APPENDIX 2.1

PLANNING APPLICATIONS WITHIN 2KM OF THE APPLICATION SITE

Planning and Environmental Consultants

Appendix 2-1 - Applications in vicinity of Dunneill Wind Farm

Dunneill Wind Farm, Co. Sligo – EIAR

1. APPLICATIONS IN VICINITY OF DUNNEILL WIND FARM

Table 1-1 Applications in the vicinity of the Application Site within 5 years.

Pl.Ref	Description	Decision
19/387	PP - for development consisting of (a) Construct new dwelling house and domestic garage, (b) Construct new septic tank and treatment system and associated works, (c) Construct new entrance to public road, (d) Connect to all services and utilities, (e) Carry out all ancillary works as required on site	Refused by Sligo CC 05/11/2019.
20/421	PP - development consisting of: (a) construction of new dwelling house, (b) domestic garage, (c) constructed new septic tank treatment system and associated works, (d) construction of new entrance to public road, (e) connection to all services and utilities (f) carrying out of all ancillary works as required on site	Refused by Sligo CC 09/02/2021
20/65	development consisting of a revised house design and location to that granted under PL18-507 together with all associated site works	Granted by Sligo CC 24/7/2020
20/257	Development consisting of the erection of a dwelling house, proprietary effluent treatment unit, percolation area and detached domestic garage including all ancillary site works	Granted by Sligo CC 19/05/2021
21/175	Development consisting of construction of a new dwelling house and domestic garage with on-site waste water treatment system	Granted by Sligo CC 12/08/2021
22/75	Development consisting of retention of alterations to plans and elevations of dwelling house as constructed which differs from those permitted under Planning Permission PL05/395 with all associated works	Granted by Sligo CC 27/05/2022
22/171	Development consisting of construction of a dwelling house, construction of domestic garage, installation of effluent treatment system with percolation area and carrying out all associated site works	Awaiting Sligo CC decision due 21/08/2022

APPENDIX 2.2

SCOPING CONSULTEES AND RESPONSES

David Naughton

From: Roger Woods <rwoods@bai.ie>
Sent: Wednesday 16 June 2021 11:56
To: David Naughton
Subject: RE: 210207 - Dunneill Wind Farm EIAR Scoping Letter

Hi David

The BAI does not perform an in-depth analysis of the effect of wind turbines on FM networks. However, we are not aware of any issues from existing windfarms into existing FM networks. Also, the proposed windfarms are not located close to any existing or planned FM transmission sites.

Regards

Roger

Senior Executive Engineer
Broadcasting Authority of Ireland
2-5 Warrington Place
Dublin D02 XP29

Tel: 01 6441200
Fax: 01 6441299

From: David Naughton <dnaughton@mkoireland.ie>
Sent: Wednesday 16 June 2021 10:44
To: Roger Woods <rwoods@bai.ie>
Subject: 210207 - Dunneill Wind Farm EIAR Scoping Letter

Hi Roger,

Please find attached an informal scoping letter for a proposed extension of duration application for the existing Dunneill wind farm (Pl. Ref. 03/619, ABP Pl. Ref. 21.204790) in Dunneill and adjacent townlands in Co. Sligo. The existing wind farm consists of 13 No. turbines with a total rated capacity of c.11 Megawatts (MW), which became operational in 2010. The wind farm has therefore been operational for approximately 11 years to date, with the current planning permission set to expire in March 2024. SSE Renewables (Ireland) Ltd. intends to apply to Sligo County Council for planning permission to extend the operational period of the existing Dunneill Wind Farm for an additional 10 – 15 years.

As part of the scoping exercise for the proposed development, we would welcome any comments in relation to the proposed project.

If you have any queries, please do not hesitate to contact me.

Kind regards,

David Naughton B.Sc. (Env.)
Environmental Scientist

MKO
Tuam Road, Galway
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+353 (0) 91 735611
www.mkoireland.ie

David Naughton

From: Environmental Co-ordination (Inbox) <Environmental_Co-ordination@agriculture.gov.ie>
Sent: Tuesday 29 June 2021 13:48
To: David Naughton
Subject: RE: 210207 - Dunneill Wind Farm EIAR Scoping

Dear Sir/Madam,
The following are the comments from the Department of Agriculture, Food & the Marine 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 **Felling Section, Department of Agriculture, Food and the Marine, Johnstown Castle Estate, Co. Wexford**. Tel: 076-1064459, Web
https://www.agriculture.gov.ie/forestservice/treefelling/treefelling/

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; https://www.agriculture.gov.ie/media/migration/forestry/treefelling/FellingReforestationPolicy240517.pdf 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 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 for 2020 are published online at:
https://www.agriculture.gov.ie/forestservice/publicconsultation/environmentalimpactassessmenteiapublicconsultationforafforestationforestroadconstructionandfellinglicenses2020/

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 28 days to the Forestry Appeals Committee. Felling Licence decisions for 2020 are published online at: https://www.agriculture.gov.ie/forestservice/publicconsultation/environmentalimpactassessment-2020registerofdecisions/

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.

Kind regards

Cathy Hewitt
Executive Officer
An tAonad um Chomhordú Timpeallachta, An Rannóg um Athrú Aeráide agus Beartas Bithfhuinnimh,
Environmental Co-ordination Unit | Climate Change & Bioenergy Policy Division |
An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine
Pailliún A, Páirc Gnó Grattan, Bóthar Átha Cliath, Port Laoise, Co Laoise, R32 K857
Pavilion A, Grattan Business Park, Dublin Road, Portlaoise, Co Laois, R32 K857
T +353 (0)57 868 9915 environmentalco-ordination@agriculture.gov.ie
www.agriculture.gov.ie

From: David Naughton <dnaughton@mkoireland.ie>
Sent: Wednesday 16 June 2021 10:51
To: Environmental Co-ordination (Inbox) <Environmental_Co-ordination@agriculture.gov.ie>
Subject: 210207 - Dunneill Wind Farm EIAR Scoping Letter

CAUTION: This Email originated from Outside of this department. Do not click links or open attachments unless you recognise the sender and know the content is safe. Otherwise Please Forward any suspicious Emails to Notify.Cyber@agriculture.gov.ie .

Dear Sir or Madam,

Please find attached an informal scoping letter for a proposed extension of duration application for the existing Dunneill wind farm (Pl. Ref. 03/619, ABP Pl. Ref. 21.204790) in Dunneill and adjacent townlands in Co. Sligo. The existing wind farm consists of 13 No. turbines with a total rated capacity of c.11 Megawatts (MW), which became operational in 2010. The wind farm has therefore been operational for approximately 11 years to date, with the current planning permission set to expire in March 2024. SSE Renewables (Ireland) Ltd. intends to apply to Sligo County Council for planning permission to extend the operational period of the existing Dunneill Wind Farm for an additional 10 – 15 years.

As part of the scoping exercise for the proposed development, we would welcome any comments in relation to the proposed project.

If you have any queries, please do not hesitate to contact me.

Kind regards,

David Naughton B.Sc. (Env.)
Environmental Scientist
MKO
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
www.mkoireland.ie

tháinig sé chugat de bharr dearmad, téigh i dteagmháil leis an seoltóir agus scrios an t-ábhar ó do ríomhaire le do thoil.

David Naughton

From: Defence Property Management Planning <PropertyManagementPlanning@defence.ie>
Sent: Thursday 17 June 2021 18:30
To: David Naughton
Cc: Gareth O'Flaherty (Defence); Sarah Zacharia (Defence)
Subject: RE: 210207 - Dunneill Wind Farm EIAR Scoping Letter

Dear Mr. Naughton,

I refer to your e-mail below and your attached letter dated 15th June 2021.

As a matter of practice, the Department of Defence does not provide any observations or advice in the Pre- planning process, except where the relevant parties have been directed by a planning authority to seek the Department's views.
The Minister for Defence reserves the right to comment on an actual planning application as and when it is submitted in accordance with the provisions of the planning regulatory code.

Please contact me if you have any queries in this regard.

Best regards
Don

Don Watchorn

Property Management Branch

An Roinn Cosanta

Department of Defence

Bóthar an Stáisiúin, An Droichead Nua, Contae Chill Dara, W12 AD93.

Station Road, Newbridge, Co.Kildare, W12 AD93.

T +353 (0)45 492199
E-mail don.watchorn@defence.ie

From: David Naughton <dnaughton@mkoireland.ie>
Sent: Wednesday 16 June 2021 10:54
To: Defence Property Management Planning <PropertyManagementPlanning@defence.ie>
Subject: 210207 - Dunneill Wind Farm EIAR Scoping Letter

Dear Sir or Madam,

Please find attached an informal scoping letter for a proposed extension of duration application for the existing Dunneill wind farm (Pl. Ref. 03/619, ABP Pl. Ref. 21.204790) in Dunneill and adjacent townlands in Co. Sligo. The existing wind farm consists of 13 No. turbines with a total rated capacity of c.11 Megawatts (MW), which became operational in 2010. The wind farm has therefore been operational for approximately 11 years to date, with the current planning permission set to expire in March 2024. SSE Renewables (Ireland) Ltd. intends to apply to Sligo County Council for planning permission to extend the operational period of the existing Dunneill Wind Farm for an additional 10 – 15 years.

As part of the scoping exercise for the proposed development, we would welcome any comments in relation to the proposed project.

If you have any queries, please do not hesitate to contact me.

Kind regards,

David Naughton B.Sc. (Env.)
Environmental Scientist

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Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
www.mkoireland.ie

David Naughton

From: GCU - Reform Communications and Emergency Planning Divisional Mailbox <GeneralCo-OrdinationUnit@transport.gov.ie>
Sent: Wednesday 23 June 2021 12:00
To: David Naughton
Subject: RE: 210207 - Dunneill Wind Farm EIAR Scoping Letter

Dear David,

Thank you for your correspondence in relation to Dunneill Wind Farm.

The Department of Transport has no comment to make at this point in time but would appreciate being informed of any future relevant matters.

Kind regards,

Jacqui

Jacqui Traynor
Reform Communications Emergency Planning

An Roinn Iompair
Department of Transport

Lána Líosain, Baile Átha Cliath, D02 TR60
Leeson Lane, Dublin, D02 TR60

T +353 (0)1 604 1177
Jacquitraynor@transport.gov.ie www.gov.ie/transport

From: David Naughton <dnaughton@mkoireland.ie>
Sent: Wednesday 16 June 2021 11:03
To: GCU - Reform Communications and Emergency Planning Divisional Mailbox <GeneralCo-OrdinationUnit@transport.gov.ie>
Subject: 210207 - Dunneill Wind Farm EIAR Scoping Letter

Dear Sir or Madam,

Please find attached an informal scoping letter for a proposed extension of duration application for the existing Dunneill wind farm (Pl. Ref. 03/619, ABP Pl. Ref. 21.204790) in Dunneill and adjacent townlands in Co. Sligo. The existing wind farm consists of 13 No. turbines with a total rated capacity of c.11 Megawatts (MW), which became operational in 2010. The wind farm has therefore been operational for approximately 11 years to date, with the current planning permission set to expire in March 2024. SSE Renewables (Ireland) Ltd. intends to apply to Sligo County Council for planning permission to extend the operational period of the existing Dunneill Wind Farm for an additional 10 – 15 years.

As part of the scoping exercise for the proposed development, we would welcome any comments in relation to the proposed project.

If you have any queries, please do not hesitate to contact me.

Kind regards,

David Naughton B.Sc. (Env.)
Environmental Scientist

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Ireland, H91 VW84
+353 (0) 91 735611
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David Naughton

From: planning applications <planning.applications@failteireland.ie>
Sent: Thursday 1 July 2021 15:39
To: David Naughton
Subject: RE: 210207 - Dunneill Wind Farm EIAR Scoping Letter
Attachments: Fáilte Ireland EIAR Guidelines.pdf

Hello David,

Thank you for your email regarding the Environmental Impact Assessment (EIA) scoping exercise for the extension of the operational life of the Dunneill Wind Farm.

Please see attached the updated copy of Fáilte Ireland's Guidelines for the Treatment of Tourism in an EIA, which you may find informative for the preparation of the Environmental Impact Assessment for the proposed project. 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.

Regards,

Yvonne

Yvonne Jackson
Product Development-Environment & Planning Support | Fáilte Ireland
Áras Fáilte, 88/95 Amiens Street, Dublin 1. D01WR86
~~T +353 (0)1 884 7224~~ | **M** +353 (0) 860357590 | **www.failteireland.ie**

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From: David Naughton <dnaughton@mkoireland.ie>
Sent: Wednesday 16 June 2021 11:49
To: planning applications <planning.applications@failteireland.ie>
Subject: 210207 - Dunneill Wind Farm EIAR Scoping Letter

Dear Sir or Madam,

Please find attached an informal scoping letter for a proposed extension of duration application for the existing Dunneill wind farm (Pl. Ref. 03/619, ABP Pl. Ref. 21.204790) in Dunneill and adjacent townlands in Co. Sligo. The existing wind farm consists of 13 No. turbines with a total rated capacity of c.11 Megawatts (MW), which became operational in 2010. The wind farm has therefore been operational for approximately 11 years to date, with the current planning permission set to expire in March 2024. SSE Renewables (Ireland) Ltd. intends to apply to Sligo County Council for planning permission to extend the operational period of the existing Dunneill Wind Farm for an additional 10 – 15 years.

As part of the scoping exercise for the proposed development, we would welcome any comments in relation to the proposed project.

If you have any queries, please do not hesitate to contact me.

Kind regards,

David Naughton B.Sc. (Env.)
Environmental Scientist

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EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects

An tÚdarás Náisiúnta Forbartha Turasóireachta
Áras Fáilte, 88–95 Sráid Amiens
Baile Átha Cliath 1
D01 WR86
Éire

National Tourism Development Authority
Áras Fáilte, 88 - 95 Amiens Street
Dublin 1
D01 WR86
Ireland

Phone 1890 525 525
or +353 1 884 7700
Email info@failteireland.ie
www.failteireland.ie

Contents

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 Cunnane Stratton Reynolds on behalf of Fáilte Ireland to update their EIA guidelines in line with changes in legislative 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 **€8.4 billion**, and exchequer revenue of **€1.78 billion** in 2018, which helps fund other key public services.

In 2018 Ireland welcomed **10.6 million overseas visitors.**

Fáilte Ireland is the National Tourism Development Authority. 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 Draft guidelines on the information to be contained in Environmental Impact Assessment Reports in August 2017. At the time of this document the guidelines have not been adopted from draft.

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.

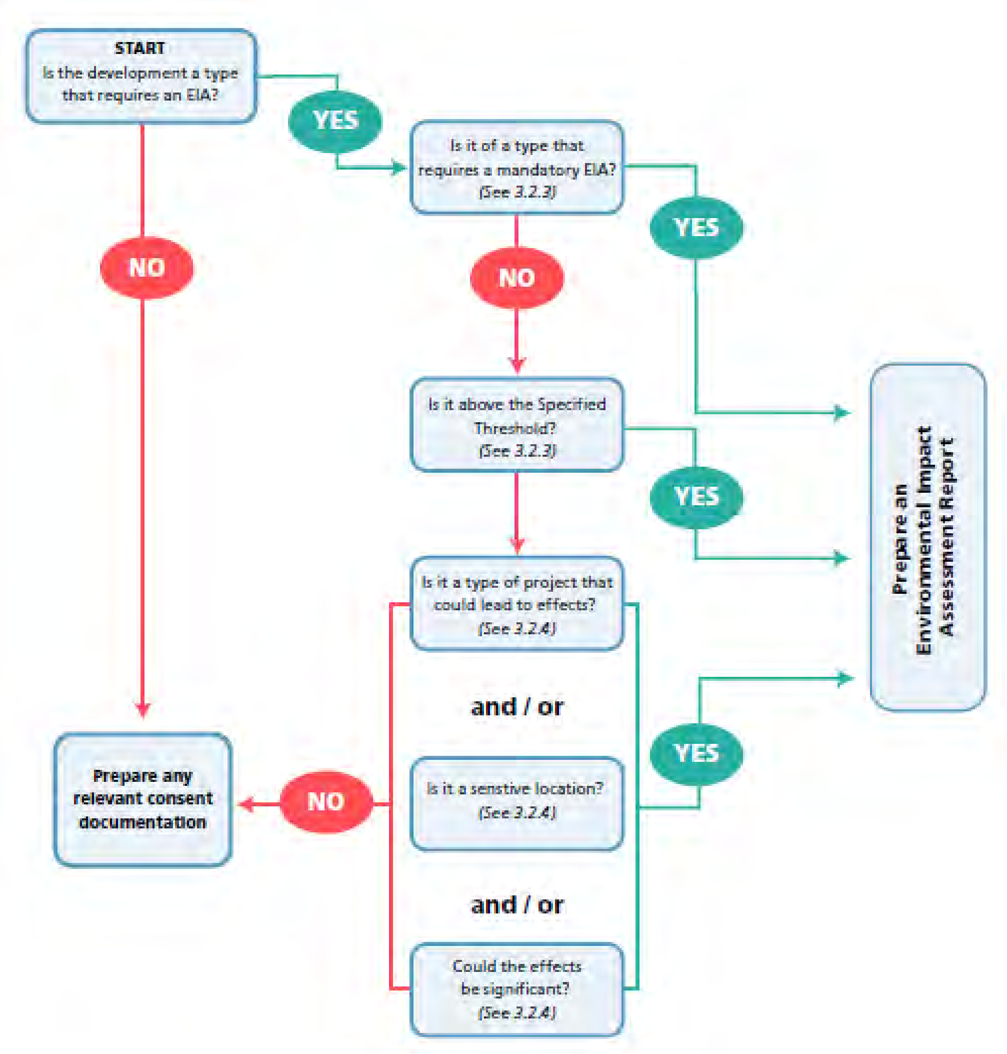
The process of EIA is set out in the EPA EIAR Guidelines, which this document should be read in conjunction with and used as supplementary guidance to. The process for ascertaining whether an EIAR is required is known as 'screening' and the process to determine the breath and scope of an EIAR is known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

Screening

Through EIAR 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 do 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 below 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 will still be a requirement for an EIAR for that development.

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 - forest trails, 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 have potential 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 2018 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 Draft 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 (eg. 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;
- impact assessment;
- cumulative impact
- interaction of impacts
- mitigation.

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 alternatives is a requirement of EIAR

Where tourism projects are location dependent the assessment of alternatives should consider alternative methods and technologies, detail the key considerations culminating in the selection of the 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 developer is expected to consider reasonable alternatives. What is considered reasonable my vary from case to case.

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 dependant on its **Context, Character, Significance,** and **Sensitivity**, as outlined in the Draft 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. Where possible the value of the contribution of such tourism assets and activities to the local economy should 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 Draft 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 assets under the 'material assets' topic 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.

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

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. 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 activity proposed and sensitivity of the location.

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 but is generally not kept in situ except in key cases which could also be considered under cultural heritage.

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 are utilities and infrastructure. Tourism itself could be considered a material asset as its impact upon the economy and the infrastructure in place to support it is a material consideration in assessing economic impact.

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 Effects

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 EIAR Screening Report.

Mitigation

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.

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.

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 an figures, briefing papers and reports and visitor feedback. The Fáilte Ireland website has a dedicated research library which 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 Authorities

Regional Authorities 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.

David Naughton, MKO
Tuam Road,
Galway,
Ireland,
H91 VW84

14 July 2021

Re: Informal EIA Scoping Request for Proposed Extension of Operation of the existing Dunneill Wind Farm, Dromore West, Co. Sligo

Your Ref: 210207
Our Ref: 21/222

Dear David,

Geological Survey Ireland is the national earth science organisation and is a division of the Department of the Environment, Climate and Communications. We provide independent geological information and advice and gather various data for that purpose. Please see our website for data availability. We recommend using these various data sets, when conducting the EIAR, SEA, planning and scoping processes. Use of our data or maps should be attributed correctly to 'Geological Survey Ireland'.

With reference to your letter dated the 15 June 2021, concerning the proposed extension of operation of the existing Dunneill Wind Farm, Dromore West, Co. Sligo, Geological Survey Ireland would encourage use of and reference to our datasets. Please find attached a list of our publicly available datasets that may be useful to the environmental assessment and planning process. We recommend that you review this list and refer to any datasets you consider relevant to your assessment. The remainder of this letter provides more detail on some of these datasets, with particular reference to the proposed development site.

Geoheritage

Geological Survey Ireland is in partnership with the National Parks and Wildlife Service (NPWS, Department of Housing, Local Government and Heritage), to identify and select important geological and geomorphological sites throughout the country for designation as geological NHAs (Natural Heritage Areas). This is addressed by the Geoheritage Programme of Geological Survey Ireland, under 16 different geological themes, in which the minimum number of scientifically significant sites that best represent the theme are rigorously selected by a panel of theme experts.

County Geological Sites (CGSs), as adopted under the National Heritage Plan, include additional sites that may also be of national importance, but which were not selected as the very best examples for NHA designation. All geological heritage sites identified by Geological Survey Ireland are categorised as CGS pending any further NHA designation by NPWS. CGSs are now routinely included in County Development Plans and in the GIS of planning departments, to ensure the recognition and appropriate protection of geological heritage within the planning system. CGSs can be viewed online under the Geological Heritage tab on the online Map Viewer.
The audit for Co. Sligo was carried out in 2004. The full report details can be found here. **Our records show that there are no CGSs in the vicinity of the wind farm.**

Groundwater

Geological Survey Ireland's Groundwater and Geothermal Unit, provides advice, data and maps relating to groundwater distribution, quality and use, which is especially relevant for safe and secure drinking water supplies and healthy ecosystems.

Proposed developments need to consider any potential impact on specific groundwater abstractions and on groundwater resources in general. We recommend using the groundwater maps on our Map viewer. which should include: wells; drinking water source protection areas; the national map suite - aquifer, groundwater vulnerability, groundwater recharge and subsoil permeability maps. For areas underlain by limestone, please refer to the karst specific data layers (karst features, tracer test database; turlough water levels (gwlevel.ie).

Background information is also provided in the Groundwater Body Descriptions. Please read all disclaimers carefully when using Geological Survey Ireland data.

The Groundwater Data Viewer indicates two aquifers classed as a 'Poor Aquifer – Bedrock which is Generally Unproductive except for Local Zones', and a 'Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones' underlie the proposed extension. The Groundwater Vulnerability map indicates both 'High' and 'Extreme' groundwater vulnerability within the area covered. We would therefore recommend use of the Groundwater Viewer to identify areas of High to Extreme Vulnerability in your assessments, as any groundwater-surface water interactions that might occur would be greater in these areas.

The Groundwater Protection Response overview and link to the main report is here: https://www.gsi.ie/en-ie/programmes-and-projects/groundwater-and-geothermal-unit/projects/protecting-drinking-water/what-is-drinking-water-protection/county-groundwater-protection-schemes/Pages/default.aspx

Geohazards

Geohazards can cause widespread damage to landscapes, wildlife, human property and human life. In Ireland, landslides, flooding and coastal erosion are the most prevalent of these hazards. We recommend that geohazards be taken into consideration, especially when developing areas where these risks are prevalent, and we encourage the use of our data when doing so.

Landslides are common in areas of peat, rock near surface and in fine to coarse range materials (such as glacial tills), areas which are found within the proposed area. Geological Survey Ireland has information available on landslides in Ireland via the National Landslide Database and Landslide Susceptibility Map both of which are available for viewing on our dedicated Map Viewer. Associated guidance documentation relating to the National Landslide Susceptibility Map is also available.

The Landslide Susceptibility viewer indicates the area is classed as variable, including areas of Moderately High to High landslide susceptibility.

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 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 Beatriz Mozo, Geological Mapping Unit, at Beatriz.Mozo@gsi.ie, 01-678 2795.

I hope that these comments are of assistance, and 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,

Clare Glanville
Senior Geologist
Geological Survey Ireland

Enc: Table - Geological Survey Ireland's Publicly Available Datasets Relevant to Planning, EIA and SEA processes.

Geological Survey Ireland's Publicly Available Datasets Relevant to Planning, EIA and SEA processes

following European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018

(S.I. No. 296 of 2018)

Geological Survey Ireland Programme	Dataset	Relevant EIA Topic	Coverage	Description / Notes	Link to Geological Survey Ireland map viewer
Geohazards	Landslide: National landslide database and landslide susceptibility map	Land & Soil/Climate/Landscape	National	Associated guidance documentation relating to the National Landslide Susceptibility Map is also available.	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=b68cf1e4a9044a5981f950e9b9c5625c
Geohazards	Groundwater Flooding (Historic)	Water	Regional	Provide information of historic flooding, both surface water and groundwater. [A lack of flooding presented in any specific location of the map only indicates that a flood has not been detected. It does not indicate that a flood cannot occur in that location at present or in the future]	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=848f83c85799436b808652f9c735b1cc
Geohazards	Groundwater Flooding (Predictive)	Water	Regional	Provides information on the probability of future karst groundwater flooding (where available). [The maps do not, and are not intended to, constitute advice. Professional or specialist advice should be sought before taking, or refraining from, any action on the basis of the flood maps]	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=848f83c85799436b808652f9c735b1cc
Geohazards	Radon Map	Land & Soils/Air	National		http://www.epa.ie/radiation/radonmap/
Geoheritage	County Geological Sites as adopted by National Heritage Plan and listed in County Development Pla	Land & Soils/Landscape	Regional	All geological heritage sites identified by Geological Survey Ireland are categorised as CGS pending any further NHA designation by NPWS.	https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228
Geological Mapping	Bedrock geology:	Land & Soils	National	1:100,000 scale and associated memoirs.	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0
Geological Mapping	Bedrock geology:	Land & Soils	Regional	1:50,000 scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0
Geological Mapping	Quaternary geology: Sediments	Land & Soils	National	1:50,000 scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0
Geological Mapping	Quaternary geology: Geomorphology	Land & Soils	National	1:50,000 scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0
Geological Mapping	Physiographic units:	Land & Soils	National	Broad-scale physical landscape units mapped at 1:100,000 scale in order to be represented as a cartographic digital map at 1:250,000 scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=afa76a420fc54877843aca1bc075c62b
Geological Mapping	GeoUrban: Spatial geological data for the greater Dublin and Cork areas	Land & Soils	Regional	includes 3D models	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=9768f4818b79416093b6b2212a850ce6&scale=0
Geological Mapping	Geotechnical database	Land & Soils	National	Digitised geotechnical and Site Investigation Reports and boreholes which can be accessed through online downloads	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=a2718be1873d47a585a3f0415b4a724c
Goldmine	Historical data sets including geological memoirs and 6" to 1 mile geological mapping records	land & Soils/Water	National	available online	https://secure.dccae.gov.ie/goldmine/index.html
Groundwater & Geothermal	Groundwater resources (aquifers)	Water	National	Data limited to 1:100,000 scale; sites should be investigated at local scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Groundwater recharge.	Water	National	Data limited to 1:40,000 scale; sites should be investigated at local scale; long term annual average recharge	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Groundwater vulnerability.	Water	National	Data limited to 1:40,000 scale; sites should be investigated at local scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Group scheme and public supply source protection areas.	Water	National	Not all PWS / GWS have SPZ / ZOC. Check with IW / coco / NFGWS for private supplies.	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Groundwater Protection Schemes	Water	National	Data is limited to scale of 1:40,000. Data does not include all of the source protections areas	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Catchment and WFD management units.	Water	National		https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	karst specific data layers	water	National	For areas underlain by limestone, includes karst features, tracer test database; turlough water levels (gwlevel.ie).	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Wells and Springs	Water	National	Not comprehensive, there may be unrecorded wells and springs	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Groundwater body Descriptions	Water	National	Not exhaustive; only those in designated SACs; could be other GWDTEs; for more information contact NPWS / EPA / site investigations	https://www.gsi.ie/en-ie/programmes-and-projects/groundwater-and-geothermal-unit/activities/understanding-ireland-groundwater/Pages/Groundwater-bodies.aspx
Groundwater & Geothermal	Geothermal Suitability maps	land & Soils/Water	National	Also, Roadmap for a Policy and Regulatory Framework for Geothermal Energy, November 2020	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=9ee46bee08de41278b90a991d60c0b9e
Marine & Coastal Unit	INFOMAR - Ireland's national marine mapping programme; providing key baseline data for Ireland's	Water	National		https://secure.dccae.gov.ie/GSI/INFOMAR_VIEWER/
Marine & Coastal Unit	CHERISH - Coastal change project (Climate, Heritage and Environments of Reefs, Islands, and Headla	Water	Regional		http://www.cherishproject.eu/en/
Marine & Coastal Unit	Coastal Vulnerability Index (CVI).	water /Land & Soils	Regional	Currently the project is being carried out on the east coast and will be rolled out nationally	https://www.gsi.ie/en-ie/programmes-and-projects/marine-and-coastal-unit/projects/Pages/Coastal-Vulnerability-Index.aspx
Minerals	Aggregate potential	Land & Soils/Material Assets	National	Consideration of mineral resources and potential resources as a material asset which should be explicitly recognised within the environmental assessment process	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=ee8c4c285a49413aa6f1344416dc9956
Minerals	Active quarries	Land & Soils	National		https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=ee8c4c285a49413aa6f1344416dc9956
Minerals	Historic mines	Land & Soils/Cultural Heritage	National	Inventory and Risk Classification 2009. Environmental Protection Agency, Economic Minerals Division and Geological Survey Ireland (DECC).	https://gis.epa.ie/EPAMaps/default?easting=?&northing=?&lid=EPA:LEMA_Facilties_Extractive_Facilities https://www.epa.ie/enforcement/mines/
Tellus	Geochemical data: multi-element data for shallow soil, stream sediment and stream water	Land & Soils	Regional	A national mapping programme	https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=6304e122b733498b99642707ff72f754
Tellus	Airborne geophysical data including radiometrics, electromagnetics and magnetics	Land & Soils	Regional	A national mapping programme	https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=6304e122b733498b99642707ff72f754
Tellus	urban geochemistry mapping (Dublin SURGE project),	Land & Soils	Regional		https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=6304e122b733498b99642707ff72f754

Notes:

1. The maps and data listed above are available on the Geological Survey Ireland map viewer https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx

2. Please read all disclaimers carefully when using Geological Survey Ireland data

3. Geological Survey Ireland and Irish Concrete Federation published guidelines for the treatment of geological heritage in the extractive industry in 2008.

An tOifig Náisiúnta um Sláinte Chomhshaoil
Feidhmeannacht na Seirbhíse Sláinte,
Urlár 2, Teach na Darach, Ascaill na Teile
Páirc na Mílaoise, An Nás, Co. Chill Dara.

National Office for Environmental Health Services
2nd Floor, Oak House, Lime Tree Avenue
Millennium Park, Naas, Co. Kildare
Eircode: W91KDC2

T: 045 880 442
ehnationaloffice@hse.ie

Date:	26.7.21
Name:	Mr David Naughton, MKO, Tuam Road, Galway
Consultant's reference:	210207
Re:	Scoping Report
Proposed development:	Proposed Extension of Operation – Dunneill Wind Farm, Co Sligo
Applicant:	SSE Renewables (Ireland) Ltd
EHIS ref:	1835

Dear Mr Naughton

Please find enclosed the HSE Consultation Report in relation to the above proposal.

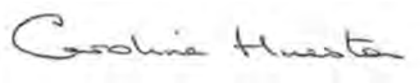
The following HSE departments were made aware of the consultation request for the proposed development on 1 July 2021

- Emergency Planning – Kay Kennington
- Estates – Helen Maher
- Assistant National Director for Health Protection – Kevin Kelleher / Laura Murphy

- CHO – John Hayes

Please contact me if you have any queries regarding this report.

Yours sincerely



Environmental Health Officer
Environment OU
Ennistymon Health Centre
Ennistymon
Co. Clare

065 7071143
086 8236817

HSE EIA Scoping

Environmental Health Service Submission Report

Date: 26.7.21

Our reference: EHIS 1835

Report to: Mr David Naughton, MKO, Tuam Road, Galway

Type of Consultation: EIA Scoping

Proposed development: Proposed Extension of Operation of existing Dunneill Wind Farm, Dromore West, Co. Sligo

Applicant: SSE Renewables (Ireland) Ltd

General Introduction

The following documents should be taken into consideration when preparing the Environmental Impact Assessment Report:

- Guidelines on the information to be contained in EIS (2002), 187kb
- Advice Notes on Current Practice in the preparation of EIS (2003), 435kb
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment

https://www.housing.gov.ie/sites/default/files/publications/files/guidelines_for_planning_authorities_and_an_bord_pleanála_on_carrying_out_eia_-_august_2018.pdf

EU publication: Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report, EU, 2017

http://ec.europa.eu/environment/eia/pdf/EIA_guidance_EIA_report_final.pdf

Adoption of the Directive (2014/52/EU) in April 2014 initiated a review of the above guidelines. The draft new guidelines can be seen at:

http://www.epa.ie/pubs/consultation/reviewofdrafteisguidelinesadvicenotes

The EIAR should note any changes which may have occurred in the receiving environment since the construction of the Dunneill wind farm and should describe any such changes under the following headings within the EIAR

a) Description of the receiving environment. This should include any new housing developments or the introduction of additional sensitive receptors into the locality since the commissioning of the wind farm and any other wind farm developments constructed since the Dunneill Wind Farm was commissioned

b) The nature and scale of the impact.

c) An assessment of the significance of the impact

d) Proposed mitigation measures

e) Residual impacts.

Directive 2014/52/EU has an enhanced requirement to assess likely significant impacts on Population and Human Health. It is the experience of the Environmental Health Service (EHS) that impacts on human health are often inadequately assessed in EIAs in Ireland. It is recommended that the wider determinants of health and wellbeing are considered in a proportionate manner when considering the EIA. Guidance on wider determinants of health can be found at www.publichealth.ie

In addition to any likely significant negative impacts from the proposed development, any positive likely significant impacts should also be assessed.

Evidence of the results of environmental monitoring undertaken for the operation of Dunneill Wind Farm should be provided in the EIAR in particular the EIAR should include evidence of compliance with planning conditions.

The HSE will consider the final EIAR accompanying the planning application and will make comments to the relevant planning authority on the applicant's history of compliance with planning and environmental conditions.

This report only comments on Environmental Health Impacts of the proposed development. It is based on an assessment of the correspondence submitted to this office dated 15th June 2021.

The Environmental Health Service (EHS) recommends that the following matters are included and assessed in the EIAR

• Public Consultation

• Decommissioning phase

• Opportunity for Health Gain

• Noise & Vibration, with particular reference to any changes in operational noise and vibration since the commissioning of the wind farm in 2010.

• Geological Impacts. Any land slippage in the vicinity of the windfarm which has occurred since its construction should be detailed.

• Ancillary facilities

• Cumulative impacts

Public Consultation

It is strongly recommended that early and meaningful public consultation with the local community should be carried out to ensure all potentially significant impacts have been adequately addressed.

All parties affected by the proposed extended operation of the wind farm, **including those who benefit financially from the project,** must be fully informed of the proposal.

It is acknowledged that current restrictions around public gatherings as a result of Covid 19 prevention measures will impact on opportunities for public consultation events. However it is expected that meaningful public consultation, where the local community is fully informed of the proposed extension to the operational life of the wind farm, will be undertaken.

Members of the public should be given sufficient opportunities to express their views on the proposal to extend the operational life of the wind farm.

The Environmental Impact Assessment Report (EIAR) should clearly demonstrate the link between public consultations and how those consultations have influenced the decision-making process in the EIA.

The Environmental Health Service would prefer to receive planning and EIAR documentation electronically by USB if possible.

The EIAR should contains details of any complaints received in respect of the operation of the Dunneill Wind Farm and measures taken by the operator in response to any complaints received.

Decommissioning Phase

The proposed extension of operation of the existing wind farm should have a clear life span and the EIAR should indicate the estimated operational phase of the wind farm. It should also detail how and when it will finally be decommissioned and any proposals for the future use of the site.

Information should be included on the use of decommissioned materials (rotor blades, nacelle and tower) and on proposals for the removal, disposal or otherwise of the foundations

Opportunity for Health Gain

The EPA has issued guidance with regard to meeting the requirements of Directive 2014/52/EU which assesses the impact of certain public and private projects on the environment. The proposed development should be assessed with a view to the potential to include opportunities for health gain within the site of the proposed wind farm by including greenways, cycle-paths or walking trails within the development site.

Assessment of Consideration of Alternatives

The EIAR should consider an assessment of alternatives including an alternative to extending the operational life of the Dunneill Wind Farm.

All existing or proposed wind farm developments in the vicinity should be clearly identified in the EIAR.

Caroline Hueston

Caroline Hueston
Environmental Health Officer
Environment Operational Unit
HSE West
Ennistymon Health Centre
Ennistymon
Co. Clare

David Naughton
MKO
Tuam road
Galway
H91VW84

Iascach Intíre Éireann
Inland Fisheries Ireland

29th June 2021

Re: - EIA Scoping Request for Proposed Extension of Operation of the existing Dunneill Wind Farm, Dromore West, Co. Sligo

Dear Sir/Madam,

Inland Fisheries Ireland (IFI) is the state body responsible for the protection, management and conservation of the inland fisheries and sea angling resource in Ireland. Protection of the aquatic environment and habitat is a vitally important element of IFI's work.

The Dunneill wind farm lies adjacent to the Dunneill River and its tributary the Fiddandoo River. The Dunneill River provides good quality habitat for wild brown trout, eel and stickleback. This catchment has been allocated good ecological status in the River Basin Management Plan and this status must be protected to comply with the Water Framework Directive.

The EIS should assess the potential impacts the Dunneill wind farm extension of operation may have on the aquatic and associated riparian habitat including the pollution of water, spread of non-native species and interference with upstream and downstream movement of aquatic life. The assessment should include an assessment of the existing infrastructure and drainage network. Please find below IFI recommendations in relation to the proposed windfarm extension of operation EIA:

1. The watercourse culvert structures within the site should be assessed to ensure there is no physical or hydrological barrier to the upstream or downstream passage of fish.

2. All watercourses that are receiving drainage from the site should be assessed in terms of aquatic biodiversity with particular emphasis on fish, the food of fish, spawning grounds and fish habitat in general. Were invertebrate sampling was carried out previously as part of this development additional invertebrate sampling could be carried out to assess any change in populations.

3. The on-site drainage system and surface water hydrology should be assessed to ensure there is no pollution, sedimentation, or erosion due to the existing drainage infrastructure. Maintenance or mitigation measure may be required.

4. A survey for the presence of invasive species should be carried out and a management plan put in place where found.

IFI request the following to be addressed:

- Water quality
- Surface water hydrology
- Fish spawning and nursery areas
- Passage of migratory fish
- Areas of natural heritage importance
- Biological diversity, ecosystem structure and functioning
- Sport and commercial fishing and angling
- Sediment transport

Iascach Intíre Éireann
Inland Fisheries Ireland

IFI looks forward to further consultation in relation to this development in due course.

Yours sincerely

____

Aisling Donegan
Senior Fisheries Environmental Officer
Abbey Street
Ballina
Co. Mayo

mko-d-wf-0621

David Naughton

From: IWT Info <info@iwt.ie>
Sent: Friday 18 June 2021 10:02
To: David Naughton
Subject: Re: 210207 - Dunneill Wind Farm EIAR Scoping Letter

Hi David,

Thank you for contacting the Irish Wildlife Trust.

We do not have the capacity to consider or respond to all scoping requests at the moment.
We will endeavour to respond if possible.

Regards,
The Irish Wildlife Trust

On Wed, 16 Jun 2021 at 12:23, David Naughton <dnaughton@mkoireland.ie> wrote:

> Dear Sir or Madam,
>
> Please find attached an informal scoping letter for a proposed extension of duration application for the existing Dunneill wind farm (Pl. Ref. 03/619, ABP Pl. Ref. 21.204790) in Dunneill and adjacent townlands in Co. Sligo. The existing wind farm consists of 13 No. turbines with a total rated capacity of c.11 Megawatts (MW), which became operational in 2010. The wind farm has therefore been operational for approximately 11 years to date, with the current planning permission set to expire in March 2024. SSE Renewables (Ireland) Ltd. intends to apply to Sligo County Council for planning permission to extend the operational period of the existing Dunneill Wind Farm for an additional 10 – 15 years.
>
> As part of the scoping exercise for the proposed development we would welcome any comments in relation to the proposed project.
>
> If you have any queries please do not hesitate to contact me.
>
> Kind regards,
>
> David Naughton B.Sc. (Env.)
> Environmental Scientist
>
> *MKO*

Tuam Road, Galway

Ireland, H91 VW84

+353 (0) 91 735611

www.mkoireland.ie

--

HELP SUPPORT OUR WORK - Join the IWT Today - https://iwt.ie/support-us/become-a-member/
Irish Wildlife Trust, 8 Cabra Road, Dublin 7, D07T1W2
Registered Charity (CRA) Number: 20010966
Facebook: IrishWildlifeTrust
Twitter: @irishwildlife
Phone: 01 445 7259

David Naughton

From: Mihaela Davidescu <mdavides@sligococo.ie>
Sent: Tuesday 22 June 2021 12:47
To: David Naughton
Subject: Dunneill Wind Farm, Co. Sligo - proposed extension of operations (informal EIA scoping)

Dear David,

Thank you for the informal scoping document (hard copy) dated 15 June 2012, received by the Planning Section of Sligo County on 18 June 2021. We confirm that SSE's Michelle Donnelly has been in contact with us in January-February 2021, and that we recommended a substantial extension of the wind farm's operational life, as opposed to an amendment to Condition 8 of PL 03-619.

At this stage, we have no further comments or suggestions. We are satisfied that MKO team has the required level of expertise to act as Environmental Consultants with the responsibility to prepare the EIAR and carry out AA in relation to the proposed development.

Please e-mail us a PDF of the document sent by post, which I will forward to our Heritage Officer (who might have comments or suggestions).

Regards,

Mihaela Davidescu
Senior Executive Planner
Development Planning Unit
& West Sligo Area Planner
Sligo County Council

David Naughton

From: INFO <Information@tii.ie>
Sent: Thursday 24 June 2021 09:04
To: David Naughton
Subject: RE: 210207 - Dunneill Wind Farm EIAR Scoping Letter

Dear Mr. Naughton,

Thank you for your email of 16 June 2021 regarding the above EIAR Scoping exercise.

TII will endeavour to consider and respond to planning applications referred to it given its status and duties as a statutory consultee under the Planning Acts. The approach to be adopted by TII in making such submissions or comments will seek to uphold official policy and guidelines as outlined in the Section 28 Ministerial Guidelines 'Spatial Planning and National Roads Guidelines for Planning Authorities' (DoECLG, 2012). Regard should also be had to other relevant guidance available at www.TII.ie.

The issuing of this correspondence is provided as best practice guidance only and does not prejudice TII's statutory right to make any observations, requests for further information, objections or appeals following the examination of any valid planning application referred.

National Strategic Outcome 2 of the National Planning Framework includes the objective to maintain the strategic capacity and safety of the national roads network. It is also an investment priority of the National Development Plan, 2018 – 2027, to ensure that the extensive transport networks which have been greatly enhanced over the last two decades, are maintained to a high level to ensure quality levels of service, accessibility and connectivity to transport users. This requirement is further reflected in the recent publication of the Draft National Investment Framework for Transport in Ireland and also the existing Statutory Section 28 Spatial Planning and National Roads Guidelines for Planning Authorities.

It is acknowledged that the proposed development represents the continuation of use of an established windfarm, however, with respect to EIAR scoping issues, the recommendations indicated below provide general guidance for the preparation of an EIAR, which may affect the national road network.

The developer/scheme promoter should have regard, inter alia, to the following;
• TII notes that the subject site adjoins the regional and local road network. Access to the road network shall be developed in accordance with official policy and road safety considerations, as outlined above. Consultations should be had with the relevant Local Authority/National Roads Design Office with regard to locations of existing and future national road schemes,

• TII would be specifically concerned as to potential significant impacts the development would have on the national road network (and junctions with national roads) in the proximity of the proposed development,

• The developer should assess visual impacts from existing national roads,

• The developer should have regard to any EIAR/EIS and all conditions and/or modifications imposed by An Bord Pleanála regarding road schemes in the area. The developer should in particular have regard to any potential cumulative impacts,

• The developer, in preparing EIAR, should have regard to TII Publications (formerly DMRB and the Manual of Contract Documents for Road Works),

• The developer, in preparing EIAR, should have regard to TII's Environmental Assessment and Construction Guidelines, including the Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (National Roads Authority, 2006),

• The EIAR/EIS should consider the Environmental Noise Regulations 2006 (SI 140 of 2006) and, in particular, how the development will affect future action plans by the relevant competent authority. The developer may need to consider the incorporation of noise barriers to reduce noise impacts (see Guidelines for the Treatment of Noise and Vibration in National Road Schemes (1st Rev., National Roads Authority, 2004)),

• It would be important that, where appropriate, subject to meeting the appropriate thresholds and criteria and having regard to best practice, a Traffic and Transport Assessment (TTA) be carried out in accordance with relevant guidelines, noting traffic volumes attending the site and traffic routes to/from the site with reference to impacts on the national road network and junctions of lower category roads with national roads. In relation to national roads, TII's Traffic and Transport Assessment Guidelines (2014) should be referred to in relation to proposed development with potential impacts on the national road network. The scheme promoter is also advised to have regard to Section 2.2 of the NRA/TII TTA Guidelines which addresses requirements for sub-threshold TTA. Any improvements required to facilitate development should be identified. It will be the responsibility of the developer to pay for the costs of any improvements to national roads to facilitate the private development proposed as TII will not be responsible for such costs,

• The designers are asked to consult TII Publications to determine whether a Road Safety Audit is required,

• In the interests of maintaining the safety and standard of the national road network, the EIAR should identify the methods/techniques proposed for any works traversing/in proximity to the national road network,

• TII recommends that that applicant/developer should clearly identify haul routes proposed and fully assess the network to be traversed. Where abnormal 'weight' loads are proposed, separate structure approvals/permits and other licences may be required in connection with the proposed haul route and all structures on the haul route through all the relevant County Council administrative areas should be checked by the applicant/developer to confirm their capacity to accommodate any abnormal 'weight' load proposed.

The national road network is managed by a combination of PPP Concessions, Motorway Maintenance and Renewal Contracts (MMaRC) and local road authorities in association with TII.

The applicant/developer should also consult with all PPP Companies, MMaRC Contractors and road authorities over which the haul route traverses to ascertain any operational requirements such as delivery timetabling, etc. and to ensure that the strategic function of the national road network is safeguarded.

Additionally, any damage caused to the pavement on the existing national road arising from any temporary works due to the turning movement of abnormal 'length' loads (eg. tearing of the surface course, etc.) shall be rectified in accordance with TII Pavement Standards and details in this regard shall be agreed with the Road Authority prior to the commencement of any development on site.

Designers should consult TII Publications to determine whether a Road Safety Audit is required for any of the temporary works proposed. Any recommendations should be incorporated into designs.

• Grid connection and cable routing proposals should be developed to safeguard proposed road schemes as TII will not be responsible for costs associated with future relocation of cable routing where proposals are catered for in an area of a proposed national road scheme. In that regard, consideration should be given to routing options, use of existing crossings, depth of cable laying, etc.

In the context of the existing national road network, in accordance with the National Planning Framework National Strategic Outcome no. 2, 'Enhanced Regional Accessibility', there is a requirement to maintain the strategic capacity and safety of the network. This requirement is further reflected in the National Development Plan, the recent publication of the Draft National Investment Framework for Transport in Ireland and also the existing Statutory Section 28 Spatial Planning and National Roads Guidelines for Planning Authorities.

There is around 99,000km of roads in Ireland, the national road network which caters for strategic inter-urban travel consists of only approx. 5.4% of this. There is a critical requirement to ensure the strategic capacity and safety of this national road network is maintained and significant Government investment already made in the national road network is safeguarded.

The provision of cabling along the national road network represents a number of significant implications for TII and road authorities in the management and maintenance of the strategic national road network and TII is of the opinion that grid connection cable routing should reflect the foregoing provisions of official policy. Therefore, TII advises that grid connection cable routing should seek to utilise the extensive existing local road network, or alternatives, as opposed to the strategic national road network contrary to the provisions of official policy.

Other consents or licences may be required from the road authority for any trenching or cabling proposals crossing the national road. TII requests referral of all proposals agreed and licensed between the road authority and the applicant which affect the national road network.

Cable routing should avoid all impacts to existing TII infrastructure such as traffic counters, weather stations, etc. and works required to such infrastructure shall only be undertaken in consultation with and subject to the agreement of TII, any costs attributable shall be borne by the applicant/developer. The developer should also be aware that separate approvals may be required for works traversing the national road network.

Notwithstanding any of the above, the developer should be aware that this list is non-exhaustive, thus site and development specific issues should be addressed in accordance with best practice.

I trust that the above comments are of use in your EIAR preparation.

Yours sincerely,

Alban Mills
Senior Regulatory & Administration Executive
Ref No. TII21-113674

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

From: David Naughton <dnaughton@mkoireland.ie>
Sent: Wednesday 16 June 2021 12:42
To: Landuse Planning <LandUsePlanning@tii.ie>
Subject: 210207 - Dunneill Wind Farm EIAR Scoping Letter

Dear Sir or Madam,

Please find attached an informal scoping letter for a proposed extension of duration application for the existing Dunneill wind farm (Pl. Ref. 03/619, ABP Pl. Ref. 21.204790) in Dunneill and adjacent townlands in Co. Sligo. The existing wind farm consists of 13 No. turbines with a total rated capacity of c.11 Megawatts (MW), which became operational in 2010. The wind farm has therefore been operational for approximately 11 years to date, with the current planning permission set to expire in March 2024. SSE Renewables (Ireland) Ltd. intends to apply to Sligo County Council for planning permission to extend the operational period of the existing Dunneill Wind Farm for an additional 10 – 15 years.

As part of the scoping exercise for the proposed development we would welcome any comments in relation to the proposed project.

If you have any queries please do not hesitate to contact me.

Kind regards,

David Naughton B.Sc. (Env.)
Environmental Scientist

MKO
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
www.mkoireland.ie

APPENDIX 2.3

COMMUNITY BENEFIT REPORT

Appendix 2-3 Community Benefit Report

Dunneill Wind Farm, Co. Sligo

DOCUMENT DETAILS

Client:	**Client Name**
Project Title:	**Dunneill Wind Farm, Co. Sligo**
Project Number:	**210207**
Document Title:	**Appendix 2-3 Community Benefit Report**
Document File Name:	**Appendix 2-3 - Community Benefit Report - F - 2022.08.10 - 210207**
Prepared By:	**MKO** **Tuam Road** **Galway** **Ireland** **H91 VW84**

Planning and Environmental Consultants

Rev	Status	Date	Author(s)	Approved By
01	Draft	28/07/2021	DN/TB	CD
02	Final	10/08/2021	AC	CD

Table of Contents

1. INTRODUCTION

This report has been prepared to record the consultation carried out with the local community in respect of the proposed extension of operation for the existing Dunneill Wind Farm (Proposed Development). Brickmount Ltd. has carried out consultation in relation to the Proposed Development with local residents. The objective of the consultations was to ensure that the views and concerns of all were considered as part of the Environmental Impact Assessment (EIA) process.

The Proposed Development has the potential to have positive benefits for the local economy, by means of landowner payments and commercial rate payments. An important part of wind farm development, which Brickmount Ltd. and SSE Renewable Ireland Ltd. has been at the forefront of, is its Community Benefit Package. The concept of directing benefits from wind farms to the local community is promoted by the National Economic and Social Council (NESC) and the Irish Wind Energy Association (IWEA) among others. Keel Energy Ltd. is endeavouring to develop new ways to direct increased gain towards the local community with particular focus on those living closest to the Proposed Development.

The Wind Energy Development Guidelines[1] (2006) state that:

> *"While it is not a mandatory requirement, it is strongly recommended that developers of a wind energy project should engage in active consultation and dialogue with the local community at an early stage in the planning process, ideally prior to submitting a planning application".*

This was further addressed in the Preferred Draft Approach to Wind Energy Development in Ireland[2] (June 2017) which stated the following with respect to planning applications for wind farms:

> *"Planning applications must contain a Community Report prepared by the applicant which will specify how the final proposal reflects community consultation. The Community Report must also outline steps taken to ensure that the proposed development will be of enduring economic benefit to the communities concerned".*

The Draft Revised Wind Energy Guidelines[3] (Department of Housing, Planning and Local Government, 2019) has retained this position stating the following:

> *"In order to promote the observance of best practice, planning authorities should require applicants to prepare and submit a Community Report with their planning application and a condition on any subsequent planning permission should require developers to carry out the development in accordance with the approved Community Report".*

This report outlines the consultation and community engagement initiatives undertaken by Brickmount Ltd. prior to the submission of the planning application. It also outlines the main issues identified during this process, how the final proposal reflects community consultation and the steps taken to ensure that the Proposed Development will be of enduring economic benefit to the communities concerned.

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[1] *The Department of the Environment, Heritage and Local Government, Wind Energy Planning Guidelines 2006, p19*
[2] *The Department of Communications, Climate Action and Environment and Department of Housing, Planning, Community and Local Government, Information Note Review of the Wind Energy Development Guidelines 2006 "Preferred Draft Approach", 2017, p.8*
[3] *The Department of Housing, Planning and Local Government, Draft Revised Wind Energy Development Guidelines 2019, p. 42*

2. CONSULTATION WITH THE LOCAL COMMUNITY

2.1 Notification of the Local Community

As this is a long-established wind farm (in operation since 2010) it is well known by local people in the community. As this is an application to extend the life of the existing Dunneill Wind Farm and as no amendments are being proposed to the layout, SSE considered that community consultations should be tailored to reflect that context.

To date, community consultations consist of a hand delivered letter drop made on 11th and 12th of April 2022 to dwellings within 2km of the wind farm, advising of the forthcoming planning application to be made to Sligo County Council. Door-to-door consultations were facilitated during the letter drop to residents within 2km of the wind farm. Where landowners where not home during the door-to-door consultations, the information leaflet and cover letter was left through their letterboxes. The letter has a dedicated email address vicky.boden@sse.com for general queries or observations. A copy of this information leaflet and letter is included as Appendix 1 to this Community Benefit Report. Additional one to one meetings can be facilitated on request.

Information is also available on https://www.sserenewables.com/onshore-wind/ireland/dunneill/. The website shall have all planning related documents for this project. The website provides details as to how the public can submit general queries by either email, telephone or post. Further online public consultation shall be facilitated throughout the remainder of the planning process.

2.1.1 Letters of Support

A total of seven letters of support were received in support of the planning application for the proposed extension of operation for the existing Dunneill Wind Farm. These support letters have been received from local community groups, including:

- Dromore West Village Enhancement Committee;
- Dromore West Astro Turf Pitch;
- Mayo Beekeepers' Association;
- Skreen Dromard Community Care, Active Retirement Group;
- Dromore West Community Council CLG
- St. Farnans Community Park Association Ltd.
- Dromore Villa FC

Copies of these letters of support can be found in Appendix 2 of this Community Benefit Report.

2.1.2 Community Feedback

A total of 74 no. dwellings were targeted for a leaflet drop during 11th and 12th of April 2022. Residents of 45 no. dwellings had leaflets handed directly to them. The remaining 29 no. dwellings had where possible a leaflet and cover letter placed in their letter box.

Of the 45 no. dwellings engaged with directly during consultation 41 no. responses were received where the general reaction to the windfarm could be described as being positive without outlining specific reasons and had no objections to its presence for a further period of time. One respondent sought information as to whether additional turbines could be developed on their land.

Of the 45 no. dwellings engaged with directly during consultation 2 no. respondents stated that while not happy with the windfarm they could put up with it and a further 2 no. respondents stated that shadow flicker was an issue at times.

Since the leaflet drop one member of the community has engaged directly with the CLO. This member of the community wanted to discuss noise, shadow flicker and additions to the existing development..

3. ENDURING ECONOMOIC BENEFIT

3.1 Economic Benefits to Date

The Proposed Development will have several significant long-term benefits for the local economy including job creation, landowner payments, local authority commercial rate payments and a Community Benefit Scheme. In 2021, SSE Renewables presented more than €19,400 to community groups near the Dunneill Wind Farm. Including the 2021 calendar year, the Dunneill Community Fund brings the company's overall contribution in the region to €251,000 since 2010.

A total of 13 local groups benefited from the 2021 community fund contribution of €19,400, including schools, sports clubs and community organisations. The successful applicants included amongst others: Eoghan Rua Ladies FC, Owenbeg National School, Mayo Beekeepers Association Subgroup Dromore West Beekeepers, West Sligo Young at Heart and Templeboy Aughris Rural Action TARA.

Dunneill Wind Farm has contributed over €1 million in county council rates since 2010. The continued annual commercial rate payments from the Proposed Development to Sligo County Council, will be redirected to the provision of public services within Co. Sligo. These services include provisions such as road upkeep, fire services, environmental protection, street lighting, footpath maintenance etc. along with other community and cultural support initiatives.

3.2 Continued Economic Benefits Associated with the Proposed Development

The community benefit scheme proposes to provide a fund of approximately €20,000 per annum over the lifespan of the Proposed Development based on the current estimated generating capacity. This will equate to potential funding in the region of €300,000 to the local community over the proposed 15 year extension of operation, which is a substantial contribution.

The number and size of grant allocations will be decided by a Community Fund liaison committee with various groups and projects benefiting to varying degrees depending on their funding requirement.

4. CONCLUSION

Brickmount Ltd. has actively engaged and consulted with the local community from an early stage during the pre-application phase. The consultation process has been an extremely valuable exercise and has provided a detailed, and enhanced understanding of the key issues and concerns of the local community.

The proposed extension of operation for the existing Dunneill Wind Farm will provide an enduring economic benefit to the communities surrounding the Proposed Development as outlined in Chapter 4 of the EIAR, through the community benefit package for residents and community groups, and through the annual rates payable to the local authority.

APPENDIX 1

INFORMATION LETTER FOR LOCAL COMMUNITY

ABOUT
DUNNEILL WIND FARM

Dunneill Wind Farm is located near Dromorewest, Co. Sligo. The wind farm comprises of 13 turbines and provides enough clean green renewable energy to power almost 7,300 homes every year.

Dunneill Wind Farm was granted planning permission in March 2004 to expire in 2024, a period of 20 years. However, the wind farm has only been in commercial operation since 2010, a period of 12 years. SSE Renewables are now seeking to extend the operational life of Dunneill Wind farm by a further 15 years up until 2039 in order to continue the provision of renewable energy and advance its contribution towards Ireland Climate Change commitments.

An extension of time will ensure that the Community Fund contributions will continue for a further 15 years. This will also ensure that the local council will continue to receive substantial rates payments every year, which will extend contributions towards local services such as roads, local infrastructure and public services.

SSE Renewables will submit a planning application to Sligo County Council for this extension of time in the summer of 2022. We would encourage anyone to contact us if there are any queries or questions regarding this application.

CONTACT US

We are very keen to keep in contact with all members of the community and we will keep you informed as the planning application progresses. In the meantime if there are any queries or concerns please contact Louise Glennon via email, telephone or post.

Vicky Boden,
vicky.boden@sse.com
clo@sse.com
0818 211 500

Post:
SSE Renewables
Red Oak South,
South County Business Park,
Leopardstown, Dublin 18.

One to one meetings will be facilitated on request

Information is also available on https://www.sserenewables.com/onshore-wind/ireland/dunneill/ and from time to time content will be updated to address any frequently asked questions.

sse Renewables

sse Renewables

ABOUT
DUNNEILL WIND FARM

INFORMATION LEAFLET
Q1/Q2 2022

ABOUT
SSE RENEWABLES

SSE Renewables is a leading developer and operator of renewable energy across the UK and Ireland, with a portfolio of 4,000MW of onshore wind, offshore wind and hydro. Part of the FTSE-listed SSE plc, our strategy is to drive the transition to a zero-carbon future through the world class development, construction and operation of renewable energy assets. Since 2008 we have invested over €2.5 billion in Ireland's sustainable energy infrastructure.

In Ireland, SSE Renewables is the leading developer, owner and operator of onshore wind farms. We operate 28 onshore wind farms making us the largest generator, and provider of renewable energy across the island of Ireland, through our sister company, SSE Airtricity.

BENEFITS OF DUNNEILL WIND PARK

- Approximately 7,300 homes powered with clean green energy.
- SSE Renewables Community Fund overall contribution in the region of €251,000 since 2010.
- The 11 MW wind farm comprises of 13 turbines and entered commercial operations in 2010.
- Prevents over 7 million KG's of harmful CO2 being released each year.

7,300 homes powered based on projected installed capacity, typical projected wind load factor of 32%, and typical annual consumption (4,200kWh). Quoted 7 million tonnes of carbon emissions abated based on projected annual MWh output and latest average CO2 Emissions (0.236g/kWh) in the All-Island Single Electricity Market,and published by the CRU in its Fuel Mix Disclosure and CO2 Emissions for 2020, October 2021.

Qualification text ROI: ^Total annual homes powered quoted based on projected capacity, typical projected wind load factor of 32%, and typical annual consumption (4,200kWh). Quoted CO2 emissions abated based on projected annual MWh output and latest average CO2 Emissions (254g/kWh) in the All-Island Single Electricity Market, and published by the CRU in its Fuel Mix Disclosure and CO2 Emissions for 2019, September 2020. Qualification text NI: ^Total annual homes powered quoted based on projected capacity, typical projected wind load factor of 32%, and typical annual consumption (3,200kWh). Quoted CO2 emissions abated based on projected annual MWh output and latest average CO2 Emissions (0.254g/kWh) in the All-Island Single Electricity Market, and published by the UR in its Fuel Mix Disclosure and CO2 Emissions for 2019, September 2020.

SSE RENEWABLES
COMMUNITY FUND

Through its Community Fund, SSE Renewables makes annual contributions to community groups in the vicinity of its wind farms. This year SSE Renewables has presented more than €19,400 to community groups near the Dunneill Wind Farm. This year's Community Fund brings the company's overall contribution in the region to €251,000 since 2010.

A total of 13 local groups benefited from this year's community fund contribution of €19,400, including schools, sports clubs and community organisations. The successful applicants included amongst others: Eoghan Rua Ladies FC, Owenbeg National School, Mayo Beekeepers Association Subgroup Dromore West Beekeepers, West Sligo Young at Heart and Templeboy Aughris Rural Action TARA.

APPENDIX 2

LETTERS OF SUPPORT FROM LOCAL COMMUNITY GROUPS

AN DROIM MÓR THIAR
Dromore West
Village Enhancement Committee

22nd July 2022

To whom it may concern,

On behalf of Dromore West Village Enhancement Committee, I would like to register support for an application by Brickmount Limited (SSE) for planning permission for the continued operation of the existing Dunneill Wind Farm located in the four townlands of Crowagh or Dunneill, Tawnadremira, Ballyglass and Dunowla, Co. Sligo. In particular we support the community benefits which will arise from the continued operation of the Dunneill Wind Farm as well as the continued provision of green energy.

SSE have been a great supporter of the many projects that we have carried out in Dromore West over the last number of years, in particular the provision of sustainable seasonal lighting that we have installed with their support! If it was not for this utility in the area, we would have been able to achieve this in the time frame we set out. In addition, SSE has supported various Tidy Towns initiatives and road side clean ups, in particular in the area where the wind farm is located!

It is also wonderful to have the support and advice from this company and their employees on ways that we can work to be a more sustainable community in the future.

We hope you look favourably on their application and we look forward to the continued success and the future of this green energy establishment in our area.

Kind regards,

Geraldine McCloat

Chairperson
Dromore West Village Enhancement Committee

Geraldine McCloat, Chairperson, Dromore West Village Enhancement Committee
Dunbeakin, Templeboy, Co. Sligo
087 7469372

Dromore West Astro Turf Pitch

25th July 2022

Dear Anne:

On behalf of Dromore West Astro Turf Pitch I would like to register support for an application by Brickmount Limited (SSE) for planning permission for the continued operation of the existing Dunneill Wind Farm located in the four townlands of Crowagh or Dunneill, Tawnadremira, Ballyglass and Dunowla, Co. Sligo. In particular we support the community benefits which will arise from the continued operation of the Dunneill Wind Farm as well as the continued provision of green energy.

Sincerely,

Mary Gordan

Alan Clancy

From:	Reynolds, Anne <Anne.Reynolds@sse.com> on behalf of Community Fund Ireland <CommunityFundIreland@sse.com>
Sent:	27 July 2022 12:37
To:	Donnelly, Caroline
Cc:	Burns, Martin
Subject:	FW: [EXTERNAL] Re: Application for the continued operation of Dunneill Wind Farm
Attachments:	image001.png; image001.png

Another one making 5 now

From: Jude Walsh <judewalsh30@gmail.com>
Sent: 26 July 2022 22:04
To: Community Fund Ireland <CommunityFundIreland@sse.com>
Subject: [EXTERNAL] Re: Application for the continued operation of Dunneill Wind Farm

WARNING: This email was sent from outside SSE. Think twice before opening any links or attachments and report anything you are unsure about with your 'Report Phishing' button.

On behalf of Mayo Beekeepers' Association, we would like to register support for an application by Brickmount Limited (SSE) for planning permission for the continued operation of the existing Dunneill Wind Farm located in the four townlands of Crowagh or Dunneill, Tawnadremira, Ballyglass and Dunowla, Co. Sligo.

In particular we support the community benefits which will arise from the continued operation of the Dunneill Wind Farm as well as the continued provision of green energy.

We beekeepers have a long and fruitful relationship with Brickmount Limited (SSE) here in County Sligo and as a result have an entire apiary underneath the windmills. The bees there are an integral part of the biodiversity in this heather and bogland of the Ox Mountains and contribute to the pollination of the typical flora of this landscape in a wide radius around the windmills.

Also, as a club we have profited tremendously of SSE's continuous support. With the financial input from the utility we could train new beekeepers, buy books for the club library, hire speakers for presentations on beekeeping, bee health and queen rearing etc.
We are very grateful for that and would indeed like to see the windfarm continue and prosper.

Many thanks
Jude Walsh and Barbara Bierach Mayo Beekeepers Association.

On Fri, 22 Jul 2022, 5:33 pm Community Fund Ireland, <CommunityFundIreland@sse.com> wrote:

> Hi Everyone,
>
> Hope you are all keeping well.

St. Farnans Community Park Association Ltd.

Cartron, Templeboy, Co. Sligo

To whom it may concern,

On behalf of St Farnans Community Park Association Ltd. I would like to register support for an application by Brickmount Limited (SSE) for planning permission for the continued operation of the existing Dunneill Wind Farm located in the four townlands of Crowagh or Dunneill, Tawnadremira, Ballyglass and Dunowla, Co. Sligo. In particular I/we support the community benefits which will arise from the continued operation of the Dunneill Wind Farm as well as the continued provision of green energy.

Yours in Sport,

Seamus Connolly
Chairman

Dromore Villa FC

To whom it may concern,

On behalf of Dromore Villa FC I would like to register support for an application by Brickmount Limited (SSE) for planning permission for the continued operation of the existing Dunneill Wind Farm located in the four townlands of Crowagh or Dunneill, Tawnadremira, Ballyglass and Dunowla, Co. Sligo. In particular I/we support the community benefits which will arise from the continued operation of the Dunneill Wind Farm as well as the continued provision of green energy.

Yours in Sport,

Seamus Connolly
Secretary Dromore Villa FC

Ballyeeskeen,
Templeboy,
Co. Sligo

AN DROIM MÓR THIAR
Dromore West
Community Council CLG

Dromore West Community Centre
Knockacullen, Dromore West, Co. Sligo
Tel: 087 1897553
E-Mail: communitycentre@dromorewest.ie

A chairde,

On behalf of Dromore West Community Council CLG I would like to register support for an application by Brickmount Limited (SSE) for planning permission for the continued operation of the existing Dunneill Wind Farm located in the four townlands of Crowagh or Dunneill, Tawnadremira, Ballyglass and Dunowla, Co. Sligo. In particular we support the community benefits which will arise from the continued operation of the Dunneill Wind Farm as well as the continued provision of green energy.

Kind Regards,

Emlyn Lang

Emlyn Lang
Chairman Dromore West Community Council

Skreen Dromard Community Care.

Active Retirement Group.

Skreen Health Centre.

Skreen.

Co Sligo.

25th July 2022

Dear Sir/ Madam,

On behalf of Skreen Dromard Community Care, Active Retirement Group, I would like to register support for an application by Brickmount Limited (SSE) for planning permission for the continued operation of the existing Dunneill Wind Farm located in the four townlands of Crowagh or Dunneill, Tawnadremira, Ballyglass and Dunowla, Co Sligo. In particular, we support the community benefits which will arise from the continued operation of the Dunneill Wind Farm as well as the continued provision of green energy.

Thanking you for your consideration.

Kathleen Kelly. (Secretary)

APPENDIX 3.1

TURBINE PERFORMANCE ASSESSMENTS

25th July 2022

To Whom it May Concern,

Brickmount Limited (a subsidiary of SSE Renewables) own and operate Dunneill Windfarm located approximately 3.5 kilometres (km) south of the village of Dromore West and approximately 3.7 km southwest of the village of Templeboy in County Sligo. Planning permission was granted, by An Bord Pleanála, for the Dunneill Wind Farm in March 2004 for a period of 20-years from the date the Decision Order (ABP Pl. Ref. 21.204790). The commissioning of the Dunneill Wind Farm was not completed until 2010, approximately 6-years following the decision of An Bord Pleanála to grant planning permission. Therefore, the actual operational life of the development has been substantially reduced and will, on the date of required decommissioning (March 2024), have only been operational for a period of approximately 14-years.

Brickmount Limited are therefore applying to Sligo County Council to extend the operational life of Dunneill Windfarm by an additional 15 years. The current performance of the site and assets, along with experience with similar turbines, indicate that the site can be successfully operated for that timeframe.

This decision to extend the operational life of Dunneill windfarm was taken after detailed safety, environmental and technical integrity considerations including;

1. SSE procure quality assets and construct our windfarms to the highest standard.

2. Assets are maintained to the highest standards and to the manufacturers requirements for the life of the Windfarm.

3. All manufacturer's Safety and Technical Notices are evaluated and incorporated.

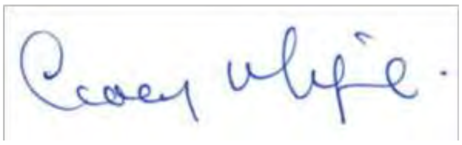
4. SSE has a detailed specific Engineering Standard for managing Windfarm life extensions. This Engineering Standard is undertaken three years prior to the design end life of a Windfarm. This standard complies with IEC and DNVGL Industry Standards for lifetime extensions. In summary it involves the collection of design, build and operational data. This data is used to carry out the necessary engineering analyses and develop the life extension strategy, primarily focused on structural elements, including foundations. The analyses includes fatigue analysis (via aeroelastic modelling), ALARP reviews, Failure Modes Effects and Criticality Assessments (FMECA), past operation etc, which will inform a Risk Based Inspection (RBI) approach, leading to detailed, targeted inspection of the assets involving all necessary skills and teams.

5. The outcomes of the Life Extension programme are assessed and actions are implemented to allow the continued operation of the Windfarm with respect to; Safety, Environmental considerations, Asset Integrity, Targeted Maintenance and Consistency in how we manage our aging assets.

6. Although this standard is not due to take place at Dunneill until 3 years prior to design life end it has already commenced in order to support the decision to apply for permission to extend the operational life of Dunneill Windfarm by 15 years.

