident.	Good spawning areas in this section with gravels intact. Also good holding pools and nursery areas available. Damage is limited to marginal areas where peat has deposited. No instream damage evident with the exception of some trees and shrubs that have been washed down. These will form extra habitat for fish in future.	Slight Negative	Slight Negative	This section seems largely undamaged to the eye. There is no evidence of scouring or of large movements of gravels and cobbles. Because the fractions of peat are now small the pools seem clear enough but silt is present in the interstitial spaces. Otter activity in the form of paw prints and anal jelly was observed.	No action needed here

Table 7 Aquatic, riparian and fisheries habitat evaluation chainage section 111-31.

Chainage section	Description	Map number	Aquatic habitat appraisal	Fisheries habitat appraisal	Level of instream impact	Level of riparian Impact	Comment	Mitigation
111- 91	Deep pools and large sections of bedrock characterize this section. There is good bankside vegetation and some good stands of mixed forestry line the edges of the river in places. Tunneling (trees) was observed at two locations.	6	Due to the depth of water in areas instream vegetation was low where it was possible to assess. Again liverworts were undamaged.	Large deep holding pools that are impossible to assess for benthic damage. However there are good areas of glide (50%) accessible and these seem untouched. Peat has not deposited instream with the exception of areas in the lee of trees in the river. Peat has deposited on the margins in some areas.	Slight Negative	Slight Negative	This section seems largely undamaged to the eye. Large numbers of deer are using this area. The only discernable difference is the peat that has deposited on the banks.	No action needed here
91 – 70	This entire section has deciduous woodland on the bankside. As a result shading occurs on most of the sections. Long pools are evident with no damage recorded.	7	Vegetation that was seen was intact. There is impoverished riparian flora as a result of shading. The instream flora is low where shading occurs but is relatively undisturbed. The lower areas 64-56 supports very good areas of instream vegetation and also seems undisturbed by then peat slip event.	Where possible to assess instream predictors no damage was recorded. Gravels were evident but on a whole deep areas and glides predominated. Siltation was observed. Peat has deposited on the margins in some areas.	Slight Negative	Slight Negative	This section was undamaged and instream vegetation was intact where noted. Areas of peat deposition were apparent.	No action needed here
70 – 50	Wide sections of river bordered on the northern bank by good improved agricultural grassland complexes. The river exhibits deep pools again with glides predominating.	8	Good sections of instream growth are evident at the lower end of this section. Again heavy shading by overhanging trees has stunted growth in some sections. All instream vegetation that was observed was undisturbed.	Where wading permitted inspection of the instream predictors these seemed undisturbed. Peat has deposited on the margins in places.	Slight Negative	Slight Negative	This section was undamaged and instream vegetation was intact where noted. Areas of peat deposition were apparent.	No action needed here
50 – 31 (SAC 2180 Gortacarnaun Wood)	Characterized by widening sections of river with good pool systems. Some nice fast water at chainage 45 with nice undisturbed gravels present. Between chainages 39 – 34 on the southern bank there is heavy woodland cover entailing observers to make use of the northern bank.	9	There have been no impacts on vegetation found in this section. Open unshaded areas support good instream vegetation.	Minimal impacts were observed in this section. Peat has deposited on the banks at various locations and overhanging trees bear the detritus of the deluge.	Imperceptible Negative	Imperceptible Negative	Fresh otter spraints were noted in this section. There is no perceptible damage in this section.	No action needed here

Table 8 Aquatic, riparian and fisheries habitat evaluation chainage section 31-1.

Chainage section	Description	Map number	Aquatic habitat appraisal	Fisheries habitat appraisal	Level of instream impact	Level of riparian impact	Comment	Mitigation
31 – 11	Extensive areas of riffle separate some long deep pools. Instream predictors were difficult to assess in places due to the depth of pools.	10	There have been no impacts on vegetation found in this section. Open unshaded areas support good instream vegetation.	No impacts recorded on this section. Some small amounts of peat have settled on the margins at certain points.	Slight Negative	Slight Negative	There is no perceptible damage in this section.	No action needed here
11 – 1	Due to the depth of this section the ShRFB surveyed this section in boats. This section leads onto the mouth of the river and a large sand bank is present at this mouth.	11	There have been no impacts on vegetation found in this section. Depth of channel made assessment of instream vegetation impossible.	Although no impacts were recorded on this section some peat may have settled at the mouth of this river. Some small amounts of peat have settled on the margins at certain points.	Slight Negative	Slight Negative	There is no perceptible damage in this section.	No action needed here

Table 9 Approximate amount of peat (m^3) deposition observed on the river margins. (Estimated by ESBI)

Chainage section	Amount of peat (m^3) deposition observed on the margins (approx.)
200 - 189	1260.1
189 – 169	936.59
169 – 151	102.35
151 – 129	51.25
129 – 111	45
111- 91	21.5
91 – 70	276.25
70 – 50	79.75
50 – 31	16.15
31 - 11	65.15
11 - 1	67

Table 10 Results of the physical habitat survey.

Site number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Grid co-ords.	M611 625	M611 624	M 6113 623	M611 272	M610 206	M 611 196	M 611 345	M611 121	M604 119	M 601 121	M 579 702	M 575 538	M 57371 125
Bank height range (m)		1 - 2m	1 - 2m	3 - 7m	.5 - 3.5	.4 - 3.5	.4 - 2	.2 - .6	.5 - 1.5	1.5 - 2	.1 - 2	.1 - 2	.1 - 1.2
River width range (m)		1 - 2m	.2 - 1.1m	2 - 4m	.3 - 1.5m	1 - 4m	.7 - 4m	2 - 4m	3 - 8m	5 - 10m	5 - 14m	7 - 15m	8 - 19m
Depth range (m)		.1 - .5	.1 - .5m	.5 - .75m	.1 - .5m	.1 - .75m	.1 - .8m	.1 - .7m	.1 - 1.5m	.1 - .75m	.1 - 8m	.1 - .8m	.2 - .6m
Riffle %		50	20	10		10	10	10	50	20	30	20	5
Glide %		40	10	30	10	20	80	80	40	70	50	5	75
Pool %		10	70	40	60	70	10	10	10	10	20	75	20
Bedrock %		90	60	85	30	30	50		10				
Cobble %				5	10	10	30	75	20	60	15	15	80
Gravel %		10	40	15	60	60		25	70		15	85	20
Boulder %							20			40	70		
Sand/Silt %													

Site number	**14**	**15**	**16**	**17**	**18**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Grid co-ords.	R572 997	R561 996	R557 994	R546 989	R517 984	R517 984	R510 984	R502 981	R484 971	R482 972	R480 972	R487 978	R487 978
Bank height range (m)	.1 - 2.5	.1 - 5	0.5 - 2	0.1 - 2	1-3m	1-3m	1 - 3m	1-15m	1-3m	.1-2	.5-2m	.1 - 2.5	.1 - 5
River width range (m)	10 - 19m	2 - 20m	2 - 8m	3 - 30m	2-17m	5-14m	2-12m	10-14m	6-12m	17-25m	16-30m	10 - 19m	2 - 20m
Depth range (m)	.1 - .75m	.1 - 1m	.1 - 1.5m	.1 - >2m	.1-3	.2-3.5	.1 - 2.5	.1 -4.5	.2->2m	.2 -.4m	.75-5m	.1 - .75m	.1 - 1m
Riffle %	25	25	10	20	10	10	20	5		10		25	25
Glide %	75	25	80	50	60	35	30	10	50	90		75	25
Pool %		50	10	30	30	55	50	85	50		100		50
Bedrock %	10	60		70	30	30	5	80	10			10	60
Cobble %	20			20	40	20						20	
Gravel %	70	10	20	10	10	10	90					70	10
Boulder %		30	80		20	40	5	20	30	5			30
Sand/Silt %									60	95	100		

4.0 IMPACT

4.1 Characteristics of the impact

The results of this preliminary investigation suggest that the peat, which entered the upper reaches of the Owendallulleegh River, had a significant impact on the aquatic habitats in the river. The impacts were related to (1) physical impacts of peat on the river (i.e. scouring, bed erosion, etc.) and (2) impacts on water quality through elevated suspended solids and other parameters.

4.1.1 Physical impacts

Evidence of physical impacts are particularly apparent in the upper reaches of the river where an acute slide of peat into the channel scoured the river bed and denuded it of deposited materials such as gravels and cobbles. Physical impacts on the middle section of the river were less significant where suspended peat was transported. Deposition along this stretch of river was confined primarily to river bends and islands. No evidence of scouring was apparent along this section.

On the lower section of river, evidence of impacts were much reduced due to the spatial and temporal dilution of peat flocs and the riparian deposition of peat in the upper and middle section of the river. Suspended peat was transported along this stretch by river flows and deposition was confined primarily to river bends, islands and areas of reduced flow. No evidence of scouring was apparent along this section.

4.4.2 Scale of the impact

The most severe impact occurred in the upper section of the river, from Flaggy Bridge to confluence at Derrybrien East. In this area, the energy of moving peat, water and debris was greatest, and resulted in the near total loss of vegetation and scouring of the riverbed in some parts. Heavy deposition of peat on the banks also occurred in this area. The impact on the remaining downstream section was less significant. The presence of a 'high water mark' of debris deposited along the entire length of channel from Derrybrien to Lough Cutra indicates the ultimate height to which the banks were affected. In most areas below Tooraglassa, this is limited to a light covering of twigs and plant debris.

The main physical impact of peat silt on instream and riparian habitats is to be found within 0.5km downstream of Flaggy Bridge, where heavy peat deposition and scouring of the river channel had a profound impact. In contrast with this, practically the entire remaining habitat, from Bellaghnamallaght to L. Cutra, shows low/no impact, with localised areas of moderate impact. Habitat quality and species composition in areas of low/no impact is as expected for this type of river, where low nutrient availability and a spate-type flood regime do not favour the growth of emergent aquatic plants. Low cover of instream vegetation in areas of low/no impact is coincident with areas of heavy shading or deep pools, both of which are unsuitable for the growth of the most instream species typical of upland rivers. Those areas where instream vegetation has suffered moderate/low damage would be expected to recover naturally over the next 2-3 years.

Areas of deposited peat will provide new habitat for colonisation by some emergent species that are tolerant of its low pH, e.g. lesser spearwort, over the coming growing season (spring/summer 2004). However most of these deposits will be moved or modified by spate floods and are generally unlikely to provide habitat beyond approximately two years, given the eroding nature of this type of river. Most of the instream species found on this river prefer a mineral- (rock) derived substrate for growing, as opposed to one derived from organic matter (e.g. peat) – that is why they are found in this eroding type of river. While some deposition of fine peat is evident in the streambed, this is not of sufficient quantity to significantly affect plant growth.

With regard to plants and habitats along most of the affected stretch of the Owendallulleegh River, no remedial action is necessary, or even desirable, as the communities present will regenerate naturally over the next 1-3 years. Peat deposits should not be removed except where they present a possible danger to humans/livestock, or a potential threat to fisheries. Accessing and removing deposits is more likely to cause harm to habitats and plants than if they are left to naturally recolonise and/or be eroded (assuming that heavy plant such as caterpillar-tracked vehicles would be used to carry out the work).

5.0 MITIGATION

Some remedial works are desirable in the upper section at Flaggy Bridge in order to stabilise denuded areas of river channel and prevent unnecessary release of sediment into the watercourse. The use of matting, geotextile or similar 'soft' engineering solution to stabilise the bank sides and allow natural regeneration to occur is preferable over the use of 'hard' engineering. As well as facilitating habitat restoration and quickly fitting in with the natural landscape, 'soft' solutions have long-term advantages of being better adapted than hard bank retention engineering to absorbing some of the energy of spate events. Planting of vegetation 'plugs' at intervals along the stabilization structure would accelerate recolonisation. Any plants used should be taken from a suitable nearby site and the use of native species is recommended.

The planting of trees to replace those damaged in the flood would help to stabilise adjacent areas. The most suitable species are those native species already found growing naturally in this area – ash, mountain ash and downy birch.

Remediation of instream vegetation is problematic as aquatic mosses are slow growing. Two options are available. The first,'do nothing', option will leave the channel to recover by itself with no interference. This will be a slow process (3+ years). Alternatively, a small number of medium-sized (football-sized) boulders with moss growth could be introduced from unaffected parts of the river, preferably from the closest point possible (to retain a species composition as close to the original as possible). Such boulders would create a more diverse flow regime and variety of instream microhabitats. It is recommended that this option be considered only when all other remediation and stabilisation works have been completed, at which stage the condition of the streambed in the worst affected area should be re-assessed. The possible introduction of such boulders should be discussed with ShRFB staff.

5.1 Proposed further work

It was not possible to assess the status of fish populations and other fauna in the river during the current survey. It is therefore recommended that a fish stock assessment coupled with a macroinvertebrate survey be undertaken. This survey should use standard quantitative methods (electrical fishing and serber sampling) and should be undertaken at 5-10 sites along the river corridor. The ideal time to undertake this survey would be during the period July-September when the maximum numbers of juvenile fish would be expected to be present in a stream of this nature. At this time detailed recommendations regarding instream physical mitigation work can be made.

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APPENDIX 1 SURVEY AREAS ON THE OWENDALLULLEEGH.

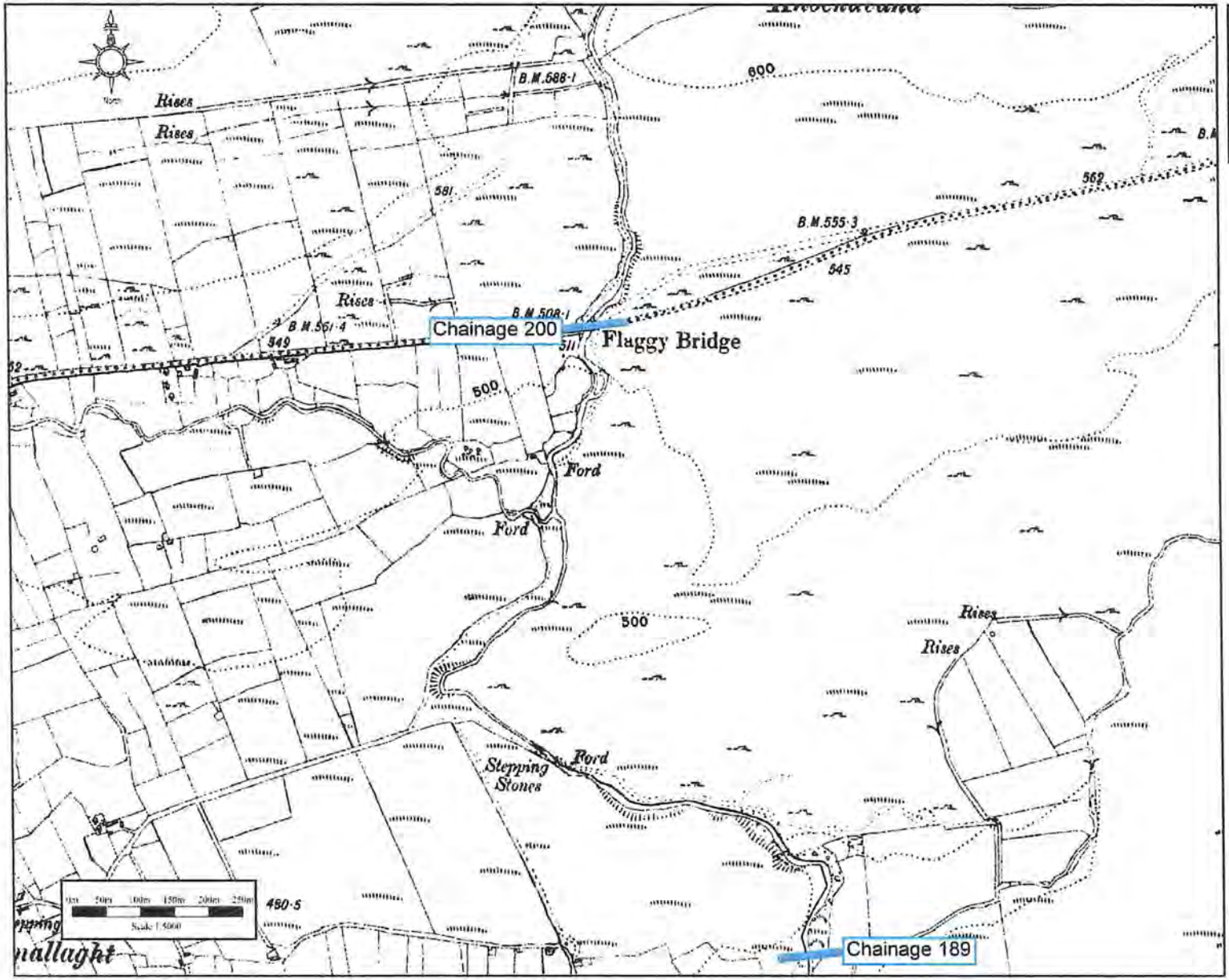

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Figure A1.1
Section one was located downstream of Flaggy Bridge. Survey section was between chainages 200 - 189.

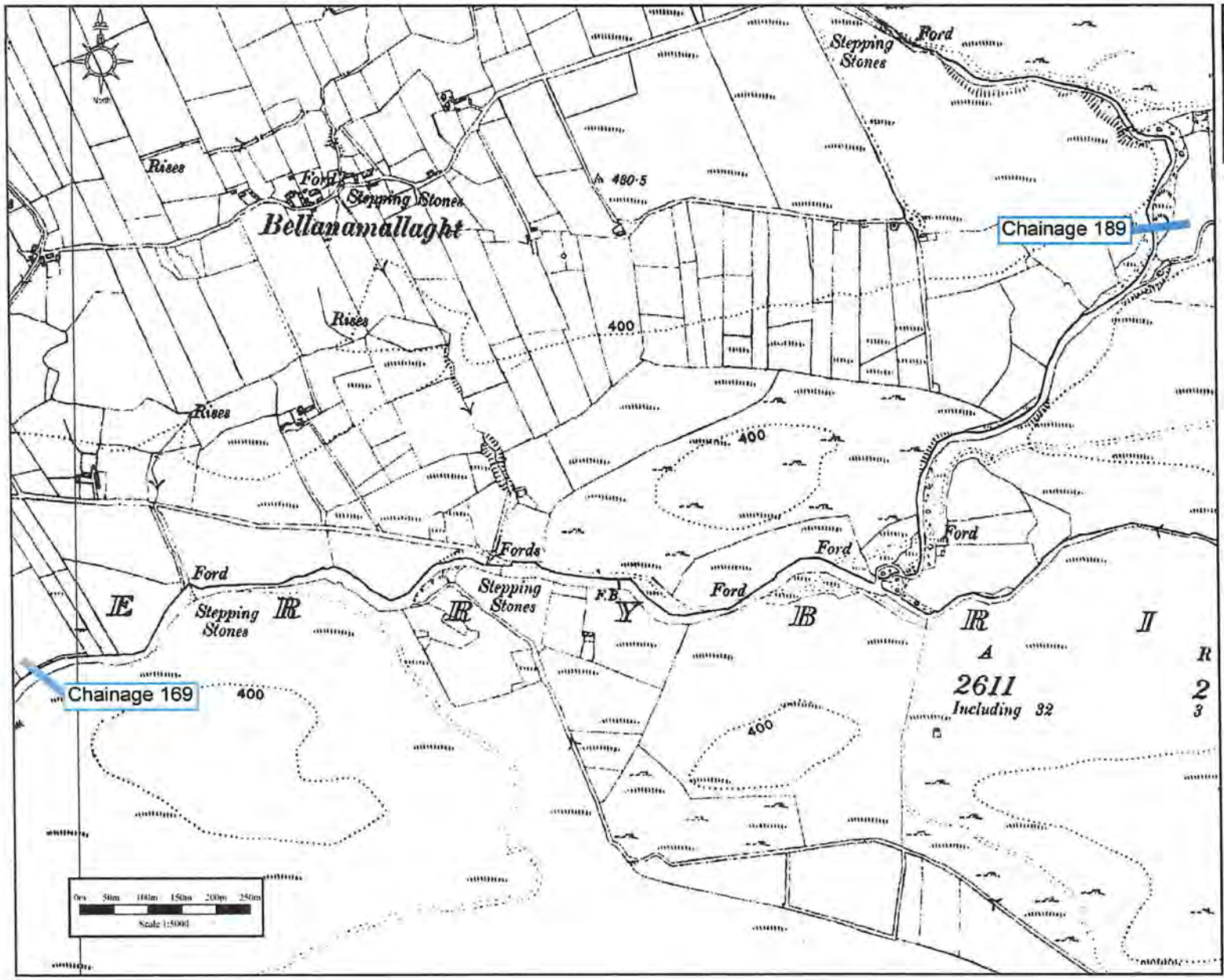

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Figure A1.2
Section two was located on the second section down-stream of Flaggy Bridge. Survey section was between chainages 189 - 169.

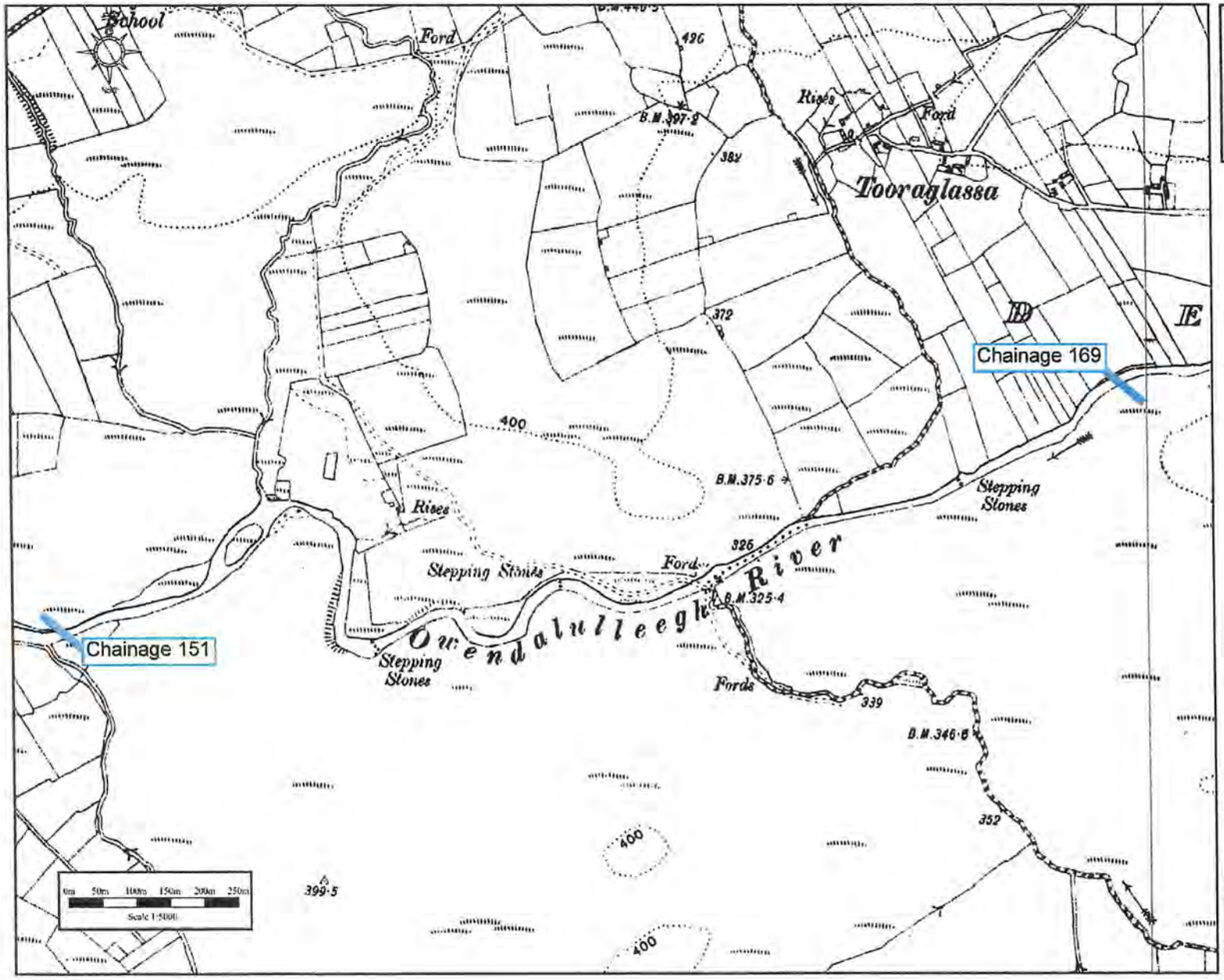

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Figure A1.3
Section three was located in the townland of Toorglassa. Survey section was between chainages 169 - 151.

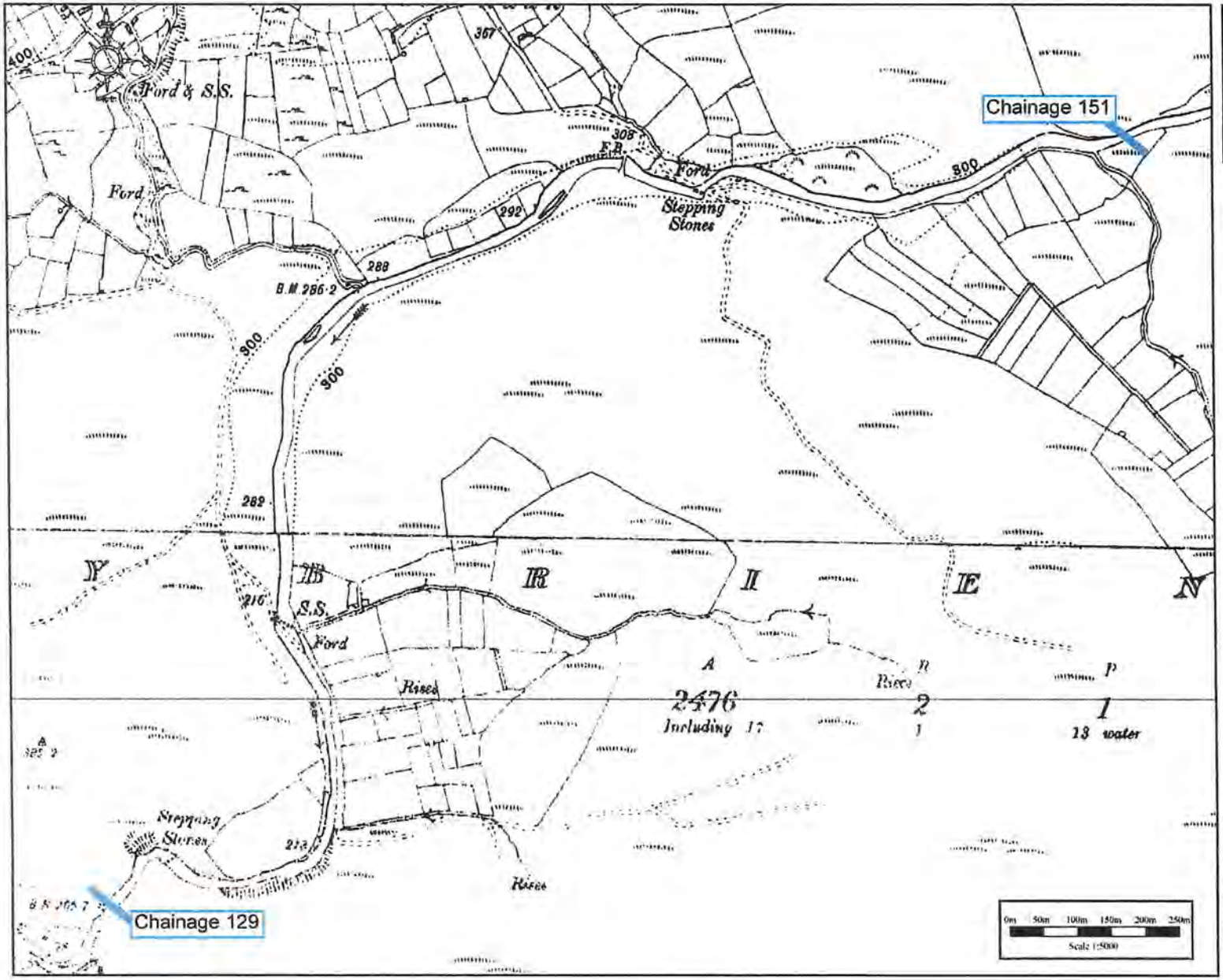

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Figure A1.4
Section four was between chainages 151 and 129.

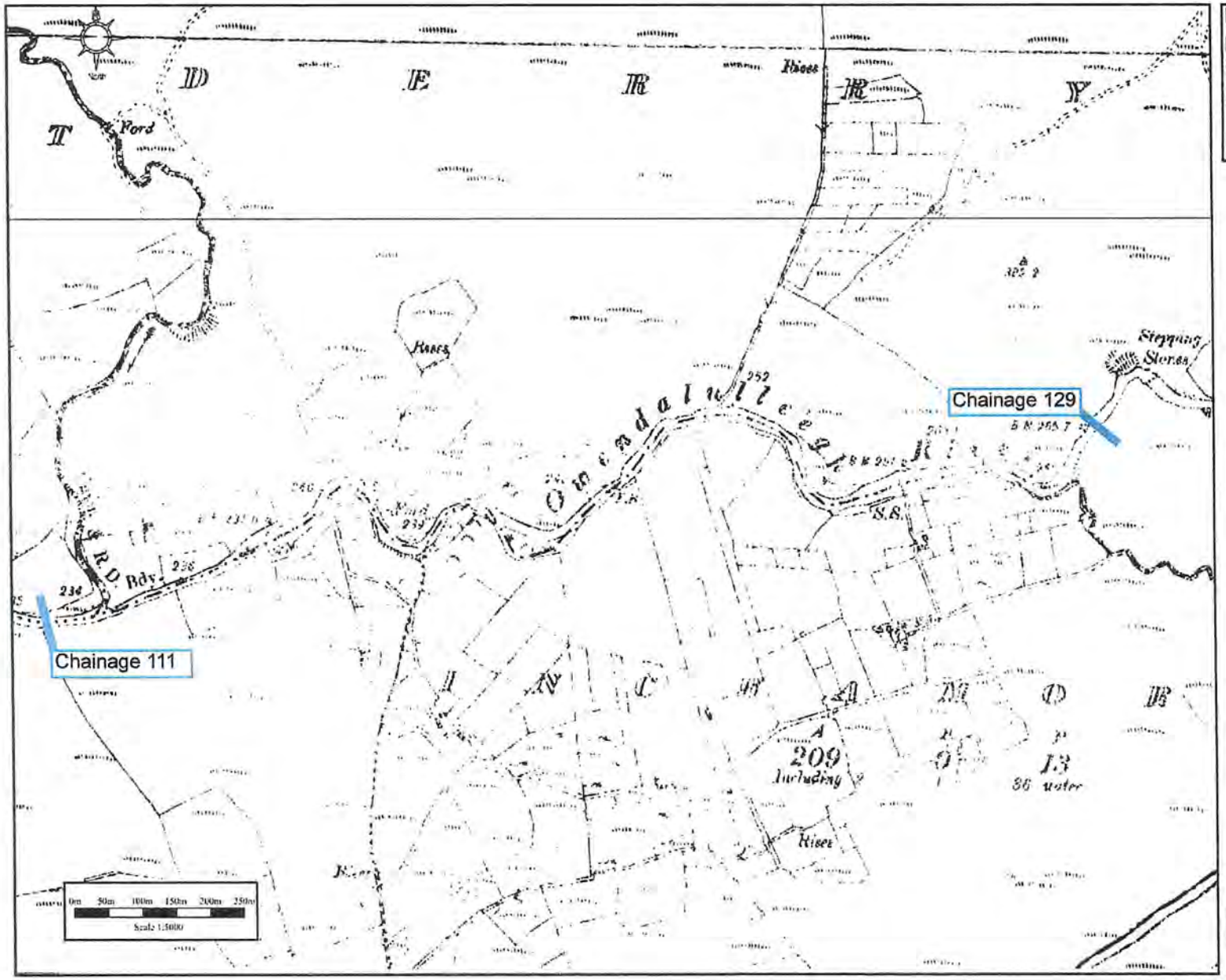

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Figure A1.5
Section five was between chainages 129 and 111.

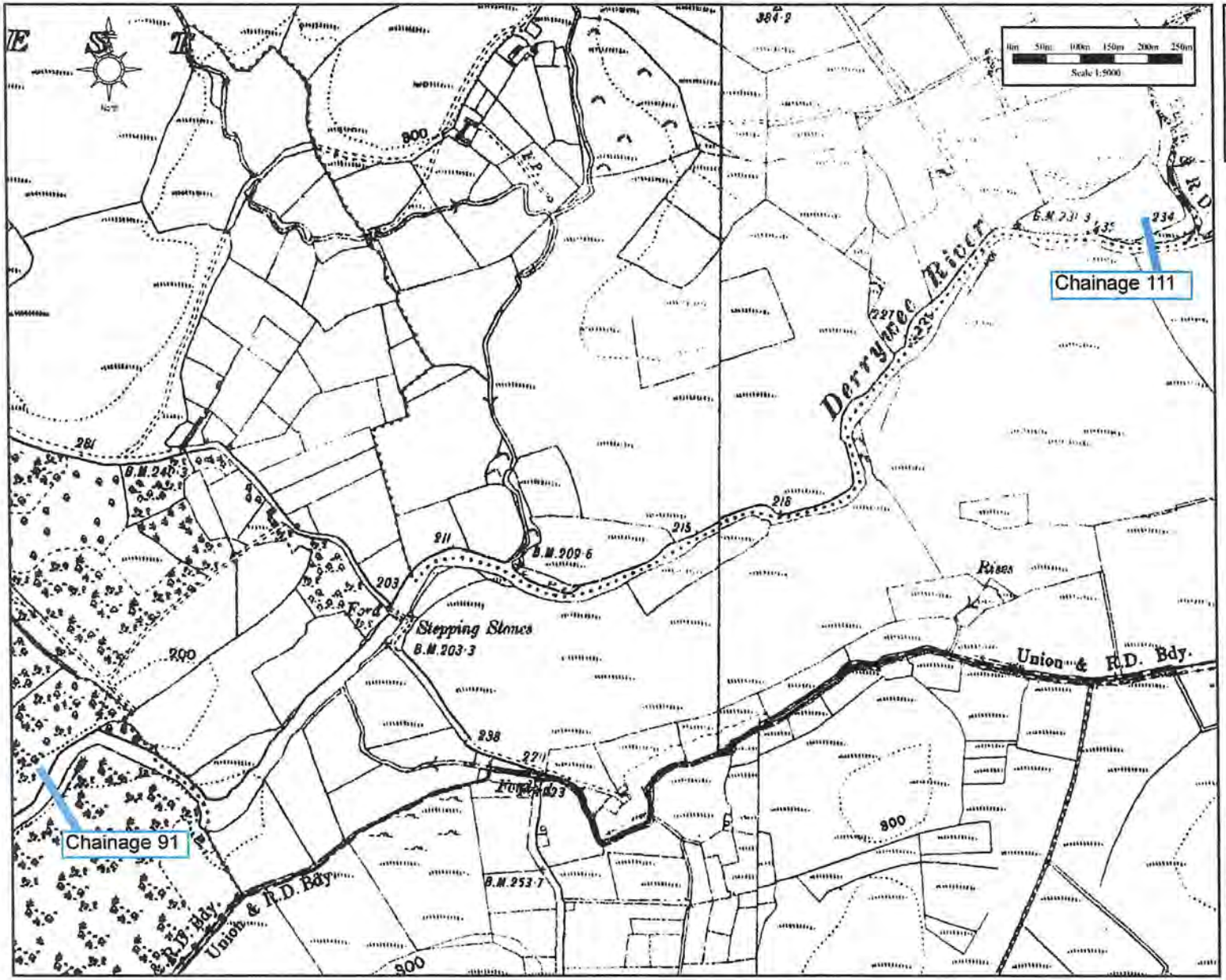

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Figure A1.6
This figure shows the extent of survey section six.This section extended from chainage 111 to chainage 91.

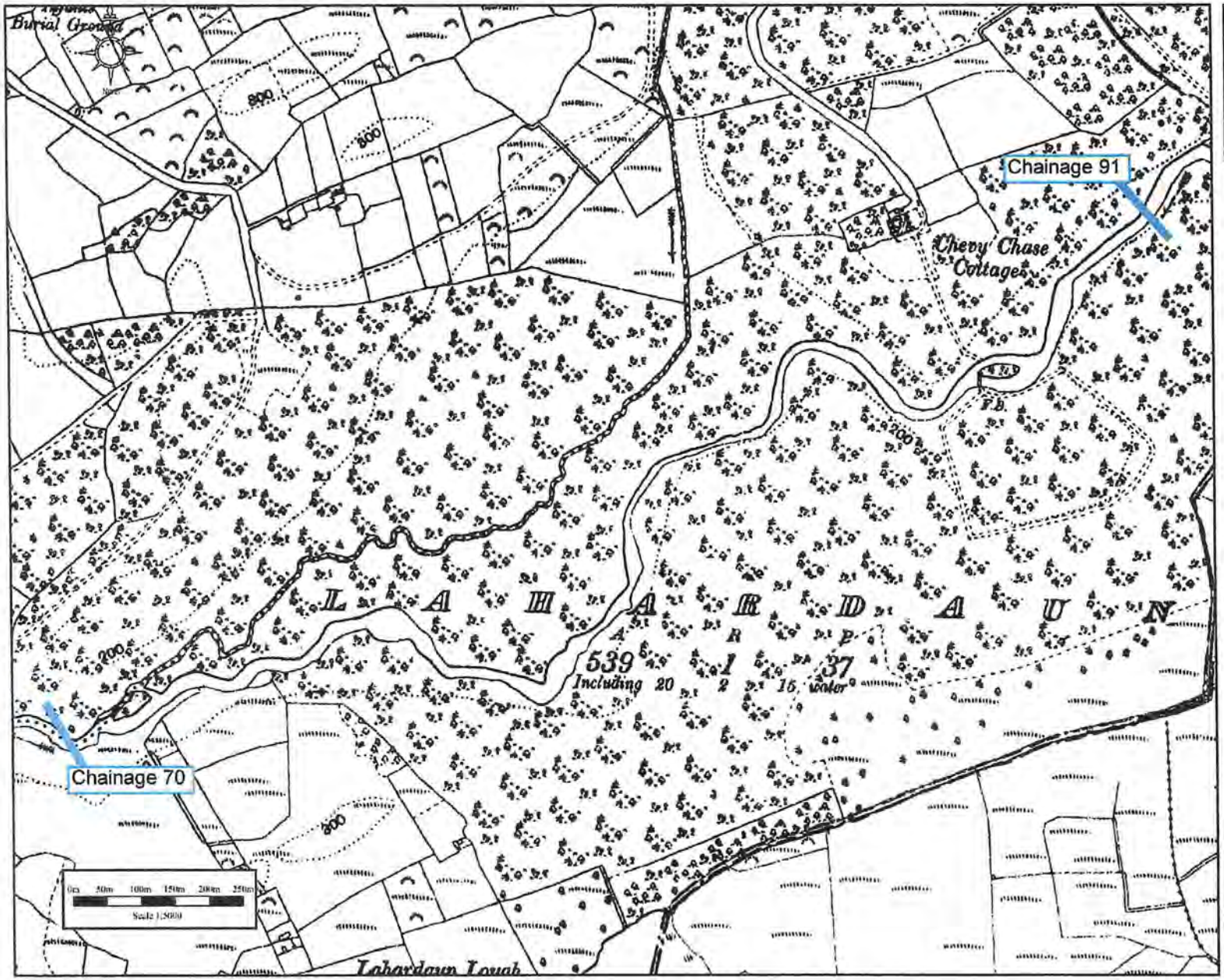

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Figure A1.7
Section seven was located in the stretch of river near Chevy Chase cottage. Survey section was between chainages 91 - 70.

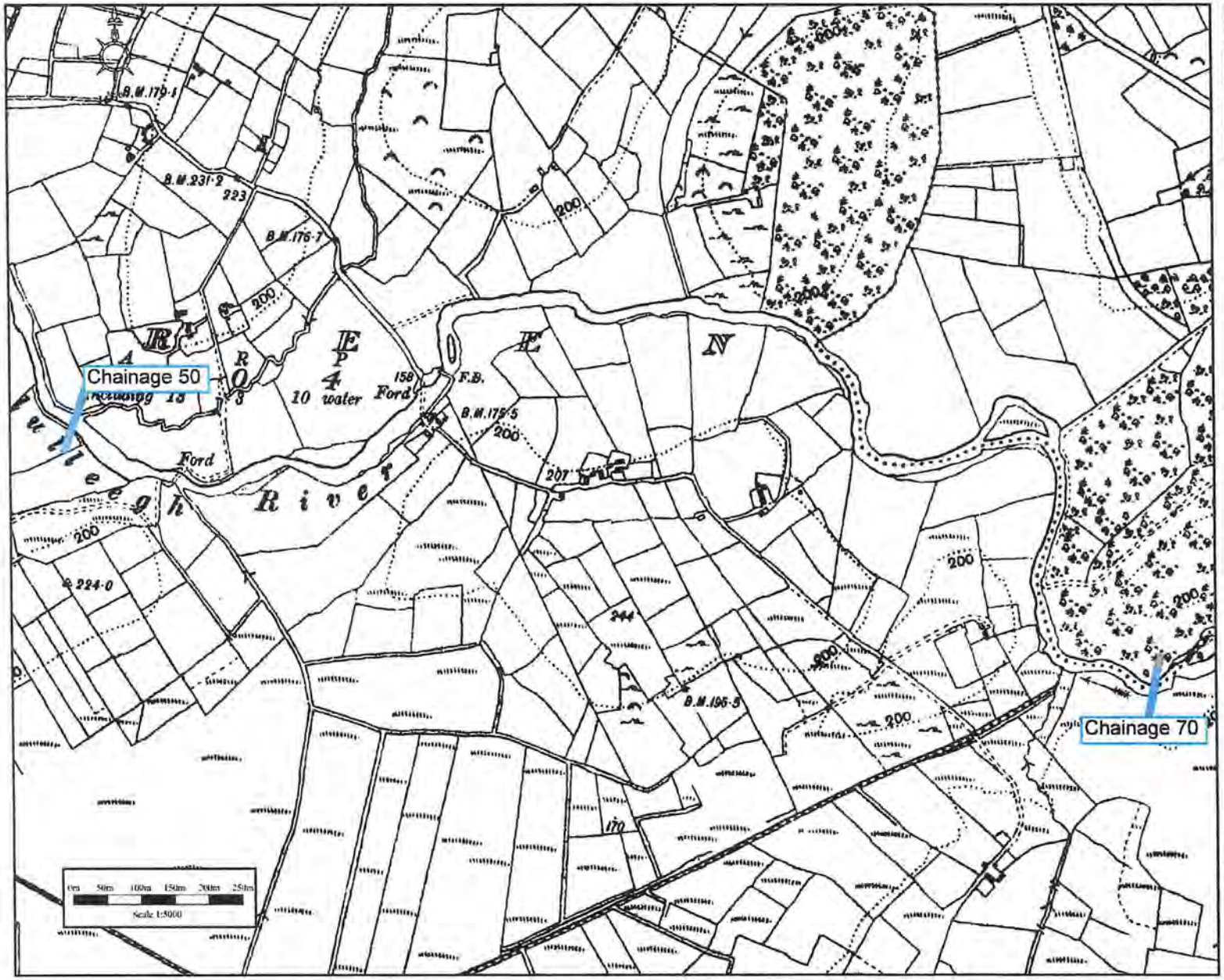

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Figure A1.8
Section eight was located immediately downstream of the Chevy Chase cottage stretch and extended from chainage 70 to 50.

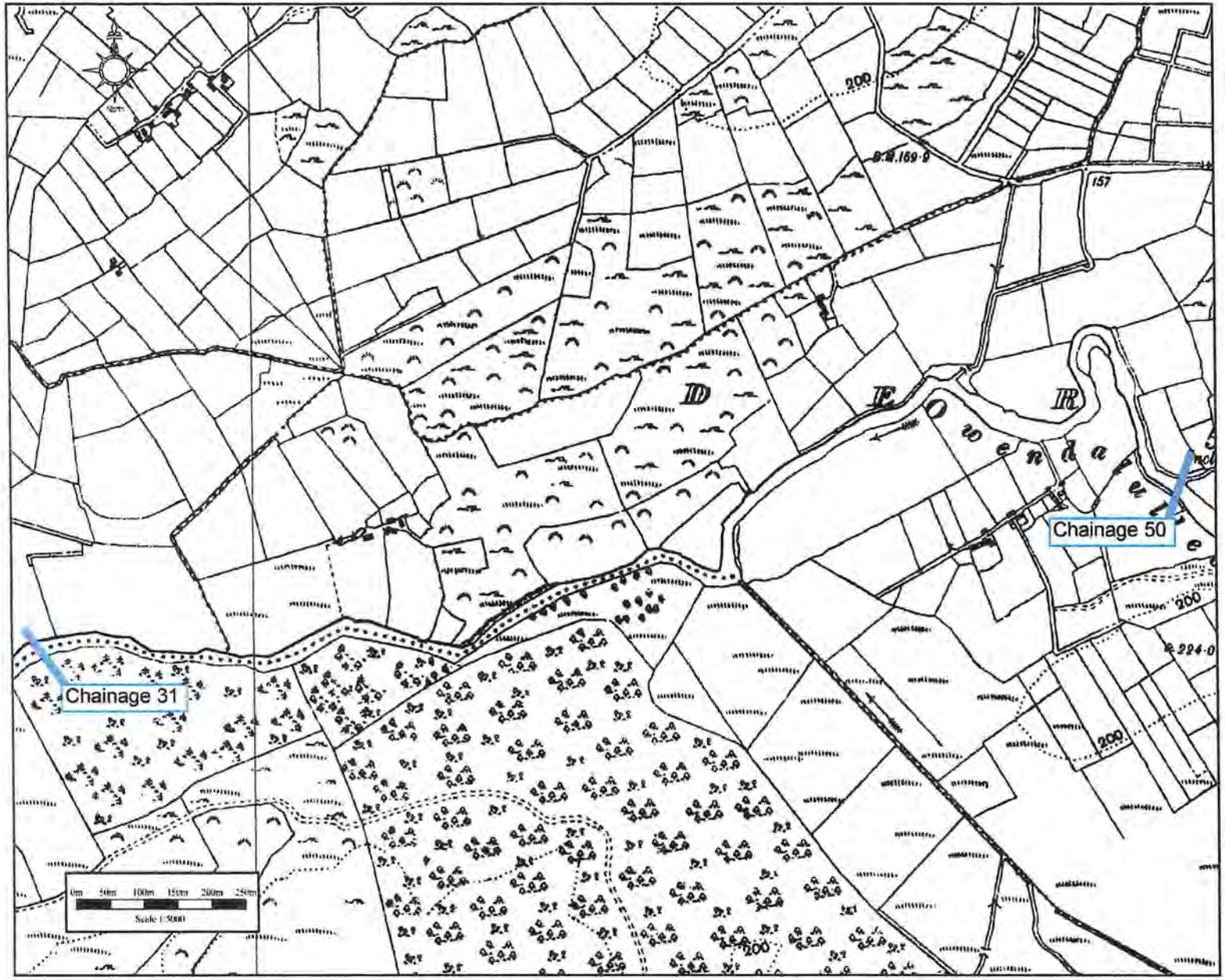

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Figure A1.9
This figure shows the extent of survey section nine. This section extended from chainage 50 to chainage 31.

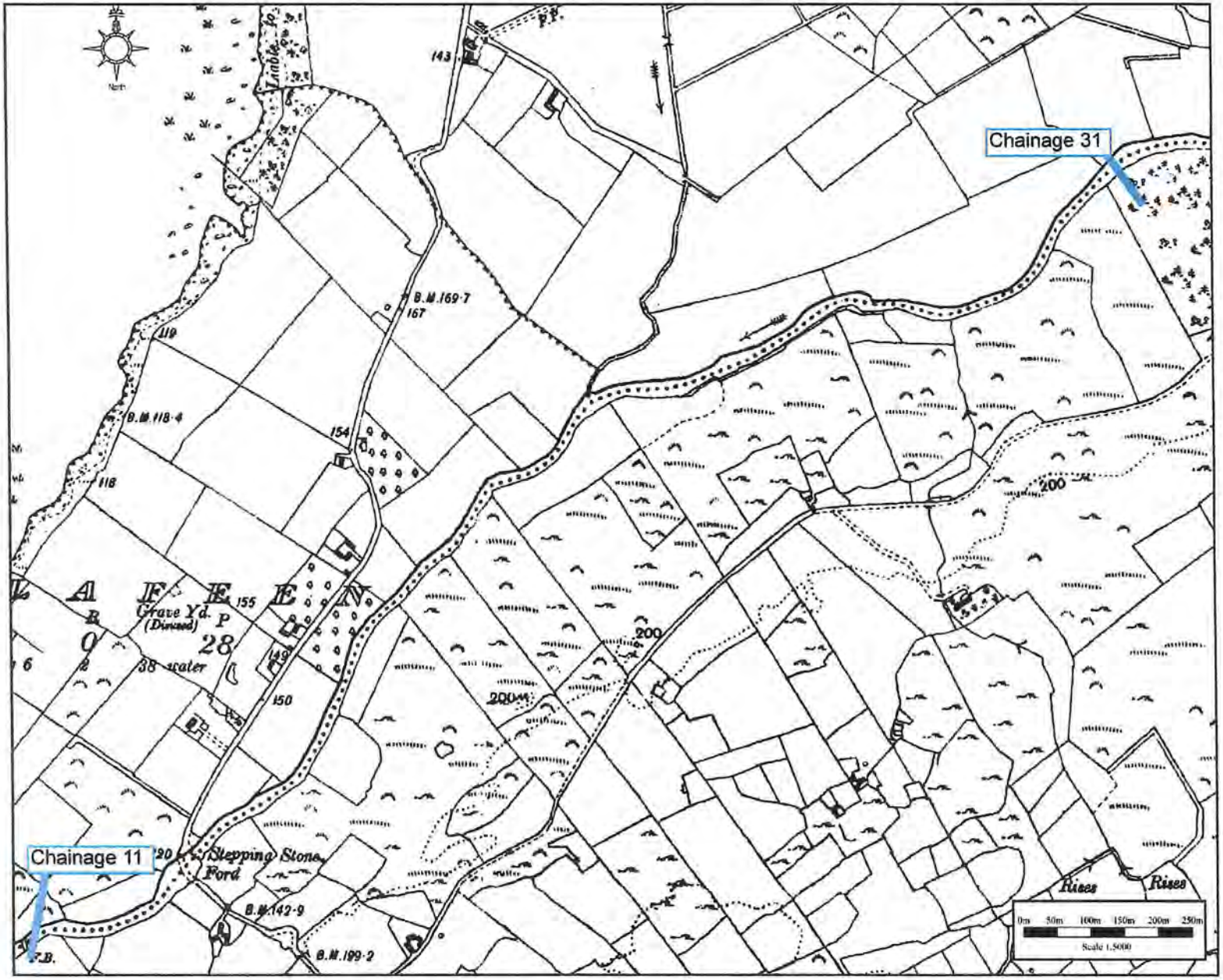

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Figure A1.10
Section ten was located in the lower reaches of the river river. Survey section was between chainages 31 and 11.

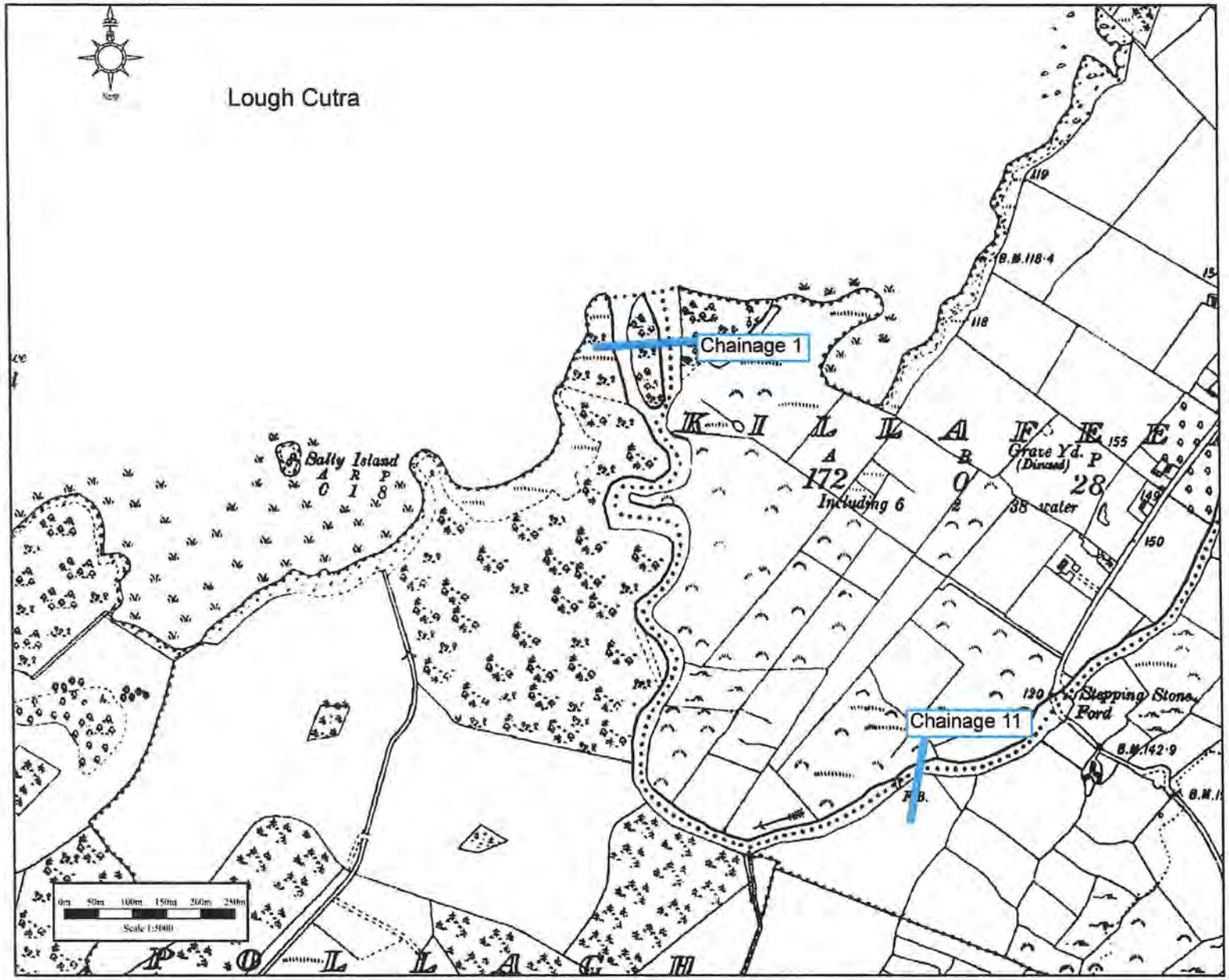

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Figure A1.11
This section was the lower-most section of the river and extended from chainage 1 at the mouth of the river to chainage 11.

APPENDIX 2 NPWS SITE SYNOPSES

SITE NAME LOUGH CUTRA

SITE CODE 000299

Lough Cutra is an oligo/mesotrophic freshwater lake lying on limestone. This lake is located 4km south-east of Gort. The lake covers an area of 390 ha and has a catchment consisting of blanket bog and mineral soils.

The main habitats of this site are; aquatic lake vegetation, reedbeds confined to sheltered bays and mixed woodland. Reedbeds of Common Reed (*Phragmites australis*), Common Club-rush (*Scirpus lacustris*) and Great Fen-sedge (*Cladium mariscus*) exist. The flora shows a mixture of calcicole and calcifuge species with the Irish Spurge (*Euphorbia hyberna*) noted in the area. There is no information available on the status of the woodland habitats in this site.

The site is internationally important for its breeding and wintering population of Cormorants (166 pairs in 1985 and max 300 individuals in winter) (Information compiled in 1987). The Cormorants use the off-shore islands for breeding purposes.

The lake is used for fishing and tourism. Precautions should be taken to ensure the lake and its surrounding area is protected from damaging operations such as application of artificial fertilizers, development close to the lakeshore, drainage and felling of woodland areas. The internationally important populations of Cormorants and Lesser Horseshoe Bats should be especially protected.

Lough Cutra is an important site with its diverse habitat types and the presence of both calcicole and calcifuge floras. The site is also of interest as it has internationally important numbers of Cormorants on the Island.

SITE NAME: LOUGH COY

SITE CODE: 002117

Lough Coy is situated approximately 6.5 km north-east of Gort and lies close to the Slieve Aughty hills. The site consists of a small permanent lake in the middle of an almost circular turlough basin. There are drift deposits as well as outcropping rocks and boulders on the relatively steep side walls and small areas of scrub towards the top of the basin. The underlying soils consist of alluvial gleys and a gleyed rendzina-like soil.

A large swallowhole occurs at one side of the basin slightly above summer water level and water enters and leaves the turlough mostly through this. During the winter the fluctuation in levels is extreme and there are no emergent plants such as Common Club-rush (*Scirpus lacustris)* or Common Reed (*Phragmites australis)* in the lake. The turlough experiences a large throughput of water and is dependant on the flows in the tributaries of the Coole River. Lough Coy is an excellent example of a 'riverine' type of turlough, and is in essence the floodplain of an underground river.

Practically the entire site consists of turlough habitat, an EU Habitats Directive Annex I priority habitat. In summer the water area contracts to a degree depending on the prevailing weather and flat mud is exposed which splits into polygonal plates. This is the habitat for a variety of specialised plants such as Mudwort (*Limosella aquatica*), Needle Spike-rush (*Eleocharis acicularis*), Northern Yellow-cress (*Rorippa islandica*) and the liverwort *Riccia cavernosa*. The lakeshore itself has some of these species along with Knotgrass (*Polygonum aviculare*) and Redshank (*Polygonum persicaria*). Above this is a more continuous cover of the sedges *Carex nigra* and *C. hirta*, Reed Canary-grass (*Phalaris arundinacea*), Creeping Cinquefoil (*Potentilla reptans*), Corn Mint (*Mentha arvensis*) and Creeping Buttercup (*Ranunculus repens*). A vegetation characterised by Meadowsweet (*Filipendula ulmaria*), Northern Bedstraw (*Galium boreale*), Common Bird's-foot-trefoil (*Lotus corniculatus*) and Adder's-tongue (*Ophioglossum vulgare*) grows amongst the rocks and includes both Dog Violet (*Viola canina*) and Fen Violet (*V. persicifolia*). The limestone boulders on the upper slopes have a covering of the moss *Cinclidotus fontinaloides*. The fringe of scrub at the edge of the basin is mostly of Blackthorn (*Prunus spinosa*), Buckthorn (*Rhamnus catharticus*) and Ash (*Fraxinus excelsior*), with some Hazel (*Corylus avellana*).

Lough Coy is part of a complex of small sites (along with nearby Blackrock, Ballylee and Bullaunagh turloughs) which supports a nationally important population of Whooper Swans and regionally/locally important numbers of several duck and wader species. Maximum counts at Lough Coy in winter 1995/96 were as follows: Whooper Swan 78, Wigeon 285, Teal 283, Pochard 45, Lapwing 300, Dunlin 120 and Curlew 80. Birds move frequently between the various sites in response to water levels and disturbance. Lough Coy is often one of the few sites in the district which holds water in late summer and autumn and consequently is of importance for post-breeding birds and early autumn arrivals - 132 Mallard were counted in August 1996 and 149 Wigeon in September 1996.

Of particular note is the occurrence of three Red Data Book plant species at this site - these are Mudwort (*Limosella aquatica*), Fen Violet (*Viola persicifolia*) and Northern Yellow-cress (*Rorippa islandica*).

The main landuse within the site is cattle grazing which is quite heavy at the lake margins and on parts of the slopes. There is some removal of gravel from the drift deposits on the north western edge.

Lough Coy is an excellent example of an eutrophic (nutrient-rich) turlough. The extreme water fluctuation supports a distinctive zonation of vegetation and provides many niches for specialist plants. It is an important site for wintering waterfowl.

SITE NAME : COOLE-GARRYLAND COMPLEX

SITE CODE : 000252

The Coole-Garryland Complex is situated in a low-lying karstic limestone area west of Gort, County Galway. It contains a series of seasonal lakes (turloughs), which are fed by springs and a partly submerged river, surrounded by woodland, pasture and limestone heath. The more well-known turloughs present in the site include Lydacan, Crannagh North, Raheen, Crannagh South, Coole, Garryland, Newtown and Hawkhill.

Turloughs are listed as priority habitat on Annex I of the EU Habitats Directive, and the turloughs at Coole-Garryland are particularly good examples of this habitat type. Vegetation

of the turloughs includes Shoreweed (*Littorella uniflora*), Spike-rush (*Eleocharis palustris*), Water-purslane (*Lythrum portula*) and Fen Violet (*Viola persicifolia*). A species of Starwort, *Callitriche palustris*, has recently been recorded from the site, its only known station in Ireland. The Coole river itself is of particular interest for the occurrence of a rare riverine habitat characterised by Trifid Bur-marigold (*Bidens tripartita*), Red Goosefoot (*Chenopodium rubrum*) and species of Knotgrass (*Polygonum* spp.).

The turloughs are fringed by a range of habitats on limestone pavement, including scrub communities containing Buckthorn (*Rhamnus catharticus*) and Hawthorn (*Crataegus monogyna*). In places, heath communities have developed over the limestone pavement, consisting of Ling Heather (*Calluna vulgaris*), Juniper (*Juniperus communis*), Blue Moor-grass (*Sesleria albicans*) and occasional Yew (*Taxus baccata*). In addition, the site contains good examples of smooth pavement and associated species-rich grasslands. Small areas of orchid-rich grassland occur at Coole-Garryland. The colourful array of orchids which can be found here include Pyramidal Orchid (*Anacamptis pyramidalis*), Spotted Orchids (*Dactylorhiza* spp.), Fragrant Orchid (*Gymnadenia conopsea*), Fly Orchid (*Ophrys insectifera*) and Greater Butterfly Orchid (*Platanthera chlorantha*).

A remarkable feature of the turloughs at Coole-Garryland is that they are closely associated with areas of woodland. Although substantial parts of the original deciduous forest have been converted to coniferous woodland composed of non-native species, stands of semi-natural deciduous woodland survive. Pedunculate Oak (*Quercus robur*) and Ash (*Fraxinus excelsior*) are the dominant species on deeper, more fertile soils, where there is also some Hazel (*Corylus avellana*), occasional Yew (*Taxus baccata*) and Elm (*Ulmus* spp.). There are also some unusual areas of dwarf Pedunculate Oak woodland growing on limestone pavement. This species of oak does not typically colonise this type of substrate.

Some of the deciduous woodlands have a mixture of native and non-native species. These mixed woodlands have a diverse shrub layer comprised of Spindle (*Euonymus europaeus*), Privet (*Ligustrum vulgare*), Burnet Rose (*Rosa pimpinellifolia*), Guelder Rose (*Viburnum opulus*), Blackthorn (*Prunus spinosa*), Pear (*Pyrus pyraster*) and Honeysuckle (*Lonicera periclymenum*). The ground flora is rich and includes Wood Anemone (*Anemone nemorosa*), Dog Violet (*Viola riviniana*), Shining Crane's-bill (*Geranium lucidum)*, Maidenhair Spleenwort (*Asplenium trichomanes*), Northern Bedstraw (*Galium boreale*), Biting Stonecrop (*Sedum acre*), Harebell (*Campanula rotundifolia*) and Bitter Vetch (*Lathyrus montanus*). The woodlands are notable for the presence of rare species of Myxomycete fungi, namely, *Licea idris*, *Licea marginata* and *Macbrideola decapillata*, the first-named in one of only three known sites for the species.

The nationally rare Mudwort (*Limosella aquatica*) and Dropwort (*Filipendula vulgaris*) also occur at this site. These two plant species are listed in the Irish Red Data Book.

The complex of habitats at Coole-Garryland provides habitat for a variety of mammal species, including Otter and Pine Marten. The otter is listed on Annex II of the EU Habitats Directive, while Pine Marten is considered to be threatened in Europe. The Coole-Garryland complex is also home to one of the most important and unique assemblages of insects in the country, including several notable species of beetles and flies.

The area is of importance for wintering waterfowl, especially Whooper Swan (mean peak of 324 in 1995/96 - 98/99), Bewick Swan (79 in winter 96/97), Wigeon (mean peak of 1044 in 1995/96 - 98/99), Mallard (mean peak of 330 in 1995/96 - 98/99), Pochard (mean peak of 176 in winter 1995/96 - 98/99), along with smaller numbers of Teal, Tufted Duck, Lapwing, Curlew and Dunlin.

In 1996 seven pairs of Lapwing bred at Newtown Turlough and two pairs of Common Sandpiper bred at Coole Lough.

A substantial portion of this site is in the ownership of the National Parks and Wildlife Service. It is a popular amenity area, and uncontrolled visitor access would pose a threat to sensitive animals. Other threats to the site may result from the intensification of agriculture (e.g. fertiliser application or pollution of water courses) outside the Nature Reserve.

The turlough system at Coole-Garryland is considered to be the most diverse in the country, for both its physiography and vegetation. It is unique in that it is so closely associated with woodland. The juxtaposition of these two distinct habitats, in addition to the presence of a variety of turloughs, has led to the development of uncommon communities, and rare species of insect and plant occur which are associated with both the turlough and the turlough/woodland transition. Overall, the range of good quality habitats at Coole-Garryland supports a high diversity of plant and animal species, rendering this site of prime importance for conservation.

APPENDIX 3 AQUATIC AND RIPARIAN PLANT SPECIES

Appendix 3.1 Plant species recorded

Common name	**Botanical name**
Instream species	
Alternate water milfoil	*Myriopyllum alternifolium*
Aquatic moss	*Fontinalis sp.*
Aquatic moss	*Racomitrium sp.*
Pondweed	*Potamogeton sp*
Emergent aquatic species	
Brooklime	Veronica beccabunga
Bulbous rush	Juncus bulbosus
Floating sweet-grass	Glyceria fluitans
Fool's water-cress	*Apium nodiflorum*
Lesser spearwort	*Ranunculus flammula*
Lesser water-parsnip	*Berula erecta*
Water dropwort	*Oenanthe* sp.
Water starwort	*Callitriche* sp.
Watercress	*Rorippa nasturtium-aquaticum*
Marginal species	
Ash	*Fraxinus excelsior*
Bilberry	*Vaccinium myrtillus*
Blackthorn	*Prunus spinosa*
Bog stitchwort	*Stellaria uliginosa*
Bracken	*Pteridium aquilinum*
Bramble	*Rubus fruticosus*
Common marsh bedstraw	*Galium palustre*
Creeping buttercup	*Ranunculus repens*
Downy birch	*Betula pubescens*
Gorse	*Ulex europaeus*
Great wood-rush	*Luzula sylvatica*
Hawthorn	*Crataegus monogyna*
Hazel	*Corylus avellana*
Horsetail	*Equisetum* sp.
Lady's smock	*Cardamine pratensis*
Liverworts	
Marsh ragwort	*Senecio aquaticus*
Rowan	*Sorbus aucuparia*
Sedges	*Carex* spp.
Sharp-flowered rush	*Juncus acutiflorus*
Sitka spruce	*Picea sitchensis*
Soft rush	*Juncus effusus*
Wild angelica	*Angelica sylvestris*
Willowherbs	*Epilobium* spp.
Willows	*Salix* spp

Appendix 3.2 Aquatic/riparian plant species recorded for the 10km-squares between Flaggy Bridge (Derrybrien) and Lough Cutra, as listed in the 'New Atlas of the British & Irish Flora (Preston, C. D., Pearman, D. A. and Dines, T. D., eds (2002). Oxford University Press, Oxford).

Species of limited distribution in Ireland are marked thus: *
Red data book species are marked thus: #
Flora Protection Order species are marked thus: !

Common name	Scientific name	Record	Status
Hemp agrimony	*Agrimonia eupatoria*	1987-1999	Native
Water plantain	*Alisma plantago-aquatica*	1987-1999	Native
!Orange foxtail	*Alopecurus aequalis*	1987-1999	Native
Marsh foxtail	*Alopecurus geniculatus*	1987-1999	Native
Wild angelica	*Angelica sylvestris*	987-1999	Native
Lesser marshwort	*Apium inundatum*	1987-1999	Native
Fool's water-cress	*Apium nodiflorum*	1987-1999	Native
Lesser water-plantain	*Baldellia ranunculoides*	1987-1999	Native
Lesser water-parsnip	*Berula erecta*	1987-1999	Native
Common water starwort	*Callitriche stagnalis sens. lat.*	1987-1999	Native
Marsh marigold	*Caltha palustris*	1987-1999	Native
Lady's smock	*Cardamine pratensis*	1987-1999	Native
*Slender tufted-sedge	*Carex acuta*	1987-1999	Native
Lesser pond-sedge	*Carex acutiformis*	Pre-1970	Native
*Water sedge	*Carex aquatilis*	1987-1999	Native
Lesser tussock-sedge	*Carex diandra*	Pre-1970	Native
Lesser tussock-sedge	*Carex diandra*	1987-1999	Native
Brown sedge	*Carex disticha*	Pre-1970	Native
Brown sedge	*Carex disticha*	1987-1999	Native
Tufted sedge	*Carex elata*	Pre-1970	Native
Tufted sedge	*Carex elata*	1987-1999	Native
Glaucous sedge	*Carex flacca*	1987-1999	Native
Hairy sedge	*Carex hirta*	1987-1999	Native
Slender sedge	*Carex lasiocarpa*	Pre-1970	Native
Slender sedge	*Carex lasiocarpa*	1987-1999	Native
Bog sedge	*Carex limosa*	1987-1999	Native
Common sedge	*Carex nigra*	1987-1999	Native
False fox-sedge	*Carex otrubae*	1987-1999	Native
Oval sedge	*Carex ovalis*	1987-1999	Native
Bottle sedge	*Carex rostrata*	1987-1999	Native
Bladder-sedge	*Carex vesicaria*	1987-1999	Native
Yellow-sedge subspecies	*Carex viridula subsp. brachyrrhyncha*	1987-1999	Native
Yellow-sedge subspecies	*Carex viridula subsp. viridula*	1987-1999	Native
*Rigid hornwort	*Ceratophyllum demersum*	1987-1999	Native
Great fen-sedge	*Cladium mariscus*	Pre-1970	Native
Great fen-sedge	*Cladium mariscus*	1987-1999	Native
Needle spike-rush	*Eleocharis acicularis*	1987-1999	Native
Many-stalked spike-rush	*Eleocharis multicaulis*	Pre-1970	Native
Many-stalked spike-rush	*Eleocharis multicaulis*	1987-1999	Native
Common spike-rush	*Eleocharis palustris*	Pre-1970	Native
Common spike-rush	*Eleocharis palustris*	1987-1999	Native

Floating club-rush	*Eleogiton fluitans*	1987-1999	Native

Common name	**Scientific name**	**Record**	**Status**
Canadian pondweed	*Elodea canadensis*	1987-1999	Alien
Marsh willowherb	*Epilobium palustre*	1987-1999	Native
Water horsetail	*Equisetum fluviatile*	1987-1999	Native
Marsh horsetail	*Equisetum palustre*	1987-1999	Native
Meadowsweet	*Filipendula ulmaria*	1987-1999	Native
Marsh bedstraw	*Galium palustre*	1987-1999	Native
Water avens	*Geum rivale*	1987-1999	Native
Small sweet-grass	*Glyceria declinata*	Pre-1970	Native
Small sweet-grass	*Glyceria declinata*	1987-1999	Native
Floating sweet-grass	*Glyceria fluitans*	1987-1999	Native
Marestail	*Hippuris vulgaris*	Pre-1970	Native
Marestail	*Hippuris vulgaris*	1987-1999	Native
Marsh pennywort	*Hydrocotyle vulgaris*	1987-1999	Native
Wild iris	*Iris pseudacorus*	1987-1999	Native
Slender club-rush	*Isolepis cernua*	1987-1999	Native
Sharp-flowered rush	*Juncus acutiflorus*	1987-1999	Native
Jointed rush	*Juncus articulatus*	1987-1999	Native
Bulbous rush	*Juncus bulbosus*	1987-1999	Native
Soft rush	*Juncus effusus*	1987-1999	Native
Hard rush	*Juncus inflexus*	1987-1999	Native
Duckweed	*Lemna minor*	1987-1999	Native
Ivy-leaved duckweed	*Lemna trisulca*	1987-1999	Native
#!Mudwort	*Limosella aquatica*	1987-1999	Native
Shoreweed	*Littorella uniflora*	1987-1999	Native
Yellow loosestrife	*Lysimachia vulgaris*	1987-1999	Native
Water purslane	*Lythrum portula*	1987-1999	Native
Purple loosestrife	*Lythrum salicaria*	1987-1999	Native
Water mint	*Mentha aquatica*	1987-1999	Native
Hybrid water mint	*Mentha aquatica x M. arvensis*	1987-1999	Native
Bog bean	*Menyanthes trifoliata*	1987-1999	Native
Blinks	*Montia fontana*	1987-1999	Native
Water forget-me-not	*Myosotis scorpioides*	1987-1999	Native
Alternate water-milfoil	*Myriophyllum alterniflorum*	1987-1999	Native
Yellow water-lily	*Nuphar lutea*	1987-1999	Native
White water-lily	*Nymphaea alba*	1970-1986	Native
White water-lily	*Nymphaea alba*	1987-1999	Native
Fine-leaved water-dropwort	*Oenanthe aquatica*	1987-1999	Native
Hemlock water-dropwort	*Oenanthe crocata*	1970-1986	Native
Hemnlock water-dropwort	*Oenanthe crocata*	1987-1999	Native
Water-pepper	*Persicaria hydropiper*	1987-1999	Native
Reed canary-grass	*Phalaris arundinacea*	1987-1999	Native
Common reed	*Phragmites australis*	1987-1999	Native
Small pondweed	*Potamogeton berchtoldii*	1987-1999	Native
Fen pondweed	*Potamogeton coloratus*	1987-1999	Native
Curled pondweed	*Potamogeton crispus*	1987-1999	Native
Various-leaved pondweed	*Potamogeton gramineus*	1987-1999	Native
Shining pondweed	*Potamogeton lucens*	1987-1999	Native
Broad-leaved pondweed	*Potamogeton natans*	1987-1999	Native
Fennel pondweed	*Potamogeton pectinatus*	1987-1999	Native

Common name	Scientific name	Record	Status
Perfoliate pondweed	*Potamogeton perfoliatus*	1987-1999	Native
Bog pondweed	*Potamogeton polygonifolius*	1987-1999	Native
*Lesser pondweed	*Potamogeton pusillus*	1987-1999	Native
Common water-crowfoot	*Ranunculus aquatilis*	Pre-1970	Native
Lesser celandine	*Ranunculus ficaria*	Pre-1970	Native
Lesser celandine	*Ranunculus ficaria*	1987-1999	Native
L. celandine subspecies	*Ranunculus ficaria subsp. bulbilifera*	1987-1999	Native
L. celandine subspecies	*Ranunculus ficaria subsp. ficaria*	1987-1999	Native
Lesser spearwort	*Ranunculus flammula*	1987-1999	Native
Ivy-leaved crowfoot	*Ranunculus hederaceus*	1987-1999	Native
Pond water-crowfoot	*Ranunculus peltatus*	1987-1999	Native
Celery-leaved buttercup	*Ranunculus sceleratus*	1987-1999	Native
Thread-leaved water-crowfoot	*Ranunculus trichophyllus*	1987-1999	Native
Great yellow-cress	*Rorippa amphibia*	1987-1999	Native
#Northern yellow-cress	*Rorippa islandica*	1987-1999	Native
Water-cress	*Rorippa nasturtium-aquaticum*	1987-1999	Native
Water-cress	*Rorippa nasturtium-aquaticum* agg.	1987-1999	Native
*Marsh yellow-cress	*Rorippa palustris*	1987-1999	Native
Eared willow	*Salix aurita*	1987-1999	Native
Goat willow	*Salix caprea*	1987-1999	Native
Olive willow	*Salix caprea x S. viminalis*	1987-1999	Native
Grey willow	*Salix cinerea*	1987-1999	Native
Sally	*Salix cinerea subsp. oleifolia*	1987-1999	Native
Crack willow	*Salix fragilis*	1987-1999	Alien
Creeping willow	*Salix repens*	1987-1999	Native
Osier willow	*Salix viminalis*	Pre-1970	Alien
Brookweed	*Samolus valerandi*	1987-1999	Native
Common club-rush	*Schoenoplectus lacustris*	1987-1999	Native
Water figwort	*Scrophularia auriculata*	1987-1999	Native
Common figwort	*Scrophularia nodosa*	1987-1999	Native
Lesser clubmoss	*Selaginella selaginoides*	1987-1999	Native
Marsh ragwort	*Senecio aquaticus*	1987-1999	Native
#Blue-eyed grass	*Sisyrinchium bermudiana*	Pre-1970	Native
Unbranched bur-reed	*Sparganium emersum*	1987-1999	Native
Branched bur-reed	*Sparganium erectum*	1987-1999	Native
Least bur-reed	*Sparganium natans*	Pre-1970	Native
Bog stitchwort	*Stellaria uliginosa*	1987-1999	Native
Comfrey	*Symphytum officinale*	1987-1999	Native
Meadow-rue	*Thalictrum flavum*	1987-1999	Native
Bulrush	*Typha latifolia*	1987-1999	Native
Intermediate bladderwort	*Utricularia intermedia sens. lat.*	Pre-1970	Native
Lesser bladderwort	*Utricularia minor*	Pre-1970	Native
Lesser bladderwort	*Utricularia minor*	1987-1999	Native
*Greater bladderwort	*Utricularia vulgaris sens. lat.*	Pre-1970	Native
Wild valerian	*Valeriana officinalis*	1987-1999	Native
Blue water-speedwell	*Veronica anagallis-aquatica*	1987-1999	Native
Brooklime	*Veronica beccabunga*	1987-1999	Native
Pink water-speedwell	*Veronica catenata*	1987-1999	Native
Viburnum	*Viburnum opulus*	1987-1999	Native
Marsh violet	*Viola palustris*	1987-1999	Native
#Fen violet	*Viola persicifolia*	1987-1999	Native

APPENDIX 4: SITE PHOTOS

Plate 1 Chainage 196 showing level to which peat slip material reached on this section of river. Bedrock is visible as a result of scouring by transported peat.

Plate 2 Chainage 198 showing silt deposition and level of peat on the banks.

Plate 3 Chainage 199. It is recommended that this blockage be removed. The left bank should be planted in high density formation with shrubs or trees that are ecologically similar to the surrounding flora.

Plate 4 Chainage 198-199 the gauge of the pipes here should be increased to assist flow through.

Plate 5 Chainage 199 – just south of Flaggy Bridge (chainage 200) showing peat deposition on the banks.

Plate 6 Scene of river from bridge (M 547 990) showing negligible impacts. This is the scenario for most of the lower sections of the river.

Plate 7 River showing some small light detritus on the banks

Plate 8 sand/silt washed down from the mountains. This photo was taken in the lower reaches of the river.

Plate 9 Section of river at confluence (chainage 182) exhibiting very little physical change. Gravels are still in situ here. River has widened considerably and accordingly the power of the slip has dissipated.

Plate 10 Fish were seen moving upstream in this section (Chainage 184)

ECOLOGICAL RECOVERY OF PEAT SLIDE AREA AT DERRYBRIEN, CO. GALWAY

A MONITORING SURVEY

OCTOBER 2004

Prepared for: **ESBI, Stephens Court, Stephens Green, Dublin 2.**

Prepared by: **INIS Environmental Services, Edenvale, Ennis, County Clare.**

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1 INTRODUCTION

Inis Environmental Services have been commissioned to carry out monitoring on the ecological recovery of an area impacted on by a peat slip at Derrybrien, Co. Galway. This document reports on the ecological status of the slip area in October 2004 and reports on any changes that have occurred since an earlier survey in February 2004 (Inis Environmental Services 2004). The major peat slip occurred at the site during October 2003.

2 METHODOLOGY

2.1 Field Survey Work

A field survey was carried out during September / October 2004. The area from the windfarm site to the lower stretches of the Owendallulleegh River (See Figure 1) was walked and target notes made on sites that were being re-colonised by vegetation. Photographs were taken along the route so that a visual record could be kept and compared with photographs taken in February 2004.

2.1 Survey Personnel

This survey was carried out by INIS Environmental Services personnel. Mr. Howard Williams B.Sc. MIEEM specialising in aquatic ecology and Mr Patrick Crushell M.Sc. B.Sc. specialising in blanket bog ecology completed the survey.

3 RESULTS

Please note: Below, in normal text, are descriptions of the ecology along the survey area as of February 2004. A description of the changes, if any, that have occurred in the period February to October 2004 are presented in bold text within each section.

3.1 Windfarm Site to Flaggy Bridge

The area of the peat-slide from the windfarm site to Flaggy Bridge is split into Area I, II, III and IV (see Figure 2) as was done in the previous report on the ecological impacts of the peat slip event (Inis Environmental Services 2004).

Area I: Windfarm Site to Main Boulder Barrage (BD10)

The habitat of this area prior to the peat slide comprised plantation coniferous forestry, of different aged stands. In the upper areas of the peat slip much of the surface peat and vegetation remains *in situ* although obvious movement has taken place. It is estimated that more than 50% of the area has a cover of live vegetation compared to only 10% further down stream. The bare peat areas that exist along the path of the slide in this location are totally denuded of vegetation. At the time of the survey there was no evidence of mosses or vascular plants having colonised these areas.

The situation is similar in October 2004; throughout the growing season there has been much growth of vegetation where it remains intact since the slide. The bare peat areas remain largely un-vegetated. It is likely that as a result of the relatively harsh climate at this altitude, it may take longer for bare peat areas to re-vegetate than on lower ground. The bare peat areas remain saturated throughout. Little streamside vegetation has established.

There is one small narrow stream (<50cm wide and c.20cm deep) formed in the northern areas within the windfarm site but this appears to split into a number of streams further downhill or possibly other streams originate in the path of the slide further down stream. Further down the slope from the windfarm site the situation changes and less of the surface peat remains in place (Grid Reference: 59743 04109).

North of the main boulder barrage (BD10) the land is largely bare of peat and is presently stripped to the underlying mineral soil and bedrock. There are a few clumps of vegetated surface peat that came to rest in the area (probably originated from further up the peat slide). The peat that was once in the area appears to have been carried downstream from this area. Mature displaced Spruce and Pine trees litter the area. Few isolated trees remain in situ.

In the area just north of the Main Barrage (BD10) there are three newly formed streams. There is no peat remaining in the path of these streams, which now run over a fine silt-sand substrate. In steeper areas the substrate changes to bare rock surfaces. On the day of the survey the water of the streams appeared clear indicating that low levels of peat are present in the water but it should also be noted that water levels were also low following a relatively dry period. Most of the peat that remains in the area is relatively shallow black peat. Other peat clumps that originate from surface peat that is deposited in places are firm un-humified brown peat. The peat clumps that are present in the area have surface vegetation remaining intact although they may not have come to rest upright.

Eighty to ninety per cent of the area in this location is bare peat and underlying mineral soil (an estimated 20% of which comprises stripped mineral subsoil and bare rock). Only c. 10 % of the area comprises deposited surface peat vegetation clumps.

There are no major peat deposits on the northern side of the main boulder barrage (BD10). This is probably due to the fact that the dam was installed after the major peat slip occurred and was built as a preventative measure in case of future peat slides.

There has been only sparse re-vegetation of bare peat areas in this area of the peat slide. One species, Bulbous Rush, in particular was recorded re-colonising the bare peat areas. In areas where the underlying mineral soil are exposed at the surface there has also been little colonisation by vegetation, species that were recorded in these areas include Common Reedmace, Soft Rush and the moss Polytrichum strictum. Some areas of black peat are after drying out considerably and are relatively firm underfoot.

Area II: Main Boulder Barrage (BD10) to Gorge Boulder Dam (BD1)
Just South of the main boulder barrage much of the area is similar to that just described North of the barrage with the land being relatively bare of peat and now stripped to the underlying mineral soil and bedrock. The peat in the area is relatively shallow, estimated to be less than 1 metre in depth. There are a few clumps of vegetated surface peat that came to rest in the area (probably originated from further up the peat slide). The peat that was once in the area appears to have been carried downstream from this section of the peat slip. Mature displaced Spruce and Pine trees litter the area. Few isolated trees remain *in situ*. On the northern side of the dam inserted at the gorge (BD1) there is an area of deep peat that has built up since the dam was put in place, this peat appears to be well-humified 'black peat'.

The area just South of the main boulder barrage has been relatively well re-vegetated, with Bulbous Rush growing throughout. Soft Rush and Purple Moor-grass are also common re-colonising the bare peat areas. Some local areas have up to 80% cover of herb vegetation.

There remains a major deposit of black peat just North of the dam inserted at the Gorge, this peat is saturated and has not re-colonised by vegetation. It occurs in the middle of the stream and therefore is expected to remain saturated.

Area III: Gorge Boulder Dam (BD1) to Black Bridge
Much of this area was not surveyed because of access difficulties. There is little peat present in the area just to the south of the gorge dam (BD1). The area near the gorge has a steep incline and the peat slide would have moved rapidly through the narrow channel area. There is a light scattering of peat on the sides of the channel where it is possible to make out the level that the peat slide reached as it passed through the gorge. The banks of the stream in this area are steep and comprise a shallow wet heath type habitat dominated by Ling Heather and Purple Moor-grass with mineral influences from the mineral soil evident by the abundance of grasses and other minerotrophic species. This habitat appears to have remained largely intact following the peat slide.

The peat in this area has been re-colonised by original bank vegetation and there is little evidence of the major peat slide incident.

To the Northern side of the Black Bridge there are considerable quantities of peat and large surface peat clumps deposited. Galway County Council had constructed two earthen dams just north of the Black Road Bridge to slow the peat slip. Displaced peat mounded in the area above these dams, which were subsequently overtopped. It appears that the area where most of this peat has been deposited was a natural river channel with wet grassland on a mineral based soil on either bank and adjoining fields prior to the peat slide episode (based on local information and surveying of adjoining lands). The area was probably used for agriculture. Based on the flora of the adjoining fields the vegetation of the area would have been dominated by grass species such as Yorkshire Fog and Soft Rush with an abundance of species such as Creeping Buttercup.

Peat has deposited at different depths in this area depending on the underlying topography. In areas of shallow peat it is evident that the original vegetation of Soft Rush is already appearing up through the surface at the time of survey.

There has been some land clearance in the area to the East of the river by heavy machinery as part of emergency drainage works. Some peat has been placed in 'lagoon' like features after being cleared. A diversion channel has been dug in a successful attempt to direct the river away from the large peat mass that has deposited in the area.