SSE Renewables have already carried out Life Extension programmes on two other wind farm sites with both planning applications successful in extending the operational life of the respective wind farms. SSE Renewables are satisfied based on the analysis by DNVGL and Wind Operations internal review of performance that the existing Dunneill Wind Farm has the ability to operate for a minimum of an additional 15 years beyond the current expiration date of March 2024.

Kind Regards,

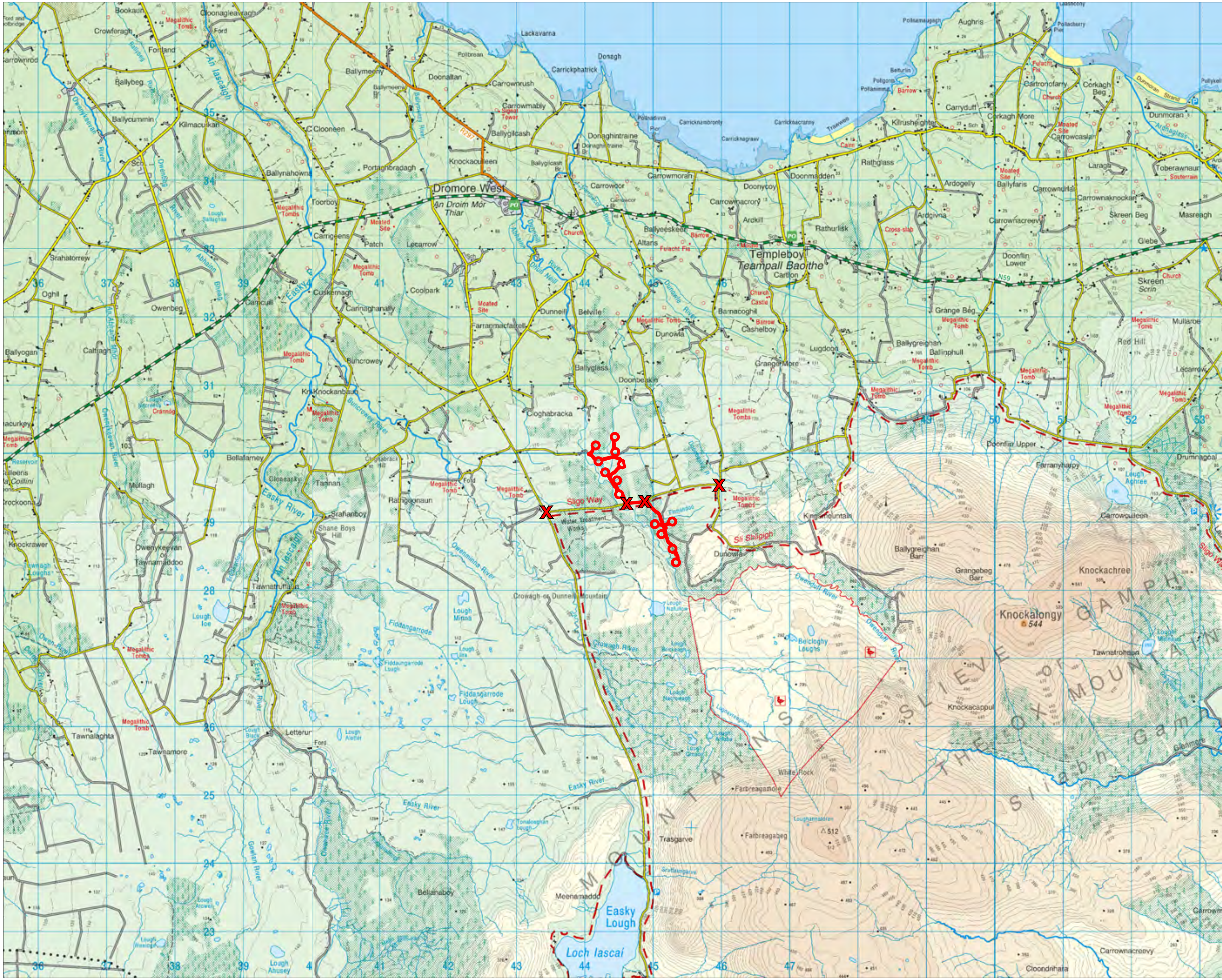


Ciaran Maguire.

SSER Onshore Wind General Manager Ireland.

APPENDIX 4.1

SITE LAYOUT PLANNING DRAWINGS (A4)



Drawing Legend

- Planning Application Boundary
- X Site Notice

DRAWING TITLE:

Location Context Map

PROJECT TITLE:

SSE Dunneill Wind Farm

DRAWING BY: Joseph O Brien	CHECKED BY: Meabhann Crowe
PROJECT No.: 210207	DRAWING No.: 210207 - 01
SCALE: 1:50,000 @ A3	DATE: 18.08.2022
OS SHEET No.: OS1232, OS1432	

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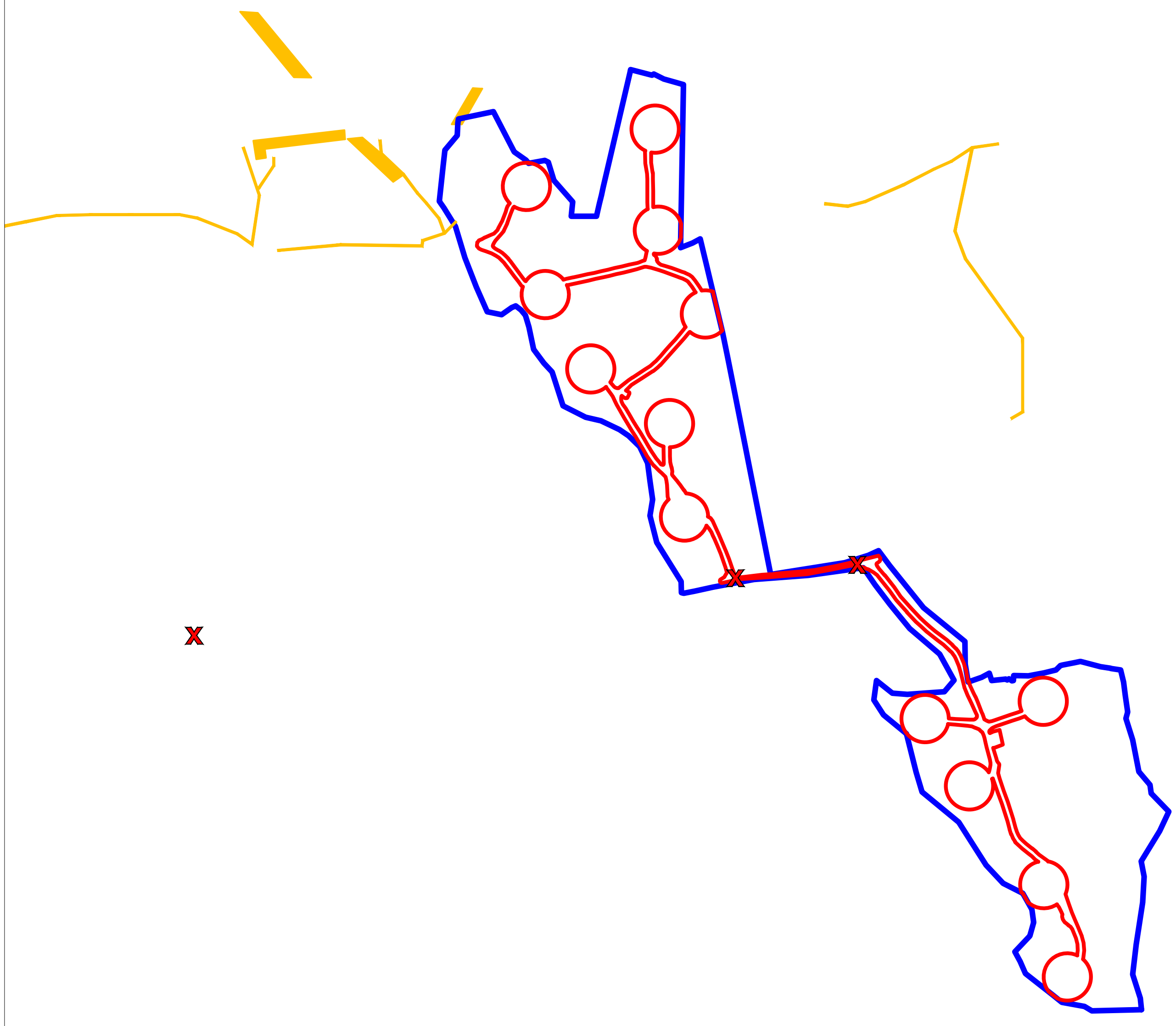

Drawing Legend

- Planning Application Boundary
- Blue Line Boundary
- Site Notice
- Wayleave

N

DRAWING TITLE:

Site Location Map

PROJECT TITLE:

SSE Dunneill Wind Farm

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Meabhann Crowe**
PROJECT No.: **210207**	DRAWING No.: **210207 - 02**
SCALE: **1:10,000 @ A3**	DATE: **18.08.2022**
OS SHEET No.: 1125, 1126	

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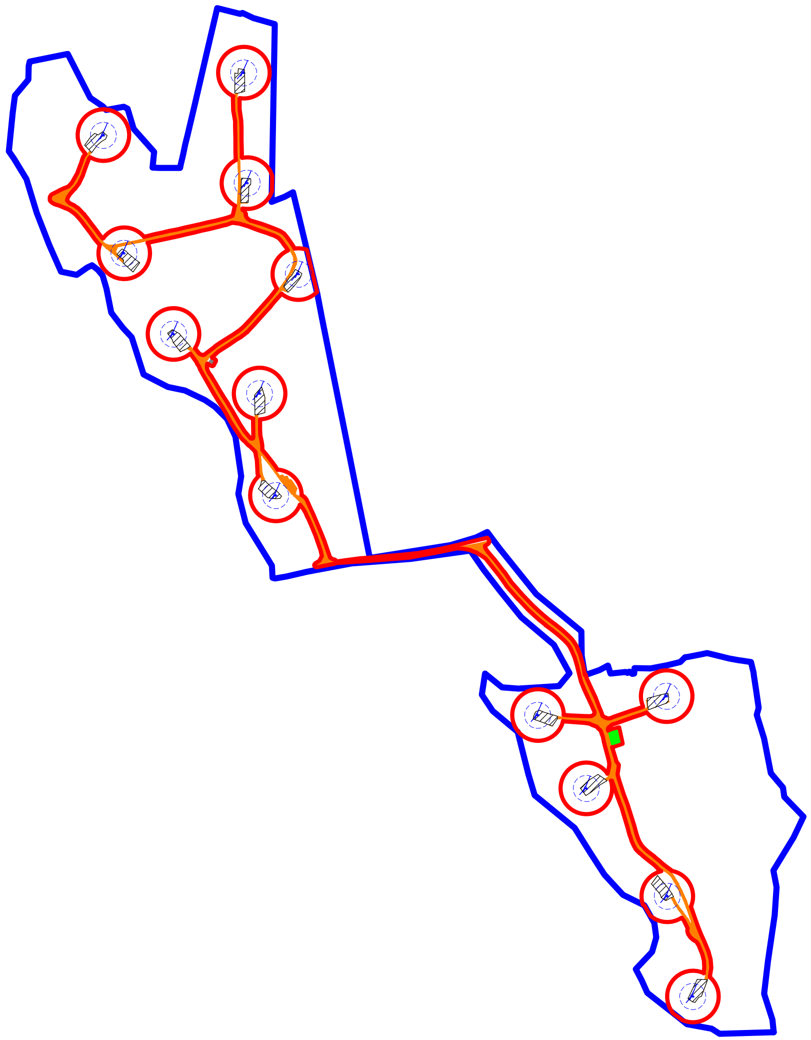

Drawing Legend

- Planning Application Boundary
- Blue Line Boundary
- As Built Site Road
- As Built Substation Compound
- As Built Met Mast Compound
- As Built Hardstanding Area
- Turbine Sweep Area

N

DRAWING TITLE:

Site Layout Plan

PROJECT TITLE:

SSE Dunneill Wind Farm

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Meabhann Crowe**
PROJECT No.: **210207**	DRAWING No.: **210207 - 03**
SCALE: **1:10,000 @ A3**	DATE: **18.08.2022**
OS SHEET No.: 1125, 1126	

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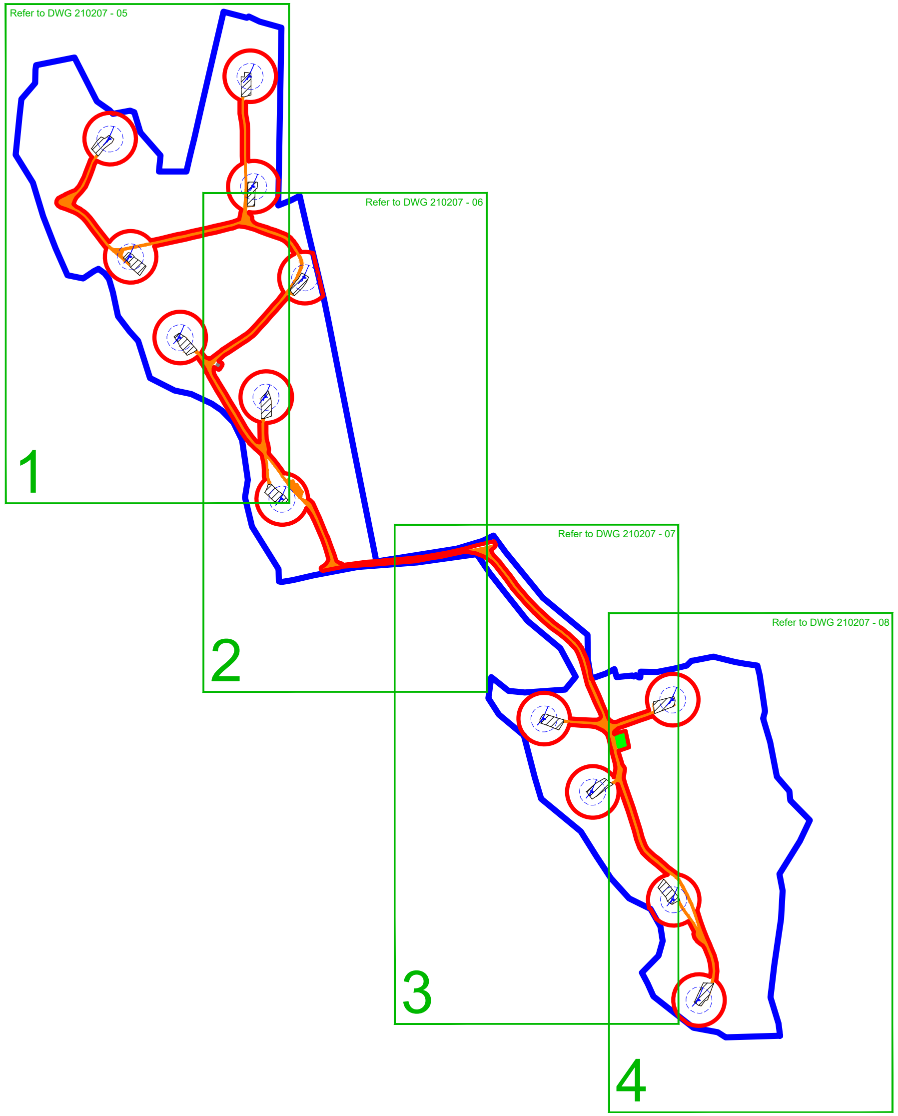

Drawing Legend

- Planning Application Boundary
- Blue Line Boundary
- As Built Site Road
- As Built Substation Compound
- As Built Met Mast Compound
- As Built Hardstanding Area
- Turbine Sweep Area

N

DRAWING TITLE:

Site Layout Keyplan

PROJECT TITLE:

SSE Dunneill Wind Farm

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Meabhann Crowe**
PROJECT No.: **210207**	DRAWING No.: **210207 - 04**
SCALE: **1:10,000 @ A3**	DATE: **18.08.2022**
OS SHEET No.: 1125, 1126	

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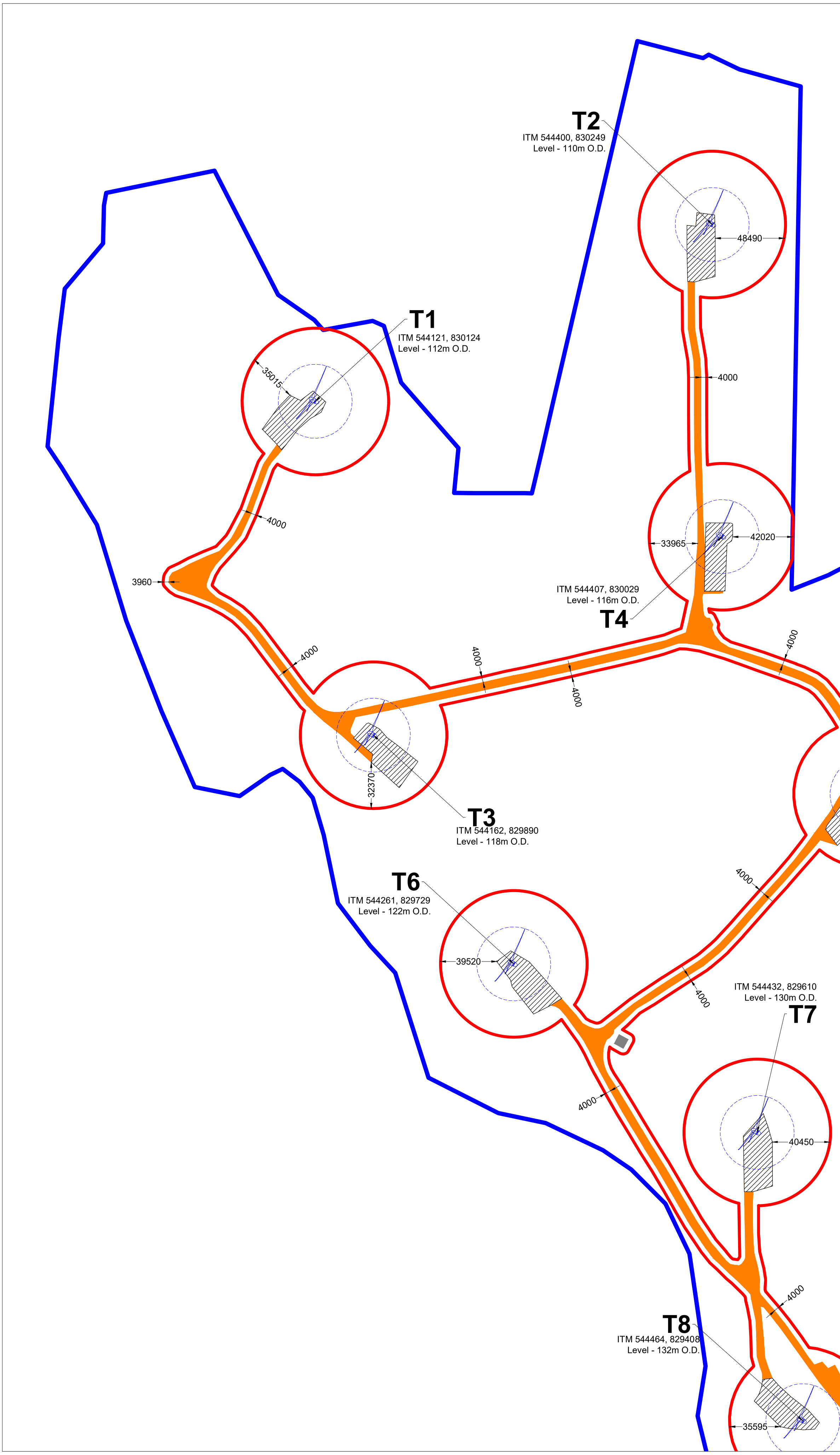

Drawing Legend

- Planning Application Boundary
- Blue Line Boundary
- As Built Site Road
- As Built Met Mast Compound
- As Built Hardstanding Area
- Turbine Sweep Area

N

DRAWING TITLE: **Site Layout Sheet 1 of 4**	
PROJECT TITLE: **SSE Dunneill Wind Farm**	
DRAWING BY: Joseph O Brien	CHECKED BY: Meabhann Crowe
PROJECT No.: 210207	DRAWING No.: 210207 - 05
SCALE: 1:2,500 @ A3	DATE: 18.08.2022
OS SHEET No.: 1125, 1126	

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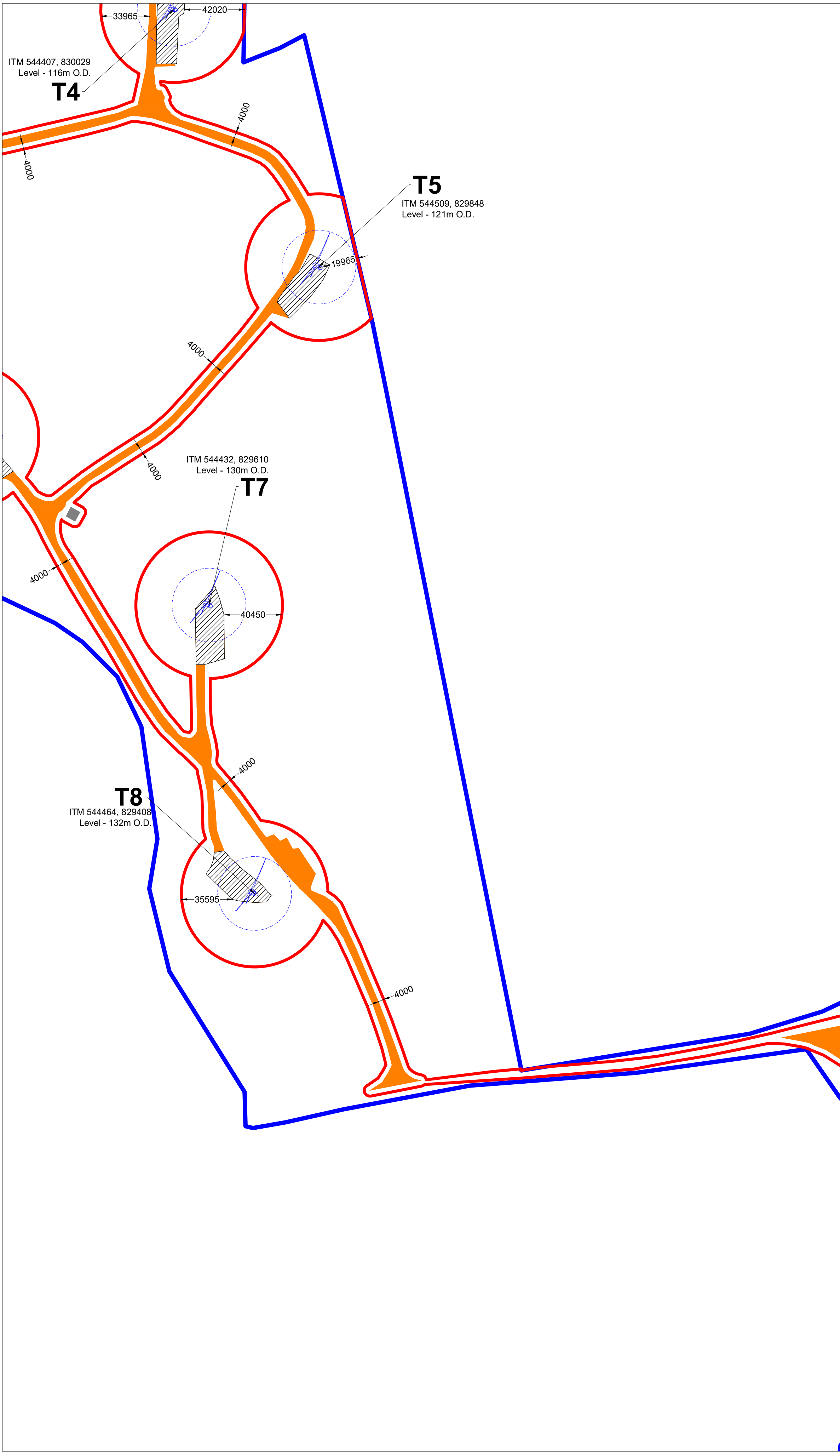

Drawing Legend

- Planning Application Boundary
- Blue Line Boundary
- As Built Site Road
- As Built Hardstanding Area
- Turbine Sweep Area

DRAWING TITLE:
Site Layout Sheet 2 of 4

PROJECT TITLE:
SSE Dunneill Wind Farm

DRAWING BY: Joseph O Brien	CHECKED BY: Meabhann Crowe
PROJECT No.: 210207	DRAWING No.: 210207 - 06
SCALE: 1:2,500 @ A3	DATE: 18.08.2022
OS SHEET No.: 1125, 1126	

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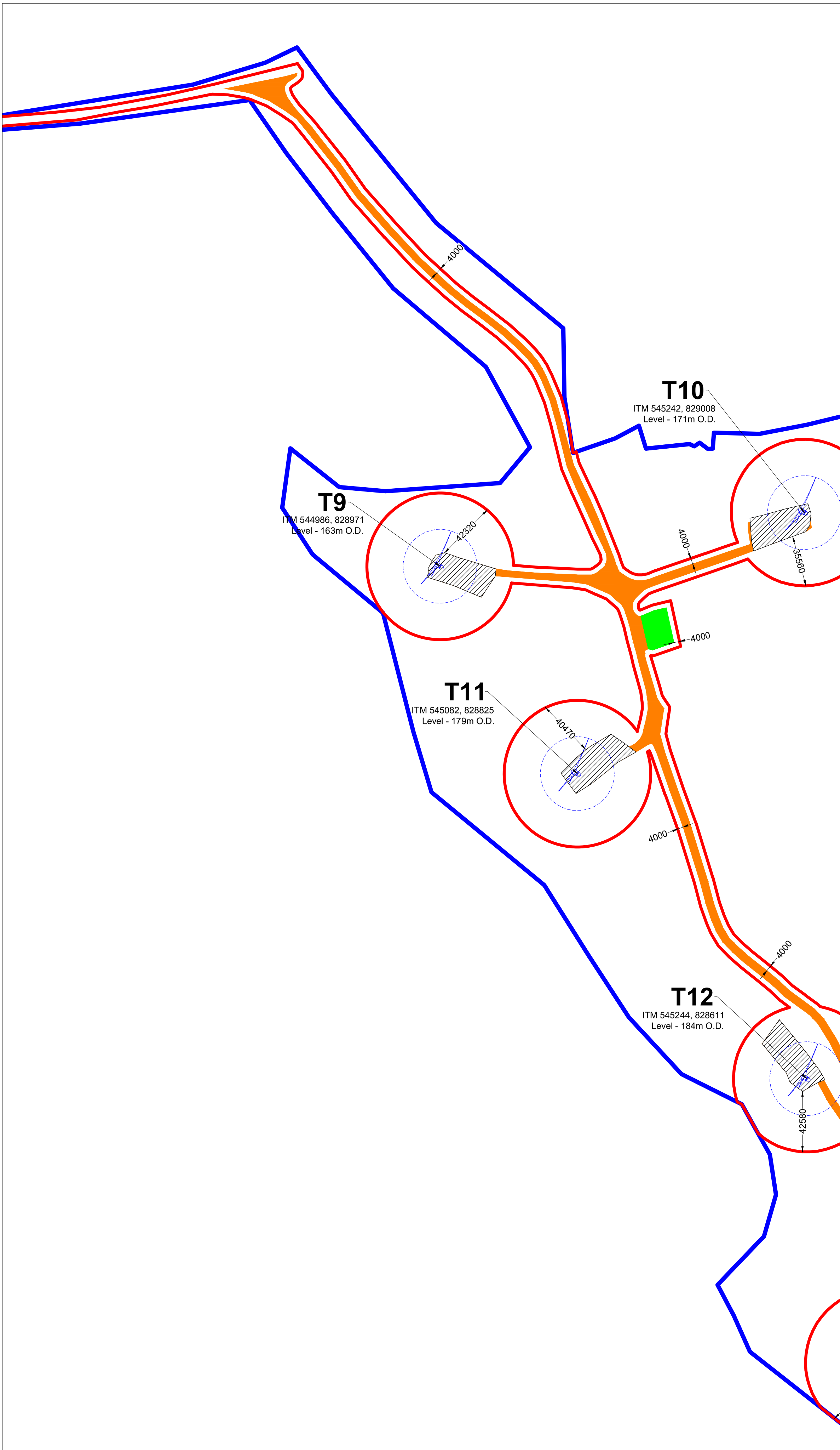

Drawing Legend

- Planning Application Boundary
- Blue Line Boundary
- As Built Site Road
- As Built Substation Compound
- As Built Hardstanding Area
- Turbine Sweep Area

N

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DRAWING TITLE:

Site Layout Sheet 3 of 4

PROJECT TITLE:

SSE Dunneill Wind Farm

DRAWING BY: Joseph O Brien	CHECKED BY: Meabhann Crowe
PROJECT No.: 210207	DRAWING No.: 210207 - 07
SCALE: 1:2,500 @ A3	DATE: 18.08.2022
OS SHEET No.: 1125, 1126	

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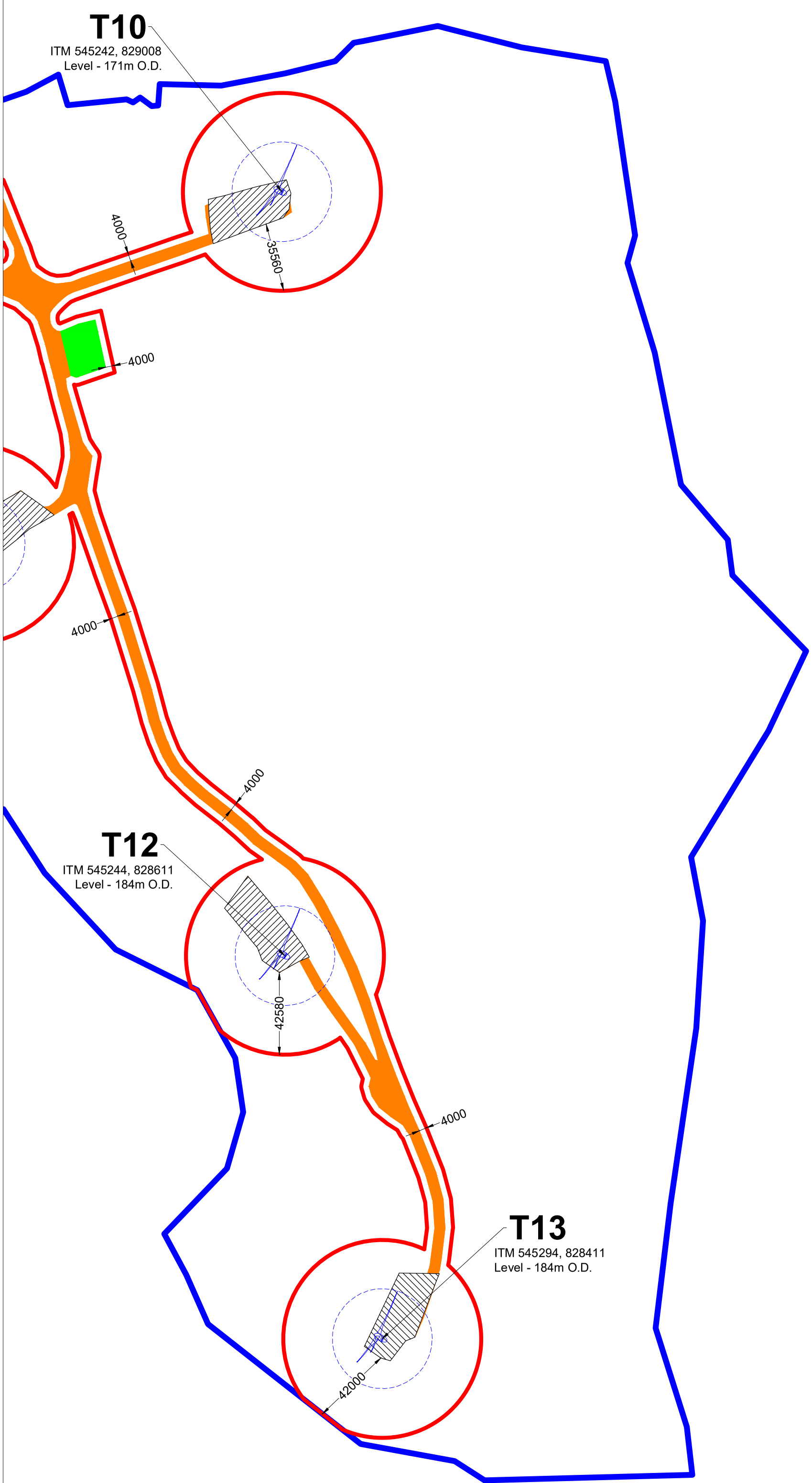

Drawing Legend

- Planning Application Boundary
- Blue Line Boundary
- As Built Site Road
- As Built Substation Compound
- As Built Hardstanding Area
- Turbine Sweep Area

DRAWING TITLE:
Site Layout Sheet 4 of 4

PROJECT TITLE:
SSE Dunneill Wind Farm

DRAWING BY: Joseph O Brien	CHECKED BY: Meabhann Crowe
PROJECT No.: 210207	DRAWING No.: 210207 - 08
SCALE: 1:2,500 @ A3	DATE: 18.08.2022
OS SHEET No.: 1125, 1126	

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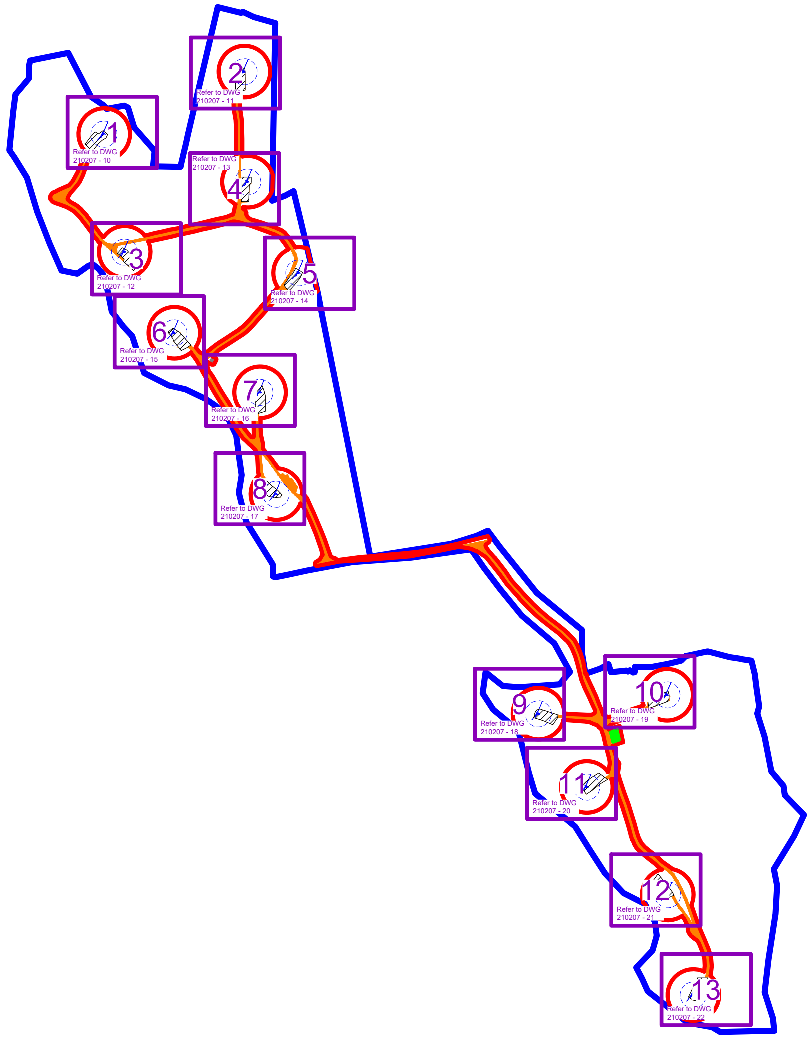

Drawing Legend

- Planning Application Boundary
- Blue Line Boundary
- As Built Site Road
- As Built Substation Compound
- As Built Met Mast Compound
- As Built Hardstanding Area
- Turbine Sweep Area

N

DRAWING TITLE:

Turbine Layout Keyplan

PROJECT TITLE:

SSE Dunneill Wind Farm

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Meabhann Crowe**
PROJECT No.: **210207**	DRAWING No.: **210207 - 09**
SCALE: **1:10,000 @ A3**	DATE: **18.08.2022**
OS SHEET No.: 1125, 1126	

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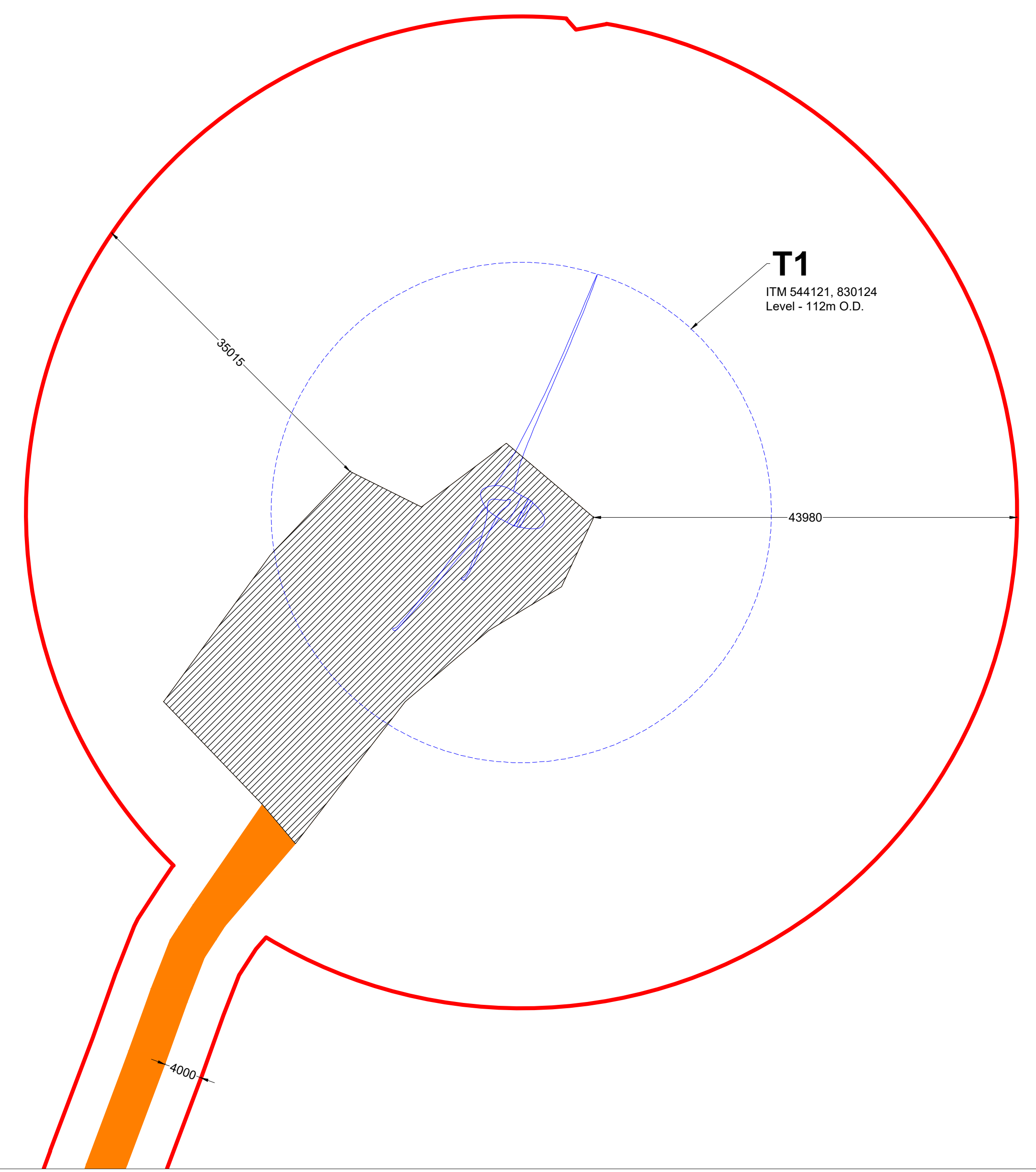

Drawing Legend

- Planning Application Boundary
- As Built Site Road
- As Built Hardstanding Area
- Turbine Sweep Area

N

DRAWING TITLE:
Turbine Layout Sheet 1 of 13

PROJECT TITLE:
SSE Dunneill Wind Farm

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Meabhann Crowe**
PROJECT No.: **210207**	DRAWING No.: **210207 - 10**
SCALE: **1:500 @ A3**	DATE: **18.08.2022**
OS SHEET No.: 1125, 1126	

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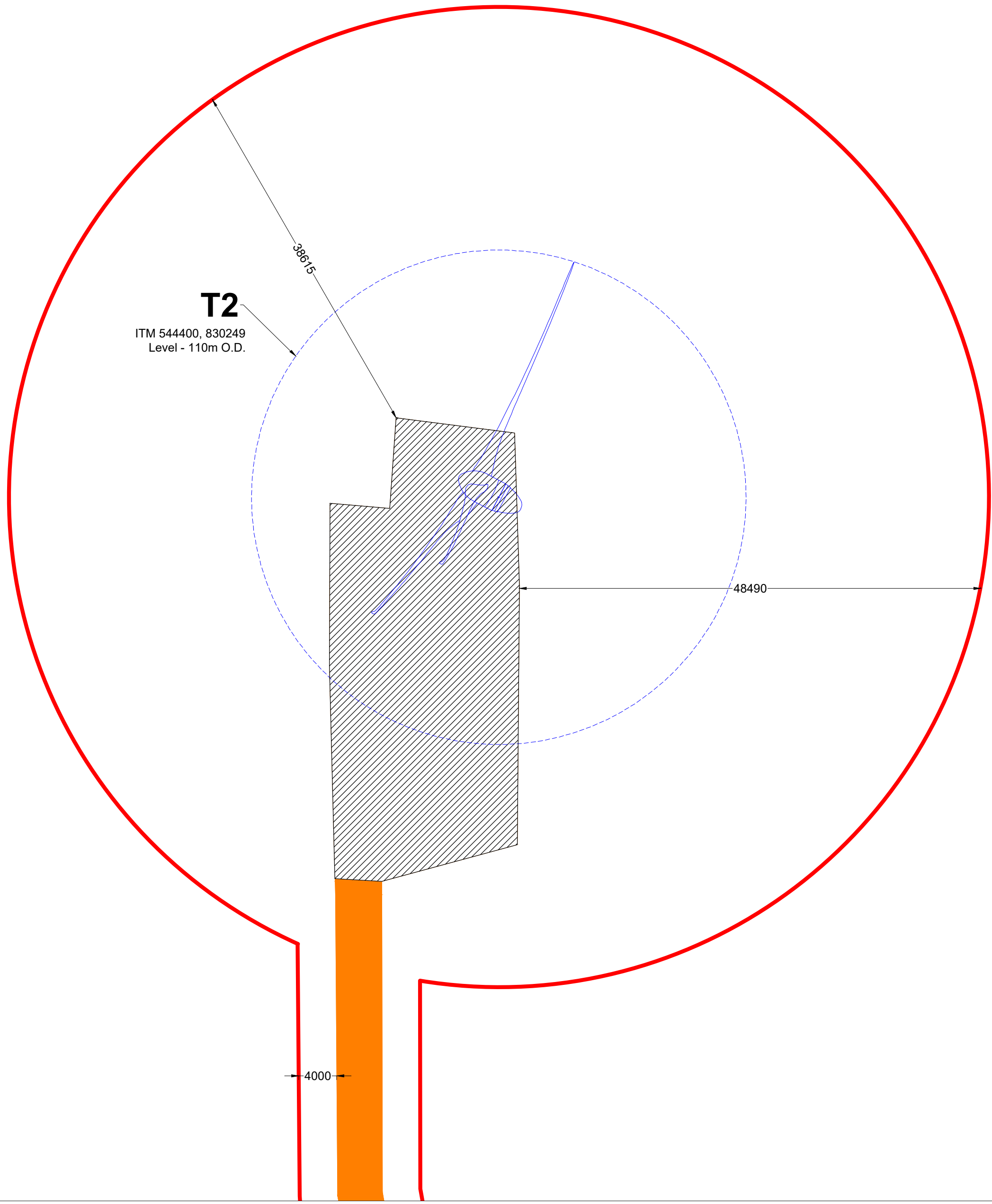

Drawing Legend

- Planning Application Boundary
- As Built Site Road
- As Built Hardstanding Area
- Turbine Sweep Area

N

DRAWING TITLE:
Turbine Layout Sheet 2 of 13

PROJECT TITLE:
SSE Dunneill Wind Farm

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Meabhann Crowe**
PROJECT No.: **210207**	DRAWING No.: **210207 - 11**
SCALE: **1:500 @ A3**	DATE: **18.08.2022**
OS SHEET No.: 1125, 1126	

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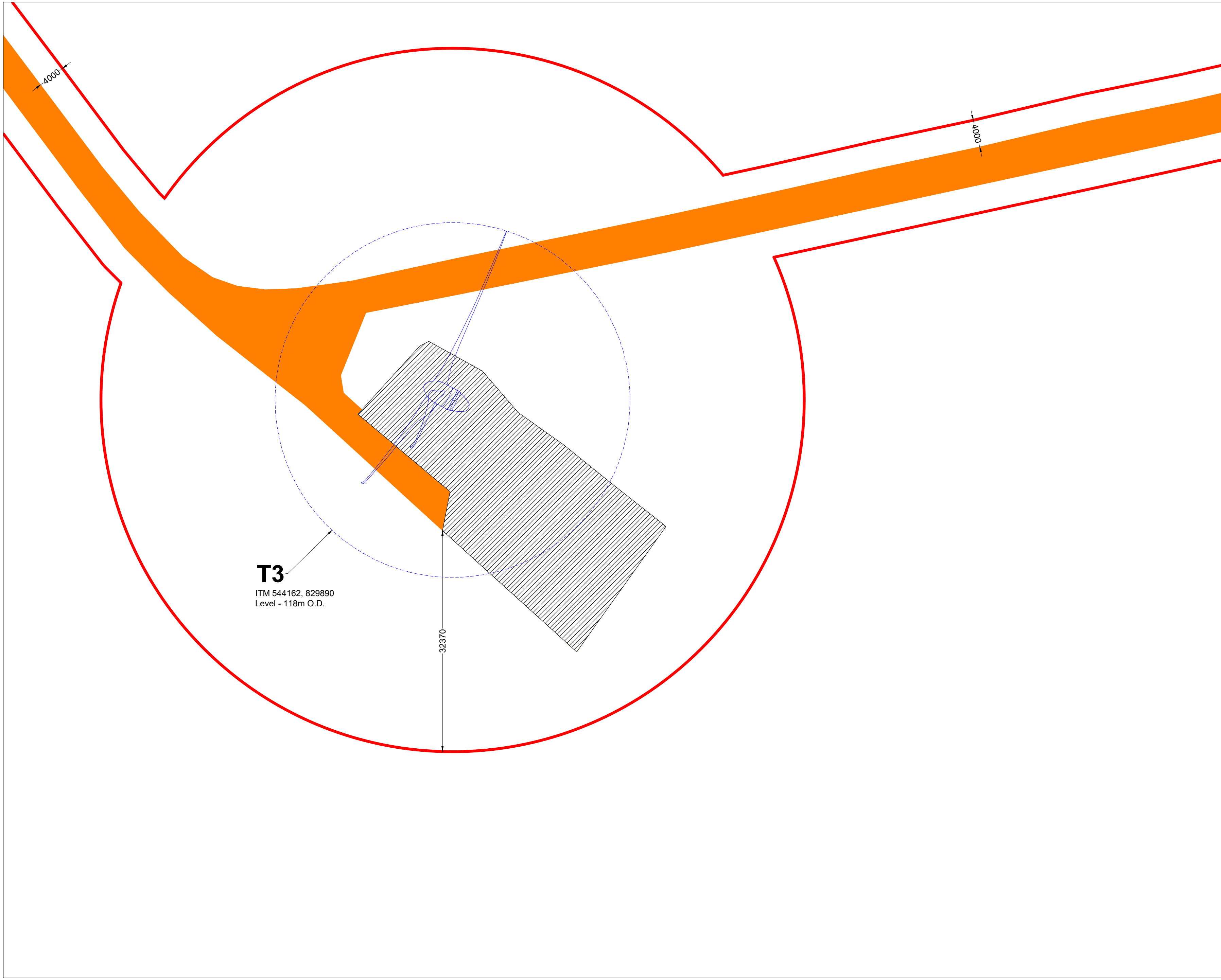

Drawing Legend

- Planning Application Boundary
- As Built Site Road
- As Built Hardstanding Area
- Turbine Sweep Area

N

DRAWING TITLE: **Turbine Layout Sheet 3 of 13**	
PROJECT TITLE: **SSE Dunneill Wind Farm**	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Meabhann Crowe**
PROJECT No.: **210207**	DRAWING No.: **210207 - 12**
SCALE: **1:500 @ A3**	DATE: **18.08.2022**
OS SHEET No.: 1125, 1126	

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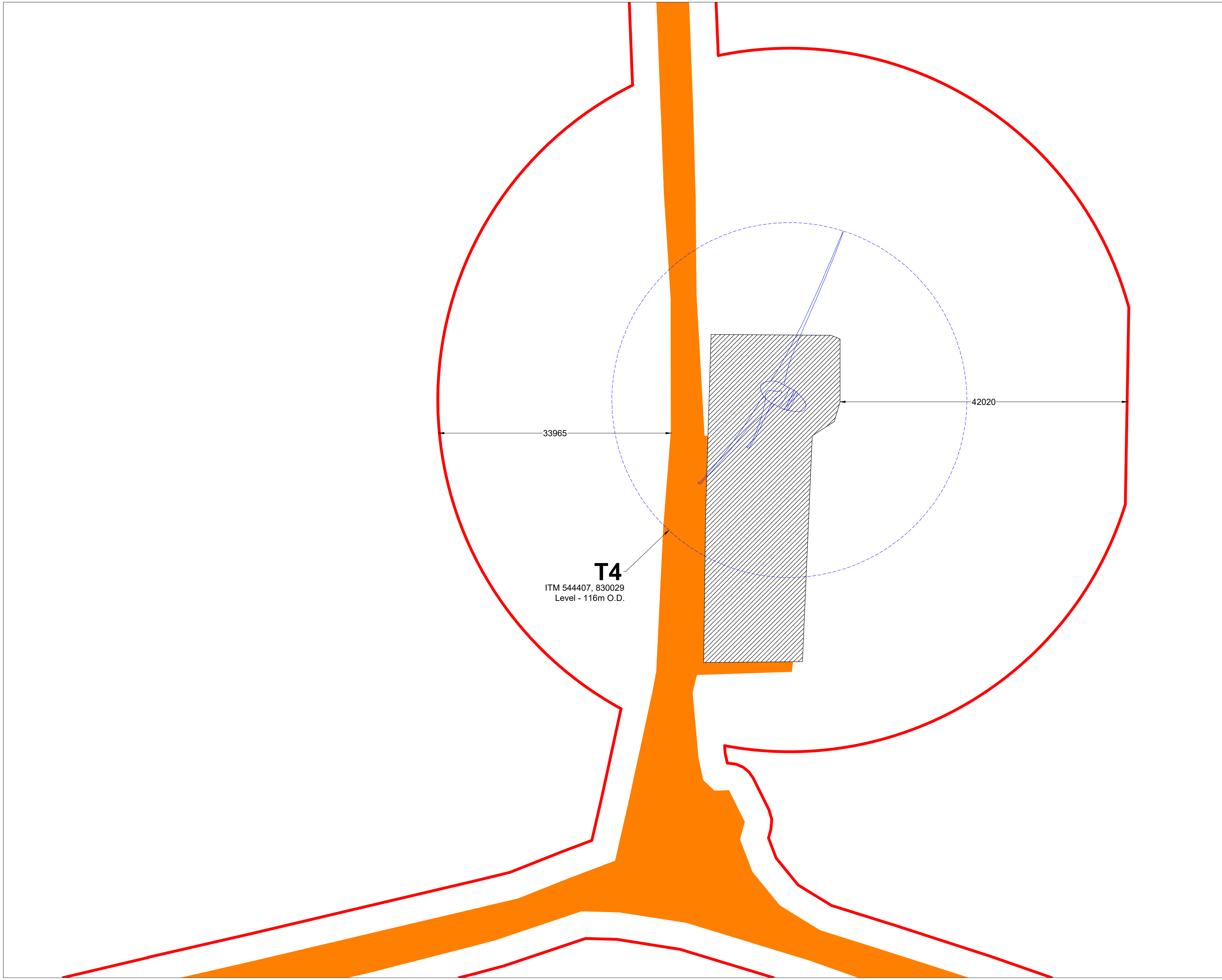

Drawing Legend

- Planning Application Boundary
- As Built Site Road
- As Built Hardstanding Area
- Turbine Sweep Area

N

DRAWING TITLE:

Turbine Layout Sheet 4 of 13

PROJECT TITLE:

SSE Dunneill Wind Farm

DRAWING BY: Joseph O Brien	CHECKED BY: Meabhann Crowe
PROJECT No.: 210207	DRAWING No.: 210207 - 13
SCALE: 1:500 @ A3	DATE: 18.08.2022
OS SHEET No.: 1125, 1126	

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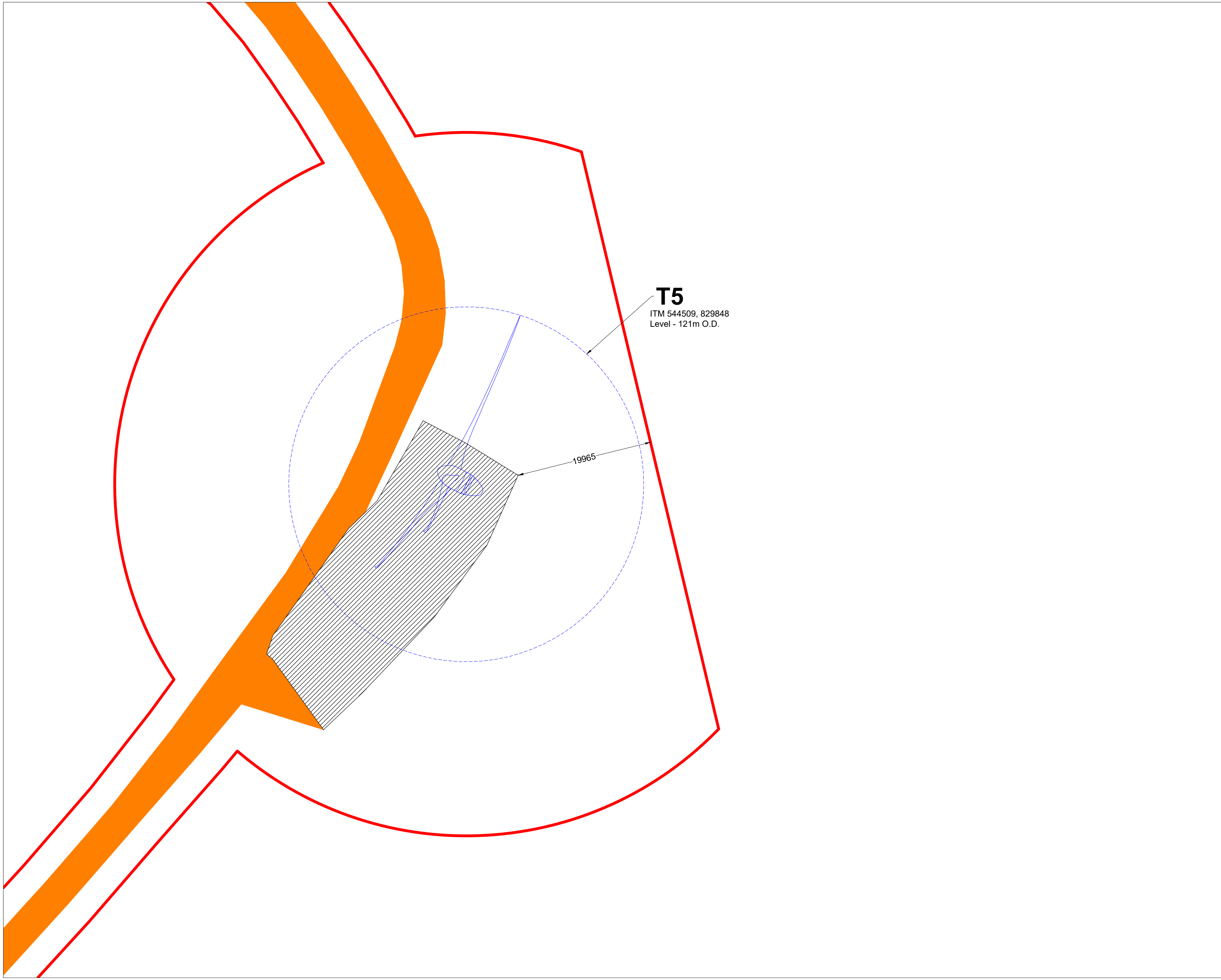

Drawing Legend

- Planning Application Boundary
- As Built Site Road
- As Built Hardstanding Area
- Turbine Sweep Area

N

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DRAWING TITLE: **Turbine Layout Sheet 5 of 13**	
PROJECT TITLE: **SSE Dunneill Wind Farm**	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Meabhann Crowe**
PROJECT No.: **210207**	DRAWING No.: **210207 - 14**
SCALE: **1:500 @ A3**	DATE: **18.08.2022**
OS SHEET No.: 1125, 1126	

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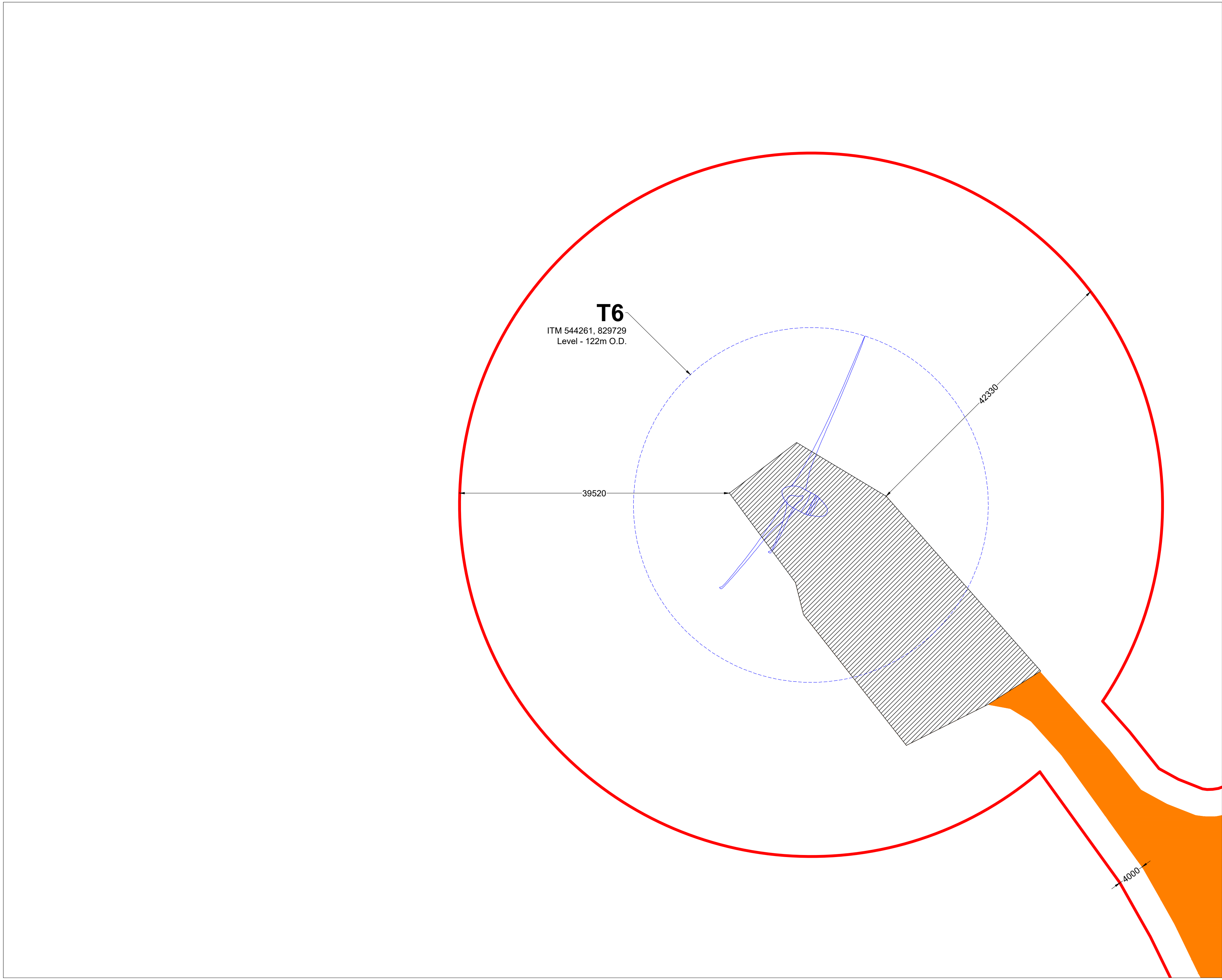

Drawing Legend

- Planning Application Boundary
- As Built Site Road
- As Built Hardstanding Area
- Turbine Sweep Area

DRAWING TITLE:
Turbine Layout Sheet 6 of 13

PROJECT TITLE:
SSE Dunneill Wind Farm

DRAWING BY: Joseph O Brien	CHECKED BY: Meabhann Crowe
PROJECT No.: 210207	DRAWING No.: 210207 - 15
SCALE: 1:500 @ A3	DATE: 18.08.2022
OS SHEET No.: 1125, 1126	

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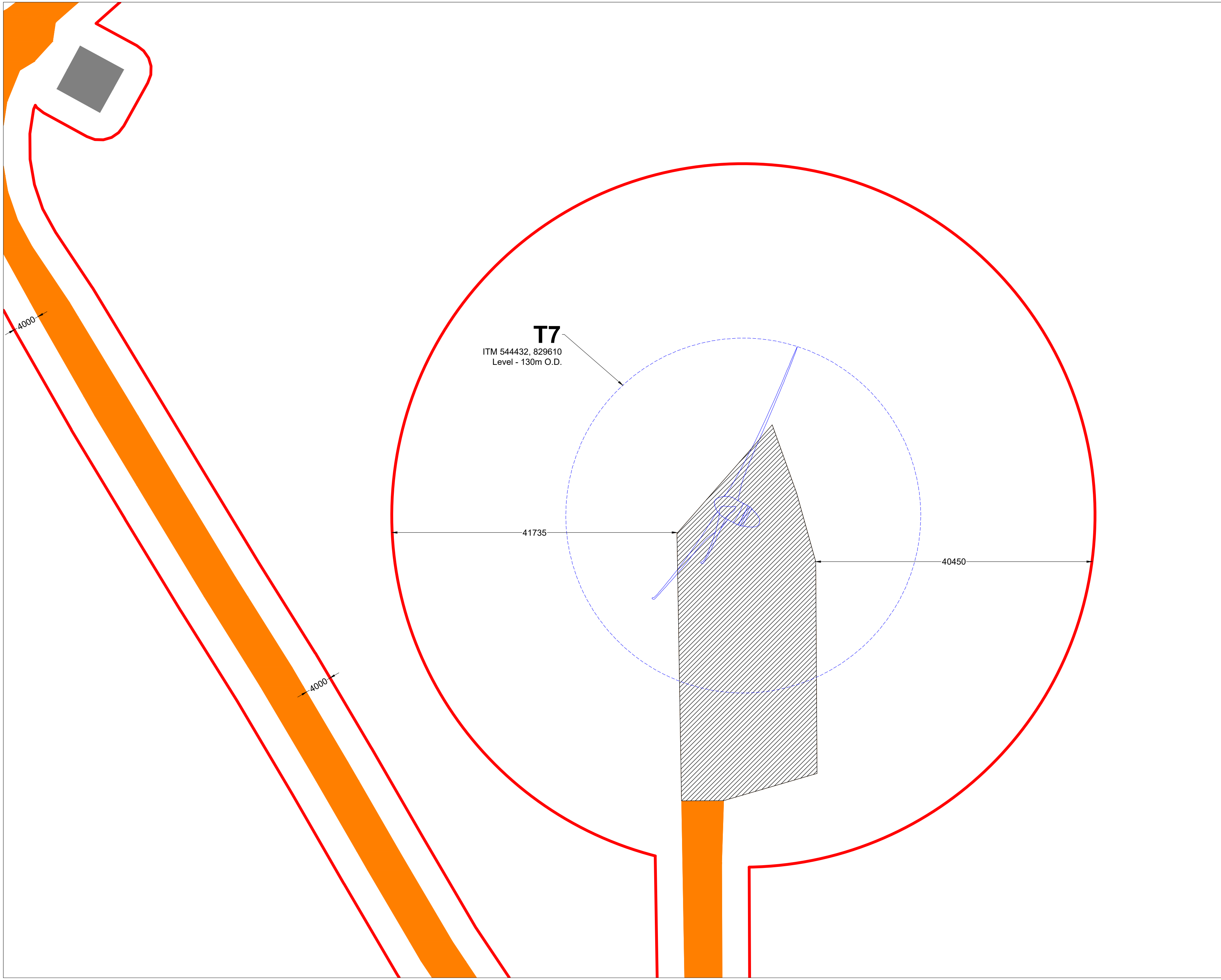

Drawing Legend

- Planning Application Boundary
- As Built Site Road
- As Built Hardstanding Area
- Turbine Sweep Area

N

DRAWING TITLE:

Turbine Layout Sheet 7 of 13

PROJECT TITLE:

SSE Dunneill Wind Farm

DRAWING BY: Joseph O Brien	CHECKED BY: Meabhann Crowe
PROJECT No.: 210207	DRAWING No.: 210207 - 16
SCALE: 1:500 @ A3	DATE: 18.08.2022
OS SHEET No.: 1125, 1126	

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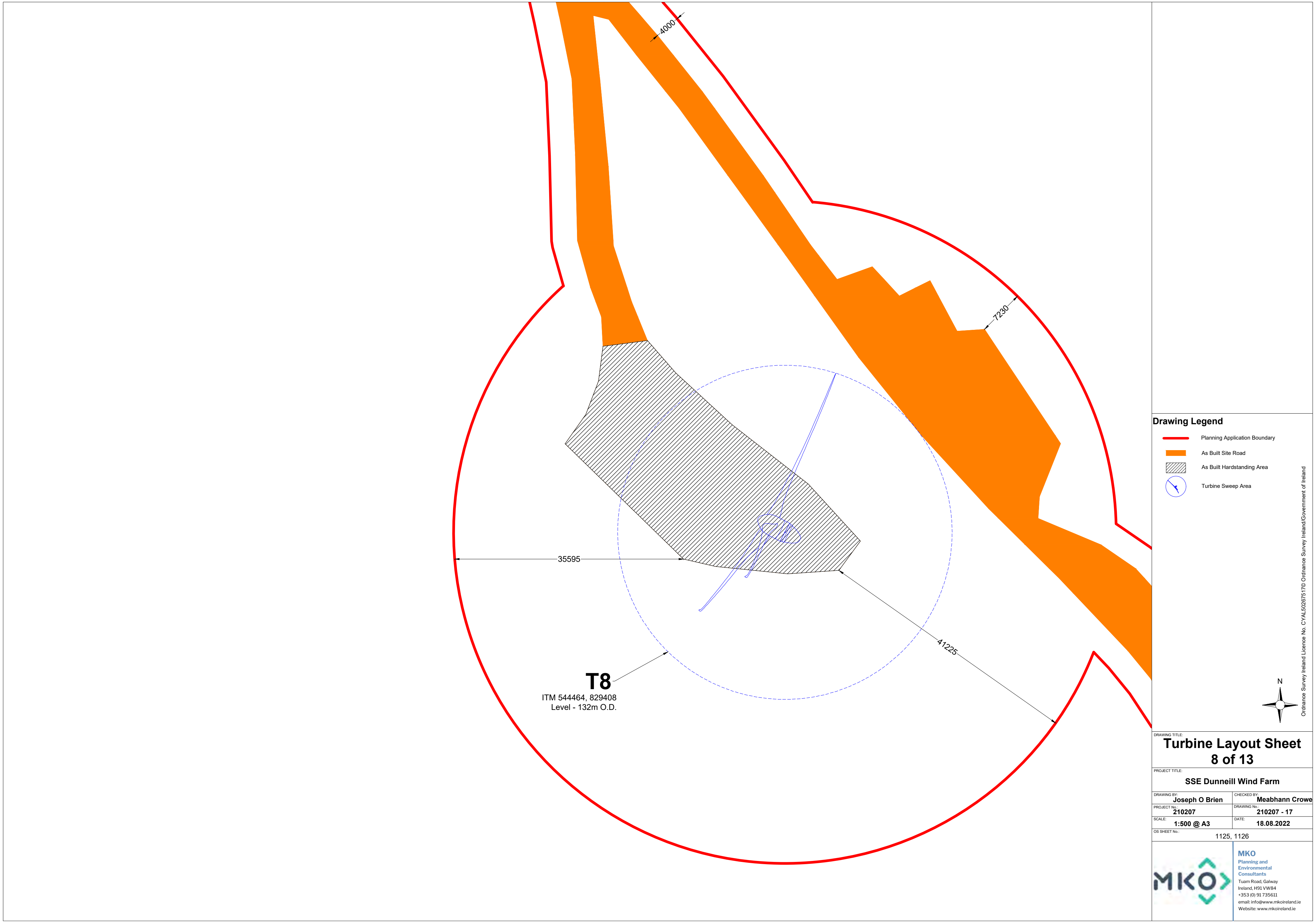

4000
7230
35595
41225
T8
ITM 544464, 829408
Level - 132m O.D.
Drawing Legend
Planning Application Boundary
As Built Site Road
As Built Hardstanding Area
Turbine Sweep Area
Ordnance Survey Ireland Licence No. CYAL50267517© Ordnance Survey Ireland/Government of Ireland
N
DRAWING TITLE:
Turbine Layout Sheet 8 of 13
PROJECT TITLE:
SSE Dunneill Wind Farm
DRAWING BY: Joseph O Brien
CHECKED BY: Meabhann Crowe
PROJECT No.: 210207
DRAWING No.: 210207 - 17
SCALE: 1:500 @ A3
DATE: 18.08.2022
OS SHEET No.: 1125, 1126
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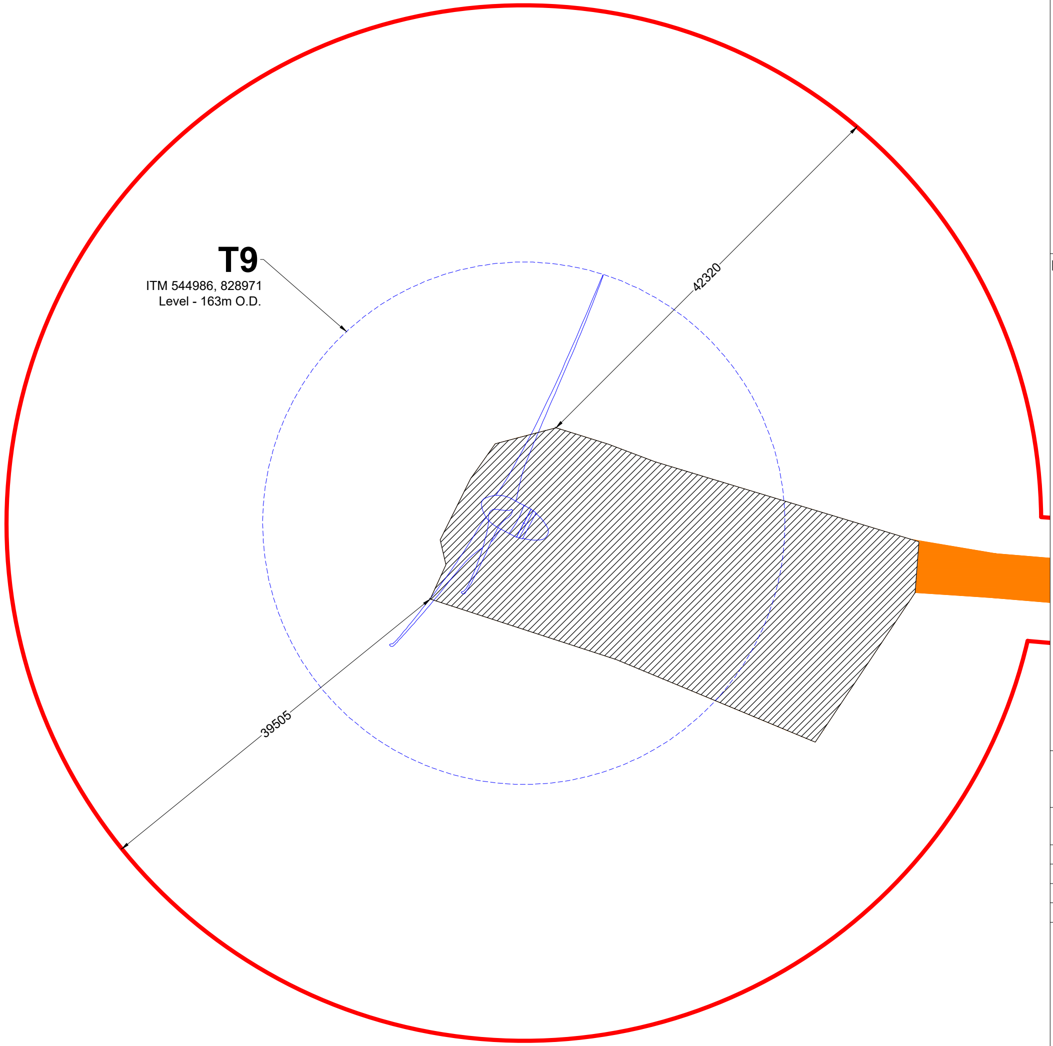
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Drawing Legend

- Planning Application Boundary
- As Built Site Road
- As Built Hardstanding Area
- Turbine Sweep Area

N

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DRAWING TITLE: **Turbine Layout Sheet 9 of 13**	
PROJECT TITLE: **SSE Dunneill Wind Farm**	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Meabhann Crowe**
PROJECT No.: **210207**	DRAWING No.: **210207 - 18**
SCALE: **1:500 @ A3**	DATE: **18.08.2022**
OS SHEET No.: 1125, 1126	

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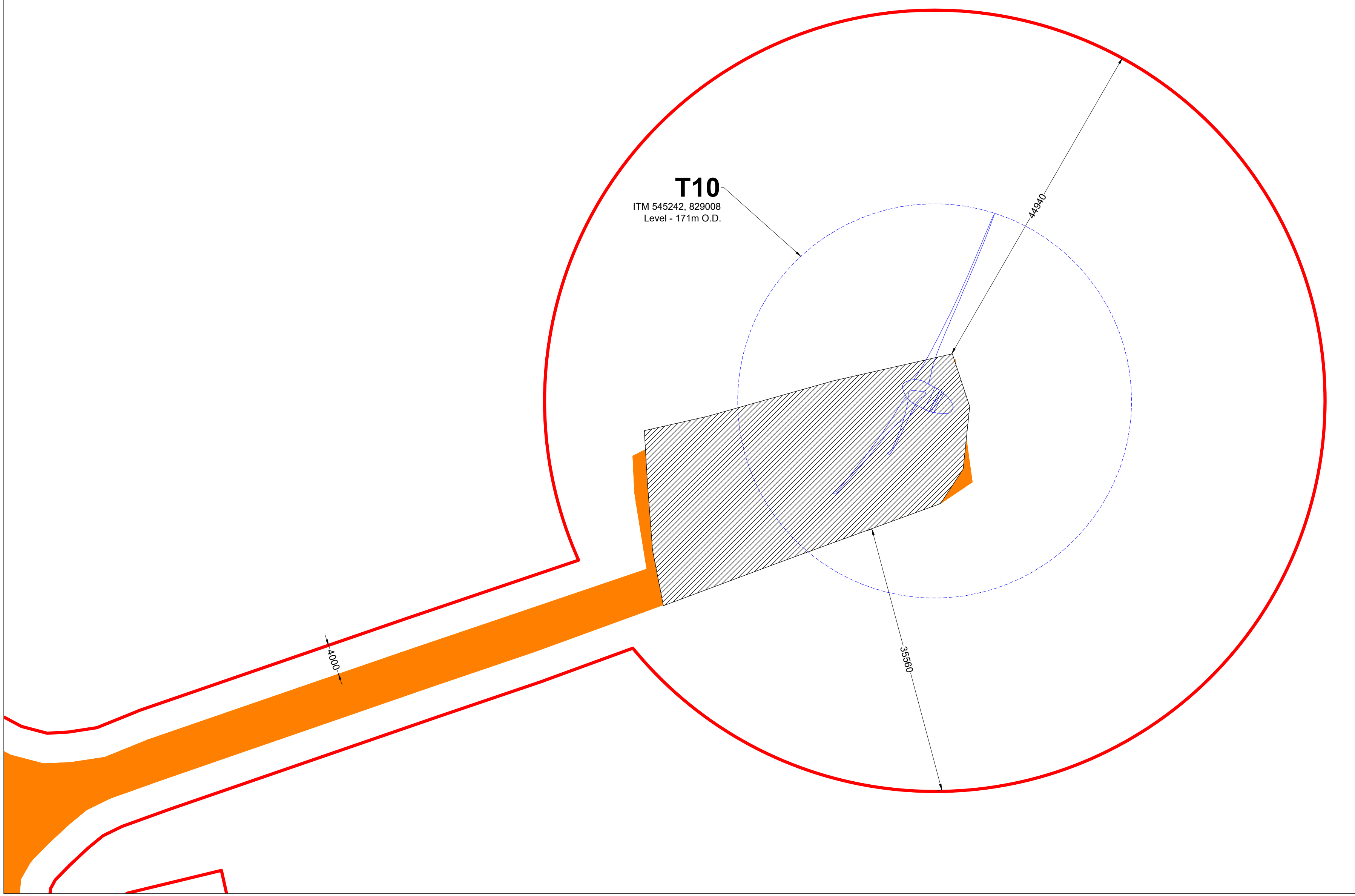
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Drawing Legend

- Planning Application Boundary
- As Built Site Road
- As Built Hardstanding Area
- Turbine Sweep Area

N

DRAWING TITLE: **Turbine Layout Sheet 10 of 13**	
PROJECT TITLE: **SSE Dunneill Wind Farm**	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Meabhann Crowe**
PROJECT No.: **210207**	DRAWING No.: **210207 - 19**
SCALE: **1:500 @ A3**	DATE: **18.08.2022**
OS SHEET No.: 1125, 1126	

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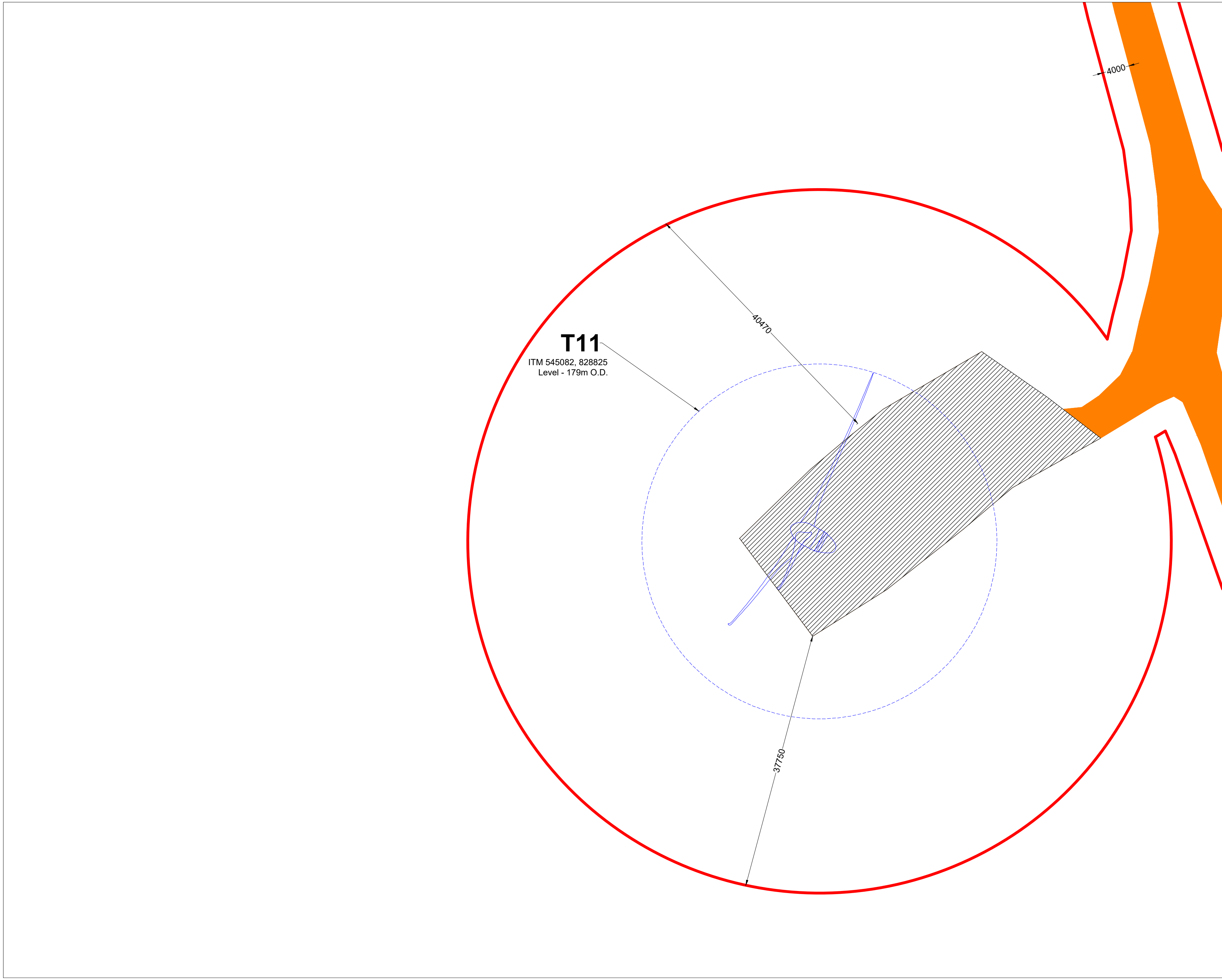

Drawing Legend

- Planning Application Boundary
- As Built Site Road
- As Built Hardstanding Area
- Turbine Sweep Area

DRAWING TITLE:

Turbine Layout Sheet 11 of 13

PROJECT TITLE:

SSE Dunneill Wind Farm

DRAWING BY: Joseph O Brien	CHECKED BY: Meabhann Crowe
PROJECT No.: 210207	DRAWING No.: 210207 - 20
SCALE: 1:500 @ A3	DATE: 18.08.2022
OS SHEET No.: 1125, 1126	

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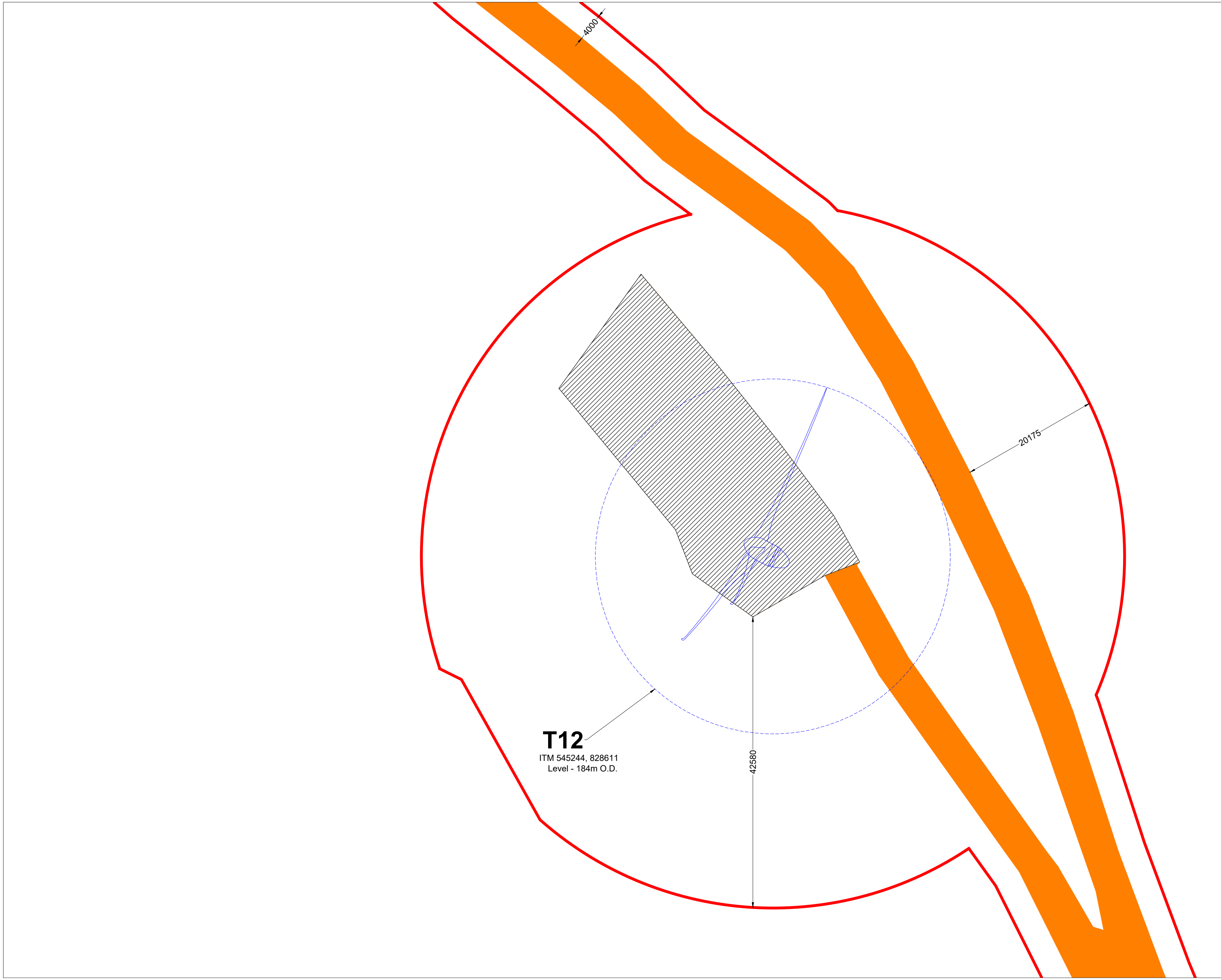

Drawing Legend

- Planning Application Boundary
- As Built Site Road
- As Built Hardstanding Area
- Turbine Sweep Area

N

DRAWING TITLE:
Turbine Layout Sheet 12 of 13

PROJECT TITLE:
SSE Dunneill Wind Farm

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Meabhann Crowe**
PROJECT No.: **210207**	DRAWING No.: **210207 - 21**
SCALE: **1:500 @ A3**	DATE: **18.08.2022**
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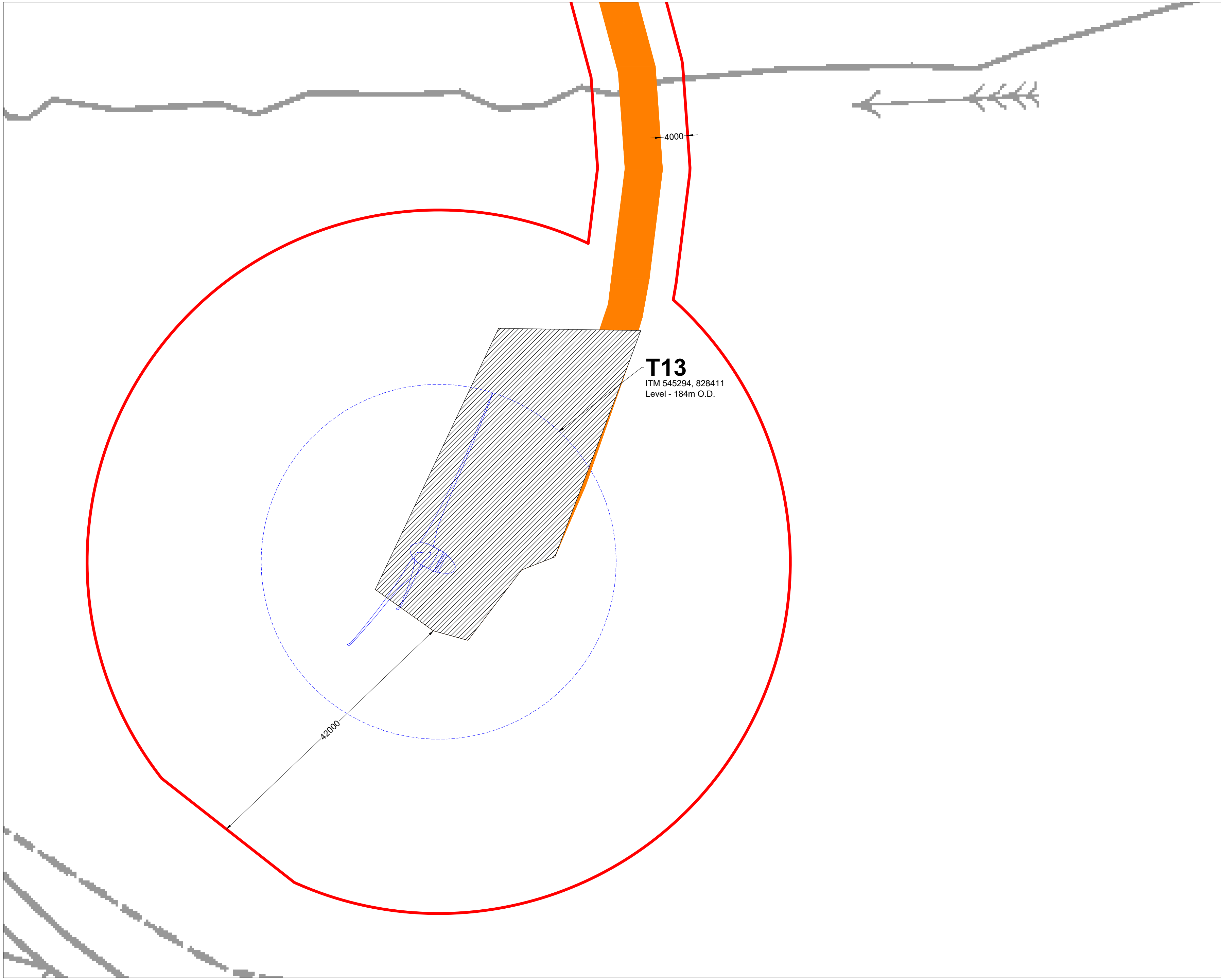

Drawing Legend

- Planning Application Boundary
- As Built Site Road
- As Built Hardstanding Area
- Turbine Sweep Area

N

DRAWING TITLE:
Turbine Layout Sheet 13 of 13

PROJECT TITLE:
SSE Dunneill Wind Farm

DRAWING BY: Joseph O Brien	CHECKED BY: Meabhann Crowe
PROJECT No.: 210207	DRAWING No.: 210207 - 22
SCALE: 1:500 @ A3	DATE: 18.08.2022
OS SHEET No.: 1125, 1126	

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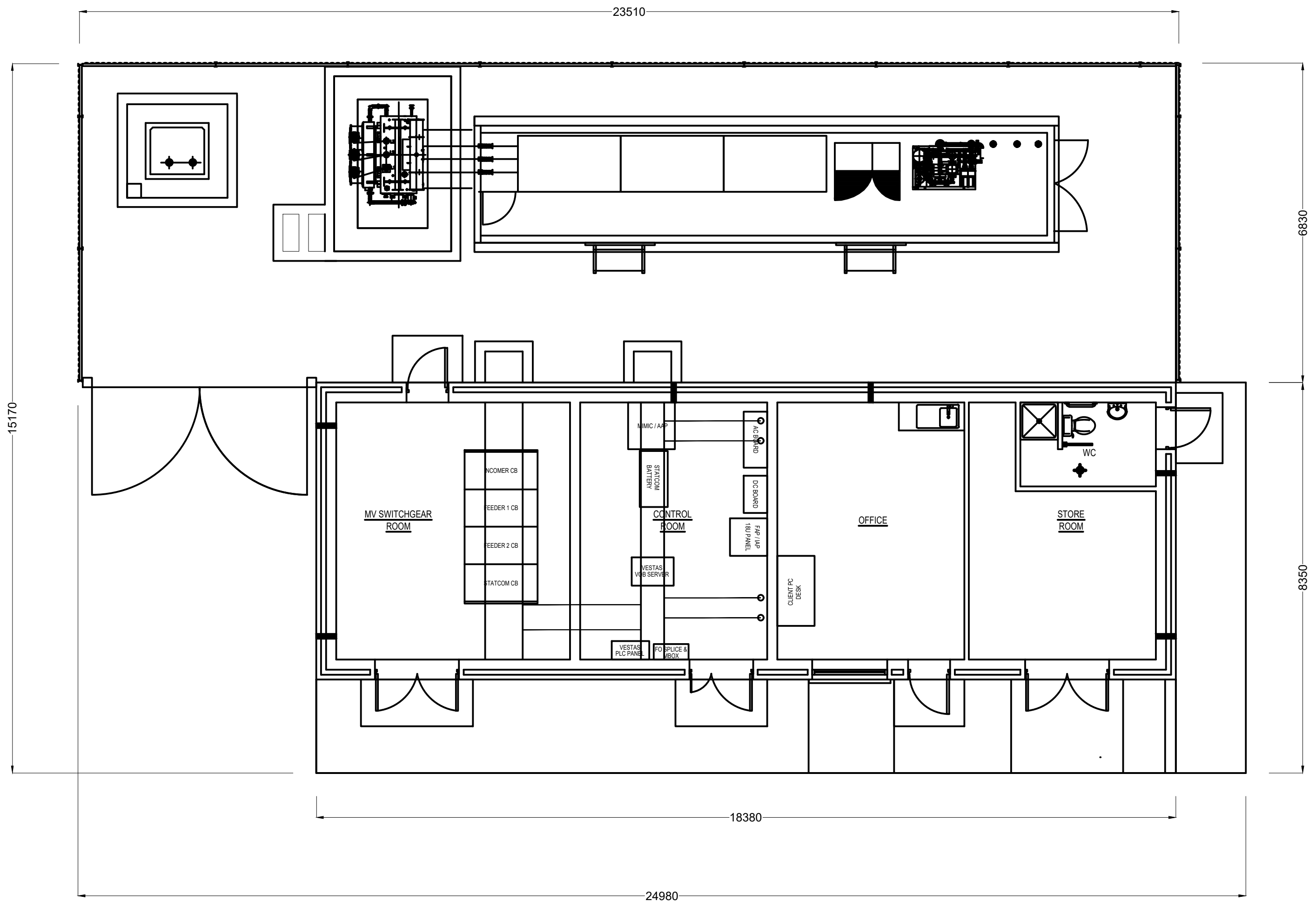

DRAWING TITLE:
Substation Layout Plan

PROJECT TITLE:
SSE Dunneill Wind Farm

DRAWING BY: Joseph O Brien	CHECKED BY: Meabhann Crowe
PROJECT No.: 210207	DRAWING No.: 210207 - 23
SCALE: 1:100 @ A3	DATE: 18.08.2022

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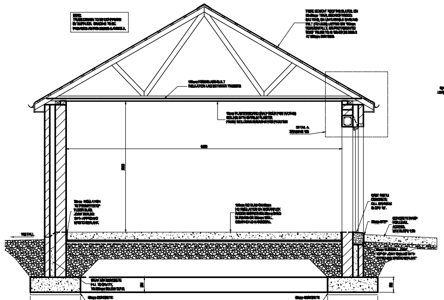
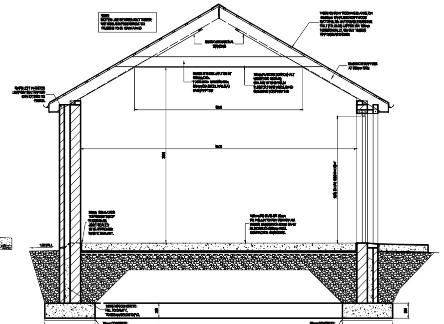


SECTION 1-1



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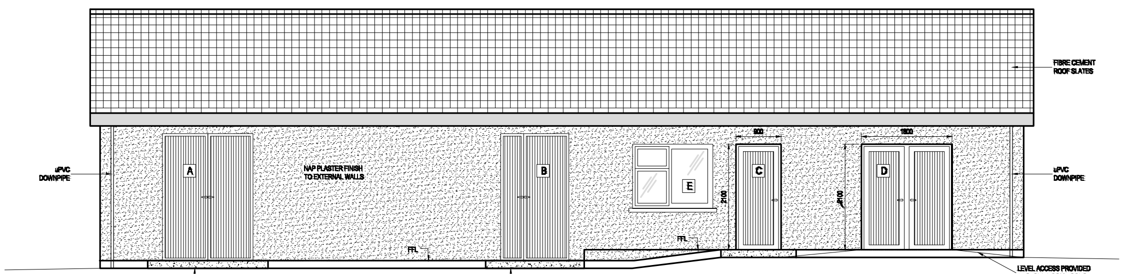
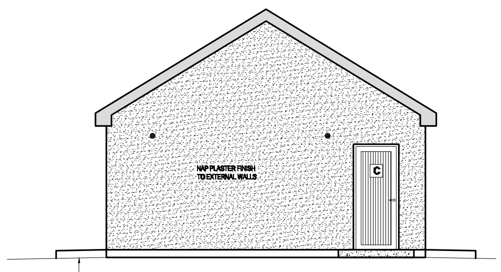
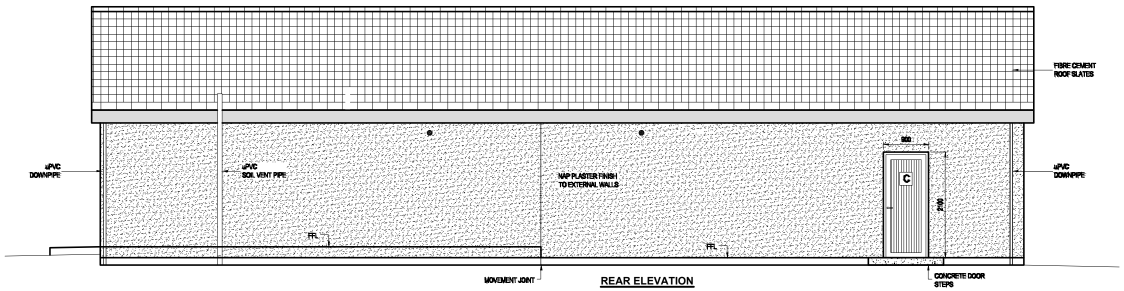


FRONT ELEVATION



SIDE ELEVATION



REAR ELEVATION

DOORS AND WINDOWS:

EXTERNAL DOORS TO BE FLAT STEEL DOORS, FITTED WITH 3 PAIRS STEEL HINGES; PLATED STEEL DOOR HANDLE WITH GOOD QUALITY MORTICE LOCK.

A. DOUBLE DOOR TO SWITCHGEAR ROOM: CLEAR DOOR OPENING HEIGHT TO BE 2525mm. DOOR SUPPLIER TO CONFIRM STRUCTURAL OPE REQUIRED.

B. $1\frac{1}{2}$ DOOR TO CONTROL ROOM: CLEAR DOOR OPENING HEIGHT TO BE 2525mm. DOOR SUPPLIER TO CONFIRM STRUCTURAL OPE REQUIRED.

C. STANDARD PERSONNEL ACCESS DOOR.

D. STANDARD DOUBLE DOORS.

E. WINDOWS TO BE DOUBLE GALZED PVC. TYPICALLY 1600mm WIDE BY 1200mm HIGH. PRECAST CONCRETE SILLS.

DRAWING TITLE: **Substation Elevations**	
PROJECT TITLE: **SSE Dunneill Wind Farm**	
DRAWING BY: Joseph O Brien	CHECKED BY: Meabhann Crowe
PROJECT No.: 210207	DRAWING No.: 210207 - 24
SCALE: 1:100 @ A3	DATE: 18.08.2022

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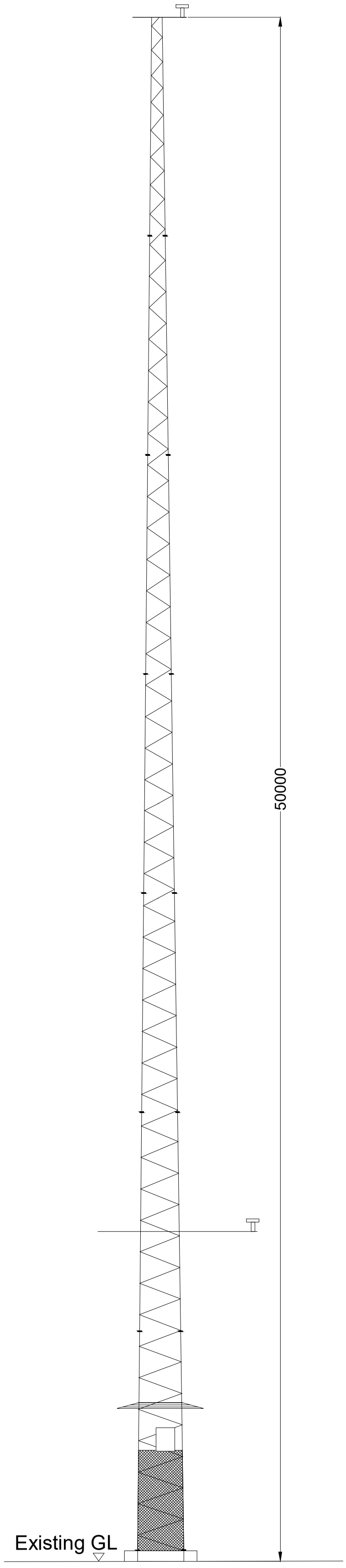

DRAWING TITLE:

Met Mast Elevation

PROJECT TITLE: SSE Dunneill Wind Farm	
DRAWING BY: Joseph O Brien	CHECKED BY: Meabhann Crowe
PROJECT No.: 210207	DRAWING No.: 210207 - 25
SCALE: 1:150 @ A3	DATE: 18.08.2022

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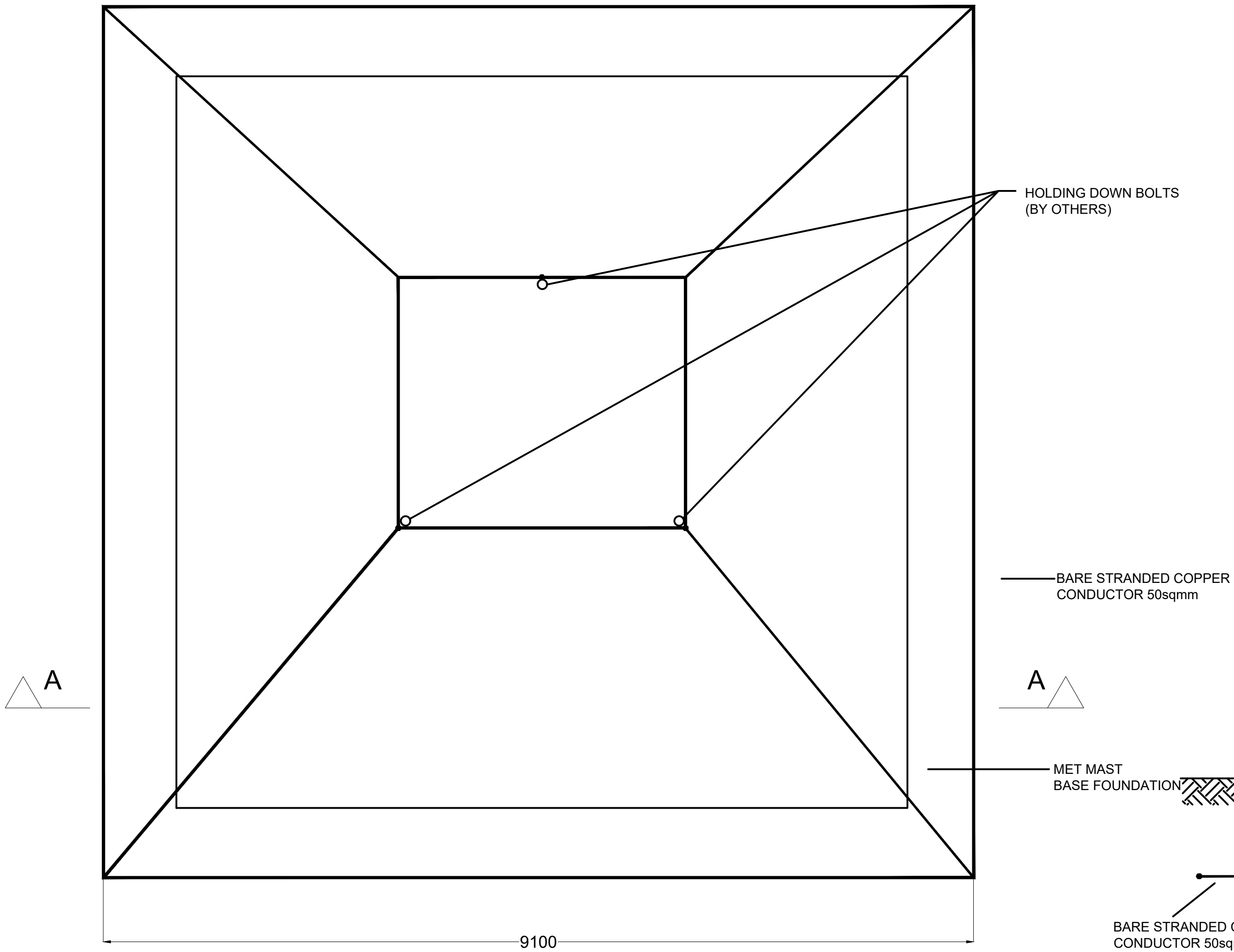
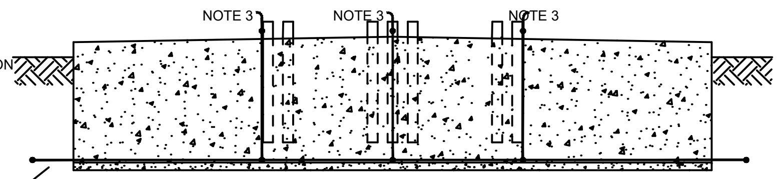


FOUNDATION PLAN



SECTION A-A

NOTES:

1. ALL INTERCONNECTIONS IN 50mmsq BARE STRANDED COPPER. OUTER RING APPROX 1m OUTSIDE OF CONCRETE.

2. 50mmsq BARE COPPER INNER SQUARE ENCASED IN CONCRETE AND BONDED AND CLAMPED TO HOLDING DOWN BOLTS.

3. TAILS LEFT ABOVE GROUND IN 3 PLACES FOR EARTHING OF ABOVE GROUND STRUCTURES.

4. 50mmsq BARE COPPER OUTER SQUARE CONNECTED TO INNER SQUARE AT CORNERS IN 4 POSITIONS.

DRAWING TITLE:

Met Mast Plan

PROJECT TITLE:

SSE Dunneill Wind Farm

DRAWING BY: Joseph O Brien	CHECKED BY: Meabhann Crowe
PROJECT No: 210207	DRAWING No: 210207 - 26
SCALE: 1:50 @ A3	DATE: 18.08.2022

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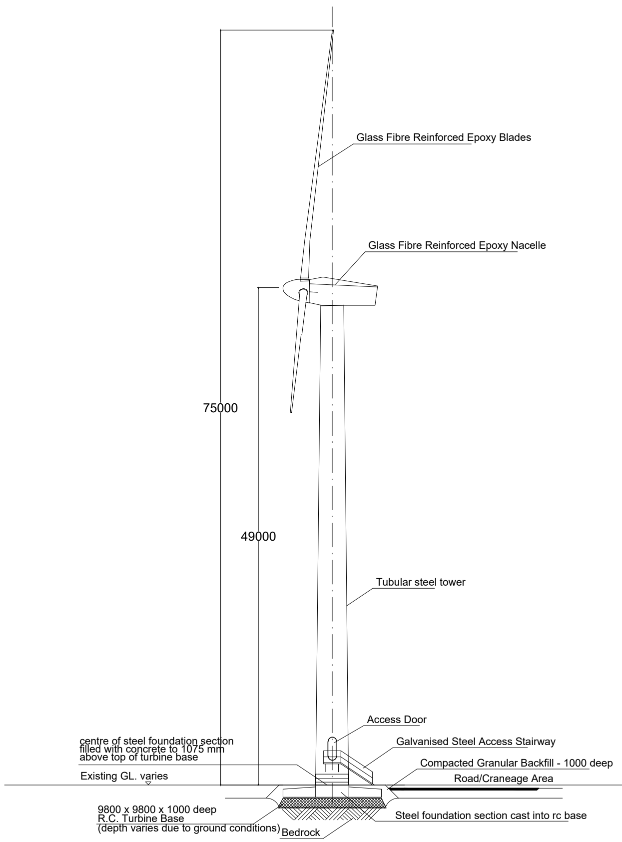
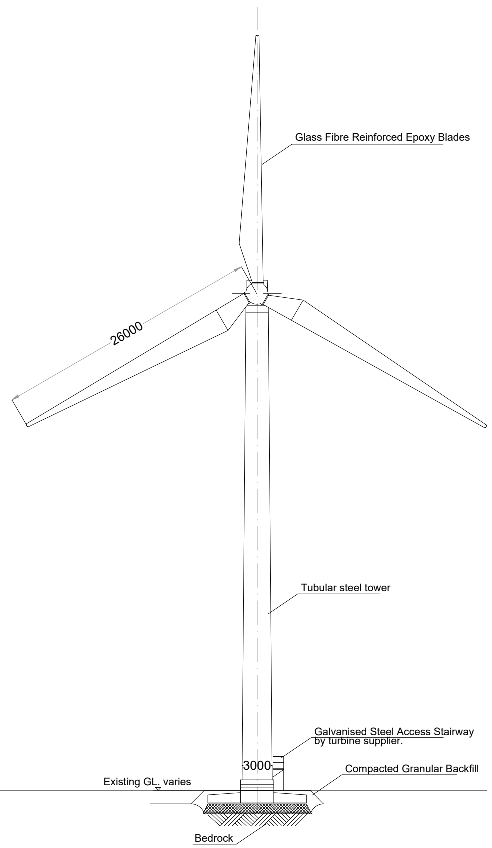


Side Sectional Elevation



Front Sectional Elevation

DRAWING TITLE:

Wind Turbine Elevations

PROJECT TITLE:

SSE Dunneill Wind Farm

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Meabhann Crowe**
PROJECT No.: **210207**	DRAWING No.: **210207 - 27**
SCALE: **1:500 @ A3**	DATE: **18.08.2022**

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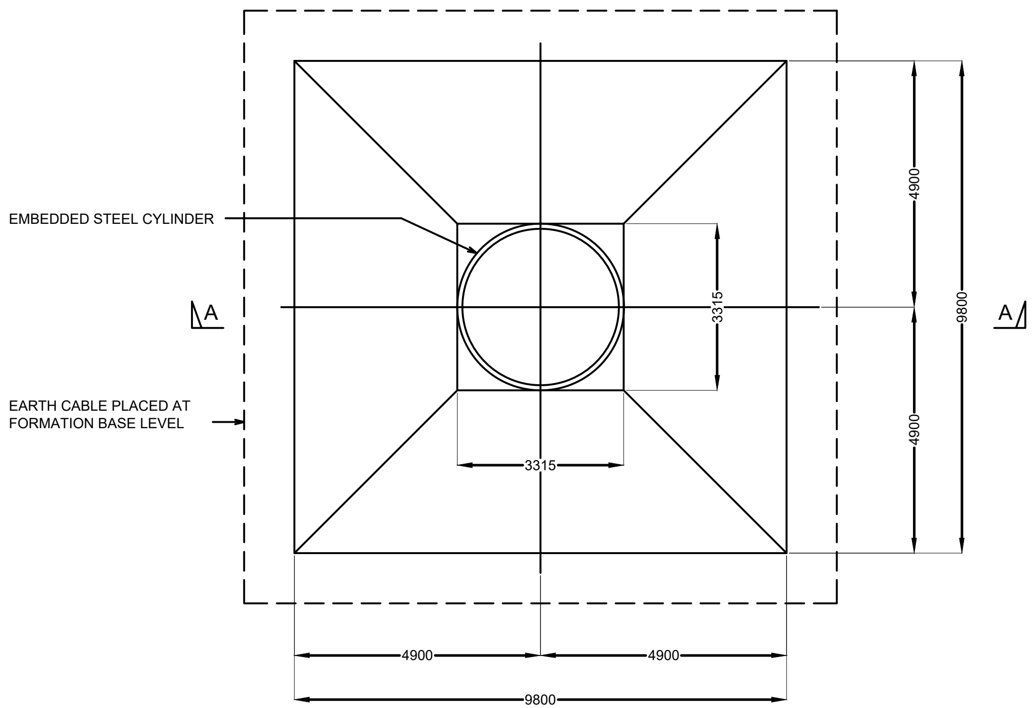
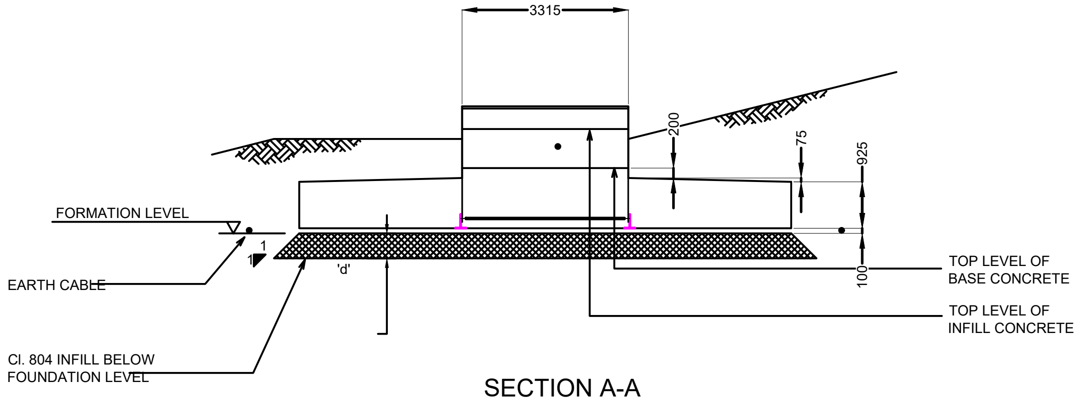
NOTE:

1. ALL DIMENSIONS IN mm UNLESS NOTED



PLAN
SCALE 1:100



SECTION A-A
SCALE 1:100

DRAWING TITLE: **Turbine Foundation**	
PROJECT TITLE: **SSE Dunneill Wind Farm**	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Meabhann Crowe**
PROJECT No.: **210207**	DRAWING No.: **210207 - 28**
SCALE: **1:100 @ A3**	DATE: **18.08.2022**

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APPENDIX 4.2

OPERATIONAL ENVIRONMENTAL MANAGEMENT PLAN (OEMP)

Operation and Environmental Management Plan

Dunneill Wind Farm, Co. Sligo

DOCUMENT DETAILS

Client:	**Brickmount Ltd.**
Project Title:	**Dunneill Wind Farm, Co. Sligo**
Project Number:	**210207**
Document Title:	**Operation and Environmental Management Plan**
Document File Name:	**OEMP Plan - F – 2022.08.09 – 210207**
Prepared By:	**MKO** **Tuam Road** **Galway** **Ireland** **H91 VW84**

Planning and Environmental Consultants

Rev	Status	Date	Author(s)	Approved By
01	Draft	28/06/2022	DN	TB
02	Final	09/08/2022	DN	TB

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1. INTRODUCTION

This Operation and Environmental Management Plan (OEMP) has been prepared by MKO on behalf of Brickmount Ltd. for the proposed extension of operation of the existing Dunneill Wind Farm, hereafter referred to as the Proposed Development. This document has been prepared as part of an Environmental Impact Assessment Report (EIAR) and planning application to Sligo County Council, to extend the operational life of the existing Dunneill Wind Farm (Pl. Ref. 03/619 and ABP Pl. Ref. 21.204790) for a further period of 15 years. SSE plc are ISO14001 certified for renewables operation and maintenance. A copy of the ISO certificate is attached as Appendix A.

This report provides the environmental management framework to be adhered to during the extended operational phase of the Proposed Development and it incorporates the mitigating and monitoring principles that minimises the potential for any environmental impacts to occur.

This document has been prepared to accompany the Environmental Impact Assessment Report (EIAR) prepared as part of the substitute consent process.

1.1 Scope of the Operation and Environmental Management Plan

This report is presented as a guidance document for the operation of the Proposed Development and is intended to replace the Construction and Environmental Management Plan (CEMP) which was provided during construction and the initial operation of the site up to March 2024 (Pl. Ref. 03/619 and ABP Pl. Ref. 21.204790). The OEMP is intended to provide a more concise document targeted specifically at the continued operation of the Proposed Development. Where the term 'site' is used in this OEMP it refers to all works associated with the operation of the Proposed Development. The OEMP clearly outlines the mitigation measures and monitoring proposals that are required to be adhered to in order to operate the site in an appropriate manner.

The report is divided into six sections, as outlined below:

Section 1 provides a brief introduction as to the scope of the report.

Section 2 outlines the Site and Project details, detailing the targets and objectives of this plan along with providing an overview of methodologies for works that will be carried out during the operational phase of the Proposed Development.

Section 3 sets out details of the environmental controls to be implemented on site including the mechanisms for implementation.

Section 4 consists of a summary table of all mitigation proposals to be adhered to during the operational-phase of the project.

Section 5 consists of a summary table of all monitoring proposals to be adhered to during the operational-phase of the project.

Section 6 outlines the proposals for reviewing compliance with the provisions of this report.

2. SITE AND PROJECT DETAILS

2.1 Site Location and Description

The Proposed Development is located approximately 3.5 kilometres (km) south of the village of Dromore West and approximately 3.7 km southwest of the village of Templeboy in County Sligo. The Proposed Development is located within the three townlands of Crowagh or Dunneill Mountain, Tawnadremira, and Ballyglass, while the approximate grid reference location for the centre of the site is ITM E544576 N829278.

The existing wind farm consists of 13 No. Vestas V52 850-kilowatt (kW) turbines with a blade tip height of 75m (49m tower, 52m rotor diameter). The existing wind farm, which became operational in 2010, has a total rated capacity of c.11 Megawatts (MW).

The existing wind farm became operational in 2010 and is connected to the National Grid by a medium voltage 20 kilovolt (kV) underground cable between the existing 20kV substation at Dunneill Wind Farm and the existing Cunghill 110 kV Substation, located approximately 20km southeast of the Proposed Development.

The grid connection is assessed as a cumulative project only within the EIAR. The planning background for Dunneill Wind Farm is detailed further in the accompanying EIAR Chapter 2: Background to the Proposed Development and Chapter 4: Description of the Proposed Development.

No construction activities or alterations to the existing wind farm are proposed beyond routine maintenance of the turbines and electrical infrastructure during the operational phase of the Proposed Development.

2.2 Description of the Proposed Development

The Proposed Development (all elements pre-existing) for which planning permission is sought, for an extension of operation, comprises:

a. *13 no. existing Vestas V52 850 kilowatt (kW) wind turbines with a maximum overall blade tip height of 75 metres (m);*
b. *1 no. onsite control building with total footprint of approximately 455 square metres (m^2), including welfare facilities, associated electrical plant and equipment, security fencing, associated underground cabling and a 6,000-litre sealed cess tank;*
c. *1 no. permanent meteorological mast with a height of 50m and an associated 50m^2 concrete platform/base;*
d. *All associated underground electrical and communications cabling connecting the turbines to the on-site substation;*
e. *Existing site access tracks of circa 3.3 kilometres (km) total length, 3 no. car parking spaces and 13 no. turbine hardstands;*
f. *2 No. existing gated site entrances from an unnamed third-class public road which dissects the windfarm site into north and south;*
g. *Site drainage; and,*
h. *All ancillary infrastructure, associated site fencing and signage.*

As described above, it is proposed to continue the operation of the existing development for a further period of 15-years, from its currently required date of decommissioning in 2024, to 2039.

All elements of the Proposed Development are pre-existing and it is not proposed to make any alterations to the current site layout, wind turbines or associated infrastructure.

The site layout showing existing individual infrastructure of the Proposed Development is shown in Figure 2-1.

As construction has been completed, elements of the project that were developed as a temporary facilitator have either been removed, restored to its original condition or will have naturally revegetated. All access roads and hardstandings areas form part of a site roadway network which will be required by the ongoing farming and forestry operations, and therefore will be left in situ for future use.

Map Legend

- EIAR Site Boundary
- Dunneil Track & Hardstanding
- Dunneill Turbines
- Existing Turbine Hardstand
- Dunneil Substation
- Existing Dunneill Met Mast

N

Drawing Title: Site Layout Map	
Project Title: Dunneill Wind Farm	
Drawn By: DN	Checked By: MW
Project No.: 210207	Drawing No.: Figure 2-1
Scale: 1:11000	Date: 09.08.22

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2.3 Targets and Objectives

The site will be operated to an approved standard and codes of practice as outlined throughout the various chapters of the EIAR. This OEMP considers environmental issues and this is enhanced by the works proposals during operation.

The key site targets are as follows;

- Ensure works and activities are completed in accordance with mitigation and best practice approach presented in the all planning documentation prepared for the site;
- Ensure operational phase works and activities have minimal impact/disturbance to local landowners and the local community;
- Ensure operation and works have minimal impact on the natural environment;
- Adopt a sustainable approach to site operation; and,
- Provide adequate environmental training and awareness for all project personnel.

The key site objectives are as follows;

- Using recycled materials if possible;
- Ensure sustainable sources for materials supply where possible;
- Avoidance of any pollution incident or near miss as a result of working around or close to existing watercourses and having emergency measures in place;
- Avoidance of vandalism;
- Keeping all watercourses free from obstruction and debris;
- Correct implementation of the sustainable drainage system (SuDS) drainage design principles;
- Keep impact of operation to a minimum on the local environment, watercourses, and wildlife;
- Correct fuel storage and refuelling procedures to be followed;
- Good waste management and house-keeping to be implemented;
- Air and noise pollution prevention to be implemented;
- Monitoring of the works and any adverse effects that it may have on the environment. Working methods will be altered where it is found there is the potential to have an adverse effect on the environment;

2.4 Wind Farm Operation Overview

An appointed Operators Controller will install a Site Manager to manage the day to day operation of the wind farm. The Site Manager will be responsible for ensuring compliance with this OEMP and any revisions made to this documents throughout the operation. An overview of the anticipated operational phase activities is provided below.

2.4.1 Turbine Maintenance

The wind farm site will be the subject of on-going maintenance of the wind turbines throughout the operational life of the site. This will be undertaken by turbine suppliers and site personnel who will manage and operate the site from the onsite control building at Dunneill Wind. The turbine maintenance will not require significant plant and equipment with all works localised in nature with operatives using vans to access the site and transport their equipment.

2.4.2 Shadow Flicker Monitoring

An assessment of the potential effects associated with shadow flicker was undertaken using the WindPRO computer software to model the predicted daily and annual shadow flicker levels in significant detail. As part of this assessment it was determined that exceedances of the 2006 DoEHLG guidelines daily threshold for shadow flicker would be experienced at 9 no. properties. The assessment found that of the 9 no. properties, three are third-party inhabitable dwellings and 1 no. property is occupied by a participating landowner with the remaining 5 properties being derelict.

If it is not possible to mitigate any identified shadow flicker limit exceedance locally using screening measures in cooperation with landowners, wind turbine control measures will be implemented.

Wind turbines can be fitted with shadow flicker control units to allow the turbines to be controlled to prevent the occurrence of an exceedance of shadow flicker limits at properties surrounding the wind turbines. The shadow flicker control units will be added to any required turbines. A shadow flicker control unit allows a wind turbine to be programmed and controlled using the wind farm's SCADA control system to change a particular turbine's operating mode during certain conditions or times, or even turn the turbine off if necessary.

All predicted incidents of shadow flicker can be pre-programmed into the wind farm's control software. The wind farm's SCADA control system can be programmed to shut down any particular turbine at any particular time on any given day to ensure that shadow flickers occurrences at properties which are not naturally screened or cannot be screened with measures outlined above.

In order to demonstrate how the SCADA control system can be applied to switch off particular turbines at the relevant times and dates. Table 2-1 lists the 3 no. third-party properties at which a shadow flicker mitigation strategy may be necessary to ensure the DoEHLG 30-minute per day shadow flicker threshold is not exceeded. In this case, the relevant turbine(s) would be programmed to switch off for the time required to reduce daily shadow flicker to a maximum of 28 minutes, which is below the guideline limit of 30 minutes. The SCADA control system would be utilised to control shadow flicker in the absence of being able to agree suitable screening measures with the relevant property owner. The mitigation strategy outlined in Table 2-1 below is based on the worst-case scenario. The details presented in Table 2-1 list the days per year and the turbines that could be programmed to switch off at specific times, in order to reduce daily shadow flicker to a maximum of 28 minutes, which is below the guideline limit of 30 minutes.

Table 2-1 Shadow Flicker Mitigation Strategy – Turbine Numbers and Dates

Property No.	No. of Days 30min/day Threshold is Exceeded	Turbine(s) Producing Shadow Flicker	Days of Year When Mitigation May be Required (Day No's)*	Post-mitigation Maximum Daily Shadow Flicker (hrs:mins:sec)
3	167	T2, T4, T5	16th January – 12th February 16th March – 3rd of April 16th May – 26th July 8th September – 26th September 29th October – 26th November	00:28:00
6	22	T5	3rd April – 13th April 29th August – 8th September	00:28:00

Property No.	No. of Days 30min/day Threshold is Exceeded	Turbine(s) Producing Shadow Flicker	Days of Year When Mitigation May be Required (Day No's)*	Post-mitigation Maximum Daily Shadow Flicker (hrs:mins:sec)
7	10	Combination of T9 and T10	17th December - 26th December	00:28:00

**Note: days of year are based on the model undertaken in 2021*

Where a shadow flicker mitigation strategy is to be implemented, it is likely that the control mechanisms would only have to be applied to one turbine to bring the duration of shadow flicker down to the 28-minute post-mitigation shadow flicker target.

However, the prediction model will still require verification on resumption of operation due to the limitations of the computer modelling. Where an exceedance of the daily threshold is experienced, the appropriate mitigation will be implemented.

2.4.3 Turbine Noise Monitoring

A noise survey has been undertaken for the site. The survey has been completed to determine compliance with the noise condition of attached to the previous grant of permission for the site (Pl. Ref. 03/619 and ABP Pl. Ref. 21.204790). The survey has determined that the relevant noise criteria have been complied with during operation of the windfarm. Furthermore, as the measurements were undertaken at the two residential properties located closest to the wind farm site it is considered that compliance can also be inferred at residential dwellings located further away from the development.

Details of this survey are included in Appendix 11-1 or the rEIAR.

The future operation of the Proposed Development will adhere to any noise compliance requirements that may be conditioned subject to the outcome of the planning application.

3. ENVIRONMENTAL MANAGEMENT

The following sections give an overview of the drainage design, dust and noise control measures, a waste management plan for the site and the implementation of the environmental management procedures for the site.

3.1 Site Drainage

During the operational phase, various combinations/adaptations of the runoff control and drainage management measures will be employed at the site depending on the local conditions and topography. These include:

- Natural vegetation filters are used regularly across the site where the local drainage and topography allowed attenuation of surface water runoff.
- Where possible, interceptor drains are installed up-gradient of infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It is now directed to areas where it can be re-distributed onto natural vegetation.
- Swales/roadside drains are used to collect runoff from access roads and turbine hardstanding areas of the site, likely to have entrained suspended sediment, and channel it onto natural vegetation filters.

Site drainage measures were installed during the construction which have been since removed as the site has naturally revegetated overtime. As the operation of the wind farm continues, these areas within the site will continue to revegetate resulting in a resumption of the natural drainage management that will have existed prior to any construction. It is not anticipated that the operation of the wind farm will interrupt this restored drainage regime in any way. The revegetation of disturbed areas and return to the pre-construction drainage regime at the site, as the operational phase progressed, has resulted in the reduction to the requirement for maintenance of drainage infrastructure.

The water quality monitoring data collected during construction has shown that the site was constructed without having any impact on water quality and will continue to do so during operation.

3.2 Refuelling, Fuel and Hazardous Materials Storage

Any plant and equipment used during the operational phase will require refuelling during the works. Appropriate management of fuels will be required to ensure that incidents relating to refuelling are avoided. The following mitigation measures are proposed to avoid release of hydrocarbons at the site:

- Road-going vehicles will be refuelled off site wherever possible;
- On-site refuelling will be carried out at designated refuelling areas at various locations throughout the site. Machinery will be refuelled directly by a fuel truck that will come to site as required
- Only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations.
- Fuel volumes stored on site should be minimised. Any fuel storage areas will be bunded appropriately for the fuel storage volume;
- The onsite electrical control building at Dunneill is bunded appropriately to the volume of oils being stored to prevent leakage to groundwater or surface water. The bunded area is fitted with a storm drainage system and an appropriate oil interceptor;
- The plant used will be regularly inspected for leaks and fitness for purpose; and,

- An emergency plan for the operational phase to deal with accidental spillages will be developed Spill kits will be available to deal with and accidental spillage in and outside the refuelling area.
- A programme for the regular inspection of plant and equipment for leaks and fitness for purpose will be developed at the outset of the operational phase.

3.2.1 Spill Control Measures

Every effort will be made to prevent an environmental incident during the operational phase of the project. Oil/fuel spillages are one of the main environmental risks that will exist on the site which will require an emergency response procedure. The importance of a swift and effective response in the event of such an incident occurring cannot be over emphasised. The following steps provide the procedure to be followed in the event of such an incident:

- Stop the source of the spill and raise the alarm to alert people working in the vicinity of any potential dangers.
- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident.
- Contain the spill using the spill control materials, track mats or other material as required. Do not spread or flush away the spill.
- If possible, cover or bund off any vulnerable areas where appropriate such as drains, watercourses or sensitive habitats.
- If possible, clean up as much as possible using the spill control materials.
- Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited.
- Notify the Site Manager immediately giving information on the location, type and extent of the spill so that they can take appropriate action.
- The Site Manager will inspect the site and ensure the necessary measures are in place to contain and clean up the spill and where necessary appoint a specialist contractor to undertake the clean-up and prevent further spillage from occurring.
- The Site Manager will notify the appropriate regulatory body such as Sligo County Council, and the Environmental Protection Agency (EPA), if deemed necessary.

The importance of a swift and effective response in the event of such an incident occurring cannot be over emphasised. Environmental incidents are not limited to just fuel spillages. Therefore, any environmental incident must be investigated in accordance with the following steps.

- The Site Manager must be immediately notified.
- If necessary, the Site Manager will inform the appropriate regulatory authority. The appropriate regulatory authority will depend on the nature of the incident.
- The details of the incident will be recorded on an Environmental Incident Form which will provide information such as the cause, extent, actions and remedial measures used following the incident. The form will also include any recommendations made to avoid reoccurrence of the incident.
- If the incident has impacted on a sensitive receptor such as an archaeological feature the Site Manager will liaise with the Project Archaeologist.
- A record of all environmental incidents will be kept on file by the Site Manager and the Main Contractor. These records will be made available to the relevant authorities such as Sligo County Council, EPA if required.

The Site Manager will be responsible for any corrective actions required as a result of the incident e.g. an investigative report, formulation of alternative works methodologies or environmental sampling, and will advise the Operators Controller as appropriate.

3.3 Noise Control

The operation of plant and machinery, including site vehicles, is a source of potential impact that will require mitigation at all locations within the site. Proposed measures to control noise include:

- Limiting the hours during which site activities likely to create noticeable levels of noise or vibration are permitted;
- Establishing channels of communication between the Applicant or contractor, Local Authorities and residents;
- Selection of plant with low inherent potential for generation of noise and/or vibration;
- No plant or machinery will be permitted to cause a public nuisance due to noise;
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of works;
- Compressors models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers;
- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use; and
- The hours of maintenance works (and associated traffic movements) will, insofar as possible, be limited to avoid unsociable hours. Activities shall generally be restricted to between 07:00hrs and 19:00hrs Monday to Friday and between 07:00hrs and 13:00hrs on Saturdays, with no activities on Sundays or public holidays unless in the event of an emergency.

Given the reduced scale of plant and equipment that will be used during operations in comparison to the construction phase, it is not anticipated that impacts associated with noise from plant and equipment will be experienced during operation when considering no significant impact was experienced during construction. However, the appropriate mitigation has been provided above for implementation as required.

The findings of the noise monitoring campaigns confirm that operational phase noise levels are below the limits set out in the planning consent for the existing development. Other than the continuation of a rigorous turbine maintenance programme in accordance with the manufacturer's specifications, no specific noise mitigation measures are required or proposed.

3.4 Traffic Management

The ongoing turbine and general site maintenance will be completed by personnel using normal road going vehicles with an average of 2 vans per day during specific maintenance periods. The small volumes of traffic and intermittent nature of the works will not require any specific traffic management.

3.5 Environmental Management Implementation

3.5.1 Roles and Responsibilities

The Site Manager will be the project focal point relating to operation-related environmental issues.

In general, the Site Manager will maintain responsibility for monitoring site operations and Contractors/Sub-contractors from an environmental perspective. The Site Manager will act as the regulatory interface on environmental matters. The Site Manager will be responsible for reporting to and liaising with Sligo County Council and other statutory bodies as required.

The Operation Controller will be responsible for employing the services of a suitably qualified ecologist, ornithologist and any other suitably qualified professionals as required throughout the operational phase.

3.5.2 Health and Safety

During the operational phase there will be ongoing maintenance of the wind turbines and associated infrastructure. Access to the turbines is through a door at the base of the structure, which will be locked at all times outside maintenance visits. ESB retains the rights to access the grid connection cables and substation as part of their routine infrastructure inspections.

Staff associated with the project will conduct frequent visits, which will include inspections to establish whether any signs have been defaced, removed or are becoming hidden by vegetation or foliage, with prompt action taken as necessary.

3.5.3 Environmental Induction

The Environmental Induction will be integrated into the general site induction on a case-by-case basis for each member of staff employed on-site depending on their assigned roles and responsibilities on site. Where necessary, the Environmental Induction will as a minimum include:

- A copy of the OEMP and discussion of the key environmental risks and constraints;
- A discussion of the applicable Works Method Statement;
- The roles and responsibilities of staff, including contractors, in relation to environmental management; and,
- An outline of the Environmental Incident Management Procedure.

3.5.4 Toolbox Talks

Toolbox talks will be held by the Site Manager at the commencement of each day, or at the commencement of new activities where required. The aims of the toolbox talks are to identify the specific work activities that are scheduled for that day or phase of work. In addition, the necessary work method statements and sub plans would be identified and discussed prior to the commencement of the day's activities.

Site meetings would be held on a regular basis involving all site personnel. The objectives of site meetings are to discuss the coming weeks activities and identify the relevant work method statements and sub plans that will be relevant to that week's activities. Additionally, any non-compliance identified during the previous week would also be discussed with the aim to reduce the potential of the same non-compliance reoccurring.

4. MITIGATION PROPOSALS

All mitigation measures relating to the operational phase of the Proposed Development were set out in the various sections of the Environmental Impact Assessment Report (EIAR) which accompanies this substitute consent application.

This section of the OEMP groups together all of the mitigation measures presented in the planning documentation. The mitigation measures are presented in the following pages.

By presenting the mitigation proposals in the below format, it is intended to provide an easy to audit list that can be reviewed and reported on during the operational phase of the project. The tabular format in which the below information is presented, can be further expanded upon during the course of operation and provides a reporting template for site compliance audits.

Table 4-1 Operational Phase Mitigation Measures

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
Operational Phase				
MM1	EIAR Chapter 5	Regarding Health and Safety during the operational phase: o Mitigation measures that are currently in place will continue during the extended operation of the Proposed Development to ensure that the risks posed to staff, landowners and the general public remain negligible throughout the operational life of the wind farm. o An operational phase Health and Safety Plan is currently in place and will continue to fully address identified Health and Safety issues associated with the operation of the site. o During the operation of the wind farm regular maintenance of the turbines will be carried out by the turbine manufacturer or appointed service company. A project or task specific Health and Safety Plan will be developed for these works in accordance with the site's health and safety requirements. o During the operational phase there will be ongoing maintenance of the wind turbines and associated infrastructure. Access to the turbines is through a door at the base of the structure, which is locked at all times outside maintenance visits.		
MM2	EIAR Chapter 5	Regarding Residential Amenity during the operational phase: o All mitigation as outlined under noise and vibration, dust, traffic, visual amenity and shadow flicker in the EIAR, will be implemented in order		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		to reduce insofar as possible impacts on residential amenity at properties located in the vicinity of the Dunneill Wind Farm development. o In the event of shadow flicker exceeding guidance levels at a residential dwelling surrounding the wind farm mitigation options will be discussed with the affected homeowner, if required, including: - Installation of appropriate window blinds in the affected rooms of the residence; - Planting of screening vegetation; - Other site-specific measures which might be agreeable to the affected party and may lead to the desired mitigation. These measures can include wind turbine control measures by way of SCADA control system to change a particular turbine's operating mode during certain conditions or times.		
MM3	EIAR Chapter 6	Regarding <u>Bat Species Mitigation Measures</u> during the operational phase: o Best practice mitigation will include blade feathering as a standard across all turbines (i.e. 'feathering' of turbine blades when wind speeds are below the cut-in speed (4m/s). This measure has been shown to significantly reduce bat fatalities (by up to 50%) in some studies). o Further details on mitigation can be found in Section 6.2 of the Bat Report, which is listed as Appendix 6-1 of this EIAR.		
MM4	EIAR Chapter 5, 11	Regarding <u>Noise Control</u> during regular maintenance works during the operational phase:		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		o Limiting the hours during which site activities likely to create noticeable levels of noise or vibration are permitted; o Establishing channels of communication between the Applicant or contractor, Local Authorities and residents; o Selection of plant with low inherent potential for generation of noise and/or vibration; o No plant or machinery will be permitted to cause a public nuisance due to noise; o The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations. o All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of works; o Compressors models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers; o Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use; and o The hours of maintenance works (and associated traffic movements) will, insofar as possible, be limited to avoid unsociable hours. Activities shall generally be restricted to between 07:00hrs and 19:00hrs Monday to Friday and between 07:00hrs and 13:00hrs on Saturdays, with no activities on Sundays or public holidays unless in the event of an emergency.		
MM5	EIAR Chapter 6, 8, 9	In order to limit impacts upon Soils and the Water Environment from potential leaks and spillages of hydrocarbons during routine maintenance works the following measures are proposed:		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		o All plant and machinery to be serviced before being mobilised to site; o No plant maintenance completed on-site, any broken down plant removed from site to be fixed; o Refuelling completed in a controlled manner using drip trays at all times; o Mobile bowsers, tanks and drums stored in secure, impermeable bunded storage areas away from open water; o Only designated trained operators authorised to refuel plant on-site; o Procedures and contingency plans set up to deal with emergency accidents or spills; and, o Highest standards of site management maintained, and utmost care and vigilance followed to prevent accidental contamination or unnecessary disturbance to the site and surrounding environment during works.		
MM6	EIAR Chapter 10	Regarding Air Quality during the operational phase: o Any vehicles or plant brought onsite during the operational phase will be maintained in good operational order, thereby minimising any emissions that arise.		
MM7	EIAR Chapter 2	In the event of further scoping responses being received from the EIA consultees, the comments of the consultees and any mitigation measures are considered during operation of the Dunneill Wind Farm, subject to the outcome of the planning process.		

5. MONITORING PROPOSALS

All monitoring proposals relating to the operational phase of the Proposed Development were set out in the various sections of the Environmental Impact Assessment Report (EIAR) which accompanies this substitute consent application.

This section of the OEMP groups together all of the monitoring proposals presented in the planning documentation. The monitoring proposals are presented in the following pages.

By presenting the monitoring proposals in the below format, it is intended to provide an easy to audit list that can be reviewed and reported on during the operational phase of the project. The tabular format in which the below information is presented, can be further expanded upon during the course of operation to provide a reporting template for site compliance audits.

Table 5-1 Schedule of Operational Phase Monitoring Proposals

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
Operational Phase				
MO1	EIAR Chapter 6	Regarding Bat Species Monitoring Proposals during the operational phase: o As part of the continued operation of the wind farm an adaptive monitoring and potential mitigation strategy for years 1-3 of the extension duration will be incorporate. This is the most robust approach for the proposed development, and is aligned with current best practice and legislation. The post consent monitoring would determine whether bat mortality beyond the NIEA significance threshold (more than 1 bat fatality per turbine per year during carcass searches) is detected, thereby confirming a requirement for adaptive mitigation. o Post-consent monitoring would be undertaken in accordance with the minimum standards set out in Table 1 of the NIEA guidance and would include static detector surveys, walked survey transects and carcass searches. At the end of each year (i.e. years 1-3), the requirement for and efficacy of the any proposed adaptive mitigation programme (i.e. curtailment and/or buffering) will be reviewed, and any identified efficiencies incorporated into the mitigation programme. o Further details on this monitoring plan can be found in Section 6.2 of the Bat Report, which is listed as Appendix 6-1 of this EIAR.		
MO2	EIAR Chapter 7	A detailed Bird Monitoring Programme has been prepared for the extended operational phase of the existing wind farm (refer to Appendix 7-6 for further details). The programme of works will monitor parameters associated with collision, displacement/barrier effects and habituation during the extended operational phase. Surveys will be scheduled to coincide with Years 1, 2, 3, 5, 10 and (if		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		applicable) 15 of the additional operational lifetime of the wind farm. Monitoring measures are broadly based on guidelines issued by SNH (2009). The following individual components are proposed: o Monthly flight activity surveys: vantage point surveys. o Targeted bird collision surveys (corpse searches) will be undertaken with trained dogs. The surveys will include detection and scavenger trials, to correct for these two biases and ensure the resulting data is robust.		
MO3	EIAR Chapter 5, 11	Regarding Noise Monitoring during the operational phase: o As part of the Proposed Development to extend the operation of Dunneill Wind Farm, it is proposed that the current noise monitoring, as part of the condition compliance (Pl. Ref. 03/619), would continue to be carried out on a 5-year basis (i.e., five noise monitoring campaigns proposed across the 15-year period including the survey years of 2024, 2029, 2034 & 2039). o Should it be necessary to assess a complaint from a location which does not have an associated representative baseline curve, noise monitoring may be carried out and directional filtering applied to assess both wind farm noise and background.		