There has been considerable work carried out in this area. To the east of the stream much of the peat has been removed and mixed with soil. The area on the eastern side of the stream is showing signs of good recovery with species such as Soft Rush and Yorkshire Fog growing throughout.

There remains large peat deposits to the West of the present course of the stream, while Soft Rush and Bulbous Rush is growing throughout, the peat mass remains saturated and hazardous to traverse on foot.

Area IV Black Road Bridge to Flaggy Bridge
There are two dams installed between Black Road Bridge and Flaggy Bridge, the first boulder dam (BD4) and the second boulder dam (BD5). The river passes through a dense mature conifer plantation immediately South of Black Bridge and therefore access to these areas proved difficult. Considerable depths of peat have also been deposited by the slide on each side of the river, which made the area very difficult to survey and treacherous.

There are few noticeable changes since the time of the original survey in February 2004. Some peat deposited in the area has dried out but vegetation cover is less than 20% on the bare peat areas. Little streamside vegetation has become established.

From what was surveyed it is apparent that large deposits have resulted on each river-bank around the base of trees within the plantation and in the river channel, this continues down as far as the first dam (BD4) South of Black Bridge. Immediately North of this dam the peat depth is considered to be extremely deep and appears to be highly humified black peat with high water content. The main concern in this area should be safety; this area of deep peat is a hazard.

Little has changed since the time of the original survey in February 2004. There is very little re-vegetation of the bare peat areas.

There is little vegetation in the area South of the first dam (BD4) and the river appears in good condition although a light cover of peat has been deposited in places.

Immediately to the North of the second dam (BD5) there is a deposit of peat extending 20m into the conifer plantation on each bank of the river. This peat appears to be at least 1 metre deep in places.

The situation remains similar in October 2004 with a deposit of black peat to the North of BD5, the significant deposit remains saturated and has little re-vegetation.

At the second dam (BD5) there is a deposit of deep black peat to the East of the dam. The area just south of the second dam (BD5) has a peat deposit (approximately 8m in width) on the western side of the river. Otherwise there is very little peat deposit between this dam and Flaggy Bridge, the lower banks of the river are washed clear of peat, further up the banks the natural Wet Heath vegetation dominated by Purple Moor-grass and Ling Heather was recorded and appears to have survived the disturbance of the peat slide.

The area immediately North of Flaggy Bridge has small quantities of peat deposited on western side of river. There has been land clearance in this area since the bog slide. An earthen dam constructed by Galway County Council at this location has been removed. It is evident that vegetation is already colonising much of the area with fresh growth of Soft Rush, Grasses, Creeping Buttercup and Dock species recorded.

The peat deposits remain at BD5 and little vegetation has colonised these deposits, the peat is saturated and liquid in consistency. The area just North of Flaggy Bridge has recovered well and there are no major deposits of peat present, the riverbank has re-vegetated particularly well.

3.2 Flaggy Bridge to Lough Cutra

This survey was carried out during mid September 2004, almost 12 months since the peat slide event.

The area that saw the most peat deposition, during the peat slip event, (approx. 2000 m^3 – estimated by ESBI engineers) was the area from Flaggy Bridge to the confluence of the Owendallulleegh River at Derrybrien East (Grid. Ref. M612 012). From this point to Lough Cutra there was peat deposited at various bends in the river and also in some low lying fields that are prone to flooding under spate conditions.

There has been considerable re-vegetation and stabilization of any remaining peat deposits that are present along the banks of the river and this is especially obvious at the areas where most deposited peat was observed in February 2003 (See plates 14 –17). The peat that was deposited at the time of the peat slip on the riverbanks was black peat with high water content and had a liquid consistency. In the most part these peat deposits have dried out considerably and much of the fine organic peat particles have been washed away by precipitation leaving behind clear areas with some peat clumps that mainly have a matted root structure (See plates 20 & 21). This peat is firm and being colonised by vegetation relatively quickly by species including Soft Rush, Bulbous Rush, Bramble and grass species including Purple Moor-grass and Yorkshire Fog. Revegetative cover is estimated to be >80% on most of the peat deposits from Flaggy Bridge to Lough Cutra.

Fish (Brown Trout) were recorded feeding on fly life along the river as far upstream as the confluence of the Owendallulleegh at Derrybrien East. Otters are active along the entire length of the river but especially around the townland of Inchamore - Grid square 56 99.

There is little evidence of the peat slip on the lower sections of the river apart from the occasional small peat deposit along the banks that have been colonised by vegetation. All the fords crossing the river are now clear of peat however some low lying areas do still contain peat due to the fact that it is trapped behind a physical structure such as a bank of earth.

4 CONCLUSION

4.1 Windfarm Site to Flaggy Bridge

There have been few changes in the ecology of the areas affected by the peat slide within the past 6 months. As predicted the areas that appear slowest to re-vegetate are those comprising saturated 'black peat'. The bare peat areas at higher altitudes are re-vegetating at a slower rate than at lower altitudes, this is thought to be a result of harsher climatic conditions.

Large peat deposits remain up-stream of the boulder dams within the study area. These peat deposits may act as a source of further pollution of the Owendallulleegh River, it is recommended that the peat be removed from the stream channel. It may be necessary to divert the streams when this work is undertaken, consultation with the fisheries authorities should take place prior to any of this work commencing however. Vegetation has been slow to establish along the course of the newly formed streams in the upper areas of the peat slide.

4.2 Flaggy Bridge to Lough Cutra

The area from Flaggy Bridge to the confluence of the Owendallulleegh is an area of the river that experienced a lot of physical damage and deposition. From the findings of this monitoring survey it is clear that this area is revegetating and rehabilitating well with >80% cover already achieved in most areas.
There is good re-vegetation of bare peat areas locally along the length of the Owendallulleegh River also; it is thought that these areas will continue to be re-vegetated at a faster rate as pioneer species have become established.

Along the entire length of the river the peat deposits have dried out considerably and been vegetated more so than further up the peat slip area. Presently any peat deposits along the river appear stable and pose little threat to the future ecological status of the river particularly because the finer peat sediment has mostly been washed downstream previously. As the riparian vegetation has become re-established the buffer that this provides will aid the recovery of the in-stream ecology.

It is felt that in time the revegetation of the survey area will be total and will revert to the original habitats found before the peat slip event.

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APPENDIX I

Scientific Names of Species Mentioned in Text

Table A1.1 Scientific Names of plants species mentioned in the text

Common English Name	Scientific Name
Bent Grass	*Agrostis stolonifera*
Bilberry	*Vaccinium myrtilus*
Bog Asphodel	*Narthecium ossifragum*
Bog Rosemary	*Andromeda polifolia*
Bracken	*Pteridium aquilinum*
Bramble	*Rubus fruiticosus agg.*
Bulbous Rush	*Juncus bulbosus*
Carnation sedge	*Carex panicea*
Common Cotton-grass	*Eriophorum angustifolium*
Common Reedmace	*Typha latifolia*
Cranberry	*Vaccinium oxycoccus*
Creeping Buttercup	*Ranunculus repens*
Cross-leaved Heath	*Erica Tetralix*
Crowberry	*Empetrum nigrum*
Deer-grass	*Scirpus caespitosus*
Dock	*Rumex spp.*
Moss	*Eurhynchium praelongum*
Hare's-tail Cotton-grass	*Eriophorum vaginatum*
Ling Heather	*Calluna vulgaris*
Lodge Pole Pine	*Pinus contorta*
Purple Moor-grass	*Molinia caerulea*
Moss	*Racomitrium lanuginosum*
Sitka Spruce	*Picea sitchensis*
Soft Rush	*Juncus effusus*
Bog Moss	*Sphagnum auriculatum*
Bog Moss	*Sphagnum capillifolium*
Bog Moss	*Sphagnum cuspidatum*
Bog Moss	*Sphagnum magellanicum*
Bog Moss	*Sphagnum papillosum*
Bog Moss	*Sphagnum subnitens*
Feather Moss	*Thuidium tamariscinum*
Tormentil	*Potentilla erecta*
Willowherb	*Epilobium sp.*
Yorkshire Fog	*Holcus lanatus*

APPENDIX II

Upstream of Flaggy Bridge
AREA I

Plate 1 (Feb 2004): In vicinity of windfarm site, high proportion of area comprises displaced surface peat when compared with further down slope.

Plate 2 (Oct 2004): Bare peat areas remain saturated and little vegetation has become established, Note the Purple Moor-grass spreading out from the surface brown peat clumps in the area.

Plate 3 (Feb 2004): North of main boulder dam, mostly bare mineral soil and patches of bare 'black' peat. Only a few clumps of 'brown' surface peat deposited in area.

Plate 4 (Oct 04): Same area as in Plate 3. Note the clumps of vegetation that have developed since February 2004 (mostly Purple Moor-grass and Bulbous Rush). The peat in this area has dried out somewhat and become firm.

AREA II

Plate 5 (Feb 2004 above) & 6 (Oct 2004 below). The vegetation has re-established extremely well in this area. South of the Main Boulder Dam.

AREA III

Plate 7 (Feb 2004 above) & 8 (Oct 2004 below): Peat deposition on lands just North of Black Bridge. The areas of black peat have re-vegetated well.

AREA IV

Plate 9 (Feb 04 above) & 10 (Oct 04 below): Peat deposition at 1st dam between Black Bridge and Flaggy Bridge. Note some of the mature conifers appear to have died as a result of the peat deposits. The deep peat deposit remains saturated and has a sparse cover of Bulbous Rush vegetation.

Plate 11: North of Flaggy Bridge (looking upstream, Oct 04). Note re-vegetation of the river banks in this area.

Plate 12: Photo illustrating the gradual colonisation of bare peat areas by Bulbous rush in Area I (Oct 04).

Plate 13: Illustrating the gradual colonisation of bare peat areas in Area II. It can be seen that vegetation comprising mainly Purple Moor-grass is spreading from the surface brow peat deposited in the area and other species including Bulbous Rush are vegetating the black peat areas in-between (Oct 04).

Downstream of Flaggy Bridge

Plate 14 (November 2003 above) & 15 (Sept. 2004 below): The photo ~~above~~ BELOW shows the vegetation recovery along the banks of the Owendallulleegh River at Grid ref. M612 014. The same stretch of river is shown ~~below~~ ABOVE shortly after the occurrence of the peat slip.

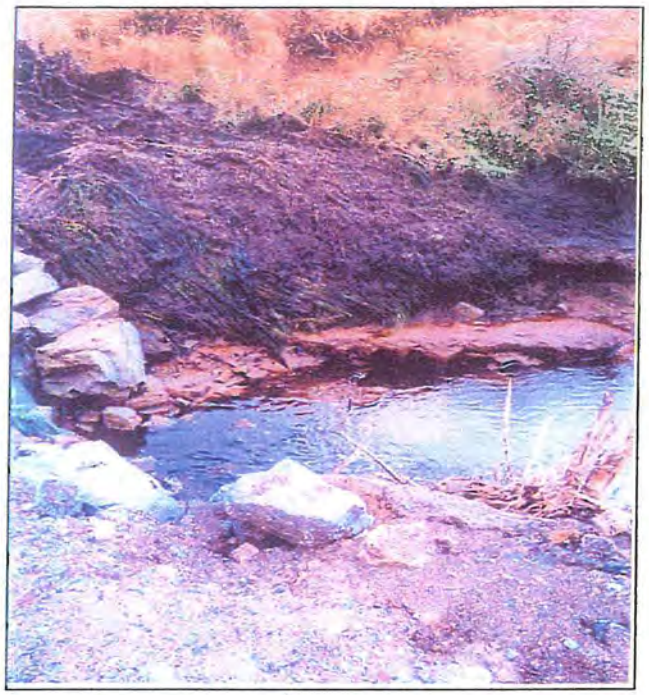

Plate 16 (November 2003 above) & 17 (Sept. 2004 below): Another 'before and after' shot of a site (173 metres south of Flaggy Bridge). Note the > 80% revegetation.

Plates 18 and 19: Flaggy Bridge downstream – right hand side bank. Large clumps of peat lying in field. The smaller fractions of organic peat have been washed away by precipitation leaving these root masses behind (Oct 04).

Plate 26: Confluence of Owendallulleegh River at Derrybrien East. Good numbers of Brown Trout were seen feeding on fly life here (Oct 04).

Plate 27: Grid ref. M 614 015 – This site recorded some of the largest peat deposits of the episode last year. This peat is revegetating slowly. There remains a significant depth of peat here (Oct 04).

Plates 24 and 25: Confluence of Owendallulleegh River at Derrybrien East. Some peat remains – the area to the immediate left of photo was under a significant amount of peat during December 2003. All that now remains is clumps that will take time to break down (Oct 04).

Plate 22: Photo showing that even larger masses of material are being revegetated at R574 997 (Oct 04).

Plate 23: R562 996. Photo showing that what remains after high precipitation and time is these clumps. These will break down in time. The smaller fractions of peat that made up the largest mass of material during the episode are not in evidence any more (Oct 04).

Plate 20: A peat clump, with all the fine sediment washed through, being overgrown with Bramble R614 018 (Oct 04).

Plate 21: Plants growing on peat sod R614 018 (Oct 04).

Plate 28: A ford on the banks of the Owendallulleegh River. This ford had a large quantity of peat deposited here during the peat slip event - it is now gone with the exception of clumps (Oct 04).

DERRYBRIEN WIND FARM

DERRYBRIEN, SLIEVE AUGHTY MOUNTAINS, CO. GALWAY

BAT ASSESSMENT

February 2012

DRAFT REPORT

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DERRYBRIEN WIND FARM

DERRYBRIEN, SLIEVE AUGHTY MOUNTAINS, CO. GALWAY

BAT ASSESSMENT

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DERRYBRIEN WIND FARM

DERRYBRIEN, SLIEVE AUGHTY MOUNTAINS, CO. GALWAY

BAT ASSESSMENT

1. INTRODUCTION

1.1. Background

Faith Wilson Ecological Consultant and licensed bat specialist was commissioned by ESB International Consulting Engineers to carry out a study in relation to bats at the Derrybrien Windfarm, Slieve Aughty Mountains, Co. Galway. The Derrybrien Windfarm Project was acquired from Saorgus by ESB with full planning permission in 2003. There were no detailed bat surveys conducted as part of the planning process for the proposed wind farm at Derrybrien as part of the original Environmental Impact Assessment.

A peat slip occurred during construction in Oct 2003 during which peat/forestry debris was mobilised. After the peat slip remediation measures were put in place. These comprised barrages/boulder dams (4 of which remain) and some rerouting of drains. Following the peat slide in 2003 some surveys of the lesser horseshoe bats at Lough Cutra were conducted (Williams, 2004a & 2004b) to try and determine if the peat slide had any adverse impacts on the local populations.

The Department of Environment Community and Local Government have advised that a substitute consent application will have to be made for Derrybrien Windfarm and the remedial measures associated with 2003 peat slip. The objective of this report is to establish the impact of the peat slide and the existing wind farm on bats.

1.2. Legislation

Note regarding the Substitute Consent Process

The Planning and Development (Amendment) Act 2010 provides for a substitute consent process, in exceptional circumstances only, to allow for retrospective planning permission for development requiring EIA, or appropriate assessment under the Habitats Directive.

The Act provides that where a planning authority becomes aware that a final judgement of a court in the state or the EU Court of Justice has been made that a planning permission was in breach of the law, invalid or otherwise defective in a material respect it will require that an

application for substitute consent is made to An Bord Pleanala to be accompanied by a remedial EIS and Natura Impact Statement.

The contents of a remedial EIS are as follows:

- A statement of significant effects, if any, on the environment, which have occurred or which can reasonably be expected to occur because of the development
- Details of any appropriate measures undertaken or proposed to remedy any significant adverse effects on the environment and the period of time within which any proposed remedial measures shall be carried out.

The contents of the remedial Natura Impact Statement are as follows:

- A statement of the significant effects, if any, on the environment, which have occurred or which are occurring or which can reasonably be expected to occur because of the development
- Details of any appropriate remedial measures undertaken or proposed to remedy any significant adverse effects on the environment and the period of time within which any proposed remedial measures shall be carried out
- Where the applicant wishes, a statement of imperative reasons of overriding public interest associated with the development or any compensatory measures being proposed by the applicant.

Legislation in relation to Bats

Wildlife Act 1976

In the Republic, under Schedule 5, of the Wildlife Act 1976, all bats, and their roosts, are protected by law. It is unlawful to disturb either without the appropriate licence. The Act was amended in 2000.

Bern and Bonn Convention

Ireland has also ratified two international wildlife laws pertaining to bats. These are known as the 'Bern' and 'Bonn' Conventions.

The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), in relation to bats, exists to conserve all species and their habitats.

The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries.

EU Habitats and Species Directive

The EC Directive on the Conservation of Natural habitats and of Wild Fauna and Flora (Habitats Directive 1992), seeks to protect rare species, including bats, and their habitats and requires that appropriate monitoring of populations is undertaken. All bat species are protected under Annex IV of the EU Habitats Directive, while the lesser horseshoe bat (*Rhinolophus hipposideros*) is listed under Annex II. Member states are required to designate Special Areas of Conservation for all species listed under Annex II in order to protect them.

The current status and legal protection of the known bat species occurring in Ireland is given in **Table 1** below.

Table 1: Legal status and protection of the Irish bat fauna

Common and scientific name	Wildlife Act 1976 & Wildlife (Amendment) Act 2000	Irish Red List status	Habitats Directive	Bern & Bonn Conventions
Common pipistrelle *Pipistrellus pipistrellus*	Yes	Least Concern	Annex IV	Appendix II
Soprano pipistrelle *Pipistrellus pygmaeus*	Yes	Least Concern	Annex IV	Appendix II
Nathusius' pipistrelle *Pipistrellus nathusii*	Yes	Not referenced	Annex IV	Appendix II
Leisler's bat *Nyctalus leisleri*	Yes	Near Threatened	Annex IV	Appendix II
Brown long-eared bat *Plecotus auritus*	Yes	Least Concern	Annex IV	Appendix II
Lesser horseshoe bat *Rhinolophus hipposideros*	Yes	Least Concern	Annex II Annex IV	Appendix II
Daubenton's bat *Myotis daubentonii*	Yes	Least Concern	Annex IV	Appendix II
Natterer's bat *Myotis nattereri*	Yes	Least Concern	Annex IV	Appendix II
Whiskered bat *Myotis mystacinus*	Yes	Least Concern	Annex IV	Appendix II
Brandt's bat *Myotis brandtii*	Yes	Data Deficient	Annex IV	Appendix II

NB: Destruction, alteration or evacuation of a known bat roost is a notifiable action under current legislation and a derogation licence has to be obtained from the National Parks and Wildlife Service before works can commence.

2. METHODOLOGY

2.1. Desk Review

A review of the previous bat surveys conducted at Lough Cutra Castle by Williams (2004a & 2004b) following the peat slide was undertaken by Faith Wilson BSc CEnv MIEEM.

2.2. Consultations

A review of known bat roosts and bat activity within 10km of the windfarm was conducted using the Bat Conservation Ireland database. Monitoring data for the Lesser Horseshoe Roost at Lough Cutra Castle was provided by National Parks and Wildlife Service. Other bat specialists including members of Bat Conservation Ireland and the local Conservation Rangers from the National Parks and Wildlife Service (Raymond Stephens and Jacinta Murphy) were contacted regarding any surveys or detector work that they had carried out in the area.

2.3. Detector Survey

A bat activity survey across the operational wind farm and in the wider landscape was conducted using bat detectors. The surveys were conducted by Faith Wilson and Chris Peppiatt (both licensed bat specialists) on the 5th November 2011. During the survey each turbine was visited and bat activity was recorded using a variety of bat detectors (Heterodyne Bat Detector: Pettersson D100; Time Expansion Bat Detector: Pettersson D240; Frequency Division Bat Detector: Bat Box Duet). Time was spent at each turbine location during the survey and the networks of tracks between each turbine were also driven slowly with the bat box mounted on the window of each vehicle pointing upwards to record any bat passes. Bats were identified by their ultrasonic calls coupled with behavioural and flight observations.

2.4. Roost Survey

Initially it was proposed to resurvey the Lough Cutra Castle Lesser Horseshoe Roost as part of this study but following discussions with local National Parks and Wildlife Service staff this proposal was revised. The roost at Lough Cutra has had some recent works conducted to it and the roost is now counted by NPWS staff on a monthly basis. In order to reduce potential disturbance to the bats from additional counts it was agreed that this data would be made available to the study from NPWS and is presented below.

2.5. Survey constraints

Given the lack of baseline bat survey data for the wind farm site it is not possible to present the results of this study in a comparative way. However detailed roost information for the Lesser Horseshoe roost at Lough Cutra Castle is available from NPWS which will enable an indication of the fortunes of the roost to be examined.

Although the detector survey was carried out towards the end of the active bat season bats are currently still active and were recorded on both the wind farm site and at lower elevations.

3. RESULTS

3.1. Site Designations in the area for bats:

The closest designated Special Area of Conservation to the Derrybrien windfarm which lists lesser horseshoe bat as a qualifying interest is the Lough Cutra SAC (Site Code: 000299). This site is located approximately 12km to the south-west of the windfarm. The site synopsis for the site is presented in **Appendix 1**.

3.2. Rare and protected bat species known from the area

The wind farm is within the known range of the lesser horseshoe bat (*Rhinolophus hipposideros*) – this species is restricted in it's distribution to the west of Ireland and is found in Counties Mayo, Galway, Clare, Limerick, Kerry and Cork (Kelleher, 2004). This species is given additional protection under Annex II of the EU Habitats which requires member states to designate Special Areas of Conservation for the species.

There are a number of known lesser horseshoe roosts, all of which are located to the west of the wind farm as summarised below in **Table 2**. Two of these are located within 10km to the south-west of the site. Lough Cutra Castle, Gort which is located c.12km to the south-west of the site is also included in this table as the peat slide from Derrybrien entered the Owendallulleegh River ultimately entering Lough Cutra and there were concerns that the population of lesser horseshoe bats that roost there and form par t of the qualifying interest for the site may have been impacted.

Table 2. Known lesser horseshoe bat roosts within a 10km radius of the wind farm

Grid Ref	Name	Source	Species	Comment
R 47 98	Lough Cutra Castle, Gort, Co. Galway	NPWS Lesser Horseshoe Bat Database	*Rhinolophus hipposideros*	c.12km south west of the site

Grid Ref	Name	Source	Species	Comment
M 48 06	Thor Ballylee, Gort, Co. Galway	Bat Conservation Ireland Database	*Rhinolophus hipposideros*	c.9.3km to the west of the site
M 47 04	Cloonbeg, Gort, Co. Galway	Bat Conservation Ireland Database	*Rhinolophus hipposideros*	c.10km west of the site

The rare Nathusius' pipistrelle (*Pipistrellus nathusii*) was recorded from County Galway in 2007 (Bat Conservation Ireland database) but has not yet been recorded from Co. Clare.

All Irish species of bats are strictly protected under both the Wildlife Act (1976, amended 2000), the Bern and Bonn Convention and under Annex IV of the EU Habitats Directive.

3.3. Records of other bat roosts within a 10km radius of the wind farm.

There are no other known bat roosts within close proximity to the wind farm. There is a known roost of brown long-eared bats (*Plecotus auritus*) and soprano pipistrelle (*Pipistrellus pygmaeus*) and a second roost of brown long-eared bats and an unidentified *Myotis* sp. from a private residence and farm buildings at Ballynagar which is some 10km to the east of the wind farm.

Table 3. Previously known bat roosts within a 10km radius of the wind farm.

Grid Ref	Name	Source	Species	Comment
M 71 04	Private residence, Ballynagar, Co. Galway	Bat Conservation Ireland Database	*Plecotus auritus* *Pipistrellus pygmaeus*	10km east of the site
M 71 04	Farm Buildings, Ballynagar, Co. Galway	Bat Conservation Ireland Database	*Plecotus auritus* *Myotis sp.*	10km east of the site

3.4. Records of bat activity within a 10km radius of the wind farm.

Bats recorded from within a 10km radius of the wider study area are documented from a variety of data sources. These include reports prepared by licensed bat specialists and ecological consultants, records of activity recorded during Bat Conservation Ireland projects such as the BATLAS 2010 project and other records collated in the Bat Conservation Ireland Database.

The closest records of bats to the wind farm were made during the BATLAS 2010 Project recorded a good diversity of species from the general area. These include:

- Daubenton's bat (*Myotis daubentonii),* Leisler's bat (*Nyctalus leisleri*), soprano pipistrelle (*Pipistrellus pygmaeus*) and common pipistrelle (*Pipistrellus pipistrellus*) from Peterswell Turlough SAC which is located west of the N66,
- Leisler's bat (*Nyctalus leisleri*), soprano pipistrelle (*Pipistrellus pygmaeus*) and common pipistrelle (*Pipistrellus pipistrellus*) from Peterswell,
- An unidentified *Myotis* sp. and an unidentified bat from Kenny's Bridge, Farnaun,
- Leisler's bat (*Nyctalus leisleri*), soprano pipistrelle (*Pipistrellus pygmaeus*) and common pipistrelle (*Pipistrellus pipistrellus*) from Brockagh near Lough Atorick,
- An unidentified *Myotis* sp. and common pipistrelle (*Pipistrellus pipistrellus*) from Corlea Bridge on the Bleach River,
- Soprano pipistrelle (*Pipistrellus pygmaeus*) at Bleach Bridge on the east side of Lough Graney,
- Leisler's bat (*Nyctalus leisleri*) and common pipistrelle (*Pipistrellus pipistrellus*) from Speightspark on the west side of Lough Graney,
- Leisler's bat (*Nyctalus leisleri*) on the Clare Way,
- Soprano pipistrelle (*Pipistrellus pygmaeus*), an unidentified *Myotis* sp. and common pipistrelle (*Pipistrellus pipistrellus*) from Ballymanagh Crossroads,
- Daubenton's bat (*Myotis daubentonii),* soprano pipistrelle (*Pipistrellus pygmaeus*) and an unidentified *Myotis* sp. from Deerpark near Kilchreest,
- Soprano pipistrelle (*Pipistrellus pygmaeus*) from Clonoo East west of Loughrea,
- Soprano pipistrelle (*Pipistrellus pygmaeus*) from Leitrim More Castle.

The closest of these records was within 6km of the site. Other EIS studies in the area also recorded;

- soprano pipistrelle (*Pipistrellus pygmaeus*) at Ballynagar,
- common pipistrelle (*Pipistrellus pipistrellus*) at Ballaba.

The bat surveys conducted during 2004 by Howard Williams focused on bat activity in the Lough Cutra Castle Demesne. A spring survey conducted in March 2004 recorded 45 bats using the castle cellars for roosting purposes. In addition to the counts of lesser horseshoe bat the surveys also recorded:

- Soprano pipistrelle (*Pipistrellus pygmaeus*)
- Common pipistrelle (*P. pipistrellus*)
- Leisler's bat (*Nyctalus leisleri*)
- Natterer's bat (*Myotis nattereri*)

A summer survey was also conducted by Williams with counts in August and September 2004. This survey confirmed the presence of:

- Lesser horseshoe bat (*Rhinolophus hipposideros*)
- Soprano pipistrelle (*Pipistrellus pygmaeus*)
- Common pipistrelle (*P. pipistrellus*)
- Leisler's bat (*Nyctalus leisleri*)
- Natterer's bat (*Myotis nattereri*)
- Daubenton's bat (*Myotis daubentonii*)
- Whiskered bat (*Myotis mystacinus*)
- Brown long-eared bat (*Plecotus auritus*)

An estimate of 60 lesser horseshoe bats divided between the boiler house and the basement was made. A roost of Soprano pipistrelle and Natterer's bats was confirmed from a tower in the gate lodge in the estate (10 – 20 Natterers' bats and c.20 soprano pipistrelle).

3.5. Detector Survey

Weather conditions

Sunset 17:00 GMT, Cloud 5-10% at start (not much change during the approx. 3.5 hours), bright night with a waxing moon, wind light W (estimated Beaufort Scale 1), few flying insects seen. Temperatures – initial temperature was 8.5°C dropping to 5°C by the end of the survey.

Confirmed and potential roosts

No new roosts were confirmed during the detector survey but a number of buildings in the general area of the wind farm have potential both as maternity roosts and potential hibernation sites for bats. As these were private residences it was not possible to examine them in detail.

Areas of importance for foraging and commuting bats

The presence of bats using the wind farm for foraging purposes was confirmed during the detector survey of the site. Bat passes were recorded on two observations – a single pass of a distant unidentified bat was recorded near Turbine 40 with a similar observation of a single pass of an unidentified pipistrelle bat on the track between the junction of Turbines 56 and 57.

Details of the detector survey and the observations made are presented below in **Table 4** and coupled with the existing data held by Bat Conservation Ireland has allowed the status of bats in the study area to be determined (**Table 5**).

Table 4. Bat activity recorded using bat detectors within the wind farm site at Derrybrien with observations on features of interest to bats for foraging and commuting and assessment of potential collision risk with wind turbines.

Turbine Number	Easting	Northing	Time	Description	Observation	Distance from turbine base to adjoining vegetation likely to be used by bats (m)	Potential collision risk (H/M/L)
T1	157724	204779	19:19:00	Forestry on two sides, turbine is located in a corner	No bat activity recorded	29/35	H
T2	157942	204861	19:21:00	Forestry on two sides, turbine is located in a corner	No bat activity recorded	17/37	H
T3	157837	204545	19:17:00	Forestry on one side	No bat activity recorded	25	H
T4	158059	204646	19:27:00	Distant forestry	No bat activity recorded	93/122	M
T5	158247	204745	19:30:00	Almost encircled by forestry	No bat activity recorded	14/35	H
T6	157971	204362	19:14:00	Forestry on one side	No bat activity recorded	29	H
T7	158185	204433	19:37:00	Surrounded by wet grassland/clear fell	No bat activity recorded	131	M
T8	158427	204563	19:39:00	Some forestry adjoining	No bat activity recorded	35	H
T9	158573	204621	19:42:00	Some forestry adjoining	No bat activity recorded	50 – 70	M
T10	158793	204712	19:45:00	Surrounded by wet grassland/clearfell	No bat activity recorded	200	L
T11	158993	204794	19:49:00	Surrounded by wet grassland/clearfell	No bat activity recorded	225	L
T12	158083	204102	18:59:00	Forestry on one side	No bat activity recorded	45	H
T13	158298	204194	19:02:00	Surrounded by wet grassland/clearfell	No bat activity recorded	270	L
T14	158495	204317	19:04:00	Surrounded by wet grassland/clearfell	No bat activity recorded	290	L
T15	158685	204373	19:08:00	Surrounded by wet grassland/clearfell	No bat activity recorded	285	L

Turbine Number	Easting	Northing	Time	Description	Observation	Distance from turbine base to adjoining vegetation likely to be used by bats (m)	Potential collision risk (H/M/L)
T17	159116	204535	19:55:00	Low scattered conifers	No bat activity recorded	90	M
T18	158212	203857	18:57:00	Forestry on one side	No bat activity recorded	35	H
T19	158417	203937	18:53:00	Forestry on one side	No bat activity recorded	20	H
T20	158626	204045	18:50:00	Forestry on one side	No bat activity recorded	20	H
T21	158826	204148	18:46:00	Forestry on one side	No bat activity recorded	30	H
T22	159022	204237	18:42:00	Forestry on one side	No bat activity recorded	20	H
T23	159255	204307	18:38:00	Forestry on one side	No bat activity recorded	40	H
T24	159638	205083	20:14:00	Forestry at some distance to N and S	No bat activity recorded	130 - 140	L
T25	159739	204816	19:24:00	Forestry blocks to N and S	No bat activity recorded	40	H
T26	159905	204601	18:26:00	Forestry on two sides	No bat activity recorded	40 – 60	H
T27	159811	205250	21:07:00	Few small (to 5 metres) isolated self-sown saplings nearby, forestry 150-200 metres away to NE	No bat activity recorded	150 - 200	L
T28	159997	204938	19:37:00	Open – clearfell	No bat activity recorded	230	L
T29	160102	204702	18:35:00	Forestry to S	No bat activity recorded	30	H
T30	160034	205346	21:10:00	Forestry to N	No bat activity recorded	25	H
T31	160207	205042	19:50:00	Open	No bat activity recorded	135	L
T32	160281	204788	18:42:00	Forestry to S	No bat activity recorded	30	H
T33	160219	205422	21:14:00	Forestry to N, plus self-sown saplings nearby	No bat activity recorded	20	H
T34	160413	205125	19:58:00	Open	No bat activity recorded	280	L
T35	160459	204883	18:52:00	Forestry to S	No bat activity recorded	50	H
T36	160413	205505	21:17:00	Forestry to N	No bat activity recorded	20	H

Turbine Number	Easting	Northing	Time	Description	Observation	Distance from turbine base to adjoining vegetation likely to be used by bats (m)	Potential collision risk (H/M/L)
T37	160618	205216	20:05:00	Open	No bat activity recorded	260	L
T38	160636	204960	19:00:00	Forestry to S	No bat activity recorded	40	H
T39	160582	205579	21:20:00	Forestry to N, plus self-sown saplings nearby.	No bat activity recorded	25	H
T40	160789	205272	20:12:00	Open	21:18: one quick pass (seemed relatively distant) of unidentified Pipistrelle, not seen	230	L
T41	160801	205061	19:09:00	Forestry to S	No bat activity recorded	55	M
T42	160844	205609	21:25:00	Forestry to N, plus self-sown saplings nearby	No bat activity recorded	45	H
T43	160951	205159	20:38:00	Forestry to S	No bat activity recorded	140	L
T44	161041	205587	21:29:00	Forestry to N, plus self-sown saplings nearby	No bat activity recorded	45	H
T45	161146	205221	20:22:00	Open	No bat activity recorded	230	L
T46	161166	204961	20:31:00	Forestry to S	No bat activity recorded	90	M
T47	158301	205328	21:33:00	Forestry very close	No bat activity recorded	30	H
T48	158447	205411	21:36:00	Forestry on one side	No bat activity recorded	25	H
T49	158704	205512	21:40:00	Forestry on one side	No bat activity recorded	35	H
T50	158884	205610	21:47:00	Forestry on one side	No bat activity recorded	30	H
T51	159107	205713	21:51:00	Surrounded by wet grassland/clearfell, forestry to N	No bat activity recorded	60	M
T52	159301	205746	21:55:00	Surrounded by wet grassland/clearfell, forestry on both sides	No bat activity recorded	45 - 90	H

Turbine Number	Easting	Northing	Time	Description	Observation	Distance from turbine base to adjoining vegetation likely to be used by bats (m)	Potential collision risk (H/M/L)
T53	158482	205154	21:27:00	Forestry on one side, clearfell on the other	No bat activity recorded	35	H
T54	158655	205235	21:24:00	Forestry on both sides, 10 - 12m tall	No bat activity recorded	30	H
T55	158822	205317	21:21:00	Forestry close by	No bat activity recorded	30	H
T56	158985	205397	21:18:00	Surrounded by wet grassland/clearfell	Unidentified pipistrelle bat recorded between here and turbine 57, single pass only, foraging in amongst self sown conifers/scrub	90	M
T57	159249	205553	21:56:00	Forestry blocks all around	No bat activity recorded	57	M
T58	159447	205569	21:09:00	Some conifers adjoining on two sides	No bat activity recorded	60	M
T59	158565	204910	20:27:00	Surrounded by wet grassland/clearfell, forestry to S	No bat activity recorded	140	L
T60	158778	204988	20:30:00	Surrounded by wet grassland/clearfell, forestry to N	No bat activity recorded	45	H
T61	158961	205080	20:33:00	Surrounded by wet grassland/clearfell, forestry to W	No bat activity recorded	80	M
T62	159206	205247	20:37:00	Forestry on both sides N and S	No bat activity recorded	65	M
T63	159408	205269	20:40:00	Surrounded by wet grassland/clearfell and several blocks forestry	No bat activity recorded	50	H
T64	159588	205374	20:43:00	Surrounded by wet grassland/clearfell, forestry to S	No bat activity recorded	50	H
T65	159822	205461	21:37:00	Forestry to N and E	No bat activity recorded	40	H

Turbine Number	Easting	Northing	Time	Description	Observation	Distance from turbine base to adjoining vegetation likely to be used by bats (m)	Potential collision risk (H/M/L)
T66	159205	204891	20:19:00	Surrounded by wet grassland/clearfell	No bat activity recorded	125	L
T67	159395	204989	20:16:00	Forestry close by to S	No bat activity recorded	50	H
T68	159294	204643	17:20:00	Youngish forestry on one side	No bat activity recorded	10	H
T69	159521	204745	17:25:00	Forestry on both sides	No bat activity recorded	45	H
T70	159515	204408	18:36:00	Forestry on both sides	No bat activity recorded	30	H
T71	159711	204495	18:30:00	Forestry nearby on two sides	No bat activity recorded	25 – 30	H

Table 5. Adjudged status of Irish bat species within the study area.

Common name	Scientific name	Occurrence	Confirmed Roosts	Source
Common pipistrelle	*Pipistrellus pipistrellus*	Present – unidentified pipistrelle recorded in site	Yes	BCI database and field survey
Soprano pipistrelle	*Pipistrellus pygmaeus*	Likely – unidentified pipistrelle recorded	Yes	BCI database and field survey
Nathusius' pipistrelle	*Pipistrellus nathusii*	Potential – recorded from the county	No	BCI database
Leisler's	*Nyctalus leisleri*	Present	No	BCI database
Brown long-eared	*Plecotus auritus*	Present	Yes	BCI database
Lesser horseshoe	*Rhinolophus hipposideros*	Present	Yes	BCI database and field survey
Daubenton's	*Myotis daubentonii*	Present	No	BCI database
Natterer's	*Myotis nattereri*	Potential	No	BCI database
Whiskered	*Myotis mystacinus*	Potential	No	BCI database
Brandt's	*Myotis brandtii*	Potential – rare	No	BCI database

Bat activity was noted at lower elevations on leaving the site. At lower elevations two soprano pipistrelles and the other 4 unidentified pipistrelles were recorded on the minor road between the wind farm entrance and the R353. Five soprano pipistrelles were recorded on the minor road from the wind farm entrance to Killeenadeema.

3.6. Lesser horseshoe roost at Lough Cutra

The lesser horseshoe roost at Lough Cutra has been monitored over a number of years by National Parks and Wildlife Service staff and this data from the NPWS lesser horseshoe roost database is presented below in **Table 6**.

Table 6. NPWS counts conducted at the Lough Cutra roost.

Date	No. of bats present	Count Type	Droppings present	Bat Activity
21/07/1987	60		No	
14/01/1988	39		No	
17/01/2001	93		No	
19/04/2000	2		No	
Winter 1999/2000	49		No	
23/02/2006	84	Visual	Yes	Semi-active
13/06/2006	5		No	
23/01/2008	78	Visual	No	
20/08/2008	30	Heterodyne	No	
09/01/2009	97	Internal count	No	Torpid
17/06/2009	84	Internal count	No	Semi-active
03/07/2009	0	Internal count	No	
06/08/2009	1	Internal count	No	Semi-active
09/09/2009	31	Internal count	No	Semi-active
02/12/2009	139	Internal count	No	Semi-active
11/01/2010	142	Internal count	No	Torpid
12/02/2010	132	Internal count	No	Torpid

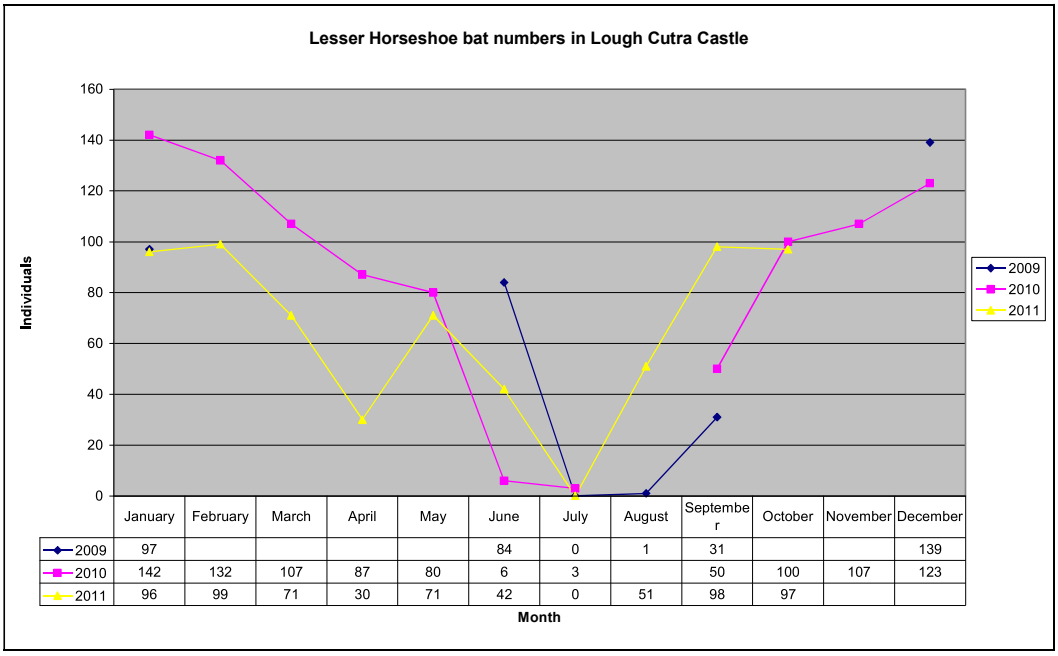
Since works to the roost took place in 2008 the roost has been monitored on a monthly basis by the local conservation staff. A summary of those counts is presented below in **Table 7**.

Table 7. Monthly monitoring counts of the roost conducted by NPWS staff following renovation works.

Month	2009	2010	2011
January	97	142	96
February		132	99
March		107	71
April		87	30
May		80	71
June	84	6	42
July	0	3	0
August	1		51
September	31	50	98
October		100	97
November		107	
December	139	123	
Average per year	***90***	***85***	***65***

These monthly counts are presented below in **Figure 1** and in general bat numbers at the roost have either increased or remained stable since the roost was first counted in 1987 when 60 bats were present indicating that the local population of lesser horseshoe bats are in favourable conservation status which is the same as the national population.

Figure 1. Lesser horseshoe bat numbers in Lough Cutra Castle 2009 – 2011.



	January	February	March	April	May	June	July	August	September	October	November	December
2009	97					84	0	1	31			139
2010	142	132	107	87	80	6	3		50	100	107	123
2011	96	99	71	30	71	42	0	51	98	97		

4. DISCUSSION AND IMPACT ASSESSMENT

4.1. Assessment of potential impacts of the peat slide in relation to bats

The peat slide which occurred in 2003, whilst causing a fish kill and degradation of water quality in the Owendalulleegh River is unlikely to have impacted on local bat populations in particular the lesser horseshoe bats in Lough Cutra Castle. The main habitats used by lesser horseshoe bats for foraging identified by NPWS (2007) include:

- Riparian
- Scrub woodland
- Deciduous woodland
- Mixed woodland
- Hazel woodland
- Lake
- Grassland
- Conifer plantation
- Limestone pavement
- Coastal
- Pasture
- Parkland
- Turlough
- Caves (sea and non-marine)
- Artificial underground habitats

Those habitats within the foraging range of the roost would have been unaffected by the peat slide at Derrybrien with the exception of Lough Cutra itself. The principal foraging habitat for lesser horseshoe bats has been shown through radio tracking studies to be woodlands with some use of pasture and wetlands, rarely foraging over open water (Biggane (2004a, 2004b, , Bontadina *et. al.* (2002)).

Given that the Lough Cutra Castle population has ultimately remained stable and in some years has increased there would appear to be no negative impacts on this population from the peat slide and subsequent pollution event.

4.2. Assessment of potential impacts of the operational wind farm in relation to bats

Bats and Windfarms

Over the past decade an increasing body of evidence has emerged to indicate that many operational wind farms are having a negative impact on bats. These include studies from Europe, Australia and North America, which has documented a number of cases where bat mortalities have been recorded. These fatalities are thought to have occurred due to collisions with wind turbines but recent research has found that many of the bats had suffered barotraumas[1] (Baerwald *et. al.* (2008)). The study found that 90% of bat fatalities involved internal haemorrhaging consistent with barotrauma, and that direct contact with turbine blades only accounted for about half of the fatalities.

Four main potential negative impacts on bats by wind farms have been identified (Bach & Rahmel 2004):

- Collision with turbine blades
- Loss of foraging habitat
- Blocking of commuting or migration routes
- Ultrasound emission by wind turbines

4.2.1. Collision with turbine blades

To date most bat mortalities that have been documented have occurred during late summer or early autumn (Brinkman 2004, Dürr and Bach 2004), particularly during the period mid-July to September, which has suggested that migratory bats may be at high risk. However, recent data from Germany show that significant numbers of bat collisions have occurred at some sites before mid July and that resident bats such as Pipistrelles, also appear to be affected (Brinkmann *et al*. 2006).

The foraging behaviour and habitat preferences of British bats has been well researched (see Altringham 2003; Walsh and Harris 1996a, b) and these observations would be expected to be replicated in Ireland given the species present and landscape similarities. At present however very little is known about bat activity within collision envelope heights and indeed activity levels of bats at elevated locations in Ireland which are typically selected for wind farm/turbine developments.

Guidance on this has been developed by Natural England in Bats and Onshore Wind Turbines: Interim Guidance (Natural England 2009). This document provides guidance on

[1] Barotrauma involves tissue damage to air-containing structures caused by rapid or excessive pressure change; pulmonary barotrauma is lung damage due to expansion of air in the lungs that is not accommodated by exhalation).

assessing the risk posed by wind turbines on various bat species by taking into account various factors including habitat preference and flight behaviour. An assessment of the risk of collision fatalities affecting bat populations was also conducted in this document. These assessments are presented below in **Tables 8** and **9**.

Table 8. Assessing risk posed by turbines by taking account of various factors including habitat preference and flight behaviour (Source: Natural England (2009))

Factor	Low Risk	Medium Risk	High Risk
Habitat preference	Bats preferring cluttered habitat	Bats able to exploit background cluttered space	Bats preferring to use open habitat
Echolocation characteristics	Short range High frequency Low intensity Detection distance ~15m	Intermediate – more plastic in their echolocation	Long range Low frequency High intensity Detection distance ~80m
Weight	Lightest	Medium	Heaviest
Wing shape	Low wing loading Low aspect ratio Broadest wings	Intermediate	High wing loading High aspect ratio Narrow wings
Flight speed	Slow	Intermediate	Fast
Flight behaviour and use of landscape	Manoeuvre well will travel in cluttered habitat Keeps close to vegetation Gaps may be avoided	Some flexibility	Less able to manoeuvre May avoid cluttered habitat Can get away from unsuitable habitat quickly Commute across open landscape
Hunting techniques	Hunt close to vegetation Exploit richer food sources in cluttered habitat Gleaners	Hunt in edge and gap habitat Aerial hawkers	Less able to exploit insect abundance in cluttered habitat Aerial hawker Feed in open
Migration	Local or regional movements	Regional migrant in some parts of range	Long-range migrant in some parts of range

Factor	Low Risk	Medium Risk	High Risk
Conclusion	*Myotis* (most species) Long eared-bats Horseshoe bats	Common pipistrelle Soprano pipistrelle *Serotine *Barbastelle	*Noctule Leisler's bat Nathusius' pipistrelle

* These bat species are not present in Ireland.

Table 9. Risk of Collision Fatalities Affecting Bat Populations, (Source: Natural England (2009), modified to only show Irish Bat Species).

Bat species	Scientific Name	Relative population size and status	Risk of collision^	Population Threat
Common pipistrelle	*Pipistrellus pipistrellus*	Common/Least Concern	Medium	Low
Soprano pipistrelle	*Pipistrellus pygmaeus*	Common/Least Concern	Medium	Low
Brown long eared bat	*Plecotus auritus*	Common/Least Concern	Low	Low
Daubenton's bat	*Myotis daubentonii*	Common/Least Concern	Low	Low
Natterer's Bat	*Myotis nattereri*	Fairly Common/Least Concern	Low	Low
Whiskered Bat	*Myotis mystacinus*	Locally distributed/Least Concern	Low	Low
Brandt's bat	*Myotis brandtii*	Data deficient	Low	Low
Leisler's Bat	*Nyctalus leisleri*	Common/ Near Threatened	High	High
Nathusius's Pipistrelle	*Pipistrellus nathusii*	Rare/Least Concern	High	High
Lesser Horseshoe	*Rhinolophus hipposideros*	Rare/Least Concern	Low	Low

** Based on Known Distribution and ranking in Irish Red Data Book – Terrestrial Mammals.
^ Risk of collision is based on what we currently know about bat behaviour.

There is currently insufficient information available on if and how bats migrate in the Irish/British environment. Leisler's, Nathusius pipistrelle and soprano pipistrelle bats can all migrate over considerable distances. Work conducted under the study team of Professor Altringham has also shown that bats may migrate over 60 miles to swarming sites during the autumn months (Rivers *et. al.* (2006)). However, it is not known if similar long-distance migrations take place in Ireland. Bats in Ireland may migrate only short distances (several kilometres) between summer roosts and winter hibernacula. However bats could still be at risk of collision and baro-trauma during such migrations depending upon the habitats and terrain present and the location of any wind turbines.

4.2.2. Habitat use by bats

In general bats tend to favour areas of broadleaf woodland and water in preference to areas such as open arable fields, improved grassland, and open moorland (Walsh and Harris 1996a, 1996b). Linear features through the landscape such as hedgerows, treelines, watercourses and woodland margins, are of importance for commuting and feeding bats, often providing ecological corridors for movement between isolated habitats. In general the direct loss of habitat associated with the erection of wind turbines and associated infrastructure, i.e. turbine foundations, access tracks and electrical sub-stations, is typically small although the wind farm itself may cover a large area of ground as at Derrybrien.

It is therefore unlikely that direct habitat loss at Derrybrien formed a significant issue for bats although on some sites this could be exacerbated if for example a small local pond used by Daubenton's was lost or works resulted in the drainage of wetland habitats.

The main potential impact in terms of habitat use by bats caused by a turbine/wind farm arises from fragmentation of habitats and the loss of or interference to commuting or migrating routes. These impacts may arise either directly through the removal of a section of hedgerow to facilitate an access track or general avoidance of the area. A study of Serotine bats in Germany found that the bats increasingly avoided a site on which a wind farm was located over a four year period, although they had previously used the area. Such avoidance may also be a species specific reaction as at the same location pipistrelle bats only altered their behaviour depending upon the position of the turbines (Bach (2002)).

Bat abundance has been positively related to the presence of woodland habitat (Walsh and Harris 1996a, 1996b), so it is perhaps not surprising that some researchers have found that bat mortalities appear to be higher in or near forests (Arnett *et al* 2004; Brinkman 2004). Research carried out in Germany has suggested that bats may be at greater risk of collision with wind turbines that have been sited in highly structured landscapes, such as forests (Brinkman 2004; Brinkman *et al* 2006).

4.2.3. Baroutrauma

Bats may also be killed by lung damage due to pressure changes around a rotating rotor blade ("barotrauma") and hence there is no necessity for bats to make contact with a rotor to be killed by its movement.

4.2.4. Disturbance due to ultrasound emission

At present it is unknown how bats react to the ultrasound emissions produced by wind turbines. In a number of cases it has been shown that bats do react to ultrasounds when the intensity/frequency is in the same range as their own sonar calls (Bach & Rahmel (2004)). However with the exception of a few single observations, the way bats react to turbine ultrasounds is completely unknown.

4.2.5. Other Considerations

Grid connections

The power lines connecting wind farms to the national grid can also have impacts on bats in the wider landscape through loss of hedgerows, severance of habitats, etc. but can also create new foraging habitat especially through dense conifer plantations in the landscape.

Site Lighting

Lighting may interfere with bat activity, as it not only can deter some species from foraging in an area but should areas around or near turbines be illuminated this could actually attract other species of bats to the area as they will come to forage on the insects which accumulate below the lights.

Bridge Upgrades

Local bridges which have roosting potential for bats often require strengthening works, pressure grouting, etc. in order to accommodate the construction traffic for the wind farm. This can result in the entombment of bats and loss of roosts.

4.2.6. Operational Impacts

The principal operational impacts on bats arising from operation of any wind farm, is a risk of collision. Recent collision studies conducted at German wind farm sites have shown a significant correlation between rates of collision and extensively forested sites; however, Brinkmann & Schauer-Weisshahn (2006) cautioned that the evaluation of each potential wind farm site on other factors besides forestation is needed. Current evidence largely, but not entirely, suggests that bat mortality in the USA appears to be highest in or near forests (especially forests along ridge tops), more moderate in open areas close to forest, and lowest in open grassland or farmland away from forests (Arnett 2005).

5. RECOMMENDATIONS AND MITIGATION OPTIONS

5.1. Detailed Bat Survey

No baseline surveys of bats were undertaken in advance of the construction of the wind farm at Derrybrien and there has been no monitoring of the operational impacts of the turbines on local populations. The presence of bats using the wind farm site at Derrybrien was confirmed during the recent detector survey on site.

Given the time of year in which this survey was conducted, which is approaching the hibernation period for bats, it is thought that this is an under-representation of the importance of the site for bats. It is therefore recommended that a detailed bat survey is conducted across the active bat season in line with the Bat Conservation Ireland Guidelines for bat surveys of Terrestrial Turbines and Wind Farms in Ireland.

Following this survey work the true significance and importance of the site for local bat populations can be assessed and suitable mitigation measures can then be designed and implemented as appropriate to ensure that the operating wind farm at Derrybrien is not negatively impacting these protected species. Potential mitigation measures are outlined below.

5.2. Collision risk mitigation

Vegetation buffer distance

One of the main mitigation measures recommended to reduce collision risk is that the layout of each turbine is buffered (from the blade tip) a minimum of 50m away from all linear habitat features (e.g. hedgerows, tree-lines, and woodland edges). This buffer distance conforms to the linear feature buffer recommended by Natural England (Mitchell-Jones & Carlin (2008)). This measure generally requires the removal of vegetation within this area to reduce its foraging suitability for bats and will also reduce turbulence for the turbines.

Clearance of such vegetation should take place during the winter months (November – February) which will also avoid the bird breeding season (March – August inclusive). The vegetation in these cleared areas will then need to be removed on an ongoing basis to reduce their attractiveness to bats.

As detailed above in **Table 4** a number of turbines are located in very close proximity to forestry edges (typically within 50m) and thus pose a risk to foraging and commuting bats. Vegetation (principally the conifer plantation) surrounding some of these turbines may need

to be cut back depending on bat activity levels in the area. These are summarised below in **Table10**.

Table 10. Buffer zones required for existing turbines at Derrybrien.

Turbine Number	Observation	Distance from adjoining vegetation likely to be used by bats (m)	Potential risk (H/M/L)	Expand buffer zone to vegetation to >50m
T1	No bat activity recorded	29/35	H	Y
T2	No bat activity recorded	17/37	H	Y
T3	No bat activity recorded	25	H	Y
T4	No bat activity recorded	93/122	M	N
T5	No bat activity recorded	14/35	H	Y
T6	No bat activity recorded	29	H	Y
T7	No bat activity recorded	131	M	N
T8	No bat activity recorded	35	H	Y
T9	No bat activity recorded	50 – 70	M	Y
T10	No bat activity recorded	200	L	N
T11	No bat activity recorded	225	L	N
T12	No bat activity recorded	45	H	Y
T13	No bat activity recorded	270	L	N
T14	No bat activity recorded	290	L	N
T15	No bat activity recorded	285	L	N
T17	No bat activity recorded	90	M	N
T18	No bat activity recorded	35	H	Y
T19	No bat activity recorded	20	H	Y
T20	No bat activity recorded	20	H	Y
T21	No bat activity recorded	30	H	Y
T22	No bat activity recorded	20	H	Y
T23	No bat activity recorded	40	H	Y
T24	No bat activity recorded	130 - 140	L	N
T25	No bat activity recorded	40	H	Y
T26	No bat activity recorded	40 – 60	H	Y
T27	No bat activity recorded	150 - 200	L	N
T28	No bat activity recorded	230	L	N
T29	No bat activity recorded	30	H	Y
T30	No bat activity recorded	25	H	Y
T31	No bat activity recorded	135	L	N
T32	No bat activity recorded	30	H	Y
T33	No bat activity recorded	20	H	Y
T34	No bat activity recorded	280	L	N
T35	No bat activity recorded	50	H	Y
T36	No bat activity recorded	20	H	Y
T37	No bat activity recorded	260	L	N
T38	No bat activity recorded	40	H	Y

Turbine Number	Observation	Distance from adjoining vegetation likely to be used by bats (m)	Potential risk (H/M/L)	Expand buffer zone to vegetation to >50m
T39	No bat activity recorded	25	H	Y
T40	21:18: one quick pass (seemed relatively distant) of unidentified Pipistrelle, not seen.	230	L	N
T41	No bat activity recorded	55	M	N
T42	No bat activity recorded	45	H	Y
T43	No bat activity recorded	140	L	N
T44	No bat activity recorded	45	H	Y
T45	No bat activity recorded	230	L	N
T46	No bat activity recorded	90	M	N
T47	No bat activity recorded	30	H	Y
T48	No bat activity recorded	25	H	Y
T49	No bat activity recorded	35	H	Y
T50	No bat activity recorded	30	H	Y
T51	No bat activity recorded	60	M	N
T52	No bat activity recorded	45 - 90	H	Y
T53	No bat activity recorded	35	H	Y
T54	No bat activity recorded	30	H	Y
T55	No bat activity recorded	30	H	Y
T56	Unidentified pipistrelle bat recorded between here and turbine 57, single pass only, foraging in amongst self sown conifers/scrub	90	M	N
T57	No bat activity recorded	57	M	N
T58	No bat activity recorded	60	M	N
T59	No bat activity recorded	140	L	N
T60	No bat activity recorded	45	H	Y
T61	No bat activity recorded	80	M	N
T62	No bat activity recorded	65	M	N
T63	No bat activity recorded	50	H	Y
T64	No bat activity recorded	50	H	Y
T65	No bat activity recorded	40	H	Y
T66	No bat activity recorded	125	L	N
T67	No bat activity recorded	50	H	Y
T68	No bat activity recorded	10	H	Y
T69	No bat activity recorded	45	H	Y
T70	No bat activity recorded	30	H	Y
T71	No bat activity recorded	25 – 30	H	Y

Operational curtailment

Should the creation of a buffer zone not have the required outcome and bat fatalities are still occurring another option is that of operational curtailment of turbines at low wind speeds as this is when bats are most likely to be foraging in close proximity to the turbines. Operational curtailment refers to selected, short-term periods when turbine rotor blades are intentionally kept from rotating. For bats, the most cost-effective type of operational curtailment appears to be a modest increase in cut-in speed, the lowest wind speed at which the rotor blades spin and generate electricity for the grid. Recent, cutting-edge research at wind farms in Canada, Germany, and the United States shows that increasing the cut-in speed from the usual 3.5–4.0 meters/second to about 6 m/s reduces bat mortality by 50–75 percent, while reducing power generation by only about 1 percent (Arnett, (2010)). This mitigation method has been proven to reduce bat kills from 53 to 87% on any given night, averaging 73%, at turbines that were partially curtailed during low-wind nights compared to those that were fully operational, (Arnett, pers. comm.) Such curtailment measures may only need to be applied to specific turbines within the wind farm where collision risk is high as opposed to across the board.

5.3. Monitoring

It is recommended that a year round bat detector activity survey and three year bat corpse monitoring study of the Derrybrien wind farm is designed and implemented to address if the wind farm is currently having an impact on bat mortality and to assess if the mitigation measures outlined above are working. This is in line with the guidelines issued by EUROBATS (Rodrigues, (2008)).

On completion of the study the results should be made available to the statutory agencies with the understanding that the results will be made available to any interested parties to assess the impacts of wind farms on Irish bat species and populations and to inform future Environmental Impact Studies, Ecological Assessment, and Appropriate Assessment work.

6. CONCLUSION

It is not thought that the peat slide at Derrybrien has had any adverse impacts on the population of lesser horseshoe bats at Lough Cutra Castle as the population there remains in favourable conservation status and is unlikely to have been impacted by this event.

At present it is unknown if the operation of the Derrybrien wind farm is having a negative impact on other species of bats as there has been no baseline surveys conducted during optimum conditions beyond a limited survey which was conducted in November 2011. This

is very late in the active bat season and does not present an accurate representation of how the site is being used by bats and the potential impacts of the wind farm.

It is therefore recommended that a year long bat detector activity survey and three year bat corpse monitoring study of the Derrybrien wind farm is designed and implemented to address if the wind farm is currently having an impact on bat mortality.

A number of possible mitigation measures have been detailed and such a survey will determine if these measures are either required, or once implemented, if they are working.

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8. APPENDIX 1. SITE SYNOPSIS FOR LOUGH CUTRA SAC.

SITE SYNOPSIS

SITE NAME: LOUGH CUTRA

SITE CODE: 000299

Lough Cutra is a large oligo/mesotrophic freshwater lake lying on limestone but with much sediment washed down from the sandstone hills above. This lake is situated about 4 km south-east of Gort, Co. Galway.

This site is a candidate SAC selected for alkaline fen, a habitat listed on Annex I of the EU Habitats Directive, and for Lesser Horseshoe Bat, a species listed on Annex II of the EU Habitats Directive. A series of connected woodlands on the western side of the lake has been included as foraging habitat for these bats.

The vegetation around the lake is diverse, with reedbeds confined to sheltered bays, marshes and fens on sandy and peaty ground and natural and planted woodlands. Shallow water communities include species such as Jointed Rush (*Juncus articulatus*), Bulbous Rush (*J. bulbosus*), Alternate Water-milfoil (*Myriophyllum alternifolium*), Water-plantain (*Alisma plantago-aquatica*), Floating Club-rush (*Scirpus fluitans*), Lesser Water-plantain (*Baldellia ranunculoides*), Water Lobelia (*Lobelia dortmanna*) and Shoreweed (*Littorella uniflora*). Winter flooded areas support marsh vegetation with Common Spike-rush (*Eleocharis palustris*), Common Marsh-bedstraw (*Galium palustre*), Purple-loosestrife (*Lythrum salicaria*), amongst others, and with notable species such as Lesser Meadow-rue (*Thalictrum minus*), Northern Bedstraw (*Galium boreale*) and Blue-eyed-grass (*Sisyrinchium bermudiana*). On wet peaty areas fen vegetation includes Black Bog-rush (*Schoenus nigricans*), Saw *Sedge (Cladium mariscus*) and a range of associated sedges (*Carex* spp.) and fen mosses.

Included in the site is a small (*c.* 3 ha.) turlough, very small areas of alkaline fen and occasional fields with affinities to *Molinia* meadow. A relatively large poor fen is present in the north of the site, adjoining the lake. The mouth of the Owendalulleegh River has formed an unusual delta where a good quality old willow (*Salix cinerea*)-dominated wet woodland has developed behind vegetated sand bars.

Woodland occurs around much of the lakeshore, as well as on a number of islands in the lake. Wet woodland on peat is dominated by Willow (*Salix cinerea*) and Alder (*Alnus glutinosa*). An old record of Irish Spurge (*Euphorbia hybernica*) probably comes from drier woodland which occurs in the Lough Cutra Demesne.

These woodlands provide feeding grounds for Lesser Horseshoe Bats. Between 1999 and 2001 up to 93 bats have been recorded in hibernation at Lough Cutra Castle and it is thought likely that a summer nursery roost also occurs here.

The lake is a regionally/locally important site for waterfowl. Monthly counts between November 1995 and March 1996, as part of an intensive study on flooding in the

catchment, gave the following numbers: Whooper Swan (18), Mallard (101), Teal (69), Tufted Duck (83) and Goldeneye (58). The latter also use the nearly Ballynakill Lough. The lake has a long-established breeding colony of cormorants, with 34 nests in 1996. Higher numbers (166 pairs, 1985) have been recorded in the past. Small numbers also winter on the lake. In recent years there have been no records of Greenland White-fronted Geese from the lake, although in the past flocks of 60-80 birds were regular and were considered to be birds from the Rahasane or Creganna population.

The lake is used for fishing and tourism. Precautions should be taken to ensure the lake and its surrounding area is protected from damaging operations such as application of artificial fertilisers, development close to the lakeshore, drainage and felling of woodland areas.

Lough Cutra is of conservation interest for the range of wetland habitat types it contains, particularly alkaline fen, a habitat listed on Annex I of the E.U. Habitats Directive. The presence of an internationally important colony of Lesser Horseshoe Bats, a species listed on Annex II of the Habitats Directive, and a regionally important population of Cormorants add further interest to the site.

19.2.2004

APPENDIX 6-2

DETAILS OF BAT DETECTOR DEPLOYMENTS.

APPENDIX 6-2

DETAILS OF BAT DETECTOR DEPLOYMENTS AND TOTAL NUMBER OF BAT PASSES FOR 2016 (TABLES 1-2) AND 2019 (TABLES 3-4)

Table 1: Details of static bat detector deployment in 2016

Turbine Location	Latitude	Longitude	April	May	June	July	August
T5	53.091808	-8.6241174	20-24/04/2016	20-24/05/2016	03-07/06/2016	27-31/07/2016	01-05/08/2016
T11	53.092272	-8.6128736	20-24/04/2016	20-24/05/2016	03-07/06/2016	01-05/07/2016	01-05/08/2016
T13	53.086936	-8.6232162	20-24/04/2016	20-24/05/2016	03-07/06/2016	01-05/07/2016	01-03/08/2016
T15	53.088741	-8.6175084	20-22/04/2016 27-29/04/2016	20-24/05/2016	03-07/06/2016	27-31/07/2016	01-05/08/2016
T17	53.090313	-8.6110282	20-24/04/2016	20-22/05/2016	03-07/06/2016	01-05/07/2016	01-05/08/2016
T18	53.084101	-8.6244607	20-24/04/2016	20-22/05/2016	03-07/06/2016	01-05/07/2016	01-05/08/2016
T21	53.086730	-8.6154485	20-22/04/2016 27-29/04/2016	20-24/05/2016	03-03/06/2016 23-24/06/2016	27-31/07/2016	01-05/08/2016
T27	53.096550	-8.6007285	20-24/04/2016	20-24/05/2016	03-07/06/2016	01-05/07/2016	01-05/08/2016
T32	53.092478	-8.5938191	20-24/04/2016 27-29/04/2016	20-23/05/2016	03-07/06/2016	01-05/07/2016	01-05/08/2016
T33	53.098096	-8.5948491	20-24/04/2016 27-29/04/2016	20-24/05/2016	03-07/06/2016	01-05/07/2016	01-05/08/2016
T41	53.094797	-8.5859227	20-24/04/2016	20-24/05/2016	03-07/06/2016	27-31/07/2016	01-05/08/2016
T54	53.096472	-8.6180663	20-24/04/2016	20-23/05/2016	N/A	01-05/07/2016	01-05/08/2016
T59	53.093612	-8.6193109	20-24/04/2016	20-24/05/2016	03-07/06/2016	01-05/07/2016	N/A

Turbine Location	Latitude	Longitude	April	May	June	July	August
T62	53.096472	-8.6097407	20-21/04/2016 27-29/04/2016	20-22/05/2016	03-07/06/2016 23-26/06/2016	N/A	01-05/08/2016
T65	53.098405	-8.6005998	27/04/2016- 02/05/2016	20-22/05/2016	03-07/06/2016	29-31/07/2016	01-05/08/2016
T67	53.094179	-8.6067367	20-21/04/2016 27-29/04/2016	20-22/05/2016	03-05/06/2016 23-25/06/2016	01-05/07/2016	N/A
T70	53.089024	-8.6051488	20-21/04/2016 27-29/04/2016	20-24/05/2016	03-07/06/2016	01-05/07/2016	01-05/08/2016
T71	53.089849	-8.6022735	20-24/04/2016	20-22/05/2016	03-05/06/2016 23-25/06/2016	01-05/07/2016	N/A

Table 2: Number of bat passes recorded during automated surveys (April-August 2016)

Bat species	T5	T11	T13	T15	T17	T18	T21	T27	T32	T33	T41	T54	T59	T62	T65	T67	T70	T71	Total
Common / Nathusius' pipistrelle	1	5	2	2				17	10	1	1				3		27	13	**82**
Common pipistrelle	79	118	57	33	3	125	9	165	428	382	548	7	6	1	233	14	273	270	**2751**
Common / Soprano pipistrelle						1				2	42				3		1		**49**
Soprano pipistrelle	10	2	7	6	6	7	2	15	24	36	118	3		1	81		21	21	**360**
Myotis species	2	20	2	1	15	14	4	4	9	2	2	3	1		3	6	7	2	**97**
Myotis / Long-eared bat sp.									2	1									**3**

Bat species	T5	T11	T13	T15	T17	T18	T21	T27	T32	T33	T41	T54	T59	T62	T65	T67	T70	T71	Total
Long eared bat sp.	2	2	1	1		6		1	1		2						4		**20**
Leisler's bat	236	373	126	106	683	735	836	1290	71	1697	69	355	63	35	470	55	1424	1123	**9747**
Total	**330**	**520**	**195**	**149**	**707**	**888**	**851**	**1492**	**545**	**2121**	**782**	**368**	**70**	**37**	**793**	**75**	**1757**	**1429**	**13109**

Table 3: Details of static bat detector deployment 2019

Turbine Location	Latitude	Longitude	Deployment date	Collection date	Number of nights recorded
T5	53.09195	-8.62396	29/08/2019	10/09/2019	10
T15	53.08865	-8.61737	29/08/2019	05/09/2019	7.5
T18	53.08398	-8.62435	29/08/2019	10/09/2019	10
T32	53.0925	-8.59359	29/08/2019	10/09/2019	10
T33	53.09819	-8.5946	29/08/2019	10/09/2019	10
T53	53.09639	-8.61792	29/08/2019	10/09/2019	10
T62	53.09654	-8.6097	29/08/2019	10/09/2019	10
T65	53.09851	-8.60054	29/08/2019	10/09/2019	10
T67	53.09424	-8.60684	29/08/2019	10/09/2019	10
T71	53.08982	-8.60207	29/08/2019	10/09/2019	10
T2	53.09292	-8.62818	10/09/2019	24/09/2019	10
T13	53.08701	-8.62311	10/09/2019	24/09/2019	10

Turbine Location	Latitude	Longitude	Deployment date	Collection date	Number of nights recorded
T17	53.09013	-8.61096	10/09/2019	24/09/2019	10
T28	53.09383	-8.59785	10/09/2019	24/09/2019	10
T38	53.09402	-8.58852	10/09/2019	24/09/2019	10
T44	53.09958	-8.58225	10/09/2019	24/09/2019	10
T49	53.09877	-8.61697	10/09/2019	24/09/2019	10
T56	53.09786	-8.61264	10/09/2019	24/09/2019	10
T58	53.09933	-8.606	10/09/2019	13/09/2019	4
T59	53.0933	-8.61921	10/09/2019	24/09/2019	10
T69	53.09192	-8.60493	10/09/2019	24/09/2019	10
T3	53.09012	-8.62996	24/09/2019	08/10/2019	10
T8	53.09022	-8.62116	24/09/2019	08/10/2019	10
T11	53.09246	-8.61283	24/09/2019	08/10/2019	10
T21	53.08664	-8.61524	24/09/2019	08/10/2019	10

Turbine Location	Latitude	Longitude	Deployment date	Collection date	Number of nights recorded
T27	53.09661	-8.6007	24/09/2019	08/10/2019	10
T37	53.09637	-8.58861	24/09/2019	08/10/2019	10
T39	53.09946	-8.58911	24/09/2019	08/10/2019	10
T47	53.09712	-8.62329	24/09/2019	08/10/2019	10
T51	53.10048	-8.61144	24/09/2019	08/10/2019	10
T70	53.08903	-8.60499	24/09/2019	08/10/2019	10
T41	53.09499	-8.58586	24/09/2019	08/10/2019	10

Table 4: Number of bat passes recorded at turbines during automated surveys 2019

Turbine Location	Nathusius' pipistrelle	Common / Nathusius' pipistrelle	Common pipistrelle	Common / Soprano pipistrelle	Soprano pipistrelle	Myotis sp.	Myotis / Long-eared bat sp.	Long eared bat sp.	Leisler's bat	Unidentified bat species	Total
T11			23	2	9	5		1	10		50
T13		14	533	48	83	5	2	2	78	3	768
T15					3	3	1		2		9
T17		23	392	73	82	8	8	10	211	5	812
T18		25	483	114	93	10	4	5	29	30	793
T2		20	2463	258	776	20	2	17	265	15	3836
T21		8	379	9	49	5		4	16	1	471
T27			66	4	4	1			30		105
T28	6	5	193	256	97	7	6	10	161	5	746
T3		4	65		5	35		2	9		120

Turbine Location	Nathusius' pipistrelle	Common / Nathusius' pipistrelle	Common pipistrelle	Common / Soprano pipistrelle	Soprano pipistrelle	Myotis sp.	Myotis / Long-eared bat sp.	Long eared bat sp.	Leisler's bat	Unidentified bat species	Total
T32		1	527	181	148	288	17	5	5	12	1184
T33	1	1	115	13	63	29	11	10	7	4	254
T37		1	5	2	2	3			7		20
T38		25	811	153	263	21	7	11	283	15	1589
T39			12	1	3				2		18
T41			21	4	3	2		2	1		33
T44		14	374	73	79	4	38	5	63	3	653
T47		4	21	3	12	4		3	16		63
T49		14	428	95	402	13	9	9	224	3	1197
T5		1	166	7	54	23	5	4	9	1	270
T51			6	1		4					11

Turbine Location	Nathusius' pipistrelle	Common / Nathusius' pipistrelle	Common pipistrelle	Common / Soprano pipistrelle	Soprano pipistrelle	Myotis sp.	Myotis / Long-eared bat sp.	Long eared bat sp.	Leisler's bat	Unidentified bat species	Total
T54			58		13	6	4	3	13	1	98
T56		2	123	26	56	17	3	11	135		373
T58			71	2	30	4	2	2	33		144
T59		5	108	28	35	11	4	8	75		274
T62			5		3	10	4	2	1	2	27
T65			93	7	62	15	3	11	17	23	231
T67			15	5	5	10	3		3	1	42
T69		18	723	90	475	12	7	14	294	139	1772
T70		2	70	12	34	8		2	11	2	141
T71			35	4	26	4	4	3	20	33	129
T8		2	13	2	2	3			9		31

Turbine Location	Nathusius' pipistrelle	Common / Nathusius' pipistrelle	Common pipistrelle	Common / Soprano pipistrelle	Soprano pipistrelle	Myotis sp.	Myotis / Long-eared bat sp.	Long eared bat sp.	Leisler's bat	Unidentified bat species	Total
Total	**7**	**189**	**8397**	**1473**	**2971**	**590**	**144**	**156**	**2039**	**298**	**16264**

APPENDIX 6-3

BAT MITIGATION REPORT OF THE BAT DEROGATION LICENCE

APPENDIX 6-3

BAT MITIGATION REPORT OF THE BAT DEROGATION LICENCE

Derogation Number
DER-BAT-2025-170 (amended)

EUROPEAN COMMUNITIES (BIRDS AND NATURAL HABITATS) REGULATIONS, 2011 (S.I. No 477 of 2011)

DEROGATION

Granted under Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011, hereinafter referred to as "the Habitats Regulations".

The Minister for Housing, Local Government & Heritage, in exercise of the powers conferred on him by Regulation 54 of the Habitats Regulations hereby grants to **John Gartland** of **Gort Windfarms Ltd., 27 Fitzwilliam Street Lower, Dublin 2, D02 KT92** a derogation. It is stated that this derogation is issued:

A. In the interests of public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment
B. As there is no satisfactory alternative, and the action authorised by this derogation will not be detrimental to the maintenance of the population of **bats** referred to below at a favourable conservation status in their natural range.

This derogation authorises the following:

1. Roost disturbance
2. Actions authorised within the derogation

The derogation is issued in respect of the following **bat species**:

- **Brown Long-Eared Bat** **Plecotus Auritus**
- **Common Pipistrelle** **Pipistrellus Pipistrellus**
- **Soprano Pipistrelle** **Pipistrellus Pygmaeus**

Terms and Conditions

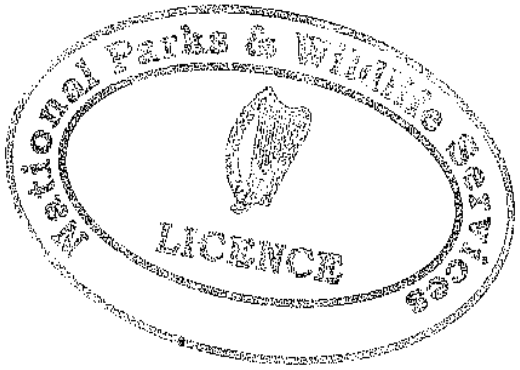
1. This derogation is granted solely to allow the activities specified in connection with the works located at **Derrybrien Wind Farm, Derrybrien North, Kylebrack, Loughrea, County Galway, H62 PE08**, for **John Gartland.**
2. All activities authorised by this derogation, and all equipment used in connection herewith, shall be carried out, constructed and maintained (as the case may be) so as to avoid unnecessary injury or distress to any species of **BAT**. Anything done other than in accordance with the terms of this derogation may constitute an offence
3. This derogation may be modified or revoked, for stated reasons, at any time.
4. The mitigation measures outlined in the application report (**Derrybrien Bat Survey and Mitigation Report_Final**), together with any changes or clarification agreed in correspondence between NPWS and the agent or applicant, are to be carried out. Strict adherence must be paid to all the proposed measures in the application.
5. The actions which this derogation authorise shall be completed between **26th February – 31st December 2025, inclusive.**
6. The works will be supervised by bat ecologists: **Kate-Marie O'Connor & David Daly**
7. If this derogation addresses works that are subject of a planning application, no such works permitted under this derogation can occur until planning permission is granted.
8. If this derogation expires prior to works permitted under this derogation commencing, a new application must be sought in advance, including the provision of any updated data or reports.
9. This derogation shall be produced for inspection on a request being made on that behalf by a member of An Garda Síochána or an authorised NPWS officer appointed under Regulation 4 of the Habitats Regulations.
10. The local **NPWS Regional Manager,** rebecca.teesdale@npws.gov.ie**,** must be contacted prior to the commencement of any activity, and if bats are detected on site during the course of the work, under the terms of this derogation.
11. On completion of the actions which this derogation authorises, all recordings of bat species affected will be made using the standardised data form provided below and must be submitted to the NPWS **within four weeks of the expiry date of this licence**. Included with the below returns form, a report will also be submitted to wildlife.reports@npws.gov.ie detailing results of works and success of mitigation. **Both documents must be submitted to constitute a derogation return.**

For the Minister for Housing, Local Government & Heritage

(an officer authorised by the Minister to sign on his behalf)

19 March 2025

Any query in relation to this derogation should be sent to reg54derogations@npws.gov.ie



Article 16 (Habitats Directive) - Returns Form

This returns form is for use in respect of:

Regulation 54 – Derogation to protect wild fauna and conserving natural habitats

1st January to 31st December 2025, inclusive

Derogation Number: DER-BAT-2025-170 (amended)
Derogation Holder: John Gartland

Species (English & Scientific)	No. of Individuals Affected	No. of Breeding Places	No. of Resting Places

Derogation Holder Signature: _____ Date: _____

Returns must be emailed to the following email address:

wildlife.reports@npws.gov.ie

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Derrybrien Wind Farm Development Decommissioning Project

Bat Survey and Mitigation Report

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Client	ESB
Project	Derrybrien Wind Farm Development Decommissioning Project, Bat Survey and Mitigation Report
Version	FINAL
Project number	P22-408

	Name	**Position**	**Date**
Originated	Daniel Foster	Principal Ecologist BSG Ecology	18 September 2023
Reviewed	Rachel Potter	Principal Ecologist BSG Ecology	09 January 2024
Reviewed	Kate-Marie O'Connor	Senior Ecologist ESB	20 September 2024
Issued	Rachel Potter	Principal Ecologist BSG Ecology	25 September 2024

Disclaimer

This report is issued to the client for their sole use and for the intended purpose as stated in the agreement between the client and BSG Ecology under which this work was completed, or else as set out within this report. This report may not be relied upon by any other party without the express written agreement of BSG Ecology. The use of this report by unauthorised third parties is at their own risk and BSG Ecology accepts no duty of care to any such third party.

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Any recommendation, opinion or finding stated in this report is based on circumstances and facts as they existed at the time that BSG Ecology performed the work. The content of this report has been provided in accordance with the provisions of the CIEEM Code of Professional Conduct. BSG Ecology works where appropriate to the scope of our brief, to the principles and requirements of British Standard BS42020.

Nothing in this report constitutes legal opinion. If legal opinion is required the advice of a qualified legal professional should be secured. Observations relating to the state of built structures or trees have been made from an ecological point of view and, unless stated otherwise, do not constitute structural or arboricultural advice.

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1 B Introduction

B1 Background to activity [location, ownership, type of and need for the proposed development, planning history, land allocation in Local Plan (or equivalent), etc]

Existing Derrybrien Wind Farm - Site Context

1.1 Derrybrien Wind Farm is owned and operated by Gort Windfarms Ltd, a wholly owned subsidiary company of ESB. The wind farm site is leased from a private landowner.

1.2 Construction of the Derrybrien Wind Farm Development was completed in 2006 and the wind farm had been generating renewable wind energy until early 2022.

1.3 Derrybrien Wind Farm is in County Galway in the northern part of the Slieve Aughty Mountains approximately 11 km due south of Loughrea, 12.7 km north northeast of Gort and 24 km west of Portumna. Galway City lies some 35 km to the northwest of the wind farm site. The wind farm site is in the south of the county approximately 4.6 km from the border with County Clare and 21 km from the border with County Tipperary in the southeast.

1.4 As illustrated in **Figure B1**, the existing Derrybrien Wind Farm Development includes the Derrybrien Wind Farm (including Derrybrien 110 kV substation), the Derrybrien to Agannygal 110 kV Overhead Line (OHL) and the Agannygal 110 kV Substation. A summary of these is provided below.

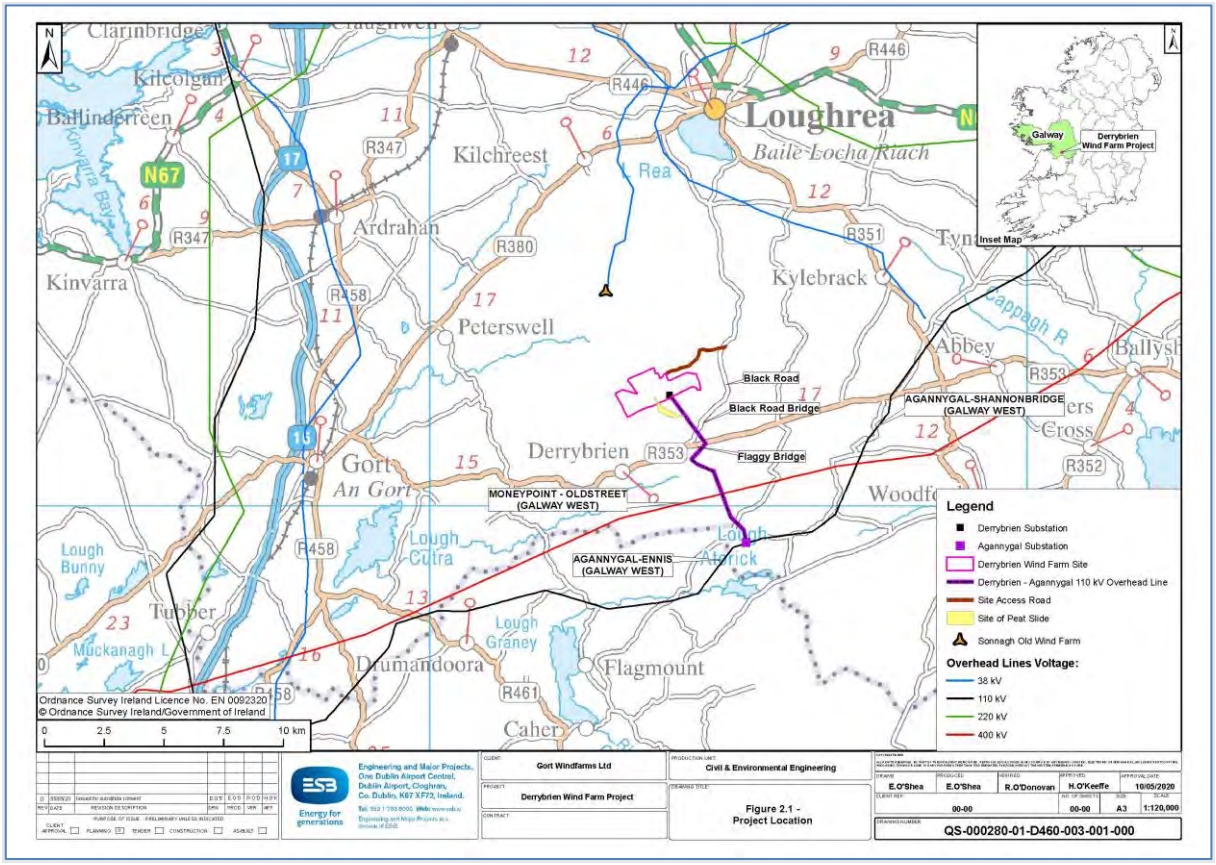

Figure B1 Site Location of Derrybrien Wind Farm

1.5 **Derrybrien Wind Farm Site:** The overall area of the wind farm site is approximately 344.5 ha, but the wind farm infrastructure occupies only a small proportion of this area (31.1 ha - approximately 9% of site). The wind farm site is accessed from a Coillte access road via a minor public road known as the Black Road (approximately 3.1 km from the wind farm to the Black Road/Coillte junction).

1.6 The main wind farm infrastructure comprises 70 turbines, crane hard standings, 17.5 km of access tracks within the site (including 14.6km of floating access tracks), drainage channels, borrow pits/quarries, on site material storage, the Derrybrien110 kV substation (including the control building), direct buried electric cables and anemometer masts.

1.7 **Derrybrien to Agannygal 110 kV Overhead Line:** The Derrybrien to Agannygal 110 kV Overhead Line (OHL) is the grid connection constructed for exporting the electricity generated at the wind farm to the national grid. It begins at the Derrybrien Substation (located within the Derrybrien wind farm site, ITM 559916E, 704736N) and ends at the Agannygal Substation (located to the south-east of the windfarm site, ITM 563118E, 698593N).

1.8 The grid connection comprises of c. 7.8 km 110 kV conductor, 34 no. double wood pole structures, 2 no. end masts, 5 no. angle masts and 1 no. intermediate mast. The OHL connects into the Ennis – Shannonbridge line at the Agannygal 110kV Substation. The Agannygal 110kV substation splits this line into two circuits: Agannygal - Shannonbridge (Galway West) and Agannygal - Ennis (Galway West).

1.9 **Agannygal 110 kV Substation:** The Agannygal 110kV substation (including the control building) is located within the townland of Loughatorick North and the approximate centre point of Agannygal Substation is at ITM co-ordinates 563118E, 698593N. The site is owned by Gort Windfarms Ltd.

1.10 The nearest villages to Agannygal 110kV substation are the following: Derrybrien – 5 km to the northwest of the site, Ballynakill – 8.7 km to the northeast, Woodford – 10 km to the east and Flagmount – 8.4 km to the southwest.

1.11 Access to the Agannygal 110kV substation and overhead line structures is from nearby roads and forestry tracks. The substation site is located within the townland of Loughatorick North.

Project Need

1.12 In 2019, pursuant to proceedings before the Court of Justice of the European Union (Case C-261-18), Ireland was found to have failed to take measures necessary to fulfil a number of obligations arising from the Environmental Impact Assessment (EIA) Directive.

1.13 On foot of that judgment and the legislative provisions set out under section 177B of the 2000 Act, on 23rd July 2020, Galway County Council directed Gort Windfarms Ltd to seek substitute consent for the development, described in the relevant notice as: '*the development of a windfarm, including ancillary development which includes service roadways, control house, transformer compounds and anemometer mast and associated development of a grid connection at Derrybrien West, Derrybrien East, Derrybrien North, Toormacnevin, Bohaboy, Caheranearl and Boleyneendorrish, all in the County of Galway, more particularly described in the grant of planning permission as set out in Schedule 2*', with Schedule 2 specifying the relevant Galway County Council planning references as 973470, 973652, 992377, 004581, 023560, 035637, 05317 and 05316.

1.14 Accordingly, an application was submitted to An Bord Pleanála (ABP) in August 2020 for substitute consent (reg. ref. ABP-308019-20) – relating to the retention and continued operation of the subject development, until its eventual decommissioning.

1.15 In February 2022, ABP refused the application for substitute consent made by Gort Windfarms Ltd in relation to the Derrybrien Wind Farm Development. As a consequence of the refusal of substitute consent, the development is now deemed to be unauthorised development,

1.16 On 29th August 2024 an enforcement notice was issued by Galway County Council requiring Gort Windfarms Ltd to '[decommission] and where appropriate in terms of possible environmental impacts on the environment at this location, [to remove] the unauthorised windfarm and associated ancillary structures'.

1.17 If the decommissioning works do not proceed it would not be possible for Gort Windfarms Ltd to comply with the stated requirements of Galway County Council as set out in the enforcement notice

EN23/235 – namely to decommission and, where appropriate in terms of possible environmental impacts on the environment at this location, remove the unauthorised windfarm and associated ancillary structures, subject to the applicable consent(s) / permissions(s) from the appropriate authority or authorities.

Alternatives Considered as part of the EIA Process

1.18 In relation to the Derrybrien Wind Farm Development, An Bord Pleanála have refused an application for substitute consent which would have authorised the continued operation of the windfarm and ancillary development (ABP-308019-20). The development is now unauthorised and is the subject of an enforcement notice that requires the decommissioning and removal of the unauthorised wind farm and unauthorised ancillary structures.

1.19 The only alternatives that can be considered relate only to its decommissioning and removal. The 'decommissioning alternatives' that have been considered are listed and summarised below:

- Alternative 1 - "Do-Nothing"
- Alternative 2 – Remove all development associated with the Derrybrien Wind Farm Development.
- Alternative 3 – 'Practicable Restoration' i.e. remove and alter existing structures on the site and, restore the site in so far as is practicable, while minimising risks to safety and the environment.

1.20 Alternative 1 "Do-Nothing" whereby all features associated with the existing Derrybrien Wind Farm Development would remain in situ in their current state – i.e., an unauthorised windfarm development that ceased commercial electricity generation in February 2022.

Alternative 1 does not facilitate the removal of the unauthorised windfarm and associated ancillary structures and is therefore in direct contravention of the enforcement notice. If the steps specified in the Enforcement Notice are not taken within a period of 36 months from the date of service of the Enforcement Notice, or an extended period as the planning authority may allow, Galway County Council may enter on the land and take such steps, including the removal, demolition, or alteration of any structure, and recover the expenses it has incurred from Gort Windfarms Ltd. Under section 156 of the 2000 Act it is an offence not to comply with an enforcement notice. Due to these legal ramifications for Gort Windfarms Ltd, the Do-Nothing scenario is not a feasible alternative.

1.21 Alternative 2 includes the total removal of all development at the Derrybrien Wind Farm Development. A breakdown of the works included in Alternative 2 is included below:

Derrybrien Windfarm including the Derrybrien 110kV Substation

- Controlled dismantling and removal of 70no. wind turbines (blades, nacelle, and tower) including their reinforced concrete foundations. Backfilling of the open excavations with suitable source of glacial till and peat to blend the area into the surrounding blanket bog.
- Controlled dismantling and removal of Derrybrien 110kV Substation including any reinforced concrete foundations within the substation compound. Backfilling of the open excavations with suitable source of glacial till and peat to blend the area into the surrounding blanket bog.
- Controlled dismantling and removal of 2no. anemometer masts including their reinforced concrete foundations and backfilling of the open excavations with suitable source of glacial till and peat to blend the area into the surrounding blanket bog.
- Removal of de-energised underground Electrical and communication cables. Note: It is physically possible to remove the underground cables by excavating open trenches along the cable routes using low ground bearing pressure tracked excavators working directly on the peat. However, this is considered a high-risk activity with regards to peat stability.
- Excavation and removal of c.17.5km access tracks network within the Derrybrien Wind Farm Site including those reconstructed after the peat slide (T68 and between T23-T70). Subsequent landscaping to match adjoining areas.

- Excavation and removal of 70no. hardstand areas and re-profiling of the adjacent areas and covering with 0.5 -1.0m of vegetated peat to blend into the surrounding blanket bog.
- Removal of naturalised peat repositories area.
- Reinstatement of the 3no. Borrow Pits / queries through infilling with material from removed access tracks and hardstands.
- Site restoration works, subsequent landscaping and bog rehabilitation measures through active drain blocking (where feasible) is also included.

Derrybrien to Agannygal 110 kV OHL and Agannygal 110kV Substation

- Destringing of the overhead line conductor
- Removal of the overhead line infrastructure (34 no. double wood pole structures and 8 no. masts)
- Controlled removal of Agannygal substation and demolition of control building
- Controlled removal of standby generator (bunded) and diesel tank, external lighting poles, lightning mast
- Removal of palisade fencing
- Removal and reinstatement of the reinforced concrete foundations for the control building and compound hardstand areas.
- Removal and reinstatement of hardcore surfaced access track
- Reinstatement of the Ennis-Shannonbridge 110kV Line.

Off-site Features constructed in response to the peat slide

- Extensive vegetation clearance and the construction of new haul routes to enable access to each offsite feature. Construction of temporary compound for the duration of the works.
- In-stream works to remove Barrage No.1 and Coillte forestry access track followed by riverbank reinstatement works.
- Infilling of minor borrow pit adjacent to Barrage No. 1 through using material removed from Barrage No.1 and other imported material if required.
- In-stream works to remove Barrage No.2 and Coillte forestry access track followed by riverbank reinstatement works.
- Removal of naturalised peat repository area adjacent to Barrage No. 2 and offsite disposal of material.
- In-stream works to remove Barrage No. 3 followed by riverbank reinstatement works.
- Removal of naturalised peat repository area adjacent to Barrage No. 3 and offsite disposal of material.
- In-stream works to remove Barrage No. 4 followed by riverbank reinstatement works.
- Removal of naturalised peat repository area at the Black Road Bridge adjacent to Barrage No. 3 and offsite disposal of material.
- Reinstatement of naturalised drainage diversion works.
- Repair works to Black Road Bridge, Flaggy Bridge and Unnamed Bridge C would remain in-situ.
- Removal of temporary haul routes and temporary compounds followed by ground reinstatement.

This alternative would involve significant civil engineering works to remove roads, reinforced turbine foundations, demolition and removal of the concrete foundations and surface buildings, etc. The works would likely be carried out mechanically using hydraulic excavators, rock breakers and earthmoving transport vehicles similar to the equipment that was used during the project construction phase.

This alternative complies with the enforcement notice as it achieves the removal of the unauthorised structures within the Derrybrien Wind Farm Development. However, it carries significant environmental, geotechnical and safety risks. For example, the intensive earthworks operations, large excavations in the peat and glacial subsoils, hydraulic breaking of reinforced concrete and the movements of fully laden heavy earthmoving trucks across access tracks – of a similar level to the original construction have the potential to give rise to peat instability increasing the risk of a future peat slide. Due to these significant risks, Alternative 2 is not a feasible alternative.

1.22 Alternative 3 'Practicable Restoration' includes the removal of the above ground structures only, leaving below ground features in situ. Alternative 3 includes the removal of the 70 turbines structure, the Derrybrien substation, the overhead line and the Agannygal Substation. The following below ground structures would remain in situ:

Derrybrien Windfarm including the Derrybrien 110kV Substation

- Reinforced concrete foundations for 70no. wind turbines.
- Reinforced concrete foundations of structures within the Derrybrien Substation compound.
- Reinforced concrete foundations of 2no. Anemometer masts.
- Approx. 17.5km of access tracks and 70no. hardstand areas
- Underground Electrical and communications cabling.
- 3no. Borrow Pits / Quarries
- Naturalised Peat Repository areas
- Onsite Drainage Infrastructure.

Derrybrien to Agannygal 110 kV OHL and Agannygal 110kV Substation

- Concrete foundations for 34no. double wooden pole sets.
- Reinforced concrete foundations for 2no. end masts.
- Reinforced concrete foundations for 5no. angle masts.
- Reinforced concrete foundations for 1no. intermediate mast.
- Reinforced concrete foundations of structures within the Agannygal Substation compound.

Off-site Features constructed in response to the peat slide

- Barrage 1 and Coillte Access Track.
- Barrage 2 and Repository Area.
- Barrage 3 and Repository Area.
- Barrage 4.
- Repository Area at the Black Road Bridge.
- Minor repairs work to instream structures/bridges – at Black Road Bridge, Flaggy Bridge, the Farmer's Track / Culvert, Crooked Bridge and Stepping Stones.
- Minor borrow pits used to source material.
- Drainage works.

The alternative complies with the enforcement notice as it achieves the removal of the unauthorised structures within the Derrybrien Wind Farm Development and significant reduces the level of ground disturbance as a means of lowering the geotechnical risk and potential impacts to the environment in general. As such it is considered to be the only feasible alternative.

Derrybrien Wind Farm Development Decommissioning Project

1.23 To comply with the enforcement notice and to minimise environmental risks on the site, Gort Windfarm Ltd are proceeding with Alternative 3 which includes the following:

Derrybrien Wind Farm (including the Derrybrien 110kV substation)

All above ground structures will be removed, leaving the wind turbine foundations, underground LV cables, meteorological mast foundations and substation foundations in situ. Any protruding foundations or structures will be cut to below ground level and infilled and levelled to match adjoining areas. Works would be confined to areas within the control of Gort Windfarms Ltd.

Derrybrien to Agannygal 110 kV Overhead Line (OHL) and Agannygal 110kV Substation

All overhead line pole sets and masts will be cut at c.300mm below ground level and removed from site. The reinforced concrete bases for angle masts would be left in situ. All above ground structures would be removed from the Agannygal 110kV substation. The palisade fencing surrounding the substation would be dismantled and removed from site. The reinforced concrete base and the platform for the substation would be left in-situ. Once the Derrybrien-Agannygal 110 kV OHL and Agannygal substation is removed, the Ennis-Shannonbridge 110kV OHL would be reinstated.

Work Area Offsite ancillary works associated with peat slide (2003)

No development works would be carried out to decommission the offsite ancillary works associated with the peat slide in 2003. All features associated with the peat slide 2003 (Barrages 1 – 4, peat repositories and the minor borrow pit adjacent to Barrage 1) which have naturalised and become heavily vegetated over the past 20 years and are virtually imperceptible today, will remain in situ. There will be no requirement for vegetation clearance, construction of temporary compounds and haul routes to access the works areas and there be no requirement for instream works to remove any items.

1.24 In order to comply with the enforcement notice, Gort Windfarms Ltd are seeking Prospective Development Consent and Substitute Consent for the decommissioning of the Derrybrien Wind Farm Development

- "Prospective Development" - the carrying out of decommissioning works to remove the majority of above-ground features from the site – including all turbines, masts, electrical plant, overhead lines etc; and enable the final decommissioning of the site (the "prospective development" and "prospective works"); and

- "Retained Development" - the 'retention' in situ and in perpetuity of part of the existing development – including at-ground and below-ground structures such as turbine and other foundations; and development associated with historic peat slide events that occurred during construction such as barrages, peat repositories, on-site borrow pits / quarries etc.

1.25 The "Prospective Development" planning application will be submitted along with its Environmental Impact Assessment Report, while the "Retained Development" substitute consent application will be submitted along with its remedial Environmental Impact Assessment Report.

Land allocation in Local Plan (or equivalent).

The lands are un-zoned.

B2 Full details of proposed works on site that are to be covered by the licence (including a site plan at Section E7). The site may be inspected by an NPWS representative, so the details given should clearly reflect the extent of the project and leave no room for doubt. This information will be used to compare site conditions with the Method Statement.

1.26 Derrybrien Substation supports a day roost of common pipistrelle *Pipistrellus pipistrellus* bat. Agannygal Substation supports day roosts of common pipistrelle, soprano pipistrelle *Pipistrellus pygmaeus* and brown long-eared *Plecotus auritus* bats. As already noted, the enforcement notice issued by Galway County Council requires the removal of the unauthorised windfarm and associated ancillary structures'. This includes both substation buildings which will result in the destruction of the bat roosts.

1.27 Prior to demolition works commencing bat boxes will be installed in two locations (near Derrybrien Wind Farm substation and near Agannygal Substation). These will act as receptor sites to relocate any bats found during works, and as long-term mitigation for the destroyed roosts. The confirmed roosts, and other potential roost areas on the buildings, will be carefully dismantled by hand under ecological supervision. Bats encountered during this work will be captured and transported from these roosts to the bat boxes.

2 C Survey and site assessment

C1 Pre-existing information on species at survey site

2.1 Bat surveys were undertaken between 2011 and 2023 within the wider Derrybrien Wind Farm site. All work completed during and after 2016 has been completed by BSG Ecology. This work included nocturnal activity surveys (driven transects and static bat detectors) and bat fatality searches using specialist search dogs. Species recorded during the activity surveys within the wider Derrybrien Wind Farm include common pipistrelle, soprano pipistrelle *Pipistrellus pygmaeus*, Nathusius's pipistrelle *Pipistrellus nathusii*, *Myotis* species, brown long-eared bat and Leisler's bat *Nyctalus leisleri*. Roost records obtained during this work are reported separately within Sections C2 – C10 of this document.

C2 Status of the species in the local/regional area

2.2 Bat Conservation Ireland (BCI) data was initially obtained for a 10 km search area around the Derrybrien Wind Farm site in 2012 (Wilson, 2012). Two lesser horseshoe *Rhinolophus hipposideros* bat roosts were identified at Thor Ballylee and Cloonbeg (both in County Galway) 9.3 km and 10 km west of the site respectively. In addition, roosts of brown long-eared bat, soprano pipistrelle and *Myotis* species were identified at a location approximately 10 km to the east of the site.

2.3 Updated data from BCI was obtained for a 10 km search area around the site in 2024. This included an additional brown long-eared and Natterer's bat roost approximately 3.1 km south west of the site, and a second brown long-eared roost approximately 7.1 km south west of the site.

2.4 A review of bat records from the National Biodiversity Data Centre and BCI data from 2024 indicates that common pipistrelle, soprano pipistrelle, Nathusius's pipistrelle, lesser horseshoe bat, Leisler's bat, brown long-eared bat, Daubenton's bat *Myotis daubentonii*, whiskered bat *Myotis mystacinus*, and Natterer's bat *Myotis nattereri* have been recorded within 10km of the site. The information obtained from BCI (Wilson, 2012) reflects these findings, with no other species recorded.

C3 Objective(s) of survey

2.5 The objectives of the bat survey work at Derrybrien Substation and Agannygal Substation were to determine the presence / likely absence of roosting bats, and characterise the roosts present.

C4 Survey area

2.6 The majority of bat survey work at the Derrybrien Wind Farm Site has been completed since 2016. Initially surveys were conducted to inform the remedial EIAR for the Site, and latterly (following refusal of the application) the decommissioning EIAR. The purpose of the surveys was originally to inform the Remedial EIA by characterising the bat community of the Site, assessing the impacts of the construction and operation of the wind farm, and subsequently to inform the decommissioning of the non-operational wind farm.

2.7 As part of an initial appraisal, habitats at the turbine locations and their proximity to features (such as pools and forest edge) were categorised. This informed the scope of sampling using static detectors; representative locations were selected and sampling undertaken over several years. Initially (in 2016) driven transects with stopping points were also completed; however subsequent changes in guidance removed the need for transect survey. Dog searching for bat carcasses was also completed at varying intensity prior to and post the implementation of a curtailment regime. Latterly, to inform the decommissioning EIAR, assessments were made of the potential of trees and buildings within and close to the project footprint to support roosting bats.

2.8 Derrybrien Substation is located within Derrybrien Wind Farm, close to its southern boundary at ITM 559915 704730. Agannygal Substation is located approximately 6.8 km south of the main Derrybrien Wind Farm at Irish Grid Reference ITM 563095 698604.

C5 Habitat description [based on daytime visit(s); to include the roost and surrounding area for context]

Derrybrien Substation (Photographs 1 to 4)

2.9 Derrybrien Substation comprises a hardstanding area approximately 70 m by 40 m in size. The substation infrastructure is located on the hardstanding and includes a control building, and various electrical transformers enclosed by a metal security fence. The substation control building is constructed from concrete rendered blocks, is approximately 25 m long by 10 m wide, and is single-storey up to 4.5 m in height at the ridge. There are external security flood lights fitted to the building. The roof is pitched with gables and covered with slate tiles which are in good condition with no potential bat access points observed. The roof eaves are overhanging and boxed with uPVC soffits, fascia and barge boards; these are typically well-sealed although there are small gaps under the gable apexes at the soffits. The roof is supported on modern timber trusses that form a cluttered loft void up to 2 m in height to the ridge. The roof tiles are underlined with type 1F bituminous underfelt which is in good condition. During the internal / external building surveys, no evidence of roosting bats was recorded. The building was considered to have low potential for roosting bats.

2.10 The habitat surrounding Derrybrien Substation offers suitable bat foraging and commuting habitats 75 m west and 90 m south where there are extensive areas of coniferous woodland, and 85 m east where there are sparser areas of coniferous trees. Habitats to the north of the substation are more open with few trees and are considered to be of limited value for foraging or commuting bats.

2.11 There are wind turbines located to the north, west and east of the building; the nearest is 97 m southwest.

Agannygal Substation (Photographs 5 to 7)

2.12 Agannygal Substation comprises a hardstanding area approximately 70 m by 50 m. The substation infrastructure is located on the hardstanding and includes a control building, and various electrical transformers which are enclosed by a metal security fence.

2.13 The substation control building is constructed from concrete rendered blocks, is approximately 15 m long by 10 m wide, and is single-storey up to 4.5 m in height at the ridge. There are external security flood lights fitted to the building. The roof is pitched with gables and covered with slate tiles which are in good condition with no potential bat access points observed. The roof eaves are overhanging and boxed with uPVC soffits, fascia and barge boards; these are typically well-sealed although there are small gaps under the gable apexes at the soffits. The roof is supported on modern timber trusses that form a cluttered loft void up to 2 m in height to the ridge. The roof tiles are underlined with type 1F bituminous underfelt which is in good condition. Approximately 15 bat droppings were found in the loft space of Agannygal Substation during the internal survey on 16 August 2022; the building was therefore noted to be a confirmed bat roost.

2.14 The habitat surrounding Agannygal Substation offers suitable bat foraging and commuting habitats 180 m south where there are extensive areas of coniferous woodland, and 85 m east where there are sparser areas of coniferous trees with woodland blocks beyond further east. Habitats to the north and west of the substation are more open with few trees and are considered to be of limited value for foraging or commuting bats.

C6 Field survey (including methods, timings, weather conditions, personnel)

2.15 Survey work was managed by Rachel Potter (Principal Ecologist at BSG Ecology) and comprised personnel as shown in Tables 1 and 2. Surveyors marked with a * hold a current National Parks & Wildlife Service bat survey licence. Surveys were undertaken with reference to Bat Conservation Trust survey guidance (Collins, 2016), which were the most up to date guidance at the time of the surveys. All surveyors are experienced in undertaking bat surveys and an Irish licenced surveyor (Caroline Shiel) was present during all surveys.

Preliminary bat roost assessment

2.16 To determine the suitability of buildings for roosting bats, a preliminary ground-level assessment of all buildings at the Derrybrien Wind Farm, including those at Derrybrien and Agannygal Substations was undertaken. Table 1 below presents a summary of the survey details.

2.17 During this survey, the interior and exteriors of the buildings at Derrybrien and Agannygal Substations were inspected for evidence of bats and to identify potential bat access points.

2.18 Externally, a search was made for potential roost features suitable for roosting bats or those giving access into the interior of the structure, such as gaps at the roof tiles, weep holes, cracks / cavities in the exterior walls, and gaps within the roof structure or between roof structure and walls. External evidence of roosting bats such as droppings, staining or feeding remains was also searched for.

2.19 To further determine the suitability of the buildings for roosting bats and search for evidence of roosts, an internal inspection of the buildings was undertaken. Where safe access allowed, the roof space of the buildings was accessed and a search made for potential roost features, and also for any evidence of roosting including live or dead bats, feeding remains, droppings, and staining.

2.20 Binoculars, torches and an endoscope were used to aid this survey as necessary, and a note was made of any signs that might indicate the presence of bats.

Table 1: Details of the preliminary bat roost assessment bat survey timings and personnel

Date	Survey type	Buildings surveyed	Survey personnel
15/08/22	Internal and external building inspection	Derrybrien Substation	Caroline Shiel* (survey licence reference DER/BAT 2023-35), Rachel Potter
16/08/22	Internal and external building inspection	Agannygal Substation	Caroline Shiel*, Rachel Potter
19/07/23	External building inspection	Agannygal Substation	Caroline Shiel*, Maurice Connolly
20/07/23	External building inspection	Derrybrien Substation	Caroline Shiel*, Maurice Connolly

Nocturnal bat survey

2.21 Nocturnal bat surveys were undertaken on the buildings at Derrybrien and Agannygal Substations to determine the presence / likely absence of roosting bats, and characterise the roosts present.

2.22 During the nocturnal surveys, surveyors were positioned so that full visual coverage could be gained of the target building and, in particular, any potential bat roost access points, which had been previously identified.

2.23 The dusk emergence bat surveys were started 15 to 30 minutes prior to sunset in order to ensure that early emerging bat species (Collins, 2016 Table 3.3), such as pipistrelle species, were detected. The surveys were generally undertaken up to 1.5 hours after sunset in order to ensure that later emerging bat species, such as brown long-eared *Plecotus auritus* bats and *Myotis* bat species were detected. The dawn roost re-entry surveys commenced from 2 hours prior to sunrise until 10 minutes following sunrise.

2.24 Echometer Touch Pro and Pettersson D240X bat detectors were used to aid bat identification in the field and record bat calls. Both surveyors recorded calls so that species could later be confirmed by studying sonograms with appropriate computer software. A Guide Pro 19 thermal imaging scope was used as a night vision aid to identify bat roost locations and roost counts.

Table 2: Details of nocturnal bat survey timings, personnel and weather conditions

Date	Survey type	Buildings surveyed	Survey times (local sunset / sunrise time)	Weather during survey	Survey personnel
15/08/22	Dusk emergence	Derrybrien Substation	20:50 to 22:35 (21:05)	Rain: none Cloud: 8/8 oktas Wind: 2 Beaufort Temp: 15°C	Caroline Shiel*, Rachel Potter
16/08/22	Dusk emergence	Agannygal Substation	20:48 to 22:33 (21:03)	Rain: none Cloud: 2/8 oktas Wind: 1-2 Beaufort Temp: 14°C dropping to 13°C	Caroline Shiel*, Rachel Potter
08/09/22	Dusk emergence	Agannygal Substation	19:40 to 21:45 (20:05)	Rain: none Cloud: 7/8 oktas clearing to 1/8 by the end of survey. Wind: 2 Beaufort Temp: 14°C	Caroline Shiel*, Maurice Connolly
09/09/22	Dawn re-entry	Derrybrien Substation	05:30 to 07:10 (06:58)	Rain: none Cloud: 8/8 oktas, foggy. Wind: 1 Beaufort Temp: 10°C	Caroline Shiel*, Maurice Connolly
26/09/22	Dusk emergence	Derrybrien Substation	19:40 to 21:45 (20:05)	Rain: none Cloud: 8/8 oktas Wind: 3-4 Beaufort Temp: 11°C dropping to 10°C	Caroline Shiel*, Maurice Connolly
19/07/23	Dusk emergence	Agannygal Substation	21:20 to 23:00 (21:47)	Rain: none Cloud: 8/8 oktas Wind: 1 Beaufort Temp: 16°C	Caroline Shiel*, Maurice Connolly
20/07/23	Dawn re-entry	Derrybrien Substation	04:00 to 05:55 (05:31)	Rain: none Cloud: 3/8 oktas Wind: 1 Beaufort Temp: 10°C	Caroline Shiel*, Maurice Connolly

Limitations to method

2.25 There were no perceived limitations to the surveys.

C7 Results (to include raw data, any processed or aggregated data, and negative results as appropriate)

Derrybrien Substation

Preliminary bat roost assessment

2.26 No evidence of roosting bats was recorded internally or externally at the Derrybrien Substation building during any of the surveys.

Nocturnal surveys

2.27 The nocturnal surveys recorded one bat roost at the Derrybrien Substation building; this was a single common pipistrelle bat roosting at the gable apex on the east building elevation. The roost location is presented on **Figure C9b**. Table 3 provides a summary of the nocturnal survey results.

Table 3: Derrybrien Substation nocturnal survey results summary

Date	Roosting bats recorded	Non-roosting bats recorded
15/08/22 (dusk)	One common pipistrelle emerged from a gap at the gable apex of the east elevation (roost reference R1).	No other bat activity was recorded.
09/09/22 (dawn)	No bat activity recorded.	
26/09/22 (dusk)	No bat activity recorded.	
20/07/23 (dawn)	One common pipistrelle returned to roost at the gable apex of the east elevation (roost reference R1).	No other bat activity was recorded.

Agannygal Substation

Preliminary bat roost assessment

2.28 Approximately 10-15 common pipistrelle and brown long-eared bat droppings (confirmed by DNA analysis - see Appendix 1) were found in the loft space of Agannygal Substation building (roost reference R4). No external evidence of roosting bats was recorded during the survey.

Nocturnal surveys

2.29 The nocturnal surveys recorded two species of bat roosting at the Agannygal Substation building; common pipistrelle bats (peak count on one survey of seven bats) roosting at the gable apexes on the northern and southern building elevations and one soprano pipistrelle bat roosting at the southern elevation gable apex. The roost location is presented on **Figure C9d**. Table 4 provides a summary of the nocturnal survey results.

Table 4: Agannygal Substation nocturnal survey results summary

Date	Roosting bats recorded	Non-roosting bats recorded
16/08/22 (dusk)	Two common pipistrelle bats emerged from a gap at the gable apex of the northern elevation (roost reference R2).	One common pipistrelle was recorded briefly at 22:18, but the bat was not seen.
08/09/22 (dusk)	Four common pipistrelle bats emerged from a gap at the gable apex of the northern elevation (roost reference R2). Three common pipistrelle bats emerged from a gap at the gable apex of the southern elevation (roost reference R3).	No other bat activity was recorded.
19/07/23 (dusk)	Seven common pipistrelle bats emerged from a gap at the gable apex of the northern elevation (roost reference R2). One soprano pipistrelle bat emerged from a gap at the gable apex of the southern elevation (roost reference R3).	No other bat activity was recorded.

Other structures associated with the Derrybrien Wind Farm

2.30 Three stone bridges are present near the Derrybrien Wind Farm. These were inspected in August 2022 and found to support very limited roosting features and capacity to support bats. All features could be fully inspected, and no bats or evidence of bat use was recorded. Each of the bridges has low roost potential, and no further survey is recommended (the features were fully inspected and absence of bats was confirmed).

C8 Interpretation and evaluation (including presence/absence, population size class assessment, site status assessment and factors influencing survey results)

2.31 Preliminary bat roost assessment and nocturnal bat surveys have confirmed bat roosts within two buildings at the Derrybrien Wind Farm site, within a building at Derrybrien Substation and a building at Agannygal Substation. Table 5 presents a summary of the bat roosts recorded, an assessment of the roost type and their conservation significance.

Table 5: Interpretation / evaluation of survey results

Roost ref.	Bat roost evidence and interpretation	Roost type[1]	Conservation significance	Consideration of seasonal use
Derrybrien Substation				
R1	Common pipistrelle bat: one bat recorded during two of the four survey occasions (15/08/22 and 20/07/23) roosting in a small crevice at the gable apex on the eastern elevation of the building (Photograph 4). Roost likely used by non-breeding individual / small numbers of bats on an occasional basis.	Day	Low	Occasional use throughout active season. Low suitability for hibernation.
Agannygal Substation				
R2	Common pipistrelle bat: between two and seven bats recorded roosting in this location during each of the three nocturnal surveys, The roost location is in a small crevice at the gable apex on the northern elevation of the building (Photograph 5). Roost likely used by non-breeding individual / small numbers of bats on an occasional basis.	Day	Low	Occasional use throughout active season. Low suitability for hibernation.
R3	Common pipistrelle: three bats recorded roosting during one of the three survey occasions (08/09/22) in a gap at the gable apex on the southern elevation of the building (Photograph 6). Likely used by individual / small numbers of bats on an occasional basis.	Day	Low	Occasional use throughout active season. Low suitability for hibernation.
	Soprano pipistrelle: one bat recorded roosting during one of the three survey occasions (19/07/23) in a gap at the gable apex on the southern elevation of the building (Photograph 6). Likely used by individual / small numbers of bats on an occasional basis.	Day	Low	Occasional use throughout active season. Low suitability for hibernation.
R4	Brown long-eared bat: 10-15 brown long-eared bat droppings recorded within the loft void (Photograph 7) of the building (confirmed by DNA analysis). No brown long-eared bats recorded roosting during nocturnal surveys. Likely used by individual / small numbers of bats on an occasional basis.	Day	Low	Occasional use throughout active season. Low suitability for hibernation.

2.36 The buildings have some intrinsic / low suitability for individual / low numbers of hibernating bats within the roof structure tiles. Hibernation surveys have not been undertaken as it would not be practical or effective to inspect the crevices that could be potentially used without dismantling them. The works with the greatest likelihood of encountering bats will be completed outside of the hibernation period and the risk of encountering hibernating bats is considered to be low. Specific hibernation survey is considered to be unnecessary.

[1] With reference to
Collins, J. (ed.) (2023) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (4th edition). The Bat Conservation Trust, London.

2.37 The surveys undertaken have recorded small numbers of common pipistrelle bats roosting at Derrybrien Substitution and small numbers of common pipistrelle, soprano pipistrelle and brown long-eared bat (based on the presence of small numbers of droppings only) at Agannygal Substation. The surveys have been undertaken at an optimal time of year, and with no significant limitations, which has allowed a robust characterisation of the roosts to be made.

C9 Map(s) of survey area (with habitat description, marking structures or features examined; summary of survey results marked on map if appropriate. Map should show area on an Ordnance Survey (or similar) base-map)

2.38 Refer to Section 8 of this report for all figures.

C10 Cross-referenced photographs of key features (if appropriate)

2.39 Refer to Section 10 of this report for all photographs.

3 D Impact assessment

D1 Pre- and mid-activity impacts

3.1 Any bats present during the works could be disturbed, injured or killed. There are a number of elements of the work that could lead to short / mid-term (the duration of the works) impacts on bats if such impacts are not mitigated, as follows:

- An increase in noise, vibration and dust and increased human presence at the roost buildings may disturb bats in proximity to the works. This is likely to result in a minor negative impact at site level.
- Removal of roof tiles may disturb bats if either uncovered or roosting in adjacent areas during the strip. This is likely to result in a major negative impact at site level.

D2 Long-term impacts [roost or habitat loss, modification, fragmentation, etc.]

3.2 Common pipistrelles are common in Ireland, and together with soprano pipistrelles are the most frequently recorded species (Schofield & Mitchell-Jones, 2011). The population in Ireland is thought to be stable and is estimated to comprise 1-2 million mature individuals (Marnell *et al.*, 2019). Results from Bat Conservation Ireland's car-based bat monitoring scheme suggests populations of common pipistrelle increased between 2003 and 2009 (Roche *et al*., 2011). The mammal red list for Ireland 2019 lists the species as of 'least concern' in Ireland (Marnell *et al.*, 2019). Common pipistrelle feed in a wide range of habitats including woodland, hedgerows, grassland, farmland, suburban and urban areas (Dietz *et al*., 2009; Schofield & Mitchell-Jones, 2011, Dietz & Keifer, 2016). Maternity roosts are mainly found in buildings, with males roosting in buildings and trees during the summer (Collins, 2016). Common pipistrelle bats have also been recorded roosting in bridges in Ireland (Masterson *et al.*, 2008). The relative abundance of common pipistrelle is considered to be **Common** in Ireland.

3.3 Soprano pipistrelles are common in Ireland, and together with common pipistrelles are the most frequently recorded species (Schofield & Mitchell-Jones, 2011). The population in Ireland is thought to be stable, and is estimated to comprise 0.54-1.2 million mature individuals (Marnell et al., 2019). Results from Bat Conservation Ireland's car-based bat monitoring scheme suggest populations of soprano pipistrelle species increased between 2003 and 2009 (Roche et al., 2011). The mammal red list for Ireland 2019 lists the species as of 'least concern' in Ireland (Marnell *et al*., 2019). Soprano pipistrelles typically feed in wetland habitats, for example over lakes and rivers, but also occur around woodland edge, along tree lines and hedgerows, and in suburban gardens and parks (Dietz *et al.,* 2009; Schofield & Mitchell-Jones, 2011; Dietz & Keifer, 2016). Soprano pipistrelle maternity roosts are mainly found in buildings (typically forming larger roosts than common pipistrelle), with males roosting in buildings and trees during the summer (Collins, 2016). Soprano pipistrelles have also been recorded roosting in bridges in Ireland (Masterson *et al.,* 2008). The relative abundance of soprano pipistrelle is considered to be **Common** in Ireland.

3.4 Brown long-eared bats are common and widespread in Ireland (Schofield & Mitchell-Jones, 2011). The population is thought to be stable, and is estimated to comprise 64,000-115,000 mature individuals (Marnell *et al.,* 2019). Results from Bat Conservation Ireland's Brown Long-eared Bat Roost Monitoring Scheme also suggest the population in Ireland is stable (Aughney *et al.,* 2011; BCI, 2019a). The mammal red list for Ireland 2019 lists the species as of 'least concern' (Marnell *et al*., 2009). Brown long-eared bats typically forage in woodlands, and roost in buildings and trees (Schofield & Mitchell-Jones, 2011). They have also been recorded roosting in bridges (BCI, 2010). Studies suggest that brown long-eared bats spend most of their time foraging within 500 m to 1 km of their roosts, and flight distances are typically under 10 km (Dietz *et al.,* 2009, Hundt *et al*., 2012). The relative abundance of brown long-eared bats is considered to be **Rarer** in Ireland.

3.5 The demolition of the building at Derrybrien Substation will result in the loss of one non-breeding roost of common pipistrelle bat. The demolition of the building at Agannygal Substation will result in the loss of non-breeding roosts of common pipistrelle, soprano pipistrelle and brown long-eared bats.

3.6 Taking account of all of the above, the following impact assessment has been made:

- The demolition of the building at Derrybrien Substation will result in the loss of one non-breeding roost of common pipistrelle bat (R1) which, without mitigation, could result in injury or killing of individual / small numbers of common pipistrelle bat. There are few other suitable roost buildings or trees within the wider wind farm site, or nearby, that could provide alternative roosts for displaced bats.
- The demolition of the building at Agannygal Substation will result in the loss of two non-breeding roost of common pipistrelle bat (R2 and R3), one non-breeding roost of soprano pipistrelle bat (R3) and one non-breeding roost of brown long-eared bat (R4) which, without mitigation, could result in injury or killing of individual / small numbers of these bat species. There are few other suitable roost buildings or trees within the wider wind farm site, or nearby, that could provide alternative roosts for displaced bats.
- The demolition of the two substations has the potential to result in a significant impact on common pipistrelle, soprano pipistrelle and brown long-eared bat at the local level. There are very limited roosting opportunities on site, and use of habitats around the substations by foraging common pipistrelle in the late summer and autumn, and by brown long-eared bat over their active season may decrease as a result.

3.7 However, given the low number of non-breeding bats roosting at Derrybrien and Agannygal Substations, the demolition works are unlikely to result in an adverse effect on the favourable conservation status of common pipistrelle, soprano pipistrelle or brown long-eared bats.

3.8 There will be no roost modification and the roosts will be destroyed.

3.9 Fragmentation impacts are not anticipated. Direct loss or degradation of foraging habitat will be temporary and localised in nature. Where working areas around turbines are required for decommissioning, these will be allowed to revegetate following work being completed. Localised clearance of conifers in a dynamic, commercially-managed landscape is typical of what is already occurring on a large scale. Effects will be temporary in nature and are unlikely to be significant at the site level for any bat species.

3.10 The above considered, the actions permitted by a derogation licence would not be detrimental to the maintenance of the populations of the species to which the Habitats Directive relates at a favourable conservation status in their natural range as is required under Section 54(2) of the European Communities (Birds and Natural Habitats) Regulations 2011, as amended.

D3 Post-activity interference impacts [disturbance etc.]

3.11 There are no impacts expected in the absence of mitigation as the substations will be cleared and no lighting or other potential sources of interference proposed.

D4 Other impacts

3.12 Not applicable.

D5 Summary of impacts at the site level

3.13 Refer to D2 above.

D6 Summary of impacts in a wider context

3.14 Refer to D2 above.

D7 Plans or maps to show impacts (clear indication of which areas would be affected and how)

3.15 Refer to Section 8 of this report for all figures.

4 E Alternative solutions examined

E1 List of alternative solutions examined.

4.1 A summary of the 'decommissioning alternatives' that have been considered for the Derrybrien Wind Farm Development Decommissioning Project as part of the EIA process are included in Section B of this report. As outlined above the rationale for retaining certain at and below ground structures is a means of reducing the significant environmental, geotechnical and safety risks that are associated with peat stability and potential peat slides. As no such rationale exists for retaining the substation buildings at Derrybrien and Agannygal, the only alternative that can be considered for the purposes of this derogation licence application is Alternative 1 Do-Nothing. Under the Do-nothing scenario, all features associated with the wind farm (including the Agannygal and Derrybrien substations) would remain in situ in their current state – i.e., an unauthorised windfarm development that ceased commercial electricity generation in February 2022.

E2 details of each alternative and how it addresses the impacts described in Section D. Include any residual impacts which the solution does not address

4.2 Under Alternative 1 "Do Nothing", no decommissioning works would be undertaken. All features associated with the Derrybrien Wind Farm Development would remain in-situ in their current condition. The infrastructure would continue to degrade over time. Under Alternative 1 the existing bat roosts (as described in Section C7) remain unaffected.

E3 Feasibility of each alternative in the context of the overall development

4.3 Alternative 1 Do-Nothing: As described above in section B1, the Derrybrien Wind Farm Decommissioning Project (including the two control buildings where the bat roosts are located) is an unauthorised development under section 177O(5) of the PDA. In August 2024 an enforcement notice was issued by Galway County Council under section 154 of the PDA requiring Gort Windfarms Ltd. to decommission the unauthorised Derrybrien Wind Farm and associated ancillary structures subject to the applicable consent(s)/ permission(s) from the appropriate competent authority or authorities. Under the "Do Nothing" scenario, the two unauthorised substation buildings would remain in place and thereby Gort Windfarms Limited would be acting in direct contravention of the enforcement notice. If the steps specified in the Enforcement Notice are not taken within a period of 36 months from the date of service of the Enforcement Notice, or an extended period as the planning authority may allow, Galway County Council may enter on the land and take such steps, including the removal, demolition or alteration of any structure, and recover the expenses it has incurred from Gort Windfarms Ltd. Under section 156 of the 2000 Act it is an offence not to comply with an enforcement notice. Due to these legal ramifications for Gort Wind Farms Ltd, the Do-Nothing scenario is not a feasible option.

E4 Reasons for accepting/rejecting each alternative solution

4.4 The "Do Nothing" scenario is rejected because the two substation buildings are unauthorised development and if they were to remain in place, Gort Windfarms Ltd would be acting in contravention of the enforcement notice, and committing an offence under section 156 of the PDA. As such, there are no satisfactory alternative solutions to the proposed demolition of the two substation buildings.

4.5 This bat derogation licence application qualifies under Regulation 54(2)(c) of the European Communities (Birds and Natural Habitats) Regulations 2011, as amended as set out below:

In the interests of public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment

4.6 It is of overriding public interest that the 2000 Act, as amended, and the enforcement notice issued by Galway County Council under it is abided by.

5 F Mitigation

F1 Mitigation strategy (overview of how the impacts will be addressed in order to ensure no detriment to the maintenance of the population at a favourable conservation status)

5.1 The following method statement addresses potential impacts on bats to ensure that the favourable conservation status of the bat species at site level is maintained. This will ensure that no bats are injured or killed during demolition works, and that compensatory roost locations are provided to replace those lost.

F2 Replacement roost site selection (including existing species status; location, ownership and status; and habitat description, size, boundaries)

5.2 Two locations have been selected to install roost replacement features:

- The Derrybrien Substation roost replacement will be located at approximately ITM 559779 705609 which is 890 m to the north of the existing roost. A pole mounted bat roost box will be installed at this location prior to the commencement of demolition / roost destruction works. This will provide mitigation for the loss of the common pipistrelle day roost (R1). The box will be placed at a height of at least 5m from the ground and will be of this specification or an available equivalent (Pole Mounted Bat Box | The Nestbox Company or Shop - Eire Ecology). This location is adjacent to suitable bat foraging / commuting habitat with a waterbody immediately to the south, and extensive areas of woodland within 200 m to the east.
- The Agannygal Substation roost replacements will be located at approximately ITM 563072 698604, which is within 10 m to the west of the existing roost . Three pole mounted bat roost boxes will be installed at this location prior to the commencement of demolition / roost destruction works. These will provide mitigation for the loss of the common pipistrelle day roosts, soprano pipistrelle day roost and brown long-eared bat day roosts (R2, R3 and R4). The boxes will be placed at a height of at least 5 m from the ground and will be of this specification or an available equivalent (Pole Mounted Bat Box | The Nestbox Company or Shop - Eire Ecology)

5.3 The bat boxes are to be located in areas of high foraging suitability with good habitat connectivity. Irish bat mitigation guidelines (Marnell *et al*., 2022) suggest that bat boxes may be used as suitable compensation for roosts of low compensation significance, where the species affected are known to use bat boxes. Common and soprano pipistrelles are accepted as using crevice and hollow type bat boxes. Brown long-eared bats are accepted as using hollow type bat boxes. The pole mounted boxes provided above will include suitable box types for all species, on a variety of aspects (to allow for roost movement with changing weather conditions / season.

5.4 There are few potential roost locations in the local area due to the absence of suitable buildings, and because coniferous tree species present do not typically develop natural roost cavities on a regular basis. It is therefore considered that there is a high likelihood of bats roosting within the bat boxes.

5.5 Gort Windfarms Ltd. will own and be responsible for the bat boxes and their maintenance.

F3 Habitat creation, restoration and/or enhancement (as appropriate)

5.6 Not applicable.

F4 Capture and exclusion

F4.1 Timing, effort, methods, capture/exclusion methods

5.7 Prior to works being undertaken which will affect the existing roosts within Derrybrien and Agannygal Substations, the pole-mounted bat boxes will be installed as detailed in section F2, to relocate any bats found during works in to and provide long-term mitigation for the loss of the roosts.

5.8 Works to render the Derrybrien and Agannygal Substation buildings unsuitable for roosting bats are proposed to be undertaken upon receipt of the licence and following erection of the bat boxes. The

buildings are not considered to support a maternity roost and therefore works, if undertaken during the spring / summer / autumn, will not impact upon pregnant females or dependant young or hibernating bats.

5.9 Prior to the commencement of works, all site contractors will be inducted by a licenced bat ecologist to make them aware of the potential presence of bats and the correct working methods to be employed. Copies of the method statement and good practice works will be clearly displayed on site and summary documents will be supplied to each contractor detailing the programme of works. Once the licenced ecologist is satisfied that contractors are suitably briefed, works may commence.

5.10 A thorough internal inspection by a licenced bat worker / named ecologist will be undertaken each day of bat related works.

5.11 Following the tool-box talk and the internal inspection, the first stage of demolition will be completed which will comprise the careful removal, by hand, of the tiles on all buildings with identified roosts. This will be directly supervised by a licenced bat ecologist. Works will require removal of the ridge tiles and 1m of roof tiles down from the ridge and removal of tiles from the eaves (including the gable apexes and verges) and 1m up from the eaves. Each tile must be checked both sides for attached bats. The areas of tile removal will be extended if considered appropriate by the supervising ecologist. Any other suitable areas such as soffits, barge boards or fascias or flashing which form a potential access point will also be removed by hand as carefully as possible and any material removed will be checked prior to disposal. Any bat found will be moved into the bat boxes by the licensed ecologist.

5.12 Safe and suitable access to the roof must be provided in order to carry this process out both safely and with consideration to removing the tiles as carefully as possible. Suitable access may include scaffolding or mechanical platforms (cherry picker or MEWP).

5.13 Once all of the tiles/other features are removed, the timber roof frame and top wall plates will be checked by the ecologist to confirm no bats are present. If bats are found within these it may not be possible to remove them by hand. In this instance works will stop immediately and the animal(s) will be allowed to disperse naturally over a period of 24 hours. At this stage roosting conditions should be unsuitable which will encourage the animal(s) to disperse. After the 24 hour period has elapsed, given that all bat roost sites will have been removed in the previous operations, this demolition will not require ecologist supervision.

5.14 In the unlikely event that a bat is discovered during unsupervised works, all operations should cease on that building and the licensed ecologist contacted for further advice. Such advice would include carefully replacing the removed roost feature if it is feasible without potential injury to the bat. Contractors would not be advised to capture the bat.

5.15 If a non-licensed species is encountered during works, demolition of the relevant building will be delayed until a licence amendment is sought and approved.

F5 Post-development site safeguard

F5.1 Roost management and maintenance (either set out details here, or if complex then give outline here and give details as an annexed stand-alone plan)

5.16 The roost will be owned and maintained by Gort Windfarms Ltd. Checks will be made annually for 10 years to ensure that the box remains in position and suitable for use by bats. Checks for presence of bats will not be completed.

F5.2 Population monitoring

5.17 Given the low conservation significance of the roosts to be affected, no post-works monitoring is proposed, this is in line with guidance given in Bat Mitigation Guidelines for Ireland – V2 (Marnell, *et al.*,2022)

F5.3 Mechanism for ensuring delivery (who will undertake the work and reporting details)

5.18 Delivery will be conditioned as part of planning permission. Gort Windfarms Ltd. will be responsible for commissioning a suitable consultant to supervise demolition works and bat box placement. Gort Windfarms Ltd. will be responsible for reporting actions undertaken under the licence and the annual maintenance survey of the bat boxes.

F6 Timetable of works (phasing diagram to include all works associated within section F and to indicate construction works timing)

5.19 The proposed demolition works will be carried out from the 1st July 2027 to the 31st December 2027, subject to planning permission.

F7 Site plan to show all work covered by the licence

5.20 Refer to Section 8 of this report for all figures.

F8 Map to show the extent of each parties interest on site (if appropriate)

5.21 Not applicable.

F9 Map to show location of receptor site in relation to development site

5.22 Refer to Section 8 of this report for all figures.

F10 Map to show habitat creation, restoration and/or enhancement

5.23 Not applicable.

F11 Map to show post activity management (if appropriate)

5.24 Not applicable.

F12 Diagram to show exclusion apparatus (only required if non-standard techniques are proposed)

5.25 Not applicable.

6 G Summary

G1 Summary of development and mitigation (NB to include overall consideration of the three main licensing criteria: effect on conservation status, purpose, and alternatives)

6.1 The project is the decommissioning of Derrybrien Wind Farm. This existing Derrybrien Wind Farm Project includes the Derrybrien Wind Farm (including Derrybrien 110 kV substation), Derrybrien to Agannygal 110 kV Overhead Line (OHL) and the Agannygal Substation.

6.2 Derrybrien Wind Farm Site comprises 70 turbines, crane hard standings, 17.5 km of access tracks within the site (including 14.6km of floating access tracks), drainage channels, borrow pits/quarries, on site material storage, the Derrybrien110 kV substation (including the control building), direct buried electric cables and anemometer masts. Derrybrien to Agannygal 110 kV Overhead Line exports the electricity generated at the wind farm to the national grid. Agannygal Substation splits this line into two circuits before connecting into the grid and includes a control building.

6.3 Survey completed as part of the Derrybrien Wind Farm Development Decommissioning Project identified that bats were roosting in both Derrybrien Substation and the Agannygal Substation. At Derrybrien Substation a single common pipistrelle was recorded roosting in the eastern gable end of the substation. At Agannygal Substation three species were recorded; brown long-eared bats (dropping only), soprano pipistrelle (one bat from gable end) and seven common pipistrelle (from both gable ends during the same survey).

6.4 The only alternative to the removal of the bat roosts is the “Do Nothing”. Under this alternative no decommissioning works would be undertaken and all features associated with the Derrybrien Wind Farm Development (including the two unauthorised substation buildings) would remain in-situ in their current condition. Under this alternative Gort Windfarms Limited would be acting in direct contravention of the enforcement notice. Under section 156 of the 2000 Act it is an offence not to comply with an enforcement notice. Due to these legal ramification for Gort Wind Farms Ltd, the Do-Nothing alternative is not a feasible option.

6.5 Given the low number of non-breeding bats roosting at Derrybrien and Agannygal Substations, the demolition works are unlikely to result in an adverse effect on the favourable conservation status of common pipistrelle, soprano pipistrelle or brown long-eared bats.

6.6 Four pole mounted roost boxes will be installed. One box will be near to the substation location and high quality foraging habitat on the Derrybrien Wind Farm Site, and three will be installed in good quality foraging habitat near Aganygal substation. Irish bat mitigation guidelines (Marnell *et al*., 2022) suggest that bat boxes may be used as suitable compensation for roosts of low compensation significance, where the species affected are known to use bat boxes. Common and soprano pipistrelles are accepted as using crevice and hollow type bat boxes. Brown long-eared bats are accepted as using hollow type bat boxes. The pole mounted boxes provided above will include suitable box types for all species, on a variety of aspects (to allow for roost movement with changing weather conditions / season).

6.7 Works will be completed under a method statement, with a qualified bat ecologist on site during works to areas that bats could roost in. This safeguards against the unintentional killing or injuring of bats.

6.8 Given the low conservation significance of the roosts to be affected, no post-works monitoring is proposed, this is in line with guidance given in Bat Mitigation Guidelines for Ireland – V2 (Marnell, *et al*.,2022)

7 H References

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8 J Annexes

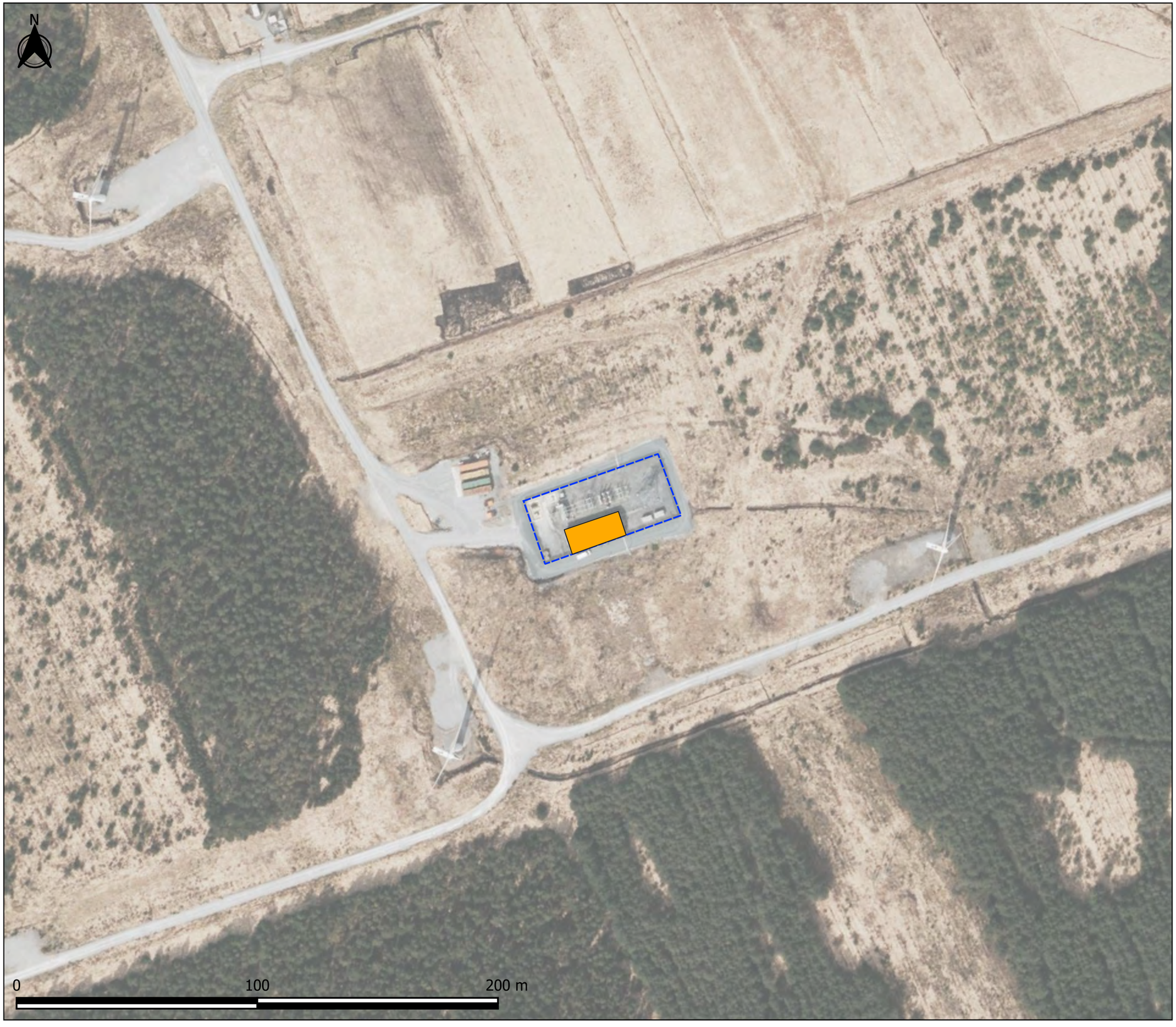
J1 Management and maintenance plan

8.1 Annual maintenance of bat boxes for 10 years.

J2 Pre-existing survey report(s)

9 Figures

(overleaf)



Legend

- Substation building
- Substation boundary

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PROJECT TITLE

DERRYBRIEN WIND FARM DECOMMISSIONING PROJECT

DRAWING TITLE

Figure C9a: Derrybrien Substation Survey Area

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DRAWN: CS APPROVED: DF VERSION:1.0

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Legend

- Substation building
- Substation boundary

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Figure C9b: Derrybrien Substation Summary Results

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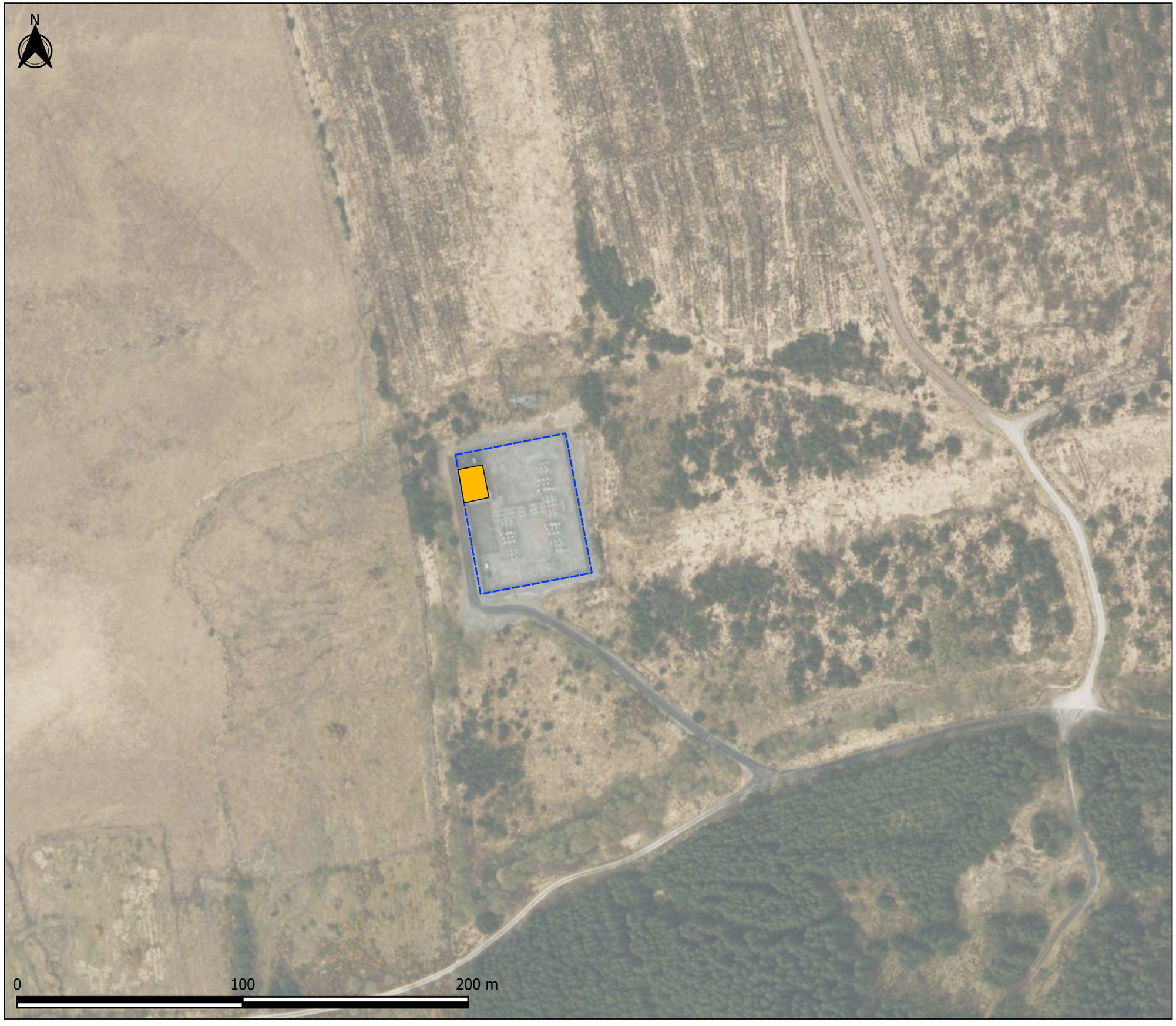

Legend

- Substation building
- Substation boundary

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Figure C9c: Agannygal Substation Survey Area

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Legend

- Substation building
- Substation boundary

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Figure C9d: Agannygal Substation Summary Results

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Legend

- Substation building
- Substation boundary
- Common pipistrelle bat day roost to be destoyed

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PROJECT TITLE

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Figure Da: Derrybrien Substation Impacts Plan

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Legend

- Substation building
- Substation boundary
- Common / soprano pipistrelle day roost to be destroyed
- Brown Long-eared bat day roost to be destroyed

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Figure Db: Agannygal Substation Impacts Plan

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10 Photographs

Photograph 1: Derrybrien Substation showing building and transformers (west elevation)

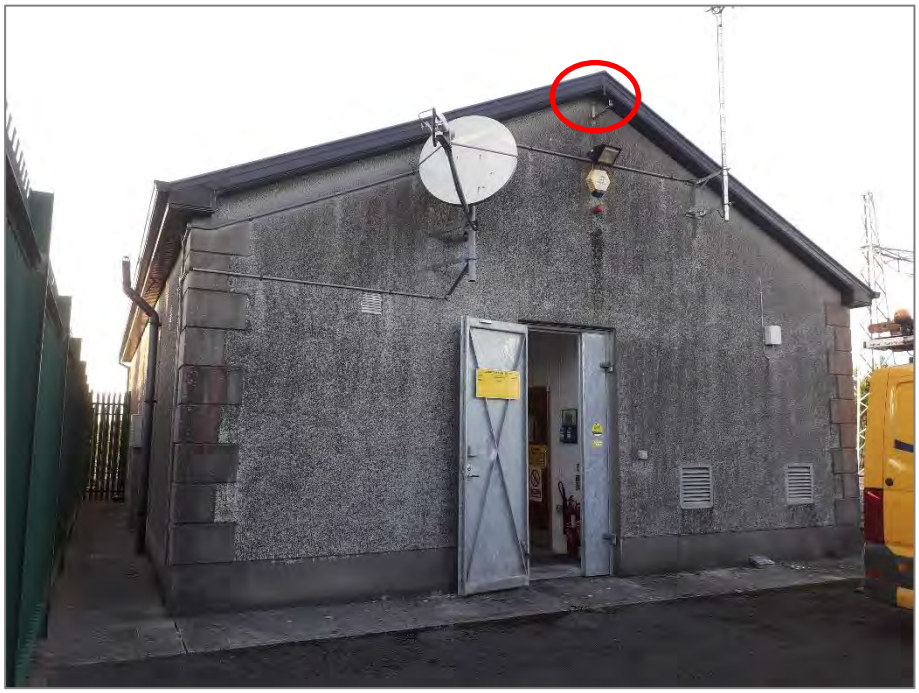
Photograph 2: Derrybrien Substation building (south elevation)

Photograph 3: Loft space within the Derrybrien Substation building

Photograph 4: Roost R1 (common pipistrelle day roost) location at Derrybrien Substation. The bat access point is highlight by the red arrow.

Photograph 5: Agannygal Substation building (north elevation). Roost R2 (common pipistrelle day roost) location circled red.

Photograph 6: Agannygal Substation building (south elevation). Roost R3 (common pipistrelle and soprano pipistrelle day roosts) location circled red.



Photograph 7: Loft space within the Agannygal Substation building. Roost R4 (brown long eared and common pipistrelle day roosts) are present within the loft.

11 Appendix 1 – eDNA results

Order Number: 1493 Swift Ecology R.Potter@bsg-ecology.com

Samples submitted

Sample Code	Multi-species?	Sample Type	Date Sample Found	Species Group	Site postcode/ post town /grid ref	Site description / comments (Optional)	Suspected identity of species
SEL-1493-1	Yes	Faecal	16/08/2022	Bats	Newport		Common pipistrelle (Pipi)

Analysis Results

Sample Code	DNA Extraction Code	Species Identified	ID Method	Ct value	% match
SEL-1493-1	EG-2022-0949	Pipistrellus pipistrellus (Common pipistrelle bat) and Plecotus auritus (Brown long-eared bat)	qPCR	21/20	

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Order Number: 1493 Swift Ecology R.Potter@bsg-ecology.com

What do my results mean?

DNA extraction code - this identifies the DNA extraction sample within our laboratory so that it can be revisited if necessary. We keep these extractions for a minimum of 3 months.

ID method: *qPCR* - These results are obtained using species specific qPCR tests. A positive result indicates the presence of DNA from the species reported.

ID method: *DNA sequencing* - where qPCR fails or is not possible, standard DNA sequencing will be performed. Sequences are then matched against a database.

Ct value - This is a relative measurement of the amount of species DNA in the sample, derived from the qPCR data. The lower the value the more DNA present in the reaction. This helps to predict the abundance of one species relative to another **in the sample**. Note: this relative abundance is not directly transferable to the site the samples were collected from.

% match - this value is the percentage match of sequences derived from DNA sequencing compared to the database. Due to differences in DNA sequence between individuals within a species this match may not always be exactly 100%.

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APPENDIX 6-4

NATIONAL BIODIVERSITY IRELAND RECORDS

APPENDIX 6-4

NATIONAL BIODIVERSITY IRELAND DATABASE RECORDS FOR RARE, PROTECTED AND INVASIVE FLORA AND FAUNA SPECIES WITHIN THE 10 KM SQUARES M50, M60 AND R69 OCCUPIED BY THE PROJECT

Appendix 6-4-1 National Biodiversity Ireland Database records for rare and protected flora and fauna species within the 10 km squares M50, M60 and R69 occupied by the project

Grid Square	Species Name	Latin Name	Date(s) of Record(s)	Legal Protection / Red List (King *et al.*, 2011, Regan *et al.*, 2010, Marnell *et al.*, 2019) / Birds of Conservation Concern (Gilbert et al., 2020)
Amphibian				
M50, M60 and R69	Common Frog	*Rana temporaria*	2011, 2015, 2018	EU Habitats Directive Annex V, Wildlife Acts, Least Concern
M50, M60 and R69	Smooth Newt	*Lissotriton vulgaris*	2012,2019,2020	Wildlife Acts, Least Concern
Birds				
M50, M60 and R69	Barn Owl	*Tyto alba*	1972,2011,2015	Wildlife Acts, Red-listed
M50, M60 and R69	Barn Swallow	*Hirundo rustica*	2011,2015,2019	Wildlife Acts, Amber-listed
M50, M60 and R69	Eurasian Sparrowhawk	*Accipiter nisus*	2011	Wildlife Acts, Amber-Listed
M50, M60 and R69	Mistle Thrush	*Turdus viscivorus*	2011	Wildlife Acts, Amber-Listed
M50, M60 and R69	European Robin	*Erithacus rubecula*	2011	Wildlife Acts, Amber-Listed
M50, M60 and R69	Stonechat	*Saxicola torquata*	2011	Wildlife Acts, Amber-Listed
M50, M60 and R69	Goldcrest	*Regulus regulus*	2011,2022	Wildlife Acts, Amber-Listed
M50, M60 and R69	Grey Wagtail	*Motacilla cinerea*	2011,2017,2022	Wildlife Acts, Amber-Listed
M50, M60 and R69	Greenfinch	*Carduelis chloris*	2011	Wildlife Acts, Amber-Listed
M50, M60 and R69	Black-headed Gull	*Larus ridibundus*	1972,2011,1972	Wildlife Acts, Red-listed
M50,R69	Common Coot	*Fulica atra*	1984,1991	EU Birds Directive: Annex II, Section I Bird Species Annex III, Section II Bird Species Wildlife Acts, Amber-listed
R69	Common Goldeneye	*Bucephala clangula*	1984	EU Birds Directive: Annex II, Section II Bird Species Wildlife Acts, Amber-listed
M50, M60 and R69	Common Grasshopper Warbler	*Locustella naevia*	2011	Wildlife Acts, Amber-listed
M50, M60 and R69	Common Kestrel	*Falco tinnunculus*	2011,2015,2023	Wildlife Acts, Amber-listed
M50, M60 and R69	Common Kingfisher	*Alcedo atthis*	1972,2015	EU Birds Directive: Annex I Bird Species Wildlife Acts, Amber-listed

Grid Square	Species Name	Latin Name	Date(s) of Record(s)	Legal Protection / Red List (King *et al.*, 2011, Regan *et al.*, 2010, Marnell *et al.*, 2019) / Birds of Conservation Concern (Gilbert et al., 2020)
M50, M60 and R69	Common Linnet	*Carduelis cannabina*	2011	Wildlife Acts, Amber-listed
M50, M60 and R69	Common Pheasant	*Phasianus colchicus*	2011 ,2022	EU Birds Directive: Annex II, Section I Bird Species Annex III, Section I Bird Species Wildlife Acts
M50	Common Pochard	*Aythya ferina*	1984	EU Birds Directive: Annex II, Section I Bird Species Annex III, Section II Bird Species Wildlife Acts, Amber-listed
M60, R69	Common Redshank	*Tringa totanus*	1972,2011	Wildlife Acts, Red-listed
R69	Common Sandpiper	*Actitis hypoleucos*	2011	Wildlife Acts, Amber-listed
M50, M60 and R69	Common Snipe	*Gallinago gallinago*	2011,2015,2018	EU Birds Directive: Annex II, Section I Bird Species Annex III, Section III Bird Species Wildlife Acts, Amber-listed
M50, M60 and R69	Common Starling	*Sturnus vulgaris*	2011,2016	Wildlife Acts, Amber-listed
M50, M60 and R69	Common Swift	*Apus apus*	1991,2011	Wildlife Acts, Amber-listed
R69	Common Tern	*Sterna hirundo*	2011	EU Birds Directive: Annex I Bird Species Wildlife Acts, Amber-listed
M50, M60 and R69	Common Wood Pigeon	*Columba palumbus*	2011, 2015	EU Birds Directive: Annex II, Section I Bird Species Annex III, Section I Bird Species, Wildlife Acts
M50, M60 and R69	Corn Crake	*Crex crex*	1972	EU Birds Directive: Annex I Bird Species Wildlife Acts, Red-listed
M50, M60 and R69	Eurasian Curlew	*Numenius arquata*	2011	EU Birds Directive: Annex II, Section II Bird Species Wildlife Acts, Red-listed
M50, M60 and R69	Eurasian Teal	*Anas crecca*	2011	EU Birds Directive: Annex II, Section I Bird Species Annex III, Section II Bird Species Wildlife Acts, Amber-listed
M50, R69	Eurasian Wigeon	*Anas penelope*	2011	EU Birds Directive: Annex II, Section I Bird Species Annex III, Section II Bird Species Wildlife Acts, Amber-listed
M50, M60 and R69	Eurasian Woodcock	*Scolopax rusticola*	1972,2011	EU Birds Directive: Annex II, Section I Bird Species Annex III, Section III Bird Species Wildlife Acts, Amber-listed
M50, R69	European Golden Plover	*Pluvialis apricaria*	2011,2019	EU Birds Directive: Annex I Bird Species Annex II, Section II Bird Species Annex III, Section III Bird Species Wildlife Acts, Red-listed

Grid Square	Species Name	Latin Name	Date(s) of Record(s)	Legal Protection / Red List (King *et al.*, 2011, Regan *et al.*, 2010, Marnell *et al.*, 2019) / Birds of Conservation Concern (Gilbert et al., 2020)
R69	Great Cormorant	*Phalacrocorax carbo*	2011	Wildlife Acts, Amber-listed
R69	Great Crested Grebe	*Podiceps cristatus*	2011	Wildlife Acts, Amber-listed
R69	Greater White-fronted Goose	*Anser albifrons*	1984	Annex I Bird Species Annex II, Section II Bird Species Annex III, Section III Bird Species Wildlife Acts, Amber-listed
M50, M60 and R69	Hen Harrier	*Circus cyaneus*	2011,2021,2011	EU Birds Directive: Annex I Bird Species Wildlife Acts, Amber-listed
R69	Herring Gull	*Larus argentatus*	1991	Wildlife Acts, Red-listed
M50, M60 and R69	House Martin	*Delichon urbicum*	2011	Wildlife Acts, Amber-listed
M50, M60 and R69	House Sparrow	*Passer domesticus*	2011	Wildlife Acts, Amber-listed
M60, R69	Jack Snipe	*Lymnocryptes minimus*	2011,1984	EU Birds Directive: Annex II, Section I Bird Species Annex III, Section III Bird Species Wildlife Acts
R69	Lesser Black-backed Gull	*Larus fuscus*	2011	Wildlife Acts, Amber-listed
M50, R69	Little Grebe	*Tachybaptus ruficollis*	2011,1972	Wildlife Acts, Amber-listed
M50, M60 and R69	Mallard	*Anas platyrhynchos*	2011	EU Birds Directive: Annex II, Section I Bird Species Annex III, Section I Bird Species Wildlife Acts
M50, M60 and R69	Merlin	*Falco columbarius*	2011,1972	EU Birds Directive: Annex I Bird Species Wildlife Acts, Amber-listed
R69	Mew Gull	*Larus canus*	2011	Wildlife Acts, Amber-listed
M50, R69	Mute Swan	*Cygnus olor*	2011	Wildlife Acts, Amber-listed
M50, M60 and R69	Northern Lapwing	*Vanellus vanellus*	2011,1984	EU Birds Directive: Annex II, Section II Bird Species – Wildlife Acts, Red-listed
M50, R69	Northern Shoveler	*Anas clypeata*	2011,1984	EU Birds Directive: Annex II, Section I Bird Species Annex III, Section III Bird Species Wildlife Acts
M50	Northern Wheatear	*Oenanthe oenanthe*	2011	Wildlife Acts, Amber-listed
M50, M60 and R69	Red Grouse	*Lagopus lagopus*	2018,2017,2011	EU Birds Directive: Annex II, Section I Bird Species Annex III, Section I Bird Species Wildlife Acts, Red-listed

Grid Square	Species Name	Latin Name	Date(s) of Record(s)	Legal Protection / Red List (King *et al.*, 2011, Regan *et al.*, 2010, Marnell *et al.*, 2019) / Birds of Conservation Concern (Gilbert et al., 2020)
R69	Red-breasted Merganser	*Mergus serrator*	1972	EU Birds Directive: Annex II, Section II Bird Species Wildlife Acts
M60	Ring Ouzel	*Turdus torquatus*	2003	Wildlife Acts, Red-listed
R69	Ringed Plover	*Charadrius hiaticula*	1991	Wildlife Acts, Amber-listed
M50, M60 and R69	Sand Martin	*Riparia riparia*	2011 ,1991	Wildlife Acts, Amber-listed
M60, R69	Short-eared Owl	*Asio flammeus*	2011,1984	EU Birds Directive: Annex I Bird Species Wildlife Acts, Amber-listed
M50, M60 and R69	Sky Lark	*Alauda arvensis*	2011	Wildlife Acts, Amber-listed
M50, M60 and R69	Spotted Flycatcher	*Muscicapa striata*	2011	Wildlife Acts, Amber-listed
M50, M60	Stock Pigeon	*Columba oenas*	2011,1972	Wildlife Acts, Amber-listed
M50, R69	Tufted Duck	*Aythya fuligula*	2001,1984	EU Birds Directive: Annex II, Section I Bird Species Annex III, Section II Bird Species Wildlife Acts, Amber-listed
R69	Water Rail	*Rallus aquaticus*	2011	Wildlife Acts, Amber-listed
M60	Whinchat	*Saxicola rubetra*	1972	Wildlife Acts, Amber-listed
M50, R69	Whooper Swan	*Cygnus cygnus*	2018,2011	EU Birds Directive: Annex I Bird Species Wildlife Acts, Amber-listed
M50, M60 and R69	Yellowhammer	*Emberiza citrinella*	2011,1972	Wildlife Acts, Red-listed
Bony fish				
R69	*European Eel*	*Anguilla anguilla*	1996	Threatened Species: Critically Endangered
Crustacean				
M60	Freshwater White-clawed Crayfish	*Austropotamobius pallipes*	2017	EU Habitats Directive: Annex II Annex V Wildlife Acts
Lepidoptera Insects-Butterflies				
M50,M60 and R69	Marsh Fritillary	*Euphydryas aurinia*	2021,2019,2010	EU Habitats Directive: Annex II, Vulnerable
M50	White Cushion Moss	*Leucobryum glaucum*	1994	EU Habitats Directive: Annex IV, Least Concern
Reptile				

Grid Square	Species Name	Latin Name	Date(s) of Record(s)	Legal Protection / Red List (King *et al.*, 2011, Regan *et al.*, 2010, Marnell *et al.*, 2019) / Birds of Conservation Concern (Gilbert et al., 2020)
R69	Common Lizard	*Zootoca vivipara*	2020	Protected Species: Wildlife Acts, Least Concern
Terrestrial Mammal				
M50, M60 and R69	Eurasian Badger	*Meles meles*	2018,2015,2012	Protected Species: Wildlife Acts, Least Concern
R69	Eurasian Pygmy Shrew	*Sorex minutus*	2015	Protected Species: Wildlife Acts, Least Concern
M50, M60 and R69	Eurasian Red Squirrel	*Sciurus vulgaris*	2018,2017,2014	Protected Species: Wildlife Acts, Least Concern
M60, R69	European Otter	*Lutra lutra*	2015,2010	EU Habitats Directive: Annex II Annex IV Protected Species: Wildlife Acts, Least Concern
M50, M60, R69	Pine Marten	*Martes martes*	2021,2020	EU Habitats Directive: Annex V, Wildlife Acts, Least Concern
M50, M60 and R69	West European Hedgehog	*Erinaceus europaeus*	2023,2022,2017	Protected Species: Wildlife Acts, Least Concern
Terrestrial Mammals-Bats (Chiroptera)				
M50	Whiskered Bat	*Myotis mystacinus*	2018	EU Habitats Directive Annex IV, Wildlife Acts, Least Concern
M50, M60 and R69	Soprano Pipistrelle	*Pipistrellus pygmaeus*	2022,2018,2016	EU Habitats Directive: Annex IV, Wildlife Acts, Least Concern
M60	Common Pipistrelle	*Pipistrellus pipistrellus sensu lato*	2015	EU Habitats Directive: Annex IV, Wildlife Acts, Least Concern
M50, M60	Natterer's Bat	*Myotis nattereri*	2019,2016	EU Habitats Directive: Annex IV, Wildlife Acts, Least Concern
M50, M60, and R69	Lesser Noctule	*Nyctalus leisleri*	2018,2016,2009	EU Habitats Directive: Annex IV, Wildlife Acts, Least Concern
M50, M60 and R69	Daubenton's Bat	*Myotis daubentonii*	2017,2016,2007	EU Habitats Directive: Annex IV, Wildlife Acts, Least Concern
M50, R69	Brown Long-eared Bat	*Plecotus auritus*	2021,2019	EU Habitats Directive: Annex IV, Wildlife Acts, Least Concern
Flowering Plants				
R69	Common Cudweed	*Filago vulgaris*	2006	Vulnerable

Appendix 6-4-2 National Biodiversity Ireland Database records for invasive flora and fauna species within the 10 km squares M50, M60 and R69 occupied by the project

Grid Square	Species Name	Latin Name	Date of Record(s)	Legal Status / Impact Invasive Species Level
M50	American Mink	*Mustela vison*	2011	High Impact Invasive Species
R69	bony fish	*Roach*	1996	Invasive Species: Regulation S.I. 477 (Ireland)
M50, R69	Brown Rat	*Rattus norvegicus*	2014,2015	High Impact Invasive Species
R69	Cherry Laurel	*Prunus laurocerasus*	2009	High Impact Invasive Species
M50, M60 and R69	Fallow Deer	*Dama dama*	2015,2014	High Impact Invasive Species
R69	House Mouse	*Mus musculus*	2015	High Impact Invasive Species
R69	Indian Balsam	*Impatiens glandulifera*	2009	High Impact Invasive Species
M50, M60 and R69	Japanese Knotweed	*Fallopia japonica*	2018,2020,1999	European Communities (Birds & Habitats): Third Schedule High Impact Invasive Species
M60, R69	Rhododendron	*Rhododendron ponticum*	2006,1999	Invasive Species: High Impact Invasive Species
M50, M60	Sika Deer	*Cervus nippon*	2015,2013	High Impact Invasive Species

APPENDIX 6-5

PHOTOGRAPHS RELATING TO HEN HARRIER HABITATS

APPENDIX 6-5

PHOTOGRAPHS RELATING TO HEN HARRIER HABITATS

Plate 1. View looking eastwards of unplanted cutover bog in eastern section of site. Hen harriers have been recorded foraging over this area of the wind farm (April 2018).

Plate 2. Much of the area that was clear-felled has regenerated with bog vegetation and attracts foraging hen harriers (April 2018).

Plate 3. Good growth of heather is often found along the road edges – this provides useful foraging habitat for hen harriers and also attracts red grouse (April 2018).

Plate 4. View of overhead line corridor, May 2018. The clearance of conifers has allowed regeneration of bog and heath vegetation, with scrub patches – this provides useful foraging habitat for hen harriers.

Plate 5. View of peat slide area to south of wind farm (September 2011). The regrowth since the slide occurred in 2003 provides suitable foraging habitat for hen harrier.

Plate 6. View of peat slide area to south of wind farm (September 2011). The regrowth is a mix of bog and heath vegetation, with self-seeded conifers becoming establish. This provides suitable foraging habitat for hen harrier.

Plate 7. View of clear fell to north of wind farm entrance (May 2018) – the second rotation conifer crop will provide suitable habitat for hen harrier from approximately 2020 to 2030 period.

APPENDIX 6-6

HEN HARRIER DEFININITION OF HABITATS AND BEHAVIOURS CODES

APPENDIX 6-6

HEN HARRIER DEFINITION OF HABITAT AND BEHAVIOUR CODES

Hen Harrier Survey - Classification of habitat types

NF 2	New forestry plantation, trees 20-30 cm high
NF 3	New forestry plantation, trees c 1m in height
NF 4	New forestry plantation, trees >2m in height, patchy thickets
2nd F 1 & 2	2nd rotation forestry plantation, trees 20-30 cm high
2nd F 3	New forestry plantation, trees c 1m in height
2nd F 4	New forestry plantation, trees >2m in height, patchy thickets
F	Post thicket plantation
G	Grazing
RG	Rough Grazing & rushy pasture
HB	Heath / Bog
DE	Deciduous woodland & scrub
GO	Gorse
CF	Clearfell
H	Hedgerow

Categories for activity and behaviour of observed birds

c - circling
d - displaying
fl - flying
fp - foodpass
g - on ground
gl - gliding
h - hunting
p - perching
s - soaring
wp - with prey
fp - foodpass

APPENDIX 6-7

DERRYBRIEN VANTAGE POINT WATCHES.

APPENDIX 6-7

DERRYBRIEN WIND FARM VANTAGE POINT WATCHES 2022 & 2024

APPENDIX 6-7-1 Summary of vantage point (VP) watch variables, Derrybrien Wind Farm, March to June 2022

Date	Season	VP no.	Duration (hrs)	Start Time	Weather conditions
29/03/2022	Breeding	1	3	10:00	Dry, good visibility, SW wind, F2-3
29/03/2022	Breeding	2	3	15:00	Dry, good visibility, SW wind, F3
30/03/2022	Breeding	1	3	08:15	Showers, good visibility, SW wind, F3
30/03/2022	Breeding	2	3	14.00	Dry, Good visibility, SW wind, F2
28/04/2022	Breeding	2	3	11:30	Dry, Good visibility, W wind, F1
28/04/2022	Breeding	1	3	15.00	Dry, Good visibility, W wind, F2
29/04/2022	Breeding	2	3	07.30	Dry, Good visibility, SW wind, F2
29/04/2022	Breeding	1	3	14.30	Showers, Good visibility, SW wind, F3
24/05/2022	Breeding	1	3	09.30	Dry, Good visibility, S wind, F1-2
24/05/2022	Breeding	2	3	15.00	Dry, Good visibility, S wind, F2
25/05/2022	Breeding	1	3	07:15	Dry, Good visibility, SW wind, F3
25/05/2022	Breeding	2	3	13:00	Dry, Good visibility, SW wind, F3
28/06/2022	Breeding	2	3	08:45	Dry, Good visibility, NW wind, F2
28/06/2022	Breeding	1	3	15.30	Dry, Good visibility, NW wind, F2
29/06/2022	Breeding	1	3	07.30	Dry, Good visibility, W wind, F2
29/06/2022	Breeding	2	3	12.30	Dry, Good visibility, W wind, F3

APPENDIX 6-7-2 Vantage Point raw data & flight activity, Derrybrien Wind Farm, March-June 2022

Date	VP No	Map Reference	Species	No.	Flight Time	Flight Duration (s)	Band 1 (0-25m)	Band 2 (25-175m)	Band 3 (175+m)	Comments
29/03/2022	1		Kestrel	1	10.54	180	100	80		Male hunting along edge of forest / track
29/03/2022	2		Red grouse	1+	17.17	0	0	0		1-2 birds heard calling from bog to NW of site over period of c.10 min. Heard again from T47 area after formal watch
30/03/2022	1									No target species 3 mistle thrushes flew across site; pair stonechats near VP; skylarks & pipits singing
30/03/2022	2									No target species. Grouse heard from bog later after watch (as yesterday evening)
28/04/2022	2		Sparrow hawk	2	13.08	180	0	180	0	Pair in display /circling over site (T54-55 area)
			Teal	2	14.10	30	30	0	0	Pair flew low between T10 and T11 area
28/04/2022	1									No target species
29/04/2022	2									No target species Several swallows over site
29/04/2022	1		Snipe	1	16.46	300	100	200	0	Snipe drumming etc over bog between T31 and T33
24/05/2022	1									No target species 2 cuckoos heard, one seen; swallows over site

Date	VP No	Map Reference	Species	No.	Flight Time	Flight Duration (s)	Band 1 (0-25m)	Band 2 (25-175m)	Band 3 (175+m)	Comments
24/05/2022	2									No target species
25/05/2022	1									
25/05/2022	2									No target species Cuckoo
28/06/2022	2		Kestrel	1	09.43	90	30	60	0	Hunting male near T66 Meadow pipit, skylark, willow warbler & stonechat with young
28/06/2022	1									No target species
29/06/2022	1									No target species
29/06/2022	2		Sparrow hawk		14.34					Heard crying from woods north of T54 area Mistle thrush family party
	2		Lesser black-backed gull	7	15.07	160	0	160	0	Loose party flew over site – at least 4-5 immature types

APPENDIX 6-7-3 Summary of vantage point (VP) watch variables, Derrybrien Wind Farm, April to June 2024

Date	Season	VP no.	Duration (hrs)	Start Time	Weather conditions
09/04/2024	Breeding	2	3	10:30	Dry, good visibility, W wind, F3
09/04/2024	Breeding	1	3	15:00	Dry, good visibility, W wind, F3
10/04/2024	Breeding	1	3	08:00	Dry, good visibility, SW wind, F3
10/04/2024	Breeding	2	3	13.00	Dry, good visibility, SW wind, F3
10/05/2024	Breeding	1	3	10:00	Dry, Good visibility, SW wind, F1
10/05/2024	Breeding	2	3	15.00	Dry, Good visibility, SW wind, F2
11/05/2024	Breeding	1	3	07.15	Dry, Good visibility, S wind, F2
11/05/2024	Breeding	2	3	12.30	Dry, Good visibility, S wind, F3
18/06/2024	Breeding	2	3	09:30	Dry, Good visibility, N wind, F3
18/06/2024	Breeding	1	3	14.30	Dry, Good visibility, N wind, F2
19/06/2024	Breeding	1	3	08.30	Dry, Good visibility, W wind, F3
19/06/2024	Breeding	2	3	12.30	Dry, Good visibility, W wind, F3

APPENDIX 6-7-4 Vantage Point raw data & flight activity, Derrybrien Wind Farm, April-June 2024

Date	VP No	Map Reference	Species	No.	Flight Time	Flight Duration (s)	Band 1 (0-25m)	Band 2 (25-175m)	Band 3 (175+m)	Comments
09/04/2024	1		Kestrel	1	12.05	220	140	80	0	Hunting near T33 and edge of bog - male
09/04/2024	2		Sparrow hawk	1	15.57	180	0	180	0	Circling bird over forest near T54-T55. Also, 3 Mistle thrushes flying between plantations
10/04/2024	1		Snipe	1	08.23	200	100	100	0	Drumming bird over bog south of T31 – T34. Also, pair stonechats near VP; skylarks & pipits singing
10/04/2024	2									No target species. 2 wheatears on track – probable migrants
10/05/2024	1		Kestrel	1	12.12	50	50	0	0	Kestrel flying low near T27 and site entrance. Cuckoo calling, swallows & several house martins over site
10/05/2024	2									No target species Willow warblers singing
11/05/2024	1									No target species 2 cuckoos active
11/05/2024	2		Sparrow hawk	1	15.13	20	20	0	0	Male hunting near T53
18/06/2024	2									No target species;

Date	VP No	Map Reference	Species	No.	Flight Time	Flight Duration (s)	Band 1 (0-25m)	Band 2 (25-175m)	Band 3 (175+m)	Comments
										12 mistle thrushes in area of VP, Meadow pipit, skylark, & willow warbler with young
18/06/2024	1									No target species; 20+ swallow & c.10 sand martins, Grey wagtail flew over VP towards quarry pond
19/06/2024	1		Snipe	1	09.16	30	30	0	0	Flew up and then back down onto bog near T31
19/06/2024	2									No target species; Mistle thrush numbers up to 16 y

APPENDIX 6-8

DERRYBRIEN TRANSECT BIRD SURVEY 2022 AND 2024

APPENDIX 6-8

DERRYBRIEN WIND FARM TRANSECT BIRD SURVEY 2022 & 2024

2022 SURVEY YEAR

The information presented here comprises the results of the breeding bird transect surveys undertaken in 2022. The locations of these transects is presented in Figure 6-1 (wind farm site) and Figure 6-2 (OHL corridor) in Section 6.2.4.2.1. T stands for Turbine, while PS stands for pole set and AM stands for angle mast.