6. COMPLIANCE AND REVIEW

6.1 Site inspections and Environmental Audits

Routine inspections of site operations will be carried out on a daily and weekly basis by the Site Manager to ensure all controls to prevent environmental impacts, relevant to the operational activities taking place at the time, are in place.

Environmental inspections will ensure that the works are undertaken in compliance with this OEMP and all other planning application documents. The Site Manager will be suitably trained to undertake environmental site inspections.

6.2 Auditing

An Environmental audit will first be carried out monthly during the operational phase of the Proposed Development to ensure the operational phase mitigation measures that are still in place as required are adequate.

In contrast to monitoring and inspection activities, audits are designed to shed light on the underlying causes of non-compliance, and not merely detect the non-compliance itself. In addition, audits are the main means by which system and performance improvement opportunities may be identified. Environmental audits will be carried out by the Site Manager on behalf of the Operation Controller. It is important that an impartial and objective approach is adopted. Environmental audits will be conducted at planned intervals to determine whether the OEMP is being properly implemented and maintained. The results of environmental audits will be provided to project management personnel.

6.3 Environmental Compliance

The following definitions shall apply in relation to the classification of Environmental Occurrences during the operation of the wind farm:

Environmental Near Miss: An occurrence which if not controlled or due to its nature could lead to an Environmental Incident.

Environmental Incident: Any occurrence which has potential, due to its scale and nature, to migrate from source and have an environmental impact beyond the site boundary.

Environmental Exceedance Event: An environmental exceedance event occurs when monitoring results indicate that limits for a particular environmental parameter (as indicated in the Environmental Monitoring Programme) has been exceeded.

An exceedance will immediately trigger an investigation into the reason for the exceedance occurring and the application of suitable mitigation where necessary.

Exceedance events can be closed out on achieving a monitoring result below the assigned limit for a particular environmental parameter.

Environmental Non-Compliance: Non-fulfilment of a requirement and includes any deviations from established procedures, programs and other arrangements related to the OEMP.

6.4 Corrective Action Procedure

A corrective action is implemented to rectify an environmental problem on-site. Corrective actions will be implemented by the Site Manager. Corrective actions may be required as a result of the following;

- Environmental Audits;
- Environmental Inspections and Reviews;
- Environmental Monitoring;
- Environmental Incidents; and,
- Environmental Complaints.

A Corrective Action Notice will be used to communicate the details of the action required to the main contractor. A Corrective Action Notice is a form that describes the cause and effect of an environmental problem on site and the recommended corrective action that is required. The Corrective Action Notice, when completed, will include details of close out and follow up actions.

If an environmental problem occurs on site that requires immediate attention direct communications between the Site Manager will be conducted. This in turn will be passed down to the site staff involved. A Corrective Action Notice will be completed at a later date.

6.5 Operation and Environmental Management Plan Review

This OEMP will be reviewed after every 6 months of operation and may also require updating after the substitute consent process to comply with any conditions should substitute consent be granted.

APPENDIX A

ISO 14001 CERTIFICATE

Certificate GB17/873624.07

The management system of

Renewables Operation and Maintenance, SSE plc

Inveralmond House, 200 Dunkeld Road, Perth, PH1 3AQ, UK

has been assessed and certified as meeting the requirements of

ISO 14001:2015

For the following activities

The generation of electricity.

This certificate is valid from 01 July 2021 until 28 June 2024 and remains valid subject to satisfactory surveillance audits.
Recertification audit due a minimum of 60 days before the expiration date.
Issue 3. Certified since 16 October 2006

Expiry date of last certificate: 28 June 2021
End date of last recertification audit: 24 June 2021

This document is part of Certificate GB17/873624.00
The validity of this certificate depends on the validity of the main certificate.
It is the management system of the whole organisation which is certified.

Authorised by

SGS United Kingdom Ltd
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APPENDIX 4.3

DECOMISSIONING PLAN

Planning and Environmental Consultants

Decommissioning Plan

Dunneill Wind Farm, Co. Sligo

DOCUMENT DETAILS

Client:	**Brickmount Ltd.**
Project Title:	**Dunneill Wind Farm, Co. Sligo**
Project Number:	**210207**
Document Title:	**Decommissioning Plan**
Document File Name:	**Decommissioning Plan – F – 2022.08.09 – 210207**
Prepared By:	**MKO** **Tuam Road** **Galway** **Ireland** **H91 VW84**

Planning and Environmental Consultants

Rev	Status	Date	Author(s)	Approved By
01	Draft	15/07/2022	DN/OC	TB
02	Final	09/08/2022	DN	TB

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1. INTRODUCTION

This Planning Stage Decommission Plan has been prepared by MKO on behalf of Brickmount Ltd. for the decommissioning of Dunneill Wind Farm and associated infrastructure, hereafter referred to as the Proposed Development. This document has been prepared as part of an Environmental Impact Assessment Report (EIAR) and planning application to Sligo County Council, to extend the operational life of the existing Dunneill Wind Farm (Pl. Ref. 03/619 and ABP Pl. Ref. 21.204790) for a further period of 15 years. Decommissioning of the Proposed Development is intended to take place after the proposed additional 15-year period (c.2039), subject to planning permission.

Should the Proposed Development not be consented, the existing Dunneill Wind Farm will be decommissioned in 2024 in line with Condition 8 of the original Planning Application granted by Sligo County Council (Pl. Ref. 03/619). While decommissioning is required under the extant planning permission, and the Proposed Development will be simply postponing those activities for another 15-years, decommissioning activities have evolved since the original planning application was submitted and this Planning Stage Decommissioning Plan has been prepared to account for such updates. This Planning Stage Decommissioning Plan is based upon current technologies, methods and best practice.

Prior to decommissioning, the applicant will engage with the Planning Authority to agree a specific Decommissioning Plan to ensure the appropriate decommissioning and reinstatement of the site having regard to prevailing environmental conditions and to ensure the use of best available recycling technology and techniques available at the time. This document should, therefore, be considered to be a 'live' document which will be further developed by the appointed decommissioning contractor who will prepare and insert detailed method statements relative to each individual work stream.

This report provides the environmental management framework to be adhered to during the decommissioning phase of the Proposed Development and it incorporates the mitigating principles to ensure that the work is carried out in a way that minimises the potential for any environmental impacts to occur.

1.1 Scope of the Decommissioning Plan

This report is presented as a guidance document for the decommissioning of the Proposed Development. Where the term 'site' is used in the Decommissioning Plan it refers to all works associated with the Proposed Development, including enabling works. The Decommissioning Plan clearly outlines the mitigation measures and monitoring proposals that are required to be adhered to in order to complete the works in an appropriate manner.

The report is divided into six sections, as outlined below:

Section 1 provides a brief introduction as to the scope of the report.

Section 2 outlines the Site and Project details, detailing the targets and objectives of this plan along with providing an overview of works methodologies that will be adopted throughout decommissioning.

Section 3 sets out details of the environmental controls to be implemented on site including the mechanisms for implementation. A waste management plan is also included in this section.

Section 4 outlines the Emergency Response Procedure to be adopted in the event of an emergency in terms of site health and safety and environmental protection.

Section 5 sets out a programme for the timing of the works.

Section 6 outlines the proposals for reviewing compliance with the provisions of this report.

2. SITE AND PROJECT DETAILS

2.1 Site Location and Description

The Proposed Development is located approximately 3.5 kilometres (km) south of the village of Dromore West and approximately 3.7 km southwest of the village of Templeboy in County Sligo. The Proposed Development is located within the four townlands of Crowagh or Dunneill, Tawnadremira, Ballyglass and Dunowla, while the approximate grid reference location for the centre of the site is ITM E544576 N829278.

The existing wind farm consists of 13 No. Vestas V52 850-kilowatt (kW) turbines with a blade tip height of 75m (49m tower, 52m rotor diameter). The existing wind farm, which became operational in 2010, has a total rated capacity of c.11 Megawatts (MW).

The existing wind farm is connected to the National Grid by a medium voltage 20 kilovolt (kV) underground cable between the existing 20kV substation at Dunneill Wind Farm and the existing Cunghill 110 kV Substation, located approximately 20km southeast of the Proposed Development.

The grid connection is assessed as a cumulative project only within the EIAR, as at the time of constructing Dunneill Wind Farm, the grid connection for this site was considered as exempted development and did not form part of the original planning application. This was generally the case for all wind farm projects of that era (i.e., pre the Peart / O'Grianna judgement). The planning background for Dunneill Wind Farm is detailed further in the accompanying EIAR Chapter 2: Background to the Proposed Development and Chapter 4: Description of the Proposed Development.

No construction activities or alterations to the existing wind farm are proposed beyond routine maintenance of the turbines and electrical infrastructure during the operational phase of the Proposed Development.

2.2 Description of the Proposed Development

The Proposed Development (all elements pre-existing) for which planning permission is sought, for an extension of operation, comprises:

a. *13 no. existing Vestas V52 850 kilowatt (kW) wind turbines with a maximum overall blade tip height of 75 metres (m);*
b. *1 no. onsite control building with total footprint of approximately 455 square metres (m^2), including welfare facilities, associated electrical plant and equipment, security fencing, associated underground cabling and a 6,000-litre sealed cess tank;*
c. *1 no. permanent meteorological mast with a height of 50m and an associated 50m^2 concrete platform/base;*
d. *All associated underground electrical and communications cabling connecting the turbines to the on-site substation;*
e. *Existing site access tracks of circa 3.3 kilometres (km) total length, 3 no. car parking spaces and 13 no. turbine hardstands;*
f. *2 No. existing gated site entrances from an unnamed third-class public road which dissects the windfarm site into north and south;*
g. *Site drainage; and,*
h. *All ancillary infrastructure, associated site fencing and signage.*

As described above, it is proposed to continue the operation of the existing development for a further period of 15-years, from its currently required date of decommissioning in 2024, to 2039.

All elements of the Proposed Development are pre-existing and it is not proposed to make any alterations to the current site layout, wind turbines or associated infrastructure. All elements of the existing wind farm were constructed in accordance with the conditions attached to the planning permission for Dunneill Wind Farm and ESB/EirGrid specifications and requirements at the time of construction.

The site layout showing existing individual infrastructure of the Proposed Development is shown in Figure 2-1.

As construction has been completed, elements of the project that were developed as a temporary facilitator have either been removed, restored to its original condition or will have naturally revegetated. All access roads and hardstandings areas form part of a site roadway network which will be required by the ongoing farming and forestry operations, and therefore will be left in situ for future use. It is intended that decommissioning will remove the existing turbines and reinstate areas where infrastructure is removed. The following elements are included:

- Wind turbines dismantling and removal off site.
- Electrical cabling removal (ducting remaining)
- Turbine foundation backfilling (Underground reinforced concrete remaining in-situ)

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Map Legend
EIAR Site Boundary
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Drawing Title
Site Layout Map
Project Title
Dunneill Wind Farm
Drawn By
DN
Checked By
MW
Project No.
210207
Drawing No.
Figure 2-1
Scale
1:11000
Date
09.08.22
MKO
Planning and Environmental Consultants
Tuam Road, Galway Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: www.mkoireland.ie

2.3 Targets and Objectives

The decommissioning phase works will be completed to approved standards, which include specified materials, standards, specifications and codes of practice. This decommissioning plan has considered environmental aspects, and this is enhanced by the works proposals as part of decommissioning.

The key site targets are as follows;

- Ensure decommissioning works and activities are completed in accordance with mitigation and best practice approach presented in the accompanying Environmental Impact Assessment Report (EIAR) and associated planning documentation;
- Ensure decommissioning works and activities have minimal impact/disturbance to local landowners and the local community;
- Ensure decommissioning works and activities have minimal impact on the natural environment;
- Adopt a sustainable approach to decommissioning; and,
- Provide adequate environmental training and awareness for all project personnel.

The key site objectives are as follows;

- Using recycled materials if possible, e.g. soil and overburden material for backfilling and reinstatement;
- Ensure sustainable sources for materials supply where possible;
- Avoidance of any pollution incident or near miss as a result of working around or close to existing watercourses and having emergency measures in place;
- Avoidance of vandalism;
- Keeping all watercourses free from obstruction and debris;
- Correct implementation of the sustainable drainage system (SuDS) drainage design principles;
- Keep impact of decommissioning works to a minimum on the local environment, watercourses, and wildlife;
- Correct fuel storage and refuelling procedures to be followed;
- Good waste management and house-keeping to be implemented;
- Air and noise pollution prevention to be implemented;
- Monitoring of the works and any adverse effects that it may have on the environment. Decommissioning methods will be altered where it is found there is the potential to have an adverse effect on the environment;

2.4 Decommissioning Methodologies Overview

2.4.1 Introduction

An experienced main contractor will be appointed to undertake the of the decommissioning of the Proposed Development. The main contractors will comply with the Operation and Environmental Management Plan (OEMP) implemented during operation and any revisions made to those documents as they develop throughout the continued operation of the wind farm. An overview of the anticipated decommissioning methodologies is provided below.

2.4.2 Decommissioning Methodology

The proposed anticipated decommissioning methodology is summarised under the following main headings:

- Wind turbines
- Turbine Foundations;
- Crane Hardstanding & Access Tracks
- Transformers and Electrical Cabling;
- Electrical Control Building.

2.4.2.1 General Principles

Unlike most other forms of development, decommissioning of wind farms is typically a straightforward process. Infrastructure can readily be dismantled on site and removed. Following the restoration of the site, there would be no significant visible evidence of prior existence, and no legacy of pollution.

The decommissioning of the Dunneill Wind Farm is not expected to pose significant risks to the environment; nevertheless, effects need to be addressed in order to ensure that no, or minimal, impact on the environment occurs.

All measures described within the Environmental Impact Assessment Report (EIAR) with regards to mitigation and protection for ecological receptors, waste management, surface water management and prevention of pollution will apply to decommissioning works; subject to review of relevant regulations and best practice at that time.

In general, all structures above ground level shall be dismantled and removed from the site for reuse or recycling where possible; however, access tracks may be retained depending on the proposed future use of the site. It is likely that, in order to minimise environmental disturbance, the majority of sub-surface elements of the wind farm shall remain in situ. For example, electrical cabling shall be removed and recycled but the ducting within which it is located would remain to avoid unnecessary excavations and ground disturbance.

The overriding principle of the decommissioning process is to minimise the extent of any ground disturbance on site. While groundworks are an inevitable consequence of the decommissioning process, they shall only be undertaken where absolutely necessary.

The following sections detail the methodologies likely to be implemented during decommissioning; however, as described above, a site-specific approach will be agreed with the Planning Authority.

2.4.2.2 Wind Turbines

Prior to any decommissioning works being undertaken, a comprehensive health and safety assessment will be carried out. In advance of works to the turbines, they will be disconnected from the on-site electrical network by an appointed electrical contractor. Turbine dismantling will be undertaken in reverse order to the methodology employed during their construction. Cranes will be brought to site and will utilise the existing crane hardstandings.

Wind turbines are comprised of the tower, nacelle and blades which are modular items that can be disassembled. If the turbines are to be sold on or reused elsewhere they shall be removed from site by specialist vehicles similar to those used during their transportation to site.

If wind turbine components are not to be reused then they shall be recycled where possible.

The tower sections and nacelle are inert steel/ferrous metal structures which are readily recyclable. These will be sent to a licensed waste facility for recycling.

The turbine blades are constructed of fibreglass which is not readily re-used or recyclable. Due to the large number of turbine blades currently being decommissioned globally, extensive research is being undertaken to find an alternative use for the fibreglass. There are a number of emerging innovations for fibreglass recycling including the re-purposing of fibreglass for other civil engineering projects (e.g. as a component in concrete production, roofs for social housing and incorporation to the construction of electrical powerline masts/structures.) While extensive research is being undertaken to find a means of recycling decommissioned wind turbine blades , this EIAR assumes that, at the proposed date of decommissioning, all blades will be removed to an approved waste management facility.

Having been dismantled, the turbine blades will be processed on the crane hardstanding to accommodate their removal by standard HGVs. This process is likely to avoid the requirement for abnormal-sized loads, or oversized vehicles, to utilise the local road network.

2.4.2.3 Turbine and Meteorological Mast Foundations and Hardstands

On the dismantling of turbines and meteorological mast, it is not intended to remove the concrete foundation from the ground. It is considered that its removal will be the least preferred options in terms of having potential effects on the environment. Therefore, the turbine foundations will be backfilled and covered with soil material. If there is usable soil or overburden material on the site, this material will be used. Alternatively, where material is not readily available on site, soil will be sourced locally and imported to site on heavy good vehicles (HGVs). The imported soil will be spread and graded over the foundation using a tracked excavator and revegetation enhanced by spreading of an appropriate seed mix to assist in revegetation and accelerate the resumption of the natural drainage management that will have existed prior to any construction. Hardstands shall be covered with soil material and regraded to match existing ground contours and profile. The area shall then be seeded out or allowed to vegetate naturally.

2.4.2.4 Transformers & Electrical Cabling

The decommissioning of transformers will depend entirely on any future use of the wind turbine. If the turbine is to be used elsewhere, the transformer will be removed from site for refurbishment and future use. If the turbine is to be recycled or sent for disposal, the transformer will be removed to an approved waste handling/recycling facility and stripped of any useable parts with the remainder being recycled.

The cables at the Dunneill Wind Farm contain a core of copper which can be recycled. Cables shall be pulled from the existing ducting and removed to an approved waste handling facility where the cores shall be recycled and the remaining material shall be disposed of at an approved facility.

2.4.2.5 Electrical Control Building

In the first instance, it should be noted that the electrical control building is under the control of ESB Networks and may be retained following the decommissioning of the wind farm. However, for the purposes of this assessment, decommissioning is assumed. The on-site electrical control building will involve the strip-out and removal of steel, conductors, switches, and other materials and equipment that can be reconditioned and reused or recycled. A soft strip of the building shall ensure that all fixtures and fittings are removed prior demolition.

Demolition of the control building shall take place using conventional demolition methods. Foundations and building services shall be grubbed up to a depth of 1m below ground level. The demolition waste shall comprise mainly rubble (blocks, broken concrete, and plaster etc.) and timber. Rubble can be segregated to provide an aggregate material which may be used in the reinstatement of the site while un-suitable material will be removed and disposed of at an approved waste management facility.

Timber and other waste shall be segregated according to material type with a view to recycling where possible or disposal. All demolition materials which cannot be reused on site shall be removed off site to a licensed waste handling facility for recycling or disposal. Excavations shall be backfilled with suitable material, soiled over and seeded out or allowed to vegetate naturally.

3. ENVIRONMENTAL MANAGEMENT

The following sections give an overview of the drainage design, dust and noise control measures, a waste management plan for the site and the implementation of the environmental management procedures for the site.

3.1 Site Drainage

The site drainage features for this site during its continued operation are outlined in Section 4.5 of the and Section 9.3.3.2 the EIAR which accompany this application. As this Decommissioning Plan is a working document and is presented as an Appendix to the EIAR, the drainage measures are not included in this document. When the final plan is prepared prior to decommissioning and presented as a standalone document, all drainage measures will be included in that document as required. The drainage proposals will be developed further prior to the commencement of decommissioning if deemed necessary. However, it should be noted that by the time decommissioning is undertaken, in 2024 or after the planned 15-year extension of operation of the Dunneill Wind Farm, the areas within the site have already or will have revegetated resulting in a resumption of the natural drainage management that will have existed prior to any construction. It is not anticipated that the decommissioning phase will interrupt this restored drainage regime in any way with the works proposed.

3.2 Refuelling, Fuel and Hazardous Materials Storage and General Pollution Prevention Measures

Pollution prevention methods will be undertaken in accordance with those measures set out in the EIAR and prevailing best practice procedures. Any material or substance which could cause pollution, including fuels/oils or silty water will be prevented from entering groundwater, surface water drains or surface waters by the appropriate use of, and appropriate placement of, temporary cut-off drains and silt traps. Any sign of ineffective water treatment measures or evidence of silted or contaminated water entering surface water on-site, will be reported immediately to the contractor. The precise implementation of these measures will be detailed in a Surface Water Management Plan (SWMP) to be prepared prior to decommissioning.

The plant and equipment used during decommissioning works will require refuelling during the works. Appropriate management of fuels will be required to ensure that incidents relating to refuelling are avoided. The following mitigation measures are proposed to avoid release of hydrocarbons at the site:

- Road-going vehicles will be refuelled off site wherever possible;
- All refuelling will be carried out in a designated area over an impermeable surface (hardstanding / protective layer/trays) at least 50m from surface waters/surface water drains where possible. Machinery will be refuelled directly by a fuel truck that will come to site as required;
- Irrespective of the buffer distance and location of refuelling, interceptor drip trays will be available in accordance with standard good practice. Interceptor drip trays will be positioned under any stationary mobile plant to prevent oil contamination of the ground surface or water;
- Only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations;
- Fuel pipes on plant outlets at fuel tanks etc. will be regularly checked and maintained to ensure that no drips or leaks to ground occur;

- Fuel volumes stored on site should be minimised. Any areas of waste oil/fuel/chemical storage and refuelling will be located 50m away from surface waters or drainage paths. Such storage areas will be appropriately sited and bunded to prevent the downward percolation of contaminants to natural soils and groundwater. Fuel, oils and chemicals will be stored on an impervious base within a bund able to contain at least 110% of the volume stored. Rainwater will not be allowed to accumulate within the bund and in any way compromise the required 110% volume capacity. No tanks or containers may be perforated or dismantled on-site. A competent operator shall empty all contents and residues for safe disposal off-site in accordance with current waste regulations;
- No burning of any materials shall be permitted;
- The use of herbicides will also be prohibited;
- Plant and site vehicles are to be well maintained and any vehicles leaking fluids must be repaired or removed from site immediately. Any servicing operations shall take place over drip trays; and,
- An emergency plan for the decommissioning phase to deal with accidental spillages will be developed (refer to Section 4) Spill kits will be available to deal with and accidental spillage in and outside the refuelling area.
- A programme for the regular inspection of plant and equipment for leaks and fitness for purpose will be developed at the outset of the decommissioning phase.

3.3 Dust Control

Dust can be generated from on-site activities during decommissioning such as backfilling of foundations and travelling on site roads during prolonged periods of dry weather. The extent of dust generation will depend on the type of activity undertaken, the location, the nature of the dust, i.e. soil, and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather. Site traffic movements also have the potential to generate dust as they travel along the haul route.

Proposed measures to control dust include:

- Any site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions;
- The designated public roads outside the site and along the main transport routes to the site will be regularly inspected by the Site Manager for cleanliness, and cleaned as necessary;
- Material handling systems and material storage areas will be designed and laid out to minimise exposure to wind;
- Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods;
- The transport of soils or other material, which has significant potential to generate dust, will be undertaken in tarpaulin-covered vehicles where necessary;
- All site related traffic will have speed restrictions on un-surfaced roads to 15 kph;
- Daily inspection of the site to examine dust measures and their effectiveness.
- When necessary, sections of the haul route will be swept using a truck mounted vacuum sweeper; and,

3.4 Noise Control

The operation of plant and machinery, including site vehicles, is a source of potential impact that will require mitigation at all locations within the site. Proposed measures to control noise include:

- Limiting the hours during which site activities likely to create noticeable levels of noise or vibration are permitted;
- Establishing channels of communication between the Applicant or contractor, Local Authorities and residents;
- Selection of plant with low inherent potential for generation of noise and/or vibration;
- No plant or machinery will be permitted to cause a public nuisance due to noise;
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of works;
- Compressors models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers;
- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use; and
- The hours of decommissioning works (and associated traffic movements) will, insofar as possible, be limited to avoid unsociable hours. Activities shall generally be restricted to between 07:00hrs and 19:00hrs Monday to Friday and between 07:00hrs and 13:00hrs on Saturdays, with no activities on Sundays or public holidays unless in the event of an emergency.

3.5 Ground Disturbance, Material Excavation & Reinstatement

During decommissioning, all plant and machinery will keep to existing infrastructure (e.g. tracks and hardstanding) and will not encroach upon adjacent habitats unless this is essential in order to progress the decommissioning works. In the event of any necessary encroachment into adjoining habitats; given the presence of wet heath at the proposed development site; appropriate trackway or matting shall be placed to avoid any loss of the adjoining habitat. However, no encroachment into areas of blanket bog will be permitted.

The reinstatement of any areas disturbed during the decommissioning works will be undertaken. The contractor will record excavated volumes and storage areas, and volumes and type of material utilised for reinstatement of relevant areas. This information will be updated for the duration of the decommissioning works.

Reinstatement will be completed using site-won materials wherever possible without compromising or damaging established/existing habitats. Natural vegetation will be preferred; however, native seed mixes may also be selected to complement surrounding species. The seed mix and method of application will be agreed with a suitably qualified ecologist to ensure that the reinstated habitats are compatible with those existing and surrounding the reinstated areas at the time of decommissioning.

All temporarily stockpiled materials will be stored in designated areas and isolated from any surface drains and a minimum of 50m away from surface water where possible. Aggregate or fine materials storage will be enclosed and screened/sheeted. No storage of materials within areas of blanket bog or wet heath shall be permitted.

Soil and vegetation must be stored separately from subsoil and shall be retained and reinstated on all areas of stripped ground as soon as possible to prevent erosion and leaching/loss of nutrients. Excavated turves; particularly in the case of wet heath, shall be appropriately stored to protect the plant species; shall be reinstated with the vegetated side facing upwards, in order to speed up the re-generation process, minimise the need for re-seeding, and help maintain the original species mix.

3.6 Invasive Species Management

Any soil material that will be imported to site as part of the foundation backfilling will be free of any invasive species (listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011). The site manager will take steps to ensure this sourcing suitably clean material and verify the quality of the material by having it inspected prior to bringing it to site by a suitably qualified ecologist. Prior to decommissioning, a suitably qualified ecologist will complete an invasive species survey.

3.7 Traffic Management

The Traffic Management Plan has been prepared to consider the decommissioning as a standalone project. The removal of turbines from site will be undertaken for a specialist haulier. The traffic management arrangements although similar to that implement for turbine delivery as outlined in the EIAR will be agreed in advance of decommission with the competent authority.

3.8 Waste Management

This section of the Decommissioning Plan provides a waste management plan (WMP) which outlines the best practice procedures during the decommissioning of the Proposed Development. The WMP will outline the methods of waste prevention and minimisation by recycling, recovery and reuse at each stage of decommissioning. Disposal of waste will be seen as a last resort.

3.8.1 Legislation

The Waste Management Act 1996 and its subsequent amendments provide for measures to improve performance in relation to waste management, recycling and recovery. The Act also provides a regulatory framework for meeting higher environmental standards set out by other national and EU legislation.

The Act requires that any waste related activity has to have all necessary licenses and authorisations. It will be the duty of the Waste Manager on the site of the Cleanrath wind farm development to ensure that all contractors hired to remove waste from the site have valid Waste Collection Permits. It will then be necessary to ensure that the waste is delivered to a licensed or permitted waste facility. The hired waste contractors and subsequent receiving facilities must adhere to the conditions set out in their respective permits and authorisations.

The Department of the Environment provides a document entitled, '*Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects' (2006).* It is important to emphasise that no demolition will take place at this site, however, this document was referred to throughout the process of completing this WMP.

3.8.2 Waste Management Hierarchy

The waste management hierarchy sets out the most efficient way of managing in the following order:

Prevention and Minimisation:

The primary aim of the WMP will be to prevent and thereby reduce the amount of waste generated at each stage of the project.

Reuse of Waste:

Reusing as much of the waste generated on site as possible will reduce the quantities of waste that will have to be transported off site to recovery facilities or landfill.

Recycling of Waste:

There are a number of established markets available for the beneficial use of Construction and Demolition waste such as using waste concrete as fill for new roads.

At all times during the implementation of the WMP, disposal of waste to landfill will be considered only as a last resort.

3.8.3 Waste Arising from Decommissioning

The relevant components will be removed from site for re-use, recycling or waste disposal. Any structural elements that are not suitable for recycling will be disposed of in an appropriate manner. All lubrication fluids will be drained down and put aside for appropriate collection, storage, transport and disposal. Any materials which cannot be re-used or recycled will be disposed of by an appropriately licenced contractor.

The waste types arising from the decommissioning of the Dunneill Wind Farm are outlined in Table 3-1 below.

Table 3-1 Expected waste types arising during the Decommissioning Phase

Material Type	Example	EWC Code
Cables	Electrical wiring	17 04 11
Metals	Copper, aluminium, lead and iron	17 04 07
Fibreglass	Turbine blade component	10 11 03
Hydrocarbons	Oils and lubricants drained from the turbines	13 01 01,13 02 04

3.8.3.1 Reuse

Many construction materials can be reused a number of times before they have to be disposed of:

- Electrical wiring can be reused on similar wind energy projects
- Elements of the turbine components can be reused but this will be determined by the condition that they are as well as when decommissioning actually takes place.

3.8.3.2 Recycling

If a certain type of construction material cannot be reused onsite, then recycling is the most suitable option. The opportunity for recycling during decommissioning will be limited and restricted to components of the wind turbines.

All waste that is produced during the decommissioning phase including dry recyclables will be deposited in the on-site skip initially and sent for subsequent segregation at a remote facility. The anticipated volume of all waste material to be generated at the Proposed Development is low, which provides the justification for adopting this method of waste management.

3.8.3.3 Implementation

3.8.3.3.1 *Roles and Responsibilities*

Prior to the commencement of the decommissioning, a Construction Waste Manager will be appointed by the Contractor. The Construction Waste Manager will be in charge of the implementation of the objectives of the plan, ensuring that all hired waste contractors have the necessary authorisations and that the waste management hierarchy is adhered to. The person nominated must have sufficient authority so that they can ensure everyone working on the decommissioning adheres to the management plan.

3.8.3.3.2 *Training*

It is important for the Construction Waste Manager to communicate effectively with colleagues in relation to the aims and objectives of the waste management plan. All employees working on site during the decommissioning phase of the project will be trained in materials management and thereby, should be able to:

- Distinguish reusable materials from those suitable for recycling;
- Ensure maximum segregation at source;
- Co-operate with site manager on the best locations for stockpiling reusable materials;
- Separate materials for recovery; and
- Identify and liaise with waste contractors and waste facility operators.

3.8.3.3.3 *Record Keeping*

The WMP will provide systems that will enable all arisings, movements and treatments of construction waste to be recorded. This system will enable the contractor to measure and record the quantity of waste being generated. It will highlight the areas from which most waste occurs and allows the measurement of arisings against performance targets. The WMP can then be adapted with changes that are seen through record keeping.

The fully licensed waste contractors employed to remove waste from the site will be required to provide documented records for all waste dispatches leaving the site. Each record will contain the following:

- Consignment Reference Number
- Material Type(s) and EWC Code(s)
- Company Name and Address of Site of Origin
- Trade Name and Collection Permit Ref. of Waste Carrier
- Trade Name and Licence Ref. of Destination Facility
- Date and Time of Waste Dispatch
- Registration no. of Waste Carrier vehicle
- Weight of Material
- Signature of Confirmation of Dispatch detail
- Date and Time of Waste Arrival at Destination
- Site Address of Destination Facility

3.8.3.4 Waste Management Plan Conclusion

The WMP will be properly adhered to by all staff involved in the project which will be outlined within the induction process for all site personnel. The waste hierarchy should always be employed when designing the plan to ensure that the least possible amount of waste is produced during decommissioning. Reuse of certain types of construction wastes will cut down on the cost and requirement of raw materials therefore further minimising waste levels.

This WMP has been prepared to outline the main objectives that are to be adhered to and it will be updated as required prior to decommissioning.

3.9 Environmental Management Implementation

3.9.1 Roles and Responsibilities

The Site Supervisor and/or Environmental Clerk of Works (ECoW) are the project focal point relating to decommissioning-related environmental aspects.

In general, the ECoW will maintain responsibility for monitoring the decommissioning works and Contractors/Sub-contractors from an environmental perspective. The ECoW will act as the regulatory interface on environmental matters. The Site Manager will be responsible for reporting to and liaising with Sligo County Council and other statutory bodies as required.

The Site Manager in consultation with the ECoW will be responsible for employing the services of a suitably qualified ecologist and any other suitably qualified professionals as required throughout the decommissioning works.

3.9.2 Timing of Works

The most intrusive decommissioning works (e.g., excavations and ground profiling) will be carefully scheduled to avoid the coldest winter months and the main bird breeding season (the main breeding season being April to August inclusive). The precise scheduling of works will be reviewed by an ecological/ornithological consultant prior to commencement.

4. EMERGENCY RESPONSE PLAN

An Emergency Response Plan (ERP) is presented in this section of the Decommissioning Plan. It provides details of procedures to be adopted in the event of an emergency in terms of site health and safety and environmental protection.

4.1 Emergency Response Procedure

The site ERP includes details on the response required and the responsibilities of all personnel in the event of an emergency. The ERP will require updating and submissions from the contractor/PSCS and sub-contractors as decommissioning progresses. Where sub-contractors that are contracted on site are governed by their own emergency response procedure a bridging arrangement will be adopted to allow for inclusion of the sub-contractor's ERP within this within this document.

This is a working document that requires updating throughout the various stages of the project.

4.1.1 Roles and Responsibilities

The chain of command during an emergency response sets out who is responsible for coordinating the response. The Site Supervisor/Construction Manager will lead the emergency response which makes him responsible for activating and coordinating the emergency response procedure. The other site personnel who can be identified at this time who will be delegated responsibilities during the emergency response are presented in Figure 4-1. In a situation where the Site Supervisor/ Construction Manager is unavailable or incapable of coordinating the emergency response, the responsibility will be transferred to the next person in the chain of command outlined in Figure 4-1. This will be updated throughout the various stages of the project.

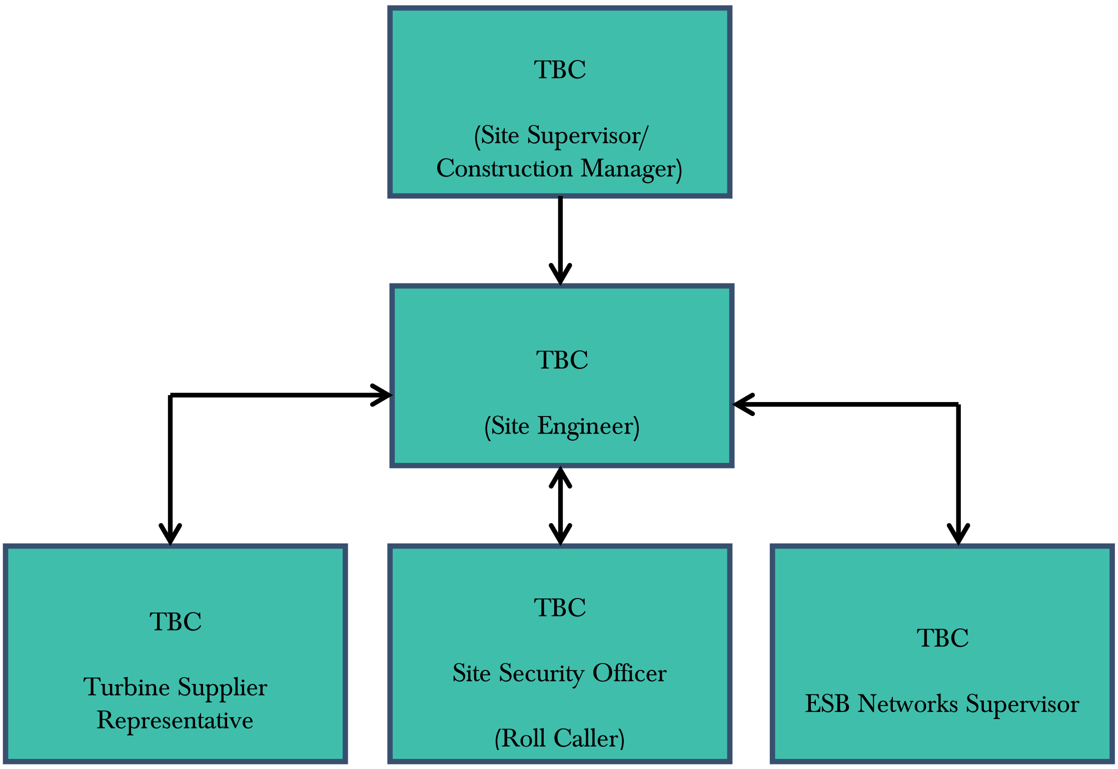

Figure 4-1 Emergency Response Procedure Chain of Command

4.1.2 Initial Steps

In order to establish the type and scale of potential emergencies that may occur, the following hazards have been identified as being potential situations that may require an emergency response in the event of an occurrence.

Table 4-1 Hazards associated with potential emergency situations

Hazard	Emergency Situation
Construction Vehicles: Dump trucks, tractors, excavators, cranes etc.	Collision or overturn which has resulted in operator or third-party injury.
Abrasive wheels/Portable Tools	Entanglement, amputation or electrical shock associated with portable tools
Contact with services	Electrical shock or gas leak associated with an accidental breach of underground services
Fire	Injury to operative through exposure to fire
Falls from heights including falls from scaffold towers, scissor lifts, ladders, roofs and turbines	Injury to operative after a fall from a height
Sickness	Illness unrelated to site activities of an operative e.g. heart attack, loss of consciousness, seizure
Turbine Specific Incident	This will be included the turbine manufacturers' emergency response plan.

In the event of an emergency situation associated with, but not restricted to, the hazards outlined in Table 4-1 the Site Supervisor/Construction Manager will carry out the following:

- Establish the scale of the emergency situation and identify the number of personnel, if any, have been injured or are at risk of injury.
- Where necessary, sound the emergency siren/fog-horn that activates an emergency evacuation on the site. The Site Supervisor/Construction Manager must proceed to the assembly point if the emergency poses any significant threat to their welfare **and if there are no injured personnel at the scene that require assistance**. The Site Supervisor/Construction Manager will be required to use their own discretion at that point. In the case of fire, the emergency evacuation of the site should proceed, without exception. The site evacuation procedure is outlined in Section 4.1.3.
- Make safe the area if possible and ensure that there is no identifiable risk exists with regard to dealing with the situation e.g. if a machine has turned over, ensure that it is in a safe position so as not to endanger others before assisting the injured.
- Contact the required emergency services or delegate the task to someone. If delegating the task, ensure that the procedures for contacting the emergency services as set out in Section 4.2 is followed.
- Take any further steps that are deemed necessary to make safe or contain the emergency incident e.g. cordon off an area where an incident associated with electrical issues has occurred.
- Contact any regulatory body or service provider as required e.g. ESB Networks the numbers for which as provided in Section 4.3.
- Contact the next of kin of any injured personnel where appropriate.

4.1.3 Site Evacuation/Fire Drill

A site evacuation/fire drill procedure will provide basis for carrying out the immediate evacuation of all site personnel in the event of an emergency. The following steps will be taken:

- Notification of the emergency situation. Provision of a siren or fog-horn to notify all personnel of an emergency situation.
- An assembly point will be designated in the construction compound area and will be marked with a sign. All site personnel will assemble at this point.
- A roll call will be carried out by the Site Security Officer to account for all personnel on site.
- The Site Security Officer will inform the Site Supervisor/Construction Manager when all personnel have been accounted for. The Site Supervisor/Construction Manager will decide the next course of action, which be determined by the situation that exists at that time and will advise all personnel accordingly.

All personnel will be made aware of the evacuation procedure during site induction. The Fire Services Acts of 1981 and 2003 require the holding of fire safety evacuation drills at specified intervals and the keeping of records of such drills.

4.1.4 Spill Control Measures

Every effort will be made to prevent an environmental incident during the decommissioning phase of the project. Oil/fuel spillages are one of the main environmental risks that will exist on the site which will require an emergency response procedure. The importance of a swift and effective response in the event of such an incident occurring cannot be over emphasised. The following steps provide the procedure to be followed in the event of such an incident:

- Stop the source of the spill and raise the alarm to alert people working in the vicinity of any potential dangers.
- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident.
- Contain the spill using the spill control materials, track mats or other material as required. Do not spread or flush away the spill.
- If possible, cover or bund off any vulnerable areas where appropriate such as drains, watercourses or sensitive habitats.
- If possible, clean up as much as possible using the spill control materials.
- Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited.
- Notify the ECoW immediately giving information on the location, type and extent of the spill so that they can take appropriate action.
- The ECoW will inspect the site and ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring.
- The ECoW will notify the appropriate regulatory body such as Sligo County Council, and the Environmental Protection Agency (EPA), if deemed necessary.

The importance of a swift and effective response in the event of such an incident occurring cannot be over emphasised. Environmental incidents are not limited to just fuel spillages. Therefore, any environmental incident must be investigated in accordance with the following steps.

- The ECoW must be immediately notified.
- If necessary, the ECoW will inform the appropriate regulatory authority. The appropriate regulatory authority will depend on the nature of the incident.
- The details of the incident will be recorded on an Environmental Incident Form which will provide information such as the cause, extent, actions and remedial measures used following the incident. The form will also include any recommendations made to avoid reoccurrence of the incident.
- If the incident has impacted on a sensitive receptor such as an archaeological feature the ECoW will liaise with the Project Archaeologist.

- A record of all environmental incidents will be kept on file by the ECoW and the Main Contractor. These records will be made available to the relevant authorities such as Sligo County Council, EPA if required.

The ECoW will be responsible for any corrective actions required as a result of the incident e.g. an investigative report, formulation of alternative works methodologies or environmental sampling, and will advise the Main Contractor as appropriate.

4.2 Contact the Emergency services

In the event of requiring the assistance of the emergency services the following steps should be taken:

Stay calm. It is important to take a deep breath and not get excited. Any situation that requires 999/112 is, by definition, an emergency. The dispatcher or call-taker knows that and will try to move things along quickly, but under control.

Know the location of the emergency and the number you are calling from. This may be asked and answered a couple of times but do not get frustrated. Even though many emergency call centres have enhanced capabilities meaning they are able to see your location on the computer screen they are still required to confirm the information. If for some reason you are disconnected, at least emergency crews will know where to go and how to call you back.

Wait for the call-taker to ask questions, then answer clearly and calmly. If you are in danger of assault, the dispatcher or call-taker will still need you to answer quietly, mostly "yes" and "no" questions.

If you reach a recording, listen to what it says. If the recording says your call cannot be completed, hang up and try again. If the recording says all call takers are busy, WAIT. When the next call-taker or dispatcher is available to take the call, it will transfer you.

Let the call-taker guide the conversation. He or she is typing the information into a computer and may seem to be taking forever. There is a good chance, however, that emergency services are already being sent while you are still on the line.

Follow all directions. In some cases, the call-taker will give you directions. Listen carefully, follow each step exactly, and ask for clarification if you do not understand.

Keep your eyes open. You may be asked to describe victims, suspects, vehicles, or other parts of the scene.

Do not hang up the call until directed to do so by the call taker.

Due to the remoteness of the site it may be necessary to liaise with the emergency services on the ground in terms of locating the site. This may involve providing an escort from a designated meeting point that may be located more easily by the emergency services. This should form part of the site induction to make new personnel and sub-contractors aware of any such arrangement or requirement if applicable.

4.3 Contact Details

A list of emergency contacts is presented in Table 4-2. A copy of these contacts will be included in the Site Safety Manual and in the site offices and the various site welfare facilities.

Table 4-2 Emergency Contacts

Contact	Telephone no.
Emergency Services – Ambulance, Fire, Gardaí	999/112
Doctor – Easkey Health Centre	096 49009
Hospital – Sligo University Hospital	071 917 1111
ESB Emergency Services	1850 372 999
Gas Networks Ireland Emergency	1850 20 50 50
Gardaí – Local Garda Station. Ballymote	071 918 9500
Health and Safety Co-ordinator - Health & Safety Services	TBC
Health and Safety Authority	1890 289 389
Inland Fisheries Ireland (IFI)	1890 347 424
Project Supervisor Construction Stage (PSCS): TBC	TBC
Project Supervisor Design Stage (PSDS): TBC	TBC
Client: Brickmount Ltd.	087 687 1869

4.3.1 Procedure for Personnel Tracking

All operatives on site without any exception will have to undergo a site induction where they will be required to provide personal contact details which will include contact information for the next of kin.

In the event of a site operative becoming in an emergency situation where serious injury has occurred and hospitalisation has taken place, it will be the responsibility of the Site Manager or next in command if unavailable to contact the next of kin to inform them of the situation that exists.

4.4 Induction Checklist

Table 4-3 provides a list of items highlighted in this ERP which must be included or obtained during the mandatory site induction of all personnel that will work on the site. This will be updated throughout the various stages of the project.

Table 4-3 Emergency Response Plan Items Applicable to the Site Induction Process

ERP Items to be included in Site Induction	Status
All personnel will be made aware of the evacuation procedure during site induction	
Due to the remoteness of the site it may be necessary to liaise with and assist the emergency services on the ground in terms of locating the site. This may involve providing an escort from a designated meeting point that may be located more easily by the emergency services. This should form part of the site induction to make new personnel and sub-contractors aware of any such arrangement or requirement if applicable.	
All operatives on site without any exception will have undergo a site induction where they will be required to provide personal contact details which will include contact information for the next of kin.	

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INCIDENTS THAT SHALL BE REPORTED WITHIN 30 MINUTES; -

- Potential lost time injuries;
- Anyone leaving site for medical treatment i.e. hospital, local doctors etc
- Injuries requiring first aid treatment with potential for MTIs
- Incidents requiring the call out of the emergency services;
- HSE (Health & Safety Executive) Reportable Injuries or Dangerous Occurrences as defined within RIDDOR;
- Road Traffic Collisions;
- All incidents involving plant and machinery
- Any incident involving electricity;
- Environmental Incidents involving a) watercourse contamination - fuels, chemicals or silt pollution; b) soil contamination – spillage of fuels or chemicals to ground requiring subsequent excavation or ground remediation; or c) damage or disturbance to protected species or habitats.
- Incidents involving the carriage of dangerous goods;
- Significant Security incidents.

Reporting First Aid and Minor Injuries

- Ensure an accident log/ book exists for your project;
- Ensure any accident is correspondingly reported in SEARs.

24 HOUR Number

30
30 Min Reporting

UK
0800 107 3207 (option 2)
ROI
1800 927 219 (option 2)

Please enter the relevant number into your phone for easy access!!!

5. PROGRAMME OF WORKS

5.1 Decommissioning Schedule

The decommissioning phase will take approximately 3 – 6 months to complete from commencing the removal of turbines to the final reinstatement of the site.

At this time, it is not possible to determine when decommissioning will take place.

The phasing and scheduling of the main decommissioning task items are outlined in Figure 5-1 below, where the 1st January has been shown as an indicative start date for decommissioning to commence.

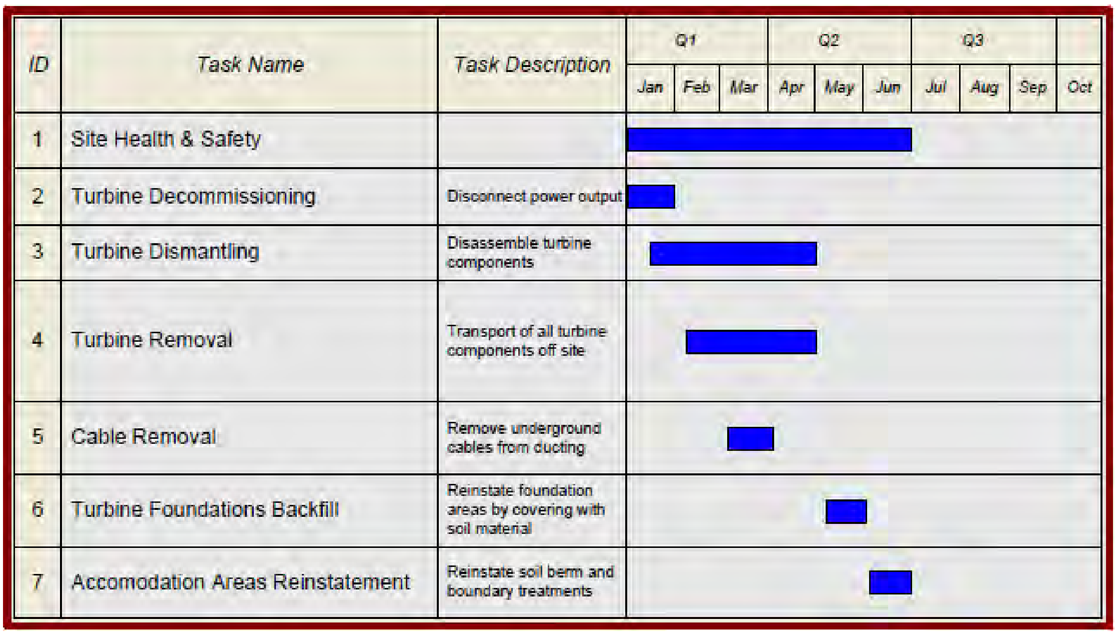

Figure 5-1 Indicative Decommissioning Schedule

6. MITIGATION PROPOSALS

All mitigation measures relating to the decommissioning phase of the Proposed Development were set out in the various sections of the Environmental Impact Assessment Report (EIAR) which accompanies this substitute consent application.

This section of the Decommissioning Plan groups together all of the mitigation measures presented in the planning documentation. The mitigation measures are presented in the following pages.

By presenting the mitigation proposals in the below format, it is intended to provide an easy to audit list that can be reviewed and reported on during the operational phase of the project. The tabular format in which the below information is presented, can be further expanded upon during the course of operation and provides a reporting template for site compliance audits.

Table 6-1 Decommissioning Phase Mitigation Measures

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
Decommissioning Phase				
MX1	EIAR Chapter 4	In the event that the Proposed Development is decommissioned after the 15 years extension of life, a Decommissioning Plan will be prepared for agreement with the local authority. This will be a comprehensive plan updated in line with decommissioning methodologies that may exist at the time.		
MX2	EIAR Chapter 4, 6, 7	During decommissioning, it may be possible to reverse or at least reduce some of the potential impacts caused during the initial construction of the wind farm by rehabilitating construction areas such as turbine bases and hard standing areas. This will be done by covering with local topsoil and reseeding with a local native mix to encourage vegetation growth and reduce run-off and sedimentation.		
MX3	EIAR Chapter 7	Regarding Ornithology and Avian Populations – This decommissioning plan will include industry best practise measures to mitigate the impact of works on birds, which may include the following: o All machinery will work from the existing access road corridor. o Any required vegetation removal will be conducted in line with the provisions of the Wildlife Acts 1976-2021. o Construction works will begin outside the bird nesting season as defined by the Wildlife Act 1976 as amended (1st of March to the 31st of August). Any requirement for works to run into the subsequent breeding season will be subject to pre-works bird surveys to confirm the absence of breeding birds of conservation concern. If such breeding activity is identified during the works, the nest sites will be located, and no works		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		shall be undertaken within an agreed buffer in line with industry best practise. o Noise limits, noise control measures, hours of operation (i.e. dusk and dawn is high faunal activity time) and selection of plant items will be considered in relation to disturbance of birds. All plant and equipment for use will comply with the European Communities (Noise Emission By Equipment For Use Outdoors) Regulations, 2001, as amended (SI 632/2001). Plant machinery will also be turned off when not in use. o Silt fences will be installed as an additional water protection measure around existing watercourses. o An Environmental Clerk of Works and Project Ecologist will be appointed. Duties will include: • Organise the undertaking of a pre-works walkover bird survey to ensure that significant effects on birds will be avoided. • Inform and educate on-site personnel of the ornithological and ecological sensitivities within the wind farm study area. • Oversee management of ornithological issues during the works period and advise on ornithological issues as they arise. • Provide guidance to contractors to ensure legal compliance with respect to protected species onsite. • Liaise with officers of consenting authorities and other relevant bodies with regular updates in relation to decommissioning progress.		
MX4	EIAR Chapter 9	Regarding the Water Environment: o The key mitigation measure during the decommissioning phase is the avoidance of sensitive aquatic areas. The Dunneill River runs within close proximity of the western border of the site of the Proposed Development.		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		A tributary of the Dunneill River, the Finandoo, bisects the development in an east-west direction. Because of this proximity to surface waters, mitigation measures were put in place in the original construction phase. No in-stream works will be required during the decommissioning phase of the existing wind farm. Best construction practices will be adhered to throughout the decommissioning phase of the development.		
MX5	EIAR Chapter 4, 8, 9, 10, 11	Regarding dust, noise and vibration during decommissioning of subsurface infrastructure: o It is proposed to leave turbine foundations in place underground and to cover them with earth and reseed as appropriate. On removal of turbines, the covering of the foundation will be completed using locally sourced material (e.g. topsoil) where possible. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove large volumes of reinforced concrete from the ground could result in significant environment nuisances such as noise, dust and/or vibration. o Use of an appropriate native seed mix to assist in revegetation and accelerate the resumption of the natural drainage management that will have existed prior to any construction is recommended.		
MX6	EIAR Chapter 8, 9	In order to limit impacts upon Soils and the Water Environment from potential leaks and spillages of hydrocarbons during decommissioning works the following measures are proposed: o All plant and machinery to be serviced before being mobilised to site and regularly inspected for leaks and fitness of purpose during use.		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		o No plant maintenance completed on-site, any broken-down plant removed from site to be fixed. o Fuel volumes stored on site should be minimised. Any fuel storage areas will be bunded appropriately. o Refuelling completed in a controlled manner using drip trays at all times. o Mobile bowsers, tanks and drums stored in secure, impermeable bunded storage areas away from open water. o Only designated trained operators authorised to refuel plant on-site. o Procedures and contingency plans set up to deal with emergency accidents or spills. o Highest standards of site management maintained, and utmost care and vigilance followed to prevent accidental contamination or unnecessary disturbance to the site and surrounding environment during works. o An emergency plan for the decommissioning phase to deal with accidental spillages will be developed. Spill kits will be available to deal with and accidental spillage within and outside the refuelling area. o A programme for the regular inspection of plant and equipment for leaks and fitness for purpose will be developed at the outset of the decommissioning phase.		
MX7	EIAR Section 10	Regarding Air Quality during the decommissioning phase: o Any vehicles or plant brought onsite during the operational phase will be maintained in good operational order, thereby minimising any emissions that arise.		
MX8	EIAR Chapter 11	Regarding Noise and Vibration control during the decommissioning phase:		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Various mitigation strategies may be employed to reduce construction noise and vibration impacts, including the following: o Limiting the hours during which site activities likely to create noticeable levels of noise or vibration are permitted; o Establishing channels of communication between the Applicant or contractor, Local Authorities and residents; o Selection of plant with low inherent potential for generation of noise and/or vibration; o No plant or machinery will be permitted to cause a public nuisance due to noise; o The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations. o All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of works; o Compressors models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers; o Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use; and o The hours of maintenance works (and associated traffic movements) will, insofar as possible, be limited to avoid unsociable hours. Activities shall generally be restricted to between 07:00hrs and 19:00hrs Monday to Friday and between 07:00hrs and 13:00hrs on Saturdays, with no activities on Sundays or public holidays unless in the event of an emergency.		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
MX9	EIAR Chapter 11	Regarding Site Traffic related impacts during the decommissioning phase: o A Traffic Management Plan will be developed to minimise impacts to the local road network and submitted as part of the Decommissioning Plan, for agreement with the local authority.		
MX10	EIAR Chapter 12	Regarding Cultural Heritage during the decommissioning phase: o Given the presence of one archaeological monument within the EIAR site boundary as well as a number of cultural heritage (non-statutory) features, the decommissioning phase could potentially have a number of direct negative impacts on the known cultural heritage. The presence of an archaeologist during specific phases of the decommissioning works will be required to ensure that no significant or adverse impacts take place to the monuments and cultural heritage features located therein. o Furthermore, buffer / exclusion zones and fencing may be required to ensure that large turbine / crane components do not encroach on the monuments' extent.		

7. MONITORING PROPOSALS

All monitoring proposals relating to the decommissioning phase of the Proposed Development were set out in the various sections of the Environmental Impact Assessment Report (EIAR) which accompanies this substitute consent application.

This section of the Decommissioning Plan groups together all of the monitoring proposals presented in the planning documentation. The monitoring proposals are presented in the following pages.

By presenting the monitoring proposals in the below format, it is intended to provide an easy to audit list that can be reviewed and reported on during the operational phase of the project. The tabular format in which the below information is presented, can be further expanded upon during the course of operation to provide a reporting template for site compliance audits.

Table 7-1 Schedule of Decommissioning Phase Monitoring Proposals

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
Decommissioning Phase				
MD1	EIAR Chapter 7	Regarding Ornithology and Avian Populations – Decommissioning phase monitoring surveys will be undertaken prior to works associated with decommissioning at the wind farm. The survey will include a thorough walkover survey to a 500m radius of the development footprint and all works areas, where access allows. If winter roosting or breeding activity of birds of high conservation concern is identified, the roost or nest site will be located and earmarked for monitoring at the beginning of the first winter or breeding season of the decommissioning phase. If it is found to be active during the decommissioning phase, no works shall be undertaken within a disturbance buffer (Forestry Commission Scotland, 2006; Ruddock and Whitfield, 2007) in line with industry best practice. No works shall be permitted within the buffer until it can be demonstrated that the roost/nest is no longer occupied.		

8. COMPLIANCE AND REVIEW

8.1 Site inspections and Environmental Audits

Routine inspections of decommissioning activities will be carried out on a daily and weekly basis by the ECoW and the Site Supervisor/Construction Manager to ensure all controls to prevent environmental impacts, relevant to the decommissioning activities taking place at the time, are in place.

Environmental inspections will ensure that the works are undertaken in compliance with this Decommissioning Plan and all other planning application documents. Only suitably trained staff will undertake environmental site inspections.

8.2 Auditing

An Environmental audit will first be carried out prior to the decommissioning phase of the Proposed Development to ensure the operational phase mitigation measures that are still in place as required are adequate. Further environmental audits will be carried out on a monthly basis during the decommissioning phase of the project and on completion of the decommissioning works.

In contrast to monitoring and inspection activities, audits are designed to shed light on the underlying causes of non-compliance, and not merely detect the non-compliance itself. In addition, audits are the main means by which system and performance improvement opportunities may be identified. Environmental audits will be carried out by the ECoW on behalf of the appointed contractor. It is important that an impartial and objective approach is adopted. Environmental audits will be conducted at planned intervals to determine whether the Decommissioning Plan is being properly implemented and maintained. The results of environmental audits will be provided to project management personnel.

8.3 Environmental Compliance

The following definitions shall apply in relation to the classification of Environmental Occurrences during the decommissioning of the wind farm:

Environmental Near Miss: An occurrence which if not controlled or due to its nature could lead to an Environmental Incident.

Environmental Incident: Any occurrence which has potential, due to its scale and nature, to migrate from source and have an environmental impact beyond the site boundary.

Environmental Exceedance Event: An environmental exceedance event occurs when monitoring results indicate that limits for a particular environmental parameter (as indicated in the Environmental Monitoring Programme) has been exceeded.

An exceedance will immediately trigger an investigation into the reason for the exceedance occurring and the application of suitable mitigation where necessary.

Exceedance events can be closed out on achieving a monitoring result below the assigned limit for a particular environmental parameter.

Environmental Non-Compliance: Non-fulfilment of a requirement and includes any deviations from established procedures, programs and other arrangements related to the Decommissioning Plan.

8.4 Corrective Action Procedure

A corrective action is implemented to rectify an environmental problem on-site. Corrective actions will be implemented by the Site Supervisor/Construction Manager, as advised by the Site Environmental Clerk of Works. Corrective actions may be required as a result of the following;

- Environmental Audits;
- Environmental Inspections and Reviews;
- Environmental Monitoring;
- Environmental Incidents; and,
- Environmental Complaints.

A Corrective Action Notice will be used to communicate the details of the action required to the main contractor. A Corrective Action Notice is a form that describes the cause and effect of an environmental problem on site and the recommended corrective action that is required. The Corrective Action Notice, when completed, will include details of close out and follow up actions.

If an environmental problem occurs on site that requires immediate attention direct communications between the Site supervisor/Construction Manager and the ECoW will be conducted. This in turn will be passed down to the site staff involved. A Corrective Action Notice will be completed at a later date.

8.5 Decommissioning Phase Plan Review

This Decommissioning Plan will be updated and reviewed prior to commencement of decommissioning.

APPENDIX 5.1

WIND FARMS & HEALTH LITERATURE REVIEW - CHAPMAN 2015

Summary of main conclusions reached in 25 reviews of the research literature on wind farms and health.

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Updated 10 April 2015.

1. Council of Canadian Academies (2015). Understanding the evidence. Wind Turbine Noise.
2. Schmidt JH, Klokker M (2014) Health effects related to wind turbine noise exposure: a systematic review. PLoS ONE 9(12): e114183. doi:10.1371/journal.pone.0114183
3. 2014: McCunney RJ, Mundt KA, Colby WD, Dobie R, Kaliski K, Blais M. Wind turbines and health: a critical review of the scientific literature. Journal of Occupational & Environmental Medicine 2014; 56(11):pe108-130.
4. 2014: Knopper LD, Olson CA, McCallum LC, Whitfield Aslund ML, Berger RG, Souweine K, McDaniel M. Wind turbines and human health. Frontiers in Public Health 2014; 19 June
5. 2014: Arra I, Lynn H, Barker K, Ogbuneke C, Regalado S. Systematic review 2013: association between wind turbines and human distress. Cureus 6(5): e183. doi:10.7759/cureus.183 [Note: this review is a very poor quality paper published in a non-indexed, pay-to-publish journal. A detailed critique of it can be found at the end of this file.]
6. 2014: National Health and Medical Research Council (Australia). University of Adelaide full report (296pp) and draft consultation report (26pp). Final Report (Feb 15 2015)
7. 2013: VTT Technical Research Centre of Finland. (in Finnish) – summary at end of document
8. 2013: Department of Health, Victoria (Australia) Wind farms, sound and health.
9. 2012: Massachusetts Department of Environmental Protection. Independent Expert Science Panel Releases Report on Potential Health Effects of Wind Turbines
10. 2012: Oregon Wind Energy Health Impact Assessment.
11. 2011: Fiumicelli D. Windfarm noise dose-response: a literature review. Acoustics Bulletin 2011; Nov/Dec:26-34 [copies available from simon.chapman@sydney.edu.au]
12. 2011: Bolin K et al. Infrasound and low frequency noise from wind turbines: exposure and health effects. Environmental Res Let 2011;
13. 2010: Knopper LD, Ollsen CA. Health effects and wind turbines: a review of the literature. Environmental Health 2010; 10:78
14. 2010: UK Health Protection Agency Report on the health effects of infrasound
15. 2010: NHMRC (Australia) Rapid Review of the evidence
16. 2010: Chief Medical Officer of Health in Ontario
17. 2010: UK Health Protection Agency. Environmental noise and health in the UK. A report by the Ad Hoc Expert Group on Noise and Health. (this report is about all environmental noise)

18. 2009: Minnesota Department of Health. Environmental Health Division. Public Health Impacts of Wind Turbines.
19. 2009: Colby et al. Wind Turbine Sound and Health Effects: An Expert Panel Review.
20. 2008: Chatham-Kent Public Health Unit.
21. 2007: National Research Council (USA): Impact of wind energy development on humans (Chapter 4: pp97-120) of: Environmental Impacts of Wind-Energy Projects.
22. 2006: Context and Opinion Related to the Health Effects of Noise Generated by Wind Turbines, Agence Française de Sécurité Sanitaire de l'Environnement et du Travail(Affset), 2006. (in French only)
23. 2005: Jakobsen J. Infrasound emission from wind turbines. *J Low Frequency Noise, Vibration and Active Control* 2005; 24(3):145-155
24. 2004: Leventhall G. Low frequency noise and annoyance. *Noise & Health 2004;*.6(23):59-72
25. 2003: Eja Pedersen's Review for the Swedish EPA

Reviews of the evidence - extracted highlights

Direct health effects from noise and WTS

- "There is no consistent evidence that noise from wind turbines—whether estimated in models or using distance as a proxy—is associated with self-reported human health effects. Isolated associations may be due to confounding, bias or chance." NHMRC (2014) full report

- "There are no direct pathological effects from wind farms and that any potential impact on humans can be minimised by following existing planning guidelines." *Source: NHMRC 2010*
  http://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/new0048_evidence_review_wind_turbines_and_health.pdf

- "There is no evidence that the audible or sub-audible sounds emitted by wind turbines have any direct adverse physiological effects." *Source: Colby 2009 review*
  http://199.88.77.35/EFiles/docs/CD/PlanCom/10_0426_IT_100416160206.pdf

- "... surveys of peer-reviewed scientific literature have consistently found no evidence linking wind turbines to human health concerns." *Source: CanWEA*
  http://www.canwea.ca/pdf/CanWEA%20-%20Addressing%20concerns%20with%20wind%20turbines%20and%20human%20health.pdf

- "There is insufficient evidence that the noise from wind turbines is directly... causing health problems or disease." *Source: Massachusetts review*
  http://www.mass.gov/dep/energy/wind/turbine_impact_study.pdf

- “There is no reason to believe, based on the levels and frequencies of the sounds and... sound exposures in occupational settings, that the sounds from wind turbines could plausibly have direct adverse health consequences.” *Source: Colby 2009 review* http://199.88.77.35/EFiles/docs/CD/PlanCom/10_0426_IT_100416160206.pdf

- “... while some people living near wind turbines report symptoms such as dizziness, headaches, and sleep disturbance, the scientific evidence available to date does not demonstrate a direct causal link between wind turbine noise and adverse health effects. The sound level from wind turbines at common residential setbacks is not sufficient to cause hearing impairment or other direct health effects...” *Source: Ontario CMOH Report* http://www.health.gov.on.ca/en/public/publications/ministry_reports/wind_turbine/wind_turbine.pdf

- “... the audible noise created by a wind turbine, constructed at the approved setback distance does not pose a health impact concern.”*Source: Chatham-Kent Public Health Unit* http://www.harvestingwindsupport.com/blog/wp-content/uploads/2011/03/Chatham-KentHealth-and-Wind-.pdf

- There is no evidence for a set of health effects, from exposure to wind turbines that could be characterized as a "Wind Turbine Syndrome." *Source: Massachusetts review* http://www.mass.gov/dep/energy/wind/turbine_impact_study.pdf

- “... there is not an association between noise from wind turbines and measures of psychological distress or mental health problems.” *Source: Massachusetts review* http://www.mass.gov/dep/energy/wind/turbine_impact_study.pdf

- “Evidence that environmental noise damages mental health is… inconclusive.” *Source: Ad Hoc Expert Group on Noise and Health* http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1279888026747

- “…no association was found between road traffic noise and overall psychological distress…”*Source: Ad Hoc Expert Group on Noise and Health* http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1279888026747

- “To date, no peer reviewed scientific journal articles demonstrate a causal link between people living in proximity to modern wind turbines, the noise (audible, low frequency noise, or infrasound) they emit and resulting physiological health effects.” *Source: Knopper&Ollson review* http://www.ehjournal.net/content/pdf/1476-069X-10-78.pdf
  “... there is no scientific evidence that noise at levels created by wind turbines could cause health problems other than annoyance...” *Source: Eja Pedersen 2003 Review* http://www.naturvardsverket.se/Documents/publikationer/620-5308-6.pdf

  “None of the... evidence reviewed suggests an association between noise from wind turbines and pain and stiffness, diabetes, high blood pressure, tinnitus, hearing impairment, cardiovascular disease, and headache/migraine." *Source: Massachusetts review* http://www.mass.gov/dep/energy/wind/turbine_impact_study.pdf

"...there are no evidences that noise from wind turbines could cause cardiovascular and psycho-physiological effects." *Source: Eja Pedersen 2003 Review* http://www.naturvardsverket.se/Documents/publikationer/620-5308-6.pdf

"…there was no evidence that environmental noise was related to raised blood pressure…"*Source: Ad Hoc Expert Group on Noise and Health* http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1279888026747

- "The health impact of the noise created by wind turbines has been studied and debated for decades with no definitive evidence supporting harm to the human ear." *Source: Chatham-Kent Public Health Unit* http://www.harvestingwindsupport.com/blog/wp-content/uploads/2011/03/Chatham-KentHealth-and-Wind-.pdf

- "The electromagnetic fields produced by the generation and export of electricity from a wind farm do not pose a threat to public health..."*Source: NHMRC 2010* http://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/new0048_evidence_review_wind_turbines_and_health.pdf

- "... no consistent associations were found between wind turbine noise exposure and symptom reporting, e.g. chronic disease, headaches, tinnitus and undue tiredness." *Source: Bolin et al 2011 Review* http://iopscience.iop.org/1748-9326/6/3/035103/pdf/1748-9326_6_3_035103.pdf

- "... low level frequency noise or infrasound emitted by wind turbines is minimal and of no consequence... Further, numerous reports have concluded that there is no evidence of health effects arising from infrasound or low frequency noise generated by wind turbines." *Source: NHMRC 2010* http://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/new0048_evidence_review_wind_turbines_and_health.pdf

- "... renewable energy generation is associated with few adverse health effects compared with the well documented health burdens of polluting forms of electricity generation..." *Source: NHMRC 2010* http://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/new0048_evidence_review_wind_turbines_and_health.pdf

- "Although opposition to wind farms on aesthetic grounds is a legitimate point of view, opposition to wind farms on the basis of potential adverse health consequences is not justified by the evidence." *Source: Chatham-Kent Public Health Unit* http://www.harvestingwindsupport.com/blog/wp-content/uploads/2011/03/Chatham-KentHealth-and-Wind-.pdf

- "What is apparent is that numerous websites have been constructed by individuals or groups to support or oppose the development of wind turbine projects, or media sites reporting on the debate. Often these websites state the perceived impacts on, or benefits to, human health to support the position of the individual or group hosting the website. The majority of information posted on these websites cannot be traced back to a scientific, peer-reviewed source and is typically anecdotal in nature. In some cases, the information contained on and propagated by internet websites and the media is not supported, or is even refuted, by scientific research. This serves to spread misconceptions about the potential impacts of wind energy on human health...” *Source: Knopper&Ollson review* http://www.ehjournal.net/content/pdf/1476-069X-10-78.pdf

- Afsset was mandated by the Ministries responsible for health and the environment to conduct a critical analysis of a report issued by the *Académie nationale de medicine* that advocated the use of a minimum 1,500 metre setback distance for 2.5 MW wind turbines or more. The Affset report concluded that “It appears that the noise emitted by wind turbines is not sufficient to result in direct health consequences as far as auditory effects are concerned. [...] A review of the data on noise measured in proximity to wind turbines, sound propagation simulations and field surveys demonstrates that a permanent definition of a minimum 1,500 m setback distance from homes, even when limited to windmills of more than 2.5 MW, does not reflect the reality of exposure to noise and does not seem relevant.”