Table 1: Transect No. 1 (T28-T37) survey results, 2022.

Species	26th May 2022	30th June 2022	Conservation Status
Mallard	**2**	**0**	**A**
Cuckoo	2	**0**	**G**
Raven	0	4	**G**
Skylark	**6**	**8**	**A**
Swallow	**10+**	**20+**	**A**
Willow warbler	**5**	**8**	**A**
Wren	2	3	**G**
Blackbird	0	1	**G**
Stonechat	3	4	**G**
Meadow pipit	**10**	**16**	**R**
Reed bunting	2	1	**G**

Conservation Status: R – Red; A – Amber; G – Green

Table 2: Transect No. 2 (T23-T70) survey results, 2022.

Species	26th May 2022	30th June 2022	Conservation Status
Woodpigeon	0	6	**G**
Cuckoo	1	0	**G**
Magpie	2	0	**G**
Goldcrest	**2**	**3**	**A**
Great tit	1	0	**G**
Coal tit	4	9	**G**
Swallow	**0**	**10+**	**A**
Willow warbler	**7**	**11**	**A**
Whitethroat	2	1	**G**
Wren	4	5	**G**
Blackbird	3	3	**G**
Song thrush	1	0	**G**
Robin	3	4	**G**
Stonechat	2	4	**G**
Meadow pipit	**6**	**9**	**R**
Chaffinch	4	6	**G**
Lesser redpoll	0	7	**G**

Conservation Status: R – Red; A – Amber; G – Green

Table 3: Transect No. 3 (T12-T15) survey results, 2022.

Species	26th May 2022	30th June 2022	Conservation Status
Mallard	**0**	**3**	**A**
Woodpigeon	8	0	**G**
Cuckoo	1	0	**G**

Species	26th May 2022	30th June 2022	Conservation Status
Hooded crow	2	4	G
Coal tit	3	0	G
Skylark	**8**	**11**	**A**
Swallow	**6**	**10+**	**A**
Willow warbler	**5**	**3**	**A**
Whitethroat	1	4	G
Wren	7	3	G
Blackbird	4	5	G
Robin	2	2	G
Stonechat	4	3	G
Meadow pipit	**12**	**10**	**R**
Chaffinch	3	1	G
Lesser redpoll	0	7	G

Conservation Status: **R – Red**; **A – Amber**; **G – Green**

Table 4: Transect No. 4 (T47-T50) survey results.

Species	26th May 2022	30th June 2022	Conservation Status
Sparrowhawk	0	1	G
Woodpigeon	4	13	G
Magpie	3	4	G
Jay	0	3	G
Goldcrest	**3**	**1**	**A**
Coal tit	7	12	G
Swallow	**0**	**6**	**A**
Willow warbler	**9**	**4**	**A**
Wren	2	5	G
Blackbird	6	10	G
Song thrush	3	1	G
Mistle thrush	4	6	G
Robin	3	4	G
Meadow pipit	**1**	**3**	**R**
Chaffinch	10+	8	G
Siskin	5	0	G
Lesser redpoll	6	3	G

Conservation Status: **R – Red**; **A – Amber**; **G – Green**

Table 5: Transect No. 5 (PS1-PS4) survey results, 2022.

Species	26th May 2022	30th June 2022	Conservation Status
Woodpigeon	**4**	**7**	**G**
Cuckoo	**1**	**0**	**G**
Coal tit	**2**	**5**	**G**
Swallow	**10+**	**0**	**A**
Willow warbler	**8**	**12**	**A**
Wren	**4**	**2**	**G**
Blackbird	**5**	**5**	**G**
Song thrush	**2**	**1**	**G**

Species	26th May 2022	30th June 2022	Conservation Status
Mistle thrush	1	4	G
Robin	1	0	G
Chaffinch	6	10	G
Lesser redpoll	0	7	G

Conservation Status: R – Red; A – Amber; G – Green

Table 6: Transect No. 6 (P10-P12) survey results, 2022.

Species	26th May 2022	30th June 2022	Conservation Status
Woodpigeon	0	3	G
Cuckoo	1	0	G
Goldcrest	2	0	A
Coal tit	5	2	G
Swallow	0	5	A
Willow warbler	6	4	A
Whitethroat	1	0	G
Wren	6	3	G
Blackbird	6	2	G
Song thrush	1	2	G
Robin	3	2	G
Stonechat	0	4	G
Meadow pipit	2	0	R
Chaffinch	9	5	G
Siskin	0	7	G

Conservation Status: R – Red; A – Amber; G – Green

Table 7: Transect No. 7 (Local road/PS36 to AM34) survey results, 2022.

Species	26th May 2022	30th June 2022	Conservation Status
Mallard	0	2	A
Kestrel	1	0	R
Cuckoo	2	0	G
Hooded crow	0	5	G
Skylark	3	6	A
Swallow	20+	0	A
Willow warbler	2	1	A
Whitethroat	2	3	G
Wren	4	1	G
Blackbird	2	0	G
Song thrush	1	2	G
Robin	2	0	G
Stonechat	3	5	G
Meadow pipit	9	15	R
Chaffinch	2	0	G
Reed bunting	2	3	G

Conservation Status: R – Red; A – Amber; G – Green

2024 SURVEY YEAR

The information presented here comprises the results of the breeding bird transect surveys undertaken in 2024. The locations of these transects is presented in Figure 6-1 (wind farm site) and Figure 6-2 (OHL corridor) in Section 6.2.4.2.1. T stands for Turbine, while PS stands for pole set and AM stands for angle mast.

Table 1: Transect No. 1 (T28-T37) survey results, 2024.

Species	9th May 2024	20th June 2024	Conservation Status
Mallard	**0**	**0**	**A**
Woodpigeon	0	7	**G**
Cuckoo	3	1	**G**
Raven	0	0	**G**
Skylark	**4**	**9**	**A**
House martin	**2**	**0**	**A**
Swallow	**6**	**20+**	**A**
Willow warbler	**3**	**4**	**A**
Wren	3	1	**G**
Blackbird	2	4	**G**
Stonechat	2	5	**G**
Meadow pipit	**7**	**11**	**R**
Reed bunting	1	3	**G**

Conservation Status: R – Red; A – Amber; G – Green

Table 2: Transect No. 2 (T23-T70) survey results, 2024.

Species	9th May 2024	20th June 2024	Conservation Status
Woodpigeon	2	4	**G**
Cuckoo	0	0	**G**
Magpie	0	0	**G**
Goldcrest	**1**	**2**	**A**
Great tit	2	2	**G**
Coal tit	7	4	**G**
Swallow	**3**	**0**	**A**
Willow warbler	**4**	**3**	**A**
Whitethroat	2	2	**G**
Wren	2	3	**G**
Blackbird	1	5	**G**
Song thrush	0	2	**G**
Robin	2	3	**G**
Stonechat	1	0	**G**
Meadow pipit	**2**	**5**	**R**
Chaffinch	6	9	**G**
Lesser redpoll	0	0	**G**

Conservation Status: R – Red; A – Amber; G – Green

Table 3: Transect No. 3 (T12-T15) survey results, 2024.

Species	9th May 2024	20th June 2024	Conservation Status
Mallard	**2**	**0**	**A**
Woodpigeon	0	0	**G**

Species	9th May 2024	20th June 2024	Conservation Status
Cuckoo	0	0	G
Hooded crow	2	1	G
Coal tit	0	0	G
Great tit	1	0	G
Skylark	**5**	**6**	**A**
Swallow	**10+**	**6**	**A**
Willow warbler	**7**	**5**	**A**
Whitethroat	2	3	G
Wren	4	5	G
Blackbird	2	1	G
Robin	3	3	G
Stonechat	3	6	G
Meadow pipit	**9**	**14**	**R**
Chaffinch	4	4	G
Lesser redpoll	6	4	G

Conservation Status: **R – Red**; **A – Amber**; **G – Green**

Table 4: Transect No. 4 (T47-T50) survey results, 2024

Species	9th May 2024	20th June 2024	Conservation Status
Sparrowhawk	0	0	G
Woodpigeon	9	14	G
Magpie	2	1	G
Jay	1+	2	G
Goldcrest	**2**	**2**	**A**
Coal tit	4	5	G
Swallow	**4**	**0**	**A**
Willow warbler	**6**	**5**	**A**
Wren	4	5	G
Blackbird	3	4	G
Song thrush	2	3	G
Mistle thrush	2	7	G
Robin	1	2	G
Meadow pipit	**0**	**2**	**R**
Chaffinch	13	7	G
Siskin	0	4	G
Lesser redpoll	12	0	G

Conservation Status: **R – Red**; **A – Amber**; **G – Green**

Table 5: Transect No. 5 (PS1-PS4) survey results, 2024.

Species	9th May 2024	20th June 2024	Conservation Status
Woodpigeon	2	5	G
Cuckoo	1	**0**	G
Goldcrest	1	**0**	A
Coal tit	5	4	G

Species	9th May 2024	20th June 2024	Conservation Status
Blue tit	2	0	G
Swallow	**10+**	**10+**	**A**
Willow warbler	**5**	**6**	**A**
Wren	2	5	G
Blackbird	3	4	G
Song thrush	1	0	G
Mistle thrush	2	0	G
Robin	3	3	G
Meadow pipit	4	2	R
Chaffinch	7	8	G
Lesser redpoll	2	0	G

Conservation Status: R – Red; A – Amber; G – Green

Table 6: Transect No. 6 (P10-P12) survey results, 2024.

Species	9th May 2024	20th June 2024	Conservation Status
Woodpigeon	4	2	G
Cuckoo	0	**0**	G
Goldcrest	**0**	**1**	**A**
Coal tit	2	6	G
Swallow	**5**	**3**	**A**
Willow warbler	**7**	**5**	**A**
Whitethroat	2	1	G
Wren	5	2	G
Blackbird	4	5	G
Song thrush	1	0	G
Robin	1	3	G
Stonechat	2	3	G
Meadow pipit	**3**	**5**	**R**
Chaffinch	6	7	G
Siskin	0	3	G

Conservation Status: R – Red; A – Amber; G – Green

Table 7: Transect No. 7 (Local road/PS36 to AM34) survey results, 2024.

Species	9th May 2024	20th June 2024	Conservation Status
Mallard	**0**	**0**	**A**
Kestrel	**0**	**0**	**R**
Cuckoo	1	0	G
Hooded crow	3	4	G
Skylark	**2**	**3**	**A**
Swallow	**12**	**4**	**A**
Willow warbler	**3**	**2**	**A**
Whitethroat	1	2	G
Wren	3	3	G
Blackbird	1	3	G
Song thrush	0	1	G
Robin	1	2	G
Stonechat	2	3	G

Species	9th May 2024	20th June 2024	Conservation Status
Meadow pipit	**6**	**8**	**R**
Chaffinch	3	1	**G**
Reed bunting	1	0	**G**

Conservation Status: R – Red; A – Amber; G – Green

APPENDIX 7-1

DERRYBRIEN MACROINVERTEBRATE DATA

Table A7-1.1 Macroinvertebrate Data 2011

2011	Category	B1	B2	B4	B5	O1	O2	O3	O4	OG1	O6	O9
MAY FLIES (Ephemeroptera)												
Heptageniidae:	A	*	*		*	*	*	*		*	*	*
Rhithrogena semicolorata		3			47					26	100+	100+
Ecdyonurus sp.			22		15	2	2	9		27	46	2
Heptagania sp.										2		3
Baetis rhodani	C	45	28		19	77	70	42	100+	15	80	30
STONE FLIES (Plecoptera)												
Perla bipunctata	A											7
Chloroperla sp.	A									1	1	
Isoperla sp.	A	2	6	2		2	1	3	2		2	
Nemouridae:	A	*	*	*	*		*	*	*	*	*	
Amphinemoura sp.				1								
Protonemoura spp.		17	26	82	73		14	48	44	76	100+	
Leuctra spp.	B		38	17	1	34	2	1	2		28	
CADDIS FLIES (Trichoptera)												
Silo pallipes	B	62	16	19	16	1	1	12	44	11	1	14
Rhyacophilidae	C	11	2	5	4		3	2	2	2	3	1
Hydropsychidae	C		2		1				2	3	9	5
Glossosomatidae:	C	*								*	*	*
Agapetus sp.										3	2	3
Glossosoma sp.		3										64
Plectronemia conspersa	C		4	12		3	1	1	1	2	5	
Philopotomus montana	C										1	
Limnephilidae:	C	*		*	*	*	*	*		*	*	
Potomophylax spp.					1					9	1	
Limnephilid indet.		2		2	2	5	8	3		2	4	
TRUE FLIES (Diptera)												
Dicranota sp.			20	6	2	5	3	7	1	5	12	3
Chironomidae	C	10		1	6	9	21	3	7		25	
Simuliidae	C	40	14		15	23	29	30	22	8	62	
Tipulidae	C	2	3			3	1					
BEETLES (Coleoptera)												
Hydraenidae	C		2							1	2	
Agabus guttatus	C			1								
Elmidae	C	6	37	62	26		3	46		22	41	22
F/W SHRIMPS (Crustacea)												
Gammarus sp.	C	46	11		30		1			21		
SNAILS (Mollusca)												
Ancyclus fluviatilis	C				3					15	15	
Sphaeriidae	D	1	2	1								
WORMS (Annelida)												
Oligochaetae	E	17	37	2		22	24	2	8	3	14	2
LEECHES (Hirudinea)												
Trocheta spp.										1	3	
FLATWORMS (Tricladia)												
Indet.	D					1						

Table A7-1.2 Macroinvertebrate Data 2014/2018

	2014						2018						
	O4	O5	O6	O7	O9	O11	B4	B3	O9A	O2	O3	O4	O7
MAY FLIES (Ephemeroptera)													
Ephemera danica													F
Heptageniidae:													
Rhithrogena semicolorata				F		+		C					C
Ecdyonurus sp.		+	C	F			F/C	N/D	C/N	F	F/C	+	N
Heptagania sp.				+	D	F							
Seratella ignita		C	C	C	C	C							
Siphonlurus sp.													
Baetis rhodani	E	E	D	C	N	C	+	C	C/N	N	D	C/N	F/C
STONE FLIES (Plecoptera)													
Perla bipunctata					C								
Chloroperla sp.					F								
Isoperla sp.						+	F/C	F	+			F/C	F
Nemouridae:													
Amphinemoura sp.		F				+							
Protonemoura spp.				F			C	F	F/C	F	F	+	F
Brachyptera risi													
Nemoura sp.													
Leuctra spp.	F	C	C	F		F	F	+		+			
CADDIS FLIES (Trichoptera)													
Goeridae				+			F/C		F	F/C			+
Sericostoma personatum						+							
Leptoceridae													+
Rhyacophilidae	C	C	F	F	C	F	F/C	F/C	F		F		
Hydropsychidae				C		F/C		F/C	F		F	F	C
Glossosomatidae:													
Agapetus sp.				+									
Glossosoma sp.					F								
Polycentropidae	F	F					+						
Philopomatidae								+					
Limnephilidae:													
Potomophylax spp.													
Limnephilid indet.										F			
TRUE FLIES (Diptera)													
Dicranota sp.			F	F		F							
Chironomidae	C			F	C	F						F	
Simuliidae	D	C	F	F	F	F/C	F	F	C/N	C		C/N	
Tipulidae									+	+			+
BEETLES (Coleoptera)													
Scirtidae													
Hydraenidae						F			F/C	F			
Haliplidae			F										
Elmidae	C	N		N		C	C/N	F/C	C	F	F	F	C
Water Mites													
***F/W SHRIMPS* (Crustacea)**					C								
Asellus						+/F							
Gammarus sp.				C		C		F	+	F/C			F
SNAILS (Mollusca)					F								
Ancyclus fluviatilis								F	+	+			F
Lymneae peregra													
Sphaeriidae				+									
Hirudinae (Leeches)													
Trchochaeta													
WORMS (Annelida)													
Oligochaetae			F	+		F		+	+	+	F	F	+

+ = Present (one or two individuals), F = Few (5%), C = Common (6-20%), N = Numerous (21-50%), D = Dominant (51-75%) E = Excessive (>75%)

MACROINVERTEBRATE ABUNDANCE KEY: + = Present (one or two); F = Few (1-5%); C = Common (6-20%); N = Numerous (21-50%); D = Dominant (51-75%); E= Excessive (>75%)

Table A7-1.3 Macroinvertebrate Data 2019

2019	O1	O2	O3	O3A	O4	O4A	O5	O5A	O6A	O7A	O7B	O8A	O9A1
MAY FLIES (Ephemeroptera)													
Ephemera danica													
Heptageniidae:													
Rhithrogena semicolorata													
Ecdyonurus sp.			C/N	C	+		N	N/D	C/N	N	C/N		
Heptagania sp.										+	+		
Seratella ignita							+		F	F	F/C		
Siphonlurus					+								
Baetis	N	D	C/N	F/C	N	+	N	C/N	N	C	C	F	C
STONE FLIES (Plecoptera)													
Perla bipunctata													
Chloroperla sp.													
Isoperla sp.				+				+	+				
Nemouridae:						N							
Amphinemoura sp.													
Protonemoura spp.		C	C/N	F	F		C/N	+				F	
Brachyptera risi													
Nemoura sp.													
Leuctra spp.	C	+	F	C	C	F/C	F	F	C/F	C	F/C	N	C/N
CADDIS FLIES (Trichoptera)													
Goeridae				+	+/F					+		+	
Sericostoma personatum											F		+
Leptoceridae											F/C		
Rhyacophilidae	+			C	F		F	F/C	F	F/C	+/F	+	F
Hydropsychidae									F	F	+/F		
Glossosomatidae:									+	F/C	F		
Agapetus sp.													
Glossosoma sp.													
Polycentropidae				F	F	F/C	+	+	+			C	F
Philopomatidae													
Limnephilidae:										+			
Potomophylax spp.													
Limnephilid indet.						+	+					+	+/F
TRUE FLIES (Diptera)													
Dicranota sp.		+			+			F/C	F	F		+	
Chironomidae						+			+/F	F	+		
Simuliidae	C/N	F	C/N	F	C/N	C	C/N	C/N	F	F		C/N	+/F
Tipulidae													
BEETLES (Coleoptera)													
Scirtidae				+	+		+	F/C				+	
Hydraenidae													
Haliplidae													
Elmidae		F	C/N	F/C	C		C/N	F	+/F	C	C/N	+	F
Water Mites							F		+	+	F/C		
F/W SHRIMPS (Crustacea)													
Asellus													
Gammarus sp.		+								+	C	+/F	C
SNAILS (Mollusca)													
Ancyclus fluviatilis											+		+
Lymneae peregra											+		
Sphaeriidae													
Hirudinae (Leeches)													
Trchochaeta											+		
WORMS (Annelida)													
Oligochaetae	+	+	+				+			F	F		
+ = Present (one or two individuals), F = Few (5%), C = Common (6-20%), N = Numerous (21-50%), D = Dominant (51-75%) E = Excessive (>75%)													

MACROINVERTEBRATE ABUNDANCE KEY: + = Present (one or two); F = Few (1-5%); C = Common (6-20%); N = Numerous (21-50%); D = Dominant (51-75%); E= Excessive (>75%)

Table A7-1.4 Macroinvertebrate Data 2020 (Peat disturbance Turbary Plot 161)

Turbary Disturbance Sampling (9 June 2020)	EPA Class	O3B	O3C
Mayflies (Ephemeroptera)			
Ecdyonurus	A	N	F/C
Heptagenia	A	+	
Rhitrogena	A	C	
Siphlonurus	A	F	
Serratella	C		C
Baetis	C	F/C	
Stone Flies (Plecoptera)			
Isoperla	A	F/C	F/C
Siphonoperla	A	F/C	F+
Leuctra	B		F
Caddis Flies (Trichoptera)			
Silo	B	+/F	+
Rhyacophila	B	+	+/F
Hydropsyche	C		F
Plectrocnemia	C	+/F	
Limnephilidae	C	+	F
True Flies (Diptera)			
Chironomidae	C		
Simuliidae	C		
Dicranota		F	F
Beetles (Coleoptera)	C		
Elmidae	C	F/C	N
Dytiscidae	C	C	C
F/W SHRIMPS (Crustacea)			
Gammarus	C		+
Snails (Mollusca)			
Radix balthica			+
Potamopyrgus antipodarum			+
Worms (Oligochaetae)			
Oligochaete	E	+/F	+
Lumbricidae	E		
Q-rating		**Q4-5**	**Q4-5**
Representative WFD Status		High	High

MACROINVERTEBRATE ABUNDANCE KEY: + = Present (one or two); F = Few (1-5%); C = Common (6-20%); N = Numerous (21-50%); D = Dominant (51-75%); E= Excessive (>75%)

Table A7-1.5 Macroinvertebrate Data 2022

2022	EPA CLASS	B4	B1A	D1A	O1	O3A	O4	O5	O5A	O8A	O8B	O9A2	OHL1	O6A
MAY FLIES (Ephemeroptera)														
Heptageniidae:														
Rhithrogena semicolorata	**A**		+/F			+/F			+		+/F			F/C
Ecdyonurus sp.	**A**		F/C			N/D		F	+		F			C
Heptagania sp.	**A**					F					+			+
Siphonlurus lacustris	**A**				+	+/F	+		+					
Leptophlebia sp	**B**												+	
Seratella ignita	**C**	C	C/N			F	+	F			F			F
Baetis	**C**	F/C	F/C	F/C	E	F/C	D/E	C/N	C	C/N	N/D		N	C
STONE FLIES (Plecoptera)														
Chloroperla sp.	**A**			+				F						
Isoperla sp.	**A**							F	F					
Nemouridae:	**A**	+										+		
Leuctra spp.	**B**	F/C	+/F	+/F	+		+/F	F/C	F/C	C	+/F		C/N	F
CADDIS FLIES (Trichoptera)														
Goeridae	**B**	F				+	F	+/F	+/F	+				
Sericostoma personatum	**B**					+								
Rhyacophilidae	**C**	+	F/C	F/C	F	+	+/F	F	F/C	+	F	C	+/F	F
Hydropsychidae	**C**	+	F	F/C		+		+			F			F/C
Glossosomatidae	**C**													C
Polycentropidae	**C**	C		F	F	F		+	C	C	F	F		
Philopomatidae	**C**										F/C			
TRUE FLIES (Diptera)														
Dicranota sp.	**C**		+/F			+/F	+	F			+		F	
Chironomidae	**C**	+/F	+	+	F	+	+	F	+/F				C	F
Simuliidae	**C**		F/C	C	F		F	C	C	N			C	F/C
BEETLES (Coleoptera)														
Elmidae	**C**	N/D	C/N	N		F		C	C	C		N/D	C	C
WATER MITES - Hydracarina	**C**													F/C
F/W SHRIMPS (Crustacea)														
Gammarus sp.	**C**		N	N						C	F/C			+/F
HYDRACARINA (mites)		F/C												
SNAILS (Mollusca)														
Ancyclus fluviatilis	**C**			C		+/F								
Hirudinae (Leeches)														
Erpobdellidae	**D**												+	+
WORMS (Annelida)														
Oligochaetes	**E**	+	+/F											
Q-Value	**E**	**Q3-4**	**Q4**	**Q4 (Q3-4)**	**Q3-4**	**Q4-5**	**Q3-4**	**Q4 (Q4-5)**	**Q4**	**Q3-4 (Q3)**	**Q4 (Q3-4)**	**Q3-4**	**Q3-4**	**Q4**

MACROINVERTEBRATE ABUNDANCE KEY: + = Present (one or two); F = Few (1-5%); C = Common (6-20%); N = Numerous (21-50%); D = Dominant (51-75%); E= Excessive (>75%)

Table A7-1.6 Macroinvertebrate data 2024

2024 Sampling		O1	O3A	O5	O7 (EPA O5)	B5 (EPA B1)	B4
EPA stream name		Unamed	Unnamed	Derrybrien North	Owendalullegh River	Boleyneendorrish 29	Boleyneendorrish 29
Sample Date		30/08/2024	30/08/2024	30/08/2024	30/08/2024	30/09/2024	30/09/2024
Width (m)		0.75	1.7m	2.70	7.50	4.25	3.00
Depth (m)		0.08	0.10	0.15	0.25	0.25	0.18
Flow type		Riffle/run	Riffle/run	Riffle/run	Riffle/run	Riffle/run	Riffle/run
Substrate		Iron bacteria biofilm (0.5cm) Bedrock, cobble, gravel, peaty silt	Cobble with some gravel and coarse sand	Cobble 30%, Gravel 60%, coarse and fine sand 10%	Sm. boulder 20%, cobble 40%, gravel 30%, coarse sand 10%	Sm. boulder 10%, cobble 60%, gravel 20%, coarse sand 10%	Sm. boulder 10%, cobble 40%, gravel 20%, coarse sand 10%
Easting ITM		562261	561853	561150	560123	555540	555846
Northing ITM		705620	704060	702601	701248	706858	706780
Taxa	**EPA Class**						
MAYFLIES (Ephemeroptera)							
Ecdyonurus spp.	A		6	23	80	25	3
Heptagenia sp.	A					3	
Rithrogenia spp.	A		4	3	40	30	
Seratella ignita	C		2				
Canidae	C						
Baetidae	C	12	100+	70		25	
STONEFLIES (Plecoptera)							
Perla bipunctata	A				2	2	
Siphlonoperla	A			2	2		2
Isoperla grammatica	A					3	5
Protonemoura	A		3	3	3	18	12
Brachyptera risi	A					5	3
Leuctra	B	7	5	10	7		15
CADDISFLIES (Trichoptera)							
Polycentropidae	C	2	4	3			6
Philopotimidae	C		3			1	
Rhyacophilidae	C		4	3		1	
Hydropsychidae	C					2	
Limnephilidae	C						3
TRUE FLIES (Diptera)							
Dicranota spp.	C	1		2			
Chironomidae	C					3	5
Tipulidae	C						
Simuliidae	C	20	16	21		3	7
BEETLES (Coleoptera)							
Dytiscidae	C	2					
Elmidae	C		1		5	5	5
ODONATA							
Anisoptera	C	1					
Zygoptera	C						
F/W SHRIMPS (Crustacea)							
Gammarus sp.	C				4	15	
LEECHES (Hirudinea)							
Trocheta sp.	D		1			1	
WORMS (Annelida)							
Oligochaetae	E		2				2
Q Value		**Q3-4**	**Q4-5**	**Q4-5**	**Q5**	**Q5**	**Q4-5**
Potential Status		Moderate	High	High	High	High	High

Macroinvertebrate Sampling Site Descriptions and Photographs 2011-2024

13/10/11 (Water levels in falling flood)				
Site	**Depth (cm)**	**Substrate**	**Velocity**	**Notes**
O1	-	Cobbles and large stones on gravel	swift/turbulent	much iron scum (with black organic layer under scum)
O2	10-20cm	Boulder on loose sand, heavily embedded, little loose material	swift/turbulent	heavy moss and liverwort cover
O3	-	Boulder and cobble on coarse sand	swift/turbulent	water coloured. Moss and liverwort present
O4	10cm	Cobble and coarse sand	swift/turbulent	clear, coloured. Some algal scum.
O6	10-20cm	boulders, small cobble & pebble	diverse turbulent swift & slacker areas	moss on small boulders
O9	10-18cm	Small cobble and pebble	riffle (mod/swift)	no plant cover
B1	15cm	Small cobble & pebble - loose	riffle (mod/swift)	no plant cover, local cattle access
B2	10-12cm	Small cobble & pebble & coarse sand - loose	riffle (mod/swift & swift)	much moss and liverwort
B4	-	Embedded boulder & cobble, pockets of gravel only (& coarse sand)	riffle/glide swift/turbulent	Heavy moss cover on boulders
B5	-	Embedded boulder & cobble, pockets of gravel	swift/turbulent	moss covered boulders
D1	-	Boulders on coarse sand and fine gravel	swift/turbulent	moss and liverwort cover.

Plate 1A-1F October 13th 2011: A=O1, B=O2, C=O3, D=O4, E = O6, F=O9

Plate 1G-1K October 13th 2011: G=B1, H=B2, I=B4, J=B5, K=D1

30/07/2014	(low to very low flow, not ideal conditions)				
Site	**Width (m)**	**Depth (cm)**	**Substrate**	**Velocity**	**Notes**
O4	1.5-1.8m	2.5-7	cobble, pebble & sand (glide/shallow riffle)	mod/turbulent	some peaty iron flocks present, some moss & liverwort
O5	3.3m	5-7cm	small cobble & pebble with fine gravel	mod/swift, riffle/cascade	FGA on stones (~5%, liverwort on boulders (~10%)
O6	4.2m	7-15cm	cobble & pebble	mod/swift/turbulent, riffle/cascade	clear, coloured, no peat silt
O8	7-8m	7-12cm	small cobble & pebble	mod/swift, riffle/riffle- run	*Myriophyllum* in slack flow u/s, FGA & BG marginally (<5%) moss & liverwort on boulders
O10	4-6m	15-20cm	cobble, pebble, coarse sand	mod/swift turbulent (weir/cascade)	Main channel site
O11	Wide	~10cm	small cobble, large pebble, coarse sand	mod/swift turbulent, riffle	*Ranunculus* common, liverwort on boulders, FGA-trace

FGA = filamentous green algae, BG = blue-green algae

Plate 2A-2F July 30th 2014: A=O4, B=O5, C=O6, D=O8, E=O10, F=O11

10/10/18 Moderate - low flow summer, peat silt in evidence			
Site	**Substrate**	**Velocity**	**Notes**
O2	embedded small boulder & lge cobble, with gravel and sand	moderate	all substrate covered in a n intact layer of peat silt (~1-3mm)overlain in places by a fine tracery of algal filaments.
O3	bedrock and embedder cobbles with pockets coarse sand and gravel	mod/turbulent	liverwort with a heavy coating of peat silt/scum (less than at O2)
O4	small and medium cobble & lge. gravel with pockets of fine gravel and coarse sand	mod/swift in riffle/cascade, mod in shallow pool/glide	scattered liverwort and moss on larger substrate elements. Peat scum recorded on cobbles but not noted in photos
O7	cobble & gravel	mod/swift (rifle, riffle/glide)	Fontinalis squamosa, liverwort and FGA present, loose peat silt coating in marginal areas
O9A	cobble & gravel, with coarse sand	mod-mod/swift, riffle & shallow glide	
B3	boulder & cobble dominated with pockets of gravel & coarse sand	mod/swift turbulent, short glide/runs	good moss and heavy liverwort cover, some peat silt in moss
B4	boulders and cobbles with small pockets of gravel and coarse sand	mod/swift turbulent	heavy cover of F. squamosa and liverworts on larger substrate elements. Water clear, silt free and very coloured

Plate 3A-3H October 10th 2018:A=O2, B=O2 (peat coating), C=O3, D=O4, E=O7, F=O9A, G=B3, H=B4

Plate 4A-4F August 1st 2019: A=O6A, B=O7A, C=O7B, D=B4B, E=B4B, F=B4C

01/08/2019	Width (m)	Depth (cm)	Substrate	Velocity	Notes
O6A	3	10-15cm	cobble (dom.) & pebble	mod/swift turbulent, riffle	very occ. *F. antipyretica* and liverwort on lge. cobbles
O7A	4.5-5	8-18cm	cobble (dom.) & pebble	mod/swift turbulent, riffle/run	shaded side of channel with much *F. squamosa,* liverwort, elsewhere plant-free
O7B	3	5-10cm	small cobble & lge. gravel (dom.)	mod/swift turbulent, shallow short riffle	plant free in kick- sample area
B4B	0.7-1.2	5-10cm	small cobble & gravel	mod/swift	clear and coloured, heavy liverwort on cobble
B4C	0.8	5-10cm	pockets of clear granitic sand and gravel between embedded, liverwort covered cobbles	mod/riffle	Difficult sampling - shallow flow and embedded cobble substrate
15/08/2019	**Width (m)**	**Depth (cm)**	**Substrate**	**Velocity**	**Notes**
O1	1.5-1.7		small boulders and embedded cobble & large gravel	mod/swift turbulent	iron bacterial & peaty biofilm with some FGA on all substrate
O3A	1.5	10-15cm	cobble & v large pebble	swift/turbulent and laminar riffle/run & glide	mainly plant-free
O4	1.3-1.5	6-15cm	cobble & lge. pebble	mod/swift, riffle & shallow glide	*F. fontinalis* & *F. squamosa* and liverwort on lge. cobble
O4A	0.5-0.7	10-15cm	cobble & lge. Pebble	mod-mod/swift	pronounced biofilm, peaty
O8A	1.7	6-20cm	med & small cobble, with gravel and clean coarse sand	mod-mod/swift	scattered liverwort
O9A1	3	10-15cm	med & small cobble and lge. pebble	swift/turbulent	much liverwort cover, no biofilm
O9A2	2	10-15cm	med & small cobble and lge. pebble	swift/torrential	Liverwort & moss, fine algal scum
O9B	1.5	6-15cm	embedded cobble with pockets of coarse pebble	swift/torrential	some moss & liverwort
B1B	0.4-1.2	13-17cm	boulders & lge embedded cobble / pebble with pockets of sand	stepped pools/cascades	heavy liverwort cover in places
B2A	0.4-1	6-8cm	angular pebble & sand/fine gravel between embedded cobble	mod/swift	scattered liverwort on cobble, no biofilm
D1A			scattered boulders, lge. And medium cobbles and lge., pebble & gravel	mod/swift turbulent	
15/09/2019	**Width (m)**	**Depth (cm)**	**Substrate**	**Velocity**	**Notes**
O2	2.4-3	10-17cm	cobble and boulders very embedded with tiny pockets of gravel	mod/swift turbulent	heavy peaty organic iron scum on cobble, fine traces of algal filaments, scattered silted moss and liverwort on boulder and cobble
O3	1.2-1.8	10-20cm	dominated by embedded cobble with a small amount of embedded gravel	mod/swift turbulent (?)	liverwort on large cobble mainly at waterline
O5	2.2-2.8	6-7cm	mix of large cobble (60%) lge. Pebble 30%, sm. Boulder 10%	mod/swift turbulent	*F. squamosa* and liverwort on scattered lge. cobble/boulder, at or below the waterline. High colour.
O5A	3	5-12cm	pebble 60%, cobble 40%	mod/swift turbulent	Scattered liverwort cover on larger substrate, trace of FGA. High colour.
B2	1.9-2.4	8-12cm	pebble (60%) small cobble (40%)	mod-mod/swift turbulent, 100% riffle	*Vaucheria* , *F. squamosa* & liverwort common
B3	4.5-5	12-20cm	cobble & boulder dominant, tiny pockets of pebble	mod-swift turbulent/torrential	very coloured; good cover of liverwort on and below waterline.
B3A	4-6m	12-20cm	massive boulders, cascade with tiny pockets of pebble	mod/swift turbulent	heavy moss and liverwort cover; difficult to kick- sample
B4	3-3.6	5-12cm	cobble 50%, pebble 40%, boulder 10%	mod/swift turbulent	good cover of F. squamosa and liverwort on lge. Cobble and boulders, fine FGA cover
22/12/2019	**Width (m)**	**Depth (cm)**	**Substrate**	**Velocity**	**Notes**
OHL 1	1-2m		cobble 60%, coarse sand 40%	mod-mod/swift	heavy liverwort cover in places
OHL 2	1-1.5	18-25	gravel 70%, small cobble 30%	mod/swift, glide/riffle- run	largely plant-free
12/01/2020	**Width (m)**	**Depth (cm)**	**Substrate**	**Velocity**	**Notes**
O4B	1	08-Dec	cobble 40%, gravel 60%	swift (100% riffle)	plant-free instream

Plate 5A-5F August 15th 2019: A=O1, B=O3A, C=O4, D=O4A, E=O8A, F=O9A1

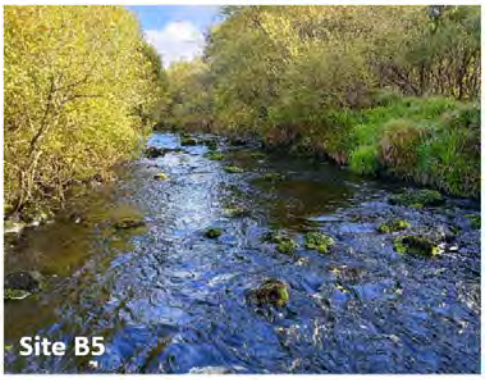
Plate 5G-5K August 15th 2019 contd: G=O9A2, H=O9B, I=B1B, J=B2A, K=D1A

Plate 6A-6F September 15th 2019: A=O2, B=O3, C=O5, D=O5A, E=B2, F=B3

Plate 6G-6L September 15th 2019: G=B3A, H=B4, December 22nd 2019: I=OHL1, J=OHL2, January 12th 2020 K = O4B (u/s Barrage 1), L = O4B close-up

30 September 2024

Site B4


Site B5

30 August 2024

Site O1

Site O3A

Site O4B

Site O5 (Flaggy Bridge)

Site O6

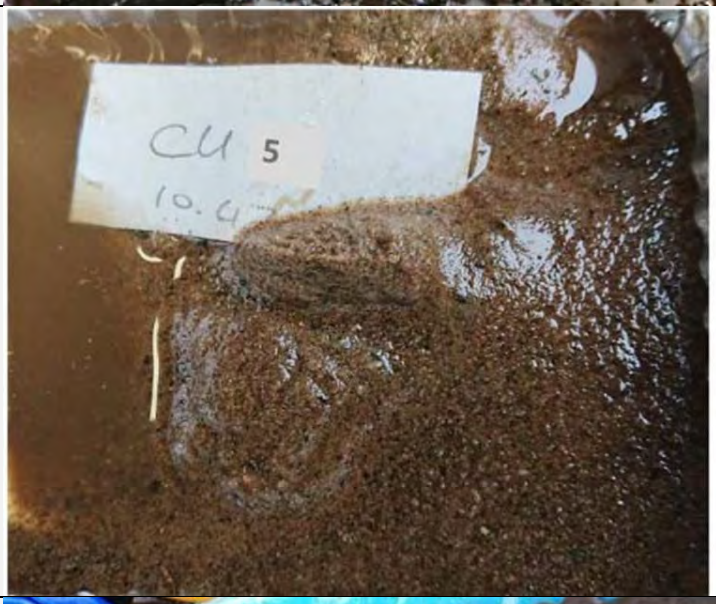
Site O7 (Stepping Stones)

APPENDIX 7-2

LOUGH CUTRA SEDIMENT SAMPLES

CU 1 – subsample for drying for granulometry	
CU 1 – portion of field sample	
CU 2 – sample in the field (note hard agglomeration of clay and coarser material beneath water on the right with an organic matrix on the left	

CU 2 – portion of mineral residue after washing (1mm sieve)	
CU 2 – organic content (removed from granulometry sample – not sieved)	
CU 3 – subsample for drying for granulometry	

CU 3 – washed residue (1mm sieve)	
CU 5 – subsample for drying for granulometry	
CU 6 - sample in the field	

CU 6 - subsample for drying for granulometry	
CU 8 - sample in the field	
CU 9 - subsample for drying for granulometry	

CU 10 - sample in the field	
CU 10 - subsample for drying for granulometry	
CU 10 - residue after washing through 1mm sieve	

CU 11 - in the field	
CU 11 - subsample for drying for granulometry	
CU 11 - washed organic residue (1mm sieve)	

APPENDIX 7-3

WATER CHEMISTRY DATA

Table A7-3.1 EPA Water Chemistry Data – Annual Means 2007-2023

Annual Mean	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Conduct. (µS/cm)	148	131	122	177	122	114	159	125	160	153	144	160	127	130	142	148	129
BOD (mg/l, O2)	0.79	0.70	0.82	0.83	1.27	0.98	0.78	0.68	0.71	0.88	1.07	<1	1.56	1.05	1.83	0.96	1.06
Ammonia (mg/l, N)	0.017	0.014	0.014	0.016	0.025	0.019	0.016	0.013	0.012	0.013	0.020	0.012	0.028	0.014	0.023	0.012	0.012
Ortho-P (mg/l, P)	0.015	0.016	0.015	0.018	0.005	0.010	0.006	0.005	0.006	0.006	0.007	<0.01	0.012	0.007	0.010	0.006	0.007
TON (mg/l, N)	0.19	0.13	0.17	0.26	0.14	0.20	0.18	0.10	0.10	0.10	0.10	<0.1	0.14	0.17	0.12	0.13	0.12
Colour (Hazan)	101	136	155	119	131	197	104	147	114	134	146	113	173	149	118	110	146
pH	7.5	7.3	7.4	7.6	7.4	7.3	7.4	7.4	7.4	7.4	7.5	7.6	~	~	~	~	~
Alkalinity (mg/l,CaCO3)	40	32	36	64	37	33	48	35	46	50	44	47	37	34	49	40	39

Notes: (1) Blue shading = high status, Yellow shading = moderate status (S.I. 77 of 2019), (2) One high outlier of (0.125mg/l, P) was not included in the annual average for ortho-P for 2011

Table A7-3.2 Project Specific Water Chemistry Results 2011-2022

Site	Sample Year	pH	Conduct. (µS/cm)	Alkalinity	Calcium (mg/l, Ca)	BOD (mg/l, O2)	TSS (mg/l)	Ammonia (mg N/l)	SRP (mg P/l)	Total P (mg P/l)	TON (mg N/l)	DOC (mg C/l)	Colour (Hazan)	ANC (µeq/l)	Total Al (µg/l)	Monomeric Al (µg/l)
Boleyneendoorish Catchment																
B1	**2011**	5.98	83	4.4		2.2		0.089	0.016	0.045	0.07	36.6		271	100	49
B1A	**2019**	6.73	64.2	13	6.92	1		0.034	0.007	0.021	0.03	27.6	353	398	138	24
B1B	**2019**	5.99	46.5	5	4.66	1.2		0.05	0.008	0.032	0.06	32.8	463	264	138	53
B2	**2011**	5.83	81	3.4		1.3		0.039	0.014	0.044	0.04	26.9		203	260	176
B2A	**2019**	6.87	67.7	17	9.21	1.4		0.04	0.061	0.104	0.06	35.1	481	516	149	46
B3	**2018**	7.3	137	38.8	15.4	1.1		0.024	0.007		0.02		159			
B4	**2011**	4.61	79	-0.7		1.2		0.049	0.022	0.046	0.03	33.4		153	250	198
	2018	6.3	81	7	5.4	1.6		0.07	0.024		0.02		411			
	2022	7.12	103	19.5	9.12	1.3	1.3	0.036	0.023	0.047	0.018	20.7	291		109	18
B4A	**2019**	6.48	57.1	8.1	5.8	1.5		0.039	0.034	0.072	0.05	32.7	454	326	185	61
B4B	**2019**	5.09	47.9	1.1	3.23	1		0.052	0.026	0.053	0.06	38.5	463	215	186	87
B5	**2011**	6.49	82	7.2		1.6		0.039	0.012	0.036	0.04	28.5		287	165	82
Owendalulleegh Catchment																
O1	**2011**	5.94	53	2		0.8		0.03	0.003	0.01	0.02	14.2		111	80	51
	2019	5.97	31.2	2.7	1.79	0.6		0.02	0.003	0.014	0.03	16.9	211	139	91	50
	2022	7.1	79	21.2	7.04	0.9	2.7	0.038	0.004	0.016	0.021	8.4	174		43	<5
O2	**2011**	6.21	70	4.1		0.8		0.03	0.005	0.02	0.05	21		187	204	125
	2018	6.74	94	19.3	8	1		0.03	0.001		0.01		81			
O3	**2011**	5.45	72	2.2		2		0.05	0.005	0.03	0.05	29.2		190	358	217
	2018	6.72	86	13.7	7.6	1.4		0.03	0.005		0.06		231			

Site	Sample Year	pH	Conduct. (µS/cm)	Alkalinity	Calcium (mg/l, Ca)	BOD (mg/l, O2)	TSS (mg/l)	Ammonia (mg N/l)	SRP (mg P/l)	Total P (mg P/l)	TON (mg N/l)	DOC (mg C/l)	Colour (Hazan)	ANC (µeq/l)	Total Al (µg/l)	Monomeric Al (µg/l)
O3A	**2019**	6.7	50.4	11.1	6.46	1.4		0.053	0.009	0.031	0.07	28	391	362	163	42
	2022	7.35	113	32.3	13.32	1.1	0.9	0.023	0.01	0.024	0.029	12.6	150		69	32
O4	**2011**	5.46	73	2.4		1.2		0.07	0.006	0.03	0.05	31.1		204	236	154
	2018	6.74	124	32.7	13.5	1.3		0.05	0.006		0.02		179			
	2019	6.17	51.4	6.2	4.63	1.2		0.04	0.006	0.026	0.04	30.7	415	278	236	81
	2022	7.12	195	72	24.84	1.1	1.1	0.051	0.007	0.015	0.045	10.3	109	1.146	60	18
O4A	**2019**	6.46	87.7	21.9	10.05	0.9		0.029	0.005	0.025	0.04	24.2	227	559	173	67
O5	2022	7.84	157	50.9	19.08	1.1	0.9	0.026	0.005	0.011	0.048	9.3	87		50	25
O5A	**2019**	6.09	48.4	4.6	3.96	1.2		0.038	0.059	0.099	0.05	31	379	245	160	57
	2022	7.48	100	43.4	16.68	1	0.7	0.028	0.008	0.022	0.074	12.4	116		45	23
O6	**2011**	6.05	76	4		1.5		0.04	0.006	0.03	0.05	28.3		222	232	116
O6A	**2022**	7.91	201	73.9	26.3	1.2	1	0.031	0.004	0.011	0.108	6.6	50		25	<5
O8A	**2019**	4.94	46.5	0.1	2.05	0.9		0.042	0.242	0.278	0.05	32.5	403	165	190	106
	2022	6.37	84	5.1	5.08	1.5	0.7	0.041	0.028	0.049	0.054	20.6	224		169	88
O7	**2018**	7.46	162	47.1	20.3	1.3		0.02	0.001		0.03		107			
O9	**2011**	7.37	107	21.6		1.5		0.03	0.005	0.02	0.09	22.7		534	168	73
O9A	**2018**	6.72	85	11	6.7	1.6		0.04	0.039		0.06				348	
O9A1	**2019**	5.76	53.6	4	4.11	1.3		0.056	0.059	0.097	0.05	39.5	514	278	265	113
O9A2	**2019**	5.09	41.6	1	2.44	1		0.043	0.062	0.094	0.04	35	433	195	209	114
	2022	7.08	90	18	7.88	1.1	1.6	0.026	0.01	0.024	0.02	17.1	212		72	16
O9B	**2019**	7.03	66.3	14.7	7.12	1.2		0.035	0.05	0.081	0.05	26.4	376	426	147	44
	2022	8.11	316	138.5	49.6	1.2	0.9	0.026	0.024	0.029	0.222	5.4	37		49	28

Site	Sample Year	pH	Conduct. (µS/cm)	Alkalinity	Calcium (mg/l, Ca)	BOD (mg/l, O2)	TSS (mg/l)	Ammonia (mg N/l)	SRP (mg P/l)	Total P (mg P/l)	TON (mg N/l)	DOC (mg C/l)	Colour (Hazan)	ANC (µeq/l)	Total Al (µg/l)	Monomeric Al (µg/l)
Duniry Catchment																
D1	**2011**	6.52	78	6.3		1		0.041	0.005	0.022	0.06	24.5		249	173	73
D1A	**2019**	4.75	49.8	-0.3	2.78	1	1.1	0.052	0.023	0.048	0.05	40.9	505		202	105
	2019	7.49	123	35	14.24	1.3		0.024	0.007	0.023	0.119	14.9	206	2.083	67	21
Lough Atorick Catchment																
OHL1	**2022**	7.42	135	42.8	15.2	1.3	2.3	0.079	0.004	0.017	0.041	14.5	195		95	16

APPENDIX 7-4

DERRYBRIEN FISHERIES DATA

2011 (Electrofishing Sites – Physical Characteristics & Photos)

Site	L(m)	W(m)	A(m^2)	AD cm (max)	Substrate	Habitat Obs.
B1	35	1.42	50	21 (40)	gravel 40%, cobble 30%, silty/peaty gravel 20%, peat 10%	80% shallow glide, 20%. Riffle/run. v. coloured
B2	35	1.5	53	20 (47)	cobble 60%, gravel 20%, boulder 20%,	pool 50%, riffle 30%, glide 20%, much liverwort, v coloured
B4	35	3.43	120	19 (65)	boulder 40%, cobble 40%, gravel 15%, sand 5% - high moss cover	~equally divided between cascade, riffle, riffle/run, glide/run, glide and pool, high moss cover - very coloured
B5	30-40	7.25	254-326	23 (45)	cobble 40%, gravel 35%, boulder 20%, sand 5%	riffle/run 80%, glide 20%- heavy moss cover
D1	30-40	3.6	108-144	21 (25)	mainly riffle and riffle run	
O1	~30	1.1	~33	11 (30)	swift flow over bedrock and cobble.	iron scum on moss and algae.
O2	30-40	3.4	102-137	14 (30)	boulder 50%, cobble 35%, fine gravel/sand 15%	shallow run 60%, riffle 20%, cascade 10%, glide 10%
O3	30	2.4	72	19 (50)	boulder 50%, cobble 10%, rock 15%, sand & gravel 25%	
O4	41	2.2	90	14 (25)		riffle 70%, pool 30%
O5A	30	2	99	12 (20)	boulder 15%, large cobble 45%, gravel 40%	riffle/cascade 100%
O6	45	24.4	178	21 (45)	boulder 25%, cobble 35%, gravel 30%, sand 10%	glide 55%, pool 20%, cascade 15%, riffle 10%
O9	44	15	660	25 (45)	boulder 10%, cobble 30%, gravel 40%, sand 10%	

L = Length, W = Width, A = Area, AD = Average Depth

Numbers and Length of Fish in Centimeters (2011 Surveys September 26th & 27th)

O1	O2	O3	O4	O5A		O6		
No Fish	No Fish	1 eel (22cm)	No Fish	Trout		Trout		
				Pass 1	Pass 2	Pass 1	Pass 2	Pass 3
				9.8	0	10	22.7	0

O9

Trout		Loach		Lamprey	Eel
Pass 1	Pass 2	Pass 1	Pass 2	Pass 2	Pass 2
16.9	0	6.5	6.5	11	20
16.5		11.2	4.9	11	
		6.2	5.7		
		6.3	6.8		
		7.2	5.9		
		7.1	6.2		
		8.4	8.2		
		6.9	7.3		
		6.6	7.1		
		5.9	7		
		7.2	6		
		6.5			
		7			
		6			
		7			

D1

Trout				Minnow
Pass 1	Pass 2	Pass 3	Pass 4	Pass 1
16.4	8.1	7.5	13.6	4.4
6.5	7.6	7.4	7.6	
9.2	6.4	9	6.8	
8.3	14.2	8.2		
8	7.3			
6.7	7.7			

B1

Trout		
Pass 1	Pass 2	Pass 3
6.4	8	0
8		

B2

Trout		
Pass 1	Pass 2	Pass 3
19.5	13.9	16.2
7.1	8.2	6.9
12.7		
7.4		
6.6		
7.3		

B4

Trout		
Pass 1	Pass 2	Pass 3
17.3	16.9	0
17	6.7	
13.8		
6.9		

B5

Trout		
Pass 1	Pass 2	Pass 3
17.2	15.8	12.3
16.6	17.3	12.7
16.6	12	
12	11.8	
15.9	13.7	
	7.3	

Plate 7A-7H Sept 26th/27th 2011: A&B=O1, C=O2, D=O3, E=O4, F=O5A, G=O6, H=O9

Plate 7I-7N Sept 26th/27th 2011: I=B1, J=B2, K=B4, L=B4 u/s Br., M=B5, N=D1

2014 (Electrofishing Sites – Physical Characteristics & Photos)

Site	L (m)	W (m)	A (m^2)	D	Substrate	Habitat Obs.
O4	30-40	1.3-1.8	40-70	pool 15-20, riffle 3-7		glide/pool 60% riffle/run 40%
O5	49	1-2	50-100			bedrock pools and short rock chutes, small cobble cascades
O6	64	3.16	202	pools 20-50	Boulder/cobble / bedrock dominant, gravel scarce	
O9	39	8.7	338	riffle 11-12		riffle, riffle/run 100%
O10	32	6.1	195	run 18-20, glide/run 30-40	u/s bridge: cobble boulder dominated; d/s bridge: cobble & gravel dom.	good moss and macrophyte (*Myriophyllum*) cover
O11	53	9.7	514	riffle 5, pool 35-80, pool / glide 40		very diverse mix of habitats

L = Length, W = Width, A = Area, AD = Average Depth

Numbers and Length of Fish in Centimeters (2014 Surveys July 17th)

O5

No fish

O4

No Fish

O6

Trout		
Pass 1	Pass 2	Pass 3
13.3	14	
18.4	14.4	
12		
17		
15		
12.9		
14.6		

O8

Trout			Stone Loach		
Pass 1	Pass 2	Pass 3	Pass 1	Pass 2	Pass 3
16.2	15	17	6.5	7.6	6.3
14.1	11.5	13	7	8	6
6.7	8	7.5	5	6.6	6.7
6.6	11.6	12	8	7.3	7
6.5	12.7	12	6.9	7.4	8
6.5	12.5	7.4	7.2	6	7.2
7	6.6	7.1	6.8	5	7
16	7	7.1	6	7	6
12	11.5	7.5	7.8	7.1	6.2
12.8	13	7.7	7	7	
	6.6	12.1	5.7	6	
	12.4		7	7.3	
	6.1		8.2	6.5	
Lamprey			7	8	
Pass 1	Pass 2	Pass 3	6.9	6.5	
8		4	6.5	7.1	
		9	7.3	6.8	
			7.2	7.2	
			7.1	7.6	
			2.4	7.1	
			6	6.5	
			5.5	5	

Numbers and Length of Fish in Centimeters (2014 Surveys July 17th)

O10

Trout				Stone Loach		
Pass 1	Pass 1	Pass 2	Pass 3	Pass 1	Pass 2	Pass 3
12	13.6	20.4	12	7.5	8.5	6
14.1	6.4	11.9	6.5	8	7.6	12.6
12.8	11	6.8	12.1	8	7	6.9
13.5	10	10.4	12.5	5	7.5	7.3
12.6	7	16.3	6.9	6	8	7.8
16	6.5	12	7.5	6.9		6.5
15	6.4	12.6		6		7.5
15	6	16.7		6		8
13.6		6.5		6		
11		7.3		7		
12.6		6.6		7.3		
14		7.4		7.2		
14.1		7.1		7.4		
14.2						
12.5				Eel		
7				Pass 1	Pass 2	Pass 3
12.6						30
7.6						
7						
7.2						
11.8						
12.6						
6.4						
6.6						
12.5						

O11

Trout				Stone Loach	Lamprey
PASS 1	PASS 1	PASS 1	PASS 1	PASS 1	PASS 1
4.7	6	6.7	13.9	11.5	11
5	6	6.8	14	5.5	
5.1	6	6.9	14	5	
5.2	6	6.9	14.3		
5.2	6.1	7	14.6		
5.3	6.2	7	15		
5.4	6.2	7	15.4		
5.4	6.2	7	16.5		
5.4	6.3	7	17.6		
5.5	6.4	7	17.7		
5.5	6.4	7	18.4		
5.6	6.4	7	18.5		
5.7	6.4	7	18.6		
5.7	6.4	7.1	18.6		
5.8	6.5	7.5	19		
5.8	6.5	7.8	19.3		
5.8	6.5	8	22.3		
5.8	6.5	8	23		
5.8	6.5	8	25.8		
5.8	6.6	11			
5.8	6.6	11.5			
5.8	6.6	11.8			
5.9	6.6	12			
5.9	6.7	13.1			
6	6.7	13.5			

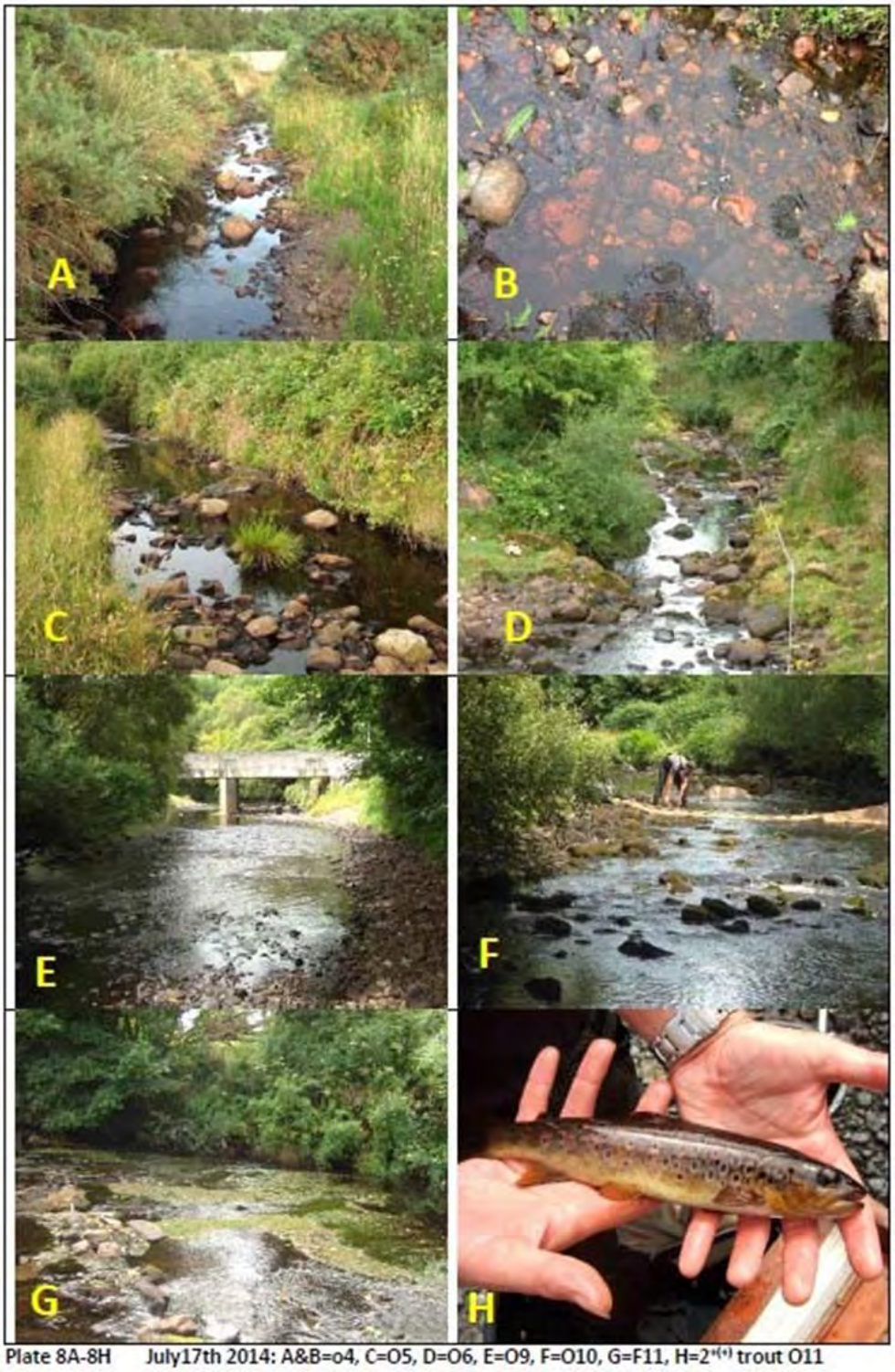


Plate 8A-8H July17th 2014: A&B=o4, C=O5, D=O6, E=O9, F=O10, G=F11, H=2*(+) trout O11

2019 (Electrofishing Sites – Physical Characteristics & Photos)

2019	L(m)	W(m)	A(m^2)	D (cm)	Substrate	Habitat Obs.
O2	38	2.5	95	pool 20-40	embedded lge. cobble & boulder 90%, lge. pebble 10%	riffle/run 50%, glide/run 50%, iron bacterial coating on substrate
O3	30	2	60	pool 40-50	cobble 70%, pebble 30%	riffle/run 60%, pool/glide 40%
O5	37	2.8	103.6	glide/run 10-20, glide/pool 30	lge. cobble, scattered boulder 60%, bedrock 25%, grave l& coarse sand 15%	glide/run 100%, very coloured
O5A	40	1.5	60	stepped riffle/cascade 25, pool 60+	Embedded boulder and cobble 75% gravel 25% occasional bedrock	stepped pool /cascades sequence of boulders and cobbles
O6	47	2-3m			cobble/boulder 90%, pebble 10%	riffle/run/cascade 80%, pool & glide/pool 20%
O6A	38	2.4		pool/glide 25-40	cobble 70%, pebble 30%	riffle/run 65% pool/glide 35%
O7A	32.5	6.8	221	pool, 40-60	cobble 70%, pebble 30%	riffle 20%, pool 25%, glide/run 55%
O7B	33	4		riffle 10-20, pool/glide 40-50	coarse pebble and scattered cobble and boulder	riffle 25%, pool/glide 75%, very coloured
O7C	25	4.7	120	riffle 10-15, pool/glide 40-60	cobble 70%, gravel 30%	glide/pool 65%, riffle 35%, very coloured
B4	50	2.8	140	pool under the bridge 30-50	cobble & boulders	cobble/boulder cascade, run dominated, glide/pool under bridge, v.coloured
B2	45	2.3	103.5	riffle 10-15, pool/glide 20-30	pebble 60%, small cobble 40%	40% riffle, 60% shallow glide

Numbers and Length of Fish in Centimeters (2019 Surveys September 21st & 22nd)

O2	O3				O5	O5A	O6
Trout	Trout		Stone Loach		No Fish	Trout	Trout
Pass 1	Pass 1	Pass 2	Pass 1	Pass 2		Pass 1	Pass 1
16	10.6	8.5	8	0		~25	16
14.1	10						9.5
8							

O6A

Trout			Stone Loach		
Pass 1	Pass 2	Pass 3	Pass 1	Pass 2	Pass 3
12.5	13.5	17	10	6.6	7
8.8	14.2	12	7.5	11	10
9.6	9.2		6.2	6.1	7.7
8.4	10.2		7	8	8
7.7	7.6		7.4	7.1	6.6
			10.5	7.8	6.8
			7.8	5.6	6.2
			7.5	7	
			7.4	6.2	
			6.4	6.5	
			7.2		
			8		
			6.5		
			7		
			7.4		
			7.5		
			6.5		
			8.2		
			8.5		
			7.6		
			7.1		
			6.6		
			6.9		

O6A

Stickleback			Lamprey		
Pass 1	Pass 2	Pass 3	Pass 1	Pass 2	Pass 3
4.1				14	
4.8					

Numbers and Length of Fish in Centimeters (2019 Surveys September 21st & 22nd)

O7A

Trout			Stoneloach		
Pass 1	Pass 2	Pass 3	Pass 1	Pass 2	Pass 3
22.5	23.2	14	6	7.8	9.7
19.1	14	8	9.5	9.4	8.6
20	15.6	8	7	9.6	6.6
15	14.5	8.1	8	7.7	7.1
17.5	16.3		10.5	8	6.5
17.6	14.1		8.1	7	7
14.4	13		8	7.6	6.8
14.1	9.7		6.4	6.8	7.2
9	9.4		7.6	7.6	7.4
8	9.8		6.7	7	6.2
9.4	8.4		6.5	8.5	5.6
8.3	8		10.5	7.7	
8.4	7.7		7.1	7.5	
7.8	7		8.1	6.1	
7.7			6.4	6.3	
8			8.7		
8.5			7.6		
8.5			8		
9.2			8		
8.6			9		
7.5			7.3		
7.8			7.5		
7.6			6.6		
8.5			7.8		
8.2					

O7B

Trout			Stone Loach			Lamprey		
Pass 1	Pass 2	Pass 3	Pass 1	Pass 2	Pass 3	Pass 1	Pass 2	Pass 3
19.5	14.8	17	7.9	7.2	7.2			10.5
19	12	17.1	6	7	10.2			9
19	13.7	8	6.5	6.1	5.1			
14	13	7.7	9.6	7.1	8.4			
14.6	7.7	7.8	10.5					
13.7	8.9	8.3	9.4					
12.8	8.9		7.2					
13	8.1		10.6					
11.7	7.6		7.8					
13	7.2		8					
13.6	7.3		8					
6.7	7.5		8.1					
8	7.5							
6.6	7.1							
7.9	7.7							
7.8								
7.7								
7								

Numbers and Length of Fish in Centimeters (2019 Surveys September 21st & 22nd)

O7C

Trout			Stone Loach			Stickleback		
Pass 1	Pass 2	Pass 3	Pass 1	Pass 2	Pass 3	Pass 1	Pass 2	Pass 3
18.8	13.5	20.2	9	5.3	6.2			3.6
17.7	12.1	15.7	5.6	5.8	6.9			
15.7	14.8	12.9		8.8	6.4			
12.8	13.6	12.6		6.5	7.1			
11.8	16	8.8		6.8	8.3			
12.6	12.5	10.7			6.4			
14.5	12.6	8.7			7.5			
12.5	12.2	7.7						
13.8	9	8.2						
7.7	16.7	7.4						
8	7.1							
8.5								
7.8								

B2

Trout		
Pass 1	Pass 2	Pass 3
12.5	8.8	8.4
13.2	8.8	8.6
9.3	7.4	8.3
8		
9.9		
8.2		
7.6		
7.4		
7.3		
9		
7.6		
8.2		

B4

Trout	
Pass 1	Pass 2
19	17
19.8	14
15.9	
17.5	
13.5	
14	
11.1	

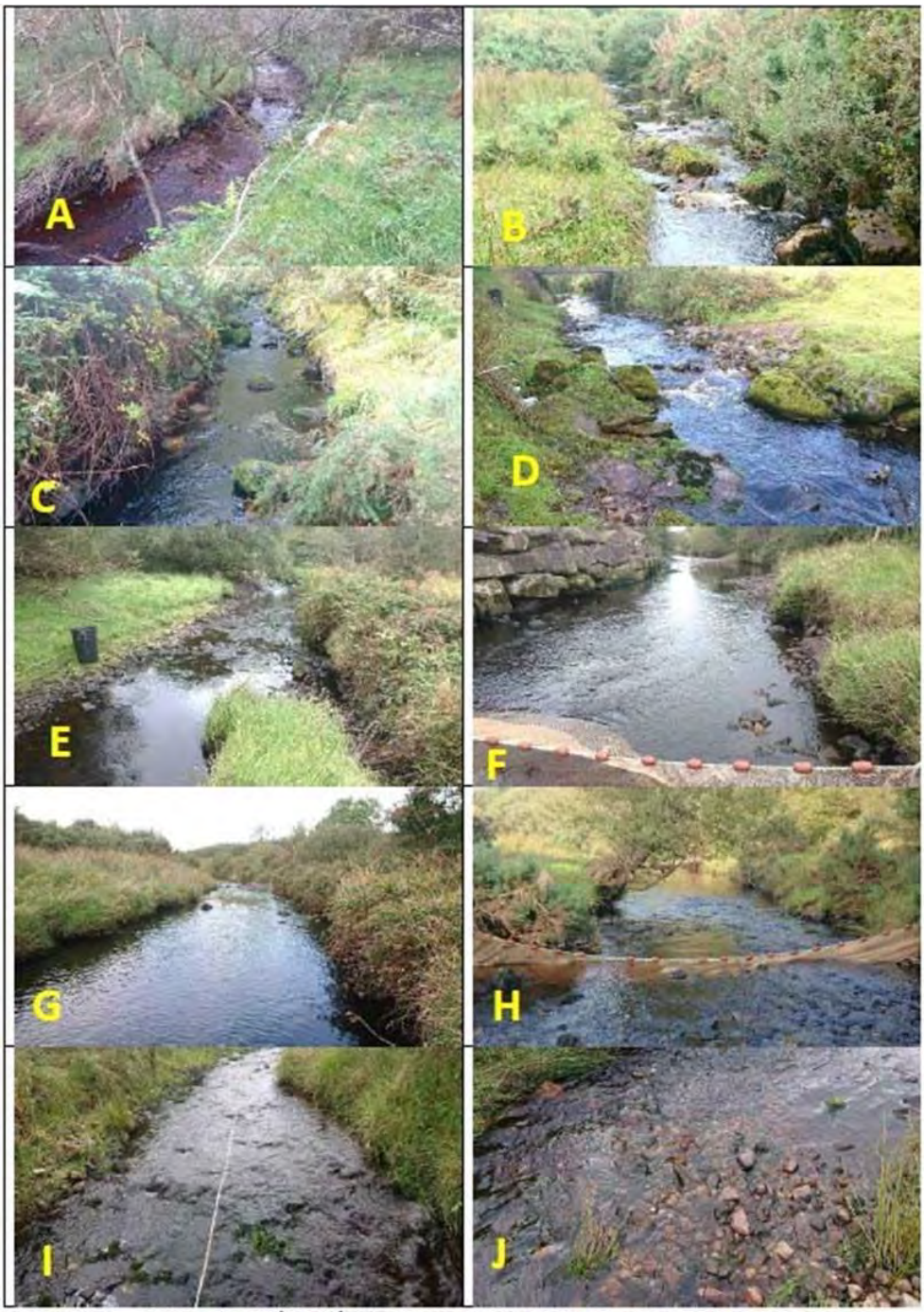


Plate 9A-9J September21st &22nd 2019:A=O2, B=O5, C=O5A, D=O6, E=O6A, F=O7A, G=O7B, H=O7C, I&J=B2

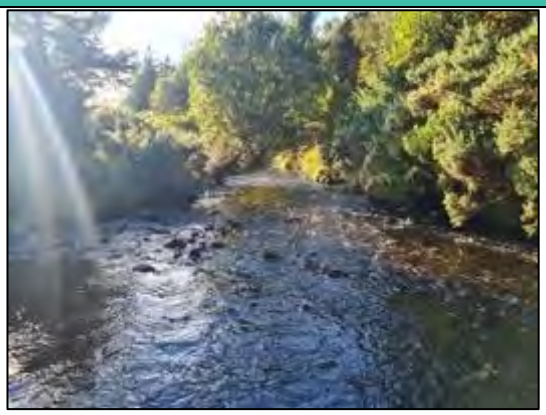
Plate 9K-9P September21st &22nd 2019: K&L=B4, M=0+ trout B2, N=1+ trout O6, O=2+ trout O7C, P=2+(+) trout O5A.

2022 (Electrofishing Sites – Physical Characteristics & Photos)

2022 Fishing Site Descriptions	Site Photograph (2022)
Site B4 – (563549 697832) 15% Boulder; 60% Cobble, 20% Pebble, 5% Gravel. Riffle/cascade. Length sampled 22.6m (10 minutes) Average width: 3.4m Average depth: 0.14m Heavy riparian cover, predominately willow and rowan. **Trout (9)**	

2022 Fishing Site Descriptions	Site Photograph (2022)
Site B2 – (557160 706458) 20% Cobble, 50% Pebble, 30% Gravel. Mostly riffle/glide with one small pool at downstream end. Length sampled 40.5m (10 minutes) Average width: 1.9m Average depth: 0.13m Open, bank vegetation a mixture of *Festuca, Holcus* sp. and *Juncus effusus.* **Trout (10)**	
Site B1A – (565030 698293) 60% Cobble, 40% Pebble, 10% Gravel. Riffle/Glide. Length sampled 50m (10 minutes). Average width 2m Average depth 0.11m Bank vegetation bramble, gorse, soft rush, grasses, ferns and peat silt/detritus dominated in slacker flows. **No fish caught**	
Site D1A – (561580 707058) 90% Cobble, 5% Pebble, 5% Gravel. Riffle /Glide /Cascade. Average width: 1m Average depth: 0.15m Overhanging willow and rowan with grasses and soft rush. Length sampled 40m over 10mins (split above and below culvert) **Minnow (3)**	
Site O4 – (561355 703613) 80% Cobble, 15% Pebble, 5% Gravel All glide Average width 2.1m, Average depth: 0.2m Heavily overgrown with gorse and bramble, overhanging riparian cover of willow 20m sampled (no fish caught) **No fish caught**	

2022 Fishing Site Descriptions	Site Photograph (2022)
Site O3 – (563549 697832) 5% Cobble, 25% Pebble, 70% Gravel Riffle/Glide (mostly glide) Average width 2.3m, Average depth 0.16m Length sampled 31m over 10 minutes Riparian woodland of willow, some gorse overhanging **Trout (4)**	
Site O5 – (561145 702597) 20% Cobble, 50% Pebble, 30% Gravel. Mostly riffle/glide with one small pool at downstream end. Length sampled 40.5m over 10 minutes Average width: 1.9m Average depth: 0.13m Open, bank vegetation a mixture of *Festuca*, *Holcus* sp. and *Juncus effusus* **No fish caught**	
Site O5A – (565030 698293) 40% Boulder, 40% Cobble, 15% Pebble. 5% Gravel. All riffle. 24m sampled (10 minutes) Average width 3m, Average depth: 0.11m Heavily overhung with Sitka spruce, some bramble and ferns on banks **No fish caught**	
Site O6 – (561114 701977) 40% Boulder, 20% Cobble, 5% Pebble, 5% Gravel Riffle with a large deep pool at the upstream end at the culvert outflow 36m sampled (10 minutes) Average width: 5m, Average depth: 0.29m **Trout (5)**	

2022 Fishing Site Descriptions	Site Photograph (2022)
Site O7C – (562447 701486) 60% Cobble, 30% Pebble, 10% Gravel. 70% Glide / 30% Riffle 36m sampled (10 minutes) Average width 5.8m, Average depth: 0.22m **Trout (29), Stone loach (7)**	
Site OHL1 – (563756 697352) 3% Boulder, 80% Cobble, 7% Pebble, 10% Gravel (Everything covered with a layer of peat sediment). 60% deep glide/40% riffle Average width 1.3m, Average depth: 0.23m 28m sampled (10 minutes) **Trout (1)**	

APPENDIX 7-5

GALWAY COUNTY COUNCIL HISTORIC WATER MONITORING DATA

Appendix 7-5 Galway County Council Historic Water Monitoring Data

Water Analysis Results from Galway County Council water Samples taken between October 2003 and January 2004 in the Owendalulleegh / Beagh / Cannahowna Rivers and Gort Water Supply.

Location	Date	Day	Colour	Turbidity	pH	Suspended Solids mg/l
Black Road Bridge						
	18/10/03	Saturday				700
	23/10/03	Thursday				76
	01/11/03	Saturday				690
	12/11/03	Wednesday	over range	334	5.35	354
	14/11/03	Friday	over range	285	4.36	
	18/11/03	Tuesday	over range	107	5.78	
	25/11/03	Tuesday	over range	91.3	6.75	116
	12/12/03	Friday	over range	63.8	5.68	
	09/01/04	Friday	over range	126.3	6.2	
	22/01/04	Thursday	349	25	7.82	
Flaggy Bridge						
	18/10/03	Saturday				0
	23/10/03	Thursday				200
	01/11/03	Saturday				1410
	12/11/03	Wednesday	over range	142	6.06	140
	14/11/03	Friday	over range	315	5.2	
	18/11/03	Tuesday	over range	102.4	6.66	
	25/11/03	Tuesday	over range	128.6	6.49	120

Location	Date	Day	Colour	Turbidity	pH	Suspended Solids mg/l
	12/12/03	Friday	over range	65.2	6.74	
	09/01/04	Friday	513	43	6.1	
	22/01/04	Thursday	322	20.16	7.44	
Tooraglassa						
	01/11/03	Saturday				230
	12/11/03	Wednesday	283	19.22	6.66	16
	14/11/03	Friday	over range	44.4	6.72	
	18/11/03	Tuesday	356	24.9	7.01	
	25/11/03	Tuesday	453	27.6	6.58	20
	12/12/03	Friday	383	29.8	7.13	
	09/01/04	Friday	282	15.14	6.1	
Inchamore bridge						
	30/10/03	Thursday				184
	01/11/03	Saturday				33
Derrywee bridge						
	18/10/03	Saturday				0
	23/10/03	Thursday				0
	31/10/03	Friday				172
Dereen bridge						
	18/10/03	Saturday				0
	23/10/03	Thursday				0
	24/10/03	Friday				24
Killafeen Bridge						
	18/10/03	Saturday				0
	23/10/03	Thursday				0
	01/11/03	Saturday				44
	03/11/03	Monday	over range	51.8	6.95	54
	06/11/03	Thursday	202	8.11	7.2	

Location	Date	Day	Colour	Turbidity	pH	Suspended Solids mg/l
	12/11/03	Wednesday	311	21.9	7.03	21
	14/11/03	Friday	497	48.4	7.21	
	18/11/03	Tuesday	252	17.73	7.18	
	25/11/03	Tuesday	106	3.05	6.78	1
	12/12/03	Friday	378	28.5	7.26	
	09/01/04	Friday	313	25	6.4	
	22/01/04	Thursday	83	3.28	7.31	
Cahills Bridge						
	03/11/03	Monday	517	34	7.24	27
	04/11/03	Tuesday	522	34.5	7.02	11
	05/11/03	Wednesday	over range	45.2	6.91	32
	06/11/03	Thursday	over range	40.8	7.12	
	07/11/03	Friday	over range	36.4	7.11	
	10/11/03	Monday	476	31.8	7.25	
	12/11/03	Wednesday	376	24.1	7.21	
	14/11/03	Friday	339	20.08	7.28	
	18/11/03	Tuesday	238	11.49	7.25	
	25/11/03	Tuesday	134	7.09	6.82	2
	12/12/03	Friday	168	4.49	7.21	
	09/01/04	Friday	171	4.33	6.72	
	22/01/04	Thursday	151	6.03	7.31	
Water Intake Gort						
	03/11/03	Monday	73	3.28	7.39	18
	04/11/03	Tuesday	377	23.1	6.85	13
	05/11/03	Wednesday	385	21.9	7.7	18
	06/11/03	Thursday	454	28.8	7.64	
	07/11/03	Friday	440	26.3	7.46	

Location	Date	Day	Colour	Turbidity	pH	Suspended Solids mg/l
	10/11/03	Monday	370	23.8	7.06	
	12/11/03	Wednesday	366	22.8	7.18	
	14/11/03	Friday	332	18.96	7.23	
	18/11/03	Tuesday	218	10.49	7.16	
	25/11/03	Tuesday	125	6.12	6.86	3
	12/12/03	Friday	142	4.08	7.34	
	09/01/04	Friday	170	4.32	6.97	
	22/01/04	Thursday	155	5.79	7.19	
Hydrant at Community Centre						
	03/11/03	Monday	17	3.43	6.85	1
	04/11/03	Tuesday	16	0.87	6.71	0
	05/11/03	Wednesday	27	2.6	6.7	0
	06/11/03	Thursday	37	3.38	6.85	
	07/11/03	Friday	47	2.5	6.82	
	10/11/03	Monday	30	1.68	6.83	
	12/11/03	Wednesday	57	2.97	6.95	
	14/11/03	Friday	58	3.08	7.07	
	18/11/03	Tuesday	56	2.8	6.83	
	25/11/03	Tuesday	25	1.31	6.96	
	12/12/03	Friday	33	1.74	7.34	
Gort Bridge						
	05/11/03	Wednesday	355	21.9	7.03	15
	06/11/03	Thursday	410	27.4	7.01	
Kiltartan Rising						
	05/11/03	Wednesday	204	9.39	6.96	5
	06/11/03	Thursday	202	8.37	7.02	
	07/11/03	Friday	213	10.34	7.01	
	10/11/03	Monday	210	10.18	7.07	
	09/01/04	Friday	177	5.4	7.23	

Location	Date	Day	Colour	Turbidity	pH	Suspended Solids mg/l
Coole River						
	05/11/03	Wednesday	174	6.87	6.83	3
	06/11/03	Thursday	203	9.14	7.04	
	07/11/03	Friday	191	6.37	7.07	
	10/11/03	Monday	191	9.36	7.18	
Kinvara Raw						
	06/11/03	Thursday	82	2.6	6.89	
	07/11/03	Friday	83	2.35	6.9	
	10/11/03	Monday	58	1.84	7.03	
	25/11/03	Tuesday	29	2.08	6.9	
Kinvara Treated						
	06/11/03	Thursday	59	2.97	6.89	
	07/11/03	Friday	66	2.88	6.95	
	10/11/03	Monday	54	1.61	7.07	
	25/11/03	Tuesday	22	1.69	6.9	

APPENDIX 7-6

WATER FRAMEWORK DIRECTIVE COMPLIANCE ASSESSMENT

Planning and Environmental Consultants

Appendix 7-6 WFD Compliance Assessment

Environmental Impact Assessment Report

DOCUMENT DETAILS

Client:	**Gort Windfarms Ltd.**
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Project Number:	**220437**
Document Title:	**Appendix 7-6 WFD Compliance Assessment**
Document File Name:	**Derrybrien EIAR_Appendix 7-6 WFD Assessment_F_2024.04.25_240450**
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Planning and Environmental Consultants

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1. WATER FRAMEWORK DIRECTIVE COMPLIANCE ASSESSMENT

1.1 Introduction

Under Article 4(1) of the Water Framework Directive (WFD) (2000/60/EC), Ireland has obligations to protect, enhance and restore all bodies of surface and groundwater water to achieve at least good status (within certain timeframes as set out in the directive) and prevent deterioration in water bodies that are already in good (or better) status.

With respect to the Derrybrien Wind Farm Development Decommissioning Project and the retention *in situ,* in perpetuity, of certain features of the existing development (i.e. the 'Retained Development') is examined within this document to ascertain, by way of a structured assessment, whether the Prospective Development and final stages of the Retained Development could affect WFD Article 4(1) objectives through:

1. *Causing or contributing to deterioration of water body status, or*
2. *Jeopardising the achievement of at least 'good' status or better (i.e., where there is a 'high' status objective) in any receiving water body.*

The elements to be retained *in situ* are listed in Chapter 7, Section 7.4.1 according to the proposed decommissioning plan. The WFD Assessment for the Retained Development includes consideration of the following phases of the Project:

- Construction Phase (2003-2006).
- Operation and Maintenance Phase (2006-2022).
- Ceased Operation Phase (2022 – Present).
- Prospective Development.
- Retained Development (noting that this includes all of the above phases, plus the Prospective Development and retention of certain elements post-decommissioning).

1.2 Methodology and Sources of Information

1.2.1 Resources

The following resources were consulted to inform this assessment:

- Water Framework Directive (2000/60/EC) full text.
- WFD Common Implementation Strategy (CIS) Guidance documents (EC 2005, 2006, 2009, 2017).
- Water Action Plan 2024: A River Basin Management Plan (RBMP) for Ireland (DHLGH, 2024).
- European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003), as amended, give legal effect in Ireland to the WFD.
- European Communities Environmental Objectives (Surface Waters) Regulations (S.I. No. 272 of 2009), as amended (S.I. 77 of 2019), establishing legally binding water quality objectives for all surface waters and environmental quality standards for pollutants.
- Relevant Litigation relating to WFD, e.g., Case C-461/13 Bund für Umwelt und Naturschutz Deutschland ECLI:EU:C:2015:433 (the *Weser* case).
- Environmental Protection Agency (EPA) maps and data: https://www.catchments.ie/
- Historical OSI maps: https://www.geohive.ie.
- Published scientific literature and journals (where required).

- Chapter 7 (Biodiversity – Aquatic Ecology and Fisheries) of the EIAR and rEIAR.
- Chapter 8 (Land Soils and Geology) of the EIAR and rEIAR.
- Chapter 9 (Hydrology and Hydrogeology) of the EIAR and rEIAR.

1.2.2 Key Information for WFD Compliance Assessment

The WFD compliance assessment uses current EPA assigned water body status classifications (2016-2021) as the baseline against which any effects of the scheme are assessed. These are the most recent formal status classifications reported to Europe going into the RBMP 3rd cycle (2022-2027). This approach is in line with case law from the Irish High Court Sweetman v An Bord Pleanála [2021] IEHC 16, known as the *Bradán Beo* case, which established that EPA assigned status is the only legal baseline against which potential changes to water body status can be evaluated.

Effects of the Prospective and Retained Developments on water body status are underpinned by detailed information provided in the Derrybrien Wind Farm Development Decommissioning Project EIAR and the rEIAR pertaining to impacts and effects on surface water and groundwater quality and instream habitats supporting the biological quality elements that define surface water body status under the WFD. This document relies on the information and conclusions from relevant Chapters as listed in Section 1.2.1, above.