Annoyance

- “... wind turbine noise is comparatively lower than road traffic, trains, construction activities, and industrial noise.”*Source: Chatham-Kent Public Health Unit* http://www.harvestingwindsupport.com/blog/wp-content/uploads/2011/03/Chatham-KentHealth-and-Wind-.pdf

- “There is consistent evidence that noise from wind turbines—whether estimated in models or using distance as a proxy—is associated with annoyance, and reasonable consistency that it is associated with sleep disturbance and poorer sleep quality and quality of life. However, it is unclear whether the observed associations are due to wind turbine noise or plausible confounders” NHMRC (2014) full report

- “The perception of noise depends in part on the individual - on a person’s hearing acuity and upon his or her subjective tolerance for or dislike of a particular type of noise. For example, a persistent “whoosh” might be a soothing sound to some people even as it annoys others.”*Source: NRC 2007* http://www.vawind.org/assets/nrc/nrc_wind_report_050307.pdf

- “... some people might find [wind turbine noise annoying. It has been suggested that annoyance may be a reaction to the characteristic “swishing” or fluctuating nature of wind turbine sound rather than to the intensity of sound.” *Source: Ontario CMOH Report* http://www.health.gov.on.ca/en/public/publications/ministry_reports/wind_turbine/wind_turbine.pdf

- "… being annoyed can lead to increasing feelings of powerlessness and frustration, which is widely believed to be at least potentially associated with adverse health effects over the longer term."*Source: Ad Hoc Expert Group on Noise and Health* http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1279888026747

- "Wind turbine annoyance has been statistically associated with wind turbine noise, but found to be more strongly related to visual impact, attitude to wind turbines and sensitivity to noise." *Source: Knopper&Ollson review* http://www.ehjournal.net/content/pdf/1476-069X-10-78.pdf

- "... self reported health effects like feeling tense, stressed, and irritable, were associated with noise annoyance and not to noise itself..." *Source: Knopper&Ollson review* http://www.ehjournal.net/content/pdf/1476-069X-10-78.pdf

- "... many of the self reported health effects are associated with numerous issues, many of which can be attributed to anxiety and annoyance." *Source: Knopper&Ollson review* http://www.ehjournal.net/content/pdf/1476-069X-10-78.pdf

- "To date, no peer reviewed articles demonstrate a direct causal link between people living in proximity to modern wind turbines, the noise they emit and resulting physiological health effects. If anything, reported health effects are likely attributed to a number of environmental stressors that result in an annoyed/stressed state in a segment of the population." *Source: Knopper&Ollson review* http://www.ehjournal.net/content/pdf/1476-069X-10-78.pdf

- "… some community studies are biased towards over-reporting of symptoms because of an explicit link between…noise and symptoms in the questions inviting people to remember and report more symptoms because of concern about noise." *Source: Ad Hoc Expert Group on Noise and Health* http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1279888026747

- "... it is probable that some persons will inevitably exhibit negative responses to turbine noise wherever and whenever it is audible, no matter what the noise level." *Source: Fiumicelli review abstract*

- "The major source of uncertainty in our assessment is related to the subjective nature of response to sound, and variability in how people perceive, respond to, and cope with sound." *Source: Oregon review* http://public.health.oregon.gov/HealthyEnvironments/TrackingAssessment/HealthImpactAssessment/Documents/Oregon%20Wind%20Energy%20HIA%20Public%20comment.pdf

- "... sleep difficulties, as well as feelings of uneasiness, associated with noise annoyance could be an effect of the exposure to noise, although it could just as well be that respondents with sleeping difficulties more easily appraised the noise as annoying." *Source: NHMRC 2010* http://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/new0048_evidence_review_wind_turbines_and_health.pdf

- "Even noise that falls within known safety limits is subjective to the recipient and will be received and subsequently perceived positively or negatively."*Source: Chatham-Kent Public Health Unit* http://www.harvestingwindsupport.com/blog/wp-content/uploads/2011/03/Chatham-KentHealth-and-Wind-.pdf

- "... annoyance was strongly correlated with a negative attitude toward the visual impact of wind turbines on the landscape..." *Source: NHMRC 2010* http://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/new0048_evidence_review_wind_turbines_and_health.pdf

- "Respondents tended to report more annoyance when they also noted a negative effect on landscape, and ability to see the turbines was strongly related to the probability of annoyance."*Source: Minnesota Health Dept 2009* http://www.health.state.mn.us/divs/eh/hazardous/topics/windturbines.pdf

- "[It is proposed that annoyance is not a direct health effect but an indication that a person's capacity to cope is under threat. The person has to resolve the threat or their coping capacity is undermined, leading to stress related health effects... Some people are very annoyed at quite low levels of noise, whilst other are not annoyed by high levels." *Source: NHMRC 2010* http://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/new0048_evidence_review_wind_turbines_and_health.pdf

- "Further, sounds, such as repetitive but low intensity noise, can evoke different responses from individuals… Some people can dismiss and ignore the signal, while for others, the signal will grow and become more apparent and unpleasant over time… These reactions may have little relationship to will or intent, and more to do with previous exposure history and personality." *Source: Minnesota Health Dept 2009* http://www.health.state.mn.us/divs/eh/hazardous/topics/windturbines.pdf

- "Stress and annoyance from noise often do not correlate with loudness. This may suggest [that other factors impact an individual's reaction to noise… individuals with an interest in a project and individuals who have some control over an environmental noise are less likely to find a noise annoying or stressful." *Source: Minnesota Health Dept 2009* http://www.health.state.mn.us/divs/eh/hazardous/topics/windturbines.pdf

- "There is a possibility of learned aversion to low frequency noise, leading to annoyance and stress..." *Source: Leventhall 2005 review* http://www.noiseandhealth.org/article.asp?issn=1463-1741;year=2004;volume=6;issue=23;spage=59;epage=72;aulast=Leventhall

- “Noise produced by wind turbines generally is not a major concern for humans beyond a half mile or so because various measures to reduce noise have been implemented in the design of modern turbines.”*Source: NRC 2007* http://www.vawind.org/assets/nrc/nrc_wind_report_050307.pdf

- “Noise… levels from an onshore wind project are typically in the 35-45 dB(A) range at a distance of about 300 meters... These are relatively low noise or sound-pressure levels compared with other common sources such as a busy office (~60 dB(A)), and with nighttime ambient noise levels in the countryside (~20-40 dB(A)).” *Source: NRC 2007* http://www.vawind.org/assets/nrc/nrc_wind_report_050307.pdf

- “Complaints about low frequency noise come from a small number of people but the degree of distress can be quite high. There is no firm evidence that exposure to this type of sound causes damage to health, in the physical sense, but some people are certainly very sensitive to it.” *Source: Ad Hoc Expert Group on Noise and Health* http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1279888026747

- “… there is the theoretical possibility that annoyance may lead to stress responses and then to illness. If there is no annoyance then there can be no mechanism for any increase in stress hormones by this pathway… if stress-related adverse health effects are mediated solely through annoyance then any mitigation plan which reduces annoyance would be equally effective in reducing any consequent adverse health effects. It would make no difference whether annoyance reduction was achieved through actual reductions in sound levels, or by changes in attitude brought about by some other means.” *Source: Ad Hoc Expert Group on Noise and Health* http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1279888026747

Infrasound

- “Infrasound is audible when the sound levels are high enough. The hearing threshold for infrasound is much higher than other frequencies. Infrasound from wind farms is at levels well below the hearing threshold and is therefore inaudible to neighbouring residents. There is no evidence that sound which is at inaudible levels can have a physiological effect on the human body . This is the case for sound at any frequency, including infrasound.” http://docs.health.vic.gov.au/docs/doc/5593AE74A5B486F2CA257B5E0014E33C/$FILE/Wind%20farms,%20sound%20and%20%20health%20-%20Technical%20information%20WEB.pdf

- "Claims that infrasound from wind turbines directly impacts the vestibular system have not been demonstrated scientifically... evidence shows that the infrasound levels near wind turbines cannot impact the vestibular system." http://www.mass.gov/dep/public/press/0112wind.htm
- “There is no evidence that infrasound ... [from wind turbines ... contributes to perceived annoyance or other health effects.” *Source: Bolin et al 2011 Review* http://iopscience.iop.org/1748-9326/6/3/035103/pdf/1748-9326_6_3_035103.pdf

- "There is no consistent evidence of any physiological or behavioural effect of acute exposure to infrasound in humans." *Source: UK HPA Report* http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1265028759369

- "... self reported health effects of people living near wind turbines are more likely attributed to physical manifestation from an annoyed state than from infrasound." *Source: Knopper&Ollson review* http://www.ehjournal.net/content/pdf/1476-069X-10-78.pdf

- "... infrasound from current generation upwind model turbines [is well below the pressure sound levels at which known health effects occur. Further, there is no scientific evidence to date that vibration from low frequency wind turbine noise causes adverse health effects." *Source: Ontario CMOH Report* http://www.health.gov.on.ca/en/public/publications/ministry_reports/wind_turbine/wind_turbine.pdf

- "It would appear... that infrasound alone is hardly responsible for the complaints... from people living up to two km from the large downwind turbines." *Source: Jakobsen 2005 review* http://multi-science.metapress.com/content/w6r4226247q6p416/

- "From a critical survey of all known published measurement results of infrasoundfrom wind turbines it is found that wind turbines of contemporary design with therotor placed upwind produce very low levels of infrasound. Even quite close to theseturbines the infrasound level is far below relevant assessment criteria, including thelimit of perception."*Source: Jakobsen 2005 review* http://multi-science.metapress.com/content/w6r4226247q6p416/

- "With older downwind turbines, some infrasound also is emitted each time a rotor blade interacts with the disturbed wind behind the tower, but it is believed that the energy at these low frequencies is insufficient to pose a health hazard." *Source: NRC 2007* http://www.vawind.org/assets/nrc/nrc_wind_report_050307.pdf

Shadow flicker

- "Scientific evidence suggests that shadow flicker [from the rotating blades of wind turbines does not pose a risk for eliciting seizures as a result of photic stimulation." *Source: Massachusetts review* http://www.mass.gov/dep/energy/wind/turbine_impact_study.pdf

- Shadow flicker from wind turbines… is unlikely to cause adverse health impacts in the general population. The low flicker rate from wind turbines is unlikely to trigger seizures in people with photosensitive epilepsy. Further, the available scientific evidence suggests that very few individuals will be annoyed by the low flicker frequencies expected from most modern wind turbines." *Source: Oregon review* http://public.health.oregon.gov/HealthyEnvironments/TrackingAssessment/HealthImpa ctAssessment/Documents/Oregon%20Wind%20Energy%20HIA%20Public%20comment.pdf

- “Flicker frequency due to a turbine is on the order of the rotor frequency (i.e., 0.6-1.0 Hz), which is harmless to humans. According to the Epilepsy Foundation, only frequencies above 10 Hz are likely to cause epileptic seizures.” *Source: NRC 2007* http://www.vawind.org/assets/nrc/nrc_wind_report_050307.pdf

Community & social response to wind turbines

- The perception of sound as noise is a subjective response that is influenced by factors related to the sound, the person, and the social/environmental setting. These factors result in considerable variability in how people perceive and respond to sound... Factors that are consistently associated with negative community response are fear of a noise source... [and noise sensitivity...” *Source: Oregon review* http://public.health.oregon.gov/HealthyEnvironments/TrackingAssessment/HealthImpactAssessment/Documents/Oregon%20Wind%20Energy%20HIA%20Public%20comment.pdf

- “Wind energy developments could indirectly result in positive health impacts... if they increase local employment, personal income, and community-wide income and revenue. However, these positive effects may be diminished if there are real or perceived increases in income inequality within a community.” *Source: Oregon review* http://public.health.oregon.gov/HealthyEnvironments/TrackingAssessment/HealthImpactAssessment/Documents/Oregon%20Wind%20Energy%20HIA%20Public%20comment.pdf

- “Effective public participation in and direct benefits from wind energy projects (such as receiving electricity from the neighboring wind turbines) have been shown to result in less annoyance in general and better public acceptance overall.” *Source: Massachusetts review* http://www.mass.gov/dep/energy/wind/turbine_impact_study.pdf

- “... people who benefit economically from wind turbines [are less likely to report noise annoyance, despite exposure to similar sound levels as those people who [are not economically benefiting.” *Source: NHMRC 2010* http://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/new0048_evidence_review_wind_turbines_and_health.pdf

- “Landowners... may perceive and respond differently (potentially more favorably) to increased sound levels from a wind turbine facility, particularly if they benefit from the facility or have good relations with the developer...” *Source: Oregon review* http://public.health.oregon.gov/HealthyEnvironments/TrackingAssessment/HealthImpactAssessment/Documents/Oregon%20Wind%20Energy%20HIA%20Public%20comment.pdf

- “The level of annoyance or disturbance experienced by those hearing wind turbine sound is influenced by individuals' perceptions of other aspects of wind energy facilities, such as turbine visibility, visual impacts, trust, fairness and equity, and the level of community engagement during the planning process." *Source: Oregon review* http://public.health.oregon.gov/HealthyEnvironments/TrackingAssessment/HealthImpactAssessment/Documents/Oregon%20Wind%20Energy%20HIA%20Public%20comment.pdf

- "Wind energy facilities... can indirectly result in positive health impacts by reducing emissions of [green house gases and harmful air pollutants, and... Communities near fossil-fuel based power plants that are displaced by wind energy could experience reduced risks for respiratory illness, cardiovascular diseases, cancer, and premature death." *Source: Oregon review* http://public.health.oregon.gov/HealthyEnvironments/TrackingAssessment/HealthImpactAssessment/Documents/Oregon%20Wind%20Energy%20HIA%20Public%20comment.pdf

- "The environmental and human-health risk reduction benefits of wind-powered electricity generation accrue through its displacement of electricity generation using other energy sources (e.g., fossil fuels), thus displacing the adverse effects of those other generators." *Source: NRC 2007* http://www.vawind.org/assets/nrc/nrc_wind_report_050307.pdf

- "Community engagement at the outset of planning for wind turbines is important and may alleviate health concerns about wind farms. Concerns about fairness and equity may also influence attitudes towards wind farms and allegationsabout effects on health. These factors deserve greater attention in future developments." *Source: Ontario CMOH Report* http://www.health.gov.on.ca/en/public/publications/ministry_reports/wind_turbine/wind_turbine.pdf

Summary of 2013 VTA Finnish report

VTT Technical Research Centre of Finland has published a new study with a conclusion that wind turbines do not cause any adverse health effects. The study consisted of a review of nearly 50 scientific research articles conducted in Europe, USA, Australia and New Zealand over the past 10 years.

Due to the increased number of wind power projects in Finland, a growing concern has arisen among the public regarding the possible negative impacts wind energy production may have on human health. VTT Technical Research Centre of Finland conducted a comprehensive literature review covering nearly 50 scientific research articles. The review concluded that in the light of current scientific research, there is no evidence to show that the infrasound produced by modern wind turbines is anything but harmless.

The sound of a nearby wind farm is does not possess such qualities or volume that it would cause physical symptoms to humans. The study also concluded that the infra sounds below the auditory threshold does not constitute a health hazard. Additionally, most of the infra sound caused by a wind farm is mixed with other infra sound from the environment and does therefore not cause any additional exposure. According to the research articles reviewed, the low frequency sound with potential hazardous health impacts would have to be of a higher volume than that caused by wind farms, in order to have an impact on our health. Also, concern that shadow flicker may cause epileptic seizures are overruled in the research material. Such seizures cannot be caused by the type of flicker the slow rotation speed of the wind turbine blades produce.

Commentary: Major problems with recent systematic review on wind farms and distress.

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At least 20 reviews of the evidence on whether wind turbines cause health problems including stress have been published since 2003 (1). Cureus recently published another (2) where the authors referenced none of these.

Highlights of the findings of these reviews may be found here (1). The most recent (2014) review by Australia's peak health and medical agency, The National Health and Medical Research Council (3) concluded:

"There is no consistent evidence that noise from wind turbines… is associated with self reported human health effects. Isolated associations may be due to confounding, bias or chance. There is consistent evidence that noise from wind turbines—whether estimated in models or using distance as a proxy—is associated with annoyance, and reasonable consistency that it is associated with sleep disturbance and poorer sleep quality and quality of life. However, it is unclear whether the observed associations are due to wind turbine noise or plausible confounders."

and

"The association between estimated noise level and annoyance was significantly affected by the visual attitude of the individual (i.e. whether they found wind farms beautiful, or ugly and unnatural) in the three studies that assessed this as a potential confounding factor. Residents in [one] study with a negative attitude to the visual impact of wind farms on the landscape had over 14 times the odds of being annoyed compared with those people without a negative visual attitude. …This means that factors other than the noise produced by wind turbines contribute to the annoyance experienced by survey respondents."

Against this background, I was curious to see what a new systematic review would conclude. According to the Cureus website, the new paper was peer reviewed. This is difficult to understand because of the sheer volume of major and minor problems it contains. Together, these make its contribution valueless to scholarly understanding of the phenomenon of noise and health complaints about wind farms. The paper shows many signs of poor understanding of the subject matter of their review, of critical appraisal methods, of some basic conventions in systematic reviewing, of structuring in scientific writing, and much more besides.

The problems commence in the first line of the abstract where the confusing statement is made that "the proximity of wind turbines to residential areas has been associated with a higher level of complaints compared to the general population." I assume here that they are trying to say that those living near turbines have a higher prevalence of health complaints like sleep disturbance and general "human distress" than in the wider population. The prevalence of sleeping problems in general populations is as high as 33% (4) and reference material exists that quantifies the prevalence of many health problems in general populations (5, 6). Instead, the authors support their statement with a reference to a small qualitative study of 15 people both affected and unaffected by turbines (7). No conclusions about the prevalence of health problems in communities near turbines or in matched comparison populations can be drawn from that paper. I know of no published evidence that would allow such a statement to be made.

The authors state that their search strategy located 18 eligible papers but that these were based on six original studies. They explain that the 12 non-original "studies" (several of which were reviews or commentaries) were then excluded. Yet in their "key results" they proceed to describe the characteristics of all 18 papers and thus act as if these were not excluded ("All 18 peer-reviewed studies captured in our review found an association…").

The authors do not appear to understand what an "outcome" is. The abstract lists "outcome" variables that are not outcomes at all (such as study quality and journal name). These are independent variables, not dependent ones.

Their eligibility criteria for study selection are perplexing. What for example, is the difference between "peer-reviewed studies" and "studies published in peer-reviewed journals"? So too, is their noting that they searched the Cochrane Library for relevant studies. The Cochrane Library is a repository of reviews of evidence for health interventions, not for data on the prevalence of health complaints.

The authors seem not to understand the difference between studies and trials. For obvious reasons, there have been no trials conducted in this area.

Their main conclusions are that:

An association exists between wind turbines and distress in humans.

The existence of a dose-response relationship (between distance from wind turbines and distress) and the consistency of the association across studies .. argues for the credibility of this association.

The first conclusion is very imprecise and sweeping and ripe for being megaphoned by anti-wind farm interest groups as if it actually meant something. One of the six original studies reviewed (Salt & Hullar) (8) should have never been included in this review – see below. The Nissenbaum et a study (9) is listed as of moderate quality with a low risk of bias. Yet all three authors and two out of three reviewers of that paper are members of Society for Wind Vigilance, an anti-wind organization. Nissenbaum has been raising health concerns in study areas for several years, potentially biasing collected data. Neither of these problems is mentioned in this review. Two critiques of this study were published in Noise and Health pointing out the very poor quality of the results, analysis and the overstatements of conclusions (10, 11).

The Shepherd et al study (12) which the authors rate as of “high” quality, failed to make any mention that the small wind farm community involved had for years been subjected to a local wind farm opposition group fomenting anxiety about health issues (13). Indeed, with one exception (14), the five studies referenced were performed in areas where complaints of annoyance were being raised. But such farms are unlikely to be representative of all wind farms. As our work shows, over nearly 65% of wind farms in Australia have never received a single complaint (15), and 73% of complainants in Australia are concentrated around just 6/51 farms. The failure of the authors to note this fundamental problem of study sample selection bias is another major problem.

Among the five “original” studies they considered satisfied their selection criteria was a paper by Salt & Hullar (8). This paper is not in any way a “study” of “the association between wind turbines and human distress.” It reports no original empirical data and is essentially a backgrounder on infrasound and the “possibility” that wind turbine might create auditory distress. It is unfathomable why this paper was included in the data set.

Table 2 purports to be a meaningful summary of the findings of these six studies on the association between turbine exposure and “distress”. I would defy anyone to make any sense of the Table, particularly the column headed “does [sic] response”.

By way of comparison to the lack of detail provided by the authors of this review, it is instructive to look at the results from the Dutch study which formed the basis of the

Pedersen 2009 paper(14) which were further analysed by Bakker et al (16) who noted that sleep disturbance was assessed by a question dealing with the frequency of sleep disturbance by environmental sound ("how often are you disturbed by sound?"). Two thirds of all respondents reported not being disturbed by any sound at all. Disturbance by traffic noise or other mechanical sound was reported by 15.2% of the respondents. Disturbance by the sound of people and of animals was reported by 13.4% of the respondents. Relevantly, disturbance by the sound of wind turbines was reported by only 4.7% of the respondents (6% in areas deemed to be quiet and 4% in areas deemed to be noisy). Bakker and colleagues (16) note that it was not clear from the study if there was a primary source causing sleep disturbance and how respondents attributed being awakened by different environmental sound sources. What was clear was that wind turbines were less frequently reported as a sleep disturbing sound source, than other environmental sounds irrespective of the area type (quiet versus noisy). Analysis showed that among respondents who could hear wind turbine sound, annoyance was the only factor that predicted sleep disturbance. The authors speculated that being annoyed might contribute to a person's sensitivity for any environmental sound, and the reaction might be caused by the combination of all sounds present. It might also be the case that people annoyed by wind turbine noise attribute their experience of sleep disturbance to wind turbine noise, even if that was not the source of their awakening.

Swathes of the paper are given over to descriptions of their efforts to rate the levels of evidence in the four reviewed studies. But they never ever describe their approach in any way that might permit replication of how they went about such rating. How was level of evidence actually determined? It should have been explicitly defined in the text. Their discussion of the risk of bias across studies is bizarre. "The quality of the study could be confounded by journal name and author". Surely the authors mean here that the evaluation of the quality of the study could be biased by this knowledge. The term "confounded" has another meaning.

Their "key results" consist of no more than five bullet points. These read like draft notes-to-self (eg: None of these studies captured in our review found any association (potential publication bias)".

The authors chose to use the term "distress" instead of "annoyance". The American Medical Dictionary defines distress as 1. Mental or physical suffering or anguish or 2. Severe strain resulting from exhaustion or trauma. Annoyance on the other hand is defined as 1. The act of annoying or the state of being annoyed or 2. A cause of irritation or vexation; a nuisance. (The American Heritage Dictionary of the English Language, Fourth Edition copyright 2000) and is generally identified as a highly subjective state in medical literature. It is clear that the authors chose a stronger term than was used by the majority of studies. Most literature refers to annoyance, while the referenced alternative of "Wind Turbine Syndrome" was coined in a vanity press published case study with extraordinary weaknesses of selection bias, methodology and analysis (17). Similarly, "extreme annoyance" is rarely used in the literature. Annoyance is by far the most commonly used term in the material referenced, so it is unclear why “distress” was chosen.

The paper is riddled with imprecise, mangled and contradictory language. For example: key finding 1: “All 18 peer-reviewed studies captured in our review found an association…” and key finding 2: “None of these studies captured in our review found any association (potential publication bias)”; infelicitous prose: “these complaints are coined in research”; “There might be a theoretical incline to give studies in high impact journals higher quality…”; basic grammatical errors: “the study’s principle outcome”; “there was no missing data.” It is unconventionally structured with extremely scant results and methods sections providing no adequate explanations of how key decisions on quality or bias were made.

The publication of this very poor paper is regrettable.

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APPENDIX 5.2

EMF & YOU

Energy for generations

EMF & YOU

Information about Electric & Magnetic Fields and the electricity network in Ireland

April 2017

ABOUT ESB

ESB was established in 1927, as a corporate body in the Republic of Ireland under the Electricity (Supply) Act of 1927. Since then, ESB has been providing energy for those life moments, big and small, profound and everyday where electricity influences people's lives for the better. As a strong, diversified, vertically integrated utility, ESB operates right across the electricity market: from generation, through transmission and distribution to supply of customers.

ESB is fully committed to protecting the health and safety of employees, contractors, customers and the public. Safety is a core company value of ESB and this value guides the approach to safety across all business activities. Arising from concerns about possible adverse health effects resulting from exposure to electric and magnetic fields (EMF) from electrical equipment, such as power lines and appliances, ESB has set out its policy in relation to this topic in this booklet.

WELCOME

ESB understands that some people may have concerns about the potential side effects of frequent EMF exposure on health. Over the last 35 years, there has been considerable public debate surrounding EMF and this has generated many questions.

The main interest of people in this country has centred around the fields produced by ESB overhead power transmission lines, but questions have also been asked about the fields produced by other electrical sources such as household electrical appliances, distribution lines and substations. In accordance with our desire to deal in an open manner with this issue we are providing you with information on this subject, covering key questions such as:

- What are EMFs?
- What studies have been carried out so far?
- Are there risks to human health?
- What is the national and international guidance on EMF exposure?
- Do power lines affect animals?
- Should people take any special precautions against EMF?

The quality of your living and working environment, along with the welfare of livestock and farm crops is of the utmost importance to us at all times. All of ESB Networks plant and equipment complies with the European Recommendation (1999/519/EC) on the limitation of exposure of the general public to electromagnetic fields (0Hz to 300 GHz). Despite over 35 years of intensive research into power frequency EMFs, the international overriding scientific consensus is that EMFs, as generated from power lines, do not cause any adverse long term health effects.

We hope you find this booklet useful and informative and that it provides the answers to the questions currently being asked on this issue, which first became an area of Irish public concern in the 1980s. To explain any technical terms used in the following pages, a glossary has been included on page 32. Please contact ESB for more information or visit our website at www.esb.ie

Pat O'Doherty, Chief Executive

WHAT ARE ELECTROMAGNETIC FIELDS?

Electromagnetic Fields have been recognised since electricity was discovered and have been the subject of thousands of scientific studies across the globe.

Our knowledge and understanding of EMF has grown significantly in recent years.

Electric and Magnetic Fields occur both naturally and from man-made sources.

All electricity, both natural and man-made, produces two types of fields: electric fields and magnetic fields. EMF are produced by natural phenomena which have been a constant part of the environment throughout human evolution. For instance, the Earth has a natural electric field and a magnetic field.

The most common source of man-made EMF that we encounter is electricity.

The man-made sources include all electrical systems including house wiring, electrical appliances and overhead and underground power lines. In Ireland the voltage in homes is 230V. Electricity in Ireland is transmitted at voltages of up to 400,000V (400kV).

The Electric Field

The electric field depends on voltage. The higher the voltage, the stronger the electric field. You can imagine it as being like pressure in a water pipe. A 400kV power line produces a higher electric field than a 110kV power line. The magnitude of an electric field is expressed in volts or kilovolts (thousands of volts) per metre. This is written as V/m or kV/m.

Electric fields are strongest closest to a power line and their level reduces quickly with distance. Electric fields are blocked by buildings, trees etc.

Therefore, inside a typical house the dominant sources of electric fields are typical household appliances such as microwave ovens, hair-dryers and electric blankets.

There are no external electric fields associated with underground cables. This is because the electric field produced is contained within the cable.

The Magnetic Field

The magnetic field is produced by moving electric charges and so the strength of the magnetic field varies directly with the current flows in lines or cables. As a result, the magnetic field can vary at different times during the day. You can imagine this as being like the flow rate of water in a water pipe. Magnetic fields are measured in units of microtesla (μT).

Unlike electric fields, magnetic fields are not blocked by buildings, trees etc. Like electric fields, magnetic fields are highest closest to an electricity line or cable and their level reduces quickly with distance from the line or cable.

Appliances that use a lot of power, such as electric heaters or cookers, generate higher levels of magnetic fields than lower powered appliances.

Q Why does a fluorescent light glow under a high voltage powe line?

There is a well-known phenomenon whereby a fluorescent light will glow dimly if placed below a high-voltage power line. This effect is caused by the electric field. The electric field causes a tiny current (measured in millionths of an ampere) to flow through the mercury vapour inside the tube which casts a weak glow. The moment you move the fluorescent light away from the line, the electric field weakens and the light goes out. This phenomenon has no impact on people or other organisms.

WHAT IS THE ELECTROMAGNETIC SPECTRUM?

Electromagnetic energy travels in waves. These waves span a broad range of frequencies from static frequency (fields that do not change direction with time) at one end of the spectrum, to very high frequency (fields that change billions of times per second) at the other end of the spectrum.

The electromagnetic spectrum shown in Figure A identifies the various types of electromagnetic energy based on their frequency. The earth's magnetic field is largely constant and therefore is described as a static field. Its frequency is very low or zero. The earth's static magnetic field (which acts like a giant bar magnet) causes a compass to align north-south.

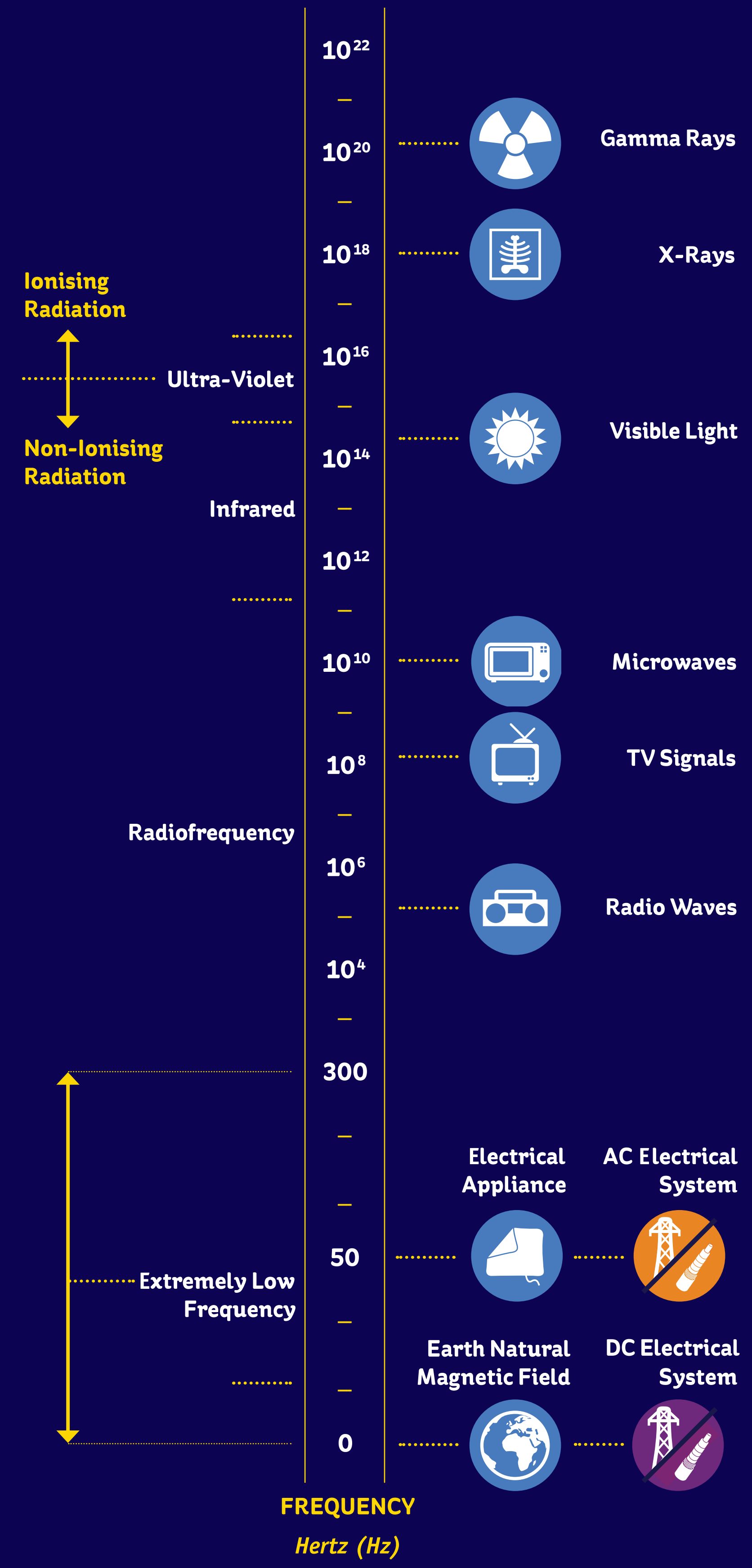
Most man-made sources of electric and magnetic fields fluctuate in direction and intensity. They are called time-varying or alternating current fields (AC). Time-varying or AC fields come from anything that runs on electricity, from electrical installations to household appliances.

Their frequency is expressed in Hertz (Hz). Hertz is the rate at which the field alternates back and forth per second. The electric power system operates at 50Hz in Ireland and Europe and 60Hz in some other places such as North America and thus is a source of EMF at these frequencies. Such frequencies are in the extremely low frequency (ELF) range, 0-300Hz. The ELF EMF from all electrical equipment are time-varying fields with a dominant frequency of 50Hz in Ireland/Europe.

The strength of the EMF or field depends on how close you are to the equipment. Hence the EMF a person can experience from a household appliance can be similar or higher than that from transmission lines because you can be much closer to the household appliance than an overhead transmission line, which is usually several metres or more away from you.

THE ELECTROMAGNETIC SPECTRUM

FIGURE A



ARE EMFs ASSOCIATED WITH ELECTRICITY THE SAME AS RADIATION?

No. The fields resulting from electricity are fundamentally different from x-ray and gamma ray radiation.

Whilst these are all forms of electromagnetic energy there are important fundamental differences.

The term radiation is usually used to refer to ionising energy. Ionising means that, if the radiation is sufficiently strong, it can break bonds in molecules and therefore damage biological molecules including the DNA of cells. Only the high-frequency portion of the electromagnetic spectrum is ionising. This includes, x-rays, gamma rays and ultraviolet light.

The energy in visible light, radio frequency and fields in the static and 50Hz ranges, including electricity, are all classified as non-ionising.

It is very important to realise that 50Hz fields, i.e. electricity, are non-ionising. They have insufficient energy to ionise molecules. Examples of non-ionising energy include EMF from the earth and electric power sources, radio waves and TV waves, microwaves, and most frequencies of visible light. *See figure A, page 9.*

WHAT SCIENTIFIC STUDIES ON THE HEALTH IMPACT OF EMF HAVE BEEN CARRIED OUT?

Since 1979 many scientific studies have been carried out on the possible effects of EMF on people.

To determine if something is harmful to health, scientists evaluate the results from three different types of studies.

1. Epidemiological Studies

Epidemiology is the study of patterns of disease in populations. It searches for statistical links or associations between exposures, such as EMF, and disease in human populations. Epidemiological studies are usually observational, meaning that researchers investigate, but do not try to change, what happens as people go about their daily lives. As a result, epidemiological studies are susceptible to certain kinds of errors that lead an exposure and a disease to be associated even when one does not cause the other. For example, the positive association between number of doctors per capita and mortality rates arises not because doctors increase mortality, but rather because of social and economic factors such as industrialisation and job opportunities. Likewise, just because persons with a certain health condition live near electric power sources does not mean that the fields from these power sources caused the condition. Other environmental and behavioural causes would have to be ruled out, as would the possibility that some people moved to the area after already developing the health condition.

2. Experimental Studies – People and Animals

These studies involve exposing people or animals to EMF in controlled laboratory conditions and looking for biological changes. For practical reasons, human experimental studies of EMF are usually short-term. Experimental studies generally study effects of short-term exposures.

3. Experimental Studies – Cells and Tissues

These studies involve exposing isolated tissues and cells to EMF in controlled laboratory conditions to investigate potential mechanisms of interaction.

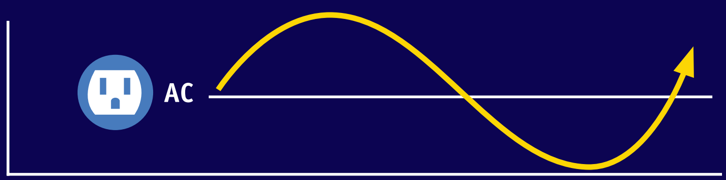
TWO TYPES OF TECHNOLOGY

Transmission systems worldwide are typically constructed as overhead lines and in some cases underground cables are used.

Two types of technology can be used to transmit electricity. Both AC and DC power lines produce electric and magnetic fields. AC lines produce AC electric and magnetic fields and DC lines produce static electric and magnetic fields. ESB Networks transmission and distribution networks are AC systems.

When electricity transmission cables are placed underground, the metallic shielding of the cables block the electric field from the cables above the ground, but this shielding does not block the magnetic field from the cables.

ALTERNATING MAGNETIC FIELDS



STATIC MAGNETIC FIELDS

Figure B. Schematic comparison of AC and DC current flow and the resulting magnetic fields.

THE EFFECT OF DISTANCE ON MAGNETIC FIELDS

Both AC and DC technologies produce magnetic fields and both decrease with distance as you move away from the line or cable. See graph below:

AC LINES AND CABLES

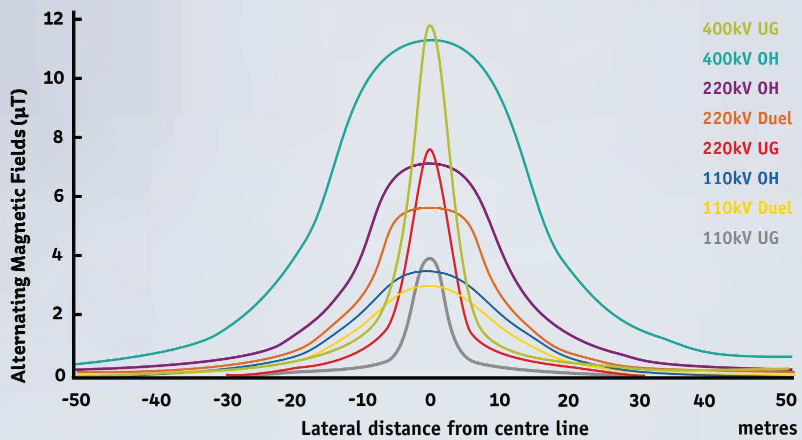


Figure C llustrates the magnetic field from overhead AC lines operating in Ireland. The field strength decreases with distance. The fields from these AC lines are far below the 1998 ICNIRP Guidelines for exposure to AC magnetic fields (100µT). In 2010 ICNIRP updated its ELF-EMF guidelines, which included the recommendation for a 200µT reference level for exposure for the general public, but these have not yet been adopted by the European Union.

WHAT DO HEALTH AND SCIENTIFIC AGENCIES SAY ABOUT RESEARCH ON AC MAGNETIC FIELDS AND HEALTH?

National and international health and scientific agencies have reviewed more than 35 years of research including thousands of studies.

None of these agencies has concluded that exposure to ELF-EMF from power lines or other electrical sources is a cause of any long-term adverse effects on human, plant, or animal health.
Agencies have recognised a statistical association between estimated higher long-term exposures to magnetic fields and childhood leukaemia in some epidemiological studies. However they have not been able to rule out the contribution of chance, selection bias and other factors to explain this association with reasonable confidence. Neither long-term studies of animals, nor studies of cellular mechanisms, have confirmed a biological basis for such an association. This explains why no health agency has concluded that there is a causal relationship between magnetic fields and health effects.

SCENIHR is the European Union's Scientific Committee on Emerging and Newly Identified Health Risks. The committee provides opinions on emerging or newly-identified health and environmental risks.

On 4 February 2014, SCENIHR published its "Preliminary opinion on Potential health effects of exposure to electromagnetic fields (EMF)". This is an update to its 2009 opinion.

The committee reported that new epidemiology studies do not shed light on a previously reported association with childhood leukaemia. Shortcomings in these studies, and a lack of experimental support from animal studies or cellular evidence prevent a causal interpretation of this statistical association.

Several recent epidemiology studies examined residential proximity to power lines and childhood leukaemia risk, but overall provided no new evidence for an association. In the largest study to date, Bunch et al. (2014) provided an extension and update to the 2005 study in the United Kingdom by Draper et al.

The authors extended the study period by 13 years (1962-2008), included lower voltage lines (132kV) in addition to 275/400kV lines, and included Scotland in addition to England and Wales in their analyses. Bunch et al. (2014) included over 53,000 childhood cancer cases and over 66,000 healthy control children and reported no overall association with residential proximity to 132kV, 275kV, and 400kV power lines for leukaemia or any other cancer among children.

The statistical association with distance that was reported in the earlier Draper et al. (2005) study was not apparent in this extended analysis.

No health agency has concluded that exposure to EMF from power lines and other electrical sources is a cause of any long-term adverse effects on human, plant, or animal health.

In 2007, the World Health Organisation updated the International Agency for Research on Cancer (IARC) report with the publication of its comprehensive review of ELF-EMF health research.[1]

The conclusions of the World Health Organisation report can be summarised as follows:

- The research does not establish that exposure to EMF of the nature associated with power lines causes or contributes to any disease or illness.
- There are no substantive health issues related to electric fields at levels generally encountered by members of the public.
- While epidemiology studies have reported a weak statistical association between childhood leukaemia and long-term exposures to magnetic fields greater than 0.3-0.4µT, this association is not supported by the laboratory studies and has not been considered a causal relationship.
- The animal studies as a whole do not show adverse effects, including cancer, among animals exposed to high levels of magnetic fields.
- The laboratory studies on cells and tissues have not confirmed any explanation as to how weak magnetic fields could cause disease.
- Because the epidemiology studies have limitations and the experimental studies provide little or no support for an association with cancer or mechanisms to cause cancer, the World Health Organisation did not conclude that magnetic fields cause childhood leukaemia. Thus, considering all of the research together, the reviewers for the World Health Organisation did not conclude that magnetic fields cause any long-term, adverse health effects.
- The view of the World Health Organisation on ELF-EMF and health issues provided on its website is "based on a recent in-depth review of scientific literature, [we conclude] that current evidence does not confirm the existence of any health consequences from exposure to low level electromagnetic fields".[2]

[1] http://www.who.int/peh-emf/publications/elf_ehc/en/index.html
[2] http://www.who.int/peh-emf/about/whatisemf/en/index.html

To date, the whole body of scientific research has not confirmed any adverse effect to human health from EMF.

Independent international health and scientific agencies are continuing to review and monitor the possibility of health effects from exposure to EMF. They are doing this not because they have identified a problem but to ensure that even the smallest possibility of a health risk has not been overlooked, given that everyone in the developed world is exposed to EMF.

The findings of these agencies carry considerable weight, as they reflect the judgements of groups of multiple scientists rather than the views of individuals.

The World Health Organisation stated that the scope of any actions we may take to reduce EMF exposure, either personally or as a society, should be proportional to the strength of the science. The actions to reduce exposure should be very low in cost and should not compromise the health, social and economic benefits of electricity to our society.

WHAT IS THE VIEW OF THE IRISH GOVERNMENT?

In March 2007, Ireland's Department of Communications, Marine and Natural Resources (DCMNR) assembled a panel of independent scientists to review EMF and radio frequency research. The conclusions are summarised in the document entitled "Health Effects of Electromagnetic Fields". The conclusions of this report were consistent with those of The International Agency for Research on Cancer (IARC), the World Health Organisation and other national and international agencies. In relation to EMF, the report states:

'No adverse health effects have been established below the limits suggested by international guidelines.'

In 1988 and 1992, The Department of Energy (Dr T. McManus) published comprehensive assessments of scientific research on electromagnetic fields. In summary of the views of the national and international organisations who have produced reports and addressed the issue, Dr. McManus concludes 'Without exception these reports and the position taken by the organisations concerned do not see enough evidence to be able to indict electromagnetic fields as a hazard to health'.

In 2011, Professor Denis O'Sullivan, Chief Scientific Advisor to the Irish Government published an updated review entitled 'A Review of Recent Investigations into the Possible Health Effects of Exposure to Electromagnetic Fields (EMF) from Power Lines'. In relation to possible long term health effects Professor O'Sullivan concludes that 'the lack of positive findings in controlled experiments or in studies on animals further weakens the belief that this association is in fact, a real one. Furthermore, there is no known biological explanation for the effect. It is simply not possible for the level of energies associated with power lines to cause cancer'.

WHAT IS THE VIEW OF THE EUROPEAN UNION?

In 1999, the Council of the European Union adopted a recommendation in relation to public and occupational exposure to EMF. This recommendation applies the exposure guidelines advocated in 1998 by the ICNIRP, to locations where people spend significant time.

The 1998 ICNIRP guidelines specify limits on exposure to EMF, which are called 'basic restrictions'. To make sure that these basic restriction limits are not exceeded, conservative measurable 'reference levels' for both electric and magnetic field exposure are provided. For the general public these reference levels at 50Hz are 5kV/M and 100µT.[3] If the EMF exposure level is less than the reference level, compliance with the basic restriction is assured. However, if exposure exceeds the reference level, the circumstances of the exposure need to be examined more closely to confirm compliance. However, even if the measured values exceed the relevant reference level, it does not necessarily follow that ICNIRP's basic restrictions for public EMF exposure will be exceeded. The circumstances of the exposure would need to be examined more closely by adopting the most up to date calculation methods available.

[3] In 2010 ICNIRP updated its ELF-EMF guidelines, which included the recommendation for a 200µT reference level for exposure for the general public, but these have not yet been adopted by the European Union.

ARE THERE ANY PRECAUTIONS THAT NEED TO BE TAKEN?

A 2007 Government report stated that, while there is limited scientific evidence of an association between ELF-EMF and childhood leukemia, considerable research carried out in laboratories does not support this possibility.

Nevertheless, the report recommended that the evidence should not be discounted and suggested no-cost, or lowcost, precautionary measures to lower people's exposure to ELF fields.

As a precautionary measure, it recommended that future power lines and power installations should be sited away from heavily populated areas. The report also noted that lowering international guideline limits as a precautionary measure is not recommended by the World Health Organisation.

These precautionary goals are achieved by routing transmission lines as far from existing residences as is reasonably possible, optimising the phasing of adjacent lines, and incorporating stakeholder input during the consultation process carried out in the development of new electricity infrastructure.

Source: Report from Expert Group on the Health Effects of Electromagnetic Fields for Department of Communications, Marine and Natural Resources, 2007.

DO POWER LINES AFFECT ANIMALS?

As with human health, some have expressed concern about the potential effects of EMF from high-voltage transmission lines on animal health, welfare, behaviour and productivity.

The potential effects from EMF on both economically important domesticated animal species and wildlife have been investigated since the 1970s. This has led to a good understanding of the potential means by which EMF could affect organisms in the vicinity of power lines.

Overall, the research does not show that EMF have adverse effects on the health, behaviour or productivity of animals, including livestock.

The substantial body of research on wild and domestic animals is informative for all large mammals and does not indicate any risk. Thus, there is no scientific basis in the research literature to conclude that the presence of a transmission line would create conditions that would impair the health of animals or would precipitate abnormal behaviour.

Studies on dairy cows, for example, failed to find any consistent variation in fertility, hormone levels, milk fat content or dry matter intake beyond what would be expected due to normal variation even when exposed to ELF-EMF far stronger than would occur from the Irish transmission system.

Other research on sheep has examined the effect of ELF-EMF on weight gain, wool production, behaviour, onset of puberty and immune function. None of the studies showed consistent or replicated evidence of adverse effects.

Crops, Plants and Trees

As scientific literature has accumulated, both from laboratory and field studies, on the potential effect of EMF from transmission lines on plants, including agricultural crops and trees, and forest and woodland vegetation, no adverse effects on plants have been reported from electric and magnetic field exposures at levels comparable to those near high-voltage transmission lines.

WHERE CAN I FIND MORE INFORMATION ON EMFS?

The following sources are recommended should you require more detailed information on EMFs.

- The World Health ORGANISATION – International EMF Project(2007)
  www.who.int/mediacentre/factsheets/fs322/en/index.html
- The European Health Risk Assessment Netw ork on Electromagnetic Fields Exposure (2010)
  http://efhran.polimi.it/docs/EFHRAN_D2_final.pdf
- Health Protection Agency
  www.hpa.org.uk/Topics/Radiation/UnderstandingRadiation/UnderstandingRadiationTopics/ElectromagneticFields/ElectricAndMagneticFields/HealthEffectsOfElectricAndMagneticFields/
- Department of Communications, Climate Action & Environment
  www.dccae.gov.ie
- European Commission
  http://ec.europa.eu/enterprise/sectors/electrical/documents/lvd/electromagnetic-fields/
- International Agency for Research on Cancer
  www.iarc.fr/en
- International Commission on Non-ionising Radiation Protection
  www.icnirp.de
- Scientific Committee of the European Commissions
  http://ec.europa.eu/health/scientific_committees/consultations/public_consultations/scenihr_consultation_19_en.htm

WHAT IS ESB'S POSITION AND COMMITMENT?

ESB's position on EMF and health is based on the authoritative conclusions and recommendations of established national and international health and scientific agencies which have reviewed the body of scientific research.

These agencies have consistently concluded that the research does not indicate that EMF cause any adverse health effects at the levels encountered in our everyday environment and that compliance with the existing ICNIRP standards provides sufficient public health protection.

ESB recognises that some individuals are concerned about issues regarding EMF and health. ESB is committed to addressing these concerns. By continuing to closely monitor engineering and scientific research in this area and provide information to the general public and to ESB staff on this issue.

ESB's policy in relation to this issue is as follows:

i. ESB shall apply all legal requirements relating to EMF in Ireland, Northern Ireland, UK and in other jurisdictions where local legislation does not set as high a standard.
ii. ESB shall design and operate generation, transmission and distribution networks and telecommunications infrastructure in compliance with legislation and with due regard to the latest recommendations and guidance of leading international experts and independent bodies on EMF.
iii. ESB shall closely monitor and support engineering / scientific research on EMF.
iv. ESB shall comply with the requirements of 1999/519/EC regarding the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz).
v. ESB shall provide information for the public on its website about the hazards and risks associated with EMF arising out of ESB equipment and/or premises.

AC ELECTRIC FIELDS

Graph 1. The graphic shows some examples of different sources of electric fields and how they compare to typical electric fields associated with overhead electricity lines that make up part of the electricity grid in Ireland.

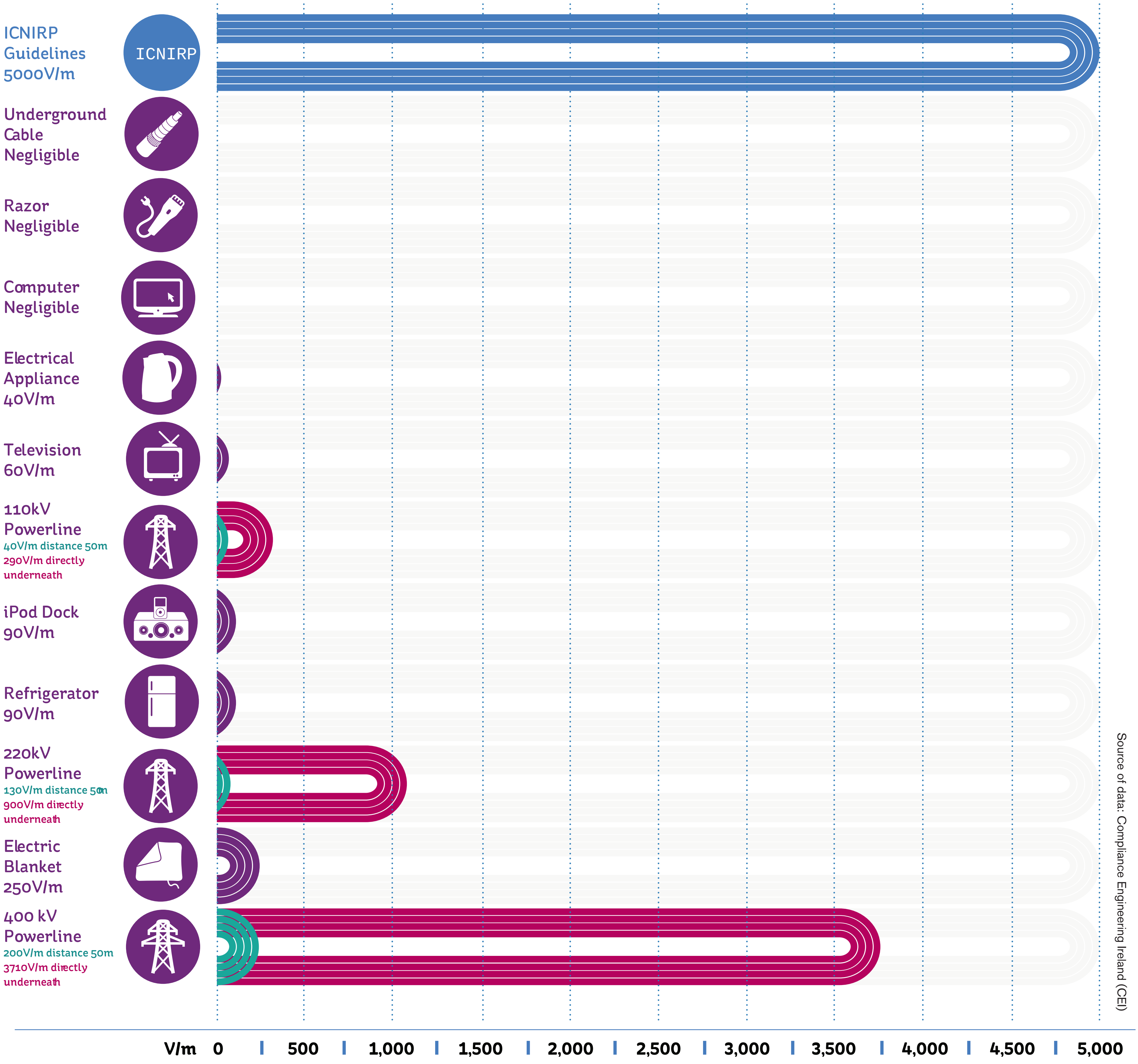
The graph also references the ICNIRP guidelines for exposure to electric fields set to ensure public health and safety.

The International Commission on Non-Ionising Radiation Protection (ICNIRP) was established in 1992.

This independent scientific commission was established to advance non-ionising radiation protection for the benefit of people and the environment. It provides science-based guidance and recommendations including independent international guidelines and recommended limits of exposure. ICNIRP is formally recognised by the World Health Organisation and the European Union as the non-governmental standard setting body for EMF.

This provides an indication of approximate fields from lines and appliances.

COMPARISON OF AC ELECTRIC FIELDS FROM COMMON SOURCES



5kV/m is a reference value, 9.2KV/m is maximum allowable electric field as per the ICNIRP recommendations (using the Dimbylow calculations).

AC MAGNETIC FIELDS

Graph 2. The graphic opposite shows some examples of different sources of magnetic fields and how magnetic field levels from these sources compare to typical magnetic field levels from electricity lines or cables that make up part of the electricity grid in Ireland.

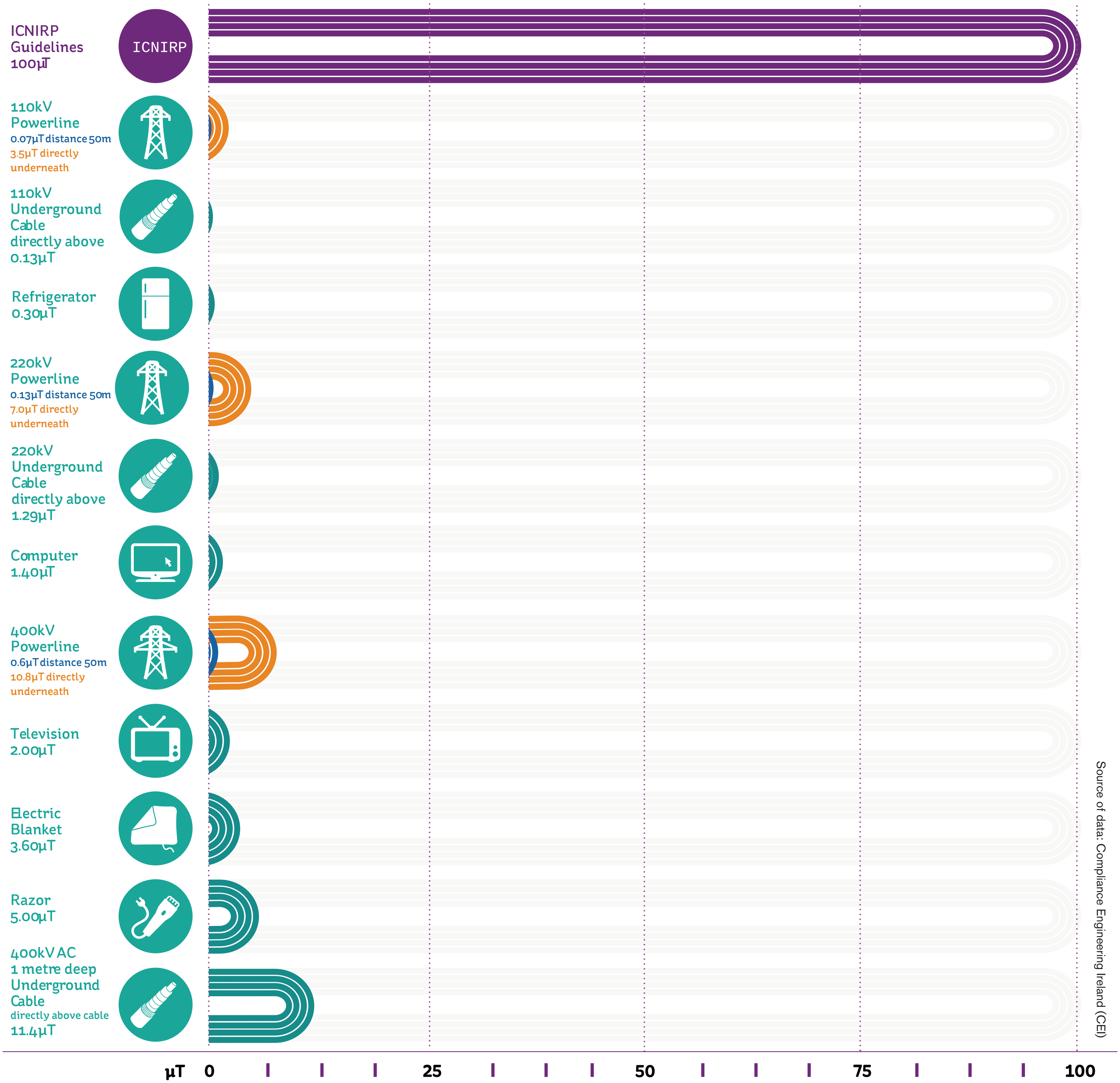
The graph also references the ICNIRP guidelines for exposure to magnetic fields set to ensure public health and safety.

The International Commission on Non-Ionising Radiation Protection (ICNIRP) was established in 1992.

This independent scientific commission was established to advance non-ionising radiation protection for the benefit of people and the environment. It provides science-based guidance and recommendations including independent international guidelines and recommended limits of exposure. ICNIRP is formally recognised by the World Health Organisation and the European Union as the non-governmental standard setting body for EMF.

This graphic provides an indication of approximate fields from lines and appliances.

COMPARISON OF DIFFERENT SOURCES OF AC MAGNETIC FIELDS (μT)



GLOSSARY

AC (ALTERN ATING CURRENT)
Electricity that changes direction at regular intervals is described as AC electricity. AC is the form in which electricity is delivered to our homes and businesses. This is the type of electricity used mainly on the Irish transmission system and in every other system in the world.

CARCINOGENIC
Any substance or agent, including ionising radiation, that causes cancer.

CONDUCTOR
An object or material that can carry electricity, like the power cables used in an overhead line.

CURRENT
The movement of an electrical charge similar to the rate of fluid flow in a pipeline.

DC (DIRECT CURRENT)
Electricity that flows in one direction only, like the battery in your car.

ELECTRIC FIELD
An electric field is created by the difference in electric potential (voltage) between the conductors in power cables. The strength of an electric field is expressed in units of volts per meter (V/m). Higher voltage sources produce higher electric fields.

ELECTROMAGNETIC FIELD
The term electromagnetic field is frequently used to refer to electromagnetic energy across a wide frequency spectrum ranging from the earth's natural fields to cosmic radiation.
Sometimes it refers to frequencies above about 100 kHz where electric and magnetic fields are coupled and radiate away from sources.

ELF (EXTREMELY LOW FREQUENCY)
Frequencies found at the end of the electromagnetic spectrum that contain very little energy and cannot directly break molecules apart, ie., non-ionising. 50Hz electric power operates at ELF levels.

FREQUENCY
AC Electricity is transmitted in waves. The number of times the wave repeats itself in a second is the frequency and is measured in Hertz. On the Irish transmission system, AC electricity is transmitted at 50Hz.

INDUCED CURRENT
A flow of electric current in an object created by the proximity to an AC power source.

IONISING RADIATI ON
Radiation, such as X-rays, which has sufficient energy to break molecular chemical and electrical bonds.

MAGNETIC FIELD
Created by the movement of electric charges. Magnetic fields surround magnetic materials and electric currents. In magnetic materials and permanent magnets, the field is created by the coordinated spins of electrons and nuclei within iron atoms. The magnitude of the magnetic field is expressed as magnetic flux density, also referred to as magnetic field strength. Measured in Tesla (for large fields) or μT (for small fields).

MOLECULE
The smallest particle of a substance that retains the properties of that substance.

NON-IONISING RADIATION
Electromagnetic fields at frequencies that do not have enough energy to disrupt atoms or molecules.

RADIATION
Any of a variety of forms of energy propagated through space.

VOLTAGE
Voltage is the difference in electric potential between any two conductors of a circuit. It is the electric 'pressure' that exists between two points and is capable of producing the flow of current through an electrical conductor. Voltage in a power line is comparable to pressure on a pipeline.

APPENDIX 5.3

HOUSE PRICES STUDY – CXC SCOTLAND 2016

Impact of wind turbines on house prices in Scotland

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With research assistance from Dr Ellie Bates[4] and Dr Tim Birabi[2]

October 2016

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Summary

This report presents the main findings of a research project estimating the impact on house prices from wind farm developments. It is based on analysis of over 500,000 property sales in Scotland between 1990 and 2014.

The methodology builds on research on the impact from wind farms on house prices in England (Gibbons 2014). This study improves the way the impact is estimated by looking at the impact of both single turbines and whole wind farms.

To control for the normal fluctuations in house prices we used a 'control group' that closely resembles the characteristics of the dwellings in the study but without being exposed to a wind farm. This provides prices that can be used to interpret a wind farm's impact on the price of dwellings nearby. As such a result showing no effect means that the house price of the property with a wind farm close by has increased or decreased at the same rate as the properties in the control group.

The study looked at both natural landscape and built environment in relation to how exposed a dwelling is to the visual impact of the wind farm.

Key findings

1. **No evidence of a consistent negative effect on house prices:** Across a very wide range of analyses, including results that replicate and improve on the approach used by Gibbons (2014), we do not find a consistent negative effect of wind turbines or wind farms when averaging across the entire sample of Scottish wind turbines and their surrounding houses. Most results either show no significant effect on the change in price of properties within 2km or 3km, or find the effect to be positive.

2. **Results vary across areas:** The results vary across different regions of Scotland. Our data do not provide sufficient information to enable us to rigorously measure and test the underlying causes of these differences, which may be interconnected and complex.

Our results persist under a variety of assumptions:

- whether or not we account for the visibility of turbines;
- whether we base the analysis on individual turbines or entire wind farms;
- whether we account for building heights or use only the natural terrain when estimating turbine visibility; and
- whether we follow individual dwellings over time or use postcode averages.

The complexity of the findings may be due to:

- attitudes towards wind farms and their benefits potentially varying across regions and different social and economic groups;
- Scotland having a higher proportion of its turbines located in remote areas; and
- the fact that some wind farms provide economic or leisure benefits (e.g. community funds or increasing access to rural landscapes through providing tracks for cycling, walking or horse riding).

Additionally these factors are not mutually exclusive. It is likely that they affect house prices simultaneously, and to varying degrees in different locations.

Contents

Introduction and background

The Scottish Government has committed to a target for renewables to generate the equivalent of 100% of Scotland's electricity demand by 2020[5]. Onshore wind power is playing a central part in decarbonising Scotland's energy supply.

The rapid growth in onshore wind (both in Scotland and globally) has been accompanied by an interest in understanding the impacts of onshore wind development, both positive and negative. The overall economic benefits of investment and spending are relatively straightforward to measure[6]; impacts on communities less so. Survey-based approaches consistently show a majority in favour of renewable power generation in principle but paint a more mixed picture for those directly affected by nearby wind farm development[7].

There is now a substantial body of research on the local impacts of wind farms. Some of this research has looked at measurable effects on house price in order to understand the objective effects on communities, beyond stated views. Have properties near to, or in sight of, new wind farm developments seen price changes that differ from other houses? Until recently, all extant studies had consistently found no robust evidence of any such price impact. One of the most recent studies, by RenewableUK and the Centre for Economics and Business Research, used seven wind farm case studies across England and Wales, and came to the same conclusion: either no impact or even a slight positive one[8].

Very shortly after that study, however, Steve Gibbons looked again at English and Welsh wind farms using a larger data-set and property prices between 2000 and 2012, and found evidence for negative price impacts[9]. In Gibbons' analysis of previous house price studies[10], the key problem he identifies is sample size: while some studies contain many properties, the number of observations actually used to estimate the price impact tends to be too low to be statistically reliable. Many also do not compare price changes across time. Gibbons' research design allows for comparison of much larger groups of property prices before and after wind farms became operational, allowing for more robust results.

The present study bases its price impact analysis on Gibbons' approach, including his use of a landscape analysis to determine whether properties can likely see a turbine[11], or whether line of sight is blocked. Line of sight analysis allows us to test whether visibility of turbines affects house prices differently to proximity alone, by separating visible and non-visible turbines into two groups. We have also explored ways of improving on Gibbons' approach, greatly increasing the resolution and precision of the data. These improvements are listed below:

1. Whilst we replicate Gibbons' approach using average house price per postcode and postcode-centre for housing location, we also repeat the analysis using individual property prices based on full address locations.
2. We use a dataset of wind turbines that includes their exact location and tip height, rather than the centre-point of wind farms. Relying on the centre-point of wind farms might be particularly problematic in a Scottish context where some wind farms are very spread out. When turbines are dispersed in this way, it is possible for a house to be a very long way from the centre of the wind farm, but very close to a peripheral turbine.
3. Our landscape analysis uses 5 metre grid squares (versus 200 metre in Gibbons). Combined with the exact property locations and turbine locations, this gives much more accurate lines of sight.

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5 2020 Routemap For Renewable Energy In Scotland – Update, 2015, http://www.gov.scot/Resource/0048/00485407.pdf
6 RenewableUK, 'Onshore Wind: Direct and Wider Economic Benefits', 2015, http://www.renewableuk.com/en/publications/index.cfm/BiGGAR.
7 See e.g. Christopher R. Jones and J. Richard Eiser, 'Understanding "Local" Opposition to Wind Development in the UK: How Big Is a Backyard?', *Energy Policy* 38, no. 6 (2010): 3106–17.
8 RenewableUK, 'The Effect of Wind Farms on House Prices', 2014, http://ruk.pixl8-hosting.co.uk/en/publications/index.cfm/RenewableUK-Cebr-Study-The-effect-of-wind-farms-on-house-prices.
9 Stephen Gibbons, 'Gone with the Wind: Valuing the Visual Impacts of Wind Turbines through House Prices', *Journal of Environmental Economics and Management* 72 (July 2015): 177–96, doi:10.1016/j.jeem.2015.04.006.
10 Ibid. p.179
11 Why 'likely'? - The real landscape may differ in ways the model has not captured - for example, vegetation may be blocking a view.

4. Taking advantage of this higher resolution, we have also added building height data (where available) to test whether buildings may block a property's view.

The following section describes the data used in more detail, and then explains the two key steps in producing the analysis: the line of sight analysis and the econometric house price analysis. The full results are then presented, before concluding with some possible explanations for the findings.

Details of the house price impact analysis

Overview of the data and method

In this section, we outline the data sources for the project and explain how they were used to produce the house price impact analysis. The following four sub-sections describe the **four sources of data** used:

1. House price data for Scotland from January 1990 to March 2014.
2. Wind turbines that became operational between November 1995 and December 2014.
3. Digital Elevation Model (DEM) data for the Scottish landscape, giving height above sea-level for 5-metre grid squares covering the whole of Scotland.
4. Building height data, added to the DEM data.

We shall then detail the two steps of data preparation and analysis. The first step was to carry out a line of sight analysis identifying which houses could most likely see at least one turbine. This provided full details for each house of the number of visible turbines and their distance. The second step was to use this information, along with property price change over time (and a number of other control variables; see below), to produce the final house price impact analysis.

House price data

Data for property prices in Scotland comes from two previously unlinked versions of price data from Registers of Scotland (RoS). By linking these, the house price record covers just over 23 years (1990 to March 2014). While RoS record every Scottish sale, the analysis here drops any sales that, for a number of reasons, were not suitable. For example, not all properties could be exactly geocoded because the RoS record contained insufficient address information to obtain a location match and had to be excluded.

Only repeat sales (properties that sold more than once within the time period of the data) were used in the house price analysis. Following properties over time in this way helps us to compare like with like when estimating the house price impact of turbines being constructed. One limitation of this repeat sales approach is that we do not know whether there have been major changes to the dwelling over time. However, provided changes to dwellings are fairly randomly distributed across all dwellings in the data, this should not have a big effect on the results. In total, the RoS data provided 637,000 repeat-sale properties, accounting for just over 1.7 million sales.

Following Gibbons, we restricted the properties used in the analysis to those within 15km of at least one turbine (i.e. within the green circles in Figure 2). This is done, as Gibbons says, because "as the distance to the wind farm increases, the number of other potential coincident and confounding factors increases, making any attempt to identify wind farm impacts less credible"[12]. This reduces the total number of properties in the analysis to 509,275.

Wind turbines

Three sources have been combined to produce the wind turbine dataset:

1. Precise wind turbine locations were acquired from Ordnance Survey's "Points of interest" (POI) data, freely available through an academic license[13]. Its latest incarnation (as of late 2015) is much more comprehensive than previous versions. This data is collated for Ordnance Survey by PointX (www.pointx.co.uk). The POI turbine data itself is mainly supplied to Ordnance Survey by RenewableUK.
2. Dates that wind farms became operational were 'scraped' from RenewableUK's website (www.renewableuk.com) and then matched to turbines.

[12] Gibbons, 'Gone with the Wind'. p.180

[13] Code and guidance for extracting specific types of POI data are accessible at the Sheffield Methods Institute github page: github.com/SheffieldMethodsInstitute/windfarmsHousePrices

3. Turbine tip height information was collated through direct research of planning applications and other publicly available sources[14].

Figure 1 shows the cumulative rise in the number of turbines becoming operational in Scotland from 1995 onwards; the total reaches just over 2,500 turbines by the end of 2014.

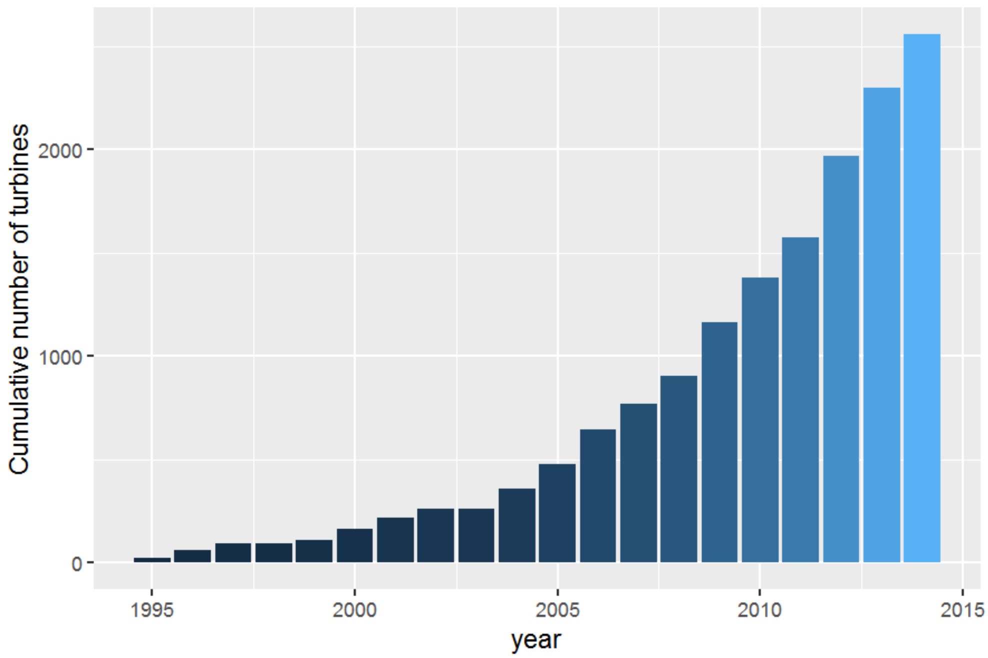

Figure 1: Number of operational wind turbines in Scotland, cumulative from 1995 to 2014

Landscape and building height data

To determine whether a turbine is likely to be viewable from a particular property, we need to know if any landscape features intervene to block the view. This requires using a 3D 'Digital Elevation Model' (DEM) of the Scottish terrain, onto which houses and turbines can be added. We use Ordnance Survey's "OS Terrain 5" DEM, which provides height above sea level for every 5-by-5 metre grid point.

The OS Terrain 5 data can be used to identify which houses have their lines of sight blocked by the physical landscape, but this does not account for the effect of other buildings. To correct for this, we also use building height data for the majority of properties in Scotland, combining Ordnance Survey's Mastermap with LIDAR data from the Centre for Environmental Data Analysis (CEDA). The OS Terrain 5 DEM data's 5 metre resolution is fine enough to allow addition of building footprints and heights derived from the Mastermap and CEDA data.

On the map of Scotland in Figure 2, areas for which we used building data are shown with the yellow (Mastermap) and red (CEDA) grid areas. Where both sources covered the same area, we used the slightly better quality Mastermap data. These two sources do not cover all buildings in Scotland, but because data exists for all the larger conurbations, 84% percent of properties have a line of sight that crosses building height data and so could potentially have that view blocked. Calculations are run both with and without building heights for comparison, with the latter using the 84% subset of houses that may have had a line of sight blocked by a building.

[14] The majority of the work tracking down tip heights was done by Dr Ellie Bates, University of Edinburgh.

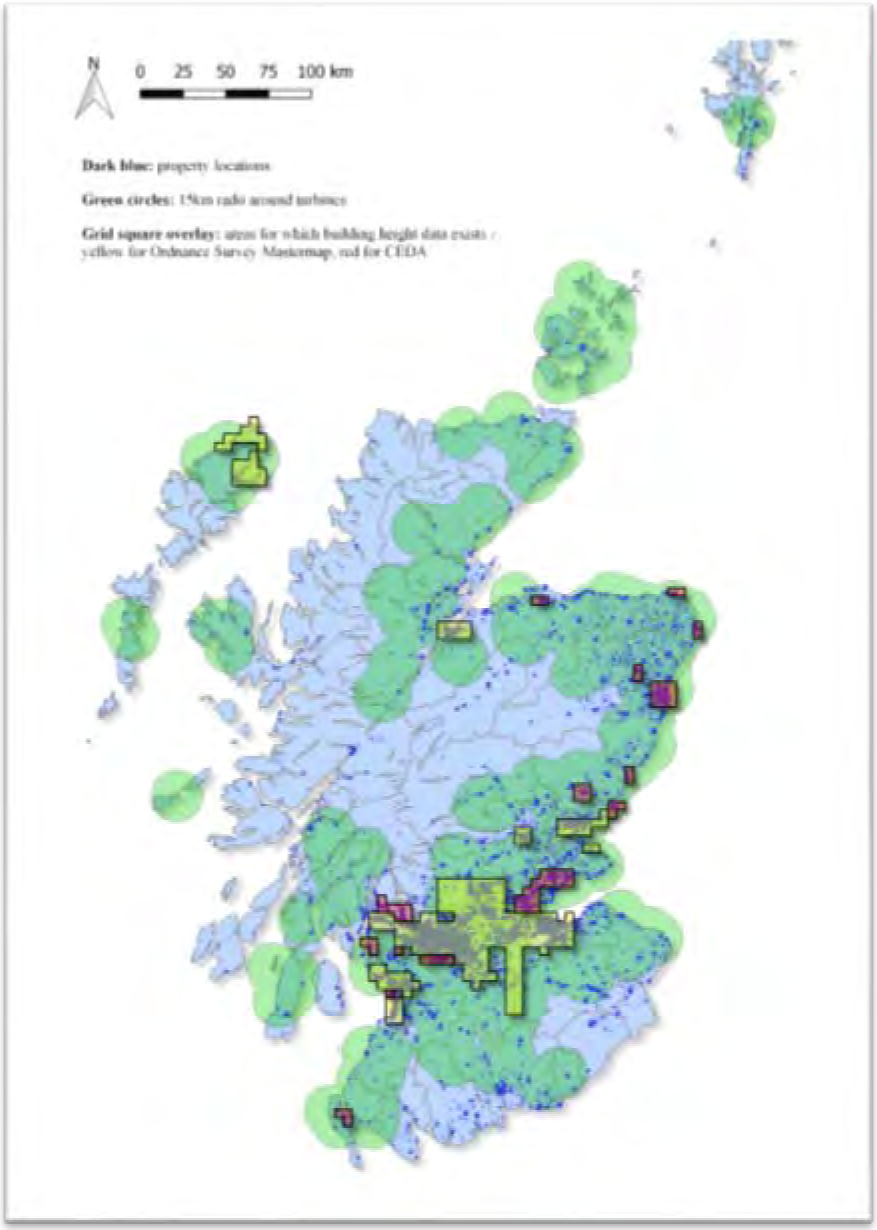

Figure 2: Scotland - housing data location (dark blue), turbine 15km radii and building height data location

Analysis step 1: Which houses can likely see turbines? 'Line of sight' analysis

The econometric analysis requires the following information for each repeat-sale property:

- Which turbines, if any, are within 15km?
- How close is each of them to the property?
- Of those turbines within this 15km range, which are visible to this property and which likely cannot be seen?

We used Pythagoras' Theorem to compute distances between each dwelling and turbine. To estimate turbine visibility, we used 'line of sight' analysis (also known as "intervisibility" analysis)[15]. Figure 3 and Figure 4 illustrate how this process is carried out using the example of a particular property in Glasgow that has its line of sight blocked by another building. 136 batches of housing, turbine and landscape data are processed - these figures use a batch covering the Cathkin Braes wind turbine, installed in 2013[16]. (Other batches process larger groups of turbines together, e.g. the Whitelee wind farm to south of Glasgow in Figure 3 is processed in one batch.)

The dotted line on the map of Glasgow in Figure 3 marks an 8.7km line of sight between this example property and the Cathkin Braes turbine. Figure 4 gives the landscape cross-section for this same line (with horizontal distance at 1/8th scale, relative to height), showing how the DEM landscape data - both with and without building heights - is used. The line starts two metres above ground level on the site of the house[17] and 'looks' towards the turbine blade tip height. If the highest point of the tip is visible above landscape and buildings, the line of sight is clear. In this example, for landscape alone, the house (left-hand side of graph) has a clear line of sight. If building heights are used, however (green in Figure 4), line of sight is blocked.

This process was repeated for all properties. The addition of building height data blocked a great many more from view of a turbine. Without building heights, 80% of properties within 15km of a turbine are identified as having a line of sight to at least one. This drops to 32% when building heights are used - an unsurprising result given how many properties are located in conurbations. Note that this binary visibility result says nothing about a turbine's actual visual impact which will depend on proximity. For example, a visible turbine will presumably have a much bigger visual impact when viewed from nearby properties compared with the view from houses 15km away. As Gibbons says:

> "Existing literature based on fieldwork suggests that large turbines are potentially perceptible up to 20km or more in good visibility conditions, but 10 to 15km is more typical for a casual observer and details of individual turbines are lost by 8km."[18]

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[15] Code and guidance for this is available at the Sheffield Methods Insitute github page: github.com/SheffieldMethodsInstitute/windfarmsHousePrices

[16] See e.g. "£5m city turbine will be visible around world (From Evening Times)." 2013. www.eveningtimes.co.uk/news/13256714.__5m_city_turbine_will_be_visible_around_world

[17] The building data for the house is discounted: for the building height check, line of sight is only checked once the line has got past the building's edge.

[18] Gibbons p.180

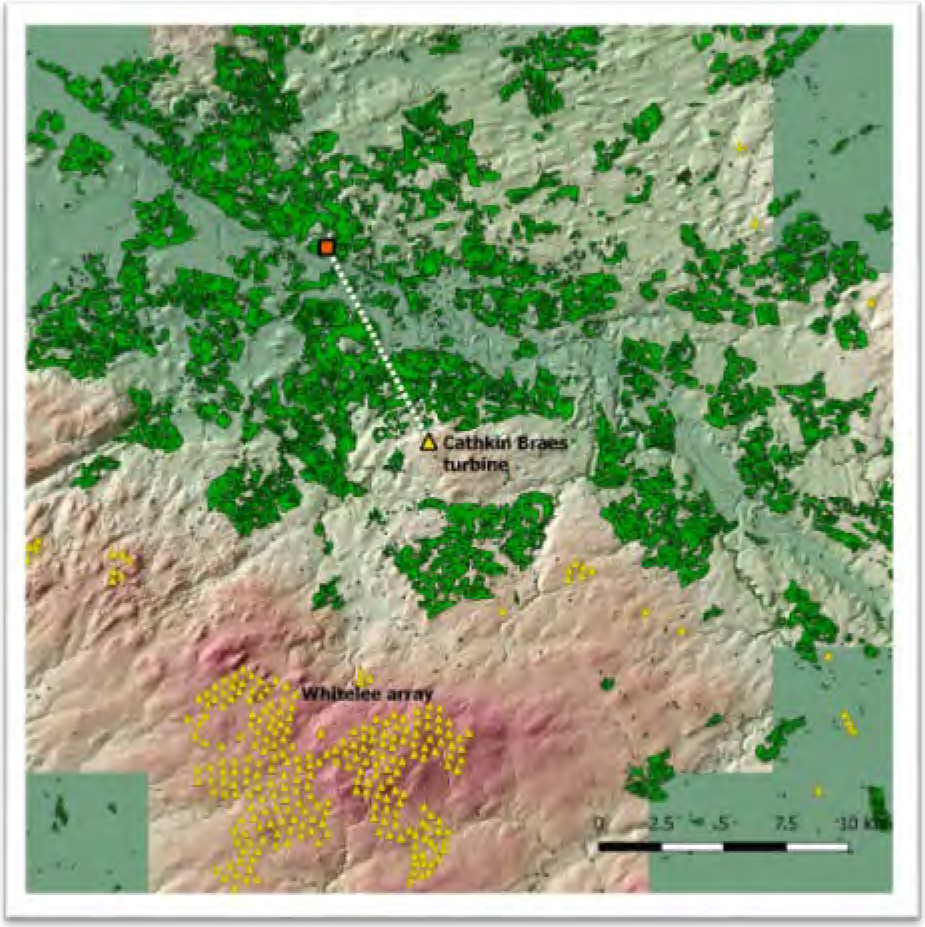

Figure 3: Digital Elevation Model for Glasgow area. Repeat-sales properties in green. Wind turbines are yellow triangles. Dotted line is an example line of sight (matches figure below) for a sample Glasgow property to Cathkin Braes turbine tip.

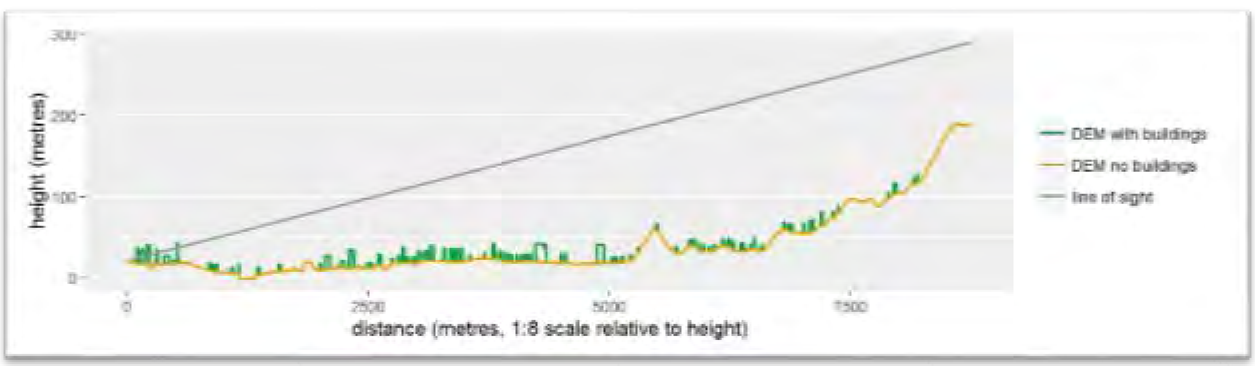

Figure 4: example line of sight blocked by buildings that would not be blocked by landscape alone. Matches dotted line in above figure. Property on left, Cathkin Braes turbine tip on right. Note horizontal distance is 1/8 of actual scale, relative to height.

Analysis step 2: house price impact using ‘difference in differences’

The aim of the econometric analysis described in this section is to assess the house price impact as distance increases, both for visible and non-visible turbines and wind farms.

We use a "difference in differences" approach to identify the causal effect of wind turbine proximity and visibility. This approach seeks to estimate how rates of change in house prices differ between properties "exposed" to wind turbines (through proximity and/or visibility) compared with those that are not exposed. We use only `repeat sale' properties, as described above. We label properties exposed to wind turbines - those we want to identify any price impact for - as the "treatment group".

To measure the causal effect of wind turbine exposure, we would ideally like to know how the same dwelling’s change in price over time is affected by the presence or absence of a wind farm. Clearly, observing both states at the same time is not possible. Instead, we construct a “control group” that closely resembles the characteristics of the treatment group but has not been exposed to a wind farm. The control group thus provides us with a counterfactual dwelling price, which we interpret as what the price would have been if the treatment group had not been in proximity to, or in sight of, wind turbines. This setup allows us to compare the average change in ‘exposed’ dwellings’ house price to the average change in ‘unexposed’ dwellings’ house price before and after turbines become operational - a so called *difference-in-differences* framework.

The first difference is how much the treatment and control groups change price between the chosen time periods. The second difference is how these two changes compare. This second difference is labelled the “treatment effect”, i.e. the causal impact of wind farm developments on house price growth. If we were to produce the same findings as Gibbons, with the treatment group's price increasing **less** than the control group, then the impact of wind turbines on house price growth would be negative. For example, if we find a house price impact of -10%, this means that prices in the treatment group went up by 10% less than they did in the control group. On the other hand, if we find a positive effect, say 10%, this means that prices in the treatment group went up by 10% more than in the control group.

Note that a key assumption in the difference-in-differences framework is that the treatment and control groups show the same trends in house price growth in the pre-treatment period (the 'common trends assumption'), which means that they are subject to the same influences on price before the turbine is installed.

For all results, we repeated our difference-in-differences analysis using a large variety of additional controls that control for possible unobserved factors. This is the same as the “fixed effects” approach used by Gibbons (2014). The essential principle of a fixed effects approach is to allow fixed (i.e. constant over time) differences in subsets of the data to be accounted for. Including fixed effects allows the analysis to control for factors that we cannot easily measure (such as cultural differences or unknown economic, political or physical factors) but are likely to be fairly constant over time and may cause different price trends. The most intuitive fixed effects are regional. For example, there might be different house price trends across NUTS2 regions because of differences in the fixed characteristics across regions, such as their physical geography. These differences can be controlled for using fixed effects even if we do not have detailed data on the different underlying characteristics. This may be important if wind farms are sited taking these features into account.

All of the results presented in this report include basic fixed effects that control for variations in overall house price trends and differences in property characteristics. We use annual and quarterly fixed-effect controls to flexibly account for house price trends. Since we are looking at repeat sales, our estimations further include a set of house fixed effects - allowing each property its own trend line - that absorb any time-invariant house characteristics such as its footprint size or number of bedrooms. These are the "basic" controls used in all the results reported here.

We then add a number of additional controls to the models in order to test sensitivity. First, a number of geographic controls are added, allowing different house price effects over time by including fixed effects for slope (for each individual property), elevation (height above sea level for each property) and aspect (which compass direction the property's slope is facing, indicating which direction their predominant view is likely to be). Second, we add controls for different price effects across distance rings. These controls are in line with the ones used by Gibbons (2014). In addition, we allow house prices to differ between Scotland's four NUTS2 regions and include a set of region-by-year interactions. These additional fixed effects results are provided in the appendices.

Results

We present three sets of results. We start with the Gibbons (2014) approach, which is based on postcode averages for house prices and computes proximity and visibility using the centre point of entire wind farms (rather than individual turbines). We then compare these baseline results with outputs based on more fine-grained analysis that follows individual dwellings over time and calculates turbine proximity and visibility based on individual wind turbines. This is done both for visibility based just on terrain, and also visibility that also accounts for any buildings that may block the view.

Result #1: Analysis based on Postcode Averages & Wind Farm Centre Points ('centroids') (Gibbons)

Figure 5 shows the percentage impact on house price growth of a dwelling close to a wind farm being able to see the wind farm (blue line) compared with not being able to see the wind farm (red line). The approach used to derive this first set of results is similar to Gibbons (2014). They are based on:

- the change in average house prices in a given postcode before and after a wind farm became operational (rather than individual dwellings); and
- the effect of entire wind farms (rather than individual turbines).

Compared to the individual-property-level repeat sales analysis, one may think of this as a repeat sales estimation at the postcode level. However, instead of looking at the same house selling multiple times, we now look at multiple transactions in the same postcode. The implicit assumption is that houses within the same postcode unit are very similar and could be used interchangeably.

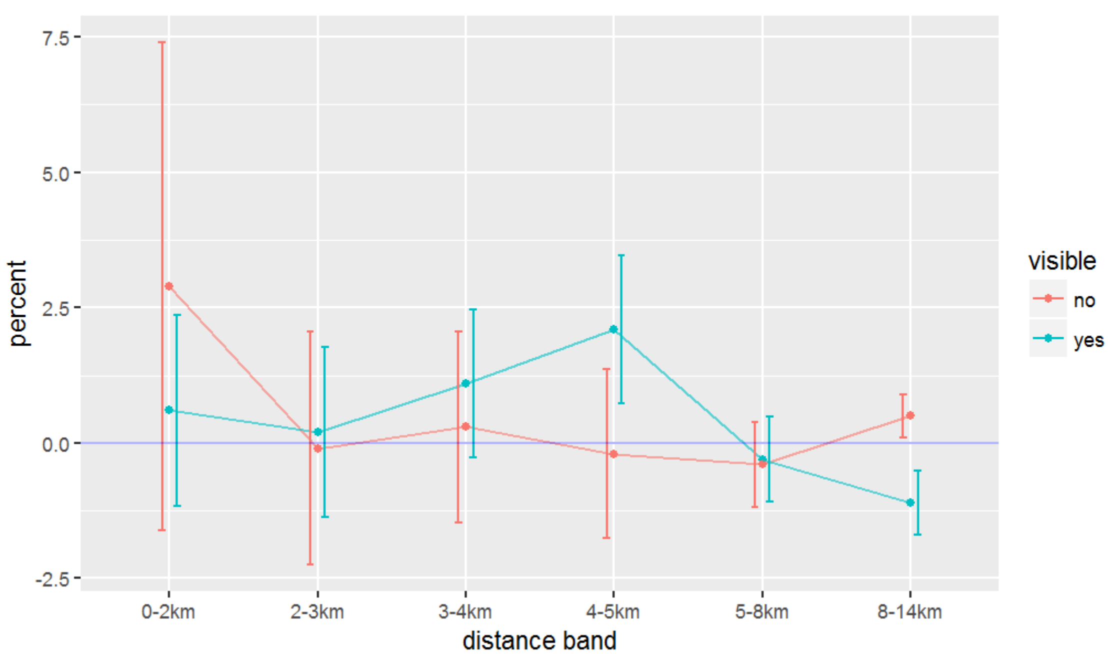

Figure 5: Result #1: Percent difference in the change of house price

(Postcode/wind farm centroids[19], **whole wind farm** visible/not visible.)

The horizontal axis shows the distance between the postcode of dwellings and the centre of the wind farm. These distances are grouped into 6 bands: (i) 0-2km, (ii) 2-3km, (iii) 3-4km, (iv) 4-5km, (v) 5-8km, and (vi) 8-14km. The vertical bars show the confidence intervals for each estimate. If the confidence interval is narrow, depicted by a short vertical bar, it means the estimate is precise. The longer the bar, the wider the confidence interval,[20] and the less precise the estimate is. If this vertical bar is entirely above zero, it means the result suggests a significant[21] positive effect on house price change caused by the construction of the wind farm. If the vertical bar lies entirely below zero, it means that the effect is significantly negative. If the vertical bar extends above and below zero, as is the case for most of the estimates in Figure 5, it means that there is no significant effect, either positive or negative. In other words, we cannot rule out a zero effect at the 95% confidence level.

A zero effect does not mean that house price growth has flat-lined. Rather it means that the treatment group (those properties that are in close proximity to a wind turbine) have a similar house price growth trajectory as the control group (those properties that are not in close proximity to a wind turbine).

The results in Figure 5 suggest that visible turbines have a positive effect on house prices (the blue line is above zero for the first four distance bands). However, the majority of confidence intervals extend above and below zero. This suggests that there is no significant house price effect in the first three distance bands, but a possible slight positive effect for visible turbines in the 4-5km band, dropping to a negative effect in the 8-14km band.

As discussed above, we repeated our analysis using a large variety of different specifications that control for a variety of possible unobserved factors using the same “fixed effects” approach used by Gibbons (2014). The results of the key variations from this exercise are presented in Figure A1 in the appendix, where Figure 5 is replicated in Figure A1(A) for comparison. We can see that the results are broadly consistent with Figure 5 in that none of the graphs show significant negative impacts of wind turbines on house price growth in the first three distance bands. Some graphs do, however, suggest a significant **positive** impact on house price growth, particularly in the second distance band (2-3 km), and particularly for visible turbines (see graphs (B), (C), (D), (F), and (H) of Figure A1). A more detailed description of the results in Figure A1 is presented in the Appendix.

Result #2: Analysis based on Repeat Sales & Individual Turbines

Figure 6 shows results based on the repeat sales of individual properties and the impact on house price growth after individual turbines become operational[22]. Here we see a significant positive impact on house price growth in the first distance band (1-2km) for properties that cannot see any turbines, but this effect is much smaller and statistically insignificant for properties in the same distance band that can see turbines. Note that the positive effect on properties, for which turbines are visible, becomes statistically significant in the second, third and fourth distance bands. The two furthest distance bands, however, do indicate negative price impacts. Though these results are mixed, as confidence intervals for visible/not visible turbines cross or touch the zero line.

Results of the sensitivity analysis—comparison with a variety of different fixed effects—are presented in Figure A2 in the appendix. Again, these different versions of the results tell a similar story with the positive impact on house price growth

[19] Centroid means centre point of an aerial unit (e.g. postcode) or multiple points.
[20] Based on the 95% level of confidence, which is the standard threshold used in statistical studies.
[21] Statistical "significance", in this context, means that there is less than a 5% chance that an estimated negative or positive house price impact is purely due to random variation in the data.
[22] Again, this is replicated in the appendix, figure A2(A).

tending to diminish with distance for properties that cannot see turbines, but rising then falling with distance for properties that can see turbines.

Crucially, there are no consistent signs of negative impacts on house price growth in the first three distance bands. In these results, the negative signal in the furthest two bands is again mixed, with no completely consistent pattern either side of zero.

Note that at shorter distances, confidence intervals tend to be larger. This is unsurprising, as sample sizes at shorter distances are smaller (there are not many houses very close to turbines) and so there will necessarily be more uncertainty in our estimates at close distances.

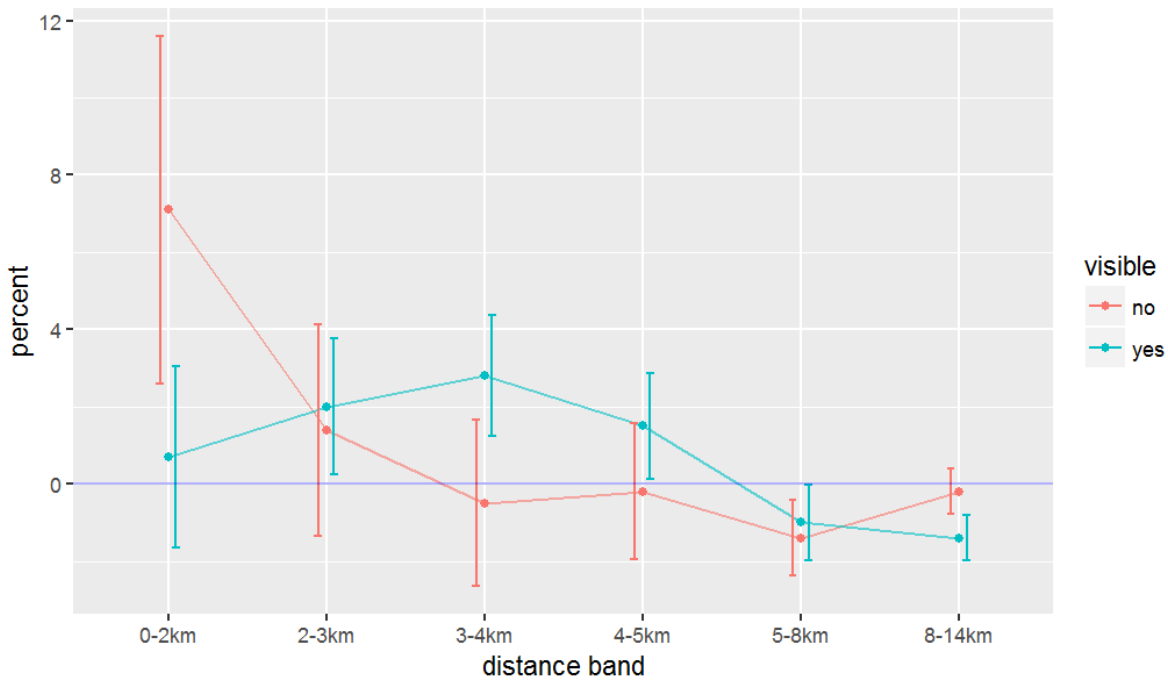

Figure 6: Result #2: Percent difference in the change of house price

(All repeat sales, turbine visible / not visible)

Results for individual repeat sales properties (Figure A2, appendix) show much the same pattern, but with larger percentage effects. The larger non-visible turbine effects at very close distance do, again, have large confidence intervals - but these do not cross the zero line. For both the centroid and repeat-sales results, any impact on house price growth tends to drop off as distances increase, though there is a great deal of variability in this response.

Repeat-sales results take advantage of having individual turbine data to distinguish between responses to turbines over and under 100 metres to tip height (appendix, figures A2(E) and A2(F); A3(E) and A3(F)). Sub-100 metre turbines are associated with consistent negative house price impacts, if they can be seen - but, again, confidence intervals cross the zero line. This is not the case for those out of sight, however.

Turbines over 100 metres in height are very similar to the main results - with perhaps a more clear decay of positive effect over distance for non-visible turbines. It is worth noting that: (a) Aberdeenshire has a large proportion of the sub-100 metre turbines and (b) most of the above 100 metre turbines were built after 2006, so this difference in response could be rooted in these different times and places.

Result #3: Analysis based on Repeat Sales & Individual Turbines, Taking into Account Building Heights

One disadvantage with both Result #1 (the Gibbons approach) and Result #2 (the individual houses/turbines approach) is that the visibility estimates do not take into account the possibility of buildings (as opposed to natural features) blocking the line of sight to turbines and wind farms.

Figure 7 shows the results of an analysis based on the repeat sales of individual properties and the impact on house price change after individual turbines become operational taking into account the height of buildings that might block the view of turbines. (Again, the appendix shows the results of the sensitivity analysis for these results in Figure A3). While the main findings remain similar to Results #1 and #2 in that there are no consistent signs of negative house price effects in the first three distance bands, it is clear that the estimates of impacts of visible and non-visible turbines on house price changes appear to be much closer in Result #3. Looking across all the results in Appendix figure A3, for both visible and non-visible turbines, the impact on house price growth seems to be more positive in the second distance band (2-3km) than in the closest distance band (0-2km), but then declines in distance bands three and four. As with the previous result, there appear to be negative price impacts in the last two distance bands, particularly for visible turbines, but these results are less consistent in the sensitivity analysis.

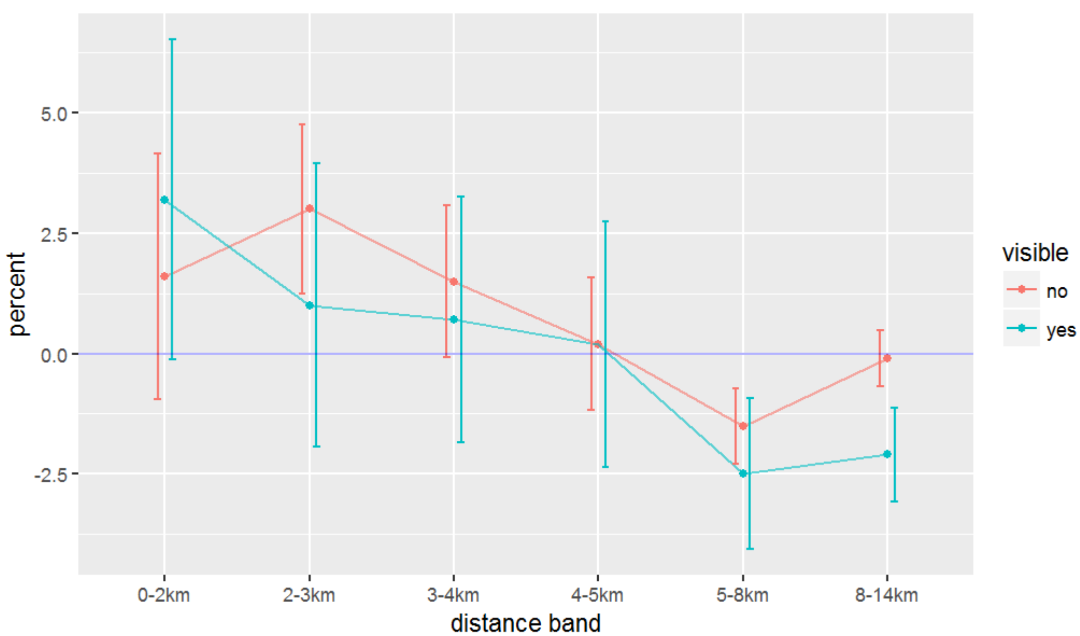

Figure 7: Result #3 Percent difference in the change of house price

(All repeat sales, turbine visible / not visible, using building height data for line-of-sight)

While results using building height data in Figure 7 are broadly similar to those relying on terrain-based line of sight, for some of these regressions there are quite different results even for properties that cannot "see" a turbine. This is because it uses a different sample of houses - only those that have lines of sight that cross areas that have available building height data. If this is not done, it is impossible to know whether a property has a clear line of sight due to no buildings blocking it, or just that no building height data was available. As mentioned above, this still accounts for 84% of properties - but these are all in the larger conurbations. The properties that "can see" and "cannot see" are, of course, also different. The building height results, then, say more about the impact of wind turbines in urban areas than the non-building height sample.

The main difference in the building height result is in the nearest distance band where the effects on house price growth for properties whose line of sight is blocked by a building are noticeably smaller in comparison to those with line of sight blocked by terrain. With terrain only, visible and non-visible appeared to show a quite different response (Figure 6), but when the building height data are included (Figure 7), the impact of visible and non-visible turbines both have the same direction of change as distance is increased (though again, the wide confidence intervals mean there is considerable uncertainty surrounding the estimates).

The pattern of difference between sub-100-metre turbines (Figure A3(E)) and those over (Figure A3(F)) is similar to the terrain-based results once the uncertainty surrounding estimates is taken into account. For turbines less than 100 metres that can be seen despite building height, there appear to be large impacts on the price growth of properties in close proximity, and these impacts diminish at further distances, but the confidence intervals are so wide, we cannot be sure that the effects are different to zero for any of the distance bands, visible or non-visible. Much more precise results are available for turbines over 100m with statistically significant positive effects for the second distance band (2-3km) in Figure A3(F).

Summary and possible explanations for the results

In summary, we have not found any consistent evidence of a negative impact of wind turbines on house price growth. Generally speaking the effect is either positive at particular distance bands (2-3km) or not distinguishable from zero.

Note again that a zero effect does not mean that house price growth has flat-lined. Rather, it means that there is no significant difference between the house price growth of the treatment group (properties close to turbines) and that of the control group (properties far away from turbines).

A positive effect means that the treatment group has a higher rate of house price growth than the control group. The repeat sales analysis, for example, finds a positive effect of 2% for houses in the 2-3km distance band that can see a turbine (Figure 6). This means that the value of those houses went up by 2% more than the increase in value of dwellings in the control group.

We also find some evidence that that the impact of wind turbines on house price growth appears to vary across different regions of Scotland. This finding has not, as far as we are aware, been systematically tested in previous UK studies using the rigorous methods applied here.

There is some evidence from the results that property prices respond differently to wind turbines in different parts of Scotland. It must be emphasised, this finding is somewhat tentative. Using the current method, sample sizes are too small to be fully reliable. However, it does suggest that while some areas see the positive impacts described above, others may see negative impacts.

Results for Angus/Dundee and Clackmannanshire/Fife regions, all clustered north of the Firth of Forth, appear to see some negative impacts for visible turbines, though most of these have confidence intervals crossing or just touching zero. In contrast, North and South Lanarkshire show the most positive price impacts at close distances. Other regions either produce no geographical results due to data limitations, or are very mixed.

Our data do not provide sufficient information to enable us to rigorously measure and test the underlying causes of these differences which may be interconnected and complex. Differential impacts may arise, for example, from interactions between variations in physical terrain, urban social structures, local approaches to turbine development policy and community engagement.

We now conclude the report by offering a number of possible explanations for our findings.

Heterogeneous and changing preferences

The reason our results are consistently different to those reported by Gibbons (2014) might be because attitudes towards wind farms may be different in Scotland than in other parts of the UK, and may also vary significantly within Scotland, and between individuals. Attitudes may also have varied over time – e.g. in response to public debates about energy futures or rural economic development. So our complex findings may reflect genuine complexity and fluidity in the preferences and attitudes of homeowners across Scotland over the time period considered.

Location of turbines

In Scotland, a much higher proportion of turbines are likely to be located on moors and mountains, and in much more remote areas than in England and Wales. These differences in terrain might be another important reason for the discrepancies between our results and those of Gibbons (2014), as might the potential alternative uses of the land on which turbines are constructed. For example, in remote mountain locations, there may be fewer alternative commercially viable uses for the land and so the opportunity cost in terms of foregone alternative revenue streams from the land may be smaller. In contrast, high quality farmland locations in England and Wales may well have more valuable alternative uses that have to be foregone, both now and in the future, if turbines are constructed. This may itself affect the attitudes of, and financial impact on, local residents and businesses.

Amenity and economic benefits

The positive house price impacts presented above may also reflect the fact that some wind farms provide economic and leisure benefits to the surrounding areas.

- E.g.1: The Whitelee wind farm had 25,000 visitors in the first two years of opening[23] and provides 130kms of tracks for walkers, cyclists, horse riders and dog walkers. These benefits may be substantial and may offset any negative aesthetic or noise effects. The positive effect of such amenities might be particularly strong if the previous land use was essentially barren and of little aesthetic merit. The effects, positive and negative, are likely to vary geographically but not necessarily in the same way.
- E.g.2: Some renewable energy companies provide community and development funds to fund a range of projects that benefit the locality and potentially generate employment. The SSE Clyde wind farm fund[24], for example, is expected to provide a total of £17.5 million for local projects that boost local investment and employment, offer training, prevent poverty, or benefit the local or social environment in some way. Such initiatives may improve the quality of life of local residents and increase house prices accordingly.

Patterns of social stratification

Attitudes towards wind turbines and the economic benefits may vary across different social and economic groups. If the location of these groups relative to the location of wind farms varies (e.g. because affluent households are more concentrated in the outskirts in some cities than in others) then the house price responses might vary depending on location.

For example, Kavanagh, Lee and Pryce (2016)[25] find that poverty is much more concentrated in the inner city in Dundee than it is in Edinburgh. The maps in Figure 11 below make the same point using the Scottish Index of Multiple Deprivation. Note also that Kavanagh, Lee and Pryce (2016) identify significant change in the geographic patterns of poverty between 2001 and 2010. Since wind turbines tend to be located in rural areas, households living near the edge of the city are most likely to be affected, either positively or negatively, and variations in the pattern of wealth over time and between cities might affect the pattern of house price impact.

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[23] http://www.pfr.co.uk/cloich/15/Wind-Power/23/Tourism/

[24] See for example http://www.southlanarkshire.gov.uk/info/200168/getting_involved_in_your_community/571/sse_clyde_wind_farm_fund

25 Kavanagh, L., Lee, D. and Pryce, G. (forthcoming) Is Poverty Decentralising? Quantifying Uncertainty in the Decentralisation of Urban Poverty. Annals of the American Association of Geographers, freely available here: http://bit.ly/2dAihAX

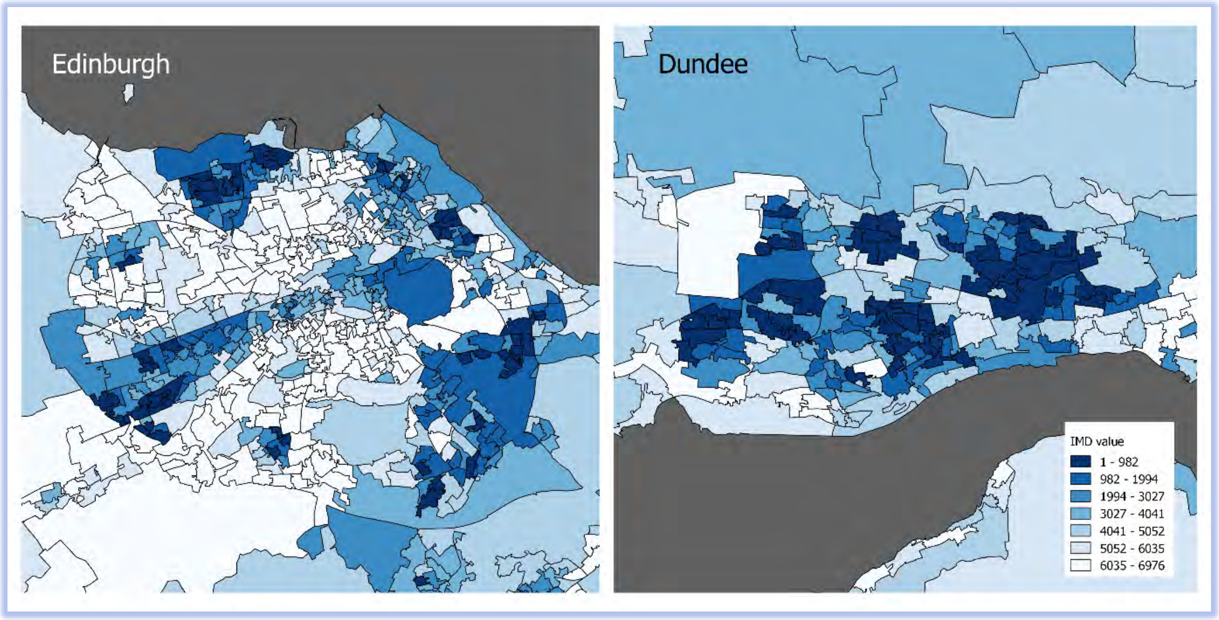

Figure 11: 2011 Scottish Index of Multiple Deprivation in Edinburgh and Dundee. Lower values (darker blue) are more deprived areas, higher values are less deprived.

Overall, those who are likely to be able to see a wind turbine typically live in lower value houses (and presumably have lower incomes) than those who cannot (Figure 12). It may be that those on lower incomes are less averse to wind turbines, perhaps because the marginal benefit of any community fund or other positive spillover from wind farm projects is larger relative to their disposable income.

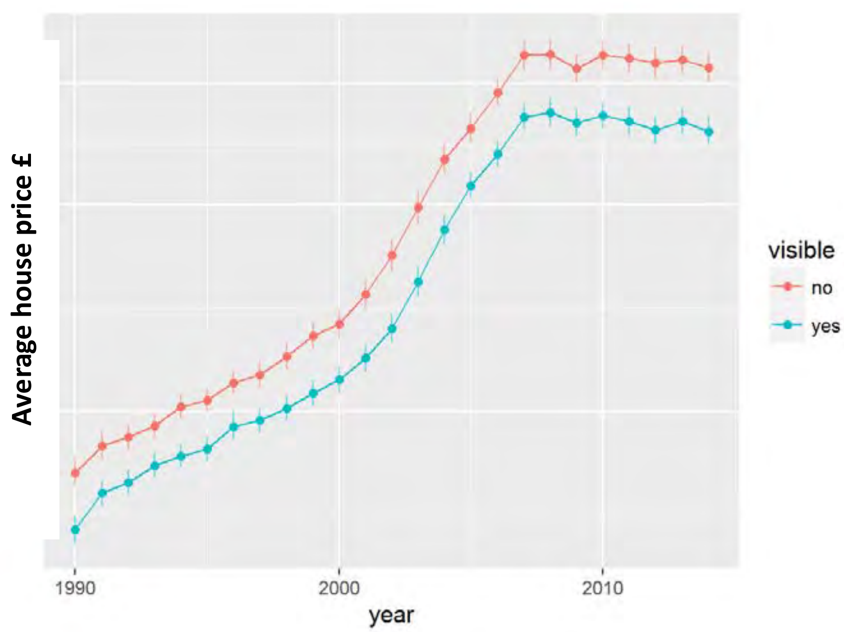

Figure 12: Average annual house prices (plotted on log scale) for houses that will have a turbine in sight at some point within the timeframe of the study vs. those that do not

Interactions between multiple causes

These explanations are not mutually exclusive. It is likely that they affect house prices simultaneously, and to varying degrees in different locations.

These forces may also reinforce or negate each other. They may each wax and wane over time and have different effects at different spatial scales leading to a complex and fluid set of potential outcomes at each point in time.

Further research would be needed to identify which of these effects is most prevalent and persistent. However, it should be noted that the data we collated for this project are unlikely to be sufficient to disentangle these effects in a robust way.

Appendix: Sensitivity analysis

Introduction

We noted above that we use a "fixed effect" methodology to control for a wide range of factors that we cannot observe or measure directly. Provided these factors remain fairly constant over time, we can control for their impact on price trends by introducing additional categorical variables into the analysis. All of the results presented in this report include basic fixed effects that control for differences in dwelling attributes, such as number of bedrooms, which we assume remain constant over time.

We also experimented with a wide number of additional controls. This allows us to test whether our results are robust to changes in how the analysis is set up. For example, we included fixed effects that allow different house price effects to occur over time for: the land gradient (for each individual property); elevation (height above sea level for each property); and aspect (which compass direction the property's slope is facing, indicating which direction their predominant view is likely to be). We also included controls for different price effects across distance rings and we allowed house prices to differ between Scotland's four NUTS2 regions and include a set of region-by-year interactions.

The impacts of these different specifications are presented in the graphs below for each of main categories of results presented under the labels A1, A2, and A3 which relate to the headings used in the main body of the report:

- Figure A1 reports sensitivity analysis for Result #1: Analysis based on Postcode Averages & Wind Farm Centre-Points ('centroids') (Gibbons),
- Figure A2 reports sensitivity analysis for Result #2: Analysis based on Repeat Sales & Individual Turbines
- Figure A3 reports sensitivity analysis for Result #3: Analysis based on Repeat Sales & Individual Turbines, Taking into Account Building Heights

You will see that each of the three figures contains eight sub-graphs, labelled (A) to (H) which give results for each type of fixed effects analysis. The labels for each are explained below:

The first sub-figure, labelled (A), is the "basic" fixed effects used in all analyses:

- **(A) "properties"**: includes fixed effects for time and properties. Note that these results are the same as the results used in the main sections above: they include the same time fixed effects and the property-level fixed effects as those used in Figures 5, 6 and 7 and follow the method described in the "Analysis Step 2" section above. We reproduce them below for ease of comparison with the additional results.

Sub-figures (B) to (D) in Figures A1, A2 and A3 below each add an extra fixed effect on top of the last. In order, these are:

- **(B) "geography":** fixed effects for slope, elevation and aspect;
- **(C) "rings"**: fixed effects for properties in each distance ring from turbines (or wind farms for figure A1);
- **(D) "NUTS2"**: fixed effects for Scotland's four NUTS2 regions.

Each sensitivity analysis includes a further four sub-figures. These run separate analyses on a particular subset of the data, with each of them using the full set of fixed effects. All three break down properties by their distance from the Scottish coast:

- **(G) "Coast < 2km"**: contains only coastal properties – i.e. those within 2km of the coast;
- **(H) "Coast > 2km"**: contains only inland properties – i.e. those located 2km or more beyond any coastal point.

Sub-figures (E) and (F) vary depending on whether the analysis is based on postcodes/wind farm centre-points or individual dwellings/turbines:

In **Figure A1** the analysis is based on postcode and wind farm centre-points and the results are broken down by wind farm size:

- **A1(E) "Single turbines"**: looks just at single turbine sites;
- **A1(F) "More than one turbine"**: looks at sites with more than one turbine.

In **Figures A2 and A3**, the analysis is based on individual turbines (rather than entire wind farms), and so we can estimate the impact of turbine height:

- **A2(E) and A3(E) "Turbines < 100m"**: plots the impact of turbines that are less than 100m tall;
- **A2(F) and A3(F) "Turbines < 100m"**: plots the impact of turbines over 100m tall.

Note that all graphs in the appendix have the same scale for the vertical axis, which is limited to the plus/minus 15% price change interval. This was done to make each sub-figure directly comparable. Any confidence intervals (i.e. the vertical bars plotted for each estimate) beyond this range are cut off at the 15% limit.

Sensitivity analysis for result #1: based on Postcode Averages & Wind Farm Centre-Points ('centroids') (Gibbons)

The results in the graphs (E) and (F) of Figure A1 allow us to compare the effects of "wind farms" consisting of single turbines (graph A1(E)) and those with two turbines or more (graph A1(F)). Single-turbine effects have wider confidence intervals making the estimates less precise and not statistically different from zero. The estimates are also noticeably less precise for coastal locations (A1(G)) than for inland properties (A1(H)). Controlling for "geography" using fixed effects for slope, elevation and aspect (A1(B)), distance rings (A1(C)) and NUTS2 region (A1(D)) yields relatively precise positive house price effects particularly for the 2-3km distance band.

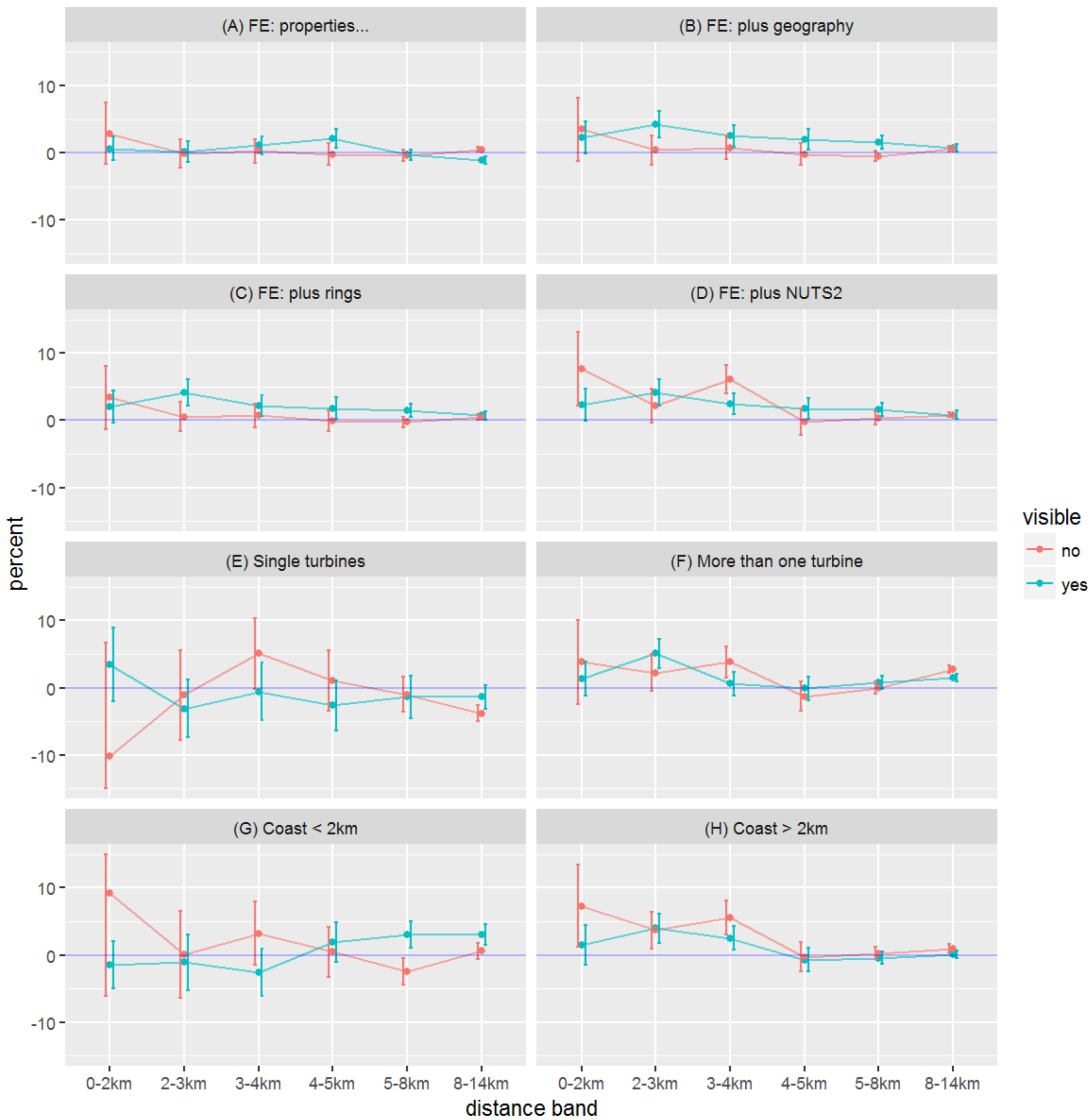

Figure A1: Percent difference in the change of house price

(Postcode/wind farm centroids, whole wind farm visible / not visible)

Sensitivity analysis for result #2: based on Repeat Sales & Individual Turbines

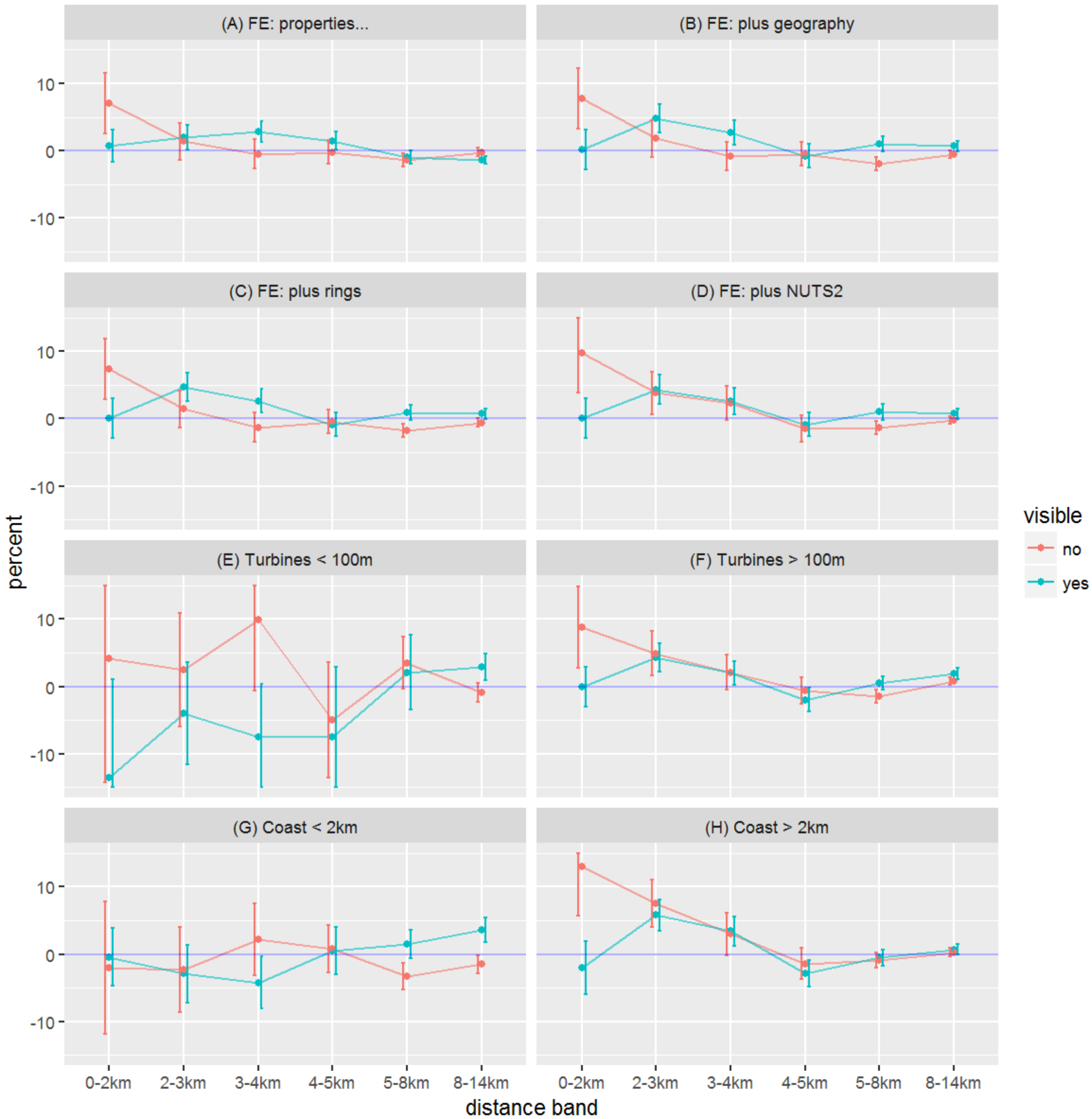

Figure A2: Percent difference in the change of house price

(All repeat sales, turbine visible / not visible)

Sensitivity analysis for result #3: based on Repeat Sales & Individual Turbines and Taking into Account Building Heights

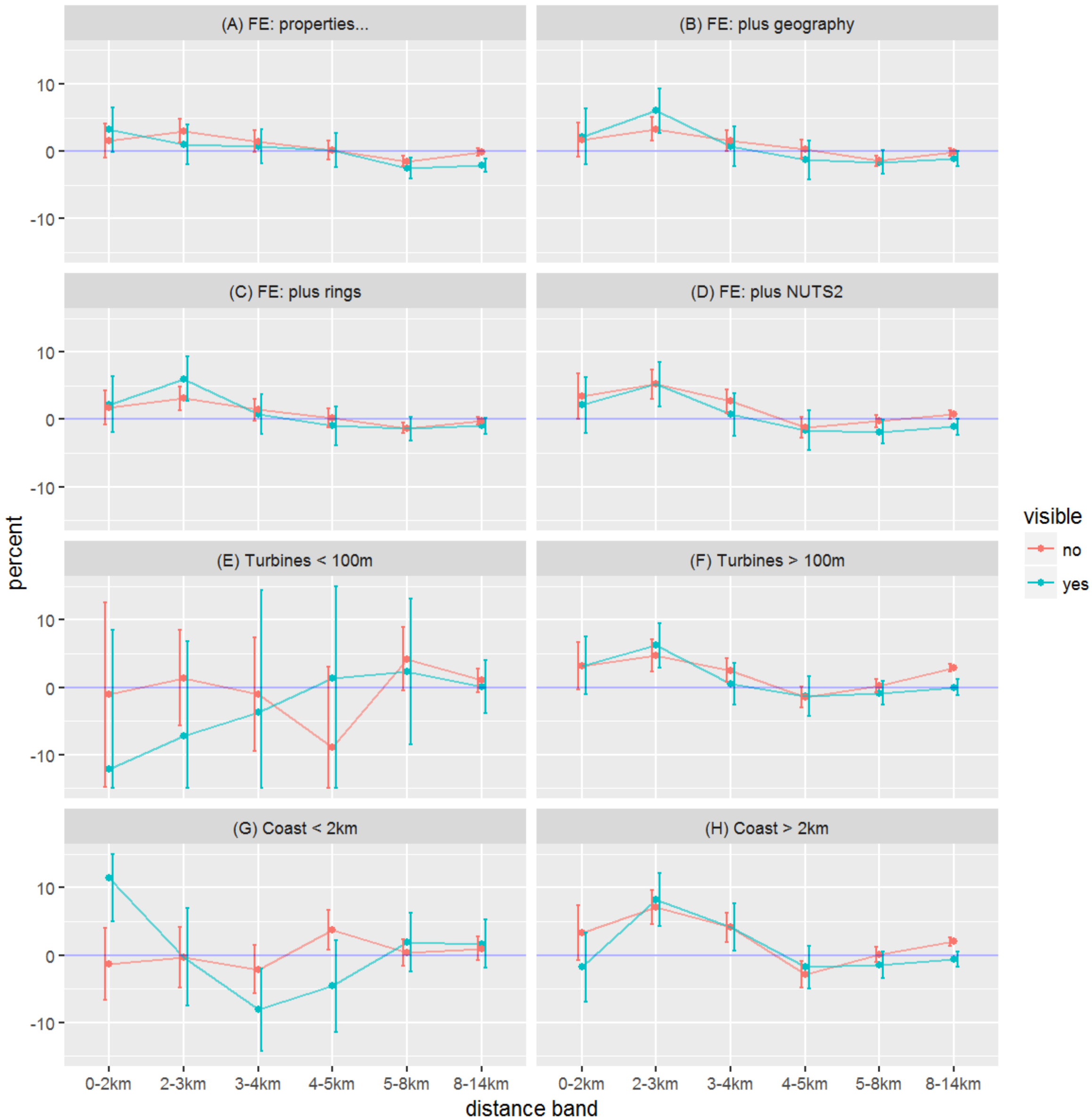

Figure A3: Percent difference in the change of house price

(All repeat sales, turbine visible / not visible accounting for building heights)

Acknowledgements

This work was partly funded by the Economic and Social Research Council (ESRC) through the Applied Quantitative Methods Network: Phase II, Grant Number ES/K006460/1

APPENDIX 6.1

BAT SURVEY REPORT

Appendix 6-1 – Bat Survey Report

Dunneill Wind Farm, Co. Sligo

DOCUMENT DETAILS

Client: **Brickmount Ltd.**

Project Title: **Dunneill Wind Farm, Co. Sligo**

Project Number: **210207**

Document Title: **Bat Survey Report**

Document File Name: **BR – F – 2022.08.16 - 210207**

Prepared By:

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Planning and Environmental Consultants

Rev	Status	Date	Author(s)	Approved By
01	Draft	21/12//2021	SC/TM	AJ/JH
02	Draft	20/05/2022	AJ/JH	DN
03	Draft	14/07/2022	AJ/JH	DN
04	Final	16/08/2022	AJ/JH	TB

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APPENDICES

1. INTRODUCTION

MKO was commissioned to complete a comprehensive assessment of the potential effects on bats, as part of an application for the Proposed Extension of Operation of the existing Dunneill Wind Farm, Co. Sligo (Proposed Development). This report provides details of the bat surveys undertaken, including survey design, methods and results, and the assessment of potential effects of the Proposed Development on bats. Where necessary, mitigation is prescribed to minimise the potential for likely significant effects.

Bat surveys were undertaken throughout 2021 and are consistent with the methodologies described in NatureScot 2021[1] (formerly Scottish Natural Heritage, 2019[2]). Bat surveys employed a combination of methods, including desktop study, habitat and landscape assessments, roost inspections, manual activity surveys and static detector surveys at ground level and at height. Surveys carried out in 2021 were based on a turbine layout of 13 turbines.

The assessment and mitigation provided in this report have been designed in accordance with NatureScot, 2021. Consideration was also given to the Northern Ireland Environment Agency (NIEA) Natural Environment Division (NED) Guidance [3], which was produced in August 2021 (amended May 2022), following the completion of the bat surveys at the Proposed Development site.

For the purposes of this EIAR, where the 'Proposed Development' is referred to, this relates to all the project components described in detail in Chapter 4 of this EIAR. Where the 'the site' is referred to, this relates to the primary study area for the site, as delineated by the EIAR Site Boundary in green as shown on Figure 2-1.

The Environmental Impact Assessment Report (EIAR) Study Area for the Proposed Development is approximately 66 hectares (ha) while the total development footprint of the Proposed Development (i.e., the existing Dunneill Wind Farm) is approximately 2.8ha. Further details on project description and components are outlined in Chapter 4 of this EIAR.

1.1 Background

Wind energy provides a clean, sustainable alternative to fossil fuels in generating electricity. However, wind energy development can impact wildlife, directly through mortality and indirectly through disturbance and habitat loss. Bat fatalities have been reported at wind energy facilities around the world, raising concern about the cumulative impacts of such developments on bat populations (Arnett *et al.* 2016). No large-scale studies have been undertaken in Ireland to date. However, a study from the UK estimated bat fatalities at 0 – 5.25 bats per turbine per month (Mathews *et al.* 2016). While these results are not directly applicable to Ireland due to differences in bat species and behaviour, Ireland shares more similarities with bat assemblages of Great Britain, when compared to those of mainland Europe.

Investigative research in North America and mainland Europe have revealed the mechanisms for bat mortality at wind turbines. Fatalities arise from direct collision with moving turbine blades (Horn *et al.* 2008, Cryand *et al.* 2014) and barotrauma (Baer Wald *et al.* 2008), i.e. internal injuries caused by air pressure changes. The reason why bats fly in the vicinity of wind turbines has been attributed to several different behavioural and environmental factors, e.g. habitat associations, weather conditions and, species ecology.

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[1] NatureScot published Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation. Version: August 2021 (NatureScot, 2021).
[2] Scottish Natural Heritage published Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation (SNH 2019).
[3] Northern Ireland Environment Agency Natural Environment Division (NED) published Guidance on Bat Surveys, Assessment and Mitigation for Onshore Wind Turbine Developments in Northern Ireland (NIEA, 2021).

Bat surveys are undertaken to provide a baseline to gain an insight into bat activity at the site and to predict and mitigate against any future risks identified. Survey design and analyses of results at the Proposed Development site were undertaken with reference to the latest policy and legislation, scientific literature and industry guidelines. Any spatial, temporal or behavioural factors that may put bats at risk were fully considered.

1.2 Bat Survey and Assessment Guidance

Several guidelines for surveying bats at wind energy developments have been produced in Europe, the UK and Ireland.

At a European level, the Advisory Committee to the EUROBATS Agreement, to which Ireland is a signatory, have produced Guidelines for Consideration of Bats in Wind Farm Projects which outlines an approach for assessing the potential impacts of wind turbines on bats during planning, construction and operation phases (Rodrigues, 2015). However, these guidelines are based on continental scenarios and include more diverse species and behaviours than those typical of Ireland. As such, EUROBATS guidance may recommend a level of survey that may prove inappropriate in Irish scenarios. Nevertheless, the guidance is evidence-based and provides a useful European context, within which Member States are encouraged to produce specific national guidance, focusing on local circumstances.

Bat Conservation Ireland produced Wind Turbine/Wind Farm Development Bat Survey Guidelines (BCI, 2012a). This document provides advice to practitioners and decision makers in Ireland on necessary qualifications for surveyors, health and safety considerations, pre-construction and post-construction survey methodologies and information to be included in a report. In the absence of comprehensive Irish research, these guidelines provide generalised methodology rather than detailed technical advice.

The second edition of the UK Bat Conservation Trust Bat Survey Good Practice Guidelines (Hundt, 2012) includes a chapter (Chapter 10) on survey methodologies for assessing the potential impacts of wind turbines on bats. The document provides technical guidance for consultants carrying out impact assessments. However, the recommendations are not based on any research findings specific to the UK. A third edition to the guidelines, published in early 2016, removed the chapter on surveying wind turbine developments. Prior to the publication of the BCT guidelines, Natural England's *Bat and Onshore Wind Turbines: Interim Guidance* provided a pragmatic interpretation of the EUROBATS recommendations, as applied to onshore wind energy facilities in the UK (Natural England, 2014). In addition, the Chartered Institute of Ecology and Environmental Management (CIEEM) publishes advice on best practice as well as updates on the current state of knowledge in *the Technical Guidance Series* and in the quarterly publication *In Practice*.

In August 2021, NatureScot (formerly Scottish Natural Heritage), published Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation (NatureScot, 2021). The 2021 version supersedes the 2019 version of the guidance. The purpose of the guidance is to help planners, developers and ecological consultants to consider the potential effects of onshore wind energy developments on bats. The emphasis is on direct impacts such as collision mortality, but there is reference throughout to the need for a full impact assessment requiring wider consideration of other (indirect) effects. The Guidance replaces previous guidance on the subject; notably that published by Natural England and Chapter 10 of the Bat Conservation Trust publication, *Bat Surveys: Good Practice Guidelines* (2nd edition), (Hundt, 2012) and tailors the generic EUROBATS guidance on assessing the impact of wind turbines on European bats (Rodrigues *et al.* (2014)). The document guides the user through the key elements of survey, impact assessment and mitigation.

In 2021 the NIEA (NED) published *Guidance on Bat Surveys, Assessment and Mitigation for Onshore Wind Turbine Developments in Northern Ireland.* This new guidance follows and builds upon the recently updated NatureScot 2021 guidance. The latter guidance has set the industry standard since its publication in 2019. The NED guidance does not aim to replace the NatureScot guidance, but it does provide additional clarifications and recommendations regarding survey requirements and impact assessment in an Irish context. An amendment to the NIEA guidance was released in May 2022.

The survey scope, assessment and mitigation provided in this report is accordance with NatureScot, 2021 Guidance with consideration given to the Northern Ireland Environment Agency (NIEA) Natural Environment Division (NED) Guidance, 2022.

1.3 Statement of Authority

Scope development and project management was overseen by Aoife Joyce (BSc., MSc.) and John Hynes (BSc., MSc., MCIEEM).

Bat surveys were conducted by MKO ecologists Tim Murphy (B.Sc.), Laura McEntegart (B.Sc.) and Aoife Joyce. All staff have relevant academic qualifications to complete the surveys and assessments that they were required to do.

Data analysis was undertaken, and results were compiled by Tim Murphy (BSc.). Impact assessment, the design of mitigation and final reporting was completed by Tim Murphy (BSc.) under the supervision of Aoife Joyce, John Hynes and Pat Roberts (BSc., MCIEEM), who reviewed and approved the final document.

Tim and Laura have over one year experience in completing bat surveys and ecological assessments. Aoife has over three years' experience in ecological assessments and has completed CIEEM and BCI courses in Bat Impacts and Mitigation, Bat Tree Roost Identification and Endoscope training and Kaleidoscope Pro Analysis. John is a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and has over 9 years' professional ecological consultancy experience. He is also a former member of the Bat Conservation Ireland management council. Pat has over 10 years' experience in management and ecological assessment.

Collision monitoring was undertaken by Gavin O'Dowd (with dog Lara who has been trained to find bird and bat carcasses), and assessed by John Curtin (BSc.), all of Éire Ecology.

1.4 Irish Bats: Legislation, Policy and Status

Ireland has nine resident bat species, comprising more than half of Ireland's native terrestrial mammals (Montgomery *et al.,* 2014).

All Irish bats are protected under European legislation, namely the Habitats Directive (92/43/EEC). All Irish species are listed under Annex IV of the Directive, requiring strict protection for individuals, their breeding sites and resting places. The lesser horseshoe bat (*Rhinolophus hipposideros*) is further listed under Annex II of the Directive, requiring the designation of conservation areas for the species. Under this Directive, Ireland is obliged to maintain the favourable conservation status of Annex-listed species. This Directive has been transposed into Irish law through the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011, as amended).

In addition, Irish species are further protected by national legislation (Wildlife Acts 1976-2021). Under this legislation, it is an offence to intentionally disturb, injure or kill a bat, or disturb its roost. Any work at a roost site must be carried out with the agreement of the National Parks and Wildlife Service (NPWS).

The NPWS monitors the conservation status of European protected habitats and species and reports their findings to the European Commission every 6 years in the form of an Article 17 Report. The most recent report for the Republic of Ireland was submitted in 2019. Table 1-1 summarises the current conservation status of Irish bat species and identified threats to Irish bat populations.

Table 1-1 Irish Bat Species Conservation Status and Threats (NPWS, 2019)

Bat Species	Conservation Status	Principal Threats
Common pipistrelle *Pipistrellus pipistrellus*	Favourable	**A05** Removal of small landscape features for agricultural land parcel consolidation (M) **A14** Livestock farming (without grazing) [impact of anti-helminthic dosing on dung fauna] (M) **B09** Clear–-cutting, removal of all trees (M) **F01** Conversion from other land uses to housing, settlement or recreational areas (M) **F02** Construction or modification (e.g. of housing and settlements) in existing urban or recreational areas (M) **F24** Residential or recreational activities and structures generating noise, light, heat or other forms of pollution (M) **H08** Other human intrusions and disturbance not mentioned above (Dumping, accidental and deliberate disturbance of bat roosts (e.g. caving) (M) **L06** Interspecific relations (competition, predation, parasitism, pathogens) (M) **M08** Flooding (natural processes) **D01** Wind, wave and tidal power, including infrastructure (M)
Soprano pipistrelle *Pipistrellus pygmaeus*	Favourable	
Nathusius' pipistrelle *Pipistrellus nathusii*	Unknown	
Leisler's bat *Nyctalus leisleri*	Favourable	
Daubenton's bat *Myotis daubentoni*	Favourable	
Natterer's bat *Myotis nattereri*	Favourable	
Whiskered bat *Myotis mystacinus*	Favourable	
Brown long-eared bat *Plecotus auritus*	Favourable	
Lesser horseshoe bat *Rhinolophus hipposideros*	Inadequate	

2. PROJECT DESCRIPTION

The Proposed Development will apply to Sligo County Council to extend the operational period of the existing Dunneill Wind Farm for an additional 15 years. The Proposed Development is located approximately 3.5 kilometres (km) south of the village of Dromore West and approximately 3.7 km southwest of the village of Templeboy in County Sligo.