1.2.3 Meaning of Deterioration in Status

With regards to physical changes to water bodies, a key decision in the European Court of Justice (CJEU) concerning hydromorphological impact on water body status came from the *Weser* case, establishing that:

> *"Member States are required – unless a derogation is granted – to refuse authorisation for an individual project where it may cause a deterioration of the status of a body of surface water or where it jeopardises the attainment of good surface water status ... by the date laid down by the directive."*

The concept of "deterioration" of water body status is not defined in the WFD. The *Weser* decision also provided the following clarifications on the interpretation of "deterioration" in the context of WFD compliance:

- Deterioration in water body status occurs when the status of at least one of the quality elements, within the meaning of Annex V to the directive, falls by one class, even if this does not result in a fall in the overall classification of the water body.
- If the quality element is already in the lowest class (bad status), any deterioration of that element represents a deterioration of the status within the meaning of WFD Article 4(1)(a)(i).

With regards to WFD assessments the following are also important to note:

- Temporary short-term effects, for example, during the construction or maintenance phase do not constitute "deterioration of status" and are not required to be addressed so long as there are no long-term adverse consequences and no delayed deterioration in the status of the defining quality elements expected in the water body thereafter (EC, 2017).
- Mitigation measures within the proposed project are taken into account in the Article 4(7) Applicability Assessment as they form an inherent element of the design and implementation of a project (EC, 2017).

1.2.4 Approach to WFD Compliance Assessment

The Retained Development at Derrybrien involves features that may be considered to represent new modifications to the physical characteristics of a surface water body' (e.g., Barrages 1, 2 3 and 4) and/or possible 'alteration to the level of bodies of groundwater' (drainage features), and (2) potential effects on 'high' status water bodies (Owendalulleegh, Boleyneendoorish) as a result of 'new sustainable human development activities'.

WFD Article 4(7) states Member States will not be in breach of the Directive when:

> *- failure to achieve good groundwater status [or] good ecological status ... or to prevent deterioration in the status of a body of surface water or groundwater is the result of new modifications to the physical characteristics of a surface water body or alterations to the level of bodies of groundwater, or*
>
> *- failure to prevent deterioration from high status to good status of a body of surface water is the result of new sustainable human development activities.*

But only when all four of the following conditions are met: (1) all practicable steps are taken to mitigate the impacts; (2) the reasons for the modifications and alterations are clearly set out in the RBMP; (3) the reasons are of overriding public interest and benefits outweigh the environmental outcomes; and (4) the benefits cannot be achieved by other means for reasons of technical feasibility or disproportionate cost.

The process for determining whether new modification(s) to the physical characteristics of a body of surface water / alterations to the level of bodies of groundwater might lead to deterioration / non-achievement of good status, or new sustainable human development activity might lead to deterioration from high status to good status, is called the Article 4(7) Applicability Assessment. The approach is set out in *CIS Guidance No. 36: Exemptions to the Environmental Objectives according to Article 4(7) New modifications to the physical characteristics of surface water bodies, alterations to the level of groundwater, or new sustainable human development activities* (EC 2017).

Whether or not the Retained Development falls under Article 4(7) or not, the Article 4(7) Applicability Assessment set out in EC (2017) provides a formal, published framework for determining whether a project has potential to cause deterioration / non-achievement of good status (or better), hence the approach is used to conduct the water status impact assessment for the Retained Development in this report.

1.2.5 WFD Article 4(7) Applicability Assessment

The first step in the "Article 4(7) Applicability Assessment" evaluates how a proposed project is expected to impact on environmental objectives for each water body, to answer the questions:

3. *Does the proposal lead to deterioration of water body status? Or,*
4. *Does the proposal prevent attainment of good status (or high status in the case of high-status objective water bodies)?*

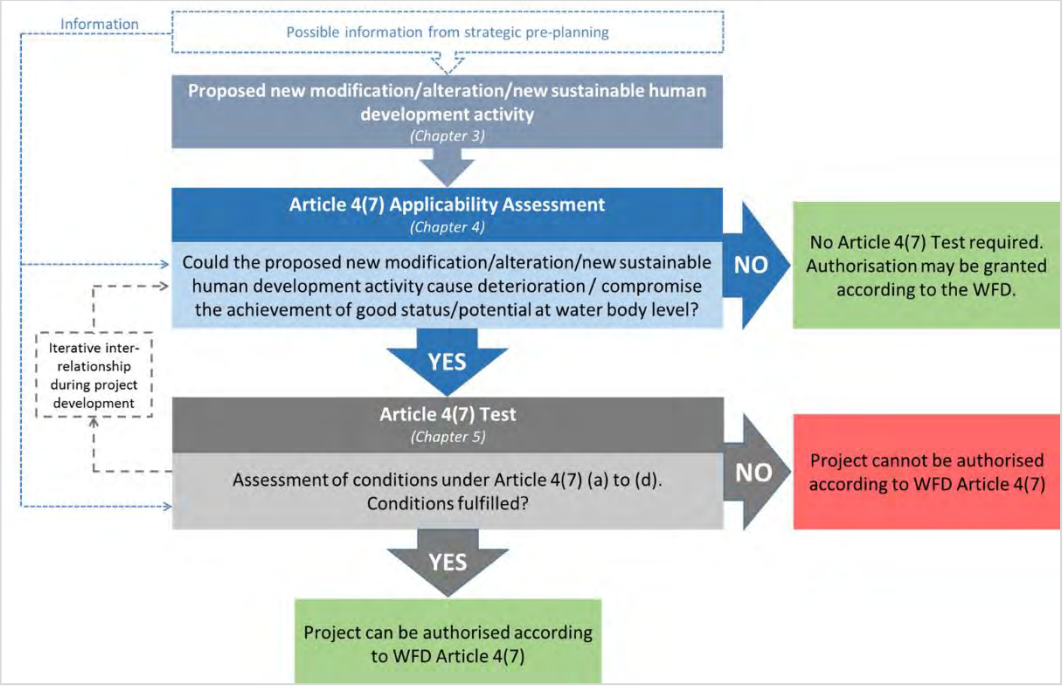

Figure 1-1 Relationship between Article 4(7) Applicability Assessment and Test (reproduced from EC 2017)

As illustrated in Figure 1-1, if the answer to either question is "No" the project is compliant with WFD Article 4(1) objectives and can be authorised under the WFD. If the answer to either question is "Yes" the project must first be 'tested' (i.e., the 'Article 4(7) Test') as to whether it meets strict conditions set out within Article 4(7) of the Directive (see Section 1.2.3, above) and may then be authorised under derogation.

To inform the Competent Authority in assessing compliance of the proposed Retained Development with WFD Article 4(1) objectives, the effects of the proposals on water body status are therefore examined in this document using a structured approach that is in line with: (i) EU CIS Guidance on the Article 4(7) Applicability Assessment, (ii) Relevant case law pertaining to WFD interpretation and application, and (iii) Goals of the Water Action Plan 2024 (RBMP).

1.2.6 Zone of Influence

Derrybrien Wind Farm and Substation, the Overhead Line (OHL), and Agannygal Substation are located in the headwaters of the Boleyneendorrish, Owendalulleegh, Duniry and Bleach catchments. The three main river catchments draining the Derrybrien Wind Farm site receive the following proportion of drainage (by area): 66.2% to the Owendalulleegh River catchment, 33.4% to the Boleyneendorrish and just 0.4% in the Duniry River catchment. All but a tiny portion of the OHL also drains to the Owendalulleegh. Agannygal Substation and a small portion of the OHL drain towards the Lough Atorick / Bleach catchment.

For this assessment, the relevant river water bodies (RWBs) are taken to be those within which the Project is located, i.e., 'directly affected RWBs'. In the case of the Owendalulleegh which receives the bulk of the drainage (66.2%), and was affected by the peat slide in 2003, adjoining downstream RWBs and Lough Cutra Lake Water Body (LWB) are also evaluated in this report. As a precaution, in the case of the Boleyneendorrish (33.4% of drainage from wind farm site) the next adjoining RWB downstream (Boleyneendoorish_020) is also considered. See Figure 1-3 for the RWBs scoped into the assessment.

The relevant Groundwater Bodies (GWBs) are those directly underlying the Project. The wind farm site and most of the OHL route is located in the GWDTE -Caherglassaun Turlough GWB. A very small

portion of the eastern wind farm site is within the Tynagh GWB. The southern end of the OHL route and Agannygal substation are in the Lough Graney GWB. See Figure 1-4 for the GWBs scoped into the assessment.

1.3 Water body Status Classification

Water quality and overall status of surface waters under WFD in Ireland is based primarily on survey data collected by the EPA as part of the National WFD Monitoring Programme. Fish status data is collected by Inland Fisheries Ireland (IFI). For surface waters, the Biological Quality Elements (BQEs) are surveyed approximately every three years, e.g., macroinvertebrate Q-value, algae, fish, and the results are converted to a metric - the Ecological Quality Ratio (EQR) - which represents the relationship between the values of the biological parameters observed for a given body of surface water and the values for these parameters in reference (pristine) conditions applicable to that body.

The EQR classifies sites according to ecological quality status as required by river basin management planning under the WFD. It is expressed as a numerical value between 0 and 1, with high ecological status represented by values close to '1' and bad ecological status by values close to '0'. This allows comparison of water quality status across the European Union since each member state has a comparable EQR value for 'High'; 'Good', 'Moderate', 'Bad' and 'Poor', based on an intercalibration of boundaries between water quality categories (McGarrigle & Lucey, 2009). Overall status of a surface water body is then assigned (in Ireland by the EPA) as a combination of ecological and chemical status. For a water body to be in overall 'good' status or better, both its ecological (or quantitative in the case of groundwater) and its chemical status must achieve at least 'good' status. In the case of 'high' status surface waters, the hydromorphological quality element (which "supports" the BQEs) must also be 'high' status.

Overall status assigned is determined by the status of the poorest quality element. This is sometimes referred to as 'one-out-all-out' principle. Furthermore, each quality element is made up of a series of sub-elements set out in Annex V of the Directive that describe the make-up of that quality element, and in many cases have defined quantitative standards that need to be met for a certain class to be assigned to that quality element.

For surface waters, including rivers and lakes referred to in this assessment, the WFD classification scheme includes five status classes: high; good; moderate; poor and bad, which are denoted by the colour scheme as shown in Figure 1-2. Ground waters are classified as either 'good' or 'poor'.

Figure 1-2 WFD Quality Classes and Colour Codes [EPA]

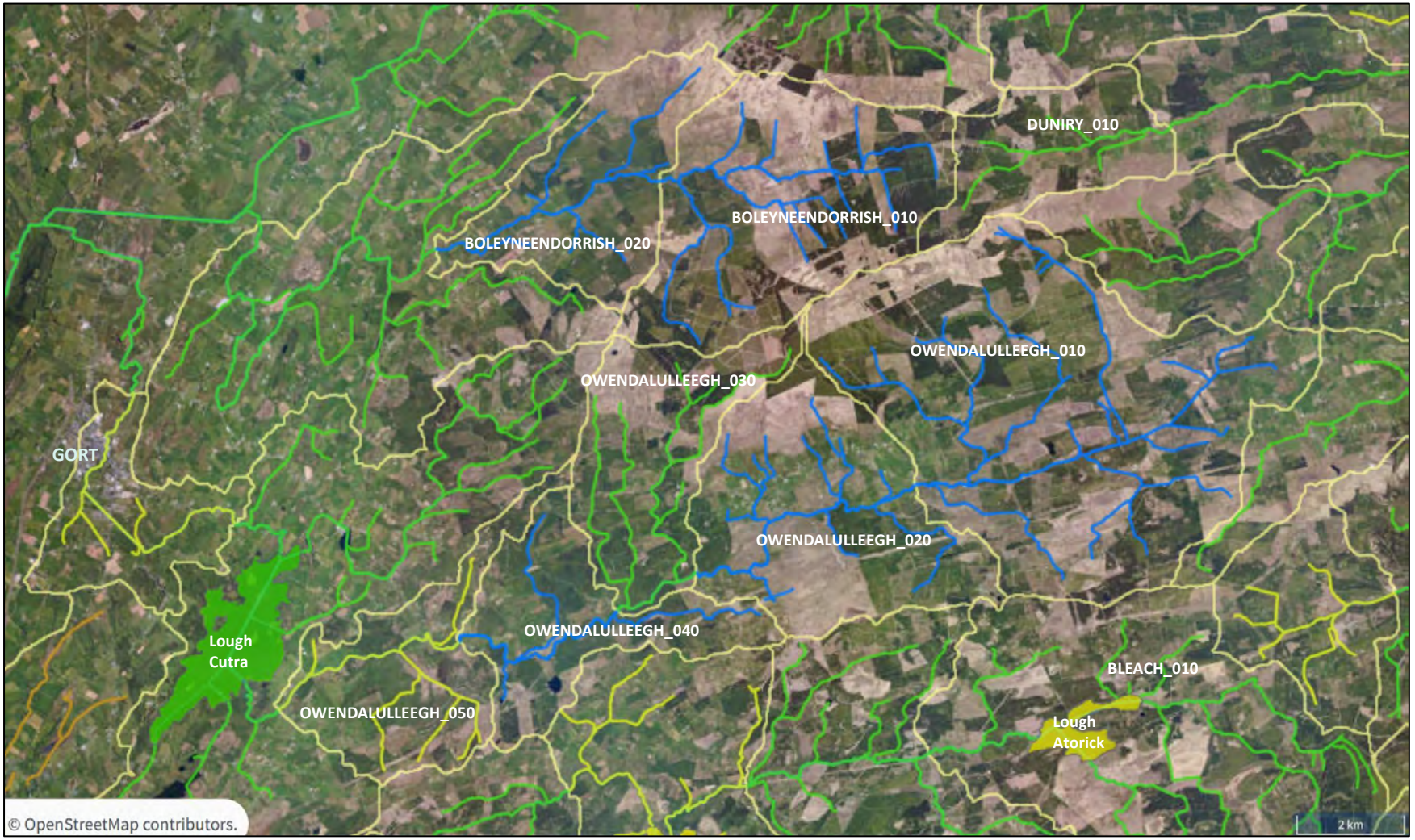

Figure 1-3 Relevant River Water Bodies in relation to Derrybrien Wind Farm Project (EPA status 2016-2021 indicated by WFD colour code)

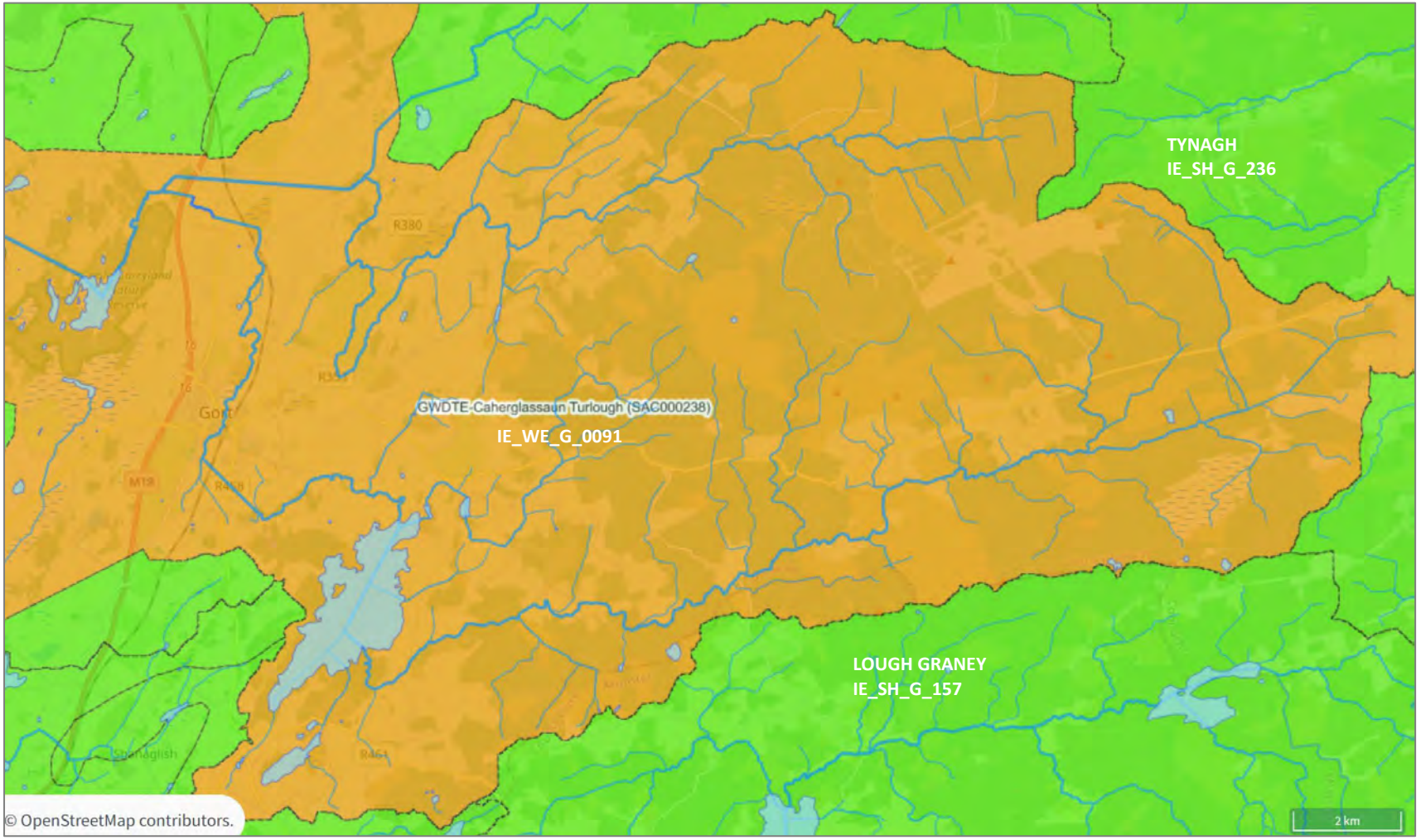

Figure 1-4 Relevant Groundwater Bodies in relation to Derrybrien Wind Farm Project (EPA status 2016-2021 indicated by WFD colour code)

1.3.1 Surface Water Body Status Classification

1.3.1.1 River Water Bodies

Ecological status of River Water Bodies (RWBs) is defined in Annex V of the WFD by the Biological Quality Elements (BQEs) along with the "supporting" hydromorphological, chemical and physico-chemical elements. BQEs (e.g., macroinvertebrates, algae, fish) employ standard methods for calculating a metric to reflect the EQR, which then equates to WFD status classes of High, Good, Moderate, Poor or Bad. Physicochemical quality elements are compared to statutory Environmental Quality Standards (EQSs) published in the surface water regulations which support High, Good and ≤Moderate status. Hydromorphology underpins structure and function of river ecosystems, hence sustaining the BQEs. Hydromorphological quality elements that support the BQEs for river water bodies are defined by:

- Hydrological regime (quantity and dynamics of water flow; connection to groundwater bodies).
- River continuity.
- Morphological conditions (river depth and width variation; structure and substrate of the river bed, structure of the riparian zone).

The above are the physical attributes by which any impacts of the proposed Retained Development on surface water body status were assessed in this report. The BQE that primarily defines status in the relevant RWBs in this assessment the macroinvertebrate Q-value, being the sole BQE monitored in all except Owendalulleegh_050, which has been monitored and assigned WFD Fish status by Inland Fisheries Ireland for WFD reporting periods to date.

1.3.1.2 Lake Water Bodies

The quality elements that define lake water body status are: (1) biological, (2) chemical, and (3) hydromorphological elements supporting the biological elements. As for rivers, the hydromorphological quality elements "support" status as defined by the poorer of the biological and chemical quality elements. Lake status is defined as being either 'High', 'Good' or 'Moderate' based on the poorest of the defining elements. The attributes by which any hydromorphological changes (which could affect biological quality elements / status) were assessed in this report are from WFD Annex V 1.2.2. as follows:

- Hydrological Regime: quantity and dynamics of flow, level, residence time, resultant connection to groundwaters.
- Morphological Condition: lake depth variation, quantity and structure of the substrate, and both the structure and condition of the lake shore zone.

The only LWB considered in this assessment is Lough Cutra, which is 22km downstream of Derrybrien Wind farm. It was included because it received run-off from the 2003 peat slide during the Project's construction phase.

1.3.2 Ground Water Body Status Classification

Groundwater body status is defined by its chemical status (concentration of pollutants) and its quantitative status (relating to ground water levels). Groundwater status is defined as being either 'Good' or 'Poor' based on the poorest of these elements. Good chemical status is defined in WFD Annex V 2.3.2 and includes meeting EQSs for pollutants, with no declining trends. The definition of good quantitative status is set out in WFD Annex V 2.1.2 (CIS Guidance No. 18, 2009). For a

groundwater body to be of good quantitative status the following criteria for the definition of good status must be met:

- Available groundwater resource is not exceeded by the long-term annual average rate of abstraction.
- No significant diminution of surface water chemistry and/or ecology resulting from anthropogenic water level alteration or change in flow conditions that would lead to failure of relevant WFD Article 4 objectives for any associated surface water bodies.
- No significant damage to groundwater dependent terrestrial ecosystems resulting from an anthropogenic water level alteration.
- No saline or other intrusions resulting from anthropogenically induced sustained changes in flow direction.

These are the attributes by which any impacts of the Retained Development on GWB quantitative status were assessed in this report.

1.4 EPA Assigned Water Body Status

Bradán Beo established that the only legal baseline against which water body status can be assessed in Ireland is that assigned by the EPA. Table 1-2, Table 1-3, Table 1-4 and Table 1-5 (below) set out the EPA assigned water body status for each reporting period under the RBMP cycles to date. The reporting periods are as follows:

- Surface Water (SW): 2007-2009, 2010-2012, 2010-2015, 2015-2018, 2016-2021.
- Groundwater (GW): 2007-2012, 2010-2015, 2013-2018, 2016-2021.

Noted is that the pre-construction baseline (1998) and the construction period (2003-2006) pre-dated the reporting of WFD status. The 1998 baseline for the Project, in fact, pre-dated the WFD (2000/60/EC). Hence there is no legal WFD status baseline against which to assess the construction phase. However, the EPA did monitor Q-values (macroinvertebrates) between 1996 and 2000 which covered the 1998 baseline period in each of the relevant RWBs, noting that all of the relevant RWBs were at high status at that time. The macroinvertebrate Q-value / EQR is still the Biological Quality Element (BQE) that defines status in most of the relevant river water bodies, i.e., all except Owendalulleegh_050 which is defined by macroinvertebrate and fish status. For ease of reference, EPA reported Q-value data are shown in **Table 1-1** (from Chapter 7, Table 7-11) covering the main receiving water catchments (Owendalulleegh, Boleyneendoorish, Duniry, Bleach).

Table 1-1 EPA Q-value Data defining each RWB

Year	EPA O1 Owendalulleegh_050	EPA O2 Owendalulleegh_040	EPA O3 Owendalulleegh_030	EPA OT1 Owendalulleegh_030	EPA O4 Owendalulleegh_020	EPA O5 Owendalulleegh_010	EPA B2 Boleyneendoorish_020	EPA B1 Boleyneendoorish_010	EPA D1 Duniry_010	Bleach_010
1996	-	-	-	-	-	-	-	-	5	4-5
1997	4-5	4-5	-	4-5	4-5	4-5	5	5	-	
1999	-	-	-	-	-	-	-	-	4-5	4-5
2000	4-5	5	5	4-5	5	4-5	5	4-5	-	
2003	4	4	4	4	3-4	2	5	5	4-5	4-5

Year	EPA O1 Owendalulleegh_050	EPA O2 Owendalulleegh_040	EPA O3 Owendalulleegh_030	EPA OT1 Owendalulleegh_030	EPA O4 Owendalulleegh_020	EPA O5 Owendalulleegh_010	EPA B2 Boleyneendoorish_020	EPA B1 Boleyneendoorish_010	EPA D1 Duniry_010	Bleach_010
2006	4	5	-	4-5	4-5	4-5	4-5	5	4	-
2009	4-5	4-5	5	4-5	-	4-5	-	-	4	-
2012	4-5	4-5	4-5	4-5	4-5	4-5	5	5	4	4
2014	-	-	-	-	-	-	-	-	-	3
2015	4-5	4-5	4-5	3-4	4-5	4-5	4-5	4-5	-	
2017	-	-	-	-	-	-	-	-	4	4
2018	5	5	4-5	4	4-5	4-5	4-5	5	-	-
2019	-	-	-	3-4	-	-	-	4	-	-
2021	5	5	-	4	4-5	4-5	4-5	4-5	-	-
2022	-	-	5	-	-	-	-	-	-	-
2023	-	-	-	-	-	-	-	-	3-4	3-4

The peat slide of October 2003 occurred in the upper headwaters of the Owendalulleegh_010 RWB. It affected Q-values (and representative RWB status) as recorded by the EPA one month after the event along a 22km reach downstream of the slide, demonstrated by results in 2003 presented in Table 1-1. The effect of the peat slide was a decline in EPA Q-value in 2003 for all RWBs between the headwater sub catchment SC7(b) in Owendalulleegh_010 and Lough Cutra, i.e., decline from representative high status in all to representative 'bad', 'moderate' and 'good' status, moving downstream. By 2006, however, EPA reported Q-values in had returned to representative 'high' status (Q4-5/Q5) in all RWBs downstream of the peat slide apart from the Owendalulleegh_050, 22km downstream (1.5km upstream of Lough Cutra), which remained at 'good' status (Q4) in 2006 then returned to high status Q-value (Q4-5) in 2009 (Table 1-1). The indication is that whilst there were negative effects on RWB status of the Owendalulleegh River sub-basins, i.e., downstream of the peat slide, the effect on the Q-value (Biological Quality Element [BQE]) had reversed in a relatively short period of time with Q5/Q4-5 (high status) returning within 3 years at all except the Owendalulleegh_050. EU CIS Guidance (EC, 2017) suggests that in the WFD context "*the frequencies mentioned for the monitoring programmes can serve as an indication*" of what constitutes a "short period of time". For the macroinvertebrate Q-value, WFD monitoring and reporting frequency is 3 years, meaning all except the Owendalulleegh_050 RWB had returned to high status within one WFD reporting cycle. Whilst the Q-value for this RWB had returned to high status following the peat slide (by 2009) within 6 years (i.e., two WFD reporting cycles), the fish community BQE has kept this site at moderate status since the 2007-2009 reporting period. However, there was no pre-peat slide fish survey conducted by IFI on the Owendalulleegh River, so it's not possible to attribute the ongoing 'moderate' status fish community solely to the peat slide, especially since the Q-value was high status both before and (within 6 years) after the peat slide and therefore the fish community index is apparently independent of the biological water quality index at this location. Furthermore, this monitoring station is furthest downstream of the wind farm (sampled 21.5 km downstream of the peat slide origin) and therefore also subject to other catchment land use effects.

Note that the term "representative status" is used above in relation to EPA sample results that pre-date either the WFD or the first official reporting of water body status by the EPA (2007-2009). This is

important because the *Bradán Beo* case established that EPA assigned water body status (which began with the 2007-2009 WFD reporting period) is the only legally valid baseline against which water status impact assessments can be made. Where 'representative status' is indicated, these data are outside the official EPA WFD reporting period. That being said, the historical EPA Q-value data is still completely valid, with the use of the Q-value and its relationship to the corresponding EQR having been through an intercalibration of boundaries between water quality categories (McGarrigle & Lucey, 2009). Had the WFD been enacted at that time, these Q-values (Table 1-1) would have defined water body status in the same way they have done since the first reporting period of 2007-2009.

Table 1-2 Directly Affected River Water Bodies (Major drainage input)

EPA Water Body Name [Code]	EPA Status Assessment Technique	EPA RWB Status (2007-2009)	EPA RWB Status (2010-2012)	EPA RWB Status (2010-2015)	EPA RWB Status (2013-2018)	EPA RWB Status (2016-2021)	Current Status Driver(s) (2016-2021)	WFD Objective Status	Water Body Risk (2016-2021)	Significant Pressure(s)
Boleyneendoorish_010 [IE_WE_29B040100]	Monitored: Invertebrate, Hymo.	Unassigned	High	High	High	High	Q-value (Invertebrate), Hymo.	High	Not at Risk	~
Owendalulleegh_010 [IE_WE_29O010500]	Monitored: Invertebrate, Hymo.	High	High	High	Good	High	Q-value (Invertebrate), Hymo.	High	Not at Risk	~

Table 1-3 Directly Affected River Water Bodies (Minor drainage input)

EPA Water Body Name [Code]	EPA Status Assessment Technique	EPA RWB Status (2007-2009)	EPA RWB Status (2010-2012)	EPA RWB Status (2010-2015)	EPA RWB Status (2013-2018)	EPA RWB Status (2016-2021)	Current Status Driver(s) (2016-2021)	WFD Objective Status	Water Body Risk (2016-2021)	Significant Pressure(s)
Owendalulleegh_020 [IE_WE_29O010700]	Monitored: Invertebrate, Hymo.	Unassigned	High	High	High	High	Q-value (Invertebrate), Hymo.	High	Not at Risk	~
Owendalulleegh_030 [IE_WE_29O010800]	Monitored: Invertebrate, Hymo.	High	High	Moderate	Good	Good	Q-value (Invertebrate)	High	At Risk	Forestry
Duniry_010 [IE_SH_25D070100]	Monitored: Invertebrate	Moderate	Good	Good	Good	Good	Q-value (Invertebrate)	Good	Not at Risk	~
Bleach_010 [IE_SH_25B070100]	Monitored: Invertebrate, GPC.	Unassigned	Good	Poor	Good	Good	Q-value (Invertebrate), GPC	Good	Not at Risk	~

Table 1-4 Relevant Indirectly Affected Waterbodies

EPA Water Body Name [Code]	EPA Status Assessment Technique	EPA RWB Status (2007-2009)	EPA RWB Status (2010-2012)	EPA RWB Status (2010-2015)	EPA RWB Status (2013-2018)	EPA RWB Status (2016-2021)	Current Status Driver(s) (2016-2021)	WFD Objective Status	Water Body Risk (2016-2021)	Significant Pressure(s)
Boleyneendoorish_020 [IE_WE_29B040200]	Monitored: Invertebrate, Hymo.	Unassigned	High	High	High	High	Q-value (Invertebrate), Hymo.	High	Not at Risk	~
Owendalulleegh_040 [IE_WE_29O010900]	Monitored: Invertebrate, Hymo.	High	High	High	High	High	Q-value (Invertebrate), Hymo.	High	Not at Risk	~
Owendalulleegh_050 [IE_WE_29O011000]	Monitored: Invertebrate, Fish, Phytobenthos, GPC, Chemical Status	Moderate	Moderate	Moderate	Moderate	Moderate	Fish (2016 IFI Survey) [Note- high and good status for all other elements]	Good	At Risk	Forestry, Hymo
Lough Cutra [IE_WE_29_37]	Monitored: Phytoplankton, Macrophyte, Hymo, GPC	Unassigned	Good	Moderate	Good	Good	Macrophyte	Good	Not at Risk	~

**Hymo = Hydromorphology. Note: EPA conduct River Hydromorphology Assessment Technique (RHAT) surveys at all sites that return 'high' status based on macroinvertebrate Q-value. For a site to be high status overall, the Biological Quality Element (in these RWBs - Q-values) must be at 'high status (Q4-5/Q5), and the RHAT Score must be in the 'high' status range.*

Table 1-5 Relevant EPA Groundwater Bodies

EPA Groundwater Body Name [Code]	EPA Status Assessment Technique	EPA RWB Status (2007-2012)	EPA RWB Status (2010-2015)	EPA RWB Status (2013-2018)	EPA RWB Status (2016-2021)	Current Status Driver(s) (2016-2021)	WFD Objective Status	Water Body Risk (2016-2021)	Significant Pressure / Issue(s)
GWDTE-Caherglassaun Turlough (SAC000238) [IE_WE_G_0091]	Monitored at Poldeelin Spring (Gort): Chemical. Quantitative.	Good	Poor	Poor	Poor	Chemical status: Failure on Total Phosphorus. Note: Quantitative status is 'Good'	Good	At Risk	Nutrients (Total Phosphorus)
Lough Graney [IE_SH_G_157]	Monitored (unpublished by EPA)	Good	Good	Good	Good	Chemical & Quantitative	Good	Not at Risk	~
Tynagh [IE_SH_G_157]	Monitored at Scariff: Chemical. Quantitative	Good	Good	Good	Good	Chemical & Quantitative	Good	Not at Risk	~

1.5 WFD Compliance Assessment

1.5.1 Surface Water Body Status Assessments

Of the RWBs listed above, the Owendalulleegh_010 and the Boleyneendoorish_010 (Table 1-2) directly receive approximately 63% and 33% of the wind farm site drainage respectively (96% in total). Furthermore, the Owendalulleegh _010 receives drainage from 93% of the OHL, i.e., only 540m of the 7.8km OHL is not within this RWB.

Of the remaining 4% of the wind farm site drainage, 3.6% has direct connectivity to the head of the Owendalulleegh _020 and Owendalulleegh _030 RWBs, while 0.4% drains to the Duniry_010. A small proportion of overall drainage, from 540m of the OHL and the Agannygal Substation, connects to the Bleach_010.

Hence the Owendalulleegh_010 and Boleyneendoorish_010 RWBs are by far the most important indicators of effects of the Project on RWB status as they have direct connectivity on a more significant scale. These two 'major' RWBs are addressed in detail in Section 1.4.1.1. RWBs with 'minor' direct connectivity are addressed in Section 1.4.1.2, whilst any relevant indirectly (downstream) affected RWBs are addressed in Section 1.4.1.3.

1.5.1.1 Directly Affected River Water Bodies (Major)

Owendalulleegh_010 RWB

OWENDALULLEEGH_010 [IE_WE_29O010500]
Starting point: Baseline status as represented by EPA Q-value in 1997 (Q4-5) and 2000 (Q4-5) would have been 'high' status. However, water body status was not officially reported by the EPA until 2007-2009 following the enactment and implementation of the WFD. The peat slide caused a temporary to short-term decrease in Q-value at the EPA River Station 29O010500 (Tooraglassa Ford), the station that defines status in this water body, which fell to representative 'bad' status (Q2) in 2003 but returned to representative 'high' status (Q4-5) by 2006. Owendalulleegh_010 RWB was officially reported by the EPA as 'high' status for the first reporting period (2007-2009) and remained 'high' status for the next 2 reporting periods (2010-2012 and 2010-2015) (Table 1-2). In the 2013-2018 reporting period, this RWB fell to overall 'good' status based on hydromorphology, but Q-value still merited 'high' status (Q4-5). The scoring of hydromorphology (using [1]RHAT) is a requirement at high-status Q-value sites, i.e., a site only merits high status if both the BQE (i.e., Q-value) and hydromorphology EQR are in the high-status band. It is a survey localised to a 500m reach, usually near the Q-value site. The less-than-high status result for hydromorphology in the 2013-2018 reporting period is not related to the Derrybrien Wind farm Project, noting that Tooraglassa Ford (the RWB monitoring site) is an active, though (based on field observations) infrequently used farm access route, i.e., a ford across the river. Google Earth imagery shows there was some earthmoving activity in the field south of the river / ford during the 2013-2018 WFD reporting period which may explain why hydromorphology was not the usual 'high' status at Tooraglassa Ford during EPA sampling of 2018. For the current EPA 2016-2021 reporting period both Q-value and hydromorphology are 'high' status. To assess the effect of leaving 'new physical modifications' in situ as part of the Retained Development, current EPA assigned high status (2016 - 2021) is considered the appropriate baseline for the waterbody status impact assessment (based on *Bradán Beo* ruling) as the Project goes into the Prospective Development and final stage of the Retained Development, noting that

[1] *RHAT = River Hydromorphology Assessment Technique – a field survey that produces a score and Ecological Quality Ratio (EQR) equating to WFD categories of high, good, moderate, poor and bad status.*

OWENDALULLEEGH_010 [IE_WE_29O010500]
this is a high-status objective waterbody where maintenance of high status is required under WFD Article 4(1).
Modification(s) proposed: This RWB receives drainage from approximately 66% of the Wind farm site on its southern side, including the Derrybrien Substation, plus most of the OHL (includes SC6, SC7(a) (b) (c) and (d)). The proposed direct modifications to this waterbody are those in SC7(b) and SC7(d) associated with offsite features in response to the 2003 peat slide as follows: (a) Barrages 1, 2, 3 and 4, (b) bridge repairs/works at Black Road, Flaggy Bridge, Stepping Stones and Unnamed Bridge C. Turbulence felling (7ha) occurred in SC7(c) of the RWB in 2017/2018. The OHL, substation and the wind farm site itself do not directly impinge on delineated watercourses of this RWB, though on-site drainage connectivity exists, arising upstream of delineated watercourses of the RWB. Apart from the Stepping Stones at Tooraglassa Ford (on Owendalulleegh main channel), the relevant modifications are entirely within SC7 (Derrybrien North tributary).
Effect of modification(s): Section 7.4.5 of this rEIAR (Effects of Prospective Development) sets out that any residual effects (with the implementation of mitigation as prescribed) are expected to be localised to several small headwaters of this RWB (represented by Sites (O1, O3A, O4/O5, O5A, O6, O6A and OHL1) in terms of slight declines in water quality, mainly related to potential sediment wash-out associated with ground disturbance near watercourses and drains. At worst, these residual effects would be localised and negligible to slight negative, reversible and temporary in duration. There is a very low probability that any effects would be picked up on the main channel of the Owendalulleegh River, and hence the potential for decline from current high status is very remote. This can be stated with a high level of confidence given everything the current study has proven about this RWB over the past two decades of the operational phase, i.e., smaller channels (if at all) tend to be affected locally, negatively and temporarily in response to the common ongoing land use activities in the RWB, i.e., forestry and turbary activity (and associated drainage), but without having a depressing effect on high status of the Owendalulleegh main channel at Tooraglassa Ford (i.e., monitoring station at the downstream end of this RWB). Section 7.4.6 (Effects of Retained Development) sets out that once the Prospective Development is complete (with prescribed mitigation measures), with listed features remaining *in-situ,* there are expected to be either neutral or slightly positive effects on water quality as the site consolidates and revegetates. Residual drainage water quality will improve over time as a consequence of increased attenuation and filtration. Importantly, based on the results of the Peat Stability Assessment set out in Chapter 8 of this rEIAR, there is low risk of peat instability (see Table 7-22) which means there are not expected to be levels of peat loss that could cause a decline in RWB status. It is clear that the presence of the wind farm and its substation, the OHL and the off-site peat slide related features are having no significant negative effect on biological water quality or hydromophology at a water body scale, given that Q4-5 (BQE high status) has been maintained since 2006, and overall RWB status has been at high status for all but one reporting period. The hydro morphological effects of off-site features related to the peat slide were assessed in Sections 7.4.6.2 and 7.4.6.3 of this rEIAR. › Repairs and Black Road Bridge, Flaggy Bridge and Unnamed Bridge C have a neutral effect on water quality and hydromorphology. Retention of Barrage 1 (plus the Coillte Access Track that runs over it) and Barrage 2 - high in the Derrybrien North tributary (SC7(b) sub catchment) where the watercourse is small, and somewhat ephemeral in nature with little to no fisheries habitat - has no negative effect on water quality or quantity and no material effect on the fish recruitment capacity of this tributary. Retention of Barrages 3 and 4 will have no significant effect on fisheries productivity in either the SC7(b) sub catchment, nor the Owendalluleegh system as a whole because fish currently fail to access even as far as Flaggy Bridge owing to two natural barriers and one artificial (forestry culvert) migration barrier between Flaggy Bridge and the Owendalluleegh main channel. By 2008

OWENDALULLEEGH_010 [IE_WE_29O010500]

(5 years after the peat slide) trout densities in the accessible reach of the SC7(d) tributary (i.e., downstream of the aforementioned forestry culvert) reflected the norm for this and adjacent small headwater sub catchments of the RWB which have naturally low productivity owing to their spate flow nature. Barrages 3 and 4 have no adverse effect on water quality and do not prevent the achievement of macroinvertebrate high status (Q4-5/Q5), noting the stream has been Q4-5 (high status) at Flaggy Bridge (Site O5) in surveys of 2019, 2022 and 2024, based on macroinvertebrate Q-values (see Table 7-12). Whilst the retention of Barrages 3 and 4 may be causing a slight reduction in finer substrate mobilization downstream, there are alternative sources of finer substrates (gravels) from numerous small tributaries adjoining both the SC7 sub catchment and the Owendalluleegh main channel, meaning the residual effect of Barrages 3 and 4 on morphology, hydrology and river continuity of the Owendalluleegh_010 at water body scale is considered a permanent (or at least long-term) imperceptible negative. As the EPA record shows, the presence of these morphological features has not caused deterioration and has not prevented achievement of high status at the water body scale.

In conclusion, there is no deterioration of any of the individual quality elements at a water body scale; the Prospective and Retained Development will not cause deterioration from high status and will not prevent achievement of high status at any time in the future.

	Biological quality element (monitored by EPA)	**Hydromorphological quality elements supporting the BQEs (monitored by EPA)**			**GPC (not monitored in this RWB)**	**Overall status**
	Invertebrate (Q-value)	Hydrology	Morphology	Continuity		
Starting point	H (2016-2021)	H	H	H	≤H*	H
Effect owing to modification	H	H	H	H	≤H*	H

Ecological Status Classes - H: High; G: Good; M: Moderate; P: Poor; B: Bad

**Conditions consistent with the achievement of high status of the biological quality element*

Boleyneendoorish_010 RWB

BOLEYNEENDOORISH_010 [IE_WE_29B040100]

Starting point: Baseline status as represented by EPA Q-value in 1997 (Q5) and 2000 (Q4-5) would have been 'high' status. However, water body status was not officially reported by the EPA until the 2010-2012 period following the enactment and implementation of the WFD.

This RWB had status "unassigned" for the first WFD reporting period (2007-2009), as it was not sampled in that period. The RWB has been assigned 'high' status for the four reporting periods (Table 1-2) since commencing 2010-2012, with BQE consistent Q5 or Q4-5. The peat slide had no hydrological connectivity with, and no physical impact on this RWB. The appropriate baseline for this water status assessment going into the Prospective and final stage of the Retained Development is current EPA assigned high status (2016-2021), noting this is a high-status objective waterbody where maintenance of high status is required under WFD Article 4(1).

Modification(s) proposed: This RWB receives drainage from approximately 33% of the Wind farm site on its northern side (SC1, SC2, SC3 and SC4). The wind farm site itself does not directly impinge on EPA delineated watercourses of this RWB, although there is on-site drainage connectivity, from tracks and turbine foundations on the northern side of the wind farm, i.e., arising upstream of the delineated watercourses of the RWB. Turbulence felling (10ha) occurred in SC1 in 2016.

BOLEYNEENDOORISH_010 [IE_WE_29B040100]

Effect of modification(s): There has been no effect on EPA assigned status of this RWB arising from the construction, operational and ceased operation phases of the project, as evidenced by the consistent 'high' status record.

Section 7.4.5 of the rEIAR and Section 7.4.2 of the EIAR (Effects of Prospective Development) sets out that any residual effects (with the implementation of mitigation as prescribed) are expected to be localised to several small headwaters of this RWB (represented by Sites B1, B1B, B2, B2A and perhaps B4A, B4B and B4C) in terms of slight declines in water quality, mainly related to potential sediment wash-out associated with ground disturbance near upland drains. At worst, these residual effects would be localised and negligible- to-slight negative, reversible and temporary in duration. There is a very low probability that any effects would be perceptible on the main channel of the Boleyneendoorish River, and hence the potential for decline from current high status is very remote. This can be stated with a high level of confidence given everything the current study has proven about this RWB over the past two decades of the operational phase, i.e., smaller channels (if at all) tend to be affected locally, negatively and temporarily in response to the common ongoing land use activities in the RWB, i.e., forestry (and associated drainage), but without having a depressing effect on high status of the Boleyneendoorish main channel at the Ford West of Poolboy (i.e. monitoring station at the downstream end of this RWB).

Section 7.4.6 of the rEIAR (Effects of Retained Development) sets out that once the Prospective Development (with prescribed mitigation measures) is complete, with listed features remaining *in-situ* there are expected to be either neutral or slightly positive effects on water quality as the site consolidates and revegetates. Drainage water quality is expected to improve over time as a consequence of increased on-site attenuation and infiltration. Importantly, based on the results of the Peat Stability Assessment set out in Chapter 8 of the rEIAR and EIAR, there is low risk of peat instability related to the Prospective and Retained Development (see Table 7-22 of rEIAR) which means there are not expected to be levels of peat loss that could cause a decline in RWB status.

The presence of the wind farm in this RWB throughout the construction, operational and ceased operation phases has had no significant negative effects on biological water quality or hydromophology at a water body scale. Q5/Q4-5 (BQE high status) has been maintained since 1997 and overall RWB status has been at high status for all reported WFD periods. In conclusion, the Prospective and Retained Development do not result in deterioration of any of the individual quality elements and will not cause deterioration from overall high status nor prevent achievement of high status at any time in the future.

Boleyneendoorish_010 IE_WE_29B040100	**Biological quality element (monitored by EPA)**	**Hydromorphological quality elements supporting the BQEs (monitored by EPA)**			**GPC (not monitored in this RWB)**	**Overall status**
	Invertebrate (Q-value)	Hydrology	Morphology	Continuity		
Starting point	H (2016-2021)	H	H	H	≤H*	H
Effect owing to modification	H	H	H	H	≤H*	H

Ecological Status Classes - H: High; G: Good; M: Moderate; P: Poor; B: Bad

**Conditions consistent with the achievement of high status of the biological quality element*

1.5.1.2 Directly Affected River Water Bodies (Minor)

Owendalulleegh_020 RWB

OWENDALULLEEGH_020 [IE_WE_29O010700]
Starting point: Baseline status as represented by EPA Q-value in 1997 (Q4-5) and 2000 (Q5) would have been 'high' status. However, water body status was not officially reported by the EPA until 2007-2009 following the enactment and implementation of the WFD. This RWB had status "unassigned" for the first WFD reporting period, as it was not sampled in that period. The RWB has been assigned 'high' status for the four reporting periods since with consistent Q4-5. The peat slide had no physical impact on this RWB. The appropriate baseline for this water status assessment going into the Prospective and final stage of the Retained Development is current EPA assigned high status (2016-2021), noting this is a high-status objective waterbody where maintenance of high status is required under WFD Article 4(1).
Modification(s) proposed: This RWB receives drainage from a tiny fraction (<1%) of the Wind farm site on its western side (SC8). The wind farm site itself does not directly impinge on delineated watercourses of this RWB, although there is on-site drainage connectivity, from a short reach of track and 1-2 turbine foundations on the western side of the wind farm, arising upstream of the delineated watercourses of the RWB. 12.58 ha of turbulence felling occurred in this RWB over 2 years (2016, 2017), although this was Coillte forestry that was due for felling in any case.
Effect of modification(s): There has been no effect on EPA assigned status of this RWB arising from the construction, operational and ceased operation phases of the project, as evidenced by the consistent 'high' status record. Given the extremely low proportion of site drainage to this RWB, the likelihood of any detectable adverse effects on water quality arising from the Prospective and Retained Development is extremely remote, either locally in the O8A tributary and certainly there will be no effect at water body scale. Section 7.4.6 of the rEIAR (Effects of Retained Development) sets out that once the Prospective Development (with prescribed mitigation measures) is complete, with listed features remaining *in-situ,* there are either neutral or slightly positive effects on water quality expected as the site consolidates and revegetates. Drainage water quality is expected to improve over time as a consequence of increased on-site attenuation and infiltration. Importantly, based on the results of the Peat Stability Assessment set out in Chapter 8 of both the rEIAR and EIAR, there is low risk of peat instability (see rEIAR Table 7-22) which means there are not expected to be levels of peat loss that could cause a decline in RWB status. There are no significant effects on hydromorphology quality elements of this RWB that could impact negatively on conditions supporting high status on the Owendalulleegh main channel at the Ford at Inchamore (i.e. monitoring station at the downstream end of this RWB). The presence of the wind farm in this RWB throughout the construction, operational and ceased operation phases has had no significant negative effects on biological water quality or hydromophology at a water body scale. Q4-5 (BQE high status) has been maintained since 1997 and overall RWB status has been at high status for all reported WFD periods. In conclusion, the Prospective and Retained Development do not result in deterioration of any of the individual quality elements and will not cause deterioration from overall high status nor prevent achievement of high status at any time in the future.

Owendalulleegh_020 IE_WE_29O010700	**Biological quality element (monitored by EPA)**	**Hydromorphological quality elements supporting the BQEs (monitored by EPA)**			**GPC (not monitored in this RWB)**	**Overall status**
	Invertebrate (Q-value)	Hydrology	Morphology	Continuity		

OWENDALULLEEGH_020 [IE_WE_29O010700]						
Starting point	H (2016-2021)	H	H	H	≤H*	H
Effect owing to modification	H	H	H	H	≤H*	H
Ecological Status Classes - H: High; G: Good; M: Moderate; P: Poor; B: Bad						
**Conditions consistent with the achievement of high status of the biological quality element*						

Owendalulleegh_030 RWB

OWENDALULLEEGH_030 [IE_WE_29O010800]
Starting point: There are two monitoring stations in this RWB (EPA O3 and EPA OT1, Table 1-1 and Figure 7-1). Note that using the WFD one-out-all-out (OOAO) principle, the poorest result in the waterbody defines status in the reporting period. Baseline status as represented by EPA Q-values in 1997 and 2000 (Q5 / Q4-5 for both sites) would have been 'high' status. However, water body status was not officially reported by the EPA until 2007-2009 following the enactment and implementation of the WFD. This RWB was assigned 'high' status for the first two WFD reporting periods, followed by 'moderate' (2010-2015), then 'good' and 'good' status for the two most recent reporting periods (2013-2018, 2016-2021). The appropriate baseline for this water status assessment going into the Prospective and final stage of the Retained Development is current EPA assigned 'good' status (2016-2021). This RWB is currently not meeting its high-status objective as set out in the RBMP.
Modification(s) proposed: This RWB receives drainage from a tiny fraction (<1%) of the Wind farm site on its western side (SC9). The wind farm site itself does not directly impinge on delineated watercourses of this RWB, although there is on-site drainage connectivity, from a short reach of track and 1-2 turbine foundations on the western side of the wind farm, arising upstream of the delineated watercourses of the RWB. 16.55 ha of turbulence felling occurred in this RWB over 3 years (2016-2018), although this was Coillte forestry due for felling in any case.
Effect of modification(s): Results from the river station on the Knocknarebana Stream (tributary of Owendalulleegh, Site EPA OT1 on Figure 7-1) are responsible for depressing overall RWB status to moderate and good (Q3-4, Q4) over the last 3 WFD reporting periods. That is, in the same years, the monitored site (EPA O3) on the main channel of the Owendalulleegh in this RWB maintained high BQE status (Q4-5). In 2022 Site EPA O3 was in fact Q5 (reference condition, i.e., pristine). It is clear therefore that activities upstream of Site EPA OT1 in this RWB are impacting on overall water body status and limiting overall 'high' status, as the main channel is unaffected and maintains high status BQE throughout. It is noted from Google Earth Imagery that a large area of non-Project related forestry felling occurred near upstream of Site EPA OT1 between 2012 and 2015, which likely explains the deterioration in status to 'moderate' in the 2010-2015 reporting period, i.e., not related to the wind farm. Further large blocks of non-Project related felling occurred between 2015 and 2018, all upstream of the RWB monitoring point at EPA OT1. Whilst it is possible that relatively small areas of Project-related turbulence felling (very high in the drainage catchment) may have contributed, cumulatively to suppression of 'high' status at EPA OT1 (Knocknarebana Stream), the very significant level of non-Project related forestry activity in this RWB is certainly the primary pressure for this RWB which is recorded in the latest RBMP (2022-2027) (EPA, 2024a) to be 'At Risk' with forestry as a significant pressure. The overall status of this RWB into the future will be defined by the significant level of non-Project related forestry activity that exists in the catchment above the limiting monitoring site EPA OT1 (Knocknarebana Stream). There is no further Project-related forestry felling to be undertaken. Given the extremely low proportion of drainage input (by area) from the wind farm site to this RWB, the likelihood of any detectable adverse effects on water quality is extremely

OWENDALULLEEGH_030 [IE_WE_29O010800]

remote, either locally in the O9A / EPA OT1 (Knocknarebana) tributary and certainly there will be no further impact or and neutral residual effects from the Project at water body scale. Drainage water quality from the fraction of the wind farm site that connects to the RWB is expected to improve over time as a consequence of increased attenuation and filtration. Importantly, based on the results of the Peat Stability Assessment set out in Chapter 8 of this rEIAR, there is low risk of peat instability (see Table 7-22) which means there are not expected to be levels of peat loss that could cause a decline in RWB status.

The wind farm did not prevent achievement of high status in the WFD 2007-2009 or 2010-2012 reporting period. Turbulence felling (noting that much of this was already ear-marked by Coillte for commercial felling as it was coming to maturity) cannot be ruled out as having a slightly negative, short term cumulative effect, contributing to keeping this RWB at 'good' status in the two most recent WFD reporting periods. However, the very high levels of non-Project related felling (and replanting) that occurred, certainly between 2012 and 2018 are primary drivers of RWB status.

Going forward, the level of Project-related disturbance in this RWB (Prospective Development and final stage of Retained Development) will be extremely low to nil and will not adversely affect water quality or hydromorphological quality that could, on its own or in-combination with ongoing catchment land-use activities (primarily forestry), prevent achievement of 'high' status in the future. The Prospective and Retained Development do not result in deterioration of any of the individual quality elements and will not cause deterioration from overall good status nor prevent achievement of high status at any time in the future.

Owendalulleegh_020 IE_WE_29O010800	**Biological quality element (monitored)**	**Hydromorphological quality elements supporting the BQEs**			**GPC (not monitored in this RWB)**	**Overall status**
	Invertebrate (Q-value)	Hydrology	Morphology	Continuity		
Starting point	G (2016-2021)	*G	*G	*G	*G	G
Effect owing to modification	**≥G	**≥G	**≥G	**≥G	**≥G	**≥G

Ecological Status Classes - H: High; G: Good; M: Moderate; P: Poor; B: Bad

**By definition, conditions consistent with the achievement of good status of the biological quality element.*
***≥ denotes that the Project does not prevent the achievement of good status or better, i.e., high status objective*

Duniry_010 RWB

DUNIRY_010 [IE_SH_25D070100]

Starting point: Baseline status as represented by EPA Q-values in 1996 and 1999 (Q5 / Q4-5) would have been 'high' status. However, water body status was not officially reported by the EPA until 2007-2009 following the enactment and implementation of the WFD. This RWB was assigned 'moderate' status for the first WFD reporting period (2007-2009), followed by 'good' status for the three most recent reporting periods. This RWB is currently, and has been, meeting its good-status objective since the 2010-2012 reporting period. The appropriate baseline for this water status assessment going into the Prospective and final stage of the Retained Development is current EPA assigned 'good' status (2016-2021).

DUNIRY_010 [IE_SH_25D070100]

Modification(s) proposed: This RWB receives drainage from a tiny fraction (<0.5%) of the Wind farm site on its eastern flank (SC5). The wind farm site itself does not directly impinge on delineated watercourses of this RWB, although there is on-site drainage connectivity, from a short reach of on-site track, 1-2 turbine foundations and the wind farm access road that occurs in this RWB catchment.

Effect of modification(s): This RWB has continued to meet its WFD objective of 'good' status since the 2010-2012 reporting period, which suggests the presence of the windfarm has no effect on downstream water quality and does not give rise to hydromorphological quality issues that impact on the BQE that defines status.

Overall RWB status was limited to 'moderate' in the 2007-2009 reporting period because it failed the pH and acidification criteria for good status, although the Q-value (Q4) in that period still met 'good' status. Acidification is a characteristic of heavily afforested small catchments and a noted effect of elevated run-off draining from blanket peat sites in many parts of Ireland (Kelly-Quinn et al., 2008). The forestry mediated effects on potential water acidification are completely unrelated to any aspect of the wind farm presence in this catchment.

Furthermore, it is noted from Google Earth Imagery that a large area of non-Project related forestry felling occurred in the upper catchment area between 2010 and 2011, with further large blocks felled between 2015 and 2018, most of that appearing to have been replanted.

Going forward, the level of Project-related disturbance in this RWB (Prospective Development and Retained Development) will be extremely low to nil and will not adversely affect water quality or hydromorphological quality elements that could, on its own or in-combination with ongoing catchment land-use activities (primarily forestry), cause deterioration or prevent achievement of 'good' status at any time in the future.

Duniry_010 IE_SH_25D070100	**Biological quality element (monitored)**	**Hydromorphological quality elements supporting the BQEs**			**GPC**	**Overall status**
	Invertebrate (Q-value)	Hydrology	Morphology	Continuity		
Starting point	G (2016-2021)	*G	*G	*G	*G	G
Effect owing to modification	G	*G	*G	*G	*G	G

Ecological Status Classes - H: High; G: Good; M: Moderate; P: Poor; B: Bad

**By definition, conditions consistent with the achievement of good status of the biological quality element.*

Bleach_010 RWB

BLEACH_010 [IE_SH_25B070100]

Starting point: Baseline status as represented by EPA Q-values in 1996 and 1999 (Q5 / Q4-5) would have been 'high' status. However, water body status was not officially reported by the EPA until 2007-2009 following the enactment and implementation of the WFD. This RWB was "unassigned" status for the first WFD reporting period (2007-2009), followed by 'good', 'poor', 'good' and 'good' for the subsequent four reporting periods. This RWB is currently, and has been, meeting its good-status objective since the 2013-2018 reporting period. The appropriate baseline for this water status assessment going into the Prospective and final stage of the Retained Development is current EPA assigned 'good' status (2016-2021).

BLEACH_010 [IE_SH_25B070100]

Modification(s) proposed: This is a large RWB (35.24 km^2), heavily afforested, also encompassing Lough Atorick. The Project has a very small footprint and drainage input within this RWB, comprising Agannygal substation, 530m of OHL plus the decommissioning haul route. There will be one upgraded culvert constructed on an existing forestry track to facilitate the Prospective Development , which will be left *in-situ* on the small, drained tributary of Lough Atorick at Site OHL2A.

Effect of modification(s): Overall RWB status was limited to 'poor' in the 2010-2015 reporting period because BQE (Q-value) was Q3, 'poor'. Historical aerial imagery (Google Earth) shows ongoing forestry activity, felling / replanting in various plots in the catchment, and it is not unreasonable to suggest that this land use activity is the dominant driver of water body status.

The presence of the Agannygal substation and 530m of OHL did not prevent achievement of required 'good' status in all but one of the WFD reporting cycles. Given the highly afforested nature of this large water body, and the comparatively tiny footprint and drainage contribution from the Retained Development, it is considered these features are having a neutral effect on status at water body scale.

The installation of an upgraded culvert on the OHL2A tributary will have a slightly positive effect on hydromorphology at a reach scale, because the existing culvert has collapsed, forcing water to flow over the track (entrain solids) and forms a localised barrier, noting that the channel is not suitable for salmonids but may support eel and stickleback.

Going forward, the level of Project-related disturbance in this RWB (Prospective Development and final stage of Retained Development) will be extremely low and will not adversely affect water quality or hydromorphological quality that could, on its own or in-combination with ongoing catchment land-use activities (primarily forestry), cause deterioration or prevent achievement of 'good' status at any time in the future.

Bleach_010 IE_SH_25B070100	**Biological quality element (monitored)**	**Hydromorphological quality elements supporting the BQEs**			**GPC**	**Overall status**
	Invertebrate (Q-value)	Hydrology	Morphology	Continuity		
Starting point	G (2016-2021)	*G	*G	*G	*G	G
Effect owing to modification	G	*G	*G	*G	*G	G

Ecological Status Classes - H: High; G: Good; M: Moderate; P: Poor; B: Bad

**By definition, conditions consistent with the achievement of good status of the biological quality element.*

1.5.1.3 Indirectly Affected Water Bodies

Owendalulleegh_040 RWB

OWENDALULLEEGH_040 [IE_WE_29O010900]

Starting point: Baseline status as represented by EPA Q-value in 1997 (Q4-5) and 2000 (Q5) would have been 'high' status. However, water body status was not officially reported by the EPA until 2007-2009 following the enactment and implementation of the WFD. This RWB has been at 'high' status for all five WFD reporting periods, therefore consistently meeting it's high-status objective. The appropriate baseline for this water status assessment going into the Prospective and final stage of the Retained Development is current EPA assigned 'good' status (2016-2021).

OWENDALULLEEGH_040 [IE_WE_29O010900]						
Modification(s) proposed: There were and are no direct physical modifications in this RWB from the Project, but it was on the pathway of the 2003 peat slide, hence considered in this assessment.						
Effect of modification(s): Technically there was a temporary decline in representative status in this waterbody when 'high' status (2000) fell to 'good' (2003), one month after the 2003 peat slide. However, status returned to Q5, 'high' (pristine, i.e., reference conditions) by 2006. Drainage water quality from the upstream wind farm is expected to improve over time as a consequence of increased attenuation and filtration. Importantly, based on the results of the Peat Stability Assessment set out in Chapter 8 of this rEIAR, there is low risk of peat instability (see Table 7-22) which means there are not expected to be Project-related levels of peat loss that could cause a decline in RWB status in the future. Going forward, the probability of the Prospective and Retained Developments will not adversely affect water quality or hydromorphological quality that could cause deterioration or prevent achievement of 'high' status at any time in the future.						
Bleach_010 IE_SH_25B070100	**Biological quality element (monitored)**	**Hydromorphological quality elements supporting the BQEs**			**GPC**	**Overall status**
	Invertebrate (Q-value)	Hydrology	Morphology	Continuity		
Starting point	H (2016-2021)	H	H	H	≤H*	H
Effect owing to modification	H	H	H	H	≤H*	H
Ecological Status Classes - H: High; G: Good; M: Moderate; P: Poor; B: Bad						
**By definition, conditions consistent with the achievement of high status of the biological quality element.*						

Owendaluleegh_050 RWB

OWENDALULLEEGH_050 [IE_WE_29O011000]
Starting point: Baseline status as represented by EPA Q-value in 1997 (Q4-5) and 2000 (Q5) would have been 'high' status. However, water body status was not officially reported by the EPA until 2007-2009 following the enactment and implementation of the WFD. This RWB has been at 'moderate' status for all five WFD reporting periods, meaning it has not met its good-status objective. The appropriate baseline for this water status assessment going into the Prospective and final stage of the Retained Development is current EPA assigned 'moderate' status (2016-2021).
Modification(s) proposed: There were and are no direct physical modifications in this RWB from the Project, but it was on the pathway of the 2003 peat slide, hence considered in this assessment.
Effect of modification(s): Technically there was a temporary decline in representative status in this waterbody when 'high' status (2000) fell to 'good' (2003), one month after the 2003 peat slide, remaining at 'good' in 2006. Since the commencement of WFD reporting, the fish BQE has limited overall RWB to 'moderate', noting that the Q-value BQE has been Q4-5 and more recently Q5 throughout that period. IFI carried out fish surveys for WFD classification in 2009, 2013 and 2016. Where fish status is used as a BQE, the Fisheries Classification Scheme 2 (FCS2 – Ireland) produces a metric that will fall into a WFD class bands of high, good, moderate, poor or bad. FCS2 uses probability-based comparisons of observed fish counts with expected (predicted) fish counts under reference (un-impacted) conditions (Kelly & Harrison, 2016). The model accounts

OWENDALULLEEGH_050 [IE_WE_29O011000]

for environmental, geographical and pressure variables, including natural impassable barriers (e.g., waterfalls, karst). The FCS2 tool is used only by IFI fisheries scientists and cannot be examined in any depth in this report, however, Kelly & Harrison (2016) sets out that a site at 'good' status under the FCS2 would have ~80% of the expected fish species present, plus at least one of the type-specific disturbance-sensitive species and the catch is 80% of the expected total catch. For 'moderate' fish status sites, assume 55% of expected species are present (the most likely) and for these the catch equals 55% of the expected total catch. In the absence of baseline fish survey data, i.e., prior to the 2003 peat slide, it is technically not possible to know what the expected catch and numbers ought to be in the Owendalulleegh system, but it appears that trout densities recorded were lower than expected for upland soft water geologies (see discussion in Chapter 7, Section 7.3.6.3). In contrast the upper tributary streams, even the SC7(d) tributary badly affected by the peat slide appeared to have recovered trout densities expected for similar stream types by 2008, 5 years after the event) (Inis Environmental Consultants, 2008) which was sustained through surveys conducted between 2011 and 2022 for this study.

Based on the results of the Peat Stability Assessment set out in Chapter 8 of this rEIAR, there is low risk of peat instability (see Table 7-22) which means there are not expected to be Project-related levels of peat loss that could cause a decline in RWB status in the future. This RWB has an overall upstream catchment that is highly afforested, with forestry and hydromorphology listed as Significant Pressures in RBMP reporting (EPA, 2024a). It is reasonable to deduce that wider catchment land use activities are the primary drivers of status in this RWB and hence the Prospective and final stage of the Retained Development will not cause deterioration in status and will not preclude achievement of good status in the future, which will be governed by the productivity of the system for trout. It could be argued that with Q-values consistently at high status, indicative of low nutrient levels, that naturally low trout productivity can be expected for this system, i.e., trout tend to thrive in slightly enriched conditions, in contrast to salmon (which cannot reach the Owendalulleegh system because of natural karst barriers) thrive in low nutrient waters such as this. It is assumed, however that these factors have been considered by the IFI FCS2 fish classification system, which ultimately defines the status of this RWB. With such good water quality, and very good habitat quality as observed during field surveys over the past 13 years, there is no Project-related reason that would prevent improvement in fish status in the future and therefore no reason that achievement of 'good' status is prevented by the Project. In conclusion, the Prospective and Retained Development do not result in deterioration of any of the individual quality elements and will not cause deterioration in status nor prevent achievement of required 'good' status at any time in the future.

Owendalulleegh _050 IE_WE_29O011000	**Biological quality element (monitored)**		**Hydromorphological quality elements supporting the BQEs**			**GPC and Chemical Status**	**Overall status**
	Invert. (Q-value)	Fish	Hydrology	Morphology	Continuity		
Starting point	H	M	*M	*M	*M	≤H	M
Effect owing to modification	H	≥M	≥M	≥M	≥M	≤H	≥M

Ecological Status Classes - H: High; G: Good; M: Moderate; P: Poor; B: Bad

**By definition, conditions consistent with the achievement of status of the poorest biological quality element, noting that habitat / hydromorphology based on field observation is very good quality*
≥M – denotes that the Project does not prevent the achievement of good status (or better)

Lough Cutra LWB

LOUGH CUTRA [IE_WE_29_37]

Starting point: No information is available to infer LWB status prior to the first WFD reporting period of 2007-2009. Status was "unassigned" by the EPA in that first reporting cycle, and was 'good' (2010-2012), 'moderate' (2010-2015), 'good' (2013-2018) and 'good' (2016-2021) for the last four reporting periods. The appropriate baseline for the water status assessment going into the Prospective and final stage of the Retained Development is the currently EPA assigned 'good' status (2016-2021).

Modification(s) proposed: There have been no direct physical modifications in this LWB from the Project, but the lake was on the pathway of the 2003 peat slide, hence considered in this assessment.

Effect of modification (Proposed Scheme): There appeared to be some evidence of an effect of the peat slide on Lough Cutra in terms of lake chemistry data for Total-P and to a lesser extent for chlorophyll a for up to 3 years after the slide. The most obvious feature of these data were three elevated Total-P results for 2004-2006 when compared to pre- peat slide 2001 (March) and 2003 (July) results, as well as all the 2010-2019 results (see rEIAR Chapter 7, Section 7.4.2.4). Peat silt did enter the lake and did spread, at least as far as the outflow river (Beagh River). Straw bales that were placed across the lake outlet shortly after the peat slide captured silt, indicating peat was had reached the outflow river and peat flushing from the lake was taking place very early in the event. It is important to note that the occurrence of the peat influx was late in the 2003 season when general biological activity (macrophyte, phytoplankton) in the lake would have been at its lowest, which likely significantly reduced any impact that may have arisen. Whilst the peat slide may have caused localised reductions in benthic littoral and open water macroinvertebrate density and diversity where deposits were thick, the late seasonal occurrence and subsequent winter flushing of silt from the system, would suggest the significance of any silt-related impacts would have diminished substantiality.

It is reasonable to deduce that wider catchment land use activities are currently the primary drivers of status in this LWB at the waterbody scale, and that 'good' status is being maintained with the current level of catchment activity (primarily forestry and agriculture). The Peat Stability Assessment set out in Chapter 8 of this rEIAR predicts low risk of peat instability (see rEIAR Table 7-22), meaning there is a low risk of excessive levels of peat loss that could reach Lough Cutra as a result of decommissioning and retention of features on the wind farm and OHL site, 22km upstream. Hence, from a starting point of the current WFD status baseline, the Prospective and Retained Development would not be likely to cause deterioration of any of the individual quality elements and will therefore not cause deterioration from 'good' status nor prevent achievement of good status at any time in the future.

Lough Cutra IE_WE_29_37	**Biological quality elements (BQEs) (monitored) (2016-2021)**		**Hydromorphological quality elements supporting the BQEs**		**GPC monitored**	**Overall status**
	Macrophyte	Phyto plankton	Hydrology	Morphology		
Starting point	G	H	G*	G*	G	G
Effect owing to modification	G	H	G*	G*	G	G

Ecological Status Classes - H: High; G: Good; M: Moderate; P: Poor; B: Bad

** "supporting conditions" are by definition equal to, or better than, poorest BQE value*

Boleyneendoorish_020 RWB

BOLEYNEENDOORISH_020 [IE_WE_29B040200]

Starting point: Baseline status as represented by EPA Q-value in 1997 (Q4-5) and 2000 (Q5) would have been 'high' status. However, water body status was not officially reported by the EPA until 2007-2009 following the enactment and implementation of the WFD.

This RWB had status "unassigned" for the first WFD reporting period, as it was not sampled in that period. The RWB has been assigned 'high' status for the four reporting periods since with consistent Q5 or Q4-5. The peat slide had no physical impact on this RWB. The appropriate baseline for this water status assessment going into the Prospective and final stage of the Retained Development is current EPA assigned high status (2016-2021), noting this is a high-status objective waterbody where maintenance of high status is required under WFD Article 4(1).

Modification(s) proposed: There were and are no direct physical modifications in this RWB from the Project. It is considered in this assessment on a precautionary basis as it is immediately downstream of the Boleyneendoorish_010 that receives 33% of drainage from the overall wind farm site.

Effect of modification(s): There has been no effect on EPA assigned status of this RWB arising from the construction, operational and ceased operation phases of the project, as evidenced by the consistent 'high' status record.

The presence of the wind farm upstream of this RWB throughout the construction, operational and ceased operation phases has had no significant negative effects on biological water quality or hydromophology at a water body scale. Q5 and Q4-5 (BQE high status) has been maintained since 1997 and overall RWB status has been at high status for all reported WFD periods. In conclusion, the Prospective and Retained Development gives no cause for deterioration of individual quality elements and will not cause deterioration from overall high status, nor prevent achievement of high status at any time in the future.

Boleyneendoorish_020 IE_WE_29B040200	**Biological quality element (monitored by EPA)**	**Hydromorphological quality elements supporting the BQEs (monitored by EPA)**			**GPC (not monitored in this RWB)**	**Overall status**
	Invertebrate (Q-value)	Hydrology	Morphology	Continuity		
Starting point	H (2016-2021)	H	H	H	≤H*	H
Effect owing to modification	H	H	H	H	≤H*	H

Ecological Status Classes - H: High; G: Good; M: Moderate; P: Poor; B: Bad

**Conditions consistent with the achievement of high status of the biological quality element*

1.6 Groundwater Body Assessments

GWDTE - Caherglassaun Turlough (SAC 000238) GWB

GWDTE - Caherglassaun Turlough (SAC 000238) [IE_WE_G_0091]
Starting point: Groundwater quantitative status has been classified as 'good' for each WFD reporting period to date. In the 2007-2012 period, overall status (i.e., quantitative + chemical) was 'good', but since then (2010-2015, 2013-2018, 2016-2021) chemical status has been 'poor', therefore limiting overall status to 'poor'. The reason for failure of chemical status is elevated Total Phosphorus. The appropriate GWB baseline for this water status assessment going into the Prospective and final stage of the Retained Development is current EPA assigned 'poor' status (2016-2021).
Effect of Proposed Scheme: As set out in the rEIAR Chapter 9, there has been no effect on EPA assigned status of this GWB arising from the construction, operational and ceased operation phases of the project. The presence of the wind farm within this GWB throughout the construction, operational and ceased operation phases has had no significant negative effects on hydrogeology at water body scale. The fall in groundwater levels during and following construction was consistent and gradual at a rate of approximately 0.1 m/year in close proximity to new drains. It is likely that groundwater levels across the wind farm site have stabilised since piezometers installed during construction stopped measuring in 2012. In general, the vast majority of dewatering of the peat close to wind farm drains took place in the early years following construction, but the degree and rate of change would have varied significantly with the greatest changes most likely taking place in the southwest of the site where most of the new drainage channels were introduced while the relatively undisturbed areas undergoing little evident change and remaining largely intact. It is estimated that only c. 1.3% of the overall wind farm area was subject to drawdown from the installation of new drainage because of the wind farm construction while the remainder saw groundwater levels unchanged. The decommissioning works and retained site will likely see that existing groundwater levels remain stable and if anything, gradually rise due to a lack of maintenance to the wind farm drainage network in the long-term. Repeated water chemistry sampling and Q-value data has shown that the wind farm is not contributing elevated levels of nutrient to connected surface waters, with 'high' status Q-value maintained in the main drainage catchment of Owendalulleegh and Boleyneendoorish as set out in Section 1.5.1, above, and there is a similarly low risk that the wind farm is adversely affecting chemical status of this groundwater body. There is a small natural peat-floored lake present close to the centre of the wind farm just north of T67. The lake is reported in to appears to be in a relatively natural state despite (Section 61315 Chapter 6 (Terrestrial & Avian Ecology) the planted forestry in the adjacent area and the development of the wind farm infrastructure close-by. It most likely would not have been affected by installation of wind farm drainage given the distance to the nearest drains, the size of these drains and the extremely low hydraulic conductivity of peat. The residual effect on quantitative and chemical status of the overall GWB will be neutral. The Prospective and Retained Development will not cause deterioration from 'good' quantitative status and will not prevent achievement of overall 'good' status at any time in the future.

		Starting point	Effect of modification
Quantitative Criteria	1) Available GW resource is not exceeded by the long term annual average rate of abstraction	G	G

	2) No significant diminution of surface water chemistry and/or ecology resulting from anthropogenic water level alteration or change in flow conditions that would lead to failure of Article 4 objectives for any associated surface water bodies?	G	G
	3) No significant damage to GW Dependent Terrestrial Ecosystems (GWDTEs) resulting from an anthropogenic water level alteration;	G	G
	4) No saline or other intrusions resulting from anthropogenically induced sustained changes in flow direction.	G	G
	Overall quantitative groundwater status	G	G
Chemical Status	No anthropogenically induced upward trends in pollutant concentrations and the reversal of such trends.	P	P
WFD GWB Status Classes - G: Good; P: Poor			

Lough Graney GWB

Lough Graney [IE_SH_G_157]			
Starting point: Overall groundwater status (quantitative + chemical) has been classified as 'good' for each WFD reporting period to date: 2007-2012, 010-2015, 2013-2018, 2016-2021.			
Effect of Proposed Scheme: Given the small footprint of the project on this GWB and the largely free-draining nature of the substation developed within it, there would have been no effects on groundwater levels nor consequently its Quantitative status. Any effect from the Project on groundwater would be no more than superficial, localised effects and would not affect GWB status at water body level. The residual effect on quantitative and chemical status of the overall GWB will be neutral. Overall quantitative GWB status will not deteriorate and the Retained Development would not cause deterioration from current overall 'good' status in the future.			
		Starting point	**Effect of modification**
Quantitative Criteria	1) Available GW resource is not exceeded by the long term annual average rate of abstraction	G	G
	2) No significant diminution of surface water chemistry and/or ecology resulting from anthropogenic water level alteration or change in flow conditions that would lead to failure of Article 4 objectives for any associated surface water bodies?	G	G
	3) No significant damage to GW Dependent Terrestrial Ecosystems (GWDTEs) resulting from an anthropogenic water level alteration;	G	G
	4) No saline or other intrusions resulting from anthropogenically induced sustained changes in flow direction.	G	G
	Overall quantitative groundwater status	G	G

Lough Graney [IE_SH_G_157]			
Chemical Status	No anthropogenically induced upward trends in pollutant concentrations and the reversal of such trends.	G	G
WFD GWB Status Classes - G: Good; P: Poor			

Tynagh GWB

Tynagh [IE_SH_G_157]			
Starting point: Overall groundwater status (quantitative + chemical) has been classified as 'good' for each WFD reporting period to date: 2007-2012, 010-2015, 2013-2018, 2016-2021.			
Effect of Proposed Scheme: Given the small footprint of the project on this GWB, there would have been no effects on groundwater levels nor consequently its Quantitative status. Any effect from the Project on groundwater would be no more than superficial, localised effects and would not affect GWB status at water body level. The residual effect on quantitative and chemical status of the overall GWB will be neutral. Overall quantitative GWB status will not deteriorate, and the Retained Development would not cause deterioration from current overall 'good' status in the future.			
		Starting point	**Effect of modification**
Quantitative Criteria	1) Available GW resource is not exceeded by the long term annual average rate of abstraction	G	G
	2) No significant diminution of surface water chemistry and/or ecology resulting from anthropogenic water level alteration or change in flow conditions that would lead to failure of Article 4 objectives for any associated surface water bodies?	G	G
	3) No significant damage to GW Dependent Terrestrial Ecosystems (GWDTEs) resulting from an anthropogenic water level alteration;	G	G
	4) No saline or other intrusions resulting from anthropogenically induced sustained changes in flow direction.	G	G
	Overall quantitative groundwater status	G	G
Chemical Status	No anthropogenically induced upward trends in pollutant concentrations and the reversal of such trends.	G	G
WFD GWB Status Classes - G: Good; P: Poor			

1.7 Conclusion

The above assessment has considered effects of the Derrybrien Wind Farm Development Decommissioning Project - Retained Development on river, lake and ground water body status throughout the lifetime of the Project: past, present and future.

The wind farm, OHL and Agannygal Substation sites are each currently in an essentially benign, ceased operation phase (2022 to present). It is important to note that any changes to ecological quality elements as defined by Annex V of the WFD would arise in comparison to current EPA assigned status. Given that the 'Do Nothing' scenario is not an option, i.e., decommissioning works are required, the effective baseline for each water body for the remaining stages of the Project is current (2016-2021) EPA assigned status, i.e., for the Prospective Development and final stage of Retained Development.

Table 1-6 summarises results of the WFD Article 4(7) Applicability Assessments for each water body in comparison to current EPA assigned water body status (2016-2021). The Prospective Development and final stage of the Retained Development are not predicted to cause deterioration of status in any water body at quality element level or overall water body status level, nor compromise improvement to good status (or high status, where required), hence the project does not need to be subject to the Article 4(7) Test for derogation. This document in conjunction with detailed information within the EIAR provides evidence supporting this conclusion. The project is compliant with WFD Article 4(1) objectives for the water bodies in question.

Table 1-6 Summary of WFD compliance tests

Water body	Deterioration of status?	Prevention of good / high status?	Is the proposed scheme compliant with WFD Article 4(1) objectives for this water body?
Boleyneendoorish_010 [IE_WE_29B040100]	No	No	Yes
Boleyneendoorish_020 [IE_WE_29B040200]	No	No	Yes
Owendalulleegh_020 [IE_WE_29O010700]	No	No	Yes
Owendalulleegh_030 [IE_WE_29O010800]	No	No	Yes
Duniry_010 [IE_SH_25D070100]	No	No	Yes
Bleach_010 [IE_SH_25B070100]	No	No	Yes
Boleyneendoorish_020 [IE_WE_29B040200]	No	No	Yes
Owendalulleegh_040 [IE_WE_29O010900]	No	No	Yes
Owendalulleegh_050 [IE_WE_29O011000]	No	No	Yes
Lough Cutra [IE_WE_29_37]	No	No	Yes
GWDTE-Caherglassaun Turlough (SAC000238) [IE_WE_G_0091]	No	No	Yes
Lough Graney [IE_SH_G_157]	No	No	Yes
Tynagh [IE_SH_G_157]	No	No	Yes
OVERALL WFD ASSESSMENT RECOMMENDATION	The Prospective Development and final stage of the Retained Development does not compromise WFD Article 4(1) objectives and could technically be authorized without an Article 4(7) Test.		

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LAND, SOIL AND GEOLOGY APPENDICES (APPENDIX 8-1 TO 8-7)

APPENDIX 8-1: AGEC 2004 REPORTS ON 2003 LANDSLIDE AND POST-LANDSLIDE APPRAISAL

Derrybrien Windfarm - Final Report on Landslide of October 2003, Applied Ground Engineering Consultants (AGEC), 4th February, 2004

Final Report on Derrybrien Windfarm Post-Landslide Site Appraisal, AGEC Report No. 378_099, Rev.0, 4th February 2004.

- **Appendix A:** Geotechnical Mapping Sheets
- **Appendix B:** In-Situ Vane Results
- **Appendix C:** Back-analysed Excavation Failures
- **Appendix D:** Stability Results for Cells
- **Appendix E:** Co-ordinates of Vane Locations
- **Appendix F:** Strength of Peat above Peat/Mineral Soil Interface

APPENDIX 8-2: GEOTECHNICAL STABILITY REPORT – WIND FARM SITE

Derrybrien Windfarm – Geotechnical Stability Report & Assessment of Stability Impacts of On-Site Activities, AGL Report No. 11-147-R04, Rev.4, 12th December, 2024

- **Appendix A – As-Built Records (Drawings)**
  - AGEC Drawing No. 003 – *Ground Investigation Location Plan for Wind Farm & Failure Scar*, Rev.0 dated 25th July, 2018
  - ESB E&MP Drawing No. QS-000192-01-D451-001 – *Derrybrien Wind Farm – Pre-existing & Constructed Drainage*, Rev.0, 29th June 2020
  - ESB E&MP Drawing No. QS-000192-01-D451-009 – *Derrybrien Wind Farm – Location Monitoring Points*, Rev.0, 29th June 2020
  - ESB E&MP Drawing No. QS-000192-01-D451-014 – *Derrybrien Wind Farm – Site Layout*, Rev.0, 5th May, 2020
  - ESB E&MP Drawing No. QS-000192-01-D451-016 – *Derrybrien Wind Farm – Approximate Location of Piezometers & Tiltmeter Points on Site*, 30th October, 2018
  - ESB E&MP Drawing No. QS-000192-01-D451-017 – *Derrybrien Wind Farm – Approximate Cable Route Locations*, 30th October, 2018
  - ESB E&MP Drawing No. QS-000192-01-D451-018 – *Derrybrien Wind Farm Constraints*, 30th October, 2018
  - ESBI Drawing No. P378015-C-0003 – *Derrybrien Wind Farm – Site Tracks Remedial Works – Remedial Works Plan*, Rev.1, 26rh March, 2014
- **Appendix B – Peat Stability Risk Assessment (PSRA)**
  - Tables B1-B5: Risk Factors & Rating Guidelines
  - Figure B-1: Baseline PSRA of Site in Original Condition in 1998 Prior to Construction
  - Figure B-2: PSRA for End of Construction in 2005 – Prior to Mitigation Measures
  - Figure B-3: Updated PSRA for Site Activities 2005-2018 - After Mitigation Measures

- Figure B-4: Updated PSRA for Site Activities 2018-End of Operation - After Mitigation Measures
- Figure 2.1B – LiDAR Topographical Survey
- Drawing No. 11-147-03: Aerial Photo
- ESB Drawing No.QS-000192-01-D451-025 – Site Layout- Peat Depth Banding
- ESBI Drawing No. 11-147-05: Slope Angle at Ground Surface
- ESB Drawing No. QS-000192-01-D451-020 – Site Layout, Bottom Peat Slope Banding
- ESB Drawing No. QS-000192-01-D451-028 – Site Layout, Infinite Slope Analysis, Peat Undrained Shear Strength, c_u = 5kPa, Surcharge = 0kPa
- ESB Drawing No. QS-000192-01-D451-026 – Site Layout, Infinite Slope Analysis, Peat Undrained Shear Strength, c_u = 2.5kPa, Surcharge = 0kPa
- ESB Drawing No. QS-000192-01-D451-029 – Site Layout, Infinite Slope Analysis, Peat Undrained Shear Strength, c_u = 5kPa, Surcharge = 13kPa
- ESB Drawing No. QS-000192-01-D451-027– Site Layout, Infinite Slope Analysis, Peat Undrained Shear Strength, c_u = 2.5kPa, Surcharge = 13kPa
- Peat Stability Assessment Worksheets, Turbine Nos. T1 to T71

- **Appendix C – AGL Report No. 11-147-R05 – Proof Load Testing of the Floating Roads in 2018**

  Derrybrien Windfarm Access Roads – Road Test on Floating Roads, AGL Report No. 11-147-R05, Rev.0, 30th October 2018
  - **Appendix A** – Results of Proof Load Test
- **Appendix D – Photos from AGL Site Inspections in 2018**
- **Appendix E – Photos from AGL Site Inspection in 2024**
- **Appendix F – AGL Report No. 11-147-R01: Construction Stage Geotechnical Investigations, Stability Analyses and Peat Stability Risk Mitigation Measures (Post-Slide)**

  Summary of Geotechnical Investigations, Stability Analyses and Peat Stability Risk Mitigation Measures Adopted During Post-Slide Construction Stage, AGL Report No. 11-147-R01, Rev.1, 14th July 2020
  - **Appendix I** – IGSL Factual Report for Pre-Construction SI (2002)

    Report on a Site Investigation at a Proposed Wind Farm, Derrybrien, Co. Galway – IGSL Report No. 7637, January 2002.
    - **Appendix I:** Trial Pit Records
    - **Appendix II:** Mackintosh Probe/Hand Auger Results
    - **Appendix III:** Laboratory Test Results
  - **Appendix II** – Factual Report on Rotary Coreholes at Turbine Locations by Irish Drilling Ltd. (2004)

    Proposed Windfarm at Derrybrien – Site Investigation Factual Report, Irish Drilling Ltd., 6th October, 2004
    - Appendix 1: Borehole Records (Rotary Core)
  - **Appendix III** – AGL Report No. 03-104-R01 (Rev.1) on Stability of Floating Roads, Turbine Excavations & Peat Disposal Areas.

    Report on the Stability of the Floating Roads, Turbine Excavations & Peat Disposal Areas on the site of the Derrybrien Windfarm, Co. Galway, AGL Report No. 03-104-R01, Rev.1, 1st November 2004.

- **Appendix A:** Results of Gouge Auger Probes and Geonor H-10 (65/130mm) Penetration Vane Tests
- **Appendix B**: Summary of Field Investigations at Proposed Peat Repository Sites
- **Appendix C:** Results of Slope/W Analyses for the Floating Roads
- **Appendix D:** Road Deflection Measurements from Field Load Tests on Floating Roads
- **Appendix E:** Results of Slope Stability Analyses for Proposed Peat Repository Sites

- **Appendix IV** – AGL Report 03-104-R02 – Report on the Stability of the Floating Roads

  Report on the Stability of the Floating Road on the site of the Derrybrien Windfarm, Co. Galway, AGL Report No. 03-104-R02, 16th December 2004.
  - **Appendix A:** Results of Gouge Auger Probes and Geonor H-10 (65/130mm) Penetration Vane Tests
  - **Appendix B:** Results of Slope/W Analyses for the Floating Roads
  - **Appendix C:** Road Deflection Measurements from Field Load Tests on Floating Roads
  - **Appendix D:** AGL Method Statement for Remedial Works on Sections of Floating Roads Classified as "Poor".
- **Appendix V** – AGL Memo 03-104-DM18 – Full Scale Testing on the Floating Roads
  - **Appendix A:** AGL Method Statement for Remedial Work on the Floating Roads
- **Appendix VI** – AGL Report 03-104-R06 – Report on the Load Test Carried Out on a Test Section of Floating Road

  Report on the Load Test Carried out on a Test Section of Floating Road on the Derrybrien Windfarm, Loughrea, Co. Galway, AGL Report No. 03-104-R06, 23rd May, 2005.
  - **Appendix A**: Vane Shear Test Results
  - **Appendix B**: Slope/W Analyses
  - **Appendix C**: Settlement Measurements
- **Appendix VII** – AGL Memo 03-104-DM24 – Transformer Load on the Floating Roads
- **Appendix VIII** – Peat Repository Sites – Geotechnical Investigations & Stability Analyses
- **Appendix IX** – AGL Memo 03-104-DM22 – Review of Blast Monitoring Records for Borrow Pit No.3.
- **Appendix X** – AGL Geotechnical Approval Certificates
- **Appendix XI** – AGL Report 03-104-R03 – Report on the Movement of the Floating Road west of T17
- **Appendix XII** – AGL Report 03-104-R04 – Report on the Assessment of the Proposed Works at Turbine Base T68
  - **Appendix A:** Summary of peat depths, slope angles and vane shear test data along the floating road in cell T68
  - **Appendix B:** Summary of peat depths, slope angles and vane shear test data for repository site T68R

- **Appendix XIII** – AGL Report 03-104-R05 - Report on the Assessment of the Proposed Works at Turbine Base T70
  - **Appendix A:** Summary of peat depths, slope angles and vane shear test data along the floating road in cell T70
- **Appendix XIV** – Factual Report of Geotechnical Investigations by ESB International-Engineering and Facilities Management (ESBIE)
  - **Volume 1** – Derrybrien Wind Farm Co. Galway, Report on ESBIE Geotechnical Testing for Hibernian Wind Power, Volume 1 of 2, Report No. 78015-C11-R1 Rev.1, 20th April 2005
  - **Volume 2** – Appendices
    - **Appendix A**: Slope Angle Measurement Results (Excel)
    - **Appendix B**: Shear Vane Test Results
    - **Appendix C**: Gouge Auger Results (Excel – Geotechnical Testing)
    - **Appendix D**: Piezometer Date

APPENDIX 8-3: PEAT STABILITY RISK ASSESSMENT (PSRA) FOR POLESETS PS-1 TO PS-4 ALONG 110KV OHL ROUTE

Derrybrien Windfarm – Peat Stability Risk Assessment (PSRA) for Decommissioning of Polesets PS-1a to PS-4 of the 110kV Derrybrien to Agannygal Overhead Line (OHL) , AGL Report No. 22-149-R001, Rev.0, 6th May, 2024

- **Appendix A** – Zonal Peat Stability Assessment (ZPSA) Worksheets
- **Appendix B –** Information on Site Characteristics, Peat Depth, Peat Strength & Topography
- **Appendix C** – Infinite Slope Factor of Safety Calculations

APPENDIX 8-4: PEAT STABILITY RISK ASSESSMENT (PSRA) FOR TURBARY PLOTS ON THE WIND FARM SITE

Derrybrien Windfarm – Peat Stability Risk Assessment (PSRA) for Turbary Plots at East End of Windfarm Site, AGL Report No. 11-147-R06, Rev.2, 7th May, 2024

- **Appendix A** – Results of Peat Stability Risk Assessment for Turbary Areas

APPENDIX 8-5: GEOTECHNICAL STABILITY REPORT 2– PEAT SLIDE AND ASSOCIATED WORKS

"Geotechnical Stability Report 2 - Peat Slide and Associated Works" Fehily Timoney, July 2020.

- **Appendix A** – Site Photographs from FT Site Walkover (2019)
- **Appendix B –** AGEC Ground Investigation (2018)- Trial Pits Logs
- **Appendix C** – Graphical Outputs & Calculations for Containment Barrages
- **Appendix D** – Calculations for Stability Assessments of Repository Areas
- **Appendix E** – Historical AGEC Reports
- **Appendix F** – INIS Report (2004)
- **Appendix G** – Ground investigation Background Information

APPENDIX 8-6: GEOTECHNICAL STABILITY REPORT 3– OVERHEAD LINE AND SUBSTATION IMPACT ASSESSMENT

Geotechnical Stability Report 3 - Overhead Line and Substation Impact Assessment, Fehily Timoney, July 2020.

- **Appendix A** – Site Photographs from FT Site Walkover (2019)

- **Appendix B –** AGEC Ground Investigation (2018)- Relevant Trial Pits
- **Appendix C** – Methodology for Peat Stability Risk Assessment
- **Appendix D** – Results of Peat Stability Risk Assessment
- **Appendix E** – Calculated FoS for Peat Slopes
- **Appendix F** – ESB Report on Slope Stability Assessment of a Section of Ground below the OHL

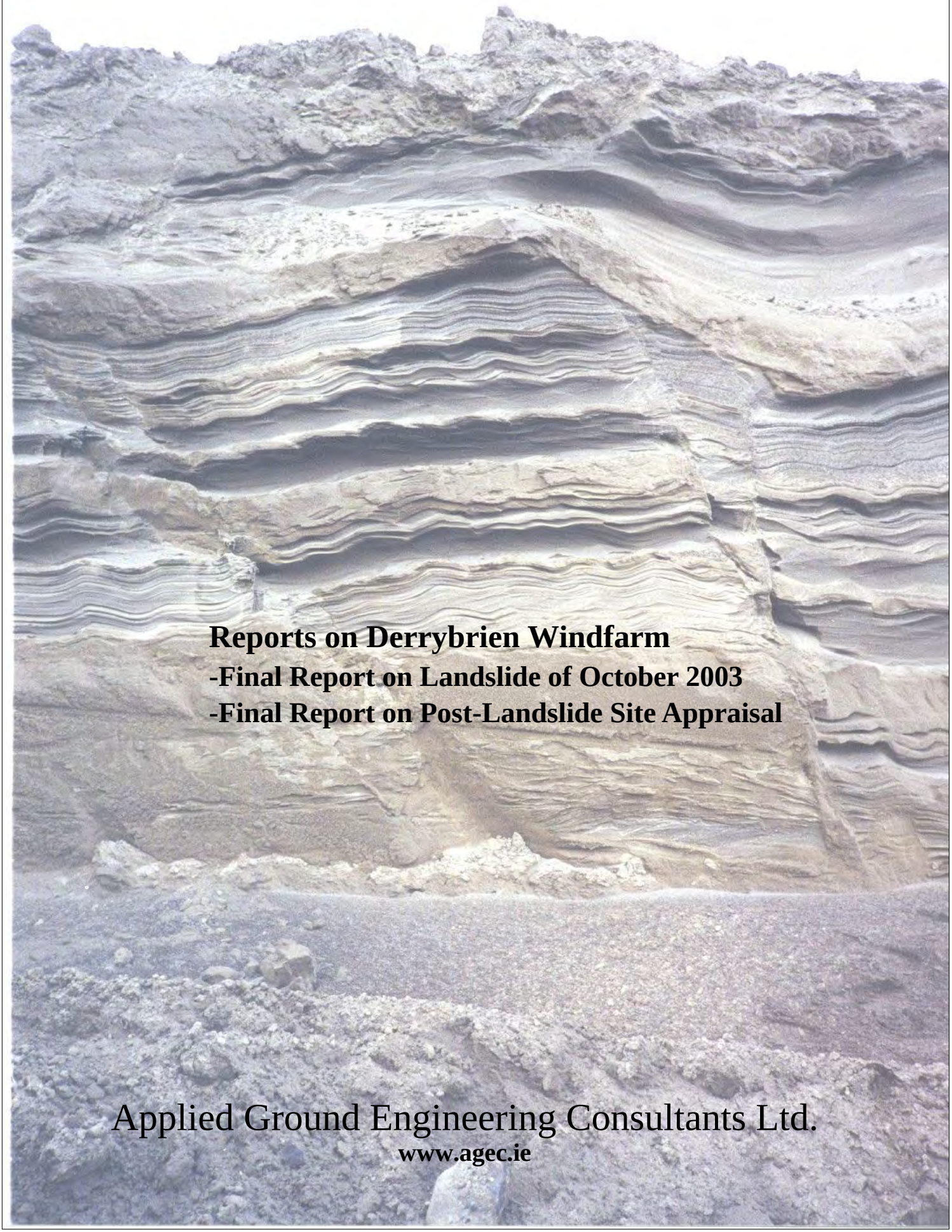
APPENDIX 8-7: GEOTECHNICAL & PEAT STABILITY REPORT – DERRYBRIEN WIND FARM – GRID CONNECTION AND ANCILLARY WORKS

Geotechnical & Peat Stability Report: Derrybrien Wind Farm – Grid Connection and Ancillary Works, **Fehily Timoney, January 2023**

- **Appendix A** – Photos from Site Walkover
- **Appendix B** – Methodology for Peat Stability Risk Assessment
- **Appendix C** – Results of Peat Stability Risk Assessment
- **Appendix D** – Calculated FoS for Peat Slopes
- **Appendix E** – ESB Report on Slope Stability Assessment of a Section of Ground below the OHL

APPENDIX 8-1

AGEC 2004 REPORTS ON 2003 LANDSIDE AND POST LANDSLIDE APPRAISAL



Reports on Derrybrien Windfarm

-Final Report on Landslide of October 2003

-Final Report on Post-Landslide Site Appraisal

Applied Ground Engineering Consultants Ltd.

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EXECUTIVE SUMMARY

The Derrybrien Windfarm site is located on Cashlaundrumlahan Mountain in the Slieve Aughty Mountains, some 11 km south of Loughrea, Co Galway. The windfarm being developed by Hibernian Wind Power Ltd comprises some 71 proposed wind turbines and associated access roads. Construction of bases for wind turbines and associated access roads was ceased following a landslide on 16 October 2003.

Applied Ground Engineering Consultants (AGEC) were commissioned on behalf of Hibernian Wind Power Ltd to:

(1) Investigate the landslide which occurred at Derrybrien, Co Galway on October 16 last, and

(2) To assess the stability of the overall windfarm site based on findings from a walkover survey and ground investigation data.

The following is a summary of the recommendations and conclusions of these reports (full details are in the reports attached).

Key Findings of Reports

Final Report on Landslide of October 2003

- This report into the cause of the peat slide found that there was a combination of contributory factors, including a zone of weak peat, a natural drainage channel and that activity associated with the windfarm construction resulted in the failure of the peat.

Final Report on Derrybrien Windfarm Post-Landslide Site Appraisal

- To ensure the safe completion of the construction at the Derrybrien Windfarm current construction work practices must be revised. Provided that the recommendations are satisfactorily implemented it is considered that the construction of the Derrybrien Windfarm can be completed safely.

Key Recommendations

- The report recommends that no concentrated loads, such as excavated material from turbine foundation excavations, shall be placed on marginally stable ground. Concentrated water flow onto the peat slopes and unstable excavations are to be avoided.

- During construction there should be suitably qualified and experienced geotechnical presence on site on a full time basis.

- Ongoing ground investigation work should continue with regular monitoring of specialist movement detection equipment, site roads and other works.

- Modified construction work practices which do not adversely affect existing stability, are to be adopted.

- A robust drainage plan is to be developed and implemented.

- Periodic inspection of the site following completion of works by suitably experienced and qualified geotechnical personnel during the life time of the site.

Paul Jennings 04.02.04

Dr Paul Jennings, Director for AGEC

Final Report on Landslide of October 2003

DERRYBRIEN WINDFARM

FINAL REPORT ON LANDSLIDE OF OCTOBER 2003

1 INTRODUCTION

Applied Ground Engineering Consultants Ltd. (AGEC) was engaged on 17 October 2003 by Electricity Supply Board International (ESBI) to undertake a site inspection of a failure at the site of the Derrybrien Windfarm Project, County Galway.

The Derrybrien Windfarm Project is located on Cashlaundrumlahan Mountain in the Slieve Aughty mountains some 11km south of Loughrea town in County Galway. The wind farm comprises some 71 proposed wind turbines and associated access roads. Construction of bases for wind turbines and associated access roads were ceased following a landslide on 16 October 2003.

The wind farm is located on the upper slopes of the mountain. The upper slopes form a gently sloping plateau with a summit elevation of 365 mAOD. The ground conditions comprise an area of peatland covered by forestry plantation.

The site inspection was requested in order to provide an opinion on the cause(s) of the failure based on a walkover site inspection of the failure.

The site inspection was undertaken on 18 October 2003 and follow-up inspection of the site during the following week by AGEC staff and included the following main elements:

(1) Visual appraisal of the failure from a walkover along the perimeter and, to a limited extent, within the failed area,

(2) Survey measurements using a global positioning system (GPS) of the extent of the failure site,

(3) Measurement of in situ undrained shear strength of the failed material at the head of the failure using a hand-held shear vane,

(4) Visual appraisal of adjacent turbine sites, and

(5) Review of eyewitness accounts and construction records.

2 FINDINGS OF SITE INSPECTION

2.1 Time of Failure

The failure was reported to have occurred at about 16:00 hours on Thursday 16 October 2003 immediately south of the location for turbine T68. The reported weather at the time of failure was fine, with no rainfall recorded.

2.2 Failure Site

The failure was located on the southern slopes of Cashlaundrumlahan Mountain (Figure 1). The head of the failure, at an elevation of about 350m AOD, was located within the site boundary of the wind farm. The toe of the failure, at an elevation of about 195m AOD on 19 October 2003, was located immediately upslope of a minor rural road.

The head of the failure, as defined by a tension crack, was located a few metres downslope of excavation work for turbine base T68 and coincident with the upslope edge of a site access road. The site access road was constructed using locally won aggregate as a floating road supported by geotextile and an underlay of brushwood and felled trees. The road was up to 1.5m thick in the centre of the failure scar.

About 300m downslope the failure scar crossed the southern boundary access road of the windfarm. At this location a drainage channel was being constructed perpendicular to the slope on the day the landslide was reported.

Measurements along the upper failure scar show slope angles between about 3˚ and 5˚. At the head of the failure the slope angle is about 5˚.

The failure was in a natural drainage line within a shallow valley, which in the upper slope is aligned in a south-easterly direction. Downslope the drainage line becomes more distinct and comprises a narrow, 10 to 15m wide, steep-sided incised channel. Where the narrow channel starts the drainage line turns and flows in a more easterly direction.

The dimensions of the failure scar are about 45m wide at the head widening to a maximum of about 270m some 750m downslope. The approximate length of the failure was recorded on 18 October 2003 as 2450m.

2.3 Ground Conditions

The failure occurred in peat which overlies mineral soil. There were few exposures of mineral soil within the failure scar. The thickness of peat at the head of the failure scar was about 2m. Limited probing of peat along the perimeter of the scar indicated peat thickness generally reduced downslope to about 1.5m.

The basal shear surface of the failure was visible in part during the walkover. The failure surface was within peat, some 200 to 400mm above mineral soil. Failure surface was very soft brown amorphous peat with recognisable plant structure. An estimate of the degree of humification within the failure zone is H_6 to H_8 (Ref: *Hobbs, N. B. (1986).*

Mire morphology and the properties and behaviour of some British and foreign peats. Quarterly Journal of Engineering Geology, London, 1986, vol. 19, pp. 7-80).

2.4 Failure Type and Volume

The initial failure was a translational peat slide. Inspection of the failure scar identified the following (Figure 1).

(1) Upper failure. Area of failed peat that moved downslope as a translational slide. Basal failure surface appeared to be within the lower part of the peat layer, typically 200 to 400mm above mineral soil. The failed ground appeared to detach itself from intact ground as distinct peat rafts. Detachment occurred along forestry plough/drainage channels. Following initial movement, breakdown of peat rafts led to flow-type movement of peat.

(2) Debris track. Failure debris entered the lower part of the natural drainage line, which is a narrow steep-sided channel, and moved downstream as a debris flow. It is likely that the channel is on or close to bedrock. Any water concentrated within the channel would have further saturated the debris increasing its mobility.

(3) Deposition area. In the lower reaches of the channel, elevation of about 210 m AOD, the channel becomes more open and slope inclination is about 2˚. Failure debris was deposited at this location as lobes of material within the drainage line with several lobes having over-topped the channel.

The failed ground appears to comprise the upper part of the failure only. Within the debris track there appears to be little failure of the ground. The likely failure volume based on the extent of the upper failure is estimated as 450,000 m^3.

Preliminary estimates suggest that about 50 to 70% of the debris was removed from the upper failure area.

2.5 Other Recent Failures and Ground Movements

As part of a wider-scale walkover inspection of the wind farm site several areas of recent failures and ground movements were identified. These recent failures and ground movements are associated with construction activity.

(1) Site of turbine base T17. This base was immediately west of T68 base, some 230m distance apart. Following placement of arisings from excavation for the turbine base, a failure of in situ peat underlying arisings occurred. Arisings would have comprised peat and some till/weathered rock material. Failure scar was about 140m long by 22m wide with a depth estimated at 0.7 to 1.5m. The upper 85m of the scar comprised failure of underlying in situ peat along a shear surface located at the base of the in situ peat some 200mm to 500mm above mineral soil. The lower 50m of the scar comprised deposition of failure debris.

This failure volume is estimated as 2000 m^3. The failure was reported to have occurred on 2 October 2003.

(2) Site of turbine base T66. This base was located upslope from T68. To the south (downslope) of the base there was failure of underlying in situ peat below arisings from base excavation. Arisings comprised both peat and till. The arisings had slumped and there was subsidence in the road indicating movement of underlying in situ peat. Failure of in situ peat comprised heaving of up to 0.8m height together with cracking and distortion of in situ peat that extended several metres downslope of the arisings.

Ponding of water within arisings and the mobility of the arisings suggest that over-pumping from the excavation into the arisings area had taken place.

(3) Site of turbine T29. This base was located some 800m to the east of T68. To the south of the base there was failure of underlying in situ peat below arisings from base excavation. Arisings comprised both peat and till. The arisings had slumped. Failure of in situ peat comprised heaving of up to 1.5m height together with cracking and distortion of in situ peat that extended some 8m downslope of the arisings.

3 POSSIBLE CONTRIBUTORY FACTORS

The following factors are likely to have contributed to the failure of 16 October 2003.

(1) Natural drainage line. The failure occurred within a shallow valley, and where there would likely be a concentration of both surface and sub-surface water flow. Peat slides have previously been recorded within natural drainage lines.

(2) Zone of weaker peat. In situ strength testing suggests a zone of weaker peat is present within the centre of the drainage line.

(3) Placement of access track. An access track is located at the head of the failure. The additional load due to this floating track would have contributed to an increase in applied load.

(4) Placement of arisings on slope. Arisings from excavation of turbine base T68 were placed at the head of the failure. The additional load due to the arisings would have contributed to an increase in applied load.

(5) Water-filled excavation. Excavation for the base of turbine T68 was underway at the time failure was reported. This excavation, which was taken to mineral soil, has several drains feeding into it, and appeared to have been water-filled. Possible sub-surface transmission of water along the base of the peat would have lead to a build-up of water pressure at the base of the peat reducing effective stresses.

(6) Drainage works downslope. Construction records indicate that drainage works were underway on the southern boundary access road, some 300m downslope of T68. The drainage works included severing of the floating road at this location in order to install a drainage pipe. There is a possibility that the excavation locally removed lateral support in an area of wet peat. The need to construct the drain also indicates that the peat was wet.

(7) Previous instability. All direct evidence of previous instability or incipient instability within the drainage line would have been destroyed during the failure of 16 October 2003. Knee-bends on some trees are orientated into the drainage line suggesting possible creep movements within the drainage line. Creep movement over time may have reduced shear resistance within the peat.

(8) Forestry plough/drain channels. Existing plough/drain channels within the forestry dissected the vegetative upper layers of the peat creating lines of potential surface weakness. Once failure was initiated peat rafts generally detached themselves from intact material along existing plough/drain channels.

Other factors considered were over-pumping on to the downslope. Site representatives have indicated that they are unaware of any over-pumping at this location.

4 FAILURE MECHANISM

Whilst failure was initially reported to have occurred immediately south of the location for turbine T68 it is not possible to say with certainty that failure was initiated at this point. However, given the circumstantial evidence of failure occurring at the time of construction for base of turbine T68, this strongly indicates that construction activity was the most likely trigger. Initial failure possibly occurred within the vicinity of the site for turbine T68.

Evidence of recent failure at turbine base T17 and ground movements resulting in failure of in situ peat at other turbine bases, all as a result of construction activity, further suggests that construction activity likely initiated of the 16 October 2003 failure. In addition, the evidence from base T17 demonstrates that larger-scale failure can be initiated by loading at the head of the failure.

Considering the above, the possible failure mechanism was localised failure of peat in the vicinity and downslope of the site of turbine T68. The additional load from the access track, which was floated on the peat, and arisings together with localised zone of weaker peat and increase in water pressure at the base of the peat due to water-filled excavation could have resulted in localised reduction in shear resistance at the base of the in situ peat layer.

The localised reduction in shear resistance increased the downslope load on the adjacent in situ peat downslope resulting in the onset of progressive failure. It is likely that failure was concentrated in the centre of the shallow valley, and as material failed and moved downslope this removed toe support from both material upslope and laterally. Widening of the failure appeared to be controlled by the topographic width of the shallow valley. A significant body of peat was set in motion.

The role of the drainage works on the southern boundary access road is uncertain. Though local removal of lateral support in an area of wet peat would have contributed to instability.

Following initial movement, peat rafts disaggregated and flow-type movement occurred. Failure debris entered the lower part of the natural drainage line, which is a narrow steep-sided channel, and moved downstream as a debris flow.

5 CONCLUSIONS

The following conclusions are based on site inspection of the failure.

(1) A failure occurred on the southern slopes of Cashlaundrumlahan Mountain. The failure is some 2.45 km in length. The head of the failure was located within the site boundary of Derrybrien Windfarm and the debris from the failure extended to immediately upslope of a minor rural road (the 'Black Road') outside of the Derrybrien Windfarm Project site boundary.

(2) The failure was located within a natural shallow valley. The upper part of the shallow valley failed as a translational slide of peat. Basal failure surface appeared to be within the lower part of the peat layer, typically 200 to 400mm above mineral soil.

(3) The likely failure volume based on the extent of the upper failure is estimated as 450,000 m3. Estimates suggest that possibly 50 to 70% of the failed material has moved from the upper failure area.

(4) Failure was initially reported as occurring immediately downslope of location for turbine T68 at the same time that construction of turbine T68 base was underway. Given the circumstantial evidence of failure occurring at the time of construction for turbine base T68 and drainage works downslope, this strongly indicates that construction activity was the likely trigger.

(5) The evidence of recent 2000 m3 failure of peat at nearby turbine base T17 and ground movements resulting in failure of in situ peat at other turbine bases, all as a result of construction activity, demonstrates that construction activity is initiating ground failure. This further supports the role of construction activity triggering the 16 October 2003 failure.

(6) The construction work practices adopted on site to date have resulted in localised failure of the underlying in situ peat.

(7) It is considered that construction activity within the head of a shallow valley, an area of poorer ground, triggered a localised failure of the underlying in situ peat. The localised failure initiated progressive failure of the in situ peat resulting in a runaway failure.

Final Report on Post-Landslide Site Appraisal

FINAL REPORT ON

DERRYBRIEN WINDFARM

POST-LANDSLIDE SITE APPRAISAL

Prepared for:

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1 INTRODUCTION

The Derrybrien Windfarm site is located on Cashlaundrumlahan Mountain in the Slieve Aughty Mountains some 11 km south of Loughrea town in County Galway (Figure 1). The windfarm comprises some 71 proposed wind turbines and associated access roads. Construction of bases for wind turbines and associated access roads were ceased following a landslide on 16 October 2003.

The developer for the windfarm is Hibernian Wind Power, with Electricity Supply Board International (ESBI) acting as agent for Hibernian Wind Power. Ascon Ltd (Design and Build Sub-contractor) are responsible for all civil design and construction works.

During construction of turbine base T68 a landslide was reported to have occurred at about 16:00 hours on Thursday 16 October 2003 immediately south of the location for turbine T68. The reported weather at the time of failure was fine, with no rainfall recorded.

Applied Ground Engineering Consultants Ltd (AGEC) was engaged on 17 October 2003 by ESBI to undertake the following:

(1) Walkover survey of the 16 October 2003 failure, in order to provide a preliminary opinion on the cause(s) of the failure,

(2) Walkover survey of the area of the Derrybrien Windfarm site in order to provide an assessment of the potential for further failure,

(3) Associated ground investigation of the Derrybrien Windfarm site comprising in situ shear vane, cone penetration testing and resistivity survey, and

(4) Assessment of the stability of the site based on the findings from walkover survey and the ground investigation data,

This report presents the assessment of the stability of the site.

2 SITE DESCRIPTION

2.1 General

For the purpose of the report the site was divided into the following areas, referred to as cells (Figure 2).

(1) 200m by 200m cells. These provide an assessment of the entire site. Cells are typically 200m by 200m in area and centred on the proposed/constructed turbine bases. These cells cover the entire site and are referenced following the turbine reference, that is T1, T2, T3 and so on. Slope instability within these cells would represent potential large-scale failure.

(2) 50m wide cells. These provide an assessment of the ground in close proximity to individual turbines where construction work will be concentrated. Cells are centred on the proposed/constructed turbine bases. These cells are similarly referenced following the turbine reference, that is t1, t2, t3 and so on. Slope instability within these cells would represent localised failure which could lead to potential large-scale failure.

The survey area comprised blanket peat underlain by mineral soil or bedrock. Mineral soil comprised weathered rock or thin depth of glacial till.

2.2 Topography

The Derrybrien Windfarm Project is located on Cashlaundrumlahan Mountain. The wind farm is located on the upper slopes of the mountain. The upper slopes form a gently sloping plateau aligned on a northeast to southwest axis with a summit elevation of 365 mAOD (Figure 2).

The southern slope of the mountain is generally uniform with inclinations of typically between 3° and 5°. Locally, inclinations increase towards shallow valleys. The heads of several shallow valleys are present on the upper slope, where they generally represented by a subdued topographic depression in the landscape. These valleys become more distinct and confined downslope where the valleys form generally narrow steep-sided channels. Significant areas of the southern slope are covered in forestry.

The northern slope of the mountain is stepped in profile, with areas of relatively level benches separated by steeper scarp slopes. Slope inclinations on the benches vary from level to about 3°. Scarp slopes are typically 5° to locally 18° with the scarp generally running across the slope for several hundred metres before fading. Most of the northern slope is covered in forestry.

The upper northern slope, above about 320 mAOD, is drained by a few streams which originate from areas of wetter ground commonly found on the benches. Below about 320m AOD several small streams are present, many of these streams have been formalised within forestry drainage.

3 GEOMORPHOLOGY

3.1 General

The main geomorphological characteristics of the site are shown in Figure 3.

Previous small-scale failure was identified on the scarp slopes on the northern side of the survey area, see below. Within the site, based on visual inspection, no apparent signs of previous large-scale failure similar to the 16 October 2003 failure were identified.

A limited review of historical records indicates that peat failures have occurred in the Slieve Aughty Mountains in the past (Table 1). In general records show that peat failures have affected many upland peat areas in Ireland.

Year and Date of Incident	Description of Incident	Reference
1890, January 27	Bog above Ballinlough, County Galway. An area of 100 acres was covered with a foot of peat, the upper part of the bog subsiding 10 to 15 feet.	Pentland (1890)
1934, October	Slieve Aughty Mountains, County Clare. Bogburst following high antecedent rainfall	Mitchell (1935)

Table 1 Historical Recorded Peat Failures in Slieve Aughty Mountains

3.2 Previous Instability at the Windfarm Site

On some of the steeper scarp slopes found on the northern slopes there is irregular ground with discordant drainage. This likely represents naturally occurring localised instability or creep movement of overburden deposits on the steeper slope. This instability is local to the scarp, being less than 10m in downslope length, and could not be observed further downslope. Failures appeared shallow and involved peat. Failures are old and not active.

In addition, small arcuate scars are present at the crest of scarp slopes (for example in cell T49). These scars appear to represent the head of minor peat slides on the scarp slope. Depth probing within the scars showed peat thickness less than 1m, whereas outside the scar peat thickness was greater than 2m. The downslope extent of these peat slides appeared to be limited to the scarp slope. Failures are old and not active.

Possible minor rockfall has occurred from the steeper parts of the scarp slopes. Within cell T50 a small cliff line shows evidence of displaced blocks. It is unsure whether this displacement is as a result of natural rockfall or rockfall from abandoned quarry workings.

3.3 Recent Instability

Several areas of recent instability and ground movements were identified. All of these were associated with construction activity in relation to the Derrybrien Windfarm, and are presented in detail in Section 9.1.

Placing of arisings from base excavation onto the in situ peat surface has resulted in bearing failure in cells T23, T29 and T66. This bearing failure has resulted in upheaval and lateral movement of the underlying in situ peat.

Within cell T17 the placing of arisings from base excavation onto the in situ peat surface has resulted in failure of the underlying in situ peat, which in turn initiated a landslide that travelled some 140m downslope.

At several locations there has been local failure of recently excavated v-ditches, cells T14, T53 and T54.

Localised tension cracks are evident around several turbine base excavations. This is indicative of sidewall failure of the excavation.

4 SUPERFICIAL DEPOSITS

The superficial deposits within the survey area can be briefly classified into the following main types.

(1) Peat
(2) Glacial Till and Subsoil
(3) Weathered Rock

In general, all superficial deposit types other than peat may be referred to as mineral soil. Exposures below the base of the peat are limited to recent excavations such as on-site borrow areas, base excavations and some ditches. Exposures suggest that there is a minimal thickness of till and weathered rock on the upper slopes.

4.1 Peat

Blanket peat covers most of the slopes. In certain areas peat is thin, such as on the scarp slopes. Examination of peat exposures in failure (cell T68) showed humification at the base of the peat varied between about H_6 and H_8 (Hobbs, 1986).

Based on a general soil map of Ireland (An Foras Taluntais, 1980), the site is covered in high-level blanket peat. The thickness of peat, based on ground investigation for the windfarm (Malone O'Regan McGillicuddy, 2002), ranged from typically 1 to 4m. There is no clear pattern of peat thickness, though locally thicker peat was recorded in the upper part of the site where slope angles are less.

The upper about 1m of peat is generally very fibrous and possibly desiccated which results in a relatively stronger and stiffer upper layer. The base of the peat, from observations within the failure, was described using BS:5930 (BSI, 1999) as very soft brown amorphous PEAT with recognisable plant structure. Peat appeared to lay directly on bedrock or a thin layer of weathered rock/ glacial till.

4.2 Glacial Till and Subsoil

Peat is underlain by till or slightly silty sandy subsoil. The subsoil is likely derived from weathered rock. Generally in exposures both till and subsoil layer were present below peat and above weathered rock/rockhead.

Till, typically derived from sandstone overlies bedrock in some areas. Commonly the thickness of till varies from less than 0.5m to greater than 1m. Exposures of till suggest a thinning of the till to the east. Till was described using BS:5930 as generally firm to soft to firm sandy slightly gravelly SILT/CLAY with occasional sub-angular to rounded cobbles and boulders of sandstone.

Subsoil thickness is typically 0.3 to less than 1m. Subsoil was described using BS:5930 as generally medium dense grey slightly silty fine SAND with occasional sandstone and quartz gravel

4.3 Weathered Rock

Weathered rock comprises generally a highly decomposed layer above a more competent rock. The subsoil possibly represents a weathered rock layer (residual soil).

5 SOLID BEDROCK GEOLOGY

The bedrock geology of the area of the windfarm consists of rocks of the Devonian Old Red Sandstone Series.

Across the area there are localised variations ranging from medium grained pale brown thinly to massively bedded sandstones in the central, northern, southern and eastern areas, fine grained pale pink thinly to medium bedded silty sandstones in the central, southern and western areas, and medium bedded conglomerates inter-bedded with sandstones in the northern areas.

The bedding is horizontal to sub-horizontal with the more competent beds forming scarp slopes, which are most notable on the northern slope where the rock is occasionally exposed. The scarp slopes range in height from 2 to 5m. Gently sloping to flat benches are located between the scarps. Scarps and benches are also present on the southern slope although the scarps are less pronounced and exposed rock is rare.

6 WATERCOURSES AND GROUNDWATER

6.1 Watercourses

A number of natural minor streams drain the upper slope. In most cases, these streams originate in shallow topographic depressions on the upper slope where surface water concentrates, typically within the relatively flat bench areas. Some benches have a back-fall which promotes ponding of surface water. Bog holes, partly obscured by localised areas of floating vegetation over water-filled holes, are present on some benches.

Streams on the upper slopes are typically narrow gullies ranging in width from less than a metre to a few metres. Stream valleys in the upper slope are ill-defined, and where present form shallow valley features. Further downslope many streams are formalised into forestry drainage.

The location of watercourses is considered important, as failures are known to occur particularly in the heads of valleys.

6.2 Groundwater

Several springs have been identified on site, particularly within scarp slopes on the northern slope. Groundwater at these springs is transmitted through the open joint network of the underlying bedrock.

7 GROUND INVESTIGATION

7.1 Fieldwork

The following ground investigation has been carried out to assess the stability of the site.

(1) In situ shear vane testing using both hand-held and rig-mounted mechanical vanes,
(2) Cone penetration testing (CPT),
(3) Resistivity survey, and
(4) Driven-in piezometers.

Fugro Ltd using a 3 tonne mini crawler mounted rig carried out shear vane testing using a mechanical Geonor H-10, 55mm diameter vane.

Hand-held shear vanes were generally carried out by AGEC in open excavations using a Geonor H-60, 25.4mm diameter vane.

CPT was abandoned during the early stages of the investigation due to a breakdown, possibly water affecting electronics. Furthermore, CPT results carried out prior to breakdown could not be correlated with actual ground conditions and results are considered unreliable.

Resistivity survey was carried out by APEX Ltd. using a Wenner resistivity array. The 2D-resistivity profiling method records a large number of resistivity readings in order to map lateral and vertical changes in ground material types. The purpose of the resistivity surveys was to principally locate the base of the peat and rockhead.

Driven-in stand-pipes were installed at 10 locations by AGL Consulting Engineers on behalf of Ascon Ltd. The standpipes comprised 19mm internal diameter PVC tubing with a 300mm perforated push-in tip with ceramic inner porous filter. The standpipes were inserted by initially pre-forming a hole to about 1m and gently pushing in the standpipe to the bottom of the peat.

7.2 Laboratory Testing

Previous experience of laboratory strength testing for peat using a range of triaxial, simple and direct simple shear testing apparatus has shown that results can be scattered and difficult to interpret. This is due to the excessive deformations that peat undergoes and the difficulty in defining the resulting failure limit.

In situ strength testing is considered to provide the most realistic indication of peat strength. To support in situ test results observations of areas of failed ground in peat were recorded. These areas of failed ground were back-analysed to determine the likely operating shear strength of peat.

8 WALKOVER SURVEY

The purpose of the walkover survey was to provide a visual assessment of the site. The survey was carried out using the 200m by 200m cells. The following details were recorded for each cell.

(1) Presence of valley or drainage line
(2) Peat thickness
(3) Slope form
(4) Slope angle measured using Abney level (accuracy to nearest 0.5˚)
(5) Previous failure – present prior to construction of windfarm
(6) Recent failure - associated with construction of windfarm

Other factors were also recorded based on a cell-by-cell basis, such as slope form, presence of springs, deformed and distressed ground, saturation of ground. Due to the dense forest cover present over much of the site most of the observations were taken in clearings, such as at the turbine base, along access roads or in forestry firebreaks.

Inspection findings for each cell based on the walkover survey are given on geotechnical mapping sheets in Appendix A.

9 FINDINGS OF WALKOVER SURVEY

9.1 Recent Landslides and Ground Movements

Several areas of recent failures and ground movements were identified. These recent failures and ground movements are related to construction activity associated with Derrybrien Windfarm. The 16 October 2003 failure in cell T68 has been reported separately.

At a number of locations there are bearing failures below placed arisings, squeezing-in of recently excavated v-ditches and localised tension cracks around several turbine base excavations. These types of localised instability would not be uncommon in construction within peat areas.

(1) Cell T17. At the site of turbine base T17. This base was immediately west of T68 base, some 230m distance. Following placement of arisings from excavation for the turbine base, a failure of in situ peat underlying arisings occurred. Arisings would have comprised peat and some till/weathered rock material. Failure scar was about 140m long by 22m wide with a depth estimated at 0.7 to 1.5m. The upper 85m of the scar comprised failure of underlying in situ peat along a shear surface located within the base of in situ peat some 200mm to 500mm above mineral soil. The lower 55m of the scar comprised deposition of failure debris.

This failure volume was estimated as 2000 m^3. The failure was reported to have occurred on 2 October 2003 during excavation for the turbine base.

Inspection at the toe of the failure showed peat thickness of about 1.5 to 1.8m, which reduced downslope to about 1 to 1.5m. Inspection of the deposition lobes indicated that there is little/no failure of underlying in situ peat. It is likely that the in situ thinner peat downslope was more competent than peat upslope, and therefore did not fail.

Assessment of slope angles indicated that slope angles reduce downslope, from about 4˚ at the head of the failure to about 2˚ below the toe of the failure.

(2) Cell T23. On the southern limit of arisings, which are from the base excavation for turbine T23, there is heaving of the underlying in situ peat. This heaving likely represents a bearing failure of the founding peat. The heave is localised to the edge of the arisings.

Probing of in situ peat around the heaved area showed peat depths typically less than 1.5m deep. Beyond the area of heave there were no signs of distress.

(3) Cell T29. Site of turbine base T29 located some 800m to the east of base T68. To the south of base T29 there was failure of underlying in situ peat below arisings from base excavation. Arisings comprised both peat and till. The arisings had slumped. Failure of in situ peat comprised heaving of up to 1.5m height together with cracking and distortion of in situ peat on the downslope limit of the arisings.

(4) Cell T66. Site of turbine base T66 located upslope from base T68. To the south (downslope) of the base there was failure of underlying in situ peat below arisings from base excavation. Arisings comprised both peat and till. The arisings had slumped and there was a depression in the road indicating movement of underlying in situ peat. Failure of in situ peat comprised heaving of up to 0.8m height together with cracking and distortion of in situ peat that extended several metres downslope of the arisings.

Ponding of water within arisings and the mobility of the arisings suggest that over-pumping from the excavation into the arisings area may have taken place.

At several locations there has been local failure of recently excavated v-ditches in cells T14, T53 and T54. Failure of these ditches, which are typically 1.5m deep, comprises squeezing-in of the sidewalls. This represents areas of weaker peat. Most ditches show no signs of sidewall instability.

A number of excavations for the turbine bases show signs of localised tension cracking, bulging of the excavated faces and slumping of peat into the base excavation.

9.2 Site Drainage

A notable number of the excavated turbine bases were water-filled. In many of these cases, there was no apparent outlet drainage path from the excavations.

To avoid possible build-up of water within excavations and subsequent uncontrolled release of water appropriate drainage paths should be constructed from each excavation. From inspection it appeared that most excavations were dewatered by over-pumping. It was not clear whether the over-pumped water was fed into a formalised drainage network.

From inspection it was not apparent whether a formalised drainage network existed on the site.

All release of water should be into a formalised drainage path which should form part site-wide drainage network. This drainage network should be in place to receive water during both temporary works, such as for de-watering, and permanent works condition.

10 ASSESSMENT OF STABILITY

10.1 General

Initial reporting by AGEC of the likelihood of failure within cells was based on a qualitative risk assessment using the factors obtained from walkover survey. This was supported by a deterministic analysis of the likely stability using infinite slope analysis with assumed parameters.

This report has assessed the stability of the site using infinite slope analysis to calculate the factor of safety for each cell using parameters determined from the ground investigation.

10.2 Factor of Safety

The code of practice for earthworks BS 6031:1981 (BSI, 1981), an internationally recognised standard provides advice on design of both temporary and permanent earthworks. It states that for a first time failure with a good standard of site investigation the design factor of safety (FoS) of should be 1.3 to 1.4. A FoS less than 1.0 indicates an unstable slope; FoS greater than 1.0 indicates a stable slope.

For this report, a minimum FoS of 1.4 for peat stability is required.

The FoS is a measure of ground resistance available compared to disturbing forces, such as weight of ground, water and construction loading. Where ground resistance is equal to the disturbing forces then the FoS is unity, and the ground would be considered to be on the point of failing. An acceptable level of stability is where FoS is 1.3 to 1.4, that is there is in effect a 30 to 40% ‘reserve’ of ground resistance over and above the disturbing forces.

Ground resistance is provided by the shear strength of the ground along an assumed failure surface.

10.3 Stability Analysis

Stability analysis was carried out to determine the FoS of the existing natural peat slopes. The analysis was carried out taking into account the following observations from failures identified from the walkover survey, namely.

(1) Failures at T17 and T68 indicate a translational sliding failure within the peat.
(2) Basal sliding surface is within the lower part of the peat layer.
(3) Failures appear to be the result of undrained loading as evident by bearing failures under arisings during construction (T23, T29 and T66). Bearing failures would be initiated as non-circular shear failure.

Stability was assessed using infinite slope analysis (Skempton and DeLory, 1957) which was verified by more rigorous stability techniques in Talren computer program (Terrasol, 1997). The infinite slope analysis is suited to long downslope lengths where the mode of failure is by translational sliding, which is the mode of failure within the natural peat

slopes based on failures recorded in cells T17 and T68. The analysis is applied to each cell in the site.

This analysis is conservative as it ignores passive resistance at the toe of a potential sliding failure. This is not as critical for long downslope lengths as used in the 200m by 200m cells. However for shorter downslope lengths, such as the 50m cells the passive resistance becomes more significant, and the calculated FoS is underestimated.

Stability was analysed using total stress condition, which applies to short-term conditions occurring during construction and for a time following construction until construction induced pore water pressures dissipate. Undrained shear strength values (c_u) for peat are used for total stress analysis.

The factor of safety (FoS) against sliding from the infinite slope analysis for total stress was determined using the following parameters:

c_u: undrained shear strength.
z: depth of sliding layer.
β: slope angle on base of sliding
γ: bulk unit weight.

The following assumptions were used in the analysis of stability of natural peat slopes.

(1) Peat strength, depth, and inclination of base of peat were determined for each cell, that is 200m by 200m cells and 50m cells.
(2) c_u was determined using a cautious estimate based on results from vanes supported by back-analysed c_u where appropriate. The lowest recorded c_u in the cell was used.
(3) The depth of sliding layer (z) was assumed as the base of the peat layer derived from probe results.
(4) Slope angle on base of sliding (β) is basal surface of peat which is assumed to be parallel to ground surface.

10.4 Stability Load Cases

Analysis was carried out using the following load cases.

(1) Existing FoS of peat slopes where there is no loading of the peat slope, and
(2) FoS where peat slopes are subjected to construction loading of 10kPa (BSI, 1994). This is equivalent to 1.0m of peat arisings.

Case (1) provides an indication of the existing FoS prior to any construction activity. Case (2) is a cautious assessment of the likely short-term reduction in FoS following typical loading that may be experienced during construction.

Following placement of load there will be a reduction in FoS, though over the long-term as pore water pressure dissipates there will be consolidation of the underlying in situ peat. Consolidation of the peat will result in strength gain and increase in FoS.

The critical condition for peat stability for the undrained case is immediately following application of load.

10.5 Peat Parameters for Stability Analysis

10.5.1 Undrained Strength c_u

Undrained shear strength (c_u) of in situ peat was determined for each cell using a cautious estimate of c_u, which in all cells was the lowest recorded value. The following sources were used to assess c_u for peat:

(1) In situ vane testing using both hand-held and mechanical,
(2) Back-analyses of sidewall collapse of v-ditches and excavations, and
(3) Back-analyses of bearing failure under arisings.

The lowest c_u value derived from any of the above sources was used in the analysis. In general, from sources (2) and (3) the lowest calculated value was 4kPa. A value of 4kPa was also the lowest value obtained from a series of laboratory testing carried out by AGL Consulting Engineers on behalf of Ascon Ltd.

In Situ Vane Testing using Both Hand-held and Mechanical Vane

In situ vane test results for each cell are included in Appendix B. Results indicate that strength ranged from $c_{u\ vane}$ of 2.8 to 25kPa (Figure 4).

$c_{u\ vane}$ results for peat depths greater than 0.7m only (Figure 4) show a lower mean value. These results exclude the near-surface more fibrous and less humified layer, this near-surface layer has a higher undrained shear strength.

Altogether over 250 number shear vane tests were carried out across the site.

Vane results have not been factored, which is similar to other work on Irish peat (see for example Hanrahan, 1964, Piggott et al., 1992) and previous experience of blanket peat in the west of Ireland (AGEC, 2003). In these cases back-analysed failures were shown to compare directly to undrained peat strength measured directly from vane testing.

The rate of strain during testing was in accordance with the manufacturer's instruction.

Back-analyses of Sidewall Collapse of V-ditches and Excavations

Recently excavated v-ditches within the site were inspected for signs of sidewall collapse. Sidewall squeezing-in of v-ditches was limited to a few locations within cells T14, T53 and T54. The height of the sidewall at failure was measured. Back-analysed $c_{u\ back}$ was estimated using standard equation for collapse of excavation sidewalls (see Simon, Menzies and Matthews, 2001) with the following parameters:

H: height of vertical sidewall at failure.
γ: bulk unit weight of peat, taken as 10kN/m^3

The results are indicative only as the squeezing-in of the sidewall did not result in any apparent development of a shear surface and the effect, if any, of the upper stronger peat layer was not considered. Results indicate a $c_{u\ back}$ of about 4kPa at the locations of v-ditch sidewall collapse.

At several of the excavations for the turbine bases where there are steep excavation sidewalls there has been instability. This is usually indicated by tension cracking or in some cases slumping of material. Back-analyses of these failures using slip circle analysis and assuming a stronger upper peat layer underlain by a weaker layer were carried out using typical side-wall geometry (Appendix C).

Indicative results show $c_{u\ back}$ of about 4kPa for the lower weaker layer where the upper stronger layer is intact. Where the upper layer is cracked, the lower weaker layer alone resists the load, and in this case $c_{u\ back}$ for the lower peat layer is 5.5kPa.

Back-analyses of Bearing Failure Under Arisings

Back-analysis of bearing failures in cells T23, T29 and T66 was carried out using bearing capacity equation (Prandtl, 1920) and assumed likely pre-failure conditions. For the analysis it is assumed that the upper stronger layer has been disturbed and has a similar strength to the underlying layer. Results indicate a $c_{u\ back}$ of about 4kPa for peat at the site of bearing failure.

10.5.2 Depth of Peat Layer

Depth of peat was determined from probe results (Malone O'Regan McGillicuddy, 2002) and the results of vane testing and probing during the recent investigation. Altogether about 650 probes were used to assess depth of peat throughout the site. Resistivity results showed the depth to the base of rockhead, and did not distinguish between base of peat and underlying mineral soil. The pattern of results obtained from probing and geophysics were compared and found to be similar.

Range of peat depth varies from 0.4m to 5.5m throughout site (Figure 6) with an average of about 2.5m. During depth probing an assessment was made of whether mineral soil or rock was present below peat. Results show about 24% of probes indicated rock below peat and 59% of the probes indicated mineral soil below peat. 17% of probes gave no indication of material below peat.

For 200m by 200m cells the average peat depth across the cell was used. This provides a reasonable estimate of the depth of a potential large-scale failure plane which is assumed to be coincidental to the base of the peat.

For 50m cells the deepest recorded peat depth is used, as over the shorter cell distance the deeper peat may be more influential in initiating potential failure. The deepest peat depth was determined by drawing a cross-section through the cell using probe results.

10.5.3 Slope Angle on Base of Sliding

Slope angles were recorded using an Abney level that can be read to the nearest 0.5˚. Slope angle measurements were carried out over about 30 to 50m lengths measured in the direction of the greatest downslope gradient. Several measurements were taken throughout the cell to assess the range of slope angles. To verify the assumption that the base of peat was parallel with peat surface a comparison was carried out using cross-sections drawn through cells. Cells where peat thickens notably downslope in 50m cells that FoS is reduced are shown in Figures 10 and 11.

Localised steeper scarp slopes that are mostly found on the northern slopes were excluded from slope angle assessment. These localised steeper slopes, where peat thickness is thinner being typically 0.5 to 1.5m, are considered separately (see Recommendations).

The range of recorded slope angles is shown in Figure 7. Typically slope angles were between 2 and 4˚, with a mean value of about 3.2˚.

10.5.4 Bulk Unit Weight

Based on review of previous testing in peat and experience, unit weight for peat is assumed as 10kN/m^3. This reflects the very high moisture content of the peat mass.

10.6 Results of Stability Analysis

10.6.1 200m by 200m Cells

The results of the stability analysis are shown on Figures 8 and 9 for load condition (1) and (2) respectively. These show the FoS for each 200m x 200m cell. Tabulated results are given in Appendix D.

The lowest recorded c_u within each cell was used for analysis. Where peat c_u values were not available the cells are shown hashed (Figures 8 and 9) and a lower bound c_u of 4kPa was assumed. Where cells showed signs of instability such as sidewall collapse of v-ditches and excavations, or bearing failure then a lower bound c_u of 4kPa was also assumed unless a lower strength was recorded.

The following excludes the cells affected by previous sliding failure (T17, T68 and T70), which are assumed to have FoS of unity under loading condition (2).

The FoS for loading condition (1) shows all cells have a FoS greater than 1.4, except for the following 4 cells, namely T2, T5, T34 and T69 which have FoS of 1.19, 1.38, 1.10 and 0.97 respectively (Figure 8).

Under loading condition (2), there are a total of 5 cells with FoS less than 1.4. These are the 4 cells named above (T2, T5, T34 and T69) plus cell T18 with FoS of 1.21 (Figure 9).

10.6.2 50m Cells

The results of the stability analysis are shown on Figures 10 and 11 for load condition (1) and (2) respectively. These show the FoS for each cell. Tabulated results are given in Appendix D.

The lowest recorded c_u within each cell was used for analysis. Where peat c_u values were not available the cells are shown hashed (Figures 10 and 11) and a lower bound c_u of 4kPa was assumed. Where cells showed signs of instability such as sidewall collapse of v-ditches and excavations, or bearing failure then a lower bound c_u of 4kPa was also assumed unless a lower strength was recorded.

The following excludes the cells affected by previous sliding failure (T17, T68 and T70), which are assumed to have FoS of unity under loading condition (2).

Turbine bases are assumed to be located a minimum distance of 25m from localised steep scarp slopes. There are no bases constructed to date within 25m of a scarp slope. Where bases yet to be constructed are proposed to be located within 25m of scarp slopes these are to be moved; this affects some bases on the northern slopes (see Recommendations).

The following excludes the cells affected by previous sliding failure (t17, t68 and t70), which are assumed to have FoS of unity under loading condition (2) base on 200m by 200m cell analysis.

The FoS for loading condition (1) shows all cells have a FoS greater than 1.4, except for the following 4 cells, namely t2, t34, t51 and t69 which have FoS of 1.10, 0.96, 1.37, 0.83 respectively.

It is recognised that the low FoS's in cell t69 is unrealistically low, as this indicates that the slope should have already failed. The analysis does not consider passive resistance at the toe of a potential slide failure, and therefore the FoS is underestimated. Nevertheless the result indicates that there is a potentially adverse stability condition in the cell.

Under loading condition (2), there are 8 cells with FoS less than 1.4. These are the 4 cells named above (t2, t34, t51 and t69) plus cells t18, t47, t66 and t71 where the FoS is 1.10, 1.21, 1.15 and 1.21 respectively.

A comparison of FoS results between 200m by 200m and 50m cells under loading condition (2) is shown in Figure 12.

10.7 Sensitivity Analysis

A sensitivity analysis has been carried out to assess the effect of the presence of a continuous zone of weak peat at depth. Evidence from the 16 October 2003 failure scar showed that the basal shear surface was located about 200 to 400mm above the peat/mineral soil interface. Vane testing in the head of the failure indicated shear strength in the peat at depth of less than 4kPa. The strength results are possibly affected by remoulding of the underlying peat due to ground movement. Whilst the above does not indicate the presence of a weak zone, the possibility of a continuous weak zone at depth in the peat has been assessed.

An assessment of vane test results in peat with depth was carried out to determine whether a weaker zone was present at depth. Figure 13 shows the depths of the measured vane shear strength relative to the depth of the peat/mineral soil interface (also see Appendix E). It can be seen that the investigation has not identified any widespread zone of weaker peat (strength less than 4kPa) near this interface. However, in some areas shear vane tests were not near the interface, and the presence of a weak zone cannot be precluded on a site covering such a large area. The consequence of such a weak zone would be a reduction in the FoS within the cell in question.

A sensitivity analysis was carried out on 50m cells to examine the effect of a hypothetical weak zone at depth in peat. For this purpose, the lowest recorded shear strength of 2.8kPa in peat from cell T34 was used assuming a basal shear plane at the base of the peat.

The results show a notable number of cells with hypothetical FoS below unity (Figure 14 and Appendix D). Site inspection of these cells showed no apparent signs of the onset of peat sliding. Furthermore, in a number of cells with low FoS, turbine bases and roads have already been constructed. The above indicates that the selected shear strength is unrealistically low for the analysis adopted. The analyses are seen therefore to be conservative.

Nevertheless as a precautionary measure further testing of peat strength at depth should be carried out in these areas prior to construction. In the event that a weaker strength zone is encountered appropriate measures need to be taken, see Recommendations.

11 CONCLUSIONS

The following conclusions are given.

(1) A geotechnical investigation of the Derrybrien Windfarm site was carried out following the failure of 16 October 2003. The investigation included a walkover survey and ground investigation that included in situ shear vane, cone penetration testing, resistivity survey and the installation of standpipe piezometers. The purpose of the investigation was to assess the stability of the windfarm site.

(2) The site is located on the upper slopes of Cashlaundrumlahan Mountain which comprises upland blanket peat ranging in depth from typically 1 to 4m overlying generally a thin cover of mineral soil over dominantly sandstone bedrock. The natural slopes in the site have inclinations of between typically 1° and 5°.

(3) The walkover survey involved a visual inspection of all turbine bases and surrounding accessible areas. The survey identified no evidence of previous large-scale failure scars.

(4) The walkover survey identified several areas of old and inactive minor failures on the northern slope located on locally steeper scarp slopes. These failures represent localised instability or creep movement of overburden deposits and minor peat slides. This instability could not be observed further downslope. Failures appeared shallow and involved peat.

(5) A number of excavations for turbine bases were found to be water-filled. In many of these cases, there was no apparent outlet drainage path from the excavations. From inspection it appeared that most excavations were dewatered by over-pumping. It was not clear whether the over-pumped water was fed into a formalised drainage network.

(6) Construction activity has resulted in localised failure of peat at a number of locations. Placing of arisings from base excavation onto the in situ peat surface appears to have resulted in bearing failure in cells T23, T29 and T66. This bearing failure has resulted in upheaval and lateral movement of the underlying in situ peat. Within cell T17 the placing of arisings from base excavation onto the in situ peat surface appears to have resulted in failure of the underlying in situ peat leading to a 130m long peat slide.

(7) Results from in situ strength testing of peat from around the site show a range of undrained strength for peat of 2.8kPa to 25kPa. The range of undrained strength used for stability analysis was between 2.5 and 10kPa. Within the area of the 16 October 2003 failure, peat strength less than 4kPa has been recorded.

(8) Based on observations of failed ground the following failure characteristics were identified.

(a) Failures are likely initiated as a result of bearing failure below arisings, which is a non-circular failure.
(b) Subsequent failure of peat is by translational sliding failure within the peat.
(c) Basal sliding surface is within the lower part of the peat layer.
(d) Failures appear to be the result of undrained loading.

(9) A stability assessment was carried out using the observations above to model the likely failure mechanism. An infinite slope analysis assuming undrained conditions was used to model failure. To provide an assessment of stability the site was divided into cells typically 200m by 200m in area. The stability in the vicinity of the turbine base was also assessed using 50m wide cells centred on the proposed/constructed turbine bases (Figure 2). The Factor of Safety for each cell was then calculated. The stability assessment provides an indication of the potential stability of each cell.

(10) The Factor of Safety (FoS) is a measure of slope stability. A FoS less than 1.0 indicates an unstable slope. The code of practice for earthworks (BSI, 1981) states that for first time failure with a good standard of site investigation the FoS should be 1.3 to 1.4. This report has adopted a minimum acceptable FoS of 1.4.

(11) Results of stability assessment for 200m by 200m cells (Figure 8) show that the existing stability of the peat slope is above FoS of 1.4, except for the following 4 cells, namely T2, T5, T34 and T69. This excludes cells that have already been affected by sliding failure.

(12) The analysis was repeated for 200m by 200m cells assuming a loading of 10kPa was placed on the peat slope over the entire cell in order to simulate construction conditions (Figure 9). Results show that there are 5 cells with FoS less than 1.4. These are the 4 cells named above (T2, T5, T34 and T69) plus cell T18. This excludes cells that have already been affected by sliding failure.

(13) Results of stability assessment for 50m cells (Figure 10) show that the existing stability of the peat slope in the vicinity of the turbine base is above FoS of 1.4, except for the following 4 cells, namely t2, t34, t51 and t69. This excludes cells that have already been affected by sliding failure.

(14) The analysis was repeated for 50m cells assuming a loading of 10kPa was placed on the natural peat slope over the entire cell in order to simulate construction conditions (Figure 11). Results show that there are 8 cells with FoS less than 1.4. These are the 4 cells named above (t2, t34, t51 and t69) plus cells t18, t47, t66 and t71. This excludes cells that have already been affected by sliding failure.

(15) Comparison of FoS results between 200m by 200m and 50m cell analysis assuming a loading of 10kPa is shown in Figure 12. In general, except for two 50m cells on the northern slope, the analyses indicate similar areas with low FoS.

(16) The stability analyses indicate a number of cells where the FoS is less than unity (T2, T34 and T69) following simulated construction loading (Figures 9 and 11). Inspection of these cells following actual construction activity showed no apparent

indication of the onset of peat sliding. The analyses are seen therefore as conservative.

(17) The analyses show that most of the site under conditions of no construction activity has an acceptable FoS of 1.4 or greater. There are a few areas of marginal stability. The effect of construction activity, as represented by current working practice, would reduce the FoS in a number of areas to an unacceptable FoS, that is less than 1.4. Current working practice on site would need to be revised to ensure that the existing FoS of the peat slope was not adversely affected.

12 RECOMMENDATIONS

To ensure the safe completion of the construction at the Derrybrien Windfarm current construction work practices must be revised. Provided that the recommendations below are satisfactorily implemented it is considered that the construction of the Derrybrien Windfarm can be completed safely.

(1) Avoidance of placing arisings from excavations and local concentrated loads on peat slope. Where arisings from excavations and/or concentrated load are to be placed onto the peat surface the adequacy of the ground to support the load shall be determined. The stability and adequacy of the ground shall be determined by suitably qualified geotechnical personnel and may involve simple in situ testing, knowledge of previous similar load being placed, or monitoring of a load test to verify that ground can adequately support the load.

(2) Avoidance of uncontrolled concentrated water flow. All water discharged from excavations during work shall be directed into suitably designed drainage lines. No discharge of water onto slope surface shall be allowed. All release of water should be into a formalised drainage path which shall form part of a site-wide drainage network. Positive drainage measures shall be provided at all turbine bases to prevent potential build-up of water in the temporary and permanent condition.

(3) Avoidance of unstable excavations. All excavation shall be suitably supported to prevent collapse and development of tension cracks. With respect to excavated v-ditches, where there is collapse or squeezing-in of v-ditches these for example shall be piped over the affected length using a free-draining stone to back-fill the ditch.

(4) Avoidance of placing fill and excavations in the vicinity of steeper peat slopes. On the northern slope of the site in particular there are locally steeper scarp slopes. All turbine bases and access roads running parallel to these slopes shall be located a minimum of 25m from the crest of such slopes. The stability and adequacy of the ground at the re-located site shall be assessed.

(5) The failure of 16 October 2003 occurred within the head of a natural shallow valley. The location of all turbine bases shall be assessed with respect to location of natural valley features and drainage lines. Where turbine bases are located within or in the vicinity of natural valley/drainage line the stability and adequacy of the ground at this location shall be determined by suitably qualified geotechnical personnel.

(6) Notwithstanding the above, work in cells where FoS is less than 1.4 (see Figures 9 and 11) must proceed with caution and appropriate measures adopted that do not adversely affect the existing stability of the natural peat slopes. On-going ground investigation will be required to be carried out to substantiate the stability of these cells.

(7) Geotechnical supervision during works by suitably qualified and experienced personnel. Supervision shall be on a full-time basis for the duration of the construction works.

(8) On-going and confirmatory ground investigation. As construction progresses, on-going assessment of ground conditions shall be carried out to confirm the findings with respect to stability contained within this report. The results of on-going ground investigation are to be assessed by suitably qualified geotechnical personnel.

(9) The revised construction work practices should recognise the potential for weaker peat zone above the peat/mineral soil interface. In advance of new construction in an area and as part of on-going ground investigation, site geotechnical personnel shall obtain measurements of shear strength for the peat depth profile and in particular shear strength above the peat/ mineral soil interface. Shear strength testing shall be by hand vane, or other suitable device, at regular depth intervals at suitably spaced locations within the area.

(10) Improved method statements for all aspects of construction working practices that impinge or may impinge upon the stability of the peat. Method statements shall be produced by the contractor and take into account recommendations given herein and on-going ground investigation. Method statements shall be reviewed by appropriately experienced and qualified geotechnical personnel.

(11) Drainage plan giving details of all flows, drain capacity, drainage paths off site and drainage paths to main stream courses. The control of water from within the site is considered critical for long-term stability of the site. A robust drainage plan, monitoring and maintenance schedule for the proposed life-time of the site shall be produced and implemented. The resulting drainage network should be in place to receive water during both temporary works and permanent works condition.

(12) Installation and monitoring of geotechnical instrumentation, as appropriate, in areas of possible poor ground, as indicated from stability assessment in this report and for example by collapsed v-ditches, continued and accelerated settlement of floating roads, sidewall instability at shallow inclinations of excavations, wet ground areas, distressed ground. Monitoring works shall include periodic monitoring of piezometers installed on behalf of Ascon Ltd.

(13) Site reporting procedures to ensure that lessons are learnt and working practices changed to reflect ground conditions. A formalised reporting procedure shall be adopted on site that records site workings, monitoring results and any observations that may be pertinent to the stability of the works.

(14) Contingency plan to detail level of response to observed poor ground conditions. The performance of the ground shall be assessed against design assumptions. Where the works perform better than expected or as expected there will be no need for contingencies to be implemented. Where findings indicate that the ground is performing outside the expected limits, then a potentially adverse situation might

develop, and corrective actions shall be implemented in accordance with the contingency plan.

(15) Stabilisation of areas of failed ground (T17, T68 and T70). A number of stabilisation measures have been constructed to stabilise the failure scar and to constrain the failed debris within the scar. Details of the effectiveness of these measures for long-term stability are required.

(16) Routine inspection of windfarm site by maintenance personnel to include an assessment of ground stability conditions. This is to comprise a non-technical assessment based on observation. Maintenance personnel shall be briefed and made aware of key observations that can be carried out in the normal course of their work that may indicate potentially unstable ground conditions.

(17) Periodic annual inspection of the site following completion of works by suitably experienced and qualified geotechnical personnel. The site shall be inspected on initially a yearly basis to assess stability. This inspection shall include a walkover inspection of the site with a report produced.

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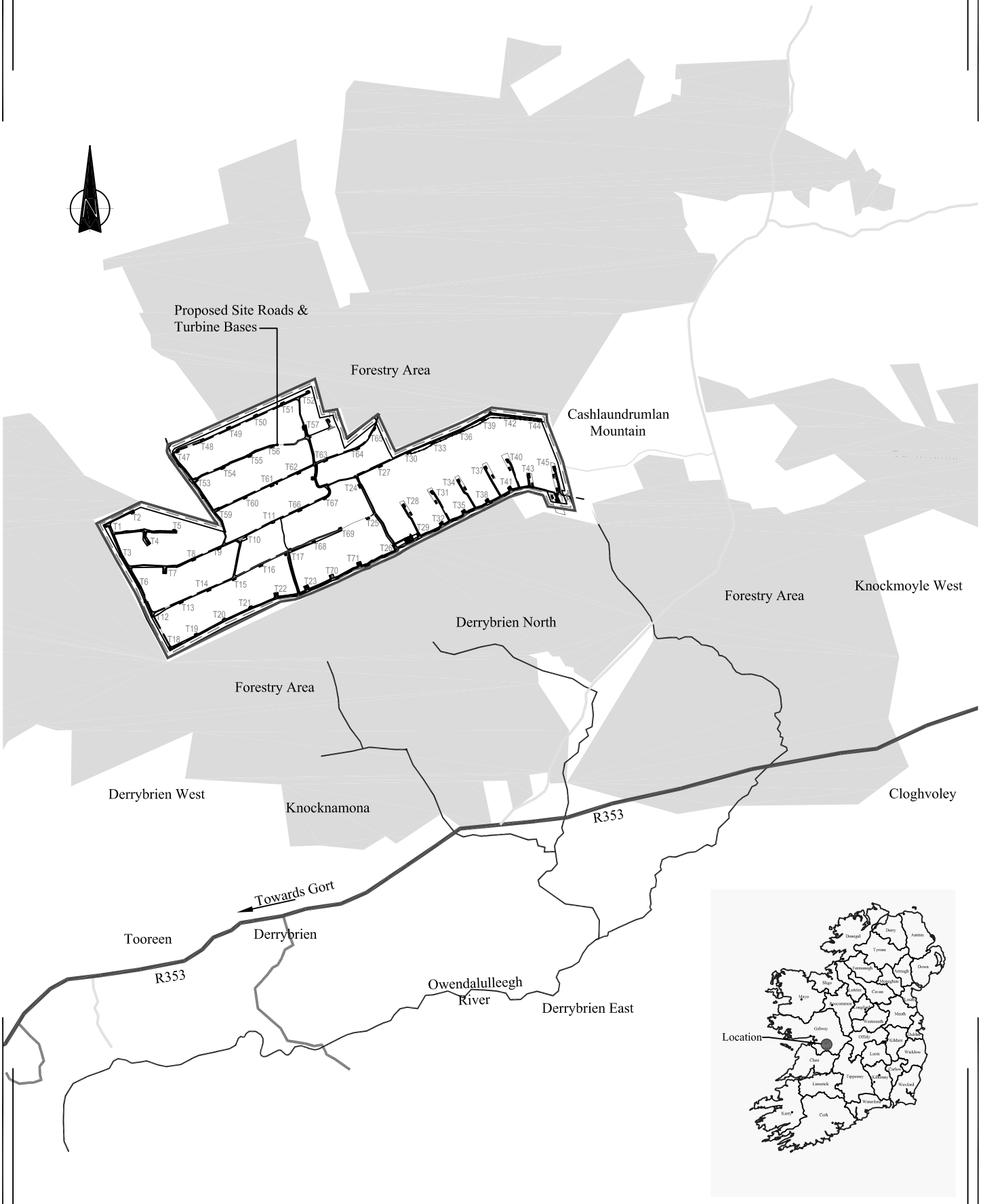
FIGURES



Scale: N.T.S. Date: 02/02/2004 Drawn: O.B. Checked: P.R. Revision: A Based on:	Client: ESB INTERNATIONAL	Job: Derrybrien Windfarm Post-Landslide Site Appraisal	Title: Site Location Figure 1	AGEC Ltd 5 Kilcarrig Street Bagenalstown Carlow Ireland Tel: +353 503 23800 Fax: +353 503 23793	agec www.agec.ie info@agec.ie

Applied Ground Engineering Consultants Limited

Notes :–

1. All dimensions are in millimetres – figured dimensions to be taken in preference to scaled dimensions.
2. All levels are in metres.

Legend:

- Forestry
- Streams/Drains
- Boundary
- 10m Contour
- 50m Contour
- Existing Road
- Spot Height +307
- Roads As Built
- Turbine Position T58
- Grid for 200m x 200m Cell
- 50m Cell
- Shear Vane Location +V27

N 206000 N 205500 N 205000 N 204500 N 204000

E 158000 E 158500 E 159000 E 159500 E 160000 E 160500 E 161000

200 210 220 240 260 270 280 290 300 310 320 330 340 350 360 307 344 385

To Site Entrance

Existing Forestry Road

Site Compound

Existing Turbary Road

Existing Trig. Station

Existing Telecoms Mast

Anenometer Mast

Borrow Pit

V1 V2 V3 V4 V5 V6 V7 V8 V9 V10 V11 V12 V13 V14 V15 V16 V17 V18 V19 V20 V21 V22 V23 V24 V25 V26 V27 V28 V29 V30 V31 V32 V33 V34 V35 V36 V37 V38 V39 V40 V41 V42 V43 V44 V45 V46

T1 T2 T3 T4 T5 T6 T7 T8 T9 T10 T11 T12 T13 T14 T15 T16 T17 T18 T19 T20 T21 T22 T23 T24 T25 T26 T27 T28 T29 T30 T31 T32 T33 T34 T35 T36 T37 T38 T39 T40 T41 T42 T43 T44 T45 T46 T47 T48 T49 T50 T51 T52 T53 T54 T55 T56 T57 T58 T59 T60 T61 T62 T63 T64 T65 T66 T67 T68 T69 T70 T71 T72 T73 T74 T75

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Further notes:

Notes:

Scale: 1:10000 A3	Checked: P.J.
Date: 02/02/2004	Revision: B
Drawn: O.B.	Based on:

Client: ESB INTERNATIONAL

Job: Derrybrien Windfarm
Post-Landslide Site Appraisal

Figure 2

Title: Site Layout Plan

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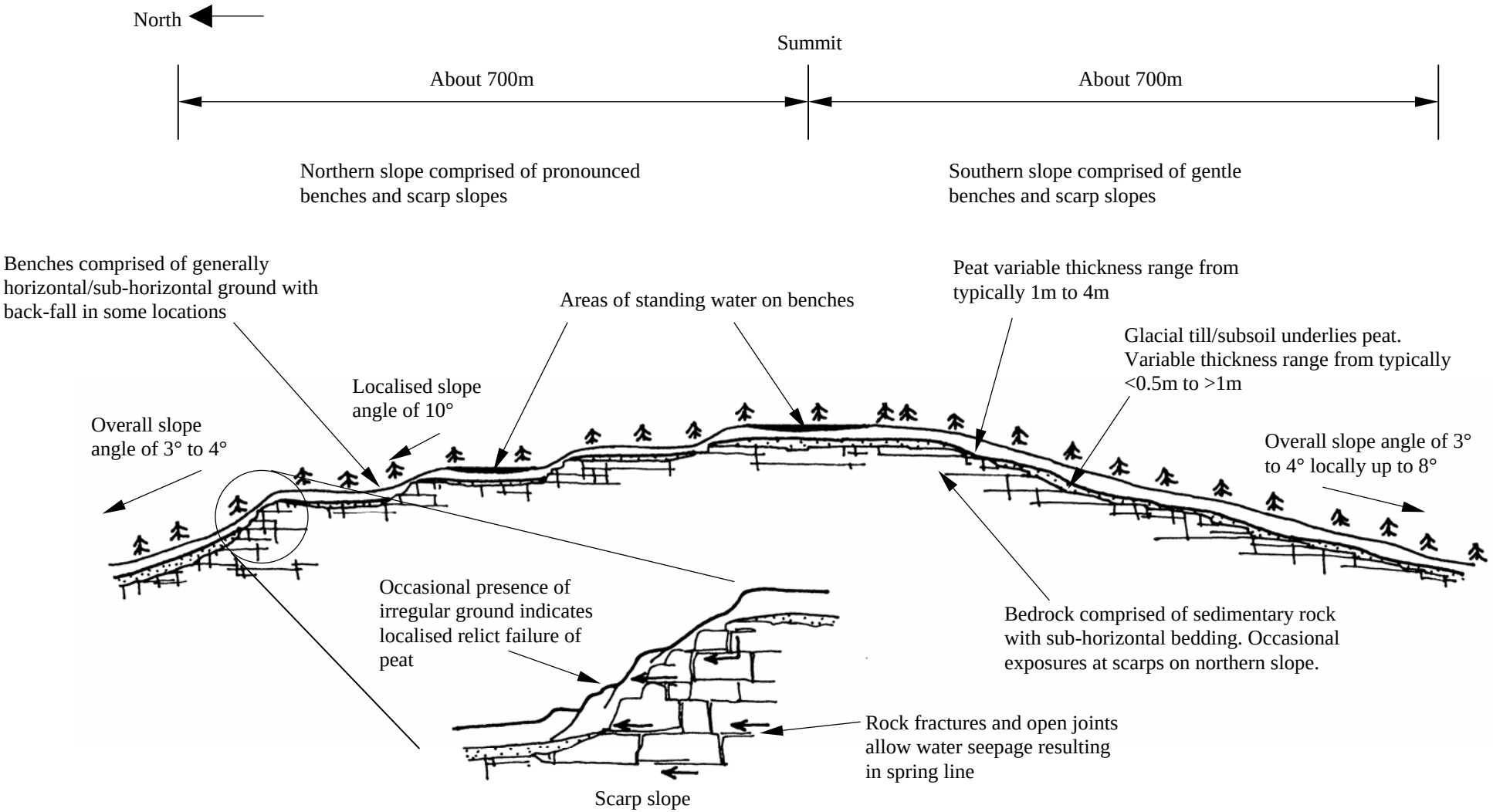


Figure 3 Geomorphological Characteristics of Site

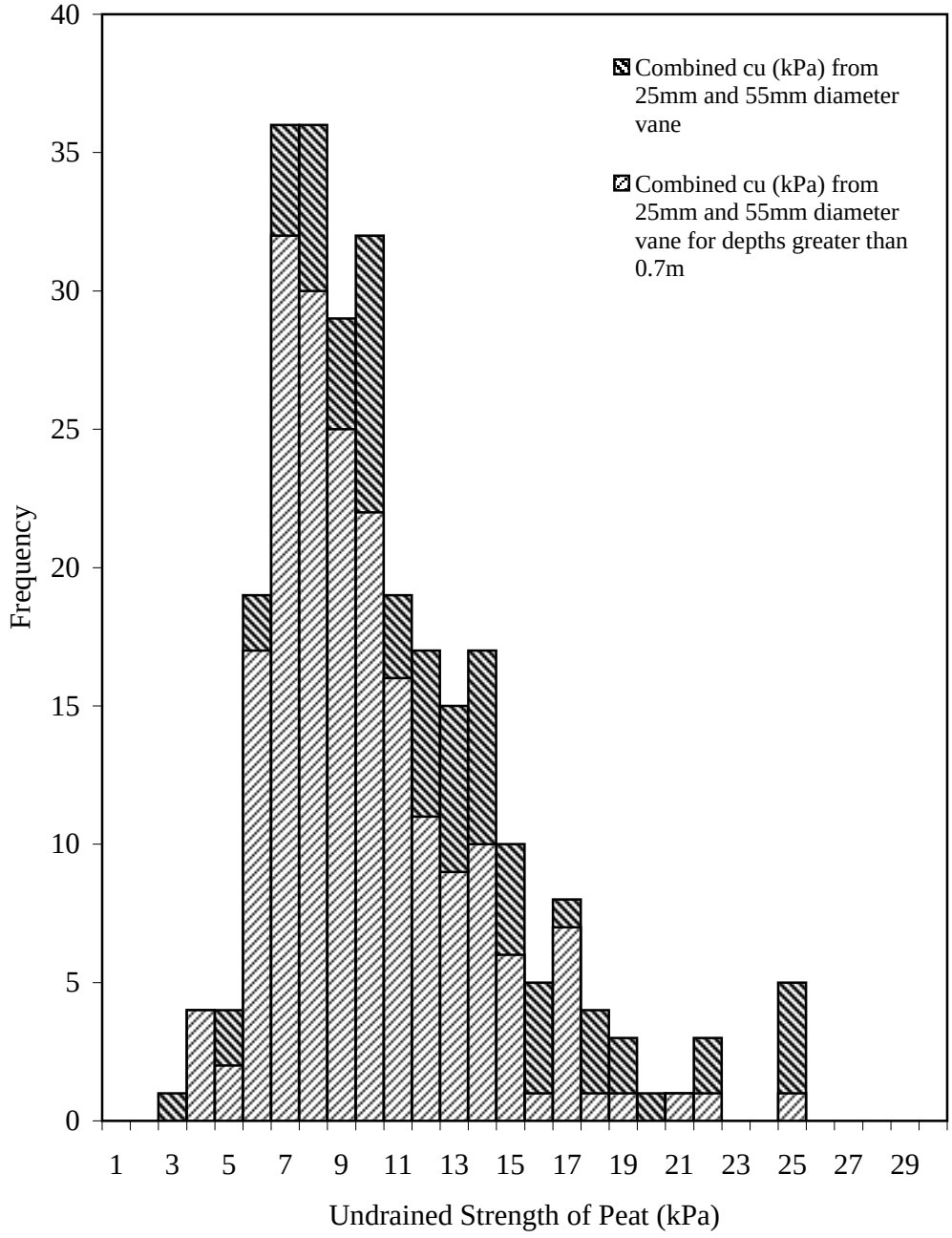


Figure 4 Range of Undrained Shear Strength (c_u) of Peat from Vane Testing

Note
(1) Vane results are from 25mm and 55mm diameter vanes

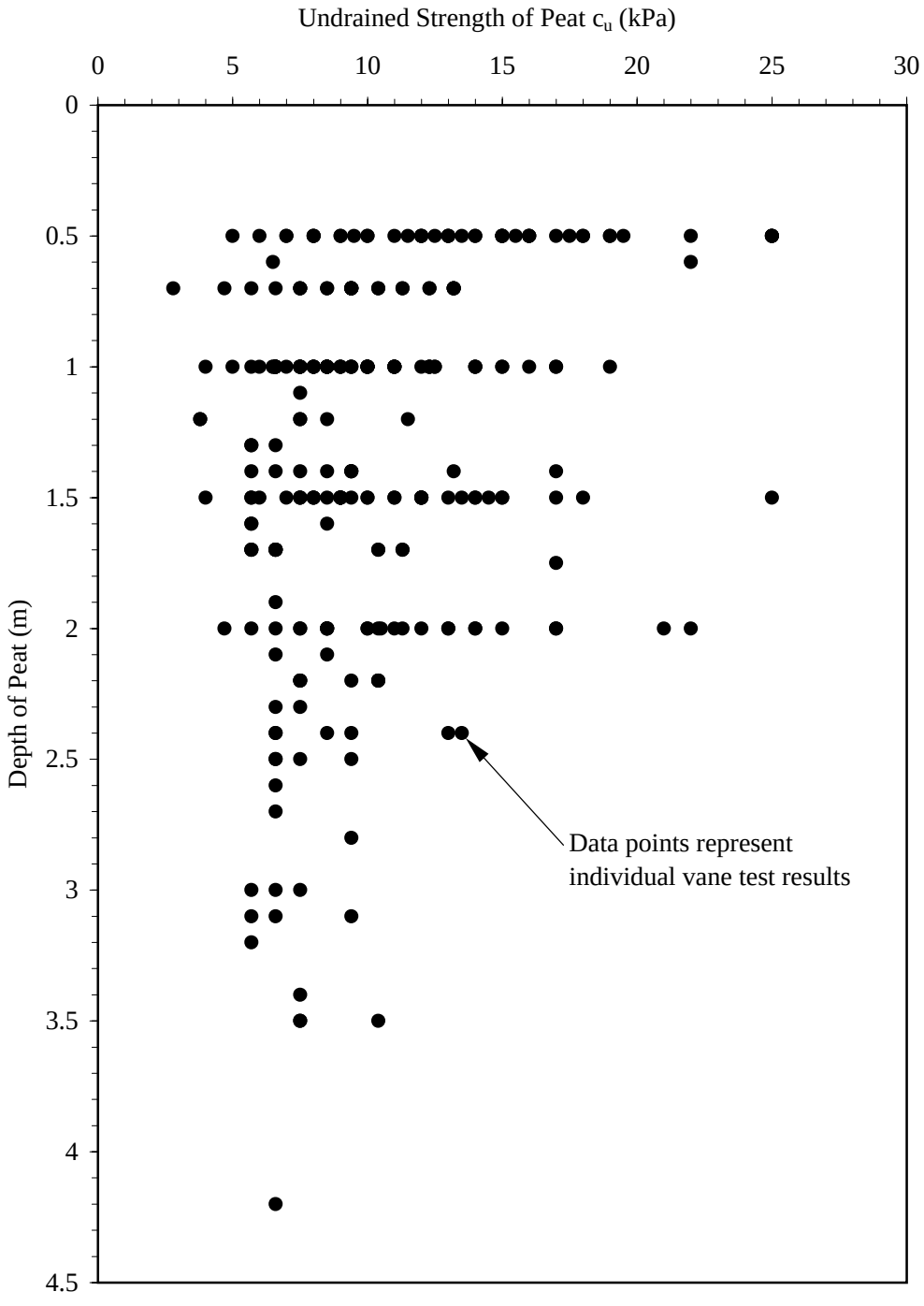


Figure 5 Profile of Undrained Shear Strength (c_u) of Peat with Depth from Vane Results

Note: Vane results are from 25mm and 55mm diameter vanes

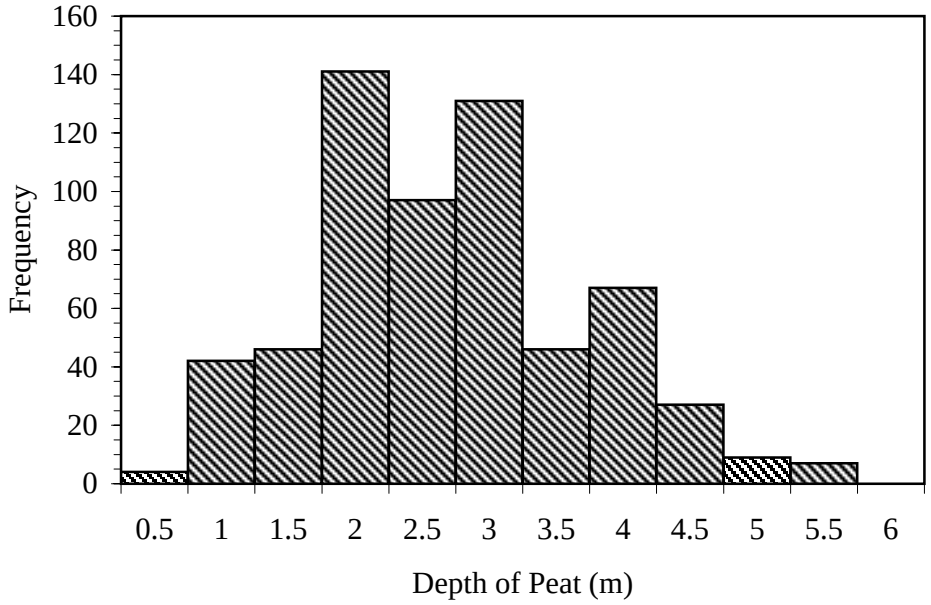


Figure 6 Range of Peat Depths

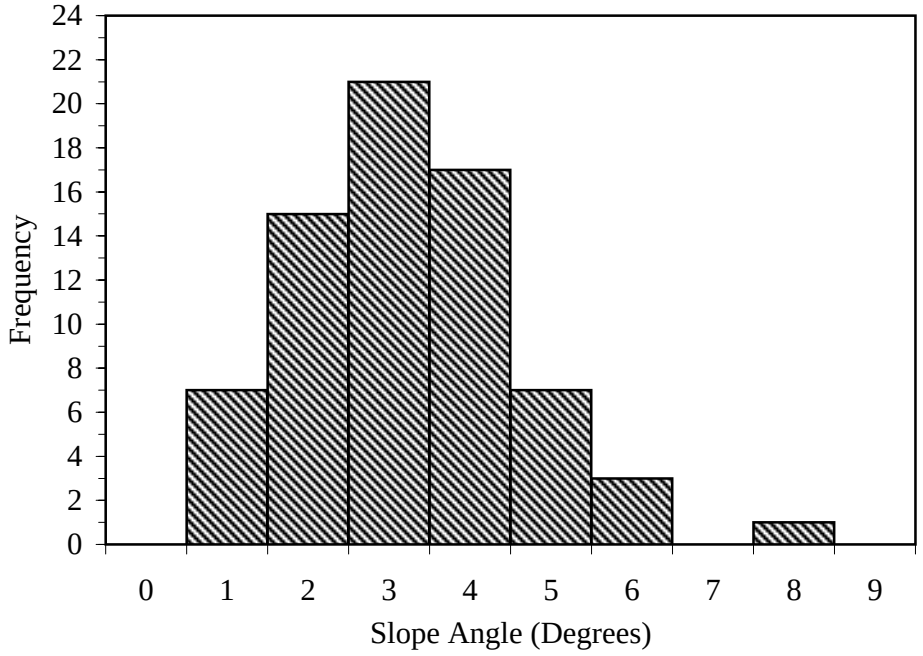


Figure 7 Range of Slope Angles

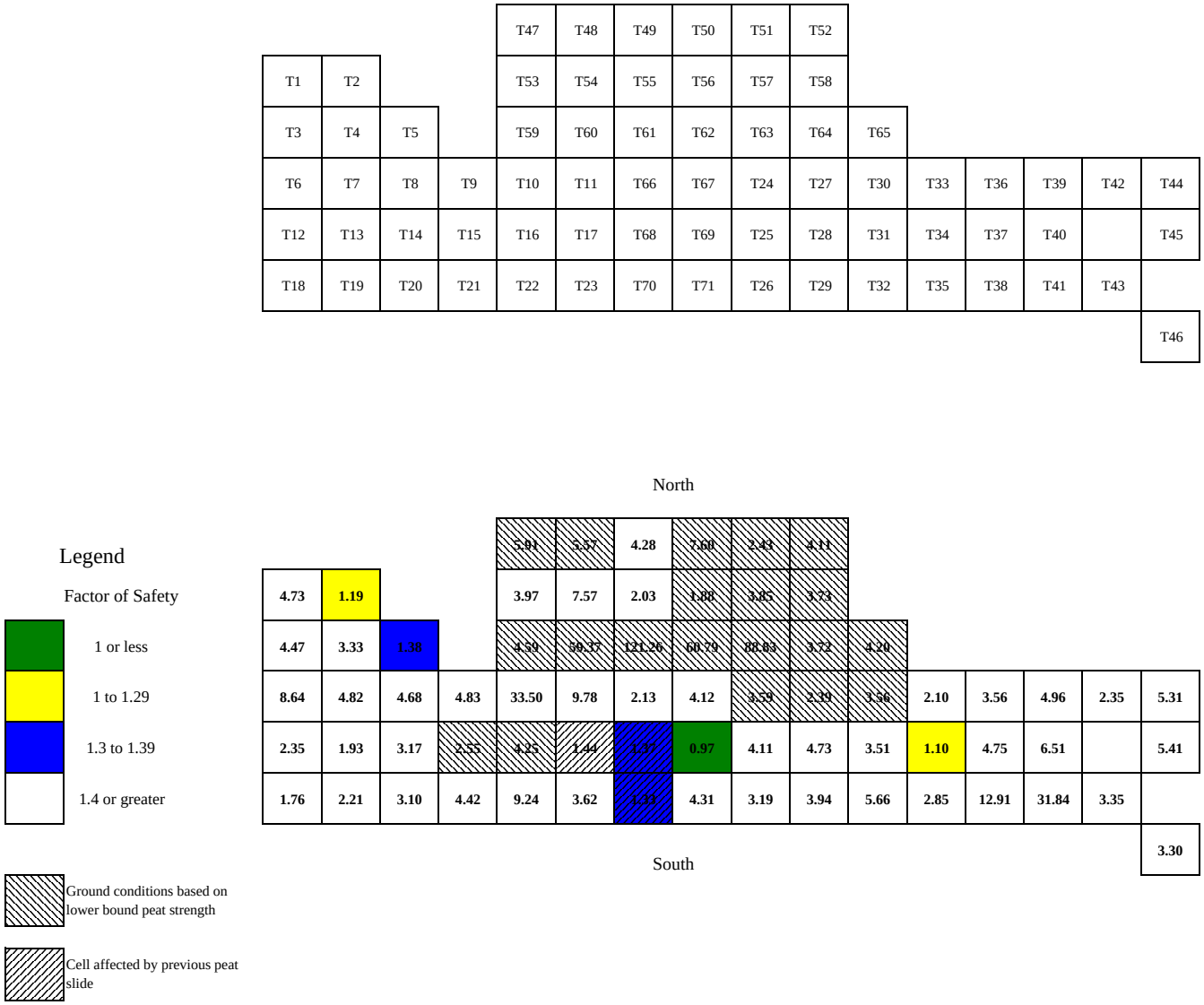


Figure 8 Factor of Safety for 200m by 200m Cell under Load Condition (1)