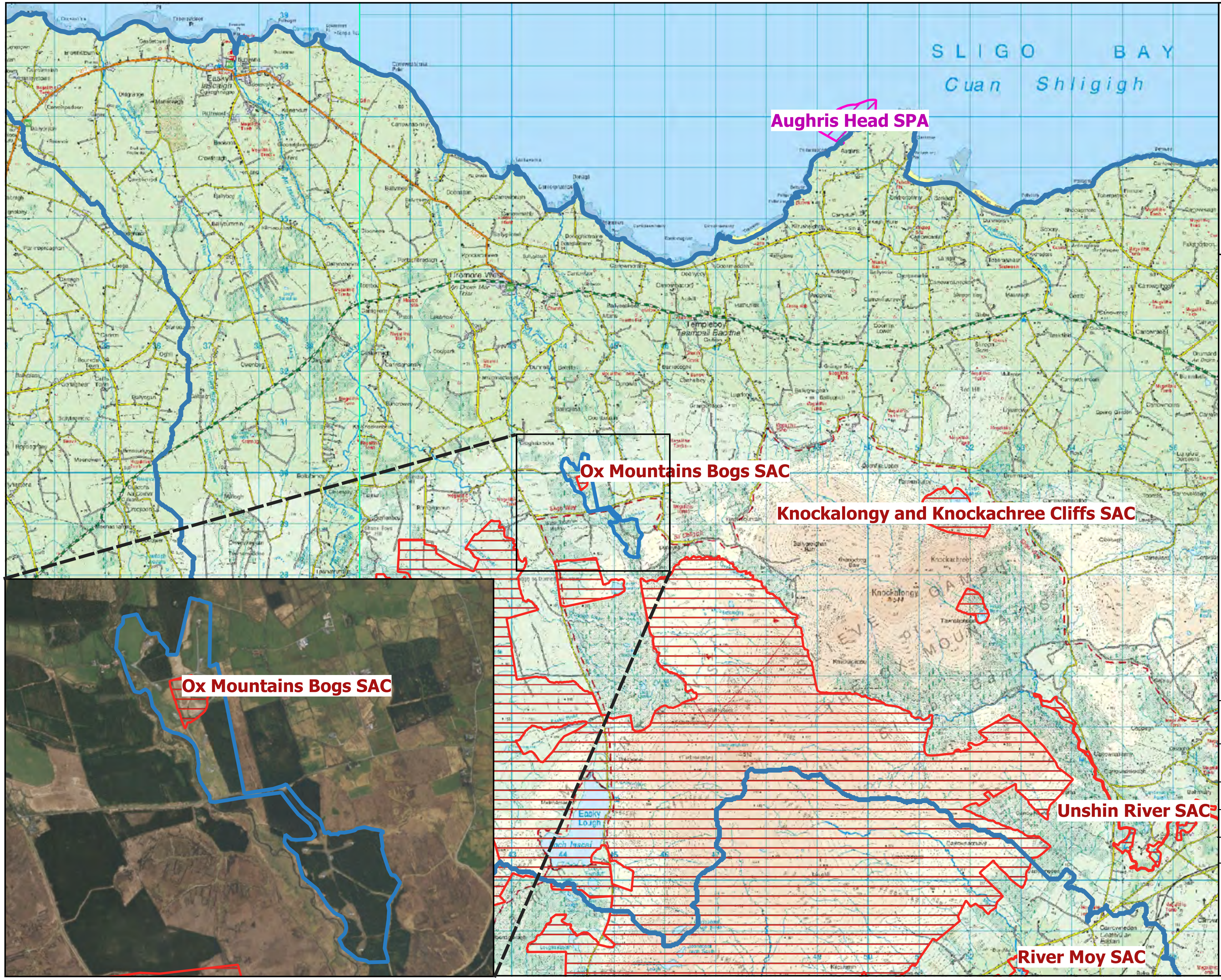
The land-use/activities within the proposed site predominantly consists of pre-existing farmland and commercial forestry. Land-use in the surrounding landscape comprises a mix of agricultural land, cutaway peatlands, forestry, small village settlements and one-off rural housing.

The Proposed Development (all elements pre-existing) for which planning permission is sought, for an extension of operation, comprises:

a. *13 no. existing Vestas V52 850 kilowatt (kW) wind turbines with a maximum overall blade tip height of 75 metres (m);*
b. *1 no. onsite control building with total footprint of approximately 455 square metres (m^2), including welfare facilities, associated electrical plant and equipment, security fencing, associated underground cabling and a 6,000-litre sealed cess tank;*
c. *1 no. permanent meteorological mast with a height of 50m and an associated 50m^2 concrete platform/base;*
d. *All associated underground electrical and communications cabling connecting the turbines to the on-site substation;*
e. *Existing site access tracks of circa 3.3 kilometres (km) total length, 3 no. car parking spaces and 13 no. turbine hardstands;*
f. *2 No. existing gated site entrances from an unnamed third-class public road which dissects the windfarm site into north and south;*
g. *Site drainage; and,*
h. *All ancillary infrastructure, associated site fencing and signage.*

This application seeks a fifteen (15) year planning permission for extension of the operational life of the existing wind farm from the date of expiration (March 2024) of the current planning permission (Pl. Ref. 03/619 and ABP Pl. Ref. 21.204790).

All elements of the existing wind farm as described in this chapter, as described above, have been assessed as part of this EIAR. All elements of the project are pre-existing and it is not proposed to make any alterations to the current site layout, wind turbines or associated infrastructure. All elements of the existing wind farm were constructed in accordance with the conditions attached to the planning permission for Dunneill Wind Farm and ESB/EirGrid specifications and requirements at the time of construction.



Map Legend

- EIAR Site Boundary
- WFD Catchments
- Special Protection Area (SPA)
- Special Area of Conservation (SAC)

N

Drawing Title
Site Location

Project Title
Dunneill Wind Farm Extension of Operation

Drawn By	Checked By
KOD	SM
Project No. 210207	Drawing No. Figure 2.1
Scale 1:97,000	Date 2022-07-07

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3. METHODS

3.1 Consultation

A scoping exercise was undertaken as part of the EIAR for the Proposed Development. A Scoping Document, providing details of the application site and the Proposed Development, was prepared by MKO and circulated to consultees in June 2021. As part of this exercise, prominent Irish conservation groups were contacted, including Bat Conservation Ireland (BCI) and National Parks and Wildlife Service (NPWS) who were specifically invited to comment on the potential of the Proposed Development to affect bats.

Details of consultation responses specifically related to bats are provided in Section 4.1 below.

3.2 Desk Study

A desk study of published material was undertaken prior to conducting field surveys. The aim was to provide context to the site in order to assist bat survey planning and assessment. This included the identification of designated sites, species of interest or any other potential risk factors within the EIAR Study Area and the surrounding region. The results of the desk study including sources of information utilised are provided below.

3.2.1 Bat Records

The National Bat Database of Ireland holds records of bat observations received and maintained by BCI. These records include results of national monitoring schemes, roost records as well as ad-hoc observations. The most recent search examined bat presence and roost records within a 10km radius of a central point within the Proposed Development (Grid Ref: G 45184 28908) (BCI 2012, Hundt 2012, NatureScot, 2021). Available bat records were provided by Bat Conservation Ireland on 16/06/2022. Results from the National Biodiversity Data Centre were also reviewed for bat species present within the relevant 10km grid squares of the Proposed Development.

In addition, information on species' range and distribution, available in the 2019 Article 17 Reports (NPWS, 2019), was reviewed in relation to the location of the Proposed Development. The aim was to identify any high-risk species at the edge of their range.

3.2.2 Bat Species' Range

EU member states are obliged to monitor the conservation status of natural habitats and species listed in the Annexes of the Habitats Directive. Under Article 17, they are required to report to the European Commission every six years. In April 2019, Ireland submitted the third assessment of conservation status for Annex-listed habitats and species, including all species of bats (NPWS, 2021).

The 2019 Article 17 Reports were reviewed for information on bat species' range and distribution in relation to the location of the Proposed Development. The aim was to identify any high-risk species at the edge of their range (NatureScot, 2021).

3.2.3 Designated Sites

The National Parks and Wildlife Service (NPWS) map viewer and website provides information on rare and protected species, sites designated for nature conservation and their conservation objectives. A search was undertaken of sites designated for the conservation of bats within a 10km radius of the EIAR

Study Area (BCI 2012, Hundt, 2012, NatureScot, 2021). This included European designated sites, i.e. SACs, and nationally designated sites, i.e. NHAs and pNHAs.

3.2.4 Landscape Features

3.2.4.1 Ordnance Survey Mapping

Ordnance survey maps (OSI 1:5,000 and 1:50,000) and aerial photographs were reviewed to identify any habitats and features likely to be used by bats. Maps and images of the Study Area and general landscape were examined for suitable foraging or commuting habitats including woodlands and forestry, hedgerows, treelines and watercourses. In addition, any potential roost sites, such as buildings and bridges, were noted for further investigation.

3.2.4.2 Geological Survey Ireland and National Monuments Service

The Geological Survey Ireland (GSI) online mapping tool and University of Bristol Speleological Society (UBSS) Cave Database for the Republic of Ireland were consulted for any indication of natural subterranean bat sites, such as caves, within 10 km of the site (BCI, 2012) (last searched on the 20/06/2022). Furthermore, the archaeological database of national monuments was reviewed for any evidence of manmade underground structures, e.g. souterrains, that may be used by bats (last searched on the 20/06/2022).

3.2.4.3 National Biodiversity Data Centre Bat Landscape Mapping

The National Biodiversity Data Centre (NBDC) map viewer presents “Bat Landscape” maps for individual species and for all species combined. Lundy *et al.* (2011) used Maximum Entropy Models to examine the relative importance of bat landscape and habitat associations in Ireland. The resulting map provides a 5-point scale, ranging from highest habitat suitability index (presented in red) to lowest suitability index (presented in green). However, squares highlighted as less favourable may still have local areas of abundance.

The location of the Proposed Development was reviewed in relation to bat habitat suitability indices. The aim of this was to assess habitat suitability for all bat species within the EIAR Study Area. It is worth noting that these results are based on a modelling exercise and not confirmed bat species records. Regardless, they may provide a useful indication of potential favourable bat associations within the Proposed Development site.

3.2.4.4 Additional Wind Energy Projects in the Wider Landscape

A search for proposed, existing and permitted wind energy developments within 10km of the Proposed Development site was undertaken (NatureScot, 2021). The Wind Energy Ireland (WEI) interactive wind map (windenergyireland.com) was reviewed in conjunction with wind farm planning applications from Sligo County Council. Other infrastructure developments and proposals (e.g. large road projects) were also noted. Information on the location and scale of these developments was gathered to inform cumulative effects. More details on other infrastructure developments within the vicinity of the Proposed Development can be found in Chapter 2 of the EIAR.

3.2.5 Multidisciplinary Surveys

Multidisciplinary walkover surveys were undertaken in 2021 and 2022 (Table 3-1). The site was systematically and thoroughly walked in a ground-truthing exercise with the habitats on the Proposed Development site assessed and classified. The habitats (including any culverts/bridges) were assessed for bat commuting, foraging and roosting suitability. Further details on the multidisciplinary surveys can be found in Chapter 6 of the main EIAR.

During the static bat detector deployments and collections each season, any incidental records and bat habitat assessments were also carried out.

Multidisciplinary walkover surveys were undertaken within the site of the Proposed Development on the following dates:

Table 3-1 Multidisciplinary Survey Effort

Multidisciplinary Survey	Dedicated Bat Survey
14th September 2021	26th April 2021
26th April 2022	12th May 2021
	11th June 2021
	24th June 2021
	2nd September 2021
	16th September 2021

3.3 Field Surveys

3.3.1 Bat Habitat Suitability Appraisal

Bat walkover surveys were carried out throughout 2021 and on 26th April 2022. During these surveys, habitats within the EIAR Study Area were assessed for their suitability to support roosting, foraging and commuting bats. Connectivity with the wider landscape was also considered. Suitability was assessed according to Collins (2016) which provides a grading protocol for roosting habitats and for commuting and foraging areas. Suitability categories are divided into *High, Moderate, Low* and *Negligible*, and are described fully in **Appendix 1**.

3.3.2 Roost Surveys

A search for roosts was undertaken within 200m plus the rotor radius (i.e. 26m) of the Existing Proposed Development footprint (NatureScot, 2021). The aim was to determine the presence of roosting bats and the need for further survey work or mitigation. The site was visited in April, May, June and September 2021. A walkover was carried out and all structures and trees were assessed for their potential to support roosting bats (see **Appendix 1** for criteria in assessing roosting habitats).

Any potential roost sites were subject to a roost assessment. This comprised a detailed inspection of the exterior and interior (if accessible) to look for evidence of bat use, including live and dead specimens, droppings, feeding remains, urine splashes, fur oil staining and noises.

Any potential tree roosts were examined for the presence of rot holes, hazard beams, cracks and splits, partially detached bark, knot holes, gaps between overlapping branches and any other potential roost features (i.e. PRFs) identified by Andrews (2018).

3.3.3 Manual Transects

Manual activity surveys comprised walked transects at dusk. A series of representative transect routes were selected throughout the Proposed Development site. The aim of these surveys was to identify bat species using the site and gather any information on bat behaviour and important features used by bats. Transect routes were prepared with reference to the existing layout, desktop and walkover survey results as well as any health and safety considerations and access limitations. As such, transect routes generally followed existing roads and tracks. Transect routes are presented in Figures 3-1 - 3-3.

Transects were walked by two surveyors, recording bats in real time. Dusk surveys commenced 30 minutes before sunset and were completed for 3 hours after sunset. Surveyors were equipped with active full spectrum bat detectors, the Batlogger M bat detector (Elekon AG, Lucerne, Switzerland), and all bat activity was recorded for subsequent analysis to confirm species identifications. Transects surveys were undertaken in Spring, Summer and Autumn 2021. Table 3-2 summarises survey effort in relation to walked transects.

Table 3-2 Survey Effort - Manual Transects

Date	Surveyors	Sunrise/ Sunset	Type	Weather	Walked (km)
26th April 2021	Tim Murphy and Laura McEntegart	20:58	Dusk	9˚C, dry, 90 % cloud cover, light breeze	9.6 km
24th June 2021	Tim Murphy and Laura McEntegart	22:13	Dusk	13˚C, dry, 95 % cloud cover, calm	9.6 km
2nd September 2021	Tim Murphy and Laura McEntegart	20:23	Dusk	19˚C, dry, 100 % cloud cover, calm	9.6 km
Total Survey Effort					**28.8 km**

Map Legend

- EIAR Site Boundary
- Existing Dunneill Footprint
- Existing Dunneill Turbines
- Spring Transect Route

N

Drawing Title	Spring Manual Transect Route
Project Title	Dunneill Wind Farm
Drawn By: TM	Checked By: AJ
Project No.: 210207	Drawing No.: Fig 3-1
Scale: 1:11000	Date: 20.06.22

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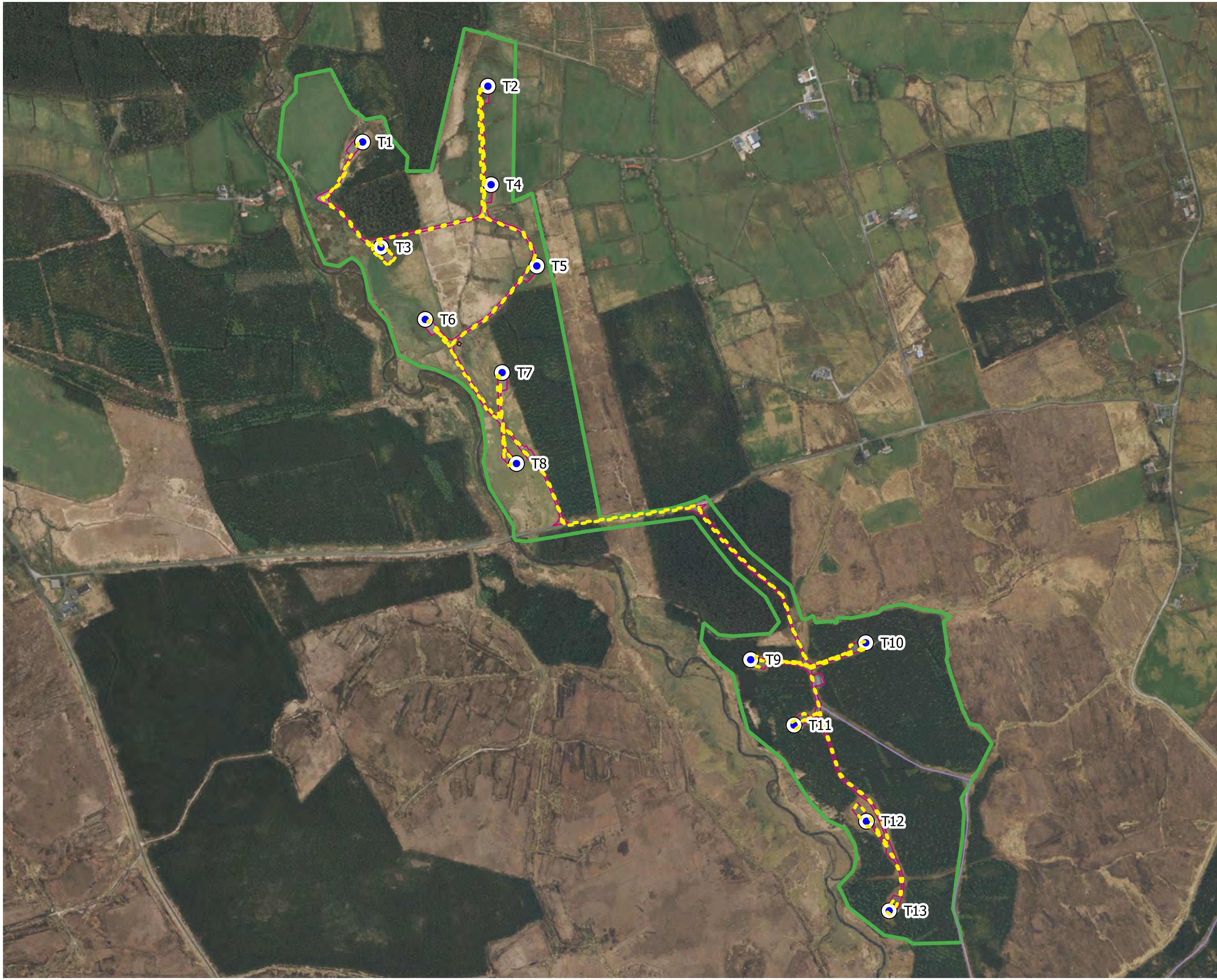

Map Legend

- EIAR Site Boundary
- Existing Dunneill Footprint
- Existing Dunneill Turbines
- Summer Transect Route

N

Drawing Title	Summer Manual Transect Route
Project Title	Dunneill Wind Farm
Drawn By: TM	Checked By: AJ
Project No.: 210207	Drawing No.: Fig 3-2
Scale: 1:11000	Date: 20.06.22

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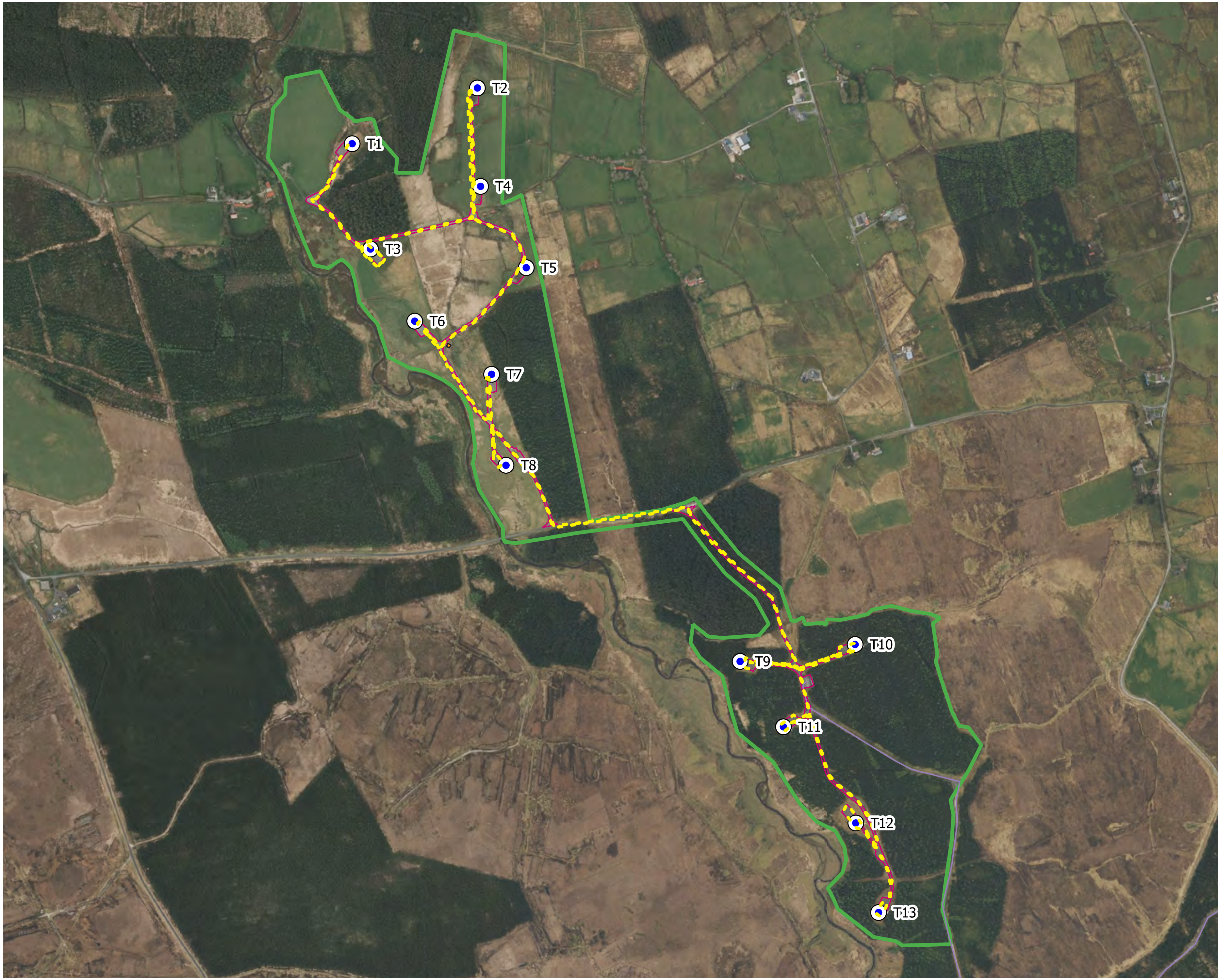

Map Legend

EIAR Site Boundary

Existing Dunneill Footprint

Existing Dunneill Turbines

Autumn Transect Route

N

Drawing Title	
Autumn Manual Transect Route	
Project Title	
Dunneill Wind Farm	
Drawn By: TM	Checked By: AJ
Project No.: 210207	Drawing No.: Fig 3-3
Scale: 1:11000	Date: 20.06.22

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3.3.4 Ground-level Static Surveys

Where developments have more than 10 turbines, NatureScot requires 1 detector per turbine up to 10 plus 1 detector for every 3 additional turbines. Given that 13 existing turbines are present within the site, 13 detectors were deployed to ensure compliance with NatureScot guidance. No additional new turbines or alterations are proposed for the extension of operation planning application.

Automated bat detectors were deployed at 13 no. locations for at least 10 nights in each of spring (April - May), summer (June – mid-August) and autumn (mid-August - October) (NatureScot, 2021). Detector locations were based at existing turbine locations. Figure 3-4 presents static detector locations in relation to the existing layout. Static detector locations are described in Table 3-3.

Table 3-3 Ground-level Static Detector Locations

ID	Location	Habitat	Linear Feature within 50m	Corresponding/ Nearest Turbine(s)
D01	E144223 N330120	Scrub (WS1)	(Mixed) Broadleaved Woodland (WD1) & Buildings and Artificial Surfaces (BL3)	T1
D02	E144412 N330265	Improved Agricultural Grassland (GA1)	Conifer Plantation (WD4) & Drainage Ditches (FW4)	T2
D03	E144177 N329838	Improved Agricultural Grassland (GA1)	Eroding/Upland Rivers (FW1)	T3
D04	E144479 N330034	Hedgerow (WL1)	Treelines (WL2)	T4
D05	E144560 N329788	Improved Agricultural Grassland (GA1)	Conifer Plantation (WD4)	T5
D06	E144337 N329735	Improved Agricultural Grassland (GA1)	Buildings and Artificial Surfaces (BL3)	T6
D07	E144476 N329616	Conifer Plantation (WD4)	Conifer Plantation (WD4)	T7
D08	E144469 N329370	Improved Agricultural Grassland (GA1)	Eroding/Upland Rivers (FW1), Drainage Ditches (FW4) & Buildings and Artificial Surfaces (BL3)	T8
D09	E145010 N328951	Conifer Plantation (WD4)	Conifer Plantation (WD4)	T9
D10	E145292 N329009	Conifer Plantation (WD4)	Conifer Plantation (WD4)	T10
D11	E145106 N328805	Conifer Plantation (WD4)	Conifer Plantation (WD4)	T11
D12	E145254 N328584	Conifer Plantation (WD4)	Conifer Plantation (WD4)	T12
D13	E145322 N328381	Conifer Plantation (WD4)	Conifer Plantation (WD4)	T13

Full spectrum bat detectors, Song Meter SM4BAT (Wildlife Acoustics, Maynard, MA, USA), were employed using settings recommended for bats, with minor adjustments in gain settings and band pass filters to reduce background noise when recording. Detectors were set to record from 30 minutes before sunset until 30 minutes after sunrise. The Song Meter automatically adjusts sunset and sunrise times using the Solar Calculation Method when provided with GPS coordinates.

Onsite weather monitoring was undertaken concurrently with static detector deployments. One Vantage Pro 2 (Davis Instruments, CA, UCS) was deployed each season and night-time hourly data was tracked remotely to ensure a sufficient number of nights (i.e. minimum 10 no.) with appropriate weather conditions were captured (i.e. dusk temperatures above 8˚C, wind speeds less than 5m/s and no or only very light rainfall). Table 3-4 summarises survey effort achieved in 2021 for each of the 13 no. detector locations.

Table 3-4 Survey Effort - Ground-level Static Surveys

Season	Survey Period	Total Survey Nights per Detector Location	Nights with Appropriate Weather
Spring	26th April – 12th May 2021	17	10
Summer	11th June – 24th June 2021	13	13
Summer Redeployment	24th June – 5th July 2021	12	-*
Autumn	2nd September – 16th September 2021	15	14
Total Survey Effort		**57**	**37**

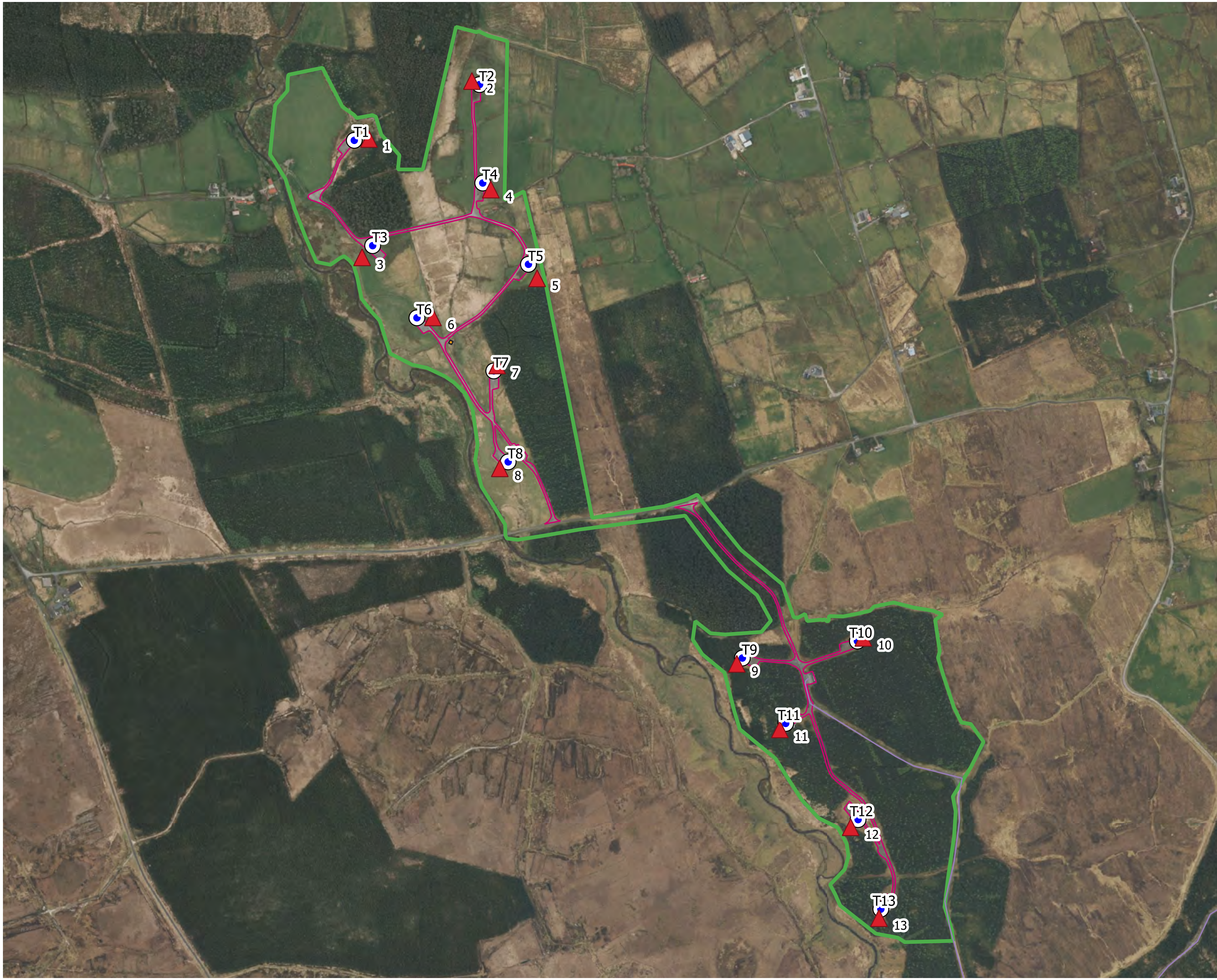
*One detector (D04) was redeployed 24th June 2021 following technical difficulties with the firmware.

3.3.5 Static Surveys at Height

Monitoring at height can provide useful information on bat activity within the rotor sweep area and is particularly relevant at proposed key-holed sites (NatureScot, 2021). Simultaneous surveying at ground level and at height was undertaken throughout 2021. One Song Meter SM3BAT (Wildlife Acoustics, Maynard, MA, USA) was installed on a meteorological mast within the Proposed Development site (Grid Ref: G 44380 29658). The detector was equipped with two microphones; one at ground level and one at height (approx. 60m above ground level) to allow for simultaneous surveying. Table 3-5 describes survey effort in relation to surveys at height and the location of the met mast is illustrated in Figure 3-4.

Table 3-5 2021 Survey Effort - Static Surveys at Height

ID	Survey Period	Total Survey Nights
Period - 1	14th May – 27th May 2021	14
Period - 2	19th July – 30th July 2021	12
Period - 3	15th September – 27th September 2021	13
Total Survey Effort		**39**



Map Legend

EIAR Site Boundary

Existing Dunneill Footprint

Existing Dunneill Turbines

Existing Dunneill Met Mast

Static Detector Locations

N

Drawing Title
Static Detector Locations

Project Title
Dunneill Wind Farm

Drawn By	Checked By
TM	AJ
Project No. 210207	Drawing No. Fig 3-4
Scale 1:11000	Date 20.06.22

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3.3.6 Collision Monitoring

Collision monitoring was conducted at the Proposed Development site to estimate the number of individual bats killed by collision with moving wind turbine rotor blades. All 13 turbines were surveyed once per month from April 2021 to March 2022 following standardised dog-led carcass search methodology. A 120 x 120m plot centred on the turbine bases was searched for an average of 65mins per month and all bat carcasses detected within were recorded. If the cause of death was not apparent, the fatality was conservatively attributed to collision with turbine blades (Johnson *et al.,* 2003).

To ensure a more accurate estimation of the total number of fatalities, dog-lead searches were calibrated to account for the dog's ability to find bird carcasses (searcher efficiency) and the likelihood of scavenging of carcasses by animals (scavenger removal). The searcher efficiency trial was conducted by planting carcasses within the site and allowing the dog to search for them. One worker left carcasses in a trial plot, and the dog and trainer team searched the following day. This gap aided in hiding any scent of the worker laying the carcasses and allowed time for scavenging to occur. Searcher efficiency was then based on the percentage retrieval success. Ten bird and bat carcasses were planted within various habitats. Eight scavenger removal trails were conducted by leaving carcasses in trial plots for 30 days, or until scavenger(s) removed the carcasses, before retrieving them. A determination on carcass removal was made when no body parts containing flesh or bone or >10 disarticulated feathers could be found. Scavenger removal rate was then determined by the amount of scavenging that occurred in the intervening period. Full survey methodology, including survey effort, is provided in Appendix 7-5 of this EIAR.

3.4 Bat Call Analysis

All recordings from 2021 were later analysed using bat call analysis software Kaleidoscope Pro v.5.4.0 (Wildlife Acoustics, MA, USA). The aim of this was to identify, to a species or genus level, what bats were present at the Proposed Development site. Bat species were identified using established call parameters, to create site-specific custom classifiers. All identified calls were also manually verified.

Echolocation signal characteristics (including signal shape, peak frequency of maximum energy, signal slope, pulse duration, start frequency, end frequency, pulse bandwidth, inter-pulse interval and power spectra) were compared to published signal characteristics for local bat species (Russ, 1999). Myotis species (potentially Daubenton's bat (*M. daubentonii*), Whiskered bat (*M. mystacinus*), Natterer's bat (*M. nattereri*) were considered as a single group, due to the difficulty in distinguishing them based on echolocation parameters alone (Russ, 1999). The echolocation of Soprano pipistrelle (*P. pygmaeus*) and Common pipistrelle (*P. pipistrellus*) are distinguished by having distinct (peak frequency of maximum energy in search flight) of ~55 kHz and ~46 kHz respectively (Jones & van Parijs, 1993).

Plate 3-1 below shows a typical sonogram of echolocation pulses for Common pipistrelle recorded with a SM4BAT bioacoustic static bat recording device. The recorded file is illustrated using Wildlife Acoustics Kaleidoscope software.

Individual bats of the same species cannot be distinguished by their echolocation alone. Thus, 'bat passes' was used as a measure of activity (Collins, 2016). A bat pass was defined as a recording of an individual species/species group's echolocation containing at least two echolocation pulses and of maximum 15s duration. All bat passes recorded in the course of this study follow these criteria, allowing comparison.

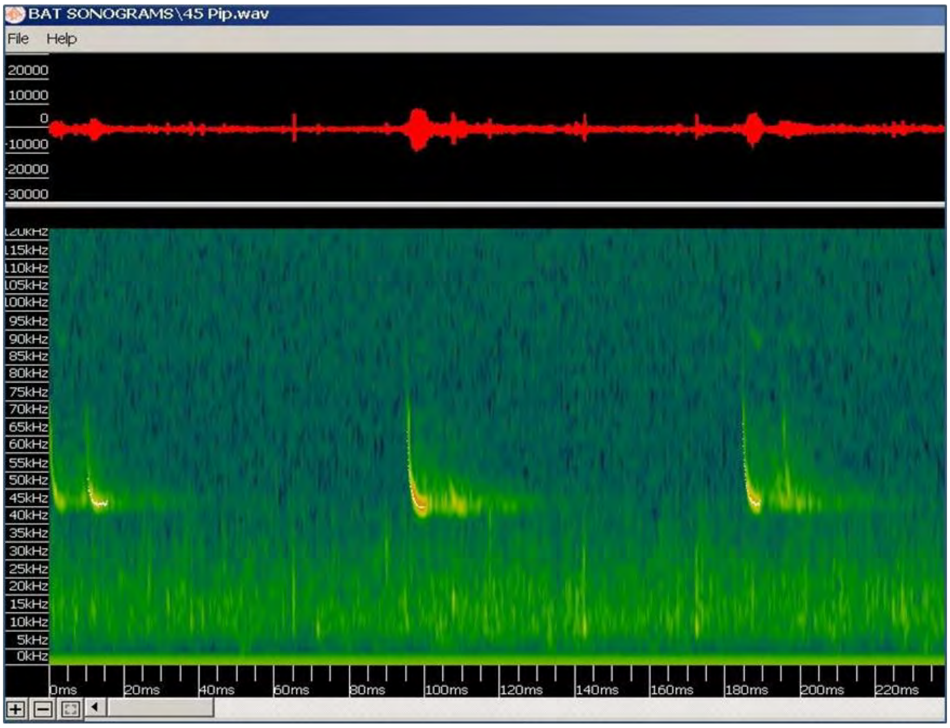


Plate 3-1 Sonogram of Echolocation Pulses of Common pipistrelle (Peak Frequency 45kHz)

3.5 Assessment of Bat Activity Levels

Static detector monitoring results were uploaded to the online database tool Eco bat (ecobat.org.uk). This web-based interface, launched in August 2016, allows users to upload activity data and to contrast results with a comparable reference range, allowing objective interpretation. Uploaded data then contributes to the overall dataset to provide increasingly robust outputs. Ecobat generates a percentile rank for each night of activity and provides a numerical way of interpreting levels of bat activity in order to provide objective and consistent assessments. Table 3-6 defines bat activity levels as they relate to Ecobat percentile values (NatureScot, 2021).

Static detector at ground level results for the Proposed Development were uploaded in December 2021. Database records used in analyses were limited to those within a similar time of year (within 30 days) and a within a similar geographic region (within 200km).

Guidelines in the use of Ecobat recommend a Reference Range of 2000+ to be confident in the relative activity level. The reference range is the stratified dataset of bat results recorded in the same region, at the same time of year, by which percentile outputs can be generated. This comprises all records of nightly bat activity across Ireland.

Although there is an increased uptake in the use of Ecobat in Ireland, some of the reference ranges remain below 2000. As Ecobat continues to be utilised in Ireland the accuracy of data outputs and results will improve over time. Results of Ecobat analysis for the Proposed Development site can be found in Table 4-5 in the results section below.

Table 3-6 Ecobat Percentile Score and Categorised Level of Activity (NatureScot, 2021)

Ecobat Percentile	Bat Activity Level
81 to 100	High
61 to 80	Moderate to High
41 to 60	Moderate
21 to 40	Low to Moderate
0 to 20	Low

3.6 Assessment of Collision Risk

3.6.1 Population Risk

NatureScot (2021) provides a generic assessment of bat collision risk for UK species, based on species behaviour and flight characteristics. In the guidelines, this measure of collision risk is used, in combination with relative abundance, to indicate the potential vulnerability of British bat populations. No such assessment is provided for Irish bat populations.

In Plate 3-2, an adapted assessment of vulnerability for Irish bat populations to collision with wind turbine blades is provided. This adaptation of the NatureScot Guidance Table 2 was based on collision risk and species abundance of Irish bat populations. Species' collision risk follows those described in NatureScot (2021). Relative abundance for Irish species was determined in accordance with Wray *et al.* (2010) using population data available in the 2019 Article 17 reports (NPWS, 2019). Feeding and commuting behaviours, and habitat preferences for bat species in Ireland were also considered.

Relative Abundance	Low Collision Risk	Medium Collision Risk	High Collision Risk
Common species			Common pipistrelle Soprano pipistrelle
Rarer species	Daubenton's bat Brown long-eared bat Lesser horseshoe bat		Leisler's bat
Rarest species	Natterer's bat Whiskered bat		Nathusius' pipistrelle
	Low Population Vulnerability	Medium Population Vulnerability	High Population Vulnerability

Plate 3-2 Population Vulnerability of Irish Bat Species (Adapted from NatureScot, 2021)

3.6.2 Site Risk

The likely impact of a development on bats is related to site-based risk factors, including habitat and development features. The cross-tablature result of habitat risk and project size determines the site risk (i.e. Low, Medium or High) (Plate 3-3) i.e. Table 3a (NatureScot, 2021). Table 5-1 in the results section below describes the criteria and site-specific characteristics used to determine an indicative risk level for the site. All site assessment levels, as per NatureScot (2021) are presented in **Appendix 2**.

		Project Size		
		Small	Medium	Large
Habitat Risk	Low	1	2	3
	Moderate	2	3	4
	High	3	4	5
		Low/Lowest Site Risk (1-2)	Medium Site Risk (3)	High/Highest Site Risk (4-5)

Plate 3-3 Site-risk Level Assessment Matrix (Table 3a, NatureScot, 2021)

3.6.3 Overall Risk Assessment

An overall assessment of risk was made by combining the site risk level (i.e. Low/Medium/High) and the population risk (i.e. Ecobat bat activity outputs), as shown in the overall risk assessment matrix table (Plate 3-4) i.e. Table 3b (NatureScot, 2021). The assessment was carried out for both median and maximum Ecobat activity categories in order to provide insight into typical bat activity (i.e. median values) and activity peaks (i.e. maximum values).

	Ecobat Activity Category					
Site Risk Level	Nil (0)	Low (1)	Low-Moderate (2)	Moderate (3)	Moderate-High (4)	High (5)
Lowest (1)	0	1	2	3	4	5
Low (2)	0	2	4	6	8	10
Medium (3)	0	3	6	9	12	15
High (4)	0	4	8	12	16	20
Highest (5)	0	5	10	15	20	25

Low Overall Risk (0-4)	Medium Overall Risk (5-12)	High Overall Risk (13-25)

Plate 3-4 Overall Risk Assessment Matrix (Table 3b, NatureScot, 2021)

This exercise was carried out for each high collision risk species. Plate 3-2 outlines high collision risk species. Overall risk assessments were also considered in the context of any potential impacts at the population level, particularly for species identified as having high population vulnerability (Plate 3-2).

3.7 Limitations

A comprehensive suite of bat surveys has been undertaken at the Proposed Development site in 2021. The surveys undertaken in 2021, in accordance with NatureScot Guidance, provide the information necessary to allow a complete, comprehensive and robust assessment of the potential impacts of the Proposed Development on bats receptors.

The information provided in this report accurately and comprehensively describes the baseline environment; provides an accurate prediction of the likely effects of the Proposed Development; prescribes mitigation as necessary; and describes the predicted residual impacts. The specialist studies, analysis and reporting have been undertaken in accordance with the appropriate guidelines.

No limitations in the scope, scale or context of the assessment have been identified. Overall, a comprehensive assessment has been achieved.

4. SURVEY RESULTS

4.1 Consultation

4.1.1 Bat Conservation Ireland

Bat Conservation Ireland were invited to comment on the potential of the Proposed Development to affect bats on 16/06/2021. As of 20/06/2022, no response has been received.

4.1.2 Development Applications Unit - NPWS

A detailed scoping exercise was undertaken for the Proposed Development. As of 20/06/2022, no specific response pertaining to the conservation of bats has been received.

4.2 Desk Study

4.2.1 Bat Records

Bat Conservation Ireland

An information request form was sent to Bat Conservation Ireland to gather information on bat roosts and species composition within 1km and 10km of a central point within the Northern and Southern Study Areas (Grid Ref: E144797 N329265). Available bat records were provided by Bat Conservation Ireland on 16/06/2022. The search yielded no results of roosts within a 1km radius of the Proposed Development. The search was extended to include a 10km radius including roosts, transects and ad-hoc observations. Two roosts were recorded within 10km. A number of transects (n=2) and ad-hoc observations (n=25) have been recorded. At least six of Ireland's nine resident bat species were recorded within 10 km of the proposed works including common and soprano pipistrelle, Leisler's bat, Daubenton's bat, Natterer's bat and brown long-eared bat, as well as several records of unidentified bats. The results of the database search are provided in Table 4-1.

Table 4-1 National Bat Database of Ireland Records within 10km

Record	Species	Grid Reference	Date	Locations/ Surveys
Within 10km of Proposed Development				
Roost	*Myotis spp.*	-	N/A	Leekfield Bridge, County Sligo
	Plecotus auritus	-	N/A	Screen, County Sligo
Transect	*Myotis daubentonii, Pipistrellus pygmaeus, Nyctalus leisleri*	G5310034300	N/A	Ardnaglass Bridge Transect
	Nyctalus leisleri, Pipistrellus pygmaeus, Pipistrellus pipistrellus (45kHz), Myotis spp.	G392258	N/A	Woodrow Sustainable Solutions
Ad-hoc	*Myotis daubentonii*	G4489723734	26/09/2009	BATLAS 2010
	Pipistrellus pygmaeus, Nyctalus leisleri	G488337	26/09/2009	BATLAS 2010
	Myotis daubentonii, Pipistrellus pygmaeus	G437325	26/09/2009	BATLAS 2010
	Nyctalus leisleri	G531343	25/09/2009	BATLAS 2010
	Pipistrellus pygmaeus	G511307	25/09/2009	BATLAS 2010
	Myotis daubentonii, Pipistrellus pygmaeus	G364354	29/09/2009	BATLAS 2010
	Unidentified bat, Pipistrellus spp. (45kHz/55kHz)	G393317	25/09/2009	BATLAS 2010
	Pipistrellus pygmaeus	G5292520503	09/07/2017	BATLAS 2020

	Pipistrellus pygmaeus, Nyctalus leisleri	G5390227058	08/07/2017	BATLAS 2020
	Pipistrellus pygmaeus, Myotis daubentonii	G3520329478	20/08/2018	BATLAS 2020
	Pipistrellus pygmaeus	G4212629629	18/05/2018	BATLAS 2020
	Pipistrellus pygmaeus, Myotis natterreri, Myotis spp.	G5104931623	03/08/2017	BATLAS 2020
	Pipistrellus pygmaeus	G5076032491	18/05/2018	BATLAS 2020
	Pipistrellus pipistrellus (45kHz)	G4482632733	07/09/2017	BATLAS 2020
	Pipistrellus pygmaeus, Myotis spp.	G4630333118	18/05/2018	BATLAS 2020
	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri, Myotis daubentonii	G5346633318	03/08/2017	BATLAS 2020
	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Myotis daubentonii	G3991833328	18/05/2018	BATLAS 2020
	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus	G4318333687	07/09/2017	BATLAS 2020
	Pipistrellus pygmaeus	G4388635121	07/09/2017	BATLAS 2020
	Pipistrellus pygmaeus	G4905935200	04/08/2017	BATLAS 2020
	Pipistrellus pygmaeus	G5092035216	03/08/2017	BATLAS 2020
	Pipistrellus pygmaeus, Nyctalus leisleri	G4137035417	07/09/2017	BATLAS 2020
	Pipistrellus pygmaeus	G5038635710	03/08/2017	BATLAS 2020
	Pipistrellus pygmaeus	G4928635792	04/08/2017	BATLAS 2020
	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Myotis spp.	G3854336057	18/05/2018	BATLAS 2020

National Bat Database of Ireland

The National Bat Database of Ireland was searched for records of bat activity and roosts within a 10km radius of the Proposed Development site (last search 20/06/2022). Hectads G42 and G43 lie within 10km of the EIAR Study Area. Three of Ireland's nine resident bat species were recorded within 10km of the Proposed Development. The results of the database search are provided in Table 4-2.

Table 4-2 NBDC Bat Records within 10km of Proposed Development

Hectad	Species	Database	Designation
G42, G43	Daubenton's Bat *Myotis daubentonii*	National Bat Database of Ireland	HD Annex IV, WA
G43	Leisler's bat *Nyctalus leisleri*	National Bat Database of Ireland	HD Annex IV, WA
G43	Soprano pipistrelle *Pipistrellus pygmaeus*	National Bat Database of Ireland	HD Annex IV, WA

4.2.2 Bat Species Range

The potential for negative impacts is likely to increase where there are high risk species at the edge of their range (NatureScot, 2021). Therefore, range maps presented in the 2019 Article 17 Reports (NWPS, 2019) were reviewed in relation to the location of the Proposed Development.

The Proposed Development site is located outside the current known range for Lesser horseshoe bat, Nathusius' pipistrelle bat, Natterer's bat and Whiskered bat. The Proposed Development site is within the range of all other species.

4.2.3 Designated Sites

Within Ireland, the Lesser horseshoe bat is the only bat species requiring the designation of Special Areas of Conservation (SACs) and the Proposed Development site is situated outside the known range of this species.

Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) may be designated for any bat species. A search of NHAs and pNHAs within a 10km radius of the EIAR Study Area found no sites designated for the conservation of bats.

4.2.4 Landscape Features and Habitat Suitability

A review of mapping and photographs provided insight into the habitats and landscape features present at the Proposed Development site. In summary, the primary land use within the southern section of existing site is conifer plantation, while the northern section primarily consists of agricultural grassland.

A review of the GSI online mapper did not indicate the possible presence of any subterranean sites within the EIAR Study Area. Four karst features were found within 10km of the study area including three springs and one swallow hole.

A search of the National Monuments Database did not reveal the presence of any manmade subterranean sites within the EIAR Study Area.

A search of the UBSS Cave Database for the Republic of Ireland found no caves within the Proposed Development site and one within 10km of the EIAR Study Area. Moylough Cave (20m partly collapsed passage) is located approximately 8.2km from the Proposed Development (Grid Ref: G 35440 30860).

A review of the NBDC bat landscape map provided a habitat suitability index of 9.44 (green) to 21.78 (yellow) for all bat species. This indicates that the Proposed Development area has high habitat suitability for bat species.

4.2.5 Other Wind Energy Developments

Table 4-3 provides an overview of wind farms in the vicinity of the wind farm.

Table 4-3 Wind Farm Developments within 10km of the Proposed Development

Wind Farm Name and Location	No. Turbines	Status
Within 5km of Proposed Dunneill Wind Farm		
Kingsmountain Wind Farm	10	Operational
Within 10km of Proposed Dunneill Wind Farm		
Black Lough Wind Farm	4	Operational
Cloonkeelaun Wind Farm	3	Operational
Cloonkeelaun II Wind Farm	1	Operational
Cloonkeelaun III Wind Farm	2	Operational
Carrowleagh Wind Farm	13 (5 within 10km)	Operational

4.3 Overview of Study Area and Bat Habitat Appraisal

A walkover survey, assessing bat habitat suitability, was conducted on the 14th September 2021 and 26th April 2022. The main habitat types identified within the boundary of the Proposed Development are ***Conifer Plantation (WD4), Improved Agricultural Grassland (GA1), Dry Meadows and Grassy Verges (GS2), Wet Grassland (GS4), Dry Heath (HH1), Wet Heath (HH3), Upland Blanket Bog (PB2), Recently Felled Woodland (WS5), Spoil and Bare Ground (ED2), Recolonising Bare Ground (ED3), Earth Banks (BL2), Eroding/Upland River (FW1), Buildings and Artificial Surfaces (BL3), Scrub (WS1),*** and ***Drainage Ditches (FW4).***

The site comprises the existing windfarm infrastructure, including turbines and associated hardstand areas and the windfarm access roads, which are classified as *Buildings and artificial surfaces (BL3).* Earth banks are present around the hardstanding bases of T9, T10, T11, T12 and T13 within the south of Dunneill Wind Farm.

Outside of the existing windfarm infrastructure the lands within the site boundary are dominated by areas of *plantation forestry (WD4),* comprising mainly of Sitka spruce (*Picea sitchenis*) and Lodgepole pine (*Pinus contorta*) to the south. To the north the site is comprised of *improved agricultural grassland (GA1)* with some *conifer plantation (WD4), wet heath (HH3)* and *dry heath (HH1).* The site is accessible via a network of local roads and the existing wind farm access tracks. A further description of the main habitats within the site boundary is provided in Chapter 6 of the EIAR.

The site is drained by the Dunneill River, Doonbeakin and Fiddandoo streams classified as *Eroding/Upland River (FW1).*

Results from the desktop review and walkover surveys were used to assess habitats for their suitability to support foraging and commuting bats, and roosting bats, according to Collins (2016). Suitability categories, divided into *High, Moderate, Low* and *Negligible*.

With regard to foraging and commuting bats, areas of closed canopy forestry as well as exposed areas of grassland, heath, blanket bog, earth banks and scrub were considered *Low* suitability, i.e. suitable but isolated habitat that could be used by small numbers of commuting or foraging bats (Collins, 2016). Forestry edge habitats created by commercial forestry, the Dunneill River and nearby streams, drainage ditches and tracks show potential for foraging and commuting bats. These habitats were classified as *Moderate* suitability, i.e. habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water (Collins, 2016).

With regard to roosting bats, an assessment of the various forestry habitats was undertaken. Trees present on site predominantly comprise a mixture of mature and immature commercial coniferous species. Overall, trees within the site did not provide optimal habitat for roosting bats and were assessed as having *Negligible* roosting potential.

Structures located within the EIAR Study Area were assessed as having *Low* to *Moderate* roosting potential i.e. A structure with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status.

All other habitats present were assigned a *Negligible* value.

4.4 Roost Inspection Surveys

Following the search for roosts within the EIAR Study Area in 2021, three derelict structures containing potential suitable bat roost features, located in Dunneill North, were identified within 200m plus the rotor radius (26m) of the Proposed Development footprint (Grid Ref: E144471 N329940 and E143999 N329994). The onsite substation was also identified within 226m of the turbines. These structures were subsequently inspected for evidence of roosting bats. A further two farm sheds, located outside the EIAR Study Area, were identified within 226m of the existing turbines.

Emergence surveys were carried out in summer and autumn of 2021. The derelict buildings were assessed as having potential for providing suitable roosting features and were subject detailed inspections of the exterior and interior (where possible) to assess for evidence of bat use. No signs of bats were identified, i.e. droppings, fur oil staining, signs of feeding remain etc. No bats were observed emerging or re-entering any of the structures during the emergence surveys; however, commuting and foraging bat activity was observed around the majority of structures within the site.

4.4.1 Derelict Farmhouse and Associated Outbuildings

Three derelict structures, located within the EIAR Study Area, were subject to a dedicated interior and exterior roost inspection survey during daylight hours on the 26th April 2021. The derelict structures comprised a farmhouse and two associated outbuildings (Plates 4-1 and 4-2). The farmhouse (Grid Ref: E144471 N329940) was comprised of stone with concrete walls and corrugated roofing. The farmhouse also contained an area of ivy coverage on the southwest corner. The associated outbuilding to the west consisted of stone walls and corrugated roofing with no insulation. The third structure to the east was comprised of stone and no longer had a roof attached.

Potential bat access points included gaps in the roofs, chimneys, timber fascia and open windows/doors. Crevices were also evident within the stonework of the two outer structures. There was a small separate attic space within the farmhouse, however no signs of bats were identified. No other evidence of bat use was identified in any of the derelict structures.

The farmhouse was assessed as having *Moderate* suitability for roosting bats i.e. A structure with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status. The two derelict outbuildings were assessed as having *Low* roosting suitability, i.e. A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (Collins, 2016).

Bat activity was observed around all three structures during the emergence survey on 24th June 2021; however, no bats were observed entering or leaving during emergence survey or manual transect surveys.

Plate 4-1 Three derelict structures within EIAR study area - North facing elevation

Plate 4-2 Three derelict structures within EIAR study area - South facing elevation

4.4.2 Onsite Electrical Control Building

The occupied onsite Electrical Control Building (Grid Ref: E145182 N328909) was comprised of concrete block walls with slate roof. This structure is in good condition and in regular use. The substation was assessed as having *Negligible* roosting suitability due to the lack of available PRFs, i.e. Negligible habitat features likely to be used by roosting bats (Collins, 2016).

No evidence of bats were identified during the daytime inspection and no bats were observed emerging or re-entering the Electrical Control Building during any of the manual transect surveys.

Plate 4-3 Onsite Electrical Control Building – Western Elevation

Plate 4-4 Onsite Electrical Control Building – Northern Elevation

4.4.3 Active Farm Sheds (Outside EIAR Study Area)

The farm sheds located to the northwest of the site (Grid Ref: E143999 N329994) are comprised of concrete block walls and corrugated roofing with no insulation. The interiors of the structures were relatively exposed with gaps between the roof and the walls. There were also high levels of light penetration within the structures during the day. No evidence of bats were identified during the daytime inspection and no bats were observed emerging or re-entering the sheds during the dusk survey. The structure was assessed as have a *Negligible* to *Low* suitability, i.e. Negligible habitat features on site likely to be used by roosting bats (Collins 2016).

The structures were assessed as have a *Negligible* to *Low* suitability i.e. A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (Collins, 2016).

4.5 Roost Emergence Surveys

Dusk emergence surveys were carried out on the nights of the 24th June and 2nd September 2021. For each survey, two surveyors were equipped with Bat Logger M bat detectors (Elekon AG, Lucerne, Switzerland).

On 24th June 2021, conditions were suitable for bat surveys; dry, 14°C and light air. The emergence surveys commenced half an hour before sunset and lasted for one hour. The emergence survey was carried out on the three derelict structures located to the south of T4 and north of T5. No bats were observed emerging or re-entering the structures during the survey.

On 2nd September 2021, conditions were suitable for bat surveys; dry, 19°C and calm. The emergence surveys commenced half an hour before sunset and lasted for one hour. The emergence survey was carried out on the active farm sheds to the east of T1 and T3. No bats were observed emerging or re-entering the structures during the survey.

The Proposed Development site was checked for potential tree roosts but no trees with high quality roosting features were identified within the site. The site is comprised predominantly of conifer species which lack suitable roost features. Trees may have increased or decreased probability of hosting roosting bats in certain circumstances i.e. Having large broadleaf trees with cavities or other damage such as rot or loose bark increased probability whereas, Conifer plantations and young trees with little – no damage have a decreased probability of hosting bats (Kelleher and Marnell, 2006).

4.6 Manual Transects

Manual transects were undertaken in Spring, Summer and Autumn 2021. Bat activity was recorded on all surveys. A total of 381 bat passes were recorded. In general, Soprano pipistrelle (n=221) was recorded most frequently, followed by Common pipistrelle (n=146) and Leisler's bat (n=13). Brown long-eared bat (n=1) was rare (Plate 4-5).

Species composition and activity levels varied significantly between surveys. Transect survey results were calculated as bat passes per km surveyed (to account for differences in survey effort). Plate 4-6 present the results for individual species per survey period.

Figures 4-1 to 4-3 present the spatial distribution of bat activity across the 2021 surveys. Bat activity was concentrated along linear (road/track) habitats.

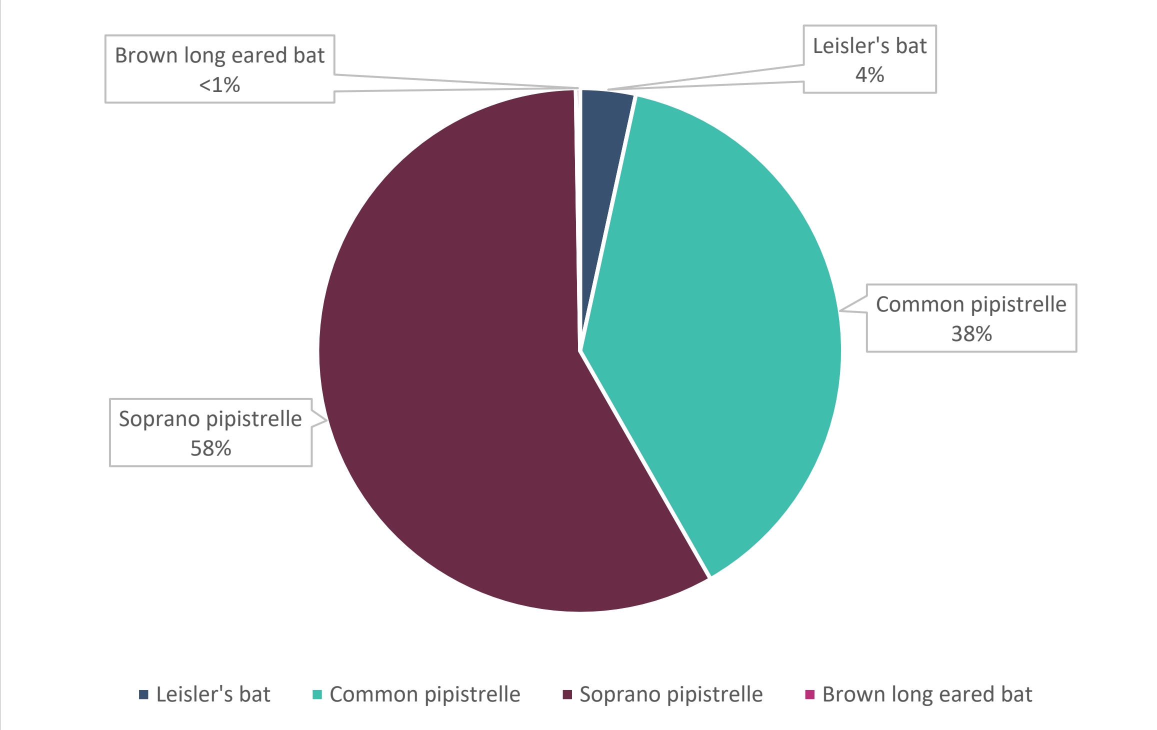


Plate 4-5 2021 Transect Results – Total Species Composition – Total Survey Period

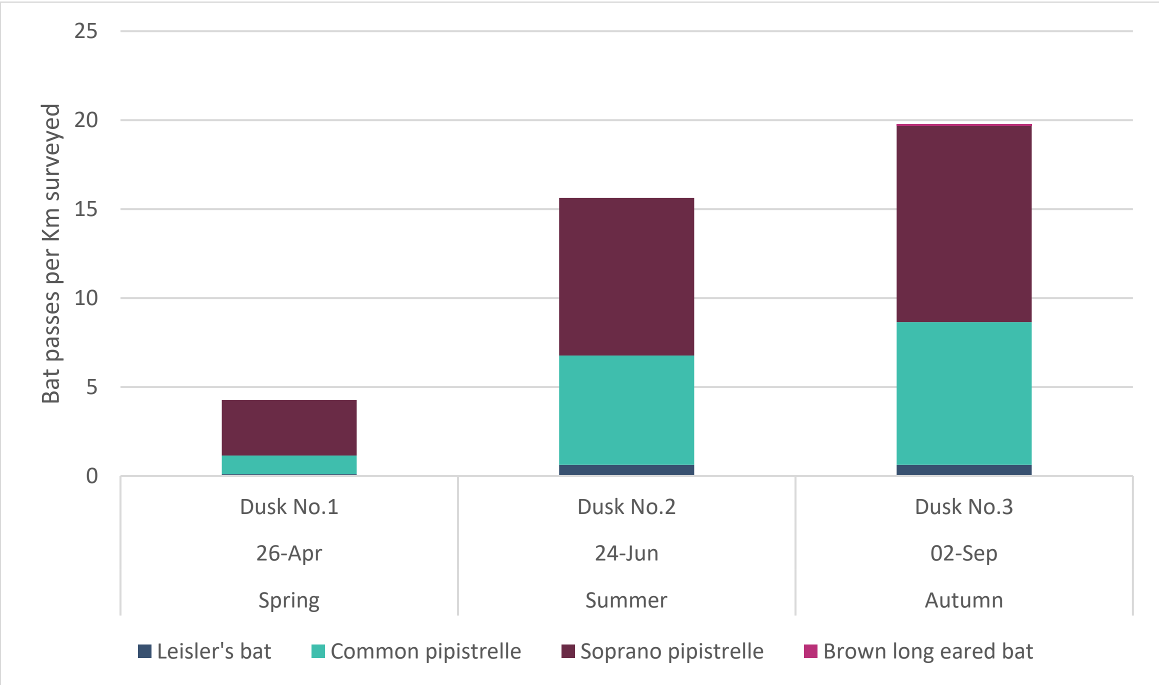
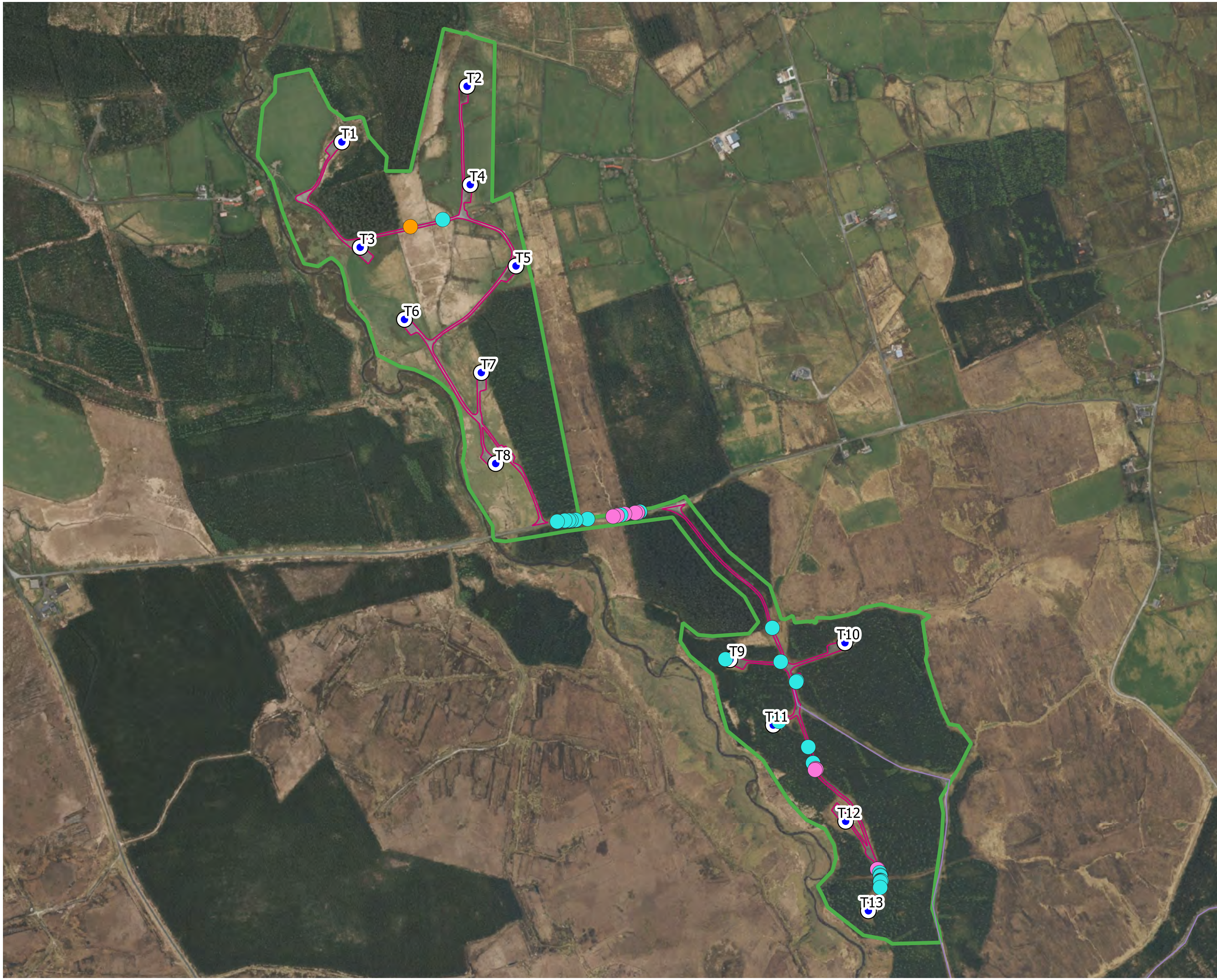


Plate 4-6 2021 Transect Results – Species Composition Per Survey Period



Map Legend

- EIAR Site Boundary
- Existing Dunneill Footprint
- Existing Dunneill Turbines

Spring Manual Results

- Leisler's bat
- Common pipistrelle
- Soprano pipistrelle

N

Drawing Title: Spring Manual Transect Results	
Project Title: Dunneill Wind Farm	
Drawn By: TM	Checked By: AJ
Project No.: 210207	Drawing No.: Fig 4-1
Scale: 1:11000	Date: 20.06.22

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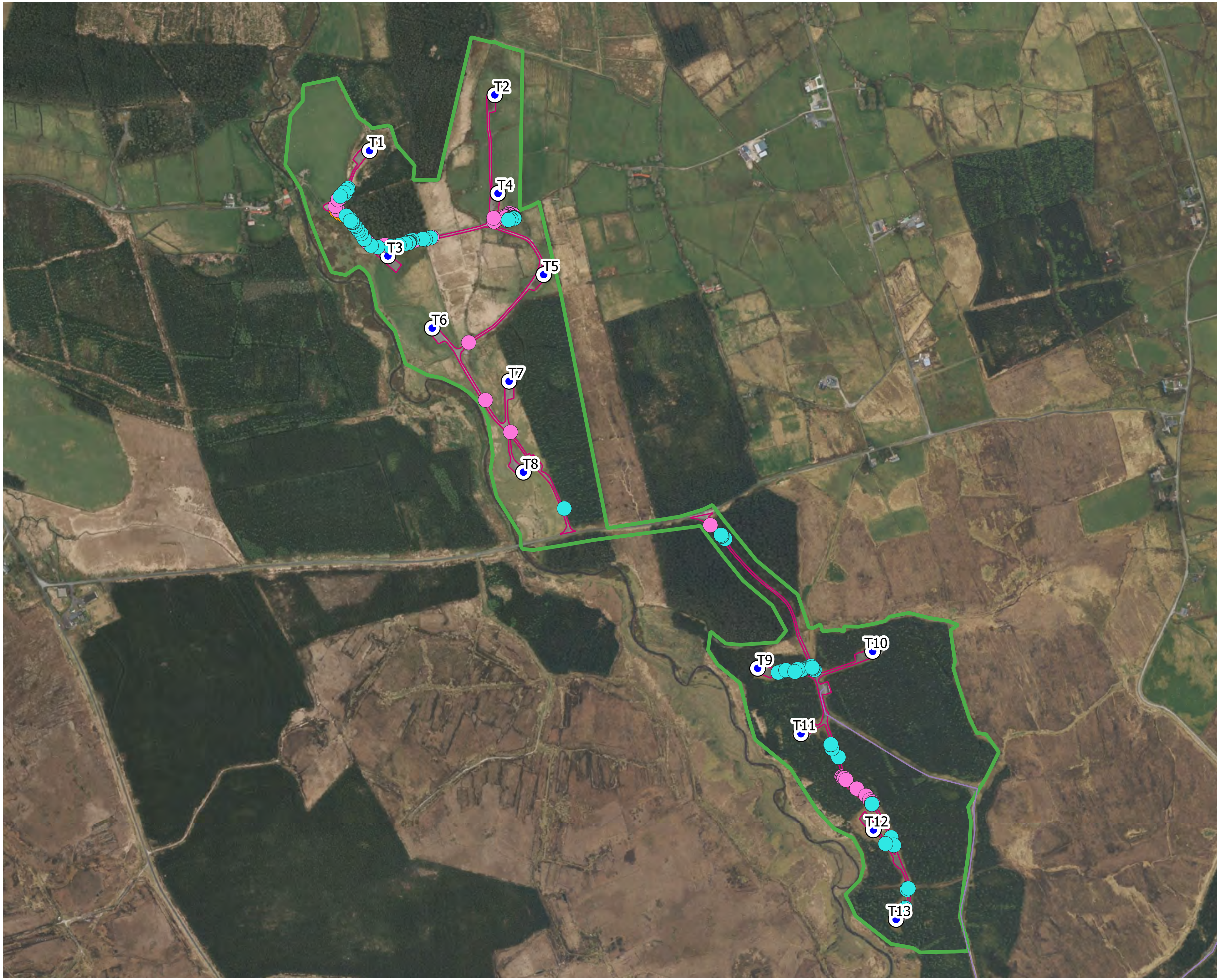

Map Legend

- EIAR Site Boundary
- Existing Dunneill Footprint
- Existing Dunneill Turbines

Summer Manual Results

- Leisler's bat
- Common pipistrelle
- Soprano pipistrelle

N

Drawing Title: Summer Manual Transect Results	
Project Title: Dunneill Wind Farm	
Drawn By: TM	Checked By: AJ
Project No.: 210207	Drawing No.: Fig 4-2
Scale: 1:11000	Date: 20.06.22

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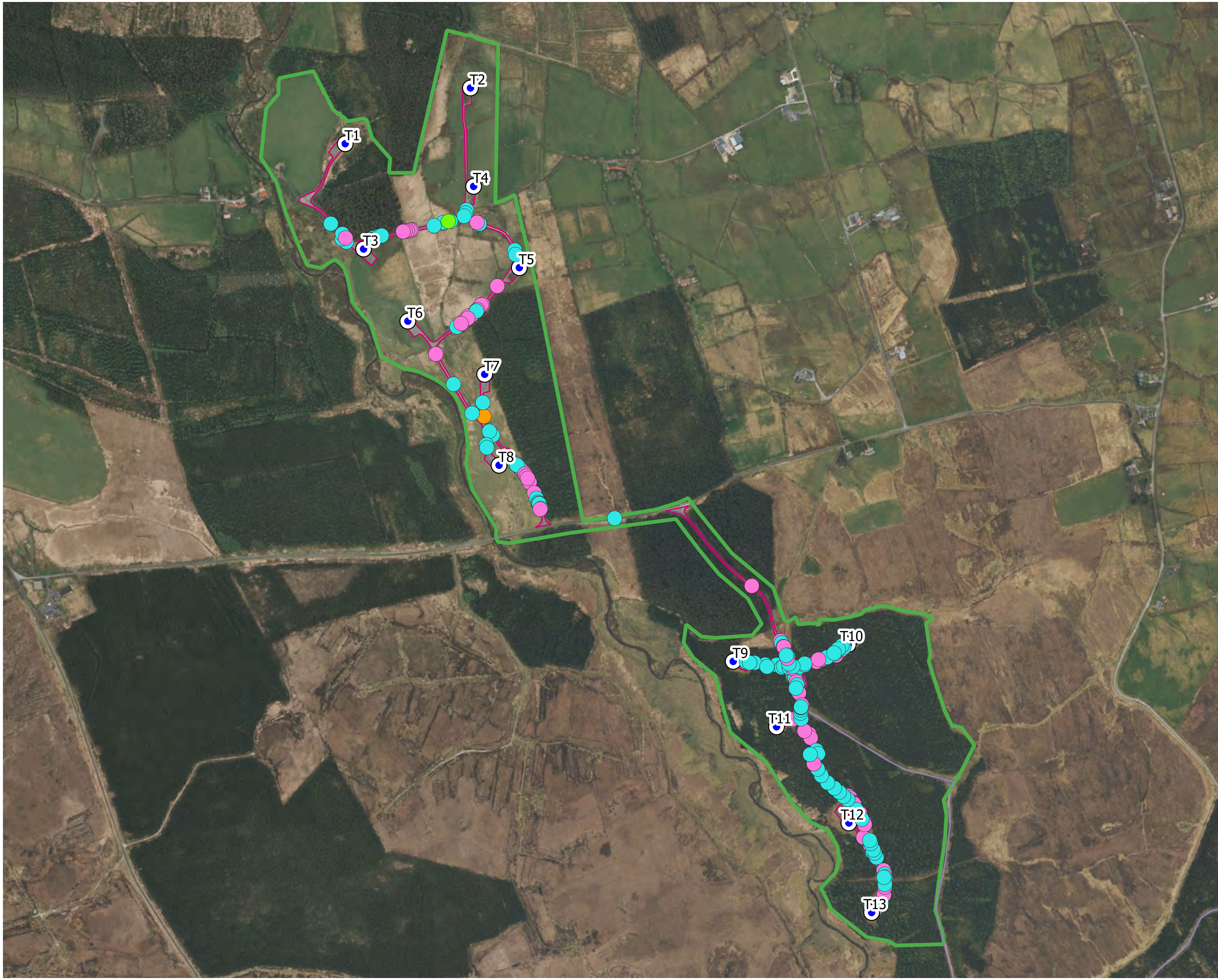

Map Legend

- EIAR Site Boundary
- Existing Dunneill Footprint
- Existing Dunneill Turbines

Autumn Manual Results

- Leisler's bat
- Common pipistrelle
- Soprano pipistrelle
- Brown long-eared bat

N

Drawing Title	
Autumn Manual Transect Results	
Project Title	
Dunneill Wind Farm	
Drawn By: TM	Checked By: AJ
Project No.: 210207	Drawing No.: Fig 4-3
Scale: 1:11000	Date: 20.06.22

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4.7 Ground-level Static Surveys

In total, 27,916 bat passes were recorded across all deployments. In general, soprano pipistrelle (n=15,448) occurred most frequently, followed by common pipistrelle (n=8,716), Leisler's bat (n=2,120) and *Myotis spp.* (n=1,451). Instances of brown long-eared bat (n=175) were significantly less, and Nathusius' pipistrelle (n=6) were rarely encountered. Plate 4-7 presents species composition across all ground-level static detectors.