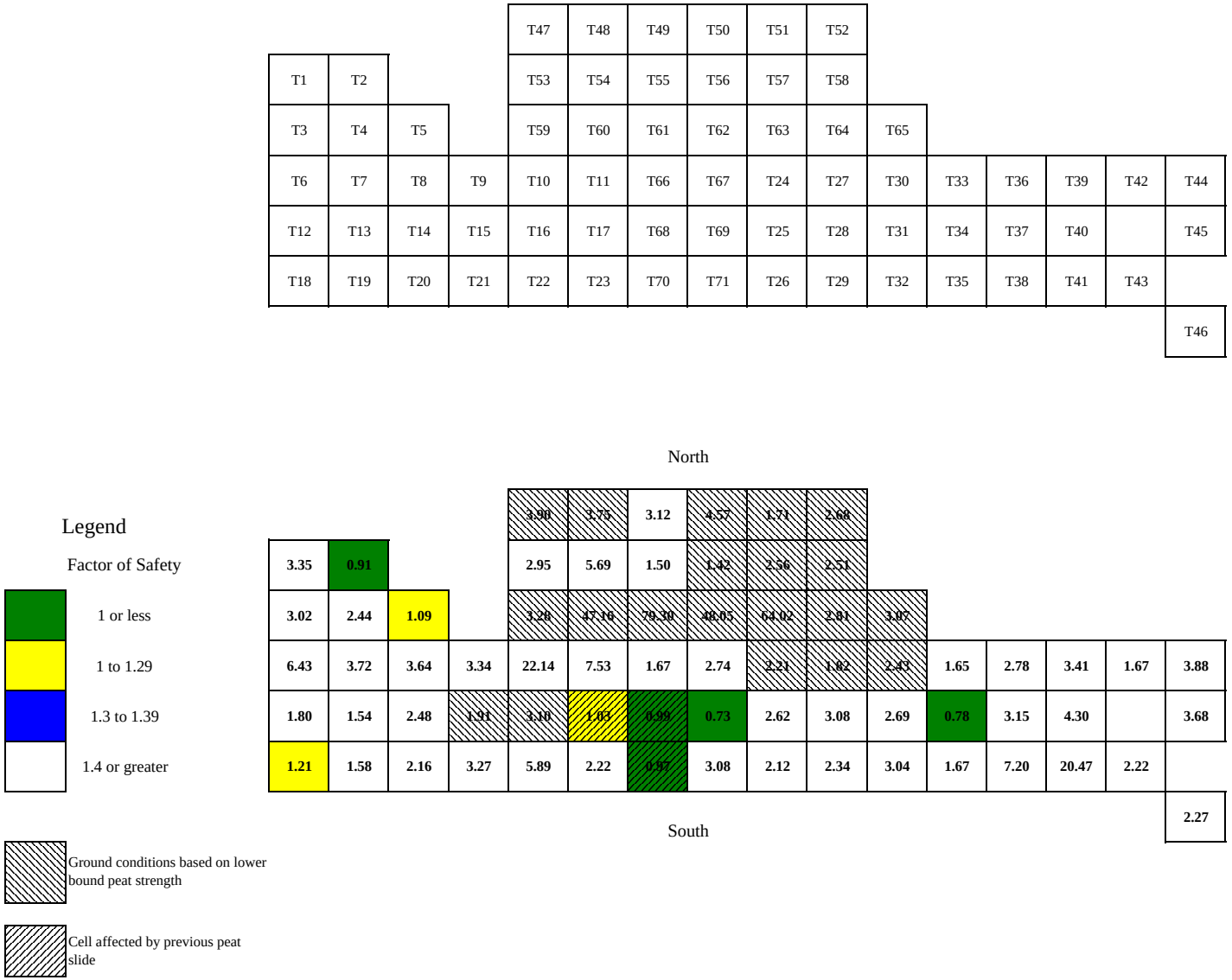


Figure 9 Factor of Safety for 200m by 200m Cell under Load Condition (2)

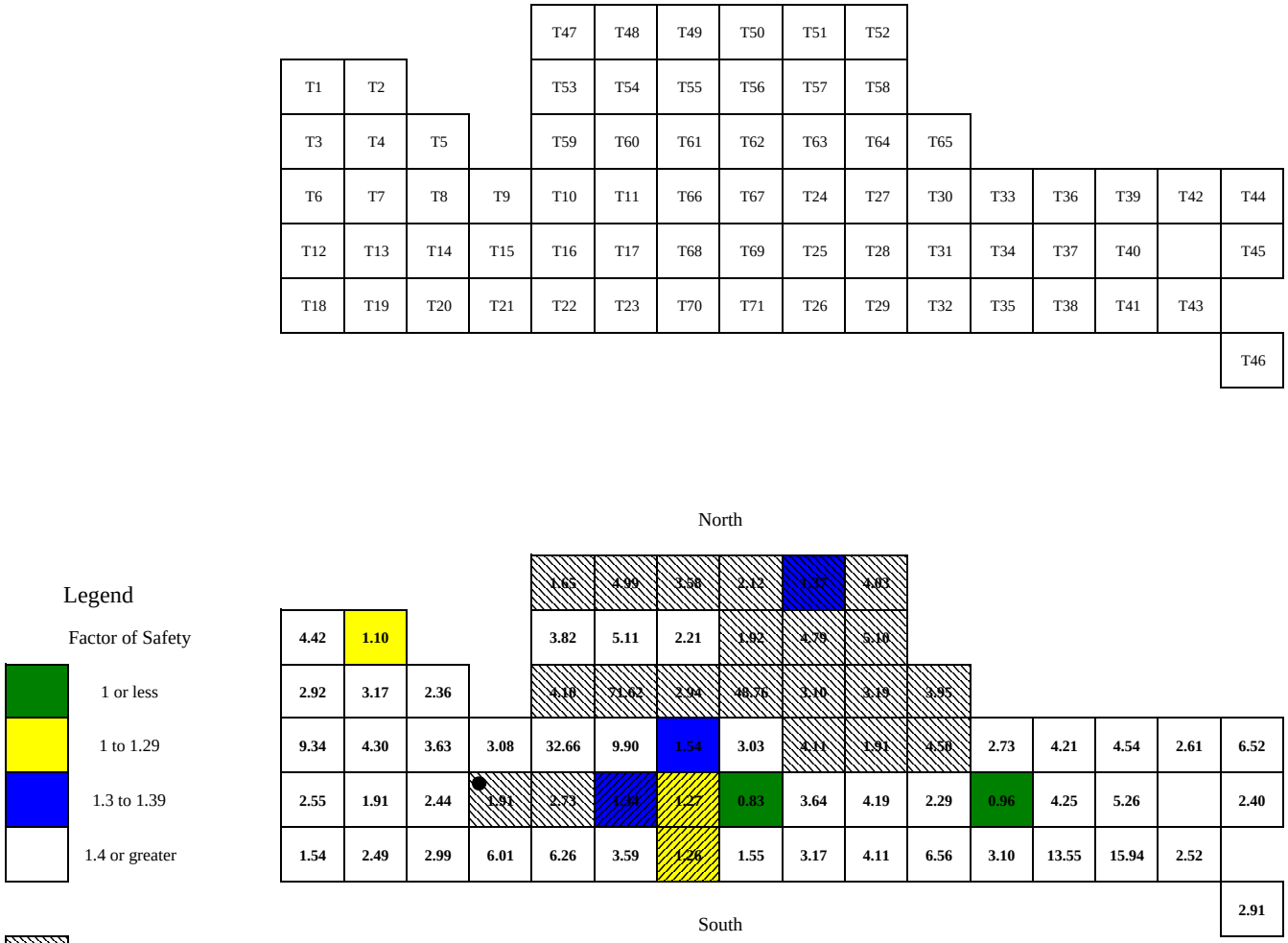


Figure 10 Factor of Safety for 50m Cell under Load Condition (1)

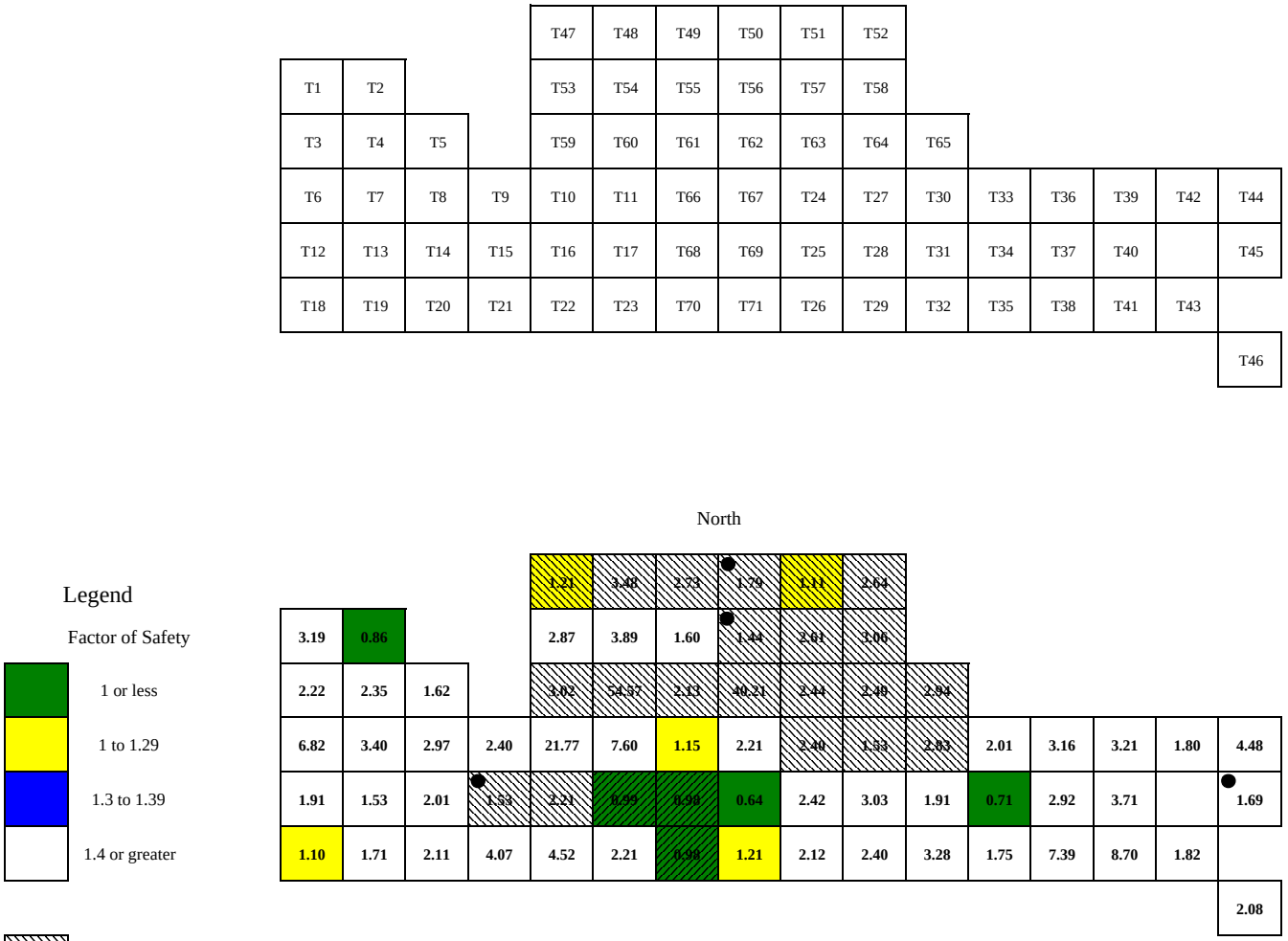


Figure 11 Factor of Safety for 50m Cell under Load Condition (2)

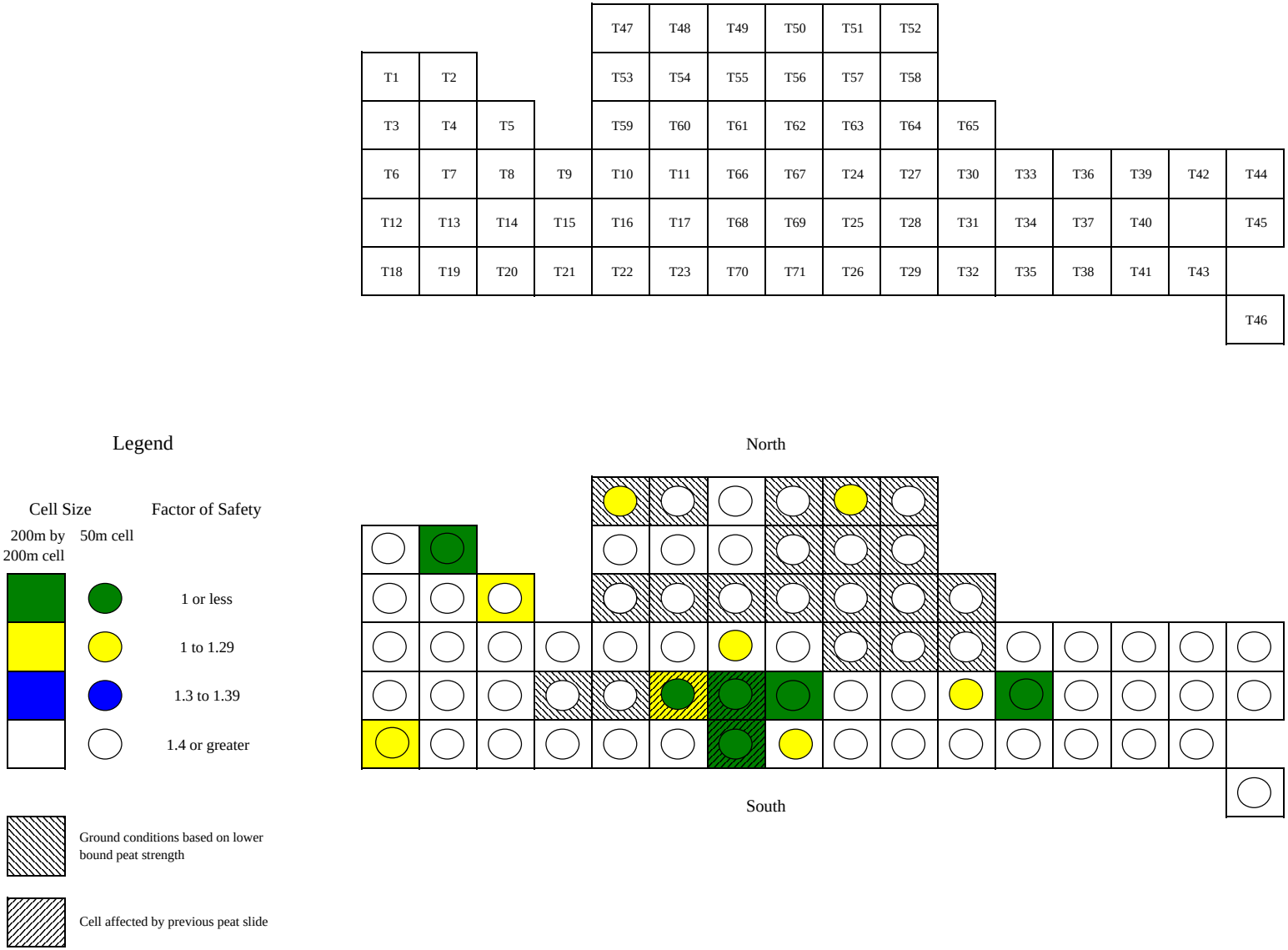


Figure 12 Summary of Factor of Safety for 200m by 200m and 50m Cells under Load Condition (2)

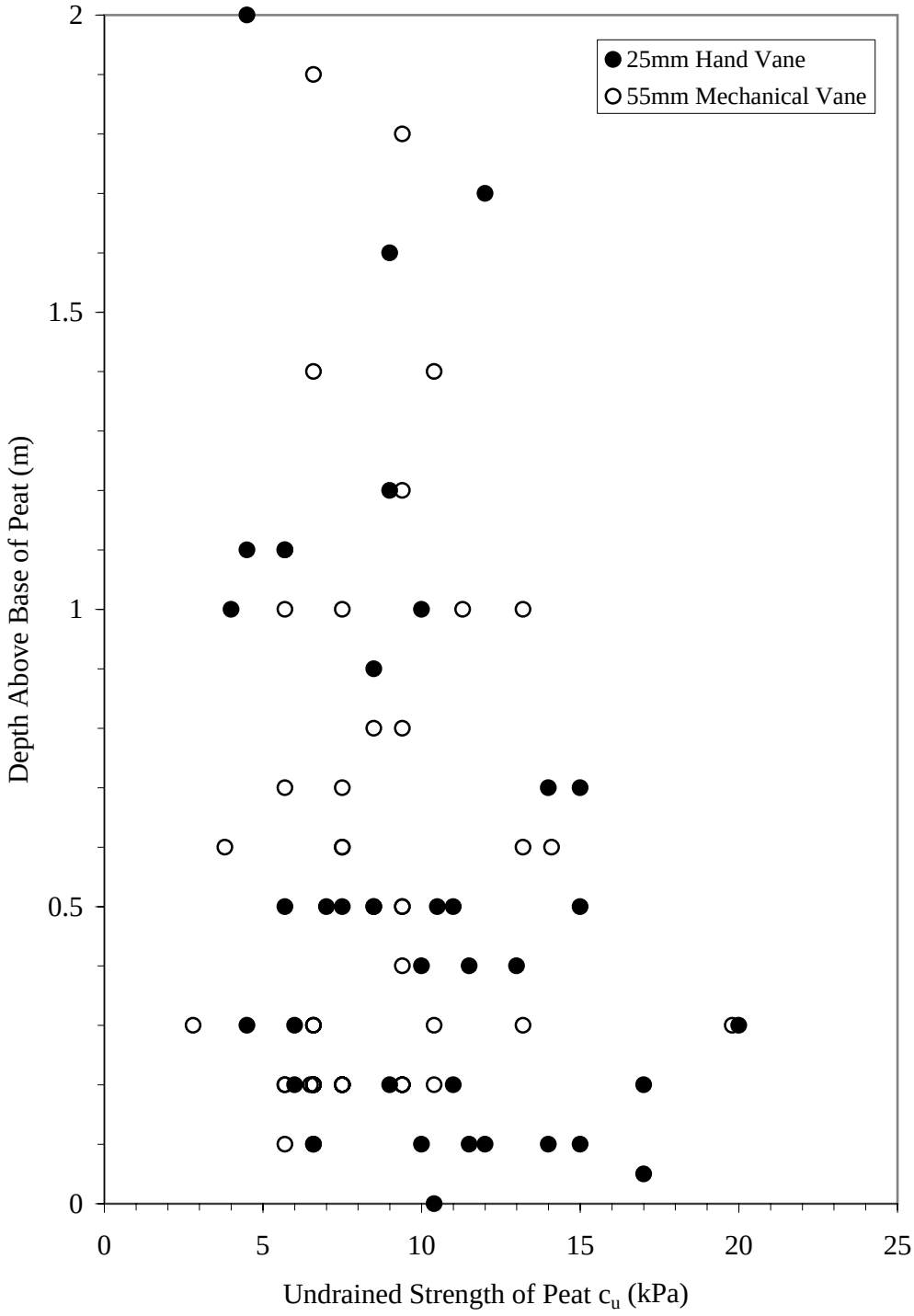


Figure 13 Variation of Undrained Shear Strength (c_u) of Peat with Depth above Base of Peat from Vane Results

Note: Vane results are from the deepest vane test within the peat at each test location

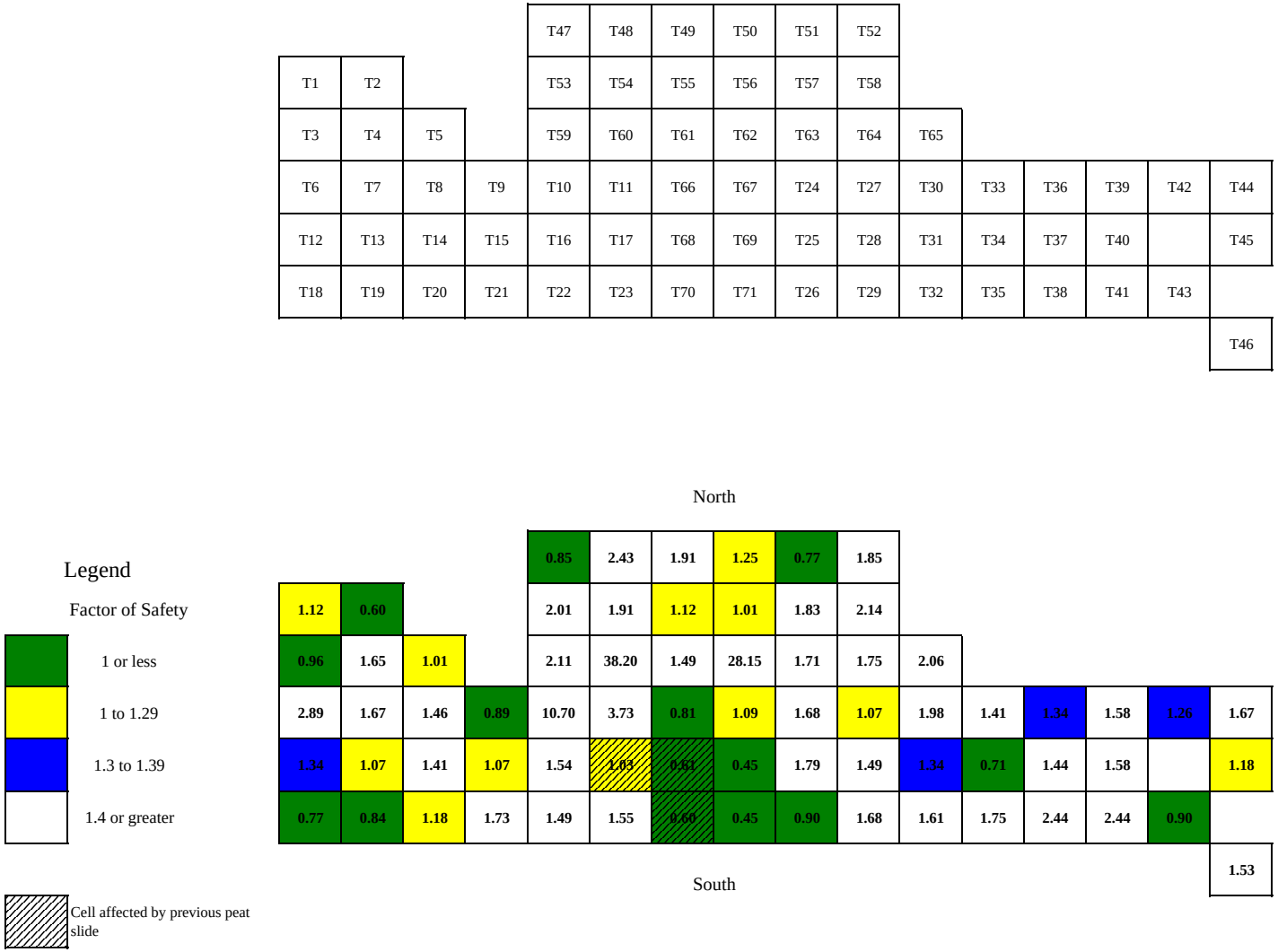


Figure 14 Sensitivity Analysis Showing Hypothetical Factor of Safety for 50m Cell under Load Condition (2)

APPENDIX A GEOTECHNICAL MAPPING SHEETS

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T1**	Mapped/Date: **DB & AL 03/11/03**
Description of Site: **Site is within the forest. Site slopes to west at 2.5°to 4°. Site is mostly on shallow uniform slope. The site is adjacent to a natural valley with a drainage channel approx 10m to north** **Peat thickness is 1.8 at east of excavation, greater than 2.0m thick further east and to the west**	
Description of Excavation: **Excavation is on a sloping site with 1.8m peat overlying between 1m and 0.4m mineral soil overlying sub-horizontal flaggy sandstone to the east. Peat slope sub-vertical.**	Description of Arisings: **Arisings to the west of excavation 20 L x 30 W x 0.5 H. Arisings to the east of excavation.**
Description of Access Road: **Floating Road running north-south turning to east-west. Site located at junction.**	Description of Dewatering: **Not Known**
Description of Watercourses/Drainage on Site**: Large drainage channel bearing 270° from T2 north of site. Thickness of peat in drainage bank to west approx 0.5m Rock in-situ in ditch bed. Extensive seepage into excavation from east draining around base egressing into 'V' ditch to west. 'V' ditch draining into main drainage ditch to west of excavation.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Seepage from peat and occasional seepage lines at mineral soil/rock interface. Slight ponding within the arisings.**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T2**	Mapped/Date: **DB & AL 03/11/03**
Description of Site: **Site is within the forest. Site slopes generally to the west at 2° to 6°. Site is mostly on shallow convex/uniform slope. A natural valley develops to the west of the excavation.** **Peat thickness is greater than 2.0m thick.**	
Description of Excavation: **Excavation has localised failure to the east with an area of standing water to the north adjacent to the excavation.**	Description of Arisings: **Arisings to the west and northeast of the excavation.**
Description of Access Road**: Floating road terminates at the south of the excavation. The sub-base of the road consists of boulders up to 0.7m**	Description of Dewatering: **Not Known**
Description of Watercourses/Drainage on Site**: Natural Drains and drainage furrows flow generally east to west. A drain bearing 230° is blocked to the east of the site. Seepage and impeded flow forms ponding to the north of the excavation and within the excavation itself. A natural drain runs to the west of the site (bearing 252°). A 'V' ditch (partially blocked) flows west from the excavation and joins the main drain.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Water seepage from the east feeding the ponding to the north of the excavation Ponding within the arisings.**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **The localised failures are cause by the excavation and inadequate drainage**	
Location/Ref. of Instability: **The failures consist of tension cracks and are located to the south and east of the excavation. They form a crescent around the excavation and the furthest crack is approx 15m from the excavation at the tree line.**	Length of Crack: **There are numerous minor scars with lengths between 0.3 and 15m in length**
Average Width of Crack: **The maximum width of the major tension crack is approx 0.5m**	Average Depth of Crack: **The depth of the cracks are greater than 2m.**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T3**	Mapped/Date: **DB & AL 03/11/03**
Description of Site: **Site is within the forest. Site slopes to the northwest at 3.5°to 4°. Site is mostly on shallow concave/uniform slope. A natural valley develops to the northwest of the site.** **Peat thickness to the northwest is 1.5m to the southwest it is 1.7m thick.**	
Description of Excavation: **Excavation is on a sloping site and is located towards the head of a northwest sloping natural valley.**	Description of Arisings: **Arisings are located to the southwest, west and north of the excavation.**
Description of Access Road: **Floating Road running northwest-southeast.**	Description of Dewatering: **Not Known**
Description of Watercourses/Drainage on Site**: Drainage channels and furrows generally flow toward the excavation from the northeast, east and south. These are commonly impeded by the access road and arising resulting from the excavation. The ground where the water flow is impeded is commonly waterlogged. Note a major stream is impeded by the access road running north west from the site. The GPS co-ordinates are E 57918, N 04575.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Seepage from peat and impeded drainage channels.**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T4**	Mapped/Date: **DB & AL 03/11/03**
Description of Site: **Site is within the forest. Site slopes to the west at 2.5°. Site is mostly on shallow uniform slope. Large boulders have been used in an attempt to stabilise the eastern side of the excavation.** **Peat thickness is greater than 2m.**	
Description of Excavation: **Excavation is on a sloping site and is located towards the head of a northwest sloping natural valley.**	Description of Arisings: **Extensive Arisings (approx 40mx25mx1.3m) are located to the west of the excavation. The arisings are waterlogged. Minor excavations are located to the north and south of the excavation and access road.**
Description of Access Road: **Floating Road running east-west located to the north of the site.**	Description of Dewatering: **Not Known**
Description of Watercourses/Drainage on Site**: Drainage furrows commonly run north-south and areimpeded by the access road in the northeast. An active drainage ditch bearing 112° flows into the excavation. A 'V' cut channel flowing west into an existing drainage ditch is located at the western side of the excavation. This ditch is impeded resulting in the excavation being water filled. Drainage channels to the west and southwest flow in a general westerly direction. Approximately 100m to the west the drainage channels are impeded by the access road.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Seepage from peat and impeded drainage channels.**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **A tension cracks is located to the east of the excavation propagating along a drainage furrow. The crack is a result of the excavation. Large boulders have been placed in the side of the excavation to impede the failure.**	
Location/Ref. of Instability: **The tension crack runs north-south approx 5m east of the excavation.**	Length of Crack: **10m**
Average Width of Crack: **0.35m**	Average Depth of Crack: **approx 0.5m**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T5**	Mapped/Date: **DB & AL 03/11/03**
Description of Site: **Site is within the forest and intersects a fire-break. Site slopes to the west and east at 2.5°. The central section of the site slopes at 5°. Site is mostly on shallow convex slope and appears to be located at the head of a drainage channel.** **Peat thickness is greater than 2m in the east and 2m in the west**	
Description of Excavation: **Excavation is on a sloping site. Boulders and stone-fill have been placed in the northeast of the excavation.**	Description of Arisings: **Arisings are located to the west and north of the excavation. The arisings are waterlogged.**
Description of Access Road: **Floating Road to the southwest of the site, terminates at the base.**	Description of Dewatering: **Not Known**
Description of Watercourses/Drainage on Site**: Drainage generally flows east to west. Surface water and water run off flows west into the excavation resulting in the excavation being flooded. To the west of the excavation a 'V' cut channel from the excavation flows into a drainage channel bearing 272°. The 'V' cut channel is impeded resulting in water flowing out of the excavation in to the trees to the northwest.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Seepage from peat to the east of the excavation and seepage from the excavation to the northwest causing waterlogging of the ground.**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T6**	Mapped/Date: **DB & AL 03/11/03**
Description of Site: **Site is within the forest. Site slopes gently to the west 1.5°. Site is on shallow uniform slope.** **Peat thickness is greater than 2m.**	
Description of Excavation: **Not Commenced**	Description of Arisings: **N/A**
Description of Access Road: **Floating Road to the east of the site.**	Description of Dewatering: **Not Known**
Description of Watercourses/Drainage on Site**: Drainage furrows generally contain no standing water and are orientated north-south. A 'V' cut ditch runs from the access road with a bearing of 253°.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T7**	Mapped/Date: **DB & AL 03/11/03**
Description of Site: **Site is within the forest. Site slopes gently to the west 2 °. Site is on shallow uniform slope.** **Peat thickness is greater than 2m.**	
Description of Excavation: **Not Commenced**	Description of Arisings: **N/A**
Description of Access Road: **Floating Road to the north of the site.**	Description of Dewatering: **Not Known**
Description of Watercourses/Drainage on Site**: Drainage furrows generally contain no standing water and are orientated north-south. A drainage ditch located to the west of the site, is impeded by the access road. A drainage ditch is located to the south of the site bearing 243°.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T8**	Mapped/Date: **DB & AL 03/11/03**
Description of Site: **Site is within the forest. Site slopes gently to the west 2 °. Site is on shallow uniform slope.** **Peat thickness is greater than 2m.**	
Description of Excavation: **Not Commenced**	Description of Arisings: **N/A**
Description of Access Road: **Floating Road to the north of the site.**	Description of Dewatering: **Not Known**
Description of Watercourses/Drainage on Site**: Drainage furrows generally contain no standing water and are orientated northeast-southwest. There are no active drainage channels located in the site area.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T9**	Mapped/Date: **DB & AL 03/11/03**
Description of Site: **Site is within the forest. The site is generally flat however the ground to the south of the site slopes to the south at 4°.** **Peat thickness is greater than 2m.**	
Description of Excavation: **Excavation is on a generally flat site. Localised slumping of the peat has occurred in the sides of the excavation.**	Description of Arisings: **Arisings (64mx35mx0.75m)are located across the access road to the north of the excavation.**
Description of Access Road: **Floating Road to the north of the site.**	Description of Dewatering: **Not Known**
Description of Watercourses/Drainage on Site**: A 'V' cut channel to the east of the arisings is blocked in the east. 'V' cut channels bearing 192° and 88° run from the south and east sides respectively from the excavation. The 'V' cut channel bearing 192° has localized slumping along the length. The channel runs into a stream bearing 270° approx 100m south of the site. The 'V' cut channel bearing 88° connects with an established drainage channel and diverts into a 'V' cut channel bearing 202°. This channel connects into the stream bearing 270° approx 100m south of the site.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Minor seepage from the peat feeds into the excavation. The water level in the excavation is approximately 2m below ground level.**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T10**	Mapped/Date: **DB & AL 03/11/03**
Description of Site: **Site is within immature forest. The site is generally flat with a gentle slope 0.5° east.** **Peat thickness is greater than 2m.**	
Description of Excavation: **Excavation is on a generally flat site. The excavation contains water at a level of 0.5m below ground level.**	Description of Arisings: **Arisings (20mx23mx1.3m) and (31mx10mx1.3m) are located to the west and south of the excavation respectively.**
Description of Access Road: **Floating Road to the south of the site.**	Description of Dewatering: **Not Known**
Description of Watercourses/Drainage on Site**: Seepage runs into the excavation from the peat and there is no obvious egress for the water. A drainage channel bearing 238° to the east of the excavation is impeded by the road. A drainage channel bearing 194° located to the east of excavation is blocked and waterlogged.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Minor seepage from the peat feeds into the excavation. The water level in the excavation is approximately 0.5m below ground level.**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T11**	Mapped/Date: **DB & AL 03/11/03**
Description of Site: **Site is within the forest. Site slopes to south at 1°. Site is mostly on shallow uniform slope.** **Peat thickness is greater than 2.0m thick.**	
Description of Excavation: **Excavation is inundated with water and depth is unknown. Localised failure at northeast of excavation.**	Description of Arisings: **Arisings to the south of access road 40 L x 30 W x 0.5 H. Arisings to the north, east and west of excavation.**
Description of Access Road: **Floating Road running south southwest to north direction.**	Description of Dewatering: **Not Known**
Description of Watercourses/Drainage on Site**: Large drainage channel running 165° towards T17. Three drains blocked bearing 190°, 085° and 116° to the north of the excavation and south of the access road.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Ponding within the arisings.**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T12**	Mapped/Date: **DB/PJ 02/11/03**
Description of Site: **Site is partially cleared of forestry surrounding base excavation. Site is located on western side of wind farm. Site slopes to southwest at 3°. Excavation for base complete, and base constructed.**	
Description of Excavation: **Excavation inundated with water, depth not known. Sideslopes approximately 45°.**	Description of Arisings: **Arisings stockpiled to the south of access road. Arisings consist mainly of peat and extend some 45m by 20m. Arisings have flowed blocking drainage ditch aligned 275° with water now re-directed into access track.**
Description of Access Road: **Access roads comprise floating roads aligned east-west and north-south.**	Description of Dewatering: **Not known.**
Description of Watercourses/Drainage on Site: **Drainage line aligned 230° has been re-routed around excavation. Drainage ditch aligned 275° passing to south of arisings has been blocked.**	
Description/Cause of Failure: **No failure of intact peat. Arisings have flowed up to about 12m.**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **Tension crack around north and east side of excavation**	
Location/Ref. of Instability: **N/A**	Length of Crack: **30 to 40m**
Average Width of Crack: **Approx. 0.3m**	Average Depth of Crack: **Approx. 1.8m**
Sketches Attached: (List) **N/A**	Photographs Taken: (List) **N/A**

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T13**	Mapped/Date: **DB/PJ 02/11/03**
Description of Site: **Site is partially cleared of forestry to west of base excavation. Site is located on western side of wind farm. Site slopes to south at 3°. Excavation for base complete, and base constructed.**	
Description of Excavation: **Excavation inundated with water, depth not known. Sideslopes approximately 45°.**	Description of Arisings: **Arisings stockpiled to the east and south of access road. Arisings consist mainly of peat. Arisings south of road have flowed some 25m downslope.**
Description of Access Road: **Access road is floating road aligned east-west.**	Description of Dewatering: **Not known.**
Description of Watercourses/Drainage on Site: **Drainage lines aligned 207° and 275° to north and south of excavation respectively.**	
Description/Cause of Failure: **No failure of intact peat. Arisings have flowed up to about 25m.**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **Tension crack around north and east side of excavation**	
Location/Ref. of Instability: **N/A**	Length of Crack: **30 to 40m**
Average Width of Crack: **Approx. 0.3m**	Average Depth of Crack: **Estimated as 1.8m**
Sketches Attached: (List) **N/A**	Photographs Taken: (List) **N/A**

Geotechnical Mapping Sheet

Project: Derrybrien Landslide

Site Reference: **T14**	Mapped/Date: **DB/PJ 02/11/03**
Description of Site: **Site is partially cleared of forestry. Site is located on western part of wind farm. Site slopes to south at 1° to 2°. Excavation for base has not been started.** **Peat is notably poorer, with some standing water, immediately west of proposed base. V-ditches have been constructed in this area to facilitate drainage.** **Peat depth greater than 2m with base proven at 3.1m**	
Description of Excavation: **N/a**	Description of Arisings: **N/A**
Description of Access Road: **Access road, which does not extend to proposed site of base is floating road aligned east-west.**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site: **V-ditches constructed along either side of proposed access route. Partial collapse of ditches in soft ground areas.**	
Description/Cause of Failure: **No failure of intact peat.**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List) **N/A**	Photographs Taken: (List) **N/A**

Geotechnical Mapping Sheet

Project: Derrybrien Landslide

T14 – Collapsed Drain.

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T15**	Mapped/Date: **DB/PJ 02/11/03**
Description of Site: **Site is partially cleared of forestry. Site is located on western part of wind farm. Site slopes to south at about 3°. Excavation for base has not been started.** **Peat depth greater than 2m.**	
Description of Excavation: **N/a**	Description of Arisings: **N/A**
Description of Access Road: **Forestry felled but not cleared for floating access road.**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site: **Some existing forestry drainage in area.**	
Description/Cause of Failure: **No failure of intact peat.**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List) **N/A**	Photographs Taken: (List) **N/A**

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T16**	Mapped/Date: **DB/PJ 02/11/03**
Description of Site: **Site is partially cleared of forestry. Site is located on western part of wind farm. Site slopes to south at 1° to 2°. Excavation for base has not been started.** **Peat depth greater than 2m.**	
Description of Excavation: **N/a**	Description of Arisings: **N/A**
Description of Access Road: **Forestry felled but not cleared for floating access road.**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site: **Some existing forestry drainage in area.**	
Description/Cause of Failure: **No failure of intact peat.**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List) **N/A**	Photographs Taken: (List) **N/A**

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 4

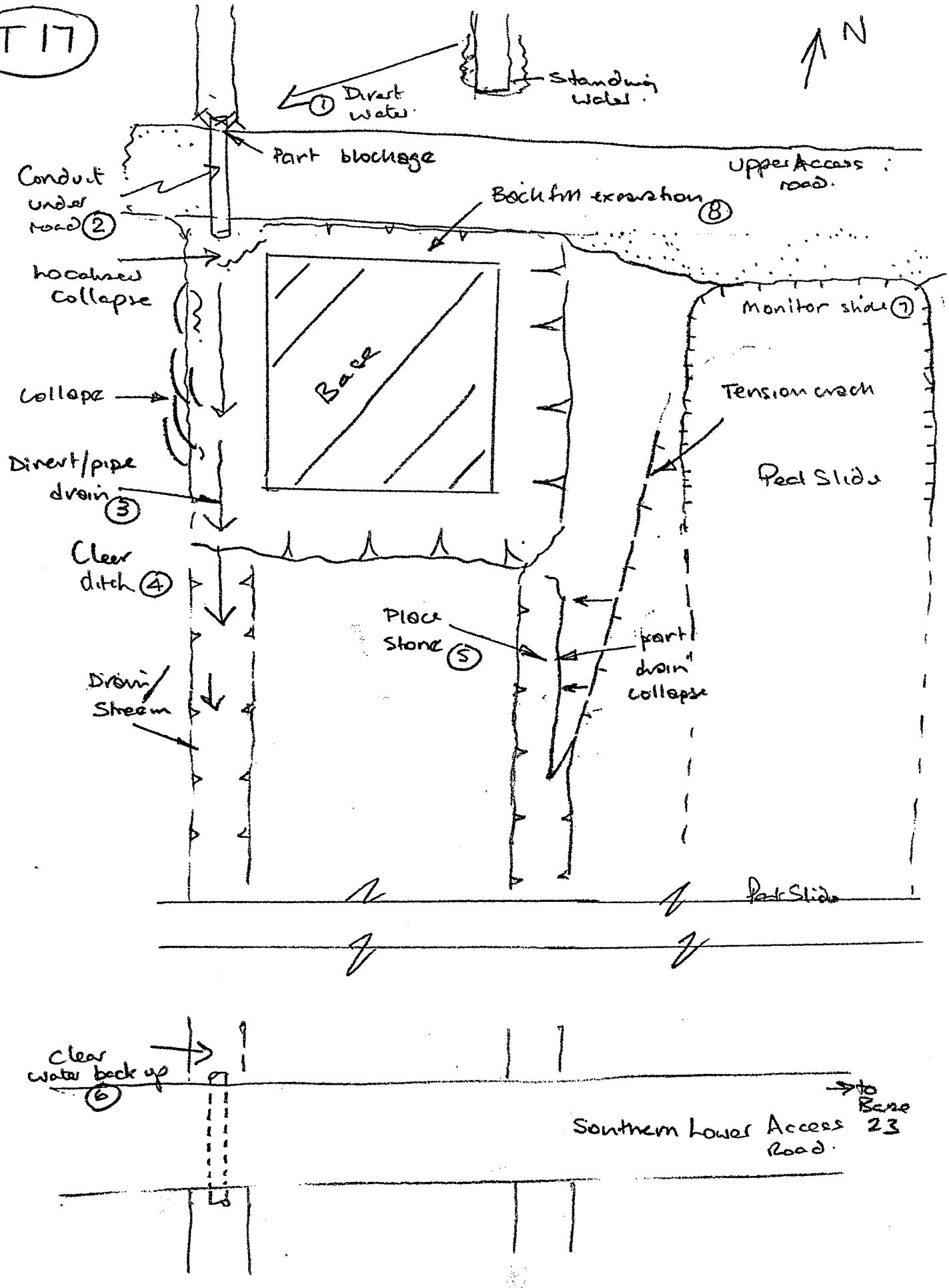
Site Reference: **T17**	Mapped/Date: **AL/PJ 31/10/03 & 1/11/03**
Description of Site: **Site is partially forested with mature trees upslope and immature trees downslope. Site is located towards the southwest of the wind farm. Site slopes to south at between 2 and 4 degs. Excavation for base complete, and base constructed.**	
Description of Excavation: **Excavation approximately 3m deep in peat with base on bedrock. Sideslopes about 45 degrees. Water flowing through excavation.**	Description of Arisings: **Arisings stockpiled to the south of the access road. Arisings are absent and assumed to have been involved in failure, see below.**
Description of Access Road: **Access road constructed from east up to base location. Access road has not been completed west of base.**	Description of Dewatering: **Ditch on downslope side of excavation drains water from within excavation.**
Description of Watercourses/Drainage on Site: **Two drainage lines, 15 m apart aligned N-S pass through base excavation. West drain is active, east drain is backing up upslope of road though there does not appear to be any active flow.**	
Description/Cause of Failure**: Failure located to 10m east of excavation. The head of the failure is coincidental with downslope edge of access road. Details of failure are as follows:** • **Possible diversion of east drain flow into head of failure; though no active flow apparent in drain during survey.** • **Arisings placed at head of failure, which would have increased applied load on slope.** • **Failure appears to be peat slide.** • **Lateral oblique tension crack to west of head of failure has partly closed drain, though no flow in drain.** • **Failure volume estimated as 2000 m^3.** • **Deposition lobes have come to rest on shallower peat thickness where slope angles are decreasing. Peat depth below lobes is about 1.8m, with peat depths reducing downslope to about 1m.** • **No evidence of failure of in situ peat below deposition lobes; no apparent significant movement at lobes.**	
Failure Location & Orientation: **From access road beside base T17 downslope in southerly direction.**	Width Dimension of Failure Scar: **Failure width about 22m.**
Length Dimension of Failure Scar: **Failure length 140m; of which upper 85m is failure within in situ peat.**	Angle/Shape of Failure Plane: **Concave slope with failure plane parallel to base of peat layer.**
Failure Material Thickness: **Depth to failure plane is typically 1.5 to 2 m bgl, and appears to be at base of peat layer**	Description of Failure Plane: **failure plane is parallel to base of peat and translational.**
Travel Distance of Failed Material: **Travel distance is about 130m; the last 45m comprises run-out beyond failure scar.**	Seepage/Water Description: **Some ponding of water in failure, though no concentrated water flow into failure scar.**
Description of Material above Failure Plane: **Very soft fibrous peat**	

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 2 of 4

Site Reference: **T17**	Mapped/Date: **AL/PJ 31/10/03 & 1/11/03**
Description of Incipient Instability: **Minor slumping of sidewall of excavation where west drain enters. Lateral oblique tension crack to west of failure head is failing into drain causing part collapse of drain.**	
Location/Ref. of Instability: **See attached**	Length of Crack: **+10**
Average Width of Crack: **0.2m (?)**	Average Depth of Crack: **1.5(?)**
Sketches Attached: (List) **see sheet 3 of 4**	Photographs Taken: (List) **see sheet 3 of 4**

T17


N
① Direct Water
Standing Water
Part blockage
Conduit under road ②
Upper Access road.
Backfill excavation ⑧
Localised Collapse
Monitor slide ⑦
Base
Collapse
Tension crack
Peat Slide
Divert/pipe drain ③
Clear ditch ④
Place Stone ⑤
part drain collapse
Drain/ Stream
Peat Slide
Clear water back up ⑥
to Base 23
Southern Lower Access Road.

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Geotechnical Mapping Sheet

Project: Derrybrien Landslide

T17 - East of Turbine Base Looking Downslope of Failure.

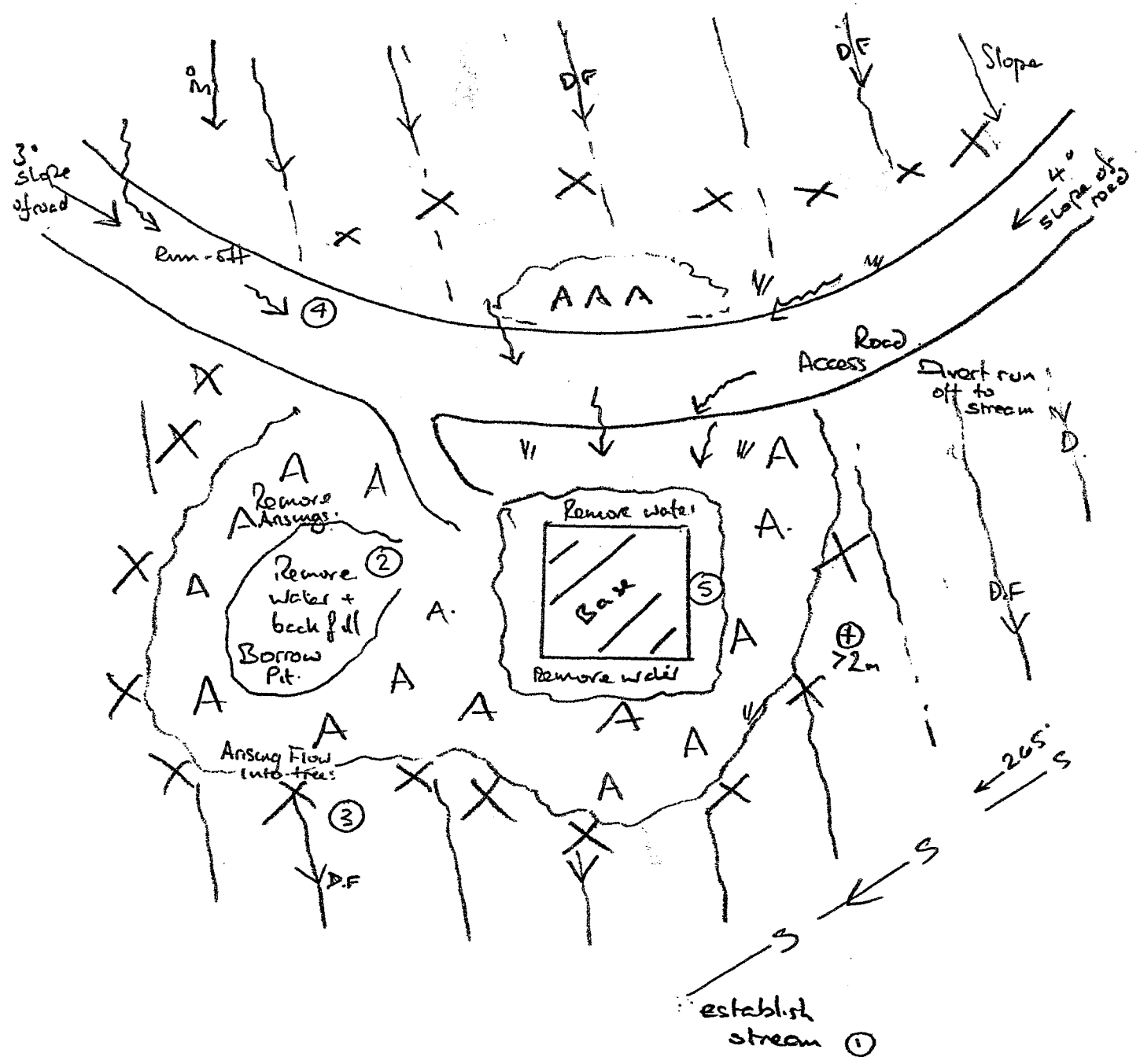
T17 - South of Failure Looking upslope

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 2

Site Reference: **T18**	Mapped/Date: **DB & TPJ 01/11/03**
Description of Site: **Site is within the forest. Site slopes to south to southwest at 4 to 6°. Site is mostly on shallow convex slope.** **Peat thickness is 1.2 to 1.7m thick.**	
Description of Excavation: **Excavation is inundated with water and depth is unknown.**	Description of Arisings: **Arisings to the south, southwest and northeast of the excavation. Arisings comprise peat and weathered bedrock. Arisings have flowed into the tree line into the forest. Lobe arisings dims are 70m by 120m wide, average height is 1.25m.**
Description of Access Road: F**loating Road running south southwest to north direction.**	Description of Dewatering: **Not Known**
Description of Watercourses/Drainage on Site**: Large drainage channel running 265° and is blocked by arisings. Dims are 0.75 deep, 1.25 depth and fast flowing. This large drain does flow into two forest furrows flowing south-southwest direction.** **9 No. forest furrows are blocked by arisings on the upslope side with standing water in some of the blocked furrows.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Ponding within the arisings.**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

T18



—S→— Stream (flow direction)

~~→ Seepage

AAA Arisings

X X X Tree line

V V Waterlogged ground

2°→ Slope

⊕ depth of Peat

—DF→ Drainage Furrow

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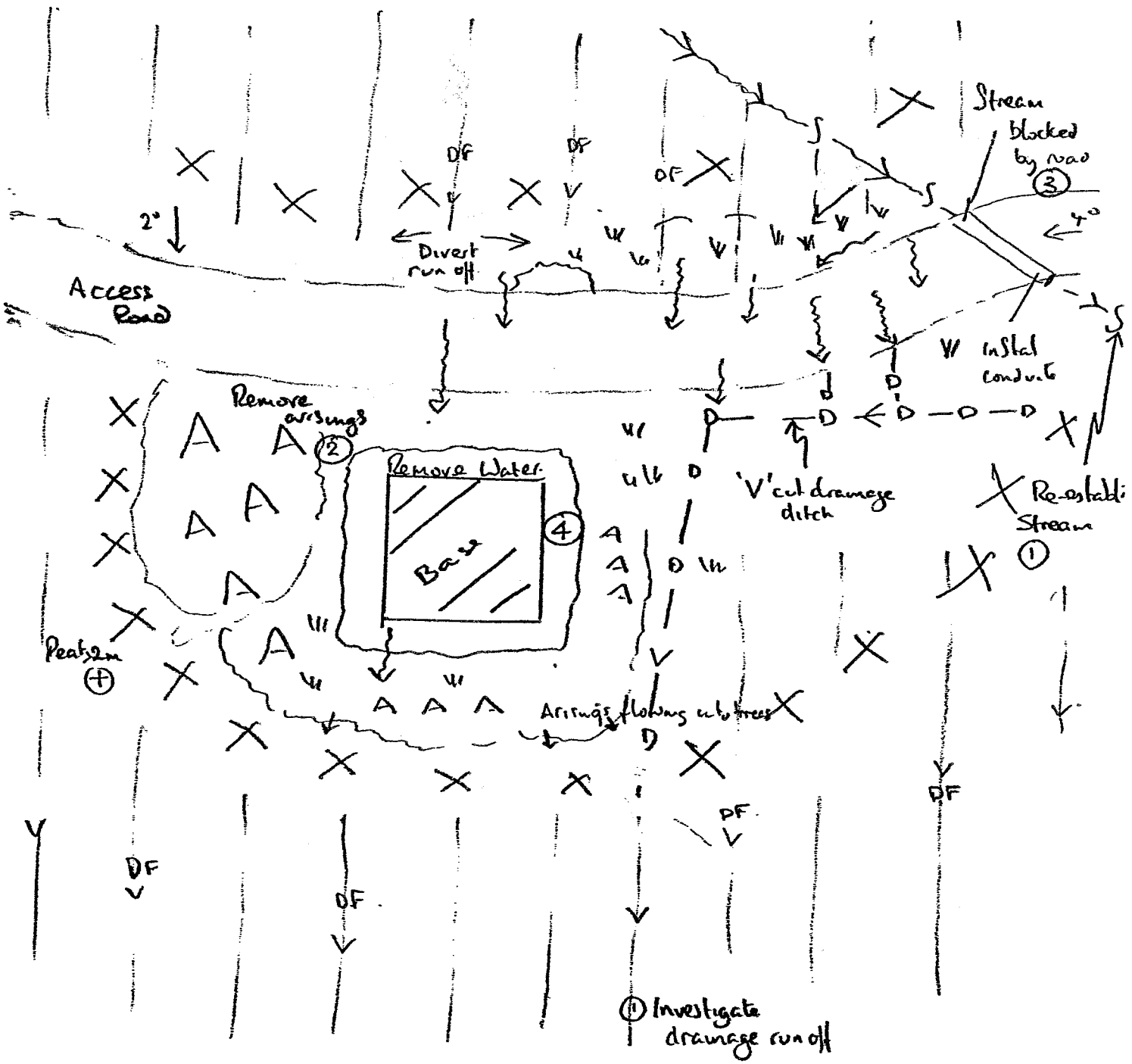
2/11/03

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 2

Site Reference: **T19**	Mapped/Date: **DB & TPJ 01/11/03**
Description of Site: **Site is within the forest. Site slopes to south to southwest at 4 to 6°. Site is mostly on shallow convex slope.** **Peat thickness is greater than 2m.**	
Description of Excavation: **Excavation is inundated with water and depth is unknown.**	Description of Arisings: **Arisings to the south, southwest and northeast of the excavation. Arisings comprise peat, glacial till and weathered bedrock. Arisings have flowed into the tree line into the forest. Lobe arisings average height is 1.25m.**
Description of Access Road: **Floating Road running south to southwest direction.**	Description of Dewatering: **Not Known**
Description of Watercourses/Drainage on Site**: Large drainage channel running 265° to the southeast of the arisings (outside site boundary). Dims are 0.75 deep, 1.25 depth and fast flowing.** **Forest furrows are blocked by arisings on the downslope side with standing water in some of the blocked furrows.** **Further large drain on upslope side of road bearing 292° is blocked by road and overflow is flowing down the north-south furrows and is saturating the ground behind the base and also to the east. There are no obvious conduits under the road and seepage is almost continuous through the length of the road.** **The v-ditch to the south of the road picks up some of the water seeping through the road. This is then channelled down furrows, past the base. However, the existing stream has been blocked and is not functioning.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Ponding within the arisings.**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

T19



— DF → Drainage furrow (+direction)

Seepage

AA Arisings

XX Tree line

Waterlogged

Slope

⊕ Depth of peat.

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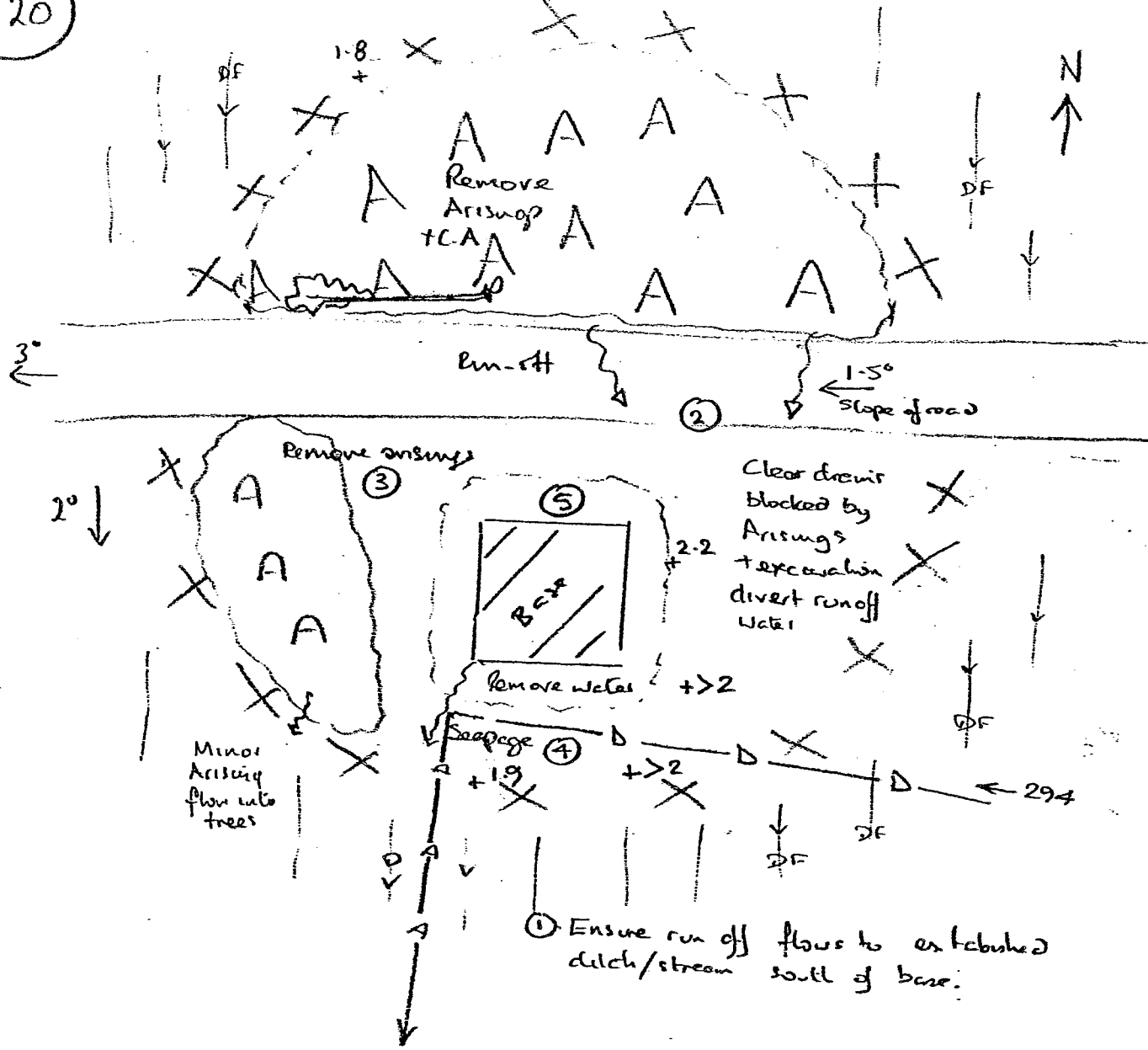
Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 2

Site Reference: **T20**	Mapped/Date: **AL 31/10/03**
Description of Site: **Site is within the forest. Site slopes to south to southwest at 2 to 4°. Site is mostly on shallow uniform slope.** **Peat thickness is greater than 2m.**	
Description of Excavation: **Excavation is inundated with water and depth is unknown.**	Description of Arisings: **Arisings to the north and west of the excavation. Arisings comprise peat and glacial till. Minor slumping of arisings.**
Description of Access Road: **Floating road running south to southwest direction.**	Description of Dewatering: **Not Known**
Description of Watercourses/Drainage on Site: **Seepage from south to southwest of excavation. Localised blockage of forest furrows and drain to south by fallen trees.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Ponding within the arisings.**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

T20



→DF→ Drainage Furrow (Direction of flow)
→D→ Drainage Ditch
AA Arisings
× Tree line
2° Slope
+1.8 Rest thickness 1.8m

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2/11/03

Sheet 2 of 2

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

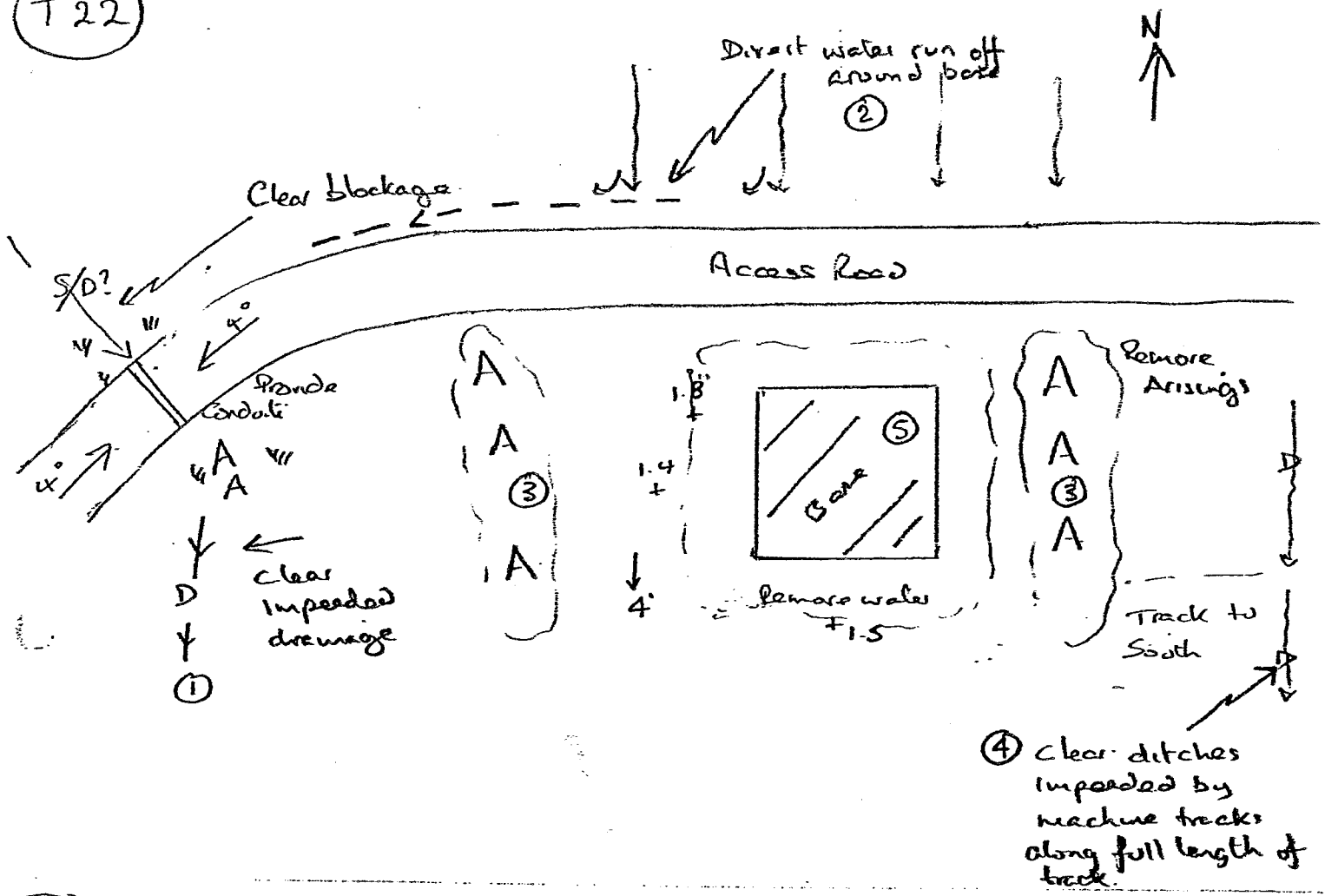
Site Reference: **T21**	Mapped/Date: **AL 31/10/03**
Description of Site: **Site is within the forest. Site slopes to south to southwest at 3°. Site is mostly on shallow uniform slope.** **Peat thickness is greater than 2m.**	
Description of Excavation: **Excavation is inundated with water and depth is unknown.**	Description of Arisings: **Arisings to the north and west of the excavation. Arisings comprise peat and glacial till. Minor slumping of arisings.**
Description of Access Road: **Floating road running south to southwest direction.**	Description of Dewatering: **Not Known**
Description of Watercourses/Drainage on Site: **Seepage from south to southwest of excavation. Localised blockage of forest furrows.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Ponding within the arisings.**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

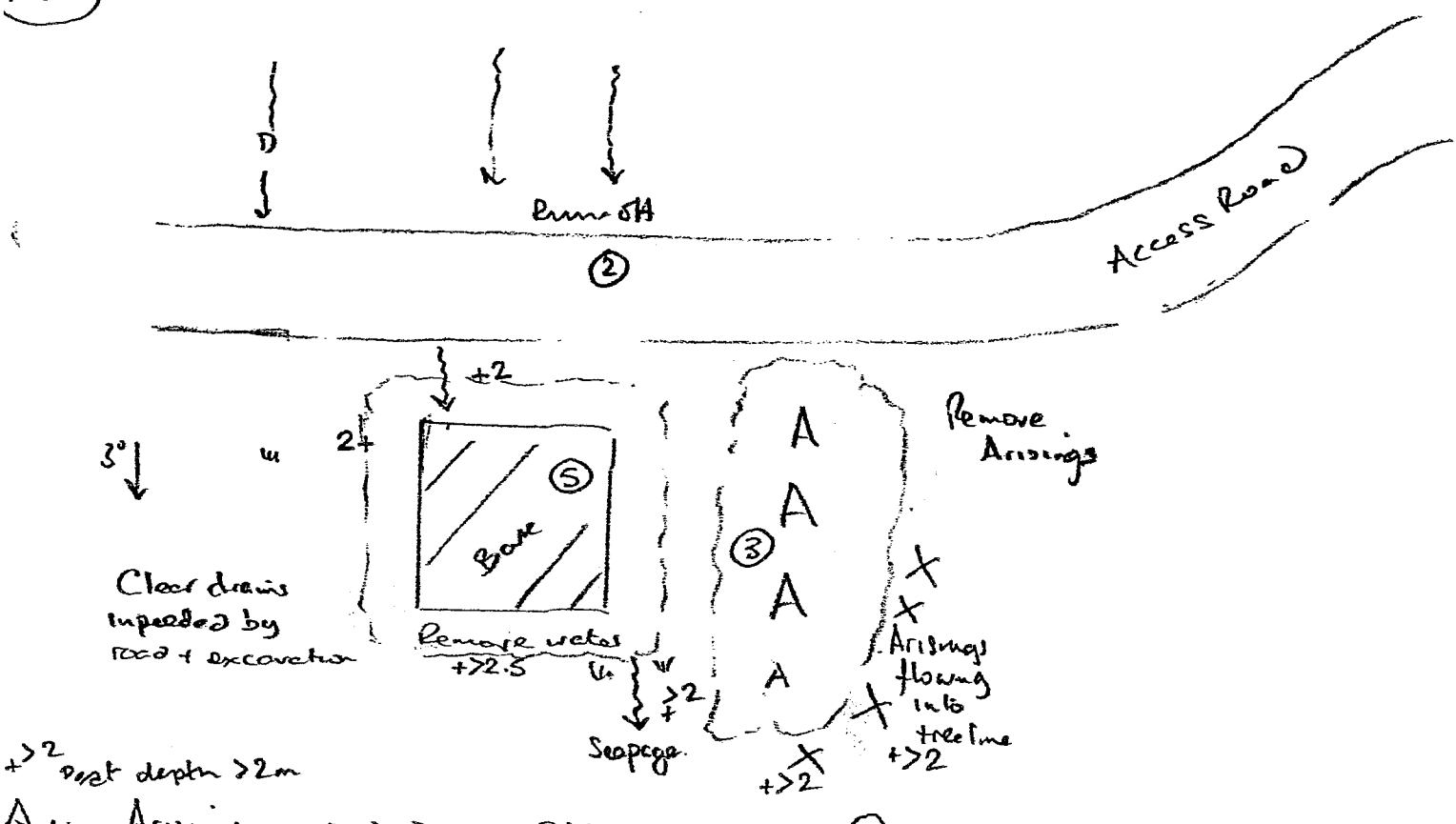
Project: Derrybrien Landslide Sheet No 1 of 2

Site Reference: **T22**	Mapped/Date: **AL 31/10/03**
Description of Site: **Site is within the forest. Site slopes to south to southwest at 3°. Site is mostly on shallow uniform slope.** **Peat thickness is between 1.5 and greater than 2m.**	
Description of Excavation: **Excavation is partly inundated and depth is unknown.**	Description of Arisings: **Arisings to the east and west of the excavation. Arisings comprise peat and glacial till. Minor slumping of arisings.**
Description of Access Road: **Floating Road running south to southwest direction.**	Description of Dewatering: **Not Known**
Description of Watercourses/Drainage on Site: **Blockage of stream/drain to west by road.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Ponding within the arisings.**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

T22



T21



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21/11/03

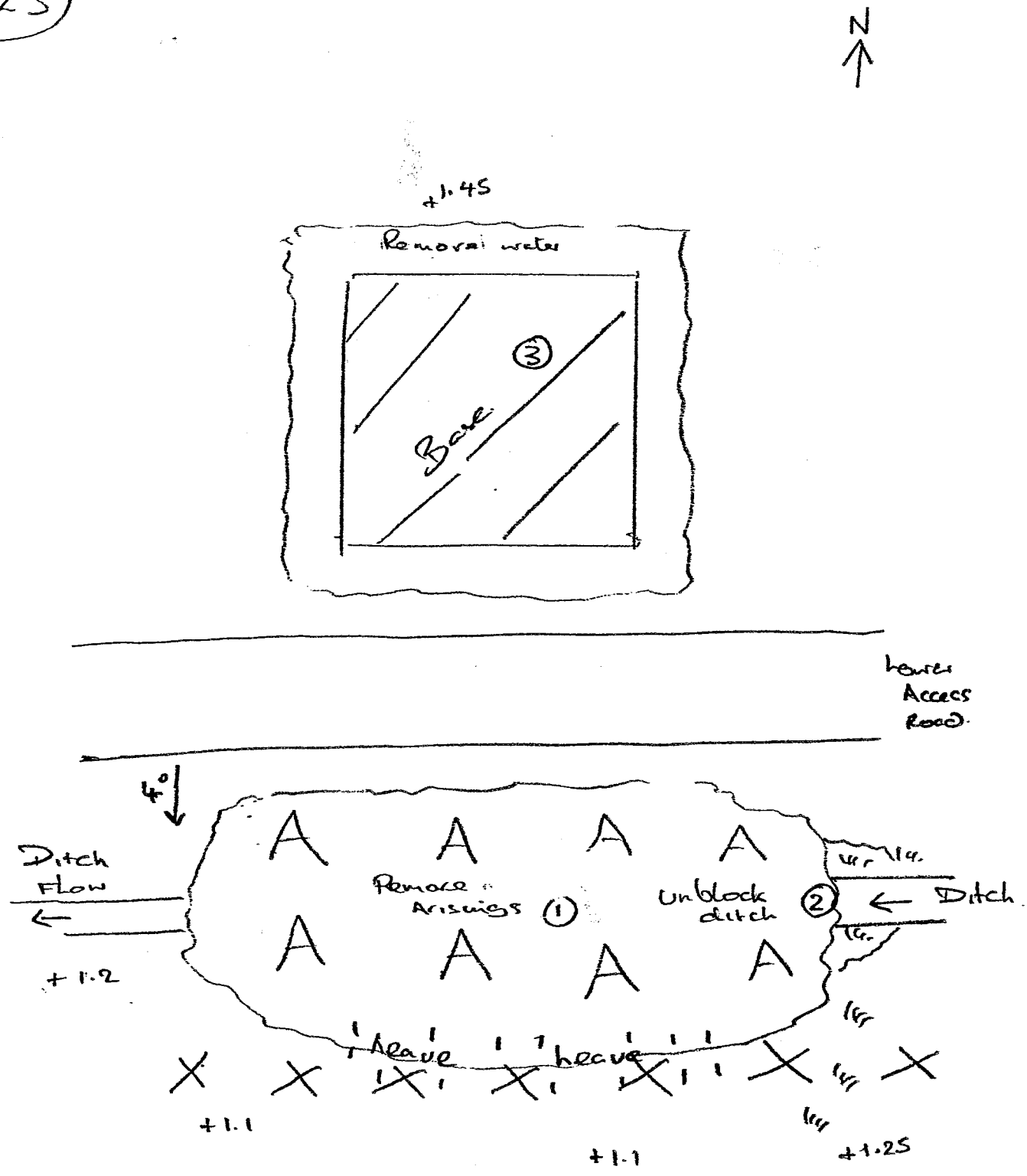
Sheet 2 of 2

Geotechnical Mapping Sheet

Project: Derrybrien Landslide

Site Reference: **T23**	Mapped/Date: **AL/PJ 31/10/03 & 1/11/03**
Description of Site: **Site is partially forested downslope of base with small immature trees to north. Site is located towards the southwest of the wind farm. Site slopes to south at 2 to 4 degs. Excavation for base complete, and base constructed.**	
Description of Excavation: **Excavation inundated with water, depth not known. Sideslopes about 45 degrees.**	Description of Arisings: **Arisings stockpiled to the south of the access road. Arisings consist of peat and till and extend some 20m by 40m. A drainage ditch has been blocked by the arisings causing back-up of water to the east.**
Description of Access Road: **Access road is a floating road aligned east-west.**	Description of Dewatering: **Not known.**
Description of Watercourses/Drainage on Site: **Two drainage lines, 15 m apart aligned N-S pass some distance to west of base excavation.**	
Description/Cause of Failure**: Failure comprises bearing failure of in situ peat underlying arisings resulting in heaving of ground. Heave is about 2m. There has possibly been trafficking of plant over arisings which has contributed to heave.**	
Failure Location & Orientation: **South of arisings within tree-line.**	Width Dimension of Failure Scar**: Heave is limited to a few meters width along edge of arisings**
Length Dimension of Failure Scar: **Assumed 20 to 40m.**	Angle/Shape of Failure Plane: **Translational/circular bearing failure surface.**
Failure Material Thickness: **Depth to failure plane is typically less than 1.5 m.**	Description of Failure Plane: **Plane not visible.**
Travel Distance of Failed Material: **None**	Seepage/Water Description: **None**
Description of Material above Failure Plane: **Very soft fibrous peat**	
Description of Incipient Instability: **None**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List) **N/A**	Photographs Taken: (List) **N/A**

23


N
+1.45
Removal water
3
Bank
Leaves Access Road
4°
Ditch Flow
+1.2
Remove Arisings
1
Unblock ditch
2
Ditch
Leave
Leave
+1.1
+1.1
+1.25

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T24**	Mapped/Date: **DB & KG 11/11/03**
Description of Site: **Site is east of T24 and is located at the centre of the wind farm. Site slopes to south at 4°. Base has been constructed**. **Peat thickness is 1.0m thick on shallow slope.**	
Description of Excavation: **Excavation in peat over mineral soil over glacial till.**	Description of Arisings: **Arisings up to 2.5m high to the North and West of the access road and base.**
Description of Access Road: **Running in an North South direction.**	Description of Dewatering: **Not known**
Description of Watercourses/Drainage on Site: **Drainage channel runs North-South along the eastern side of the base**	
Description/Cause of Failure: **N/A.**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T25**	Mapped/Date: **DB & KG 11/11/03**
Description of Site: **Site is south of T24 and is located to the South of the wind farm, to the West of the access road to T24 to T26 at its junction with access road (T17-T25). Site slopes at 3° to the South. Base excavation is complete. Peat thickness is 1.8m.**	
Description of Excavation: **Excavation in peat over mineral soil over glacial till.**	Description of Arisings: **Arisings occur to the North and East of the site. Further arisings occur 15m to the south of the base West and South (across the access road) from the excavation. The arisings are 1m high.**
Description of Access Road: **Running in an East-West direction and North South direction.**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site: **30m west of base flowing North-South, blocked by arisings**	
Description/Cause of Failure: **Localised slumping of the northeastern corner of the base. Micro-Cracking of the T25-T26 access road, 20m south of the base, east of the southern arisings occur. These run in an east west direction for the full width of the access road and cease to the south of the lower arisings.**	
Failure Location & Orientation:	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar:**N/A.**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	

Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T26**	Mapped/Date: **ML/DB 20&21/10/03**
Description of Site: **Site is forested and is located towards the southern part of the wind farm. Site slopes to south at 6 degs. and is downslope from T25. Excavation for base complete.**	
Description of Excavation: **Excavation approximately 2m in peat over 0.30m soft silty grey silt over 0.60m glacial till.**	Description of Arisings: **Arisings stockpiled to the east and west of the excavation and south of the access road, ground was saturated around arisings.**
Description of Access Road: **Access road running in an east west direction. No obvious settlement.**	Description of Dewatering: **Not known**
Description of Watercourses/Drainage on Site: **N/A**	
Description/Cause of Failure: **No indication of failure.**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane:**N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Seepage at northeast corner of the excavation.**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T27**	Mapped/Date: **DB & KG 11/11/03**
Description of Site: **Site is located at the centre of the wind farm, to the North of the access road for turbine bases T27-T44. Site slopes to south at 3° and at 2° to the east. Excavation has been completed and ponding has occurred. Peat thickness is > 2m thick on shallow slope.**	
Description of Excavation: **Excavation in peat over mineral soil over glacial till.**	Description of Arisings: **Arisings 2m high (20x40m in plan) were recorded at a distance 30m to the East of the base, and 0.5m high, (20x27m in plan) at a distance of 15m to the West of the base.**
Description of Access Road: **Running in an East-West direction.**	Description of Dewatering: **Not known**
Description of Watercourses/Drainage on Site: **None Noted**	
Description/Cause of Failure: **Side slope instability noted at Northern part of excavation**	
Failure Location & Orientation: **Horizontal tension cracks (24m long in an East West direction) noted at 2.4m North of the base, and (20m long in an East West direction) at 18.5m North of the base.**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **24 and 20m.**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	

Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **20m-24m.**
Average Width of Crack: **<0.4m**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T28**	Mapped/Date: **DB 12/11/03**
Description of Site: **Site is west of T31 and is located to the East of the wind farm, to the North of the access road T26 to T46. Site slopes at 3° to the West. Base excavation is complete**. **Peat thickness is >2.4m.**	
Description of Excavation: **Excavation in peat over mineral soil over glacial till.**	Description of Arisings: **Arisings occur to the West, 1.5m high (85mx15m in plan).**
Description of Access Road: **Running in an East-West direction.**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site: **The East-West access road drain is blocked by the turbine access road. An old excavated peat channel lies to the west of the arisings. A dry drainage ditch occurs to the east (running North–South) of the base.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A.**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide

Site Reference: **T29**	Mapped/Date: **DB & AL 21/10/03**
Description of Site: **Site is east of proposed substation and compound and is located on the southern boundary of the wind farm. Site slopes to south at 2° to 4°. Base has been constructed**. **Peat thickness is >2m thick on shallow slope.**	
Description of Excavation: **Excavation in 2m of peat, 15m wide by 17m long.**	Description of Arisings: **Arisings 27m long, 8m wide and 1m high. Arisings generally glacial till placed near tree line south of access road.**
Description of Access Road: **Running in an east west direction.**	Description of Dewatering: **Not known**
Description of Watercourses/Drainage on Site: **Drainage line (possibly natural line) runs N-S south of of access road, this area is very saturated.**	
Description/Cause of Failure: **Bearing failure of underlying intact peat. Arisings have slumped and flowed a small distance into forestry forming a lobe. The lobe has caused bearing failure of the underlying peat which has been displaced vertically upwards and outwards from under lobe.**	
Failure Location & Orientation: **South of access road, within the forestry.**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **1.5m**	Description of Failure Plane: **Shallow circular failure.**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Drainage line east of failure.**
Description of Material above Failure Plane: **Very soft fibrous peat**	
Description of Incipient Instability: **Cracks within area of bearing failure.**	
Location/Ref. of Instability: **South of access road.**	Length of Crack: **greater than 1m.**
Average Width of Crack: **greater than 0.10m**	Average Depth of Crack: **greater than 1m**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide

T29 – Bearing Failure South of Access Road and Arisings.

T29 – Tension Crack at Tree Line

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T30**	Mapped/Date: **DB & KG 11/11/03**
Description of Site: **Site is east of T27 and is located at the east of the wind farm, to the North of the access road to T27-T44. Site appears to be at the brow of a hill and slopes to south at 3° and at 3° to the North. No Excavation has taken place. Peat thickness is > 2.4m.**	
Description of Excavation: **N/A**	Description of Arisings: **N/A**
Description of Access Road: **Running in an East-West direction.**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site: **Drain along road edge is blocked, Old drainage ditch/previous access road 3m wide to the south of the access road.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar:**N/A.**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T31**	Mapped/Date: **DB 12/11/03**
Description of Site: **Site is west of T34 and is located to the East of the wind farm, to the North of the access road T26 to T46. Site slopes at 2° to the North and East. No construction has occurred**. **Peat thickness is >2.4m.**	
Description of Excavation: **N/A**	Description of Arisings: **N/A**
Description of Access Road: **Running in an East-West direction.**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site: **A v-ditch drain runs North-South to the West of the proposed base. A deep drain is present to the south of the access road.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A.**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T32**	Mapped/Date: **DB & AL 21/10/03**
Description of Site: **Site is east of T29 and is located on the southern boundary of the wind farm. Site slopes to south at 5°. Base has been constructed**. **Peat thickness is >1m thick on shallow slope.**	
Description of Excavation: **Excavation in peat over mineral soil over glacial till, 15m wide by 17m long.**	Description of Arisings: **Arisings to east of the excavation and to the south of the access road.**
Description of Access Road: **Running in an east west direction. Slowing down water flow from drainage channels upslope.**	Description of Dewatering: **Not known**
Description of Watercourses/Drainage on Site: **Drainage line runs N-S south to the east of the excavation, drainage line infilled in areas during excavation works. Drainage channel running in a west east direction and 2.5m wide.**	
Description/Cause of Failure: **N/A.**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T33**	Mapped/Date: **DB & KG 11/11/03**
Description of Site: **Site is east of T30 and is located to the North-East of the wind farm, to the North of the access road to T27-T44. Site appears to be at the crest of a hill and slopes to south at 3° and at 3° to the North. No Excavation has taken place. Peat thickness is > 2.4m.**	
Description of Excavation: **N/A**	Description of Arisings: **N/A**
Description of Access Road: **Running in an East-West direction.**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site: **Channel runs North-South, to the West of the base.**	
Description/Cause of Failure: **Some localised tension cracking around edges of the access road.**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar:**N/A.**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T34**	Mapped/Date: **DB 12/11/03**
Description of Site: **Site is west of T37 and is located to the East of the wind farm, to the North of the access road T26 to T46. Site slopes at 3-6° to the North. Excavation is complete**. **Peat thickness is >2.4m.**	
Description of Excavation: **Excavation in peat over mineral soil over glacial till.**	Description of Arisings: **Arisings occur to the North West of the base and appear to have spread/slumped**
Description of Access Road: **Running in an East-West direction.**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site: **A v-ditch drain runs East West terminating 10-15m to the east of the base in a North-South trending old excavated peat trench. A north –south trending drain is present 15-20m west of the base and is not evident beyond the arising, possibly because of infilling by the excavated material. The access road drain is blocked by the turbine road construction.**	
Description/Cause of Failure: **The excavated material appears to have flowed some 80-130m downslope.**	
Failure Location & Orientation: **Steep slope and ponding water**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A.**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **80-130m**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	

Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T35**	Mapped/Date: **DB & AL 21/10/03**
Description of Site: **Site is east of T32 and is located in the forest on the southern boundary of the wind farm. Site slopes to south at 4°. Base has been constructed**. **Peat thickness is 0.75m thick on shallow slope.**	
Description of Excavation: **Excavation in peat over mineral soil over glacial till.**	Description of Arisings: **Arisings to east and west of the excavation and to the south of the access road.**
Description of Access Road: **Running in an east west direction. Slowing down water flow from drainage channels upslope.**	Description of Dewatering: **Not known**
Description of Watercourses/Drainage on Site: **Drainage line runs NW-SE to the west of the excavation.**	
Description/Cause of Failure: **N/A.**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	

Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T36**	Mapped/Date: **DB & KG 11/11/03**
Description of Site: **Site is east of T33 and is located to the North-East of the wind farm, to the South of the access road to T27-T44. Site is relatively flat in area of proposed base and slopes gently (≤ 3°) thereafter to the south. No Excavation has taken place. Peat thickness is > 2.4m.**	
Description of Excavation: **N/A**	Description of Arisings: **N/A**
Description of Access Road: **Running in an East-West direction.**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site: **Old drainage ditch/previous access road 3m wide to the south of the base location.**	
Description/Cause of Failure:	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar:**N/A.**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T37**	Mapped/Date: **DB & KG 11/11/03**
Description of Site: **Site is west of T40 and is located to the East of the wind farm, to the North of the access road T26 to T46. Site slopes at 3.5° to the South and 2° to the east. Base excavation is complete**. **Peat thickness is 1.5-2.0m.**	
Description of Excavation: **Excavation in peat over mineral soil over glacial till.**	Description of Arisings: **Arisings occur to the East, 1.5m high (70mx8m in plan), and to the South, 1m high (15mx10m in plan).**
Description of Access Road: **Running in an East-West direction.**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site: **The access road drain, to the North of the base has been blocked by arisings. Old peat excavated channels exist to the east and west of the base.**	
Description/Cause of Failure: **Localised failure at the face of the excavation in the South-West corner, where spoil heap is closest to excavation.**	
Failure Location & Orientation: **Localised failures of east and west excavated faces evident**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A.**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T38**	Mapped/Date: **DB & AL 21/10/03**
Description of Site: **Site is east of T35 and is located within the forestry on the southern boundary of the wind farm. Site slopes to south at 3°. Base has been constructed**. **Peat thickness is 0.75m thick on shallow slope.**	
Description of Excavation: **Excavation in peat over mineral soil over bedrock.**	Description of Arisings: **Arisings to east and west of the excavation and to the south of the access road.**
Description of Access Road: **Running in an east west direction.**	Description of Dewatering: **Not known**
Description of Watercourses/Drainage on Site: **Drainage line runs from west and east meeting at the south of the access road then running south.**	
Description/Cause of Failure: **N/A.**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T39**	Mapped/Date: **DB & KG 11/11/03**
Description of Site: **Site is east of T36 and is located to the North-East of the wind farm, to the South of the access road to T27-T44. Site slopes at 2° to the North and 3° to the East. No Excavation has taken place. Peat thickness is > 2.4m.**	
Description of Excavation: **N/A**	Description of Arisings: **N/A**
Description of Access Road: **Running in an East-West direction.**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site: **Old drainage ditch/previous access road 3m wide to the south of the base location.**	
Description/Cause of Failure:**.**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar:**N/A.**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T40**	Mapped/Date: **DB 12/11/03**
Description of Site: **Site is east of T37 and is located to the East of the wind farm, to the Nortth of the access road T25 to T45. Site slopes at 3° to the South. Base excavation is complete. Peat thickness is 2.0m.**	
Description of Excavation: **Excavation in peat over mineral soil over glacial till.**	Description of Arisings: **Arisings occur to the West, 1m high (35mx8m in plan), to the South, 2m high (20mx5m in plan) and to the East, 1m high (35x8m in plan).**
Description of Access Road: **Running in an East-West direction.**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site: **The access road drain, to the South of the base has been blocked by arisings.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A.**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	

Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T41**	Mapped/Date: **DB & AL 21/10/03**
Description of Site: **Site is east of T38 and is located within the forestry on the southern boundary of the wind farm. Site slopes to south at 3°. Base has been constructed**. **Peat thickness is 1.5m thick on shallow slope.**	
Description of Excavation: **Excavation in peat over mineral soil over glacial till.**	Description of Arisings: **Arisings to the south of the access road. The arisings have blocked drain and have flowed into the tree line.**
Description of Access Road: **Running in an east west direction.**	Description of Dewatering: **Not known**
Description of Watercourses/Drainage on Site: **Drainage line runs in an east west direction at the south of the access road. Drain blocked by peat arising, arisings saturated around drain line.**	
Description/Cause of Failure: **N/A.**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T42**	Mapped/Date: **DB & KG 11/11/03**
Description of Site: **Site is east of T39 and is located to the North-East of the wind farm, to the North of the access road to T27-T44. Site slopes at 4° to the East. Base construction is complete. Peat thickness is 2.1m.**	
Description of Excavation: **Excavation in peat over mineral soil over glacial till.**	Description of Arisings: **Arisings occur approx 20m to the East, West and South (across the access road) from the excavation. The arisings are 0.5-1m high, show signs of slumping.**
Description of Access Road: **Running in an East-West direction.**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site: **Old drainage ditch/previous access road 3m wide to the south of the base location. A drainage channel has been excavated in an easterly direction from the North East corner of the base. This is blocked by arisings.**	
Description/Cause of Failure: **Slumping of the Northern face of the base is evident.**	
Failure Location & Orientation:	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **Tension crack 20m upslope to the west of the base, terminating at the base.**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T43**	Mapped/Date: **DB & KG 11/11/03**
Description of Site: **Site is east of T40 and is located to the East of the wind farm, to the North of the access road to T26 to T46. Site slopes at 5° to the South. Base excavation is complete**. **Peat thickness is 1.5m.**	
Description of Excavation: **Excavation in peat over mineral soil over glacial till.**	Description of Arisings: **Arisings occur to the West, 0.5m high (30mx20m in plan), to the North, 0.5m high (8mx15m in plan) and to the East, 2m high (60x10m in plan).**
Description of Access Road: **Running in an East-West direction.**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site: **A north-south trending drain has been excavated from the South-West corner of the base. This runs to the east-west access road drain.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A.**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T44**	Mapped/Date: **DB & KG 11/11/03**
Description of Site: **Site is east of T42 and is located to the North-East of the wind farm, to the North of the access road to T27-T44. Site slopes at 3° to the East. Base excavation is complete. Peat thickness is 2.3m.**	
Description of Excavation: **Excavation in peat over mineral soil over glacial till.**	Description of Arisings: **Arisings occur approx 20m to the East, West and South (across the access road) from the excavation. The arisings are <1m high.**
Description of Access Road: **Running in an East-West direction.**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site: **Old drainage ditch/previous access road 3m wide to the south of the base location. A drainage channel 2.3m to the north of the base is blocked by arisings.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar:**N/A.**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T45**	Mapped/Date: **DB & KG 11/11/03**
Description of Site: **Site is west of T46 and is located to the East of the wind farm, to the North of the access road T26 to T46. Site slopes at 2° to the South, and 4° to the east. Base excavation is complete. Peat thickness is > 2.0m.**	
Description of Excavation: **Excavation in peat over mineral soil over glacial till.**	Description of Arisings: **Arisings occur 10-15m to West, 1m high (70mx10m in plan), and to the East, 1m high (50x10m in plan).**
Description of Access Road: **Running in an East-West direction.**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site: **The access road drain, to the North of the base has been blocked by arisings. A dry channel exists at the rear of the base.**	
Description/Cause of Failure: **Localised failure at the face of the excavation in the South-West corner, where arisings is closest to excavation.**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A.**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	

Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T46**	Mapped/Date: **DB & KG 11/11/03**
Description of Site: **Site is south of T45 and is located to the East of the wind farm, to the South of the access road to T26 to T46. Site slopes at 3° to the South. Base excavation is complete. Peat thickness is 1.5m to 1.8m.**	
Description of Excavation: **Excavation in peat over mineral soil over glacial till.**	Description of Arisings: **Arisings occur approx. 20m South (20mx15m in plan) and East (50mx15m in plan) of the site. The arisings are up to 1.5m high.**
Description of Access Road: **Running in an East-West direction.**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site: **Excavated channels/peak harvested areas occur 25m to the east and West of the base. Both channels run in a North South direction, with the eastern channel being 5m wide and 1.2m deep, and the western channel being 10m wide and up to 1.5m deep. A drain runs along the access road.**	
Description/Cause of Failure: **N/A**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar:**N/A.**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T47**	Mapped/Date: **PJ & ML 22/10/03**
Description of Site: **Site is forested and is located on the north-western boundary of wind farm. Site slopes to northwest at 1° to 13°. Site is mostly on shallow slope with a scarp slope along northern side. Proposed base for T47 is some 65m south of crest of scarp slope. Scarp slope is about 13°.** **Peat thickness is >2m thick on shallow slope decreasing to about 1.6m on scarp slope and further downslope.**	
Description of Excavation: **None**	Description of Arisings: **None**
Description of Access Road: **None**	Description of Dewatering: **None**
Description of Watercourses/Drainage on Site: **Western boundary v-ditch discharges into existing channel. V-ditch is some 10m to west of proposed base.**	
Description/Cause of Failure: **None**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Numerous wet areas and springs present along scarp slope. Forestry furrows channel surface water into scarp slope.**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **Areas of irregular ground along scarp slope. Movement is not recent and does not appear active.**	
Location/Ref. of Instability: **On scarp slope along northern boundary of site.**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T48**	Mapped/Date: **PJ & ML 22/10/03**
Description of Site: **Site is forested and is located on the northern boundary of wind farm. Site slopes to northwest at 2° to 13°. Site is mostly on shallow slope with a scarp slope along northern side. Proposed base for T48 is some 30m south of crest of scarp slope. Scarp slope is about 13°.** **Peat thickness is >2m thick on shallow slope decreasing to about 1m on scarp slope and further downslope.**	
Description of Excavation: **None**	Description of Arisings: **None**
Description of Access Road: **None**	Description of Dewatering: **None**
Description of Watercourses/Drainage on Site: **None**	
Description/Cause of Failure: **None**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Numerous wet areas and springs present along scarp slope. Forestry furrows channel surface water into scarp slope.**
Description of Material above Failure Plane: **N/A**	

Description of Incipient Instability: A**reas of irregular ground along scarp slope. Movement is not recent and does not appear active.**	
Location/Ref. of Instability: **On scarp slope along northern boundary of site.**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T49**	Mapped/Date: **PJ & ML 21/10/03**

Description of Site: **Site is forested and is located on the northern boundary of the wind farm. Site slopes to northwest at 2° to 15°. Site is mostly on shallow slope with a scarp slope along northern side. Proposed base for T49 is 10m south of crest of scarp slope. Scarp slope is 10° and comprises irregular ground.**

Peat thickness is >2m thick on shallow slope decreasing to about 1m thick on scarp slope. Rock is considered to be at shallow depth on scarp slope.

Description of Excavation: **None**	Description of Arisings: **None**
Description of Access Road: **None**	Description of Dewatering: **None**

Description of Watercourses/Drainage on Site: **No existing watercourses or drainage. Fire-break running N-S through site is notably wetter than forested area.**

Numerous wet areas and springs present along scarp slope.

Description/Cause of Failure: **Possible several failures on scarp slope comprising irregular ground with discordant drainage. Cracks or possibly narrow incised watercourses at some locations. Failures are considered shallow and likely comprised movement of peat over rock.**

Failures are not recent and show no signs of activity.

Downslope extent of irregular ground is about 20m, that is the extent of the scarp slope. There is a fire-break at the toe of the scarp slope. Examination of mature forest at the toe of the scarp slope showed no apparent signs of instability.

Failure Location & Orientation: **On scarp slope along northern boundary of site.**	Width Dimension of Failure Scar: **10 to 20m.**
Length Dimension of Failure Scar: **Up to 20m.**	Angle/Shape of Failure Plane: **8° to 15°.**
Failure Material Thickness: **Less than 2m.**	Description of Failure Plane: **Translational sliding on rockhead.**
Travel Distance of Failed Material: **Less than 20m.**	Seepage/Water Description: **Numerous wet areas and springs present along scarp slope. Forestry furrows channel surface water into scarp slope.**

Description of Material above Failure Plane: **Very soft to soft black fibrous peat (?)**

Description of Incipient Instability: **Numerous areas of irregular ground along scarp slope. Movement is not recent and does not appear active.**

Location/Ref. of Instability: **On scarp slope along northern boundary of site.**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T50**	Mapped/Date: **PJ & ML 22/10/03**

Description of Site: **Site is forested and is located on the northern boundary of wind farm. Site slopes to northwest at 2° to 18°. Site is mostly on shallow slope with a scarp slope along northern side. Proposed base for T50 is several metres south of crest of scarp slope. Scarp slope is about 18°.**

Peat thickness about 1.5m to >2m thick on shallow slope decreasing to about <0.5m thick on scarp slope. Rock is considered to be at shallow depth on scarp slope.

Rock exposures along scarp slope. 20m length of minor cliff with voids in rock (2W x 3L x 1.5H). Possible quarry or local failure of rock.

Areas of wet ground with standing water some 100m south of location of proposed base.

Description of Excavation: **None**	Description of Arisings: **None**
Description of Access Road: **Floating road**	Description of Dewatering: **None**

Description of Watercourses/Drainage on Site: **No existing watercourses or drainage. Fire-break running N-S through site is notably wetter than forested area.**

Numerous wet areas and springs present along scarp slope.

Description/Cause of Failure: **Possible failure on scarp slope comprising irregular ground with discordant drainage and reduced peat thickness. Failure considered shallow and likely comprised movement of peat over rock.**

Failure is not recent and shows no signs of activity.

Downslope extent of irregular ground is about 20m, that is the extent of the scarp slope. There is a fire-break at the toe of the scarp slope. Examination of mature forest at the toe of the scarp slope showed no apparent signs of instability.

Failure Location & Orientation: **On scarp slope along northern boundary of site.**	Width Dimension of Failure Scar: **9m.**
Length Dimension of Failure Scar: **Up to 20m.**	Angle/Shape of Failure Plane: **14°.**
Failure Material Thickness: **Less than 2m.**	Description of Failure Plane: **Translational sliding on rockhead.**
Travel Distance of Failed Material: **Less than 20m.**	Seepage/Water Description: **Numerous wet areas and springs present along scarp slope. Forestry furrows channel surface water into scarp slope.**

Description of Material above Failure Plane: **Very soft to soft black fibrous peat (?)**

Description of Incipient Instability: **Numerous areas of irregular ground along scarp slope. Movement is not recent and does not appear active.**

Location/Ref. of Instability: **On scarp slope along northern boundary of site.**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T51**	Mapped/Date: **PJ & ML 22/10/03**
Description of Site: **Site is forested and is located on the northern boundary of wind farm. Site slopes to northwest at 1° to 6°. Site is mostly on shallow slope with a scarp slope along northern side. Proposed base for T51 is 25m south of crest of scarp slope. Scarp slope is about 4° to 6°, note scarp slope becomes steeper to the west.** **Peat thickness is >2m thick on shallow slope and on scarp slope.**	
Description of Excavation: **None**	Description of Arisings: **None**
Description of Access Road: **Floating road**	Description of Dewatering: **None**
Description of Watercourses/Drainage on Site: **Drainage line (possibly natural line) runs N-S and passes 50m to west of proposed location of base. Upstream drainage line comprises some 20m wide wet ground with standing water.** **Fire-break running N-S in forest below proposed base site is notably wetter than forested area and contains stream. Slope angle is about 6°**. **Numerous wet areas present at base of scarp slope.**	
Description/Cause of Failure: **None**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T52**	Mapped/Date: **PJ & ML 22/10/03**
Description of Site: **Site is forested and is located on the north-eastern boundary of wind farm. Site slopes to northwest at 2° to 5°. Site is mostly on shallow slope with a scarp slope along northern side. Proposed base for T52 is south of crest of scarp slope. Scarp slope is about 5°, note scarp slope becomes steeper to the west.** **Peat thickness is 1.5m to 2.8m thick on shallow slope and on scarp slope.** **Dense mature and upright trees surround proposed location of base.**	
Description of Excavation: **None**	Description of Arisings: **None**
Description of Access Road: **Floating road**	Description of Dewatering: **None**
Description of Watercourses/Drainage on Site: **Drainage line (possibly natural line further downslope) runs N-S and passes some 100m to west of proposed location of base. Drainage line is V-ditch.**	
Description/Cause of Failure: **None**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T53**	Mapped/Date: **PJ & ML 21/10/03**

Description of Site: **Site is forested and is located on the north-western boundary of wind farm. Site slopes to northwest at 1° to 7°. Site is mostly on shallow slope with a minor scarp slope along southern side. Proposed base for T53 is some 70m north of scarp slope. Scarp slope is about 2.5m high at about 7°.**

Peat thickness is 1.2m to 3.5m thick.

Area of shallow depression lies to south of proposed base.

Description of Excavation: **None**	Description of Arisings: **None**
Description of Access Road: **Floating road**	Description of Dewatering: **None**

Description of Watercourses/Drainage on Site: **Drainage line runs N-S and passes some 10m to west of proposed location of base. Drainage line is V-ditch.**

Further V-ditch runs NE-SW some 5m south of proposed location for base.

Description/Cause of Failure: **None**

Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**

Description of Material above Failure Plane: **N/A**

Description of Incipient Instability: **Closure of walls of V-ditch located some 5m to south. This also corresponds to kink in road (7m distance) and area of hard standing (12m distance).**

Location/Ref. of Instability: **Within V-ditch located to south of base.**	Length: **20m**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T54**	Mapped/Date: **PJ & ML 21/10/03**
Description of Site: **Site is forested and is located in the northern part of wind farm. Site slopes to northwest at 1° to 15°. Site is mostly on shallow slope with a minor scarp slope along northern side. Proposed base for T54 is some 70m south of scarp slope. Scarp slope is about 5m high at about 15°.** **Peat thickness is 1.3m to 2.7m thick.**	
Description of Excavation: **None**	Description of Arisings: **None**
Description of Access Road: **Floating road**	Description of Dewatering: **None**
Description of Watercourses/Drainage on Site: **V-ditch running NE-SW some 10m from proposed location for base.**	
Description/Cause of Failure: **Minor scar at head of scarp slope.**	
Failure Location & Orientation: **On scarp slope 70m to north.**	Width Dimension of Failure Scar: **5m(?)**
Length Dimension of Failure Scar: **>20m**	Angle/Shape of Failure Plane: **15°**
Failure Material Thickness: **<1m**	Description of Failure Plane: **Translational slide likely on rockhead**
Travel Distance of Failed Material: **<20m**	Seepage/Water Description: **N/K**
Description of Material above Failure Plane: **Peat**	
Description of Incipient Instability: **Areas of irregular ground with discordant drainage on scarp slope.**	
Location/Ref. of Instability: **N/A**	Length: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T55**	Mapped/Date: **PJ & ML 21/10/03**
Description of Site: **Site is forested and is located in the northern part of wind farm. Site slopes to northwest at 1° to 7°. Site is mostly on shallow slope with a minor scarp slope along northern side. Proposed base for T55 is some 75m south of scarp slope. Scarp slope is about 3m to 5m high at about 7°.** **Peat thickness is 1.3m to >3.1m thick.** **Shallow depression, with standing water some 70m to south**	
Description of Excavation: **None**	Description of Arisings: **None**
Description of Access Road: **Floating road**	Description of Dewatering: **None**
Description of Watercourses/Drainage on Site: **V-ditch running NE-SW some 10m from proposed location for base.**	
Description/Cause of Failure: **None**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **Localised bulging of V-ditch**	
Location/Ref. of Instability: **N/A**	Length: **5m**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T56**	Mapped/Date: **PJ & ML 21/10/03**
Description of Site: **Site is forested and is located in the northern part of wind farm. Site slopes to northwest at 1° to 5°. Site is mostly on shallow slope with a minor scarp slope to the south.** **Peat thickness is 1m to >2m thick.** **Shallow depression, with standing water to north**	
Description of Excavation: **None**	Description of Arisings: **None**
Description of Access Road: **Floating road**	Description of Dewatering: **None**
Description of Watercourses/Drainage on Site: **V-ditch running NE-SW some 10m from proposed location for base.** **Natural drainage line runs N-S and passes 35m to west of proposed location of base. Downstream drainage line comprises some 20m wide wet ground with standing water.**	
Description/Cause of Failure: **None**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **None**	
Location/Ref. of Instability: **N/A**	Length: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T57**	Mapped/Date: **ML & DB 23/10/03**

Description of Site: **Site is located on the northern slope of mountain, in cleared ground adjacent (east) to an access road intersection and west of dense forest. To the north of T57 the site slopes northward at 4°. Peat depths range between 1.3 and 1.7m. At T57 peat depth is generally 1.0m. To the south, the ground rises at 6/7° (a break in slope). The peat thins to less than 0.5m at the base of this slope and thickens to 1.2m higher up the slope**.

Westward along the west/east access road, the ground is generally level. Eastward the site is densely forested.

Description of Excavation: **None**	Description of Arisings: **None**
Description of Access Road: **None**	Description of Dewatering: **None**

Description of Watercourses/Drainage on Site: **A south to north drainage ditch commences adjacent to T57 and runs parallel to the access road. This appears to follow a natural drainage path northward. A west/east drain links into the north/south drain immediately north of T57. A natural drainage line (disturbed) feeds into the west/east drain 27m west of T57. The west/east drain sides have slumped on both sides at this point.**

Description/Cause of Failure: **None**

Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**

Description of Material above Failure Plane: **N/A**

Description of Incipient Instability: **N/A**

Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T58**	Mapped/Date: **ML & DB 23/10/03**

Description of Site: **Site is located on the northern slope of mountain, in dense forest. The ground is relatively uniform, sloping 3° generally from north to south. Peat depths range between 1.7 to greater than 2.0m.**

Location of T58 is approximate, as it has not been set out. No tree clearing or construction of access roads has been undertaken.

Description of Excavation: **None**	Description of Arisings: **None**
Description of Access Road: **None**	Description of Dewatering: **None**

Description of Watercourses/Drainage on Site: **A natural drainage path occurs approximately 50/100m east of the T58, striking 009° /025°**.

Description/Cause of Failure: **None**

Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**

Description of Material above Failure Plane: **N/A**

Description of Incipient Instability: **N/A**

Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T59**	Mapped/Date: **DB & AL 22/10/03**
Description of Site: **Site is forested and is located on the western boundary of wind farm. Site slopes to northwest at 2°. Proposed base for T59 is west of T60.** **Peat thickness is >2m thick on shallow slope.**	
Description of Excavation: **N/A**	Description of Arisings: **N/A**
Description of Access Road: **N/A**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site**: Drainage channel offset 4m from access road running in a northeast to southwest location.**	
Description/Cause of Failure: **None**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T60**	Mapped/Date: **DB & AL 22/10/03**
Description of Site: **Site is forested and is located on the west of wind farm. Site is flat.** **Peat thickness is >2m thick.**	
Description of Excavation: **N/A**	Description of Arisings: **N/A**
Description of Access Road: **Depression in access road south of proposed location for T60.**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site**: Drainage channel offset 4m from access road running in a east to west location.**	
Description/Cause of Failure: **None**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **Tension crack north of access road from settlement of road.**	
Location/Ref. of Instability: **N/A**	Length of Crack: **4m**
Average Width of Crack: **0.10m**	Average Depth of Crack: **1m**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T61**	Mapped/Date: **DB & AL 22/10/03**
Description of Site: **Site is forested and is located on the west of wind farm. Site slopes at 2 to 3 degrees.** **Peat thickness is >2m thick.**	
Description of Excavation: **N/A**	Description of Arisings: **N/A**
Description of Access Road: **Depression in access road south of proposed location for T60.**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site**: Drainage channel offset 4m from access road running in a east to west location. Flat saturated area to the south of proposed excavation, localised ponding.**	
Description/Cause of Failure: **None**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **Localised tension crack north of access road from settlement of road.**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T62**	Mapped/Date: **DB & AL 22/10/03**
Description of Site: **Site is witin forested area and is located towards centre of wind farm. Site is flat. Proposed base for T62 is east of T61** **Peat thickness is >2m thick on shallow slope.**	
Description of Excavation: **Partially excavated**	Description of Arisings: **Arisings to the north, south and east of excavation.**
Description of Access Road: **N/A**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site**: Drainage channel for pumping in an east direction**	
Description/Cause of Failure: **None**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Saturated flat area.**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T63**	Mapped/Date: **DB & AL 22/10/03**
Description of Site: **Site is within forested area and is located towards centre of wind farm. Site is flat to 4 degrees. Locally minor steep slope at 8 degrees to east.** **Peat thickness is 2.5m thick on shallow slope.**	
Description of Excavation: **Excavation in 2.5m of peat over rock.**	Description of Arisings: **To the east of the excavation and north of the access road.**
Description of Access Road: **N/A**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site**: N/A**	
Description/Cause of Failure: **None**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Localised ponding of water around arisings.**
Description of Material above Failure Plane: **N/A**	

Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T64**	Mapped/Date: **DB & AL 22/10/03**
Description of Site: **Site is forested and is located on the towards the east of wind farm. Site slopes in a east to northeast direction 2°.** **Peat thickness is >2m thick.**	
Description of Excavation: **N/A**	Description of Arisings: **N/A**
Description of Access Road: **N/A**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site**: N/A**	
Description/Cause of Failure: **None**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T65**	Mapped/Date: **DB & AL 22/10/03**
Description of Site: **Site is forested and is located on the east of wind farm. Site slopes in an east to northeast direction 2°. Borrow pit no. 3 located 30m north of proposed excavation.** **Peat thickness is 2.5m thick.**	
Description of Excavation: **N/A**	Description of Arisings: **N/A**
Description of Access Road: **N/A**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site**: N/A**	
Description/Cause of Failure: **None**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **N/A**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide

Site Reference: **T66**	Mapped/Date: **DB & ML 22/10/03**
Description of Site: **Site is forested and is located towards the centre of the wind farm. Site slopes to south at 3 to 5 degs. and is immediately upslope of the failure at site T68. Base has been constructed.** **Peat depth greater than 2m.**	
Description of Excavation: **N/A**	Description of Arisings: **N/A**
Description of Access Road: **N/A**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site: **Possibly natural drainage valley north of T68 . Water appears to follow furrows within the forestry which drain downslope.**	
Description/Cause of Failure: **Bearing failure of underlying intact peat. Arisings have slumped and flowed a small distance into forestry forming a lobe. The lobe has caused bearing failure of the underlying peat which has been displaced vertically upwards and outwards from under lobe.**	
Failure Location & Orientation: **South of road, within forestry.**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **greater than 2m**	Description of Failure Plane: **Shallow circular/ translational in disturbed and intact peat**
Travel Distance of Failed Material: **(1) 2-3 m downslope, (2) 1m upward and about 1m horizontal**	Seepage/Water Description: **Ponded water presumed from over-pumping of water from excavation.**
Description of Material above Failure Plane: **Very soft black fibrous peat**	
Description of Incipient Instability: **Tension cracking and bulging of excavated peat slope. Repaired slip in excavated peat slope. Subsidence of road behind failure.**	
Location/Ref. of Instability: **Tension cracks N of excavation within 2m of crest. Bulging and repaired slip in N face**	Length of Crack: **Cracks are several metres in length. Subsidence is about 5m long**
Average Width of Crack: **Subsidence is about 1m wide**	Average Depth of Crack: **Cracks 1.0m with water at 0.4m bgl. Subsidence 0.2 m deep.**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide

T66 – Heave of Intact Peat.

T66 – Bearing Failure South of Access Road and Arisings.

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T67**	Mapped/Date: **DB & ML 22/10/03**
Description of Site: **Site is within the forest and is located in the centre of wind farm. Site slopes to south at 4°. Site is mostly on shallow slope. Base for T67 is located east of T66. Base is constructed**. **Peat thickness is 2.5m thick on a shallow slope.**	
Description of Excavation: **Excavation in 2.5m thick of peat.**	Description of Arisings: **Arisings to the east and west of the excavation and to the south of the access road.**
Description of Access Road: **Running west to east then turning to a north direction. Depression valley where the road turns from east to north.**	Description of Dewatering: **Pumping was carried out at the east of the excavation close to depression.**
Description of Watercourses/Drainage on Site**: Drainage channel to the north east of the excavation, pond present 20 to 30m north of excavation.**	
Description/Cause of Failure: **None**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Ponding within the forest from over pumping.**
Description of Material above Failure Plane: **N/A**	

Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 2

Site Reference: **T68**	Mapped/Date: **DB & ML 20/10/03**
Description of Site: **Site is within the forest and is location of failure of 16 October 2003. Site slopes to south at 2 to 6°. Base for T69 is located east of T68. Base excavation is partially excavated**. **Peat thickness is 3.5m thick on a shallow slope.**	
Description of Excavation: **Excavation is 3.5m thick of peat.**	Description of Arisings: **Arisings to the west and east of the excavation and also probably to the south of the access road.**
Description of Access Road: **Running west to east direction. Horizontal and vertical displacement.**	Description of Dewatering: **Not Known**
Description of Watercourses/Drainage on Site**: Drainage channel running from west around the north of the excavation and turning to the south along the east of the failure.** **Shallow valley running north-south through site.**	
Description/Cause of Failure: **Slip failure, possibly from loading to south of access road.**	
Failure Location & Orientation: **Failure in a south direction**	Width Dimension of Failure Scar: **45 to 275m**
Length Dimension of Failure Scar: **1.75km**	Angle/Shape of Failure Plane: **2 to 8 deg**
Failure Material Thickness: **1.5 to 2.5m**	Description of Failure Plane: **Failure on base of peat**
Travel Distance of Failed Material: **1.3km**	Seepage/Water Description: **Water within failure scar, partly fed by drains intercepted by failure**
Description of Material above Failure Plane: **Very soft fibrous peat**	
Description of Incipient Instability: **Localised tension cracks south of excavation and in access road.**	
Location/Ref. of Instability: **North to northeast of excavation.**	Length of Crack: **5 to 6m**
Average Width of Crack: **0.5 to 0.7m**	Average Depth of Crack: **0.8m**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide

T68 – Crest of Failure, Bowing of Access Road.

T68 – Failure Plane Approximately 50m South of Base.

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T69**	Mapped/Date: **DB & ML 20/10/03**
Description of Site: **Site is within the forest and is located in the centre of wind farm. Site slopes to south at 8°. Site is mostly on shallow slope. Base for T69 is located east of T68. Base is partially constructed**. **Peat thickness is >2m thick on a shallow slope.**	
Description of Excavation: **Excavation in greater than 2m thick of peat.**	Description of Arisings: **Arisings to the west of the excavation and to the south of the access road.**
Description of Access Road: **Running west to east direction.**	Description of Dewatering: **Over pumping was carried out at the south of the excavation, pump water follow furrows which ran into a water channel. Water channel runs to the east of T71.**
Description of Watercourses/Drainage on Site**: Drainage channel to the north west of the excavation.**	
Description/Cause of Failure: **None**	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Ponding within the forest from over pumping.**
Description of Material above Failure Plane: **N/A**	

Description of Incipient Instability: **Localised tension cracks around excavation. Slumping of arisings, but no apparent signs of failure of underlying ground.**	
Location/Ref. of Instability: **North to northeast of excavation.**	Length of Crack: **5 to 6m**
Average Width of Crack: **0.5 to 0.7m**	Average Depth of Crack: **0.8m**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T70**	Mapped/Date: **ML/DB 20/10/03**
Description of Site: **Site located on southern boundary of wind farm. Site is immediately downslope of the failure and was wiped out during failure. Base was not constructed.**	
Description of Excavation: **N/A**	Description of Arisings: **N/A**
Description of Access Road: **Access road was taken downslope with failure.**	Description of Dewatering: **N/A**
Description of Watercourses/Drainage on Site: **N/A**	
Description/Cause of Failure: **Failure of intact peat.**	
Failure Location & Orientation:**Orientated southeast.**	Width Dimension of Failure Scar: **Approximately 50m**
Length Dimension of Failure Scar:	Angle/Shape of Failure Plane: **5 to 8 degrees.**
Failure Material Thickness: **up to 2.5m**	Description of Failure Plane: **Translational in disturbed and intact peat**
Travel Distance of Failed Material: **30 to 40m**	Seepage/Water Description: **Seepage along failure plane and areas of ponding.**
Description of Material above Failure Plane: **Islands of very soft black fibrous (near surface) peat.**	
Description of Incipient Instability: **Tension cracking laterally to the east and west of failure.**	
Location/Ref. of Instability: **Tension cracks E and W occurring along furrows within forestry.**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

Geotechnical Mapping Sheet

Project: Derrybrien Landslide Sheet No 1 of 1

Site Reference: **T71**	Mapped/Date: **ML/DB 20&21/10/03**
Description of Site: **Site is forested and is located towards the southeast of phase 3 of the wind farm. Site slopes to south at 4 to 8 degs. and is immediately downslope from T69. Excavation for base has started.**	
Description of Excavation: **Excavation approximately 3.5m deep in peat, sideslopes 45 degrees. Glacial till at east end at base. Water at base of excavation**	Description of Arisings: **Arisings stockpiled to the south of the access road, ground saturated to the east of arisings.**
Description of Access Road: **From centre line of T71, 14m east slight rise, a further 41m bowl depression.**	Description of Dewatering: **Not known**
Description of Watercourses/Drainage on Site: **Ponding to the south of the road to the east of arisings. Drainage channel to the east of excavation which channelled pumping from T69, this contributes to ponding near arisings.**	
Description/Cause of Failure: No indication of failure, 15 to 20m south of arisings ground saturated, trees leaning over and bowing, area of potential failure.	
Failure Location & Orientation: **N/A**	Width Dimension of Failure Scar: **N/A**
Length Dimension of Failure Scar: **N/A**	Angle/Shape of Failure Plane: **N/A**
Failure Material Thickness: **N/A**	Description of Failure Plane: **N/A**
Travel Distance of Failed Material: **N/A**	Seepage/Water Description: **Ponded water presumed from localised water channels from upslope.**
Description of Material above Failure Plane: **N/A**	
Description of Incipient Instability: **N/A**	
Location/Ref. of Instability: **N/A**	Length of Crack: **N/A**
Average Width of Crack: **N/A**	Average Depth of Crack: **N/A**
Sketches Attached: (List)	Photographs Taken: (List)

APPENDIX B IN SITU VANE RESULTS

In Situ Vane Results

In situ vane results were obtained from both the Geonor H-60 25.4mm diameter hand vane and the Geonor H-10 55mm diameter mechanical vane.

Vane results are presented in the following tables. Hand vane tests were carried out by AGEC within mostly turbine base excavations.

Mechanical vane tests were carried out by Fugro Ltd using a 3 tonne mini crawler mounted. Mechanical vane testing was carried out by pushing the vane, which is within a protected sleeve, into peat at selected locations (see Appendix E). Note Fugro Ltd have prefixed their vane test reference with ‘CPT’, this should be replaced with ’V’.

Grid Cell T1

Depth (m bgl)	cu (kPa)	Comments
0.5	12,8	excavation east face
1	11,17	
1.5	11,13	
1.7	47,33	Mineral Soil
2	70,66,78	Mineral Soil

Grid Cell T2

Depth (m bgl)	cu (kPa)	Comments
0.5	17,19.5	excavation south east vertical
1	8,9	
1.5	9,8	
2	12,8.5	

Grid Cell T3

Depth (m bgl)	cu (kPa)	Comments
0.6	6.5,22	V-ditch north east of exc.(vertical)
1	9,12.5	
1.5	12,19	
2	15,22	
2.5	32,42.5	Mineral Soil

Grid Cell T5

Depth (m bgl)	cu (kPa)	Comments
0.5	14,9	excavation north east face
1	4.5,8	1.3m deep peat

Grid Cell T6

Depth (m bgl)	cu (kPa)	Comments
0.5	21,9,12	
1	11,11,12.5	
1.5	13,12,16	
2	15,14,15	

Grid Cell T9

Depth (m bgl)	cu (kPa)	Comments
1	10,10	v-ditch north east of excavation
1.5	9,9	
2	15,10	
2.3	15,15	

Grid Cell T10

Depth (m bgl)	cu (kPa)	Comments
0.5	11,10	excavation north face vertical
1	8,10	
1.5	8.5,10	
2	13,27	Mineral Soil
2.4	58	

Grid Cell T11

Depth (m bgl)	cu (kPa)	Comments
0.5	10,9	excavation east face vertical
1	7.5,10	
1.5	9,10	
2	13,14	
2.4	13,13.5	

Grid Cell T12

Depth (m bgl)	cu (kPa)	Comments
0.5	20,11	v-ditch west of excavation (vertical)
1	15,9	
1.5	11.5,7.5	
2	11,12	

Grid Cell T13

Depth (m bgl)	cu (kPa)	Comments
0.5	7.5,5.5	excavation north face
1	12,11	
1.5	10,11.5	
2	12,9	

Grid Cell T14

Depth (m bgl)	cu (kPa)	Comments
0.5	6.5,9	v-ditch
1	6,5	
1.5	6,8	
2	4.5,7	

Grid Cell T17

Depth (m bgl)	cu (kPa)	Comments
0.5	8,9.5	north of access road
1	7.5,6.5	
1.5	7.5,8	
2	10,11	

Grid Cell T18

Depth (m bgl)	cu (kPa)	Comments
0.5	25,8,9	v-ditch
1	4,6.5	
1.5	4,8	
2	10.5,13	

Grid Cell T19

Depth (m bgl)	cu (kPa)	Comments
0.5	18,19	excavation east face
1	14,15	
1.5	14,13.5	
2	17,21	

Grid Cell T20

Depth (m bgl)	cu (kPa)	Comments
0.5	7,5	excavation east face
1	6,5	
1.5	12,7	
2	17,14	

Grid Cell T21

Depth (m bgl)	cu (kPa)	Comments
0.5	12,13	excavation north face
1	11,14	
1.5	15,15	
2	10	
2.1	54	Mineral Soil

Grid Cell T22

Depth (m bgl)	cu (kPa)	Comments
0.5	16,14	v-ditch south east of base
1	14,16	
1.5	17,25	
1.7	60	Mineral Soil

Table: Shear Vane Results from Open Excavations using 25mm (25.4mm) Hand-held Vane
Note : Vane testing carried out in turbine excavation unless otherwise stated

Grid Cell T23

Depth (m bgl)	cu (kPa)	Comments
0.5	16,13	excavation north face
1	11,8	
1.5	18,12	
1.6	62,85	Mineral Soil

Grid Cell T25

Depth (m bgl)	cu (kPa)	Comments
1.4	9.4	

Grid Cell T25

Depth (m bgl)	cu (kPa)	Comments
0.7	13.2	
1.7	11.3	
2.2	10.4	

Grid Cell T25

Depth (m bgl)	cu (kPa)	Comments
0.7	9.4	
1.2	3.8	

Grid Cell T26

Depth (m bgl)	cu (kPa)	Comments
0.5	18,16	beside excavation
1	10,12.5	

Grid Cell T26

Depth (m bgl)	cu (kPa)	Comments
0.7	12.3	
1.7	6.6	

Grid Cell T28

Depth (m bgl)	cu (kPa)	Comments
1	6.6	
1.5	5.7	

Grid Cell T28

Depth (m bgl)	cu (kPa)	Comments
1	6.6	

Grid Cell T29

Depth (m bgl)	cu (kPa)	Comments
0.5	7,6	beside excavation
1	8	
1.5	6	

Grid Cell T31

Depth (m bgl)	cu (kPa)	Comments
0.7	13.2	
1.7	33	

Grid Cell T32

Depth (m bgl)	cu (kPa)	Comments
0.5	25	access road excavation
1	12,15,11	
1.5	9,9	

Grid Cell T34

Depth (m bgl)	cu (kPa)	Comments
0.7	2.8	

Grid Cell T34

Depth (m bgl)	cu (kPa)	Comments
1	8.5	

Grid Cell T35

Depth (m bgl)	cu (kPa)	Comments
0.5	15,15	excavation west face
1.2	50	mineral soil

Grid Cell T37

Depth (m bgl)	cu (kPa)	Comments
0.7	9.4	
1.6	5.7	

Grid Cell T37

Depth (m bgl)	cu (kPa)	Comments
0.7	9.4	
1.6	5.7	

Grid Cell T37

Depth (m bgl)	cu (kPa)	Comments
1	12.3	

Grid Cell T38

Depth (m bgl)	cu (kPa)	Comments
0.5	17.5,15,11.5	excavation north face
0.9	40	mineral soil

Table: Shear Vane Results from Open Excavations using 25mm (25.4mm) Hand-held Vane
Note : Vane testing carried out in turbine excavation unless otherwise stated

Grid Cell T41

Depth (m bgl)	cu (kPa)	Comments
0.5	12.5	excavation west face
1	10	
1.4	17	base of peat
1.6	30	mineral soil

Grid Cell T43

Depth (m bgl)	cu (kPa)	Comments
0.5	15.5	v-ditch 15m west of base
1	10	
1.2	11.5	

Grid Cell T46

Depth (m bgl)	cu (kPa)	Comments
0.5	25, 25	v-ditch 5m north of base
1	19	
1.5	14	
1.75	17	

Grid Cell T53

Depth (m bgl)	cu (kPa)	Comments
0.5	12,9	v-ditch
1	10,7.5	
1.2	6,5	
1.5	6,5	
1.8	5,4.5	

Grid Cell T66

Depth (m bgl)	cu (kPa)	Comments
0.5	13,14	excavation west face (vertical)
1	6,9	
1.5	5.5,9	
2	7.5,10	
2.3	6,8	

Grid Cell T67

Depth (m bgl)	cu (kPa)	Comments
0.5	12,8	excavation North west face (Vertical)
1	16,11	
1.5	13,11	
2	20,25	
2.3	40	Mineral soil

Grid Cell T68

Depth (m bgl)	cu (kPa)	Comments
0.5	13.5,12	excavation east (vertical)
1	11,10	
1.5	9,11	

Grid Cell T69

Depth (m bgl)	cu (kPa)	Comments
0.5	22,13,15	excavation west (vertical)
1	7,17,9	
1.5	12,14.5,12	

Grid Cell T71

Depth (m bgl)	cu (kPa)	Comments
0.5	19,14	peat depth 1.7
		v-ditch 15m n&s of road

Grid Cell T71

Depth (m bgl)	cu (kPa)	Comments
1.2	7.5	
1.7	10.4	
2.2	7.5	

Table: Shear Vane Results from Open Excavations using 25mm (25.4mm) Hand-held Vane
Note : Vane testing carried out in turbine excavation unless otherwise stated

ESBI
DERRYBRIEN, GALWAY, IRELAND

Location	Depth (m)	Natural Shear Strength (kPa)
CPT03	1.2	7.5
	1.7	10.4
	2.2	7.5
CPT05	0.7	12.3
	1.7	6.6
CPT06	1.4	9.4
CPT06A	0.7	13.2
	1.7	11.3
	2.2	10.4
CPT07	0.7	9.4
	1.2	3.8
CPT08	1.0	6.6
CPT08A	1.0	6.6
	1.5	5.7
CPT09	0.7	13.2
	1.7	33.0
CPT10	1.0	8.5
CPT11	0.7	2.8
CPT12	0.7	9.4
	1.6	5.7
CPT12A	1.0	12.3
CPT13	0.7	8.5
	1.5	19.8

NATURAL VANE TESTS

Location	Depth (m)	Natural Shear Strength (kPa)
CPT14	1.0	12.3
	2.0	11.3
	3.0	7.5
CPT15	1.0	8.5
	2.0	8.5
	3.0	6.6
CPT16	1.0	6.6
	2.0	8.5
	3.0	5.7
CPT17	0.7	9.4
	1.7	6.6
	2.3	6.6
	2.8	9.4
CPT18	0.7	6.6
	1.7	5.7
	2.2	9.4
CPT19	1.0	9.4
	2.0	4.7
	2.4	6.6
CPT20	1.0	5.7
	1.5	7.5
	2.2	10.4
CPT21	0.7	10.4
	1.7	5.7
CPT22	1.0	7.5
	1.4	7.5

NATURAL VANE TESTS

Location	Depth (m)	Natural Shear Strength (kPa)
CPT23	1.0	9.4
	1.4	9.4
CPT24	0.7	5.7
	1.4	6.6
CPT25	1.0	8.5
	1.5	5.7
	2.0	7.5
	2.4	13.2
CPT26	0.7	7.5
	1.7	6.6
	2.4	14.1
CPT27	1.0	8.5
	1.5	9.4
CPT28	0.7	11.3
CPT29	1.0	7.5
	1.4	8.5
	2.0	6.6
	2.4	9.4
CPT30	0.7	7.5
	1.3	5.7
	2.0	8.5
	2.5	6.6
	3.5	7.5

NATURAL VANE TESTS

ESBI
DERRYBRIEN, GALWAY, IRELAND

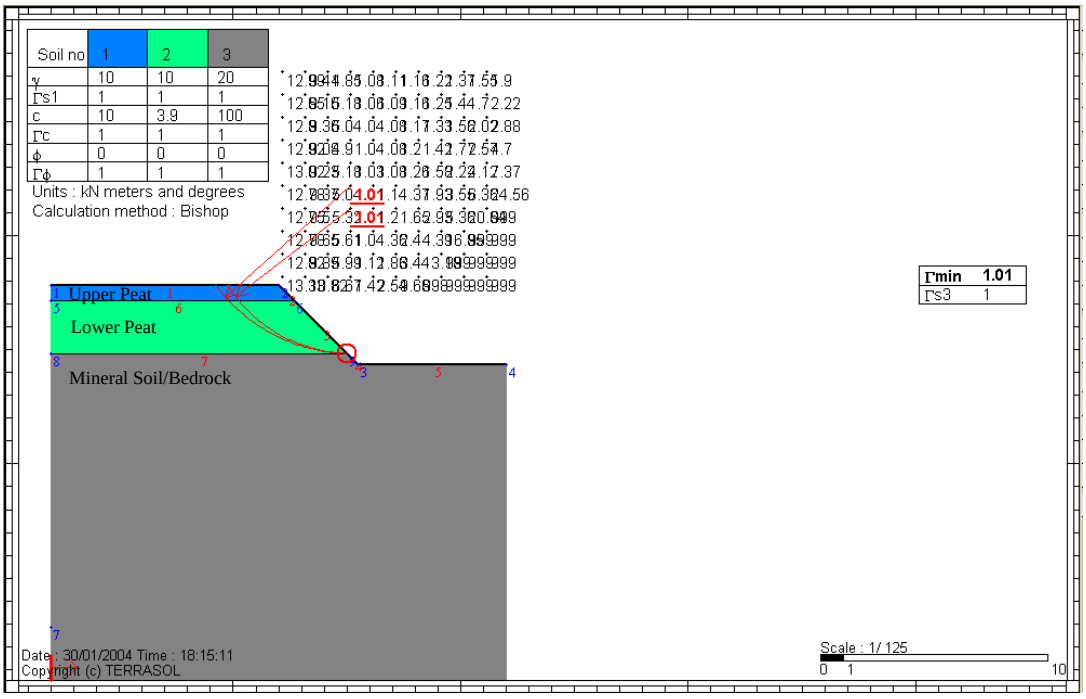
Location	Depth (m)	Natural Shear Strength (kPa)
CPT31	1.0	8.5
	1.4	5.7
	2.0	7.5
	2.6	6.6
	3.1	9.4
	3.5	10.4
CPT32	1.0	7.5
	1.9	6.6
	2.4	6.6
CPT33	1.0	12.3
	2.0	10.4
	2.4	8.5
	3.4	7.5
CPT34	1.0	6.6
	1.7	5.7
	2.3	7.5
CPT35	0.7	13.2
	1.4	13.2
CPT36	0.7	9.4
CPT37	0.7	11.3
	1.1	7.5
	2.1	8.5
	3.1	6.6
CPT38	1.0	6.6
	1.5	7.5
	2.1	6.6
	3.1	5.7

NATURAL VANE TESTS

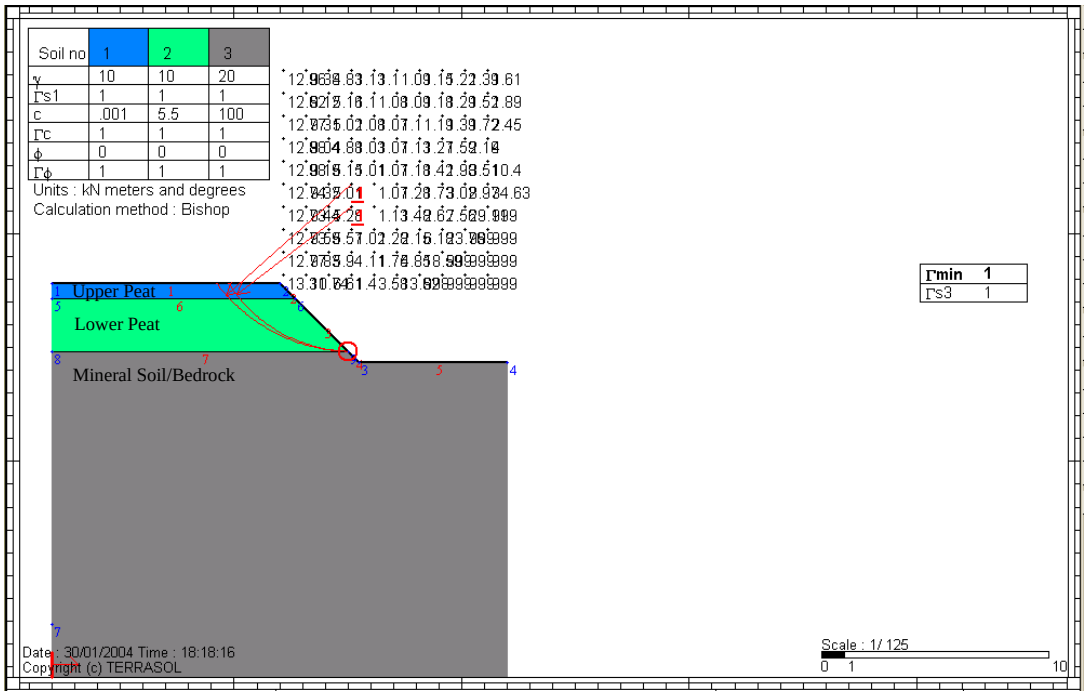
Location	Depth (m)	Natural Shear Strength (kPa)
CPT39	1.0	8.5
	1.7	6.6
	2.2	7.5
	3.2	5.7
	4.2	6.6
CPT40	1.0	6.6
	2.0	5.7
CPT41	0.7	8.5
	1.7	6.6
	2.7	6.6
CPT42	0.7	7.5
	1.6	8.5
CPT43	1.0	9.4
CPT44	0.7	9.4
	1.3	5.7
	2.5	6.6
CPT45	0.7	10.4
	1.3	6.6
	2.5	7.5
CPT46	0.7	4.7
	1.2	8.5
	2.5	9.4
	3.5	7.5
	4.5	10.4

NATURAL VANE TESTS

APPENDIX C BACK-ANALYSED EXCAVATION FAILURES



(a) Analysis with intact upper peat



(b) Analysis with upper peat assumed to be cracked

Figure: Back-analysis of Side-wall Failure of Turbine Base Excavations

Notes: Analysis assumes a 45 degree excavation face with 3m high face

APPENDIX D STABILITY RESULTS FOR CELLS

Grid no.	Slope	Instability	In situ c_u measurement		Design c_u	Bulk unit weight	Depth of In situ Peat	Surcharge Equivalent Placed Fill Depth	Factor of Safety for Load Condition	
	β (deg)		$c_{u\,25}$	$c_{u\,55}$	c_u (kPa)	γ (kN/m^3)	(m)	Condition (2)	Condition (1)	Condition (2)
West Side										
T1	4.0		8.0	9.4	8.0	10.0	2.43	1.0	**4.73**	**3.35**
T2	6.0	T	8.0	6.6	4.0	10.0	3.22	1.0	**1.19**	**0.91**
T3	4.0		6.5	7.5	6.5	10.0	2.09	1.0	**4.47**	**3.02**
T4	2.5	T	4.5	5.7	4.0	10.0	2.76	1.0	**3.33**	**2.44**
T5	5.0		9.0	13.2	4.5	10.0	3.75	1.0	**1.38**	**1.09**
T6	1.5			6.6	6.6	10.0	2.92	1.0	**8.64**	**6.43**
T7	2.0			5.7	5.7	10.0	3.39	1.0	**4.82**	**3.72**
T8	2.0			5.7	5.7	10.0	3.49	1.0	**4.68**	**3.64**
T9	4.0		9.0	7.5	7.5	10.0	2.23	1.0	**4.83**	**3.34**
T10	0.5		8.0	5.7	5.7	10.0	1.95	1.0	**33.50**	**22.14**
T11	1.0		7.5	5.7	5.7	10.0	3.34	1.0	**9.78**	**7.53**
T12	3.0	T	7.5	5.7	4.0	10.0	3.25	1.0	**2.35**	**1.80**
T13	3.0	T	5.5	5.7	4.0	10.0	3.96	1.0	**1.93**	**1.54**
T14	2.0	C	4.5		4.0	10.0	3.62	1.0	**3.17**	**2.48**
T15***	3.0				4.0	10.0	3.00	1.0	**2.55**	**1.91**
T16***	2.0				4.0	10.0	2.70	1.0	**4.25**	**3.10**
T17	4.0	F	6.5	4.7	2.5	10.0	2.49	1.0	**1.44**	**1.03**
T18	6.0		4.0	9.4	4.0	10.0	2.19	1.0	**1.76**	**1.21**
T19	6.0		13.5	5.7	5.7	10.0	2.48	1.0	**2.21**	**1.58**
T20	4.0		5.0	5.7	5.0	10.0	2.32	1.0	**3.10**	**2.16**
T21	3.0		10.0	6.6	6.6	10.0	2.86	1.0	**4.42**	**3.27**
T22	3.0		14.0	8.5	8.5	10.0	1.76	1.0	**9.24**	**5.89**
T23	4.0	B	8.0	11.3	4.0	10.0	1.59	1.0	**3.62**	**2.22**
East Side										
T24***	4.0				4.0	10.0	1.60	1.0	**3.59**	**2.21**
T25	3.0		3.8		3.8	10.0	1.77	1.0	**4.11**	**2.62**
T26	6.0		6.6	7.5	6.6	10.0	1.99	1.0	**3.19**	**2.12**
T27***	3.0	T			4.0	10.0	3.20	1.0	**2.39**	**1.82**
T28	3.0		5.7		4.6	10.0	1.86	1.0	**4.73**	**3.08**
T29	4.0	B	6.0	8.5	4.0	10.0	1.46	1.0	**3.94**	**2.34**
T30***	3.0				4.0	10.0	2.15	1.0	**3.56**	**2.43**
T31	2.0		4.0		4.0	10.0	3.27	1.0	**3.51**	**2.69**
T32	5.0		9.0	5.7	5.7	10.0	1.16	1.0	**5.66**	**3.04**
T33	3.0	T		4.7	4.0	10.0	3.65	1.0	**2.10**	**1.65**
T34	6.0		2.8		2.8	10.0	2.45	1.0	**1.10**	**0.78**
T35	4.0		15.0	2.8	2.8	10.0	1.41	1.0	**2.85**	**1.67**
T36	3.0			6.6	6.6	10.0	3.55	1.0	**3.56**	**2.78**
T37	3.5	T	5.7		5.7	10.0	1.97	1.0	**4.75**	**3.15**
T38	3.0		11.5	8.5	8.5	10.0	1.26	1.0	**12.91**	**7.20**
T39	3.0			5.7	5.7	10.0	2.20	1.0	**4.96**	**3.41**
T40	3.0			6.6	6.6	10.0	1.94	1.0	**6.51**	**4.30**
T41	1.0		10.0	13.2	10.0	10.0	1.80	1.0	**31.84**	**20.47**
T42	4.0	T		9.4	4.0	10.0	2.45	1.0	**2.35**	**1.67**
T43	5.0		10.0	5.7	5.7	10.0	1.96	1.0	**3.35**	**2.22**
T44	3.0			7.5	7.5	10.0	2.70	1.0	**5.31**	**3.88**
T45	2.0	T		9.4	4.0	10.0	2.12	1.0	**5.41**	**3.68**
T46	3.0		14.0	3.8	3.8	10.0	2.20	1.0	**3.30**	**2.27**
Central Area										
T47***	2.0				4.0	10.0	1.94	1.0	**5.91**	**3.90**
T48***	2.0				4.0	10.0	2.06	1.0	**5.57**	**3.75**
T49**	2.0				4.0	10.0	2.68	1.0	**4.28**	**3.12**
T50***	2.0				4.0	10.0	1.51	1.0	**7.60**	**4.57**
T51***	4.0				4.0	10.0	2.37	1.0	**2.43**	**1.71**
T52***	3.0				4.0	10.0	1.86	1.0	**4.11**	**2.68**
T53	2.0	C	4.5		4.0	10.0	2.89	1.0	**3.97**	**2.95**
T54	1.0			5.7	4.0	10.0	3.03	1.0	**7.57**	**5.69**
T55	4.0	C		6.6	4.0	10.0	2.83	1.0	**2.03**	**1.50**
T56***	4.0				4.0	10.0	3.05	1.0	**1.88**	**1.42**
T57***	3.0	C			4.0	10.0	1.99	1.0	**3.85**	**2.56**
T58***	3.0				4.0	10.0	2.05	1.0	**3.73**	**2.51**
T59***	2.0				4.0	10.0	2.50	1.0	**4.59**	**3.28**
T60***	0.1	T			4.0	10.0	3.86	1.0	**59.37**	**47.16**
T61***	0.1	T			4.0	10.0	1.89	1.0	**121.26**	**79.30**
T62***	0.1				4.0	10.0	3.77	1.0	**60.79**	**48.05**
T63***	0.1				4.0	10.0	2.58	1.0	**88.83**	**64.02**
T64***	2.0				4.0	10.0	3.08	1.0	**3.72**	**2.81**
T65***	2.0				4.0	10.0	2.73	1.0	**4.20**	**3.07**
T66	3.0	B	5.5	6.6	4.0	10.0	3.59	1.0	**2.13**	**1.67**
T67	4.0		8.0	5.7	5.7	10.0	1.99	1.0	**4.12**	**2.74**
T68	4.0	F	9.0	5.7	2.5	10.0	2.63	1.0	**1.37**	**0.99**
T69	8.0	T	7.0	6.6	4.0	10.0	3.00	1.0	**0.97**	**0.73**
T70	4.0	F		6.6	2.5	10.0	2.70	1.0	**1.33**	**0.97**
T71	4.0		7.5	7.5	7.5	10.0	2.50	1.0	**4.31**	**3.08**

Notes:

(1) *** No ground investigation assuming c_u of (kPa) — 4.0

(2) Assuming a bulk unit weight of peat (kN/m^3) — 10.0

(3) Assuming a surcharge equivalent to fill depth of (m) — 1.0

(4) β angles are based on Abney level readings

(5) Cells that have already failed due to peat slide (T17, T66 and T70) are assumed to have FoS of unity or less following loading

(6) Instability definitions: T - tension crack adjacent excavations, B - bearing failure, C - sidewall collapse

(7) Where instability has been identified as denoted by T, B or C then c_u of 4 kPa is assumed as operating strength unless a lower strength has been recorded.

(8) For load conditions see Report text.

Cell where FoS is less than 1.4

Table: Analysis of 200m by 200m Cells

Grid no.	Slope	Instability	In situ c_u measurement		Design c_u	Bulk unit weight	Depth of In situ Peat	Surcharge Equivalent Placed Fill Depth (m)	Factor of Safety for Load Condition	
	β (deg)		$c_{u\,25}$	$c_{u\,55}$	c_u (kPa)	γ (kN/m^3)	(m)	Condition (2)	Condition (1)	Condition (2)
West Side										
T1	4		8.0	9.4	8.0	10.0	2.6	1.0	**4.42**	**3.19**
T2	6	T	8.0	6.6	4.0	10.0	3.5	1.0	**1.10**	**0.86**
T3	4		6.5	7.5	6.5	10.0	3.2	1.0	**2.92**	**2.22**
T4	2.5	T		5.7	4.0	10.0	2.9	1.0	**3.17**	**2.35**
T5	5		4.5	13.2	4.5	10.0	2.2	1.0	**2.36**	**1.62**
T6	1.5			6.6	6.6	10.0	2.7	1.0	**9.34**	**6.82**
T7	2			5.7	5.7	10.0	3.8	1.0	**4.30**	**3.40**
T8	2			5.7	5.7	10.0	4.5	1.0	**3.63**	**2.97**
T9	4		9.0	7.5	7.5	10.0	3.5	1.0	**3.08**	**2.40**
T10	0.5		8.0	5.7	5.7	10.0	2	1.0	**32.66**	**21.77**
T11	1		7.5	5.7	5.7	10.0	3.3	1.0	**9.90**	**7.60**
T12	3	T	7.5	5.7	4.0	10.0	3	1.0	**2.55**	**1.91**
T13	3	T	5.5	5.7	4.0	10.0	4	1.0	**1.91**	**1.53**
T14	2	C	4.5		4.0	10.0	4.7	1.0	**2.44**	**2.01**
T15***	3				4.0	10.0	4	1.0	**1.91**	**1.53**
T16***	2				4.0	10.0	4.2	1.0	**2.73**	**2.21**
T17	4	F	6.5	4.7	2.7	10.0	2.9	1.0	**1.34**	**0.99**
T18	6		4.0	9.4	4.0	10.0	2.5	1.0	**1.54**	**1.10**
T19	6		13.5	5.7	5.7	10.0	2.2	1.0	**2.49**	**1.71**
T20	4		5.0	5.7	5.0	10.0	2.4	1.0	**2.99**	**2.11**
T21	3		10.0	6.6	6.6	10.0	2.1	1.0	**6.01**	**4.07**
T22	3		14.0	8.5	8.5	10.0	2.6	1.0	**6.26**	**4.52**
T23	4	B	8.0	11.3	4.0	10.0	1.6	1.0	**3.59**	**2.21**
East Side										
T24***	4				4.0	10.0	1.4	1.0	**4.11**	**2.40**
T25	3		3.8		3.8	10.0	2	1.0	**3.64**	**2.42**
T26	6		6.6	7.5	6.6	10.0	2	1.0	**3.17**	**2.12**
T27***	3	T			4.0	10.0	4	1.0	**1.91**	**1.53**
T28	3		5.7	6.6	5.7	10.0	2.6	1.0	**4.19**	**3.03**
T29	4	B	6.0	8.5	4.0	10.0	1.4	1.0	**4.11**	**2.40**
T30***	3				4.0	10.0	1.7	1.0	**4.50**	**2.83**
T31	2		4.0		4.0	10.0	5	1.0	**2.29**	**1.91**
T32	5		9.0	5.7	5.7	10.0	1	1.0	**6.56**	**3.28**
T33	3	T		4.7	4.0	10.0	2.8	1.0	**2.73**	**2.01**
T34	6		2.8		2.8	10.0	2.8	1.0	**0.96**	**0.71**
T35	4		15.0	2.8	2.8	10.0	1.3	1.0	**3.10**	**1.75**
T36	3			6.6	6.6	10.0	3	1.0	**4.21**	**3.16**
T37	3.5	T	5.7		5.7	10.0	2.2	1.0	**4.25**	**2.92**
T38	3		11.5	8.5	8.5	10.0	1.2	1.0	**13.55**	**7.39**
T39	3			5.7	5.7	10.0	2.4	1.0	**4.54**	**3.21**
T40	3			6.6	6.6	10.0	2.4	1.0	**5.26**	**3.71**
T41	3		10.0	13.2	10.0	10.0	1.2	1.0	**15.94**	**8.70**
T42	4	T		9.4	4.0	10.0	2.2	1.0	**2.61**	**1.80**
T43	5		10.0	5.7	5.7	10.0	2.6	1.0	**2.52**	**1.82**
T44	3			7.5	7.5	10.0	2.2	1.0	**6.52**	**4.48**
T45	4	T		9.4	4.0	10.0	2.4	1.0	**2.40**	**1.69**
T46	3		14.0	3.8	3.8	10.0	2.5	1.0	**2.91**	**2.08**
Central Area										
T47***	5				4.0	10.0	2.8	1.0	**1.65**	**1.21**
T48***	2				4.0	10.0	2.3	1.0	**4.99**	**3.48**
T49**	2				4.0	10.0	3.2	1.0	**3.58**	**2.73**
T50***	2				4.0	10.0	5.4	1.0	**2.12**	**1.79**
T51***	4				4.0	10.0	4.2	1.0	**1.37**	**1.11**
T52***	3				4.0	10.0	1.9	1.0	**4.03**	**2.64**
T53	2	C	4.5		4.0	10.0	3	1.0	**3.82**	**2.87**
T54	2			5.7	5.7	10.0	3.2	1.0	**5.11**	**3.89**
T55	4	C		6.6	4.0	10.0	2.6	1.0	**2.21**	**1.60**
T56***	4				4.0	10.0	3	1.0	**1.92**	**1.44**
T57***	4	C			4.0	10.0	1.2	1.0	**4.79**	**2.61**
T58***	3				4.0	10.0	1.5	1.0	**5.10**	**3.06**
T59***	2				4.0	10.0	2.8	1.0	**4.10**	**3.02**
T60***	0.1	T			4.0	10.0	3.2	1.0	**71.62**	**54.57**
T61***	3	T			4.0	10.0	2.6	1.0	**2.94**	**2.13**
T62***	0.1				4.0	10.0	4.7	1.0	**48.76**	**40.21**
T63***	2				4.0	10.0	3.7	1.0	**3.10**	**2.44**
T64***	2				4.0	10.0	3.6	1.0	**3.19**	**2.49**
T65***	2				4.0	10.0	2.9	1.0	**3.95**	**2.94**
T66	5	B	5.5	6.6	4.0	10.0	3	1.0	**1.54**	**1.15**
T67	4		8.0	5.7	5.7	10.0	2.7	1.0	**3.03**	**2.21**
T68	6	F	9.0	5.7	4.5	10.0	3.4	1.0	**1.27**	**0.98**
T69	8	T	7.0	6.6	4.0	10.0	3.5	1.0	**0.83**	**0.64**
T70	6	F		6.6	4.6	10.0	3.5	1.0	**1.26**	**0.98**
T71	8		7.5	7.5	7.5	10.0	3.5	1.0	**1.55**	**1.21**

Notes:

(1) *** No ground investigation assuming c_u of (kPa)	4.0
(2) Assuming a bulk unit weight of peat (kN/m^3)	10.0
(3) Assuming a surcharge equivalent to fill depth of (m)	1.0

(4) β angles are based on Abney level readings

(5) Cells that have already failed due to peat slide (T17, T66 and T70) are assumed to have FoS of unity or less following loading

(6) Instability definitions: T - tension crack adjacent excavations, B - bearing failure, C - sidewall collapse, F - sliding failure

(7) Where instability has been identified as denoted by T, B or C then c_u of 4 kPa is assumed as operating strength unless a lower strength has been recorded.

(8) For load conditions see Report text.

(9) Peat depths are based on deepest recorded peat depth in cell. Where no depths are given then nearest recorded depth is used.

(10) Depth of in situ peat is based on maximum peat depth from cross-section through cell.

Cell where FoS is less than 1.4

Table: Analysis of 50m Cells

Grid no.	Slope	Instability	In situ c_u measurement		Design c_u	Bulk unit weight	Depth of In situ Peat	Surcharge Equivalent Placed Fill Depth (m)	Factor of Safety for Load Condition	
	β (deg)		$c_{u\,25}$	$c_{u\,55}$	c_u (kPa)	γ (kN/m^3)	(m)	Condition (2)	Condition (1)	Condition (2)
West Side										
T1	4		8.0	9.4	2.8	10.0	2.6	1.0	**1.55**	**1.12**
T2	6	T	8.0	6.6	2.8	10.0	3.5	1.0	**0.77**	**0.60**
T3	4		6.5	7.5	2.8	10.0	3.2	1.0	**1.26**	**0.96**
T4	2.5	T		5.7	2.8	10.0	2.9	1.0	**2.22**	**1.65**
T5	5		4.5	13.2	2.8	10.0	2.2	1.0	**1.47**	**1.01**
T6	1.5			6.6	2.8	10.0	2.7	1.0	**3.96**	**2.89**
T7	2			5.7	2.8	10.0	3.8	1.0	**2.11**	**1.67**
T8	2			5.7	2.8	10.0	4.5	1.0	**1.78**	**1.46**
T9	4		9.0	7.5	2.8	10.0	3.5	1.0	**1.15**	**0.89**
T10	0.5		8.0	5.7	2.8	10.0	2	1.0	**16.04**	**10.70**
T11	1		7.5	5.7	2.8	10.0	3.3	1.0	**4.86**	**3.73**
T12	3	T	7.5	5.7	2.8	10.0	3	1.0	**1.79**	**1.34**
T13	3	T	5.5	5.7	2.8	10.0	4	1.0	**1.34**	**1.07**
T14	2	C	4.5		2.8	10.0	4.7	1.0	**1.71**	**1.41**
T15	3				2.8	10.0	4	1.0	**1.34**	**1.07**
T16	2				2.8	10.0	4.2	1.0	**1.91**	**1.54**
T17	4	F	6.5	4.7	2.8	10.0	2.9	1.0	**1.39**	**1.03**
T18	6		4.0	9.4	2.8	10.0	2.5	1.0	**1.08**	**0.77**
T19	6		13.5	5.7	2.8	10.0	2.2	1.0	**1.22**	**0.84**
T20	4		5.0	5.7	2.8	10.0	2.4	1.0	**1.68**	**1.18**
T21	3		10.0	6.6	2.8	10.0	2.1	1.0	**2.55**	**1.73**
T22	3		14.0	8.5	2.8	10.0	2.6	1.0	**2.06**	**1.49**
T23	4	B	8.0	11.3	2.8	10.0	1.6	1.0	**2.51**	**1.55**
East Side					2.8					
T24	4				2.8	10.0	1.4	1.0	**2.87**	**1.68**
T25	3		3.8		2.8	10.0	2	1.0	**2.68**	**1.79**
T26	6		6.6	7.5	2.8	10.0	2	1.0	**1.35**	**0.90**
T27	3	T			2.8	10.0	4	1.0	**1.34**	**1.07**
T28	3		5.7	6.6	2.8	10.0	2.6	1.0	**2.06**	**1.49**
T29	4	B	6.0	8.5	2.8	10.0	1.4	1.0	**2.87**	**1.68**
T30	3				2.8	10.0	1.7	1.0	**3.15**	**1.98**
T31	2		4.0		2.8	10.0	5	1.0	**1.61**	**1.34**
T32	5		9.0	5.7	2.8	10.0	1	1.0	**3.22**	**1.61**
T33	3	T		4.7	2.8	10.0	2.8	1.0	**1.91**	**1.41**
T34	6		2.8		2.8	10.0	2.8	1.0	**0.96**	**0.71**
T35	4		15.0	2.8	2.8	10.0	1.3	1.0	**3.10**	**1.75**
T36	3			6.6	2.8	10.0	3	1.0	**1.79**	**1.34**
T37	3.5	T	5.7		2.8	10.0	2.2	1.0	**2.09**	**1.44**
T38	3		11.5	8.5	2.8	10.0	1.2	1.0	**4.46**	**2.44**
T39	3			5.7	2.8	10.0	2.4	1.0	**2.23**	**1.58**
T40	3			6.6	2.8	10.0	2.4	1.0	**2.23**	**1.58**
T41	3		10.0	13.2	2.8	10.0	1.2	1.0	**4.46**	**2.44**
T42	4	T		9.4	2.8	10.0	2.2	1.0	**1.83**	**1.26**
T43	5		10.0	5.7	2.8	10.0	2.6	1.0	**1.24**	**0.90**
T44	3			7.5	2.8	10.0	2.2	1.0	**2.44**	**1.67**
T45	4	T		9.4	2.8	10.0	2.4	1.0	**1.68**	**1.18**
T46	3		14.0	3.8	2.8	10.0	2.5	1.0	**2.14**	**1.53**
Central Area					2.8					
T47	5				2.8	10.0	2.8	1.0	**1.15**	**0.85**
T48	2				2.8	10.0	2.3	1.0	**3.49**	**2.43**
T49	2				2.8	10.0	3.2	1.0	**2.51**	**1.91**
T50	2				2.8	10.0	5.4	1.0	**1.49**	**1.25**
T51	4				2.8	10.0	4.2	1.0	**0.96**	**0.77**
T52	3				2.8	10.0	1.9	1.0	**2.82**	**1.85**
T53	2	C	4.5		2.8	10.0	3	1.0	**2.68**	**2.01**
T54	2			5.7	2.8	10.0	3.2	1.0	**2.51**	**1.91**
T55	4	C		6.6	2.8	10.0	2.6	1.0	**1.55**	**1.12**
T56	4				2.8	10.0	3	1.0	**1.34**	**1.01**
T57	4	C			2.8	10.0	1.2	1.0	**3.35**	**1.83**
T58	3				2.8	10.0	1.5	1.0	**3.57**	**2.14**
T59	2				2.8	10.0	2.8	1.0	**2.87**	**2.11**
T60	0.1	T			2.8	10.0	3.2	1.0	**50.13**	**38.20**
T61	3	T			2.8	10.0	2.6	1.0	**2.06**	**1.49**
T62	0.1				2.8	10.0	4.7	1.0	**34.13**	**28.15**
T63	2				2.8	10.0	3.7	1.0	**2.17**	**1.71**
T64	2				2.8	10.0	3.6	1.0	**2.23**	**1.75**
T65	2				2.8	10.0	2.9	1.0	**2.77**	**2.06**
T66	5	B	5.5	6.6	2.8	10.0	3	1.0	**1.07**	**0.81**
T67	4		8.0	5.7	2.8	10.0	2.7	1.0	**1.49**	**1.09**
T68	6	F	9.0	5.7	2.8	10.0	3.4	1.0	**0.79**	**0.61**
T69	8	T	7.0	6.6	2.8	10.0	3.5	1.0	**0.58**	**0.45**
T70	6	F		6.6	2.8	10.0	3.5	1.0	**0.77**	**0.60**
	8		7.5	7.5	2.8	10.0	3.5	1.0	**0.58**	**0.45**

Notes:

(1) Assuming an ultimate lower bound c_u of (kPa)	2.8
(2) Assuming a bulk unit weight of peat (kN/m^3)	10.0
(3) Assuming a surcharge equivalent to fill depth of (m)	1.0

(4) β angles are based on Abney level readings

(5) Instability definitions: T - tension crack adjacent excavations, B - bearing failure, C - sidewall collapse, F - sliding failure

(6) For load conditions see Report text.

(7) Peat depths are based on deepest recorded peat depth in cell. Where no depths are given then nearest recorded depth is used.

(8) Depth of in situ peat is based on maximum peat depth from cross-section through cell.

Cell where FoS is less than 1.4

Table: Sensitivity Analysis of 50m Cells

APPENDIX E CO-ORDINATES OF VANE LOCATIONS

Test	Test No.	Easting	Northing
Shear Vane	V3	159681	204444
Shear Vane	V5	160737	205287
Shear Vane	V6	161130	205243
Shear Vane	V7	161186	205014
Shear Vane	V8	159960	204939
Shear Vane	V9	160774	205001
Shear Vane	V10	160673	204977
Shear Vane	V11	160520	204856
Shear Vane	V12	160334	204821
Shear Vane	V13	160133	204683
Shear Vane	V14	159950	204591
Shear Vane	V15	159480	204692
Shear Vane	V16	159387	204964
Shear Vane	V17	159186	204873
Shear Vane	V18	159296	204625
Shear Vane	V19	159146	204564
Shear Vane	V20	158998	204752
Shear Vane	V21	158839	204704
Shear Vane	V22	158619	204691
Shear Vane	V23	158262	203891
Shear Vane	V24	158512	203992
Shear Vane	V25	158639	204065
Shear Vane	V26	158804	204165
Shear Vane	V27	159055	204246
Shear Vane	V28	159222	204292
Shear Vane	V29	159366	204343
Shear Vane	V30	158075	204049
Shear Vane	V31	158332	204192
Shear Vane	V32	158005	204333
Shear Vane	V33	157888	204549
Shear Vane	V34	158116	204673

Shear Vane	V35	158207	204705
Shear Vane	V36	157744	204726
Shear Vane	V37	157947	204833
Shear Vane	V38	158164	204430
Shear Vane	V39	158387	204569
Shear Vane	V40	158655	205216
Shear Vane	V41	158837	205312
Shear Vane	V42	160974	205591
Shear Vane	V43	160793	205605
Shear Vane	V44	160613	205581
Shear Vane	V45	160436	205497
Shear Vane	V46	160232	205422

APPENDIX F STRENGTH OF PEAT ABOVE PEAT/MINERAL SOIL INTERFACE

Grid no.	Hand Held Shear Vane Test	Depth of Peat at/in Vicinity of test Location (m)	Depth of Deepest Test Result in Peat (mbgl)	Vertical Distance from Deepest Test Result to Base of Peat (m)	Shear Strength from Deepest Test Result (c_u)	Lowest Recorded Shear Strength from Test in Peat if not at Deepest Test Result (c_u)	Comments
West Side							
T1	Yes	1.7	1.5	0.2	11, 13	8.0	
T2	Yes	2.5	2.0	0.5	12, 8.5	8.0	Peat depth from nearest depth probe result
T3	Yes	2.5	2.0	0.5	15, 22	6.5	Shear test possibly affected by mineral soil
T4	No						
T5	Yes	1.3	1.0	0.3	4.5, 8	4.5	
T6	Yes	2.7	2.0	0.7	15, 14, 15	9.0	
T7	No						
T8	No						
T9	Yes	2.4	2.3	0.1	15, 15	9.0	Peat depth from nearest depth probe result
T10	Yes	2	1.5	0.5	8.5,10	8.0	Mineral Soil at 2.0mbgl
T11	Yes	2.8	2.4	0.4	13, 13.5	7.5	Peat depth from nearest depth probe result
T12	Yes	2.5	2.0	0.5	11, 12	7.5	Peat depth from nearest depth probe result
T13	Yes	3.6	2.0	1.6	12, 9	5.5	Peat depth from nearest depth probe result
T14	Yes	4	2.0	2.0	4.5, 7	4.5	Peat depth from nearest depth probe result
T15	No						
T16	No						
T17	Yes	3	2.0	1.0	10, 11	6.5	Peat depth from nearest depth probe result
T18	Yes	2.5	2.0	0.5	10.5, 13	4.0	Peat depth from nearest depth probe result
T19	Yes	2.5	2.0	0.5	17, 21	14.0	Shear test possibly affected by mineral soil
T20	Yes	2.1	2.0	0.1	17, 14	5.0	
T21	Yes	2.1	2.0	0.1	10	10.0	
T22	Yes	1.7	1.5	0.2	17, 25	14.0	Shear test possibly affected by mineral soil
T23	Yes	1.6	1.5	0.1	18, 12	8.0	
East Side							
T24	No						
T25	Yes	2.2	2.2	0.0	10.4	3.8	Shear test possibly affected by mineral soil
T26	Yes	1.8	1.7	0.1	6.6		
T27	No						
T28	Yes	2.6	1.5	1.1	5.7		Peat depth from nearest depth probe result
T29	Yes	1.8	1.5	0.3	6		Peat depth from nearest depth probe result
T30	No						
T31	Yes	2.5	1.5	1.0	4	13.2	Shear test possibly affected by mineral soil
T32	Yes	1.7	1.5	0.2	9, 9	9.0	Peat depth from nearest depth probe result
T33	No						
T34	Yes	1.9	1.0	0.9	8.5	2.8	Peat depth from nearest depth probe result
T35	Yes	1.2	0.5	0.7	15, 15	15.0	Peat depth from nearest depth probe result
T36	No						
T37	Yes	2.1	1.6	0.5	5.7	5.7	Peat depth from nearest depth probe result
T38	Yes	0.9	0.5	0.4	17.5, 15, 11.5	11.5	
T39	No						
T40	No						
T41	Yes	1.4	1.0	0.4	10	10.0	
T42	No						
T43	Yes	1.3	1.2	0.1	11.5	10.0	Peat depth from nearest depth probe result
T44	No						
T45	No						
T46	Yes	1.8	1.8	0.1	17	14.0	Shear test possibly affected by mineral soil
Central							
T47	No						
T48	No						
T49	No						
T50	No						
T51	No						
T52	No						
T53	Yes	2.9	1.8	1.1	5, 4.5	4.5	Peat depth from nearest depth probe result
T54	No						
T55	No						
T56	No						
T57	No						
T58	No						
T59	No						
T60	No						
T61	No						
T62	No						
T63	No						
T64	No						
T65	No						
T66	Yes	2.5	2.3	0.2	6, 8	5.5	Peat depth from nearest depth probe result
T67	Yes	2.3	2.0	0.3	20, 25	8.0	Shear test possibly affected by mineral soil
T68	Yes	2.7	1.5	1.2	9, 11	9.0	Peat depth from nearest depth probe result
T69	Yes	3.2	1.5	1.7	12, 14.5, 12	7.0	Peat depth from nearest depth probe result
T70	No						
T71	Yes	2.7	2.2	0.5	7.5	7.5	Peat depth from nearest depth probe result

Table: Showing Deepest Shear Vane Results from Hand Vane Test

Grid no.	Mechanical Shear Vane Test	Depth of Peat at/in Vicinity of test Location (m)	Depth of Deepest Test Result in Peat (mbgl)	Vertical Distance from Deepest Test Result to Base of Peat (m)	Shear Strength from Deepest Test Result (c_u)	Lowest Recorded Shear Strength from Test in Peat if not at Deepest Test Result (c_u)	Comments
West Side							
T1	Yes	2.5	0.7	1.8	9.4		Peat depth from nearest depth probe result
T2	Yes	4.5	3.1	1.4	6.6		Peat depth from nearest depth probe result
T3	Yes	3.6	3.4	0.2	7.5		Note 1
T4	Yes	2.9	2.3	0.6	7.5	5.7	Peat depth from nearest depth probe result
T5	Yes	2	1.4	0.6	13.2		Peat depth from nearest depth probe result
T6	Yes	2.7	2.4	0.3	6.6		Peat depth from nearest depth probe result
T7	Yes	3.8	3.1	0.7	5.7		Peat depth from nearest depth probe result
T8	Yes	4.5	4.2	0.3	6.6	5.7	Peat depth from nearest depth probe result
T9	Yes	1.6	1.4	0.2	7.5		Peat depth from nearest depth probe result
T10	Yes	1.9	1.7	0.2	5.7		Peat depth from nearest depth probe result
T11	Yes	3.6	2.2	1.4	10.4	5.7	Peat depth from nearest depth probe result
T12	Yes	4.2	3.5	0.7	7.5	5.7	Peat depth from nearest depth probe result
T13	Yes	3.8	3.5	0.3	10.4	5.7	Peat depth from nearest depth probe result
T14	No						
T15	No						
T16	No						
T17	Yes	2.6	2.4	0.2	6.6	4.7	Peat depth from nearest depth probe result
T18	Yes	2.2	1.4	0.8	9.4		Peat depth from nearest depth probe result
T19	Yes	1.6	1.4	0.2	6.5	5.7	Peat depth from nearest depth probe result
T20	Yes	2.7	2.4	0.3	13.2	5.7	Peat depth from nearest depth probe result
T21	Yes	3.0	2.4	0.6	14.1	6.6	Peat depth from nearest depth probe result
T22	Yes	2	1.5	0.5	9.4	8.5	Peat depth from nearest depth probe result
T23	Yes	1.7	0.7	1.0	11.3		Peat depth from nearest depth probe result
East Side							
T24	No						
T25	No						
T26	Yes	3.2	3.0	0.2	7.5		Note 1
T27	No						
T28	Yes	2.6	1.5	1.1	5.7		Peat depth from nearest depth probe result
T29	Yes	1.8	1.5	0.3	19.8	8.5	Shear test possibly affected by mineral soil
T30	No						
T31	No						
T32	Yes	1.7	1.6	0.1	5.7		Peat depth from nearest depth probe result
T33	Yes	4.7	4.5	0.2	10.4	4.7	Note 1
T34	No						
T35	Yes	1.0	0.7	0.3	2.8		Peat depth from nearest depth probe result
T36	Yes	3.1	2.5	0.6	7.5	6.6	Peat depth from nearest depth probe result
T37	No						
T38	Yes	1.8	1.0	0.8	8.5		Peat depth from nearest depth probe result
T39	Yes	2.7	2.5	0.2	6.6	5.7	Note 1
T40	Yes	1.8	1.7	0.1	6.6		Peat depth from nearest depth probe result
T41	Yes	1.7	0.7	1.0	13.2		Shear test possibly affected by mineral soil
T42	Yes	2.2	1.0	1.2	9.4		Peat depth from nearest depth probe result
T43	No						
T44	Yes	2.7	2.5	0.2	6.6	5.7	Peat depth from nearest depth probe result
T45	Yes	1.8	1.4	0.4	9.4		Peat depth from nearest depth probe result
T46	Yes	1.8	1.2	0.6	3.8		Peat depth from nearest depth probe result
Central							
T47	No						
T48	No						
T49	No						
T50	No						
T51	No						
T52	No						
T53	No						
T54	Yes	3.0	2.0	1.0	5.7		Peat depth from nearest depth probe result
T55	Yes	4.6	2.7	1.9	6.6		Peat depth from nearest depth probe result
T56	No						
T57	No						
T58	No						
T59	No						
T60	No						
T61	No						
T62	No						
T63	No						
T64	No						
T65	No						
T66	Yes	3	2.8	0.2	9.4	6.6	Note 1
T67	Yes	3.2	3.0	0.2	5.7		Note 1
T68	Yes	2.7	2.2	0.5	9.4	5.7	Peat depth from nearest depth probe result
T69	Yes	3.2	3.0	0.2	6.6		Peat depth from nearest depth probe result
T70	Yes	2.6	2.4	0.2	9.4	6.6	Note 1
T71	Yes	3.2	2.2	1.0	7.5		Peat depth from nearest CPT

Note 1 Peat depth from nearest probe shows base of peat is at shallower depth than deepest vane test. Assume vane within 0.2m of base of peat.

Table: Showing Deepest Shear Vane Results from Mechanical Vane Test