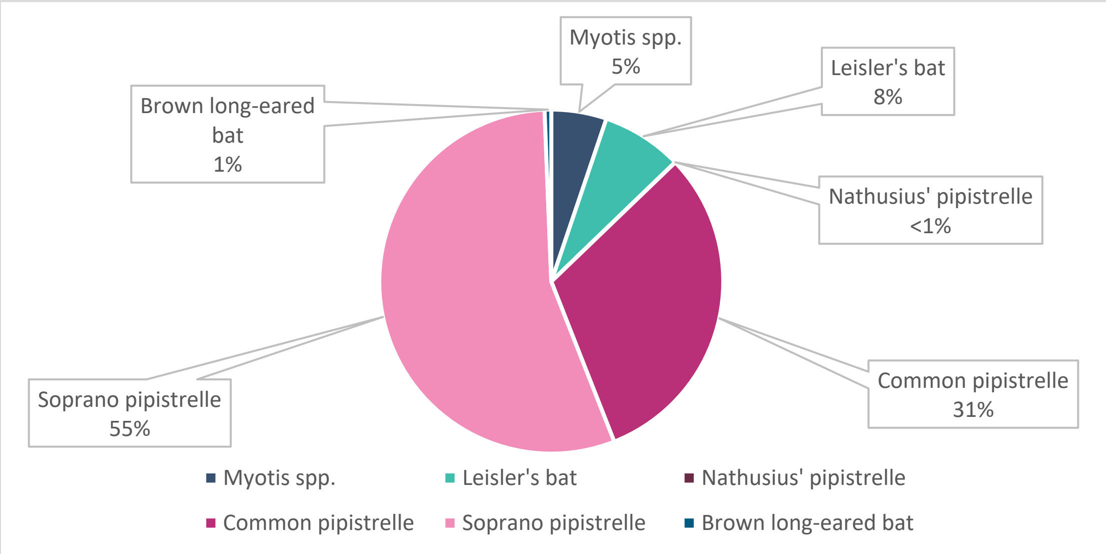

Plate 4-7 2021 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes)

Bat activity was calculated as total bat passes per hour (bpph) per season to account for any bias in survey effort, resulting from varying night lengths between seasons. Plate 4-8 and Table 4-4 present these results for each species. Bat activity was dominated by soprano pipistrelle in spring and autumn. Both common and soprano pipistrelle were the most common species in summer and had similar levels of activity. Instances of Leisler's bat and *Myotis spp.* were less frequent. Brown long-eared bat and Nathusius' pipistrelle were relatively rare.

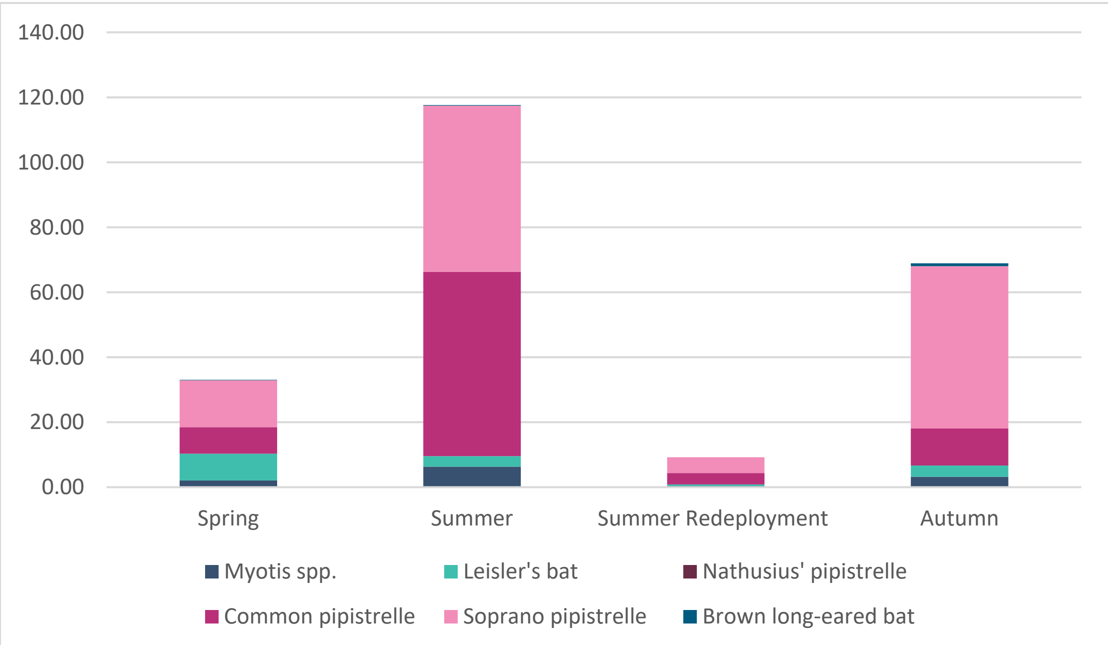

Plate 4-8 2021 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes Per Hour, All Nights)

Table 4-4 2021 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes Per Hour, All Nights)

	Spring	Summer	Summer Redeployment	Autumn
Total Survey Hours	**147.7**	**95.7**	**68.8**	**161.8**
Myotis spp.	2.06	6.32	0.36	3.19
Leisler's bat	8.23	3.22	0.47	3.49
Nathusius' pipistrelle	-	-	-	0.04
Common pipistrelle	8.17	56.74	3.53	11.39
Soprano pipistrelle	14.46	51.15	4.85	49.96
Brown long-eared bat	0.11	0.17	0.00	0.88

The Nightly Pass Rate (i.e. total bat passes per hour, per night) was used to determine typical bat activity at the Proposed Development site. Activity is often variable between survey nights. Therefore, the median Nightly Pass Rate was used as the most appropriate measure of bat activity (Lintott & Mathews, 2018).

Plate 4-9 illustrates the median Nightly Pass Rate per species per deployment. Zero data, when a species was not detected on a night, was also included.

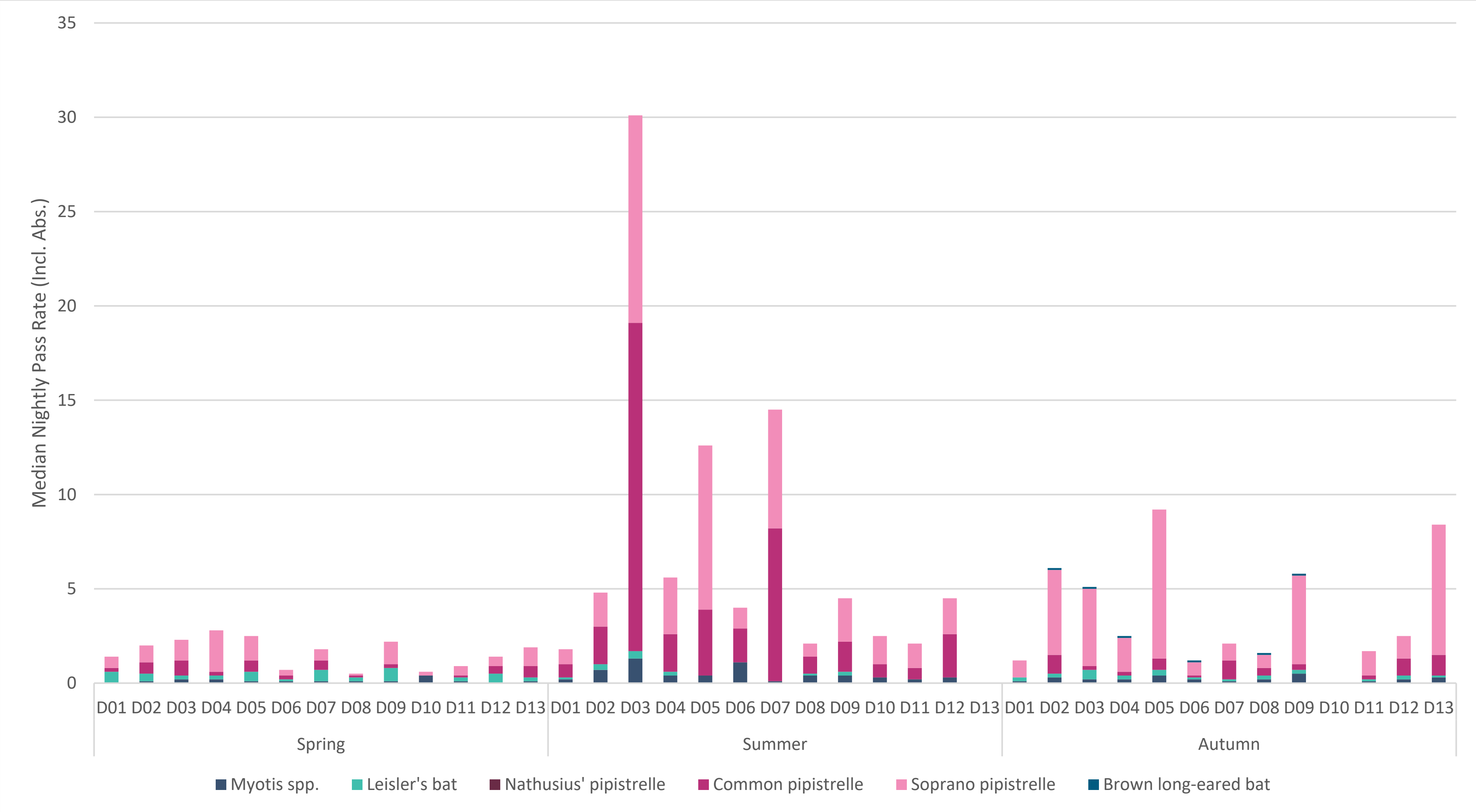

Plate 4-9 2021 Static Detector Surveys: Median Nightly Pass Rate (bpph) Including Absences, Per Location Per Survey Period

Soprano pipistrelle bats were predominant at the majority of detectors during the spring and autumn survey periods. Summer activity varied at each detector with common pipistrelle and soprano pipistrelle as the dominant species.

Bat activity levels were objectively assessed against a reference dataset using Ecobat. Table 4-5 presents the results of Ecobat analysis for each species per season on a site-level. **Appendix 3** provides these results per detector. Median activity levels for soprano pipistrelle peaked at ***High*** for autumn. Median activity levels for common pipistrelle peaked at ***Moderate to High*** for summer, and Leisler's bat peaked at ***Moderate*** for spring and autumn. Median activity levels for *Myotis spp.* peaked at ***Moderate*** for two seasons. Brown long-eared bat peaked at ***Low to Moderate*** for two seasons. Median activity levels for Nathusius' pipistrelle peaked at ***Low to Moderate*** in autumn. Maximum activity levels peaked with ***High*** activity for four species for at least one season, with the exception of brown long-eared bat and Nathusius' pipistrelle, which peaked at ***Moderate to High.***

Table 4-5 Static Detector Surveys: Site-level Ecobat Analysis

Survey Period	Median Percentile	Median Bat Activity	Max Percentile	Max Bat Activity	Nights Recorded	Ref Range
Soprano pipistrelle						
Spring	59	Moderate	94	High	172	4862
Summer	72	Moderate to High	96	High	168	8458
Autumn	83	High	99	High	175	6459
Common pipistrelle						
Spring	43	Moderate	93	High	152	5190
Summer	71	Moderate to High	98	High	165	8711
Autumn	63	Moderate to High	94	High	146	5915
Leisler's bat						
Spring	46	Moderate	93	High	148	4750
Summer	31	Low to Moderate	83	High	90	7890
Autumn	52	Moderate	84	High	140	4752
***Myotis* spp.**						
Spring	30	Low to Moderate	68	Moderate to High	120	3537
Summer	42	Moderate	81	High	136	5639
Autumn	52	Moderate	82	High	139	4797
Brown long-eared bat						
Spring	11	Low	30	Low to Moderate	15	1538
Summer	12	Low	42	Moderate	14	2809
Autumn	22	Low to Moderate	63	Moderate to High	87	3441
Nathusius' pipistrelle						
Spring	-	Nil	-	Nil	-	-
Summer	-	Nil	-	Nil	-	-
Autumn	22	Low to Moderate	63	Moderate to High	6	1967

4.8 Surveys at Height

Simultaneous surveying at ground level and at height was undertaken using a SM3 static bat detector. One U1 microphone was attached at height (approx. 60m) on the meteorological mast (Grid Ref: G 44380 29658) while another U1 microphone was placed 2m from ground level.

In 2021, 38 nights of simultaneous bat monitoring at ground level and at height was from May to October 2021. In total, 1,163 bat passes were recorded with bat activity higher at ground level (86%) compared to activity at height (14%) (Plate 4-10). Common pipistrelle (n=525) was predominantly recorded at ground level with soprano pipistrelle (n=251) and Leisler's bat (n=204) also present. *Myotis spp.* (n=13) and brown long-eared bat (n=7) were also recorded at ground level.

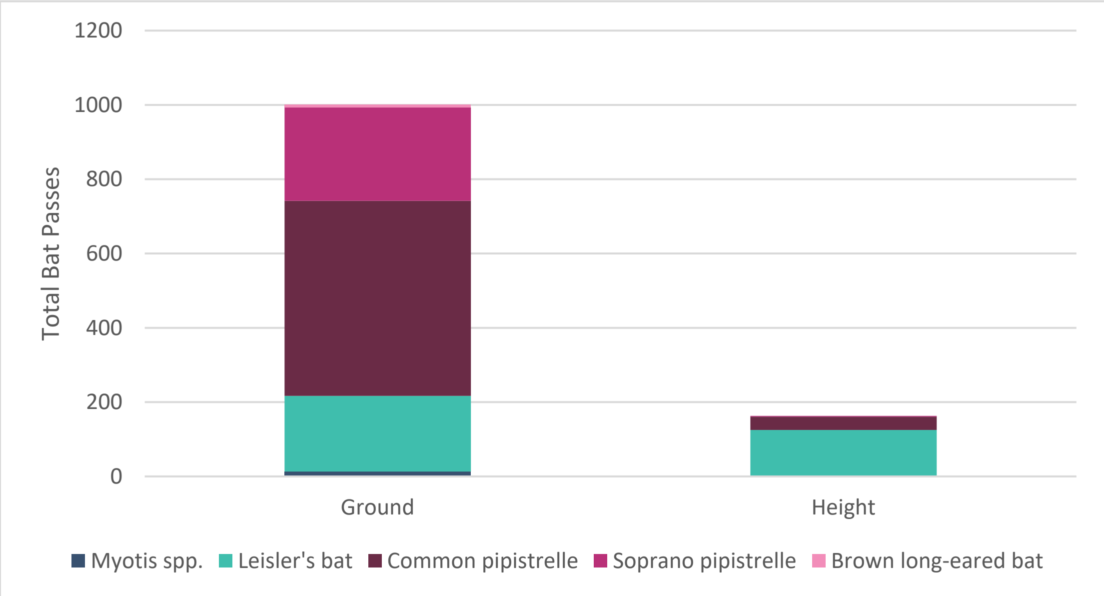

Plate 4-10 Surveys at Height: Overall Species Composition Per Microphone

Table 4-6 presents met mast monitoring as total bat passes. All individual bat records arising from static detector monitoring at height are appended to this report as **Appendix 4.** Plate 4-11 presents total bat passes per night. Activity was dominated by Common pipistrelle.

Table 4-6 Static Detector Surveys at Height: 2021 Total Bat Passes

Species	Ground Level	At Height	Total
Myotis spp.	13	-	**13**
Leisler's bat	204	125	**329**
Common pipistrelle	525	36	**561**
Soprano pipistrelle	251	2	**253**
Brown long-eared bat	7	-	**7**
Total	**1000**	**163**	**1163**

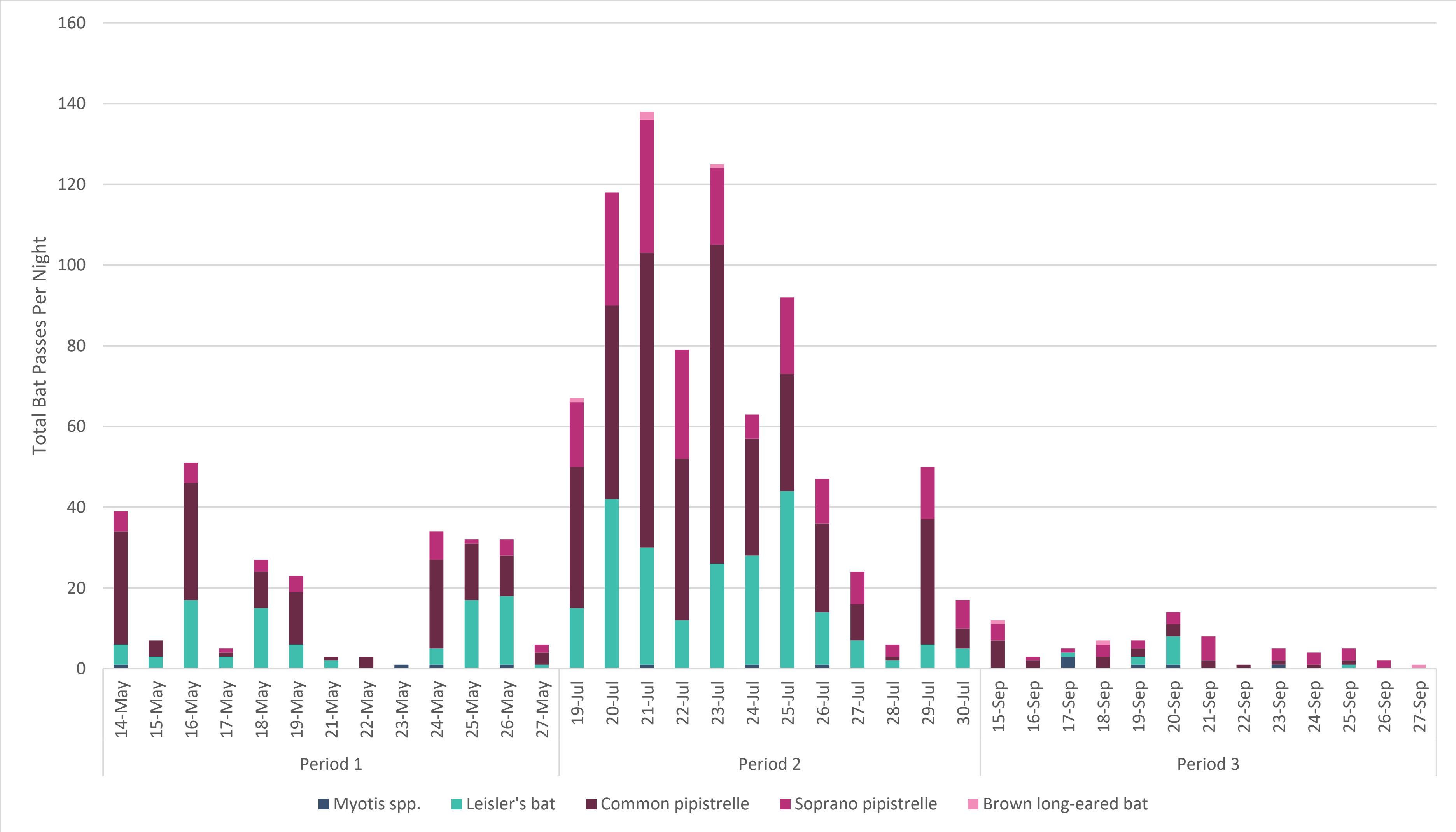

Plate 4-11 Surveys at Height: Total Bat Passes Per Night

4.9 Summary of Collision Monitoring Results

A total of two bat fatalities were discovered at the Proposed Development site during the collision monitoring survey period. An intact Common pipistrelle was recorded on gravel 4m from T2 on 29th April 2021. An intact Soprano pipistrelle was found on gravel, 35m from T3 on 21st July 2021.

It is noted that the monitoring surveys alone do not provide a total count of bat fatalities associated with a wind farm but do provide a representative sample of bat fatalities.

During the searcher efficiency trials, eight of the ten carcasses were retrieved by the dog, indicating a searcher efficiency of 88.9%. The scavenger removal rate was determined to be high: the median predation period occurred 2.33 days after the carcass was laid.

To estimate the total count of bat fatalities, the carcass returns, along with the results of searcher efficiency and carcass removal trials, were used to calculate the collision rates for the Proposed Development using the US Fish and Wildlife Service Evidence of Absence software (EoA, version 2.0). The results predict, with a 90% credibility level, that no more than 46 bat fatalities occurred during the survey period 2021 to 2022. This equates to 3.5 bats per turbine per year, or 4.14 bat fatalities per megawatt per year.

Further details on collision monitoring can be found in Chapter 7, Appendix 7-5 of this EIAR.

4.10 Importance of Bat Population Recorded at the Site

Ecological evaluation within this section follows a methodology that is set out in Chapter three of the '*Guidelines for Assessment of Ecological Impacts of National Roads Schemes'* (NRA, 2009).

All bat species in Ireland are protected under the Bonn Convention (1992), Bern Convention (1982) and the EU Habitats Directive (92/43/EEC). Additionally, in Ireland bat species are afforded further protection under the Birds and Natural Habitats Regulations (2011) and the Wildlife Acts 1976-2021. No bat roosts were identified within the footprint of the Proposed Development. Bats as an Ecological Receptor have been assigned ***Local Importance (Higher value)*** on the basis that the habitats within the EIAR Study Area are utilized by a regularly occurring bat population of Local Importance.

No roosting site of National Importance (i.e., site greater than 100 individuals) was recorded within the site. The Proposed Development site does not support a roosting site of ecological significance.

5. RISK AND IMPACT ASSESSMENT

This risk and impact assessment has been undertaken in accordance with NatureScot Guidance with consideration given to NIEA NED Guidance. As per the NatureScot Guidance, wind farms present four potential risks to bats:

- Collision mortality, barotrauma and other injuries
- Loss or damage to commuting and foraging habitat
- Loss of, or damage to, roosts
- Displacement of individuals or populations

For each of these four risks, the detailed knowledge of bat distribution and activity within the site has been utilized to predict the potential effects of the wind farm on bats.

5.1 Collision Mortality

5.1.1 Assessment of Site-Risk

The likely impact of a development on bats is related to site-based risk factors, including habitat and development features. The site risk assessment, as per Table 3a of the NatureScot guidance, is provided in Table 5-1 below.

Table 5-1 Site-risk Level Determination for the Proposed Development Site (Adapted from NatureScot 2021)

Criteria	Site-specific Evaluation	Site Assessment
Habitat Risk	Although, no roosts were identified within the site during the surveys undertaken, structures with potential for roosting bats were identified within the Proposed Development site. Habitats within the site provide potential suitable commuting and foraging habitat for bats and is connected to the wider landscape by linear features such as conifer woodland edge, tracks, river, hedgerow and scrub. However, it does not provide an extensive and diverse habitat mosaic of high quality for foraging bats or meet any of the criteria of a high-risk site as set out in Table 3a of NatureScot, 2021.	Moderate
Project Size	Following the criteria set out in NatureScot, 2021 the project is of *Medium* scale as it consists of 13 no. turbines of 75m in height (NatureScot, 2021). One other wind farm is located within a 5km radius of the Proposed Development. Some wind farms within 10km of the Proposed Development.	Medium
Site Risk Assessment (from criteria in Plate 3-3)		**Medium Site Risk (3)**

The site of the Proposed Development is located in an area predominantly consisting of agricultural grassland and conifer plantation. As per table 3a of the NatureScot Guidance (2021), it has a *Moderate* habitat risk score. As per Table 3a, the Proposed Development is a *Medium* project size (13 turbines). The cross tabulation of a *Medium* project on a *Moderate* risk site results in an overall risk score of **Medium (3)** (NatureScot Table 3a).

5.1.2 Assessment of Collision Risk

The following high-risk species were recorded during the dedicated surveys:

- Leisler's bat,
- Soprano pipistrelle,
- Common pipistrelle
- Nathusius' pipistrelle

The Overall Risk Assessment for high collision risk species is provided in the sections below. Overall Risk was determined, in accordance with Table 3b of NatureScot guidance (**Appendix 5**), by a cross-tablature of the site risk level (i.e. Low) and Ecobat bat activity outputs for each species. The assessment was carried out for both median and maximum Ecobat activity categories in order to provide insight into typical bat activity (i.e. median values) and activity peaks (i.e. maximum values). NatureScot recommends that that most appropriate activity level (i.e. median or maximum) be utilised to determine the overall risk assessment for a species.

As per NatureScot guidance there is no requirement to complete an Overall Risk Assessment for low-risk species. During the extensive suite of surveys undertaken that following low risk species were recorded:

- Brown long-eared bat
- *Myotis* spp.

Overall activity levels were low for the above species; therefore, no significant collision related effects are anticipated.

5.1.2.1 Leisler's bat

This site is within the current range of the Leisler's bat (NPWS, 2019). Leisler's bats are classed as a rarer species of a high population risk which have a high collision risk (Plate 3-4). Leisler's bats were recorded during activity surveys across the Proposed Development site. When assessed in the context of the identified site risk and in line with Table 3b (NatureScot, 2021) overall activity risk for Leisler's bat was found to be ***Medium*** at typical activity levels and ***High*** at peak activity levels (See Table 5-2 below).

Based on site visit and survey data, including walked transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the site, which is agricultural grassland and conifer forestry with moderate levels of bat activity recorded during the walked transects undertaken.

Thus, there is ***Medium*** collision risk level assigned to the local population of Leisler's Bat.

Table 5-2 Leisler's bat - Overall Risk Assessment

Survey Period	Site Risk	Typical Activity (Median)	Typical Risk Assessment (as per Table 3b NatureScot 2021)	Activity Peaks (Maximum)	Peak Risk Assessment (as per Table 3b NatureScot 2021)
Spring	Medium (3)	Moderate (3)	Typical Risk is Medium (9)	High (5)	Peak Risk is High (15)
Summer		Low - Moderate (2)	Typical Risk is Medium (6)	High (5)	Peak Risk is High (15)
Autumn		Moderate (3)	Typical Risk is Medium (9)	High (5)	Peak Risk is High (15)

5.1.2.2 Soprano pipistrelle

This site is within the current range of the soprano pipistrelle bat (NPWS, 2019). Soprano pipistrelle bats are classed as a common species of a medium population risk which have a high potential collision risk (Plate 3-4). Soprano pipistrelle was recorded during activity surveys across the Proposed Development site. When assessed in the context of the identified site risk and in line with Table 3b (NatureScot, 2021), overall activity risk for soprano pipistrelle was found to be ***Medium*** during spring and summer and ***High*** during autumn at typical activity levels and ***High*** at peak activity levels (See Table 5-3 below).

Based on site visit and survey data, including walked transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the site, which is agricultural grassland and conifer forestry with moderate levels of bat activity recorded during the walked transects undertaken.

Thus, there is ***Medium*** collision risk level assigned to the local population of soprano pipistrelle during spring and summer and ***High*** in autumn.

Table 5-3 Soprano pipistrelle - Overall Risk Assessment

Survey Period	Site Risk	Typical Activity (Median)	Typical Risk Assessment (as per Table 3b NatureScot 2021)	Activity Peaks (Maximum)	Peak Risk Assessment (as per Table 3b NatureScot 2021)
Spring	Medium (3)	Moderate (3)	Typical Risk is Medium (9)	High (5)	Peak Risk is High (15)
Summer		Moderate to High (4)	Typical Risk is Medium (12)	High (5)	Peak Risk is High (15)
Autumn		High (5)	Typical Risk is High (15)	High (5)	Peak Risk is High (15)

5.1.2.3 Common pipistrelle

This site is within the current range of the common pipistrelle bat (NPWS, 2019). Common pipistrelle bats are classed as a common species of a medium population risk which have a high collision risk (Plate 3-4). Common pipistrelles were recorded during activity surveys across the Proposed Development site. When assessed in the context of the identified site risk and in line with Table 3b (NatureScot, 2021) overall activity risk for common pipistrelle was found to be ***Medium*** at typical activity levels in all seasons. Peak activity levels were ***High*** across all seasons (See Table 5-4 below).

Based on site visit and survey data, including walked transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the site, which is agricultural grassland and conifer forestry with moderate levels of bat activity recorded during the walked transects undertaken.

Thus, there is ***Medium*** collision risk level assigned to the local population of common pipistrelle across all seasons.

Table 5-4 Common pipistrelle - Overall Risk Assessment

Survey Period	Site Risk	Typical Activity (Median)	Typical Risk Assessment (as per Table 3b NatureScot 2021)	Activity Peaks (Maximum)	Peak Risk Assessment (as per Table 3b NatureScot 2021)
Spring	Medium (3)	Moderate (3)	Typical Risk is Medium (9)	High (5)	Peak Risk is High (15)
Summer		Moderate to High (4)	Typical Risk is Medium (12)	High (5)	Peak Risk is High (15)
Autumn		Moderate to High (4)	Typical Risk is Medium (12)	High (5)	Peak Risk is High (15)

5.1.2.4 Nathusius' pipistrelle

This Proposed Development site is outside the current known range of the Nathusius' pipistrelle bat (NPWS, 2019). Nathusius' pipistrelle are classed as a rarest species of a high population risk which have a high collision risk (Plate 3-4). Low numbers of Nathusius' pipistrelle (n=6) were recorded during the autumn static activity survey across the Proposed Development site. When assessed in the context of the identified site risk and in line with Table 3b (NatureScot, 2021); overall activity risk for Nathusius' pipistrelle at typical activity levels was found to be ***Low*** in spring and summer and ***Medium*** in autumn. Peak risk levels for Nathusius' pipistrelle were found to be ***Low*** in spring and summer and ***Medium*** in autumn (See Table 5-5 below).

Based on site visit and survey data, including walked transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the site, which is predominantly agricultural and conifer plantation with low levels of bat activity recorded during the walked transects undertaken.

Thus, there is ***Low*** collision risk level assigned to the local population of Nathusius' pipistrelle in spring and summer and a ***Medium*** collision risk level assigned to the local population in autumn.

Table 5-5 Nathusius' Pipistrelle - Overall Risk Assessment

Survey Period	Site Risk	Typical Activity (Median)	Typical Risk Assessment (as per Table 3b NatureScot 2021)	Activity Peaks (Maximum)	Peak Risk Assessment (as per Table 3b NatureScot 2021)
Spring	Medium (3)	Nil (0)	Typical Risk is Low (0)	Nil (0)	Peak Risk is Low (0)
Summer		Nil (0)	Typical Risk is Low (0)	Nil (0)	Peak Risk is Low (0)
Autumn		Low - Moderate (2)	Typical Risk is Medium (6)	Moderate to High (4)	Peak Risk is Medium (12)

5.1.3 Collision Risk Summary

High levels of bat activity were recorded throughout the Proposed Development site in 2021. The Proposed Development is for the extension of operation of an existing wind farm which has been in operation for 12 years. Although the surveys identified high levels of bat activity, it doesn't appear that the existing wind farm has been significantly affecting local bat populations.

Site-level collision risk for high collision risk bat species was typically *Medium,* with the exception of soprano pipistrelle which had a *High* risk level for autumn. Overall bat activity levels were typical of the nature of the site, which is predominantly grassland and key-holed conifer forestry with moderate to high levels of bat activity recorded during the static detector surveys as well as the walked transects undertaken.

5.2 Loss or Damage to Commuting and Foraging Habitat

The Proposed Development relates to the extension of operation of the existing Dunneill Wind Farm by 15 years. There will be no changes in infrastructure, layout or landscape as part of the Proposed Development. No loss or damage to commuting or foraging habitats is anticipated.

Given the extensive area of habitat that will remain undisturbed throughout the site, no significant effects with regard to loss of commuting and foraging habitat are anticipated.

5.3 Loss of, or Damage to, Roosts

The Proposed Development relates to the extension of operation of the existing Dunneill Wind Farm by 15 years. There will be no changes in infrastructure, layout or landscape as part of the Proposed Development.

No bats were observed emerging from the structures or trees within the EIAR Site Boundary during any of the surveys. Additionally, all structures and trees will be retained, thus no loss or damage to roosts is anticipated.

Consequently, there is no potential for significant effect with regard to the loss or disturbance of roosting habitat.

5.4 Displacement of Individuals or Populations

The Proposed Development is predominantly located within grassland/bog habitat and keyholed conifer forestry. There will be no net loss of linear landscape features for commuting and foraging bats and there will be no loss of any roosting site of ecological significance. The habitats on the site will remain suitable for bats. No significant displacement of individuals or populations is anticipated.

However, based on the collision monitoring surveys and associated report completed, bat fatalities were recorded within the site (Section 4.9 above). Fatalities included Common and Soprano pipistrelle species.

Although bat fatalities were recorded within the site, high median levels of bat activity were still recorded at some turbines (Table 5-6), and it is likely that bats have become habituated to the site. It does not appear that the operation of the wind farm to date has had a significant effect on the local bat population.

Common and Soprano pipistrelles are common and widespread across Ireland with stable and increasing populations. Having reviewed the Article 17 reports, Common and Soprano pipistrelle bats have no specific pressures or threats, and the future prospects of the population are good. Given the favourable conservation status (Table 1-1 above) and future prospects of Common and Soprano pipistrelles, while it is acknowledged that the Proposed Development has the potential to kill bats, no significant impact on bat activity is anticipated. Additionally, no significant effects on bats at County, National or International level is expected.

An adaptive mitigation programme, including further monitoring with more detailed carcass search regime is proposed, as outlined in Section 6.2 below. The results of the monitoring regime will be assessed each year and mitigation adapted accordingly.
With the implementation of the mitigation and monitoring programme, no significant displacement of individuals or populations is anticipated.

6. BEST PRACTICE AND MITIGATION MEASURES

This section describes the best practice and site-specific mitigation measures that are in place to avoid and reduce the potential for significant effects on local bat populations.

6.1 Standard Best Practice Measures

6.1.1 Noise Restrictions

No construction works or new upgrades are included as part of the Proposed Development application. Therefore, there is no requirement for noise restrictions.

6.1.2 Lighting Restrictions

Lighting within the Proposed Development site is not proposed to change. There are no construction works or upgrades in lighting as part of the Proposed Development application. Therefore, there is no requirement for lighting restrictions. Bats are utilising and are habituated to the site. No significant impacts in relation to additional lighting are anticipated.

With regard to the potential for lighting to increase collision risk, it is noted that there will be continued illumination of the turbines in the form of aviation lighting, and whilst this lighting is unlikely to result in any significant increase in collision risk, a comprehensive and site-specific mitigation and monitoring programme is proposed for a period of at least 3 years post construction. No significant effects are anticipated.

6.1.3 Buffering

No bat fatalities were recorded in areas where buffers could be utilised to reduce impacts on bats. Therefore, buffers are not proposed for the existing turbines. If, during the post-consent monitoring, an issue is identified with bat fatalities, buffers will be applied in line with NatureScot 2021 Guidance.

6.1.4 Blade Feathering

NatureScot Guidelines recommend that all wind turbines (where practically possible) are subject to 'feathering' of turbine blades when wind speeds are below the cut-in speed of the existing turbine (4m/s) and there remains uncertainty of the risk posed to bats. This means that the turbine blades are pitched at 90 degrees or parallel to the wind to reduce their rotation speed to below two revolutions per minute while idling. This measure has been shown to significantly reduce bat fatalities (by up to 50%) in some studies (NatureScot, 2021).

In accordance with NatureScot and having consideration of NIEA Guidelines, blade feathering will be implemented as a standard across all proposed turbines when wind speeds are below the cut-in speed of the turbine.

6.2 Bat Mitigation and Monitoring Plan

Overall risk levels for high collision risk bat species was typically ***Medium,*** with the exception of Soprano pipistrelle, which had a ***High*** risk level for autumn. This risk level is reflective of the nature of the site, which is agricultural grassland and conifer forestry with low to moderate levels of bat activity recorded during the walked transects undertaken.

However, given that high collision risk was recorded at median and peak activity levels, and two bat fatalities were recorded at T2 and T3, an adaptive monitoring and mitigation strategy has been devised for the Proposed Development, in line with the case study example provided in Appendix 5 of the NatureScot, (2021) and based on the site-specific data.

6.2.1 Blade Feathering

As discussed in Section 6.1.4, in accordance with NatureScot guidelines and recent NIEA Guidelines, and as an extra precaution, blade feathering will be implemented as a standard across all turbines when wind speeds are below the cut-in speed of the turbine.

6.2.2 Operational Monitoring

To assess the effects of the Proposed Development on bat activity, at least 3 years of post-consent monitoring is proposed. Post-consent monitoring will include static detector surveys, walked survey transects and corpse searching to record any bat fatalities resulting from collision.

The results of post consent monitoring shall be utilised to assess any potential changes in bat activity patterns and to monitor the implementation of the mitigation strategy. At the end of Year 1, and if a curtailment requirement is identified (i.e. significant bat fatalities encountered), a curtailment programme shall be devised around key activity periods and weather parameters. NIEA guidance defines the difference between incidental and significant killing as the discovery of "more than 1 bat carcass per turbine per year during carcass searches" and sets out a minimum survey effort for carcass searches upon which this threshold value is based.

Curtailment involves raising the cut-in speed with associated loss of power generation in combination with reducing the blade rotation (blade feathering) below the cut-in speed. The most basic and least sophisticated form of curtailment "blanket" curtailment -involves feathering the blades between dusk and dawn over the entire bat active period (April to October). A more sophisticated and efficient solution is to focus on certain times and dates, corresponding with those periods when the highest level of bat activity is expected to occur. Further savings can be achieved by programming the SCADA operating system to only pause/feather the blades below a specified wind speed and above a specified temperature within specified time periods.

In order to minimise down time, the threshold values at which turbines are feathered should be site specific and informed by bat activity peaks at that location, but as an indication, they are likely to be in the range of wind speeds between 5.0 and 6.5m/s and at temperatures above approximately 10 or 11ºC measured at the nacelle. Significant savings can be achieved by so-called "smart "curtailment over the other less sophisticated alternatives.

The effectiveness of curtailment needs to be monitored in order to determine (a) whether it is working effectively (i.e. the level of bat mortality is incidental), and (b) whether the curtailment regime can be refined such that turbine down-time can be minimised whilst ensuring that it remains effective at preventing casualties. If required, turbine buffering could be reviewed.

At the end of each year, the efficacy of the curtailment programme will be reviewed, and any identified efficiencies incorporated into the curtailment programme. This approach allows for an evidence-based review of the potential or bat fatalities at the site, post consent, to ensure that the necessary measures, based on a new baseline post-consent, are implemented for the protection of bat species locally.

The below subsections provide additional detail on the proposed survey effort, timing, and mitigation.

6.2.2.1 Monitoring Year 1

6.2.2.2 Bat activity surveys

Static monitoring at turbine bases and nacelle shall take place at each turbine during the bat activity season (between April and October) (NIEA, 2021). Full spectrum recording detectors will be utilised for the same duration as during pre-application surveys and at the same density (NatureScot, 2021). As described in Section 3.5 above, the assessment of bat activity levels will include the use of 'Ecobat', a web-based interface, allowing uploaded activity data to be contrasted with a comparable reference range, allowing objective and robust interpretation. Walked transect surveys will also be conducted.

Key weather parameters and other factors that are known to influence collision risk will be monitored and shall include:

- Windspeed in m/s (measured at nacelle height)
- Temperature (ºC)
- Precipitation (mm/hr)

6.2.2.3 Carcass searches

Carcass searches, to monitor and record bat fatalities, shall be conducted at each turbine in accordance with NIEA Guidance. This shall include searcher efficiency trials and an assessment of scavenger removal rates to determine the appropriate correction factor to be applied in relation to determining an accurate estimate of collision mortality. Casualty searches shall use a method with high observer efficiency (>50% as per NatureScot). NIEA guidance acknowledges that trained dog search teams are "*significantly more efficient and faster at finding carcasses than human surveyors"* and NatureScot guidance states that conservation dogs "*should preferably be used to achieve more robust results*". Therefore, the use of conservation dogs will be necessary where observed human searcher efficiency is less than 50%.

Calculating casualty rates across the site shall be done in accordance with the methods and formulas provided in Appendix 4 of the NatureScot Guidance. Surveys should cover all activity seasons and should be undertaken by trained surveyors.

6.2.2.4 Monitoring Years 2 and 3

Monitoring surveys shall continue in Year 2 and 3 and, where a curtailment requirement has been identified, the success of the curtailment strategy shall be assessed in line with the baseline data collected in the subsequent year(s).

The performance of the curtailment programme in terms of its ability to respond to the changes in bat abundance based on temperature and wind speed shall be analysed to confirm it is neither significantly over- nor under- curtailing during different periods of bat activity.

At the end of each year, the efficacy of the curtailment programme shall be reviewed, and any identified efficiencies incorporated into the curtailment programme. The requirement for continued post-consent monitoring will also be considered. Should no bat fatalities be recorded in Year 1, mitigation/curtailment (where applicable) in Year 2 and Year 3 could be reduced/re-evaluated or removed with monitoring continuing to inform this strategy.

6.2.2.5 Carcass Search Survey Methodology

Carcass searches shall be conducted at each turbine in accordance with NIEA Guidance for a *Medium* risk site. This shall include searcher efficiency trials and an assessment of scavenger removal rates.

6.3 Residual Impacts

Not Significant Effect

Taking into consideration the nature of the project, the proposed best practice and adaptive mitigation measures; significant residual effects on bats with regard to 1) Collision mortality, barotrauma and other injuries, 2) Loss or damage to commuting and foraging habitat, 3) Loss of, or damage to, roosts and 4) Displacement of individuals or populations are not anticipated.

6.4 Cumulative effects

The Proposed Development was considered in combination with other plans, existing and approved projects and planning applications pending a decision, in the surrounding area that could result in cumulative impacts on bats. This included a review of online Planning Registers and served to identify past, present and future plans and projects, their activities and their predicted environmental effects. The plans and projects considered are listed in Chapter 2 of the EIAR: Background of the Proposed Development.

Following the detailed assessment provided in the preceding sections, it is concluded that, the Proposed Development will not result in any residual adverse effects on bats, when considered on its own. Therefore, no potential for the Proposed Development to contribute to any cumulative adverse effects on any bat populations when considered in-combination with other plans and projects.

In the review of the projects that was undertaken, no connection, that could potentially result in additional or cumulative impacts was identified. Neither was any potential for different (new) impacts resulting from the combination of the various projects and plans in association with the Proposed Development.

Taking into consideration the reported residual impacts from other plans and projects in the area and the predicted impacts with the current proposal, no residual cumulative impacts have been identified regarding bats.

7. CONCLUSION

This report provides a full and comprehensive assessment of the potential for impact on bat populations at the Proposed Development site. Following consideration of the residual effects (post mitigation) it is noted that the Proposed Development will not result in any significant effects on bats.

Provided that the Proposed Development is operated in accordance with the best practice and mitigation that is described within this report, significant effects on bats are not anticipated at any geographic scale.

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APPENDIX 1

BAT HABITAT SUITABILITY APPRAISAL

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Bat Survey Report

Appendix 1 – Habitat Suitability Assessment

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HABITAT SUITABILITY ASSESSMENT

Guidelines for assessing the potential suitability of a site for bats, based on the presence of habitat features (taken from Collins, 2016)

Suitability	Roosting Habitats	Commuting and Foraging Habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions1 and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats, i.e. unlikely to be suitable for maternity or hibernation2. A tree of sufficient size and age to contain potential roost features but with none seen from the ground or features seen with only very limited roosting potential3.	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitats. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High	A structure or tree with one or potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland. Site is close to and connected to known roosts.

[1] For example, in terms of temperature, humidity, height above ground, light levels or levels of disturbance.
[2] Larger numbers of Common pipistrelle may be present during autumn and winter in large buildings in highly urbanised areas, based on evidence from the Netherlands (Korsten *et al.* 2015).
[3] Categorisation aligns with BS 8596:2015 Surveying for bats in trees and woodland (BSI, 2015).

APPENDIX 2

SITE RISK ASSESSMENT

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Bat Survey Report

Appendix 2 – Site Risk Assessment (Table 3a, NatureScot, 2021)

SITE RISK ASSESSMENT

Table 3a: *Stage 1 - Initial site risk assessment*

Site Risk Level (1-5)*	**Project Size**			
		Small	**Medium**	**Large**
Habitat Risk	**Low**	1	2	3
	Moderate	2	3	4
	High	3	4	5

Key: Green (1-2) - low/lowest site risk; Amber (3) - medium site risk; Red (4-5) - high/highest site risk.

* Some sites could conceivably be assessed as being of no (0) risk to bats. This assessment is only likely to be valid in more extreme environments, such as above the known altitudinal range of bats, or outside the known geographical distribution of any resident British species.

Habitat Risk	**Description**
Low	Small number of potential roost features, of low quality. Low quality foraging habitat that could be used by small numbers of foraging bats. Isolated site not connected to the wider landscape by prominent linear features.
Moderate	Buildings, trees or other structures with moderate-high potential as roost sites on or near the site. Habitat could be used extensively by foraging bats. Site is connected to the wider landscape by linear features such as scrub, tree lines and streams.
High	Numerous suitable buildings, trees (particularly mature ancient woodland) or other structures with moderate-high potential as roost sites on or near the site, and/or confirmed roosts present close to or on the site. Extensive and diverse habitat mosaic of high quality for foraging bats. Site is connected to the wider landscape by a network of strong linear features such as rivers, blocks of woodland and mature hedgerows. At/near edge of range and/or on an important flyway. Close to key roost and/or swarming site.

Project Size	**Description**
Small	Small scale development (≤10 turbines). No other wind energy developments within 10km. Comprising turbines <50m in height.
Medium	Larger developments (between 10 and 40 turbines). May have some other wind developments within 5km. Comprising turbines 50-100m in height.
Large	Largest developments (>40 turbines) with other wind energy developments within 5km. Comprising turbines >100m in height.

APPENDIX 3

ECOBAT PER DETECTOR RESULTS

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Appendix 3 – 2021 Ecobat Per Detector Results

Summary tables are provided in the main bat report for each species recorded showing key metrics per detector per survey period.

LEISLER'S BAT

Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity	Max Bat Activity	Max Bat Activity Level
Spring	13	4750	D01	70	Moderate - High	93	High
Spring	15	4750	D02	46	Moderate	62	Moderate - High
Spring	11	4750	D03	57	Moderate	74	Moderate - High
Spring	13	4750	D04	40	Low - Moderate	62	Moderate - High
Spring	13	4750	D05	51	Moderate	72	Moderate - High
Spring	10	4750	D06	43	Moderate	62	Moderate - High
Spring	12	4750	D07	53	Moderate	85	High
Spring	9	4750	D08	40	Low - Moderate	57	Moderate
Spring	12	4750	D09	57	Moderate	74	Moderate - High
Spring	6	4750	D10	21	Low - Moderate	40	Low - Moderate
Spring	11	4750	D11	40	Low - Moderate	77	Moderate - High
Spring	12	4750	D12	49	Moderate	86	High
Spring	11	4750	D13	46	Moderate	80	Moderate - High
Summer	8	7890	D01	27	Low - Moderate	64	Moderate - High
Summer	11	7890	D02	42	Moderate	72	Moderate - High
Summer	12	7890	D03	51	Moderate	83	High
Summer	10	7890	D04	31	Low - Moderate	66	Moderate - High
Summer	6	7890	D05	31	Low - Moderate	53	Moderate
Summer	6	7890	D06	22	Low - Moderate	42	Moderate
Summer	6	7890	D07	22	Low - Moderate	31	Low - Moderate
Summer	7	7890	D08	31	Low - Moderate	48	Moderate
Summer	8	7890	D09	44	Moderate	62	Moderate - High
Summer	6	7890	D10	12	Low	66	Moderate - High
Summer	5	7890	D11	12	Low	60	Moderate
Summer	5	7890	D12	48	Moderate	71	Moderate - High
Summer	9	7890	D13	52	Moderate	78	Moderate - High
Autumn	10	4752	D01	42	Moderate	78	Moderate - High
Autumn	13	4752	D02	52	Moderate	80	Moderate - High
Autumn	13	4752	D03	66	Moderate - High	76	Moderate - High
Autumn	13	4752	D04	42	Moderate	66	Moderate - High
Autumn	13	4752	D05	52	Moderate	66	Moderate - High
Autumn	12	4752	D06	32	Low - Moderate	69	Moderate - High
Autumn	11	4752	D07	52	Moderate	63	Moderate - High
Autumn	13	4752	D08	42	Moderate	73	Moderate - High

Autumn	11	4752	D09	42	Moderate	84	High
Autumn	11	4752	D10	58	Moderate	80	Moderate - High
Autumn	11	4752	D11	58	Moderate	82	High
Autumn	9	4752	D12	52	Moderate	78	Moderate - High
Autumn	10	4752	D13	42	Moderate	78	Moderate - High

MYOTIS SPP.

Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity	Max Bat Activity	Max Bat Activity Level
Spring	7	3537	D01	11	Low	30	Low - Moderate
Spring	9	3537	D02	11	Low	51	Moderate
Spring	14	3537	D03	35	Low - Moderate	57	Moderate
Spring	11	3537	D04	40	Low - Moderate	54	Moderate
Spring	12	3537	D05	21	Low - Moderate	51	Moderate
Spring	11	3537	D06	11	Low	51	Moderate
Spring	10	3537	D07	21	Low - Moderate	40	Low - Moderate
Spring	8	3537	D08	21	Low - Moderate	46	Moderate
Spring	9	3537	D09	40	Low - Moderate	57	Moderate
Spring	8	3537	D10	50	Moderate	68	Moderate - High
Spring	8	3537	D11	21	Low - Moderate	63	Moderate - High
Spring	4	3537	D12	21	Low - Moderate	40	Low - Moderate
Spring	9	3537	D13	40	Low - Moderate	57	Moderate
Summer	10	5639	D01	31	Low - Moderate	42	Moderate
Summer	12	5639	D02	53	Moderate	72	Moderate - High
Summer	13	5639	D03	66	Moderate - High	78	Moderate - High
Summer	13	5639	D04	42	Moderate	57	Moderate
Summer	12	5639	D05	42	Moderate	57	Moderate
Summer	11	5639	D06	68	Moderate - High	81	High
Summer	8	5639	D07	31	Low - Moderate	57	Moderate
Summer	11	5639	D08	48	Moderate	57	Moderate
Summer	14	5639	D09	42	Moderate	68	Moderate - High
Summer	11	5639	D10	42	Moderate	68	Moderate - High
Summer	11	5639	D11	42	Moderate	57	Moderate
Summer	10	5639	D12	31	Low - Moderate	60	Moderate
Summer	13	5639	D13	58	Moderate	82	High
Autumn	10	4797	D01	37	Low - Moderate	58	Moderate
Autumn	12	4797	D02	52	Moderate	66	Moderate - High
Autumn	11	4797	D03	52	Moderate	71	Moderate - High

Autumn	11	4797	D04	52	Moderate	73	Moderate - High
Autumn	15	4797	D05	63	Moderate - High	78	Moderate - High
Autumn	14	4797	D06	42	Moderate	66	Moderate - High
Autumn	11	4797	D07	42	Moderate	69	Moderate - High
Autumn	10	4797	D08	50	Moderate	73	Moderate - High
Autumn	13	4797	D09	66	Moderate - High	74	Moderate - High
Autumn	8	4797	D10	47	Moderate	63	Moderate - High
Autumn	11	4797	D11	42	Moderate	69	Moderate - High
Autumn	13	4797	D12	58	Moderate	82	High
Autumn	10	4797	D13	37	Low - Moderate	58	Moderate

SOPRANO PIPISTRELLE

Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity	Max Bat Activity	Max Bat Activity Level
Spring	14	4862	D01	57	Moderate	77	Moderate - High
Spring	14	4862	D02	62	Moderate - High	74	Moderate - High
Spring	15	4862	D03	68	Moderate - High	91	High
Spring	15	4862	D04	73	Moderate - High	94	High
Spring	14	4862	D05	66	Moderate - High	86	High
Spring	12	4862	D06	51	Moderate	68	Moderate - High
Spring	13	4862	D07	60	Moderate	82	High
Spring	11	4862	D08	11	Low	62	Moderate - High
Spring	14	4862	D09	67	Moderate - High	85	High
Spring	9	4862	D10	30	Low - Moderate	73	Moderate - High
Spring	13	4862	D11	46	Moderate	63	Moderate - High
Spring	14	4862	D12	52	Moderate	65	Moderate - High
Spring	14	4862	D13	64	Moderate - High	82	High
Summer	14	8458	D01	55	Moderate	74	Moderate - High
Summer	14	8458	D02	69	Moderate - High	86	High
Summer	14	8458	D03	91	High	95	High
Summer	16	8458	D04	77	Moderate - High	90	High
Summer	14	8458	D05	89	High	96	High
Summer	14	8458	D06	61	Moderate - High	87	High
Summer	14	8458	D07	86	High	96	High
Summer	14	8458	D08	53	Moderate	66	Moderate - High
Summer	14	8458	D09	74	Moderate - High	91	High
Summer	13	8458	D10	68	Moderate - High	88	High
Summer	13	8458	D11	64	Moderate - High	74	Moderate - High
Summer	14	8458	D12	71	Moderate - High	85	High

Summer	15	8458	D13	78	Moderate - High	94	High
Autumn	14	6459	D01	74	Moderate - High	91	High
Autumn	15	6459	D02	90	High	96	High
Autumn	15	6459	D03	89	High	97	High
Autumn	15	6459	D04	83	High	90	High
Autumn	15	6459	D05	93	High	99	High
Autumn	14	6459	D06	69	Moderate - High	80	High
Autumn	13	6459	D07	74	Moderate - High	92	High
Autumn	14	6459	D08	70	Moderate - High	89	High
Autumn	15	6459	D09	90	High	95	High
Autumn	15	6459	D10	79	Moderate - High	95	High
Autumn	15	6459	D11	78	Moderate - High	94	High
Autumn	15	6459	D12	92	High	97	High
Autumn	14	6459	D13	74	Moderate - High	91	High

COMMON PIPISTRELLE

Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity	Max Bat Activity	Max Bat Activity Level
Spring	13	5190	D01	30	Low - Moderate	68	Moderate - High
Spring	12	5190	D02	60	Moderate	80	Moderate - High
Spring	14	5190	D03	63	Moderate - High	80	Moderate - High
Spring	13	5190	D04	30	Low - Moderate	57	Moderate
Spring	12	5190	D05	61	Moderate - High	86	High
Spring	13	5190	D06	30	Low - Moderate	62	Moderate - High
Spring	11	5190	D07	67	Moderate - High	93	High
Spring	10	5190	D08	21	Low - Moderate	51	Moderate
Spring	13	5190	D09	40	Low - Moderate	72	Moderate - High
Spring	5	5190	D10	30	Low - Moderate	46	Moderate
Spring	10	5190	D11	35	Low - Moderate	51	Moderate
Spring	13	5190	D12	54	Moderate	86	High
Spring	13	5190	D13	54	Moderate	72	Moderate - High
Summer	14	8711	D01	53	Moderate	73	Moderate - High
Summer	14	8711	D02	72	Moderate - High	92	High
Summer	14	8711	D03	94	High	98	High
Summer	16	8711	D04	72	Moderate - High	85	High
Summer	14	8711	D05	80	Moderate - High	93	High
Summer	14	8711	D06	70	Moderate - High	93	High
Summer	14	8711	D07	88	High	98	High

Summer	14	8711	D08	57	Moderate	77	Moderate - High
Summer	14	8711	D09	68	Moderate - High	77	Moderate - High
Summer	12	8711	D10	53	Moderate	91	High
Summer	11	8711	D11	60	Moderate	69	Moderate - High
Summer	14	8711	D12	74	Moderate - High	89	High
Summer	12	8711	D13	79	Moderate - High	94	High
Autumn	7	5915	D01	58	Moderate	66	Moderate - High
Autumn	13	5915	D02	79	Moderate - High	94	High
Autumn	12	5915	D03	58	Moderate	76	Moderate - High
Autumn	11	5915	D04	52	Moderate	69	Moderate - High
Autumn	14	5915	D05	72	Moderate - High	88	High
Autumn	9	5915	D06	52	Moderate	69	Moderate - High
Autumn	14	5915	D07	72	Moderate - High	94	High
Autumn	13	5915	D08	63	Moderate - High	87	High
Autumn	15	5915	D09	52	Moderate	84	High
Autumn	11	5915	D10	42	Moderate	89	High
Autumn	15	5915	D11	74	Moderate - High	90	High
Autumn	12	5915	D12	79	Moderate - High	94	High
Autumn	7	5915	D13	58	Moderate	66	Moderate - High

NATHUSIUS' PIPISTRELLE

Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity	Max Bat Activity	Max Bat Activity Level
Spring	-	-	D01	-	Nil	-	Nil
Spring	-	-	D02	-	Nil	-	Nil
Spring	-	-	D03	-	Nil	-	Nil
Spring	-	-	D04	-	Nil	-	Nil
Spring	-	-	D05	-	Nil	-	Nil
Spring	-	-	D06	-	Nil	-	Nil
Spring	-	-	D07	-	Nil	-	Nil
Spring	-	-	D08	-	Nil	-	Nil
Spring	-	-	D09	-	Nil	-	Nil
Spring	-	-	D10	-	Nil	-	Nil
Spring	-	-	D11	-	Nil	-	Nil
Spring	-	-	D12	-	Nil	-	Nil
Spring	-	-	D13	-	Nil	-	Nil
Summer	-	-	D01	-	Nil	-	Nil
Summer	-	-	D02	-	Nil	-	Nil

Summer	-	-	D03	-	Nil	-	Nil
Summer	-	-	D04	-	Nil	-	Nil
Summer	-	-	D05	-	Nil	-	Nil
Summer	-	-	D06	-	Nil	-	Nil
Summer	-	-	D07	-	Nil	-	Nil
Summer	-	-	D08	-	Nil	-	Nil
Summer	-	-	D09	-	Nil	-	Nil
Summer	-	-	D10	-	Nil	-	Nil
Summer	-	-	D11	-	Nil	-	Nil
Summer	-	-	D12	-	Nil	-	Nil
Summer	-	-	D13	-	Nil	-	Nil
Autumn	-	1967	D01	-	Nil	-	Nil
Autumn	2	1967	D02	22	Low - Moderate	22	Low - Moderate
Autumn	2	1967	D03	22	Low - Moderate	22	Low - Moderate
Autumn	-	1967	D04	-	Nil	-	Nil
Autumn	1	1967	D05	22	Low - Moderate	22	Low - Moderate
Autumn	-	1967	D06	-	Nil	-	Nil
Autumn	-	1967	D07	-	Nil	-	Nil
Autumn	-	1967	D08	-	Nil	-	Nil
Autumn	1	1967	D09	22	Low - Moderate	22	Low - Moderate
Autumn	-	1967	D10	-	Nil	-	Nil
Autumn	-	1967	D11	-	Nil	-	Nil
Autumn	-	1967	D12	-	Nil	-	Nil
Autumn	-	1967	D13	-	Nil	-	Nil

BROWN LONG-EARED BAT

Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity	Max Bat Activity	Max Bat Activity Level
Spring	4	1538	D01	11	Low	11	Low
Spring	-	1538	D02	-	Nil	-	Nil
Spring	2	1538	D03	11	Low	11	Low
Spring	-	1538	D04	-	Nil	-	Nil
Spring	-	1538	D05	-	Nil	-	Nil
Spring	1	1538	D06	11	Low	11	Low
Spring	2	1538	D07	21	Low - Moderate	30	Low - Moderate
Spring	1	1538	D08	11	Low	11	Low
Spring	2	1538	D09	11	Low	11	Low
Spring	-	1538	D10	-	Nil	-	Nil

Spring	-	1538	D11	-	Nil	-	Nil
Spring	2	1538	D12	11	Low	11	Low
Spring	1	1538	D13	11	Low	11	Low
Summer	-	2809	D01	-	Nil	-	Nil
Summer	1	2809	D02	12	Low	12	Low
Summer	3	2809	D03	12	Low	12	Low
Summer	-	2809	D04	-	Nil	-	Nil
Summer	-	2809	D05	-	Nil	-	Nil
Summer	1	2809	D06	12	Low	12	Low
Summer	1	2809	D07	12	Low	12	Low
Summer	1	2809	D08	12	Low	12	Low
Summer	1	2809	D09	42	Moderate	42	Moderate
Summer	1	2809	D10	12	Low	12	Low
Summer	3	2809	D11	12	Low	12	Low
Summer	2	2809	D12	12	Low	12	Low
Summer	-	2809	D13	-	Nil	-	Nil
Autumn	4	3441	D01	42	Moderate	58	Moderate
Autumn	10	3441	D02	42	Moderate	52	Moderate
Autumn	8	3441	D03	32	Low - Moderate	52	Moderate
Autumn	10	3441	D04	22	Low - Moderate	22	Low - Moderate
Autumn	7	3441	D05	22	Low - Moderate	52	Moderate
Autumn	9	3441	D06	22	Low - Moderate	58	Moderate
Autumn	5	3441	D07	22	Low - Moderate	42	Moderate
Autumn	8	3441	D08	22	Low - Moderate	52	Moderate
Autumn	11	3441	D09	42	Moderate	63	Moderate - High
Autumn	3	3441	D10	52	Moderate	58	Moderate
Autumn	5	3441	D11	22	Low - Moderate	42	Moderate
Autumn	7	3441	D12	22	Low - Moderate	42	Moderate
Autumn	4	3441	D13	42	Moderate	58	Moderate

APPENDIX 4

SURVEY AT HIGHT RESULTS

Planning and Environmental Consultants

Bat Survey Report

Appendix 4 – Dunneill Static Detector Survey at Height Results 2021

SURVEY AT HEIGHT RESULTS 2021

Date	Time	Mic. level	Species
14/05/2021	00:14:22	Ground	Common pipistrelle
14/05/2021	00:18:27	Ground	Common pipistrelle
14/05/2021	00:38:11	Ground	Common pipistrelle
14/05/2021	00:40:21	Ground	Leisler's bat
14/05/2021	00:40:21	Height	Leisler's bat
14/05/2021	00:49:22	Ground	Myotis spp.
14/05/2021	01:29:32	Ground	Common pipistrelle
14/05/2021	02:06:51	Ground	Common pipistrelle
14/05/2021	22:36:11	Ground	Common pipistrelle
14/05/2021	22:36:13	Ground	Common pipistrelle
14/05/2021	22:39:58	Ground	Soprano pipistrelle
14/05/2021	22:41:19	Height	Leisler's bat
14/05/2021	22:41:19	Ground	Common pipistrelle
14/05/2021	22:42:36	Ground	Common pipistrelle
14/05/2021	22:42:59	Ground	Common pipistrelle
14/05/2021	22:47:51	Ground	Common pipistrelle
14/05/2021	22:48:06	Ground	Common pipistrelle
14/05/2021	22:51:23	Ground	Soprano pipistrelle
14/05/2021	22:55:23	Ground	Common pipistrelle
14/05/2021	22:55:31	Ground	Common pipistrelle
14/05/2021	23:02:29	Ground	Common pipistrelle
14/05/2021	23:11:14	Ground	Common pipistrelle
14/05/2021	23:11:26	Ground	Common pipistrelle
14/05/2021	23:11:58	Ground	Common pipistrelle
14/05/2021	23:14:48	Ground	Common pipistrelle
14/05/2021	23:16:05	Ground	Common pipistrelle
14/05/2021	23:16:52	Ground	Common pipistrelle
14/05/2021	23:19:04	Ground	Common pipistrelle
14/05/2021	23:19:09	Ground	Common pipistrelle
14/05/2021	23:23:57	Ground	Common pipistrelle
14/05/2021	23:29:20	Ground	Common pipistrelle
14/05/2021	23:29:25	Ground	Common pipistrelle
14/05/2021	23:31:32	Ground	Soprano pipistrelle
14/05/2021	23:33:30	Ground	Soprano pipistrelle
14/05/2021	23:40:41	Ground	Leisler's bat
14/05/2021	23:41:15	Ground	Soprano pipistrelle
14/05/2021	23:45:43	Ground	Common pipistrelle

Date	Time	Mic. level	Species
14/05/2021	23:52:03	Ground	Leisler's bat
15/05/2021	22:02:35	Ground	Leisler's bat
15/05/2021	22:06:17	Ground	Leisler's bat
15/05/2021	22:31:33	Ground	Leisler's bat
15/05/2021	22:37:23	Ground	Common pipistrelle
15/05/2021	22:42:53	Ground	Common pipistrelle
15/05/2021	22:47:54	Ground	Common pipistrelle
15/05/2021	23:34:10	Ground	Common pipistrelle
16/05/2021	00:05:52	Ground	Common pipistrelle
16/05/2021	00:06:44	Ground	Leisler's bat
16/05/2021	00:45:26	Ground	Leisler's bat
16/05/2021	00:47:28	Ground	Common pipistrelle
16/05/2021	00:47:36	Ground	Common pipistrelle
16/05/2021	00:47:45	Ground	Common pipistrelle
16/05/2021	01:11:39	Ground	Leisler's bat
16/05/2021	01:27:32	Ground	Common pipistrelle
16/05/2021	01:33:39	Ground	Common pipistrelle
16/05/2021	01:35:51	Ground	Common pipistrelle
16/05/2021	01:46:41	Ground	Leisler's bat
16/05/2021	01:52:36	Ground	Leisler's bat
16/05/2021	02:20:55	Ground	Common pipistrelle
16/05/2021	21:46:31	Ground	Leisler's bat
16/05/2021	21:46:35	Ground	Leisler's bat
16/05/2021	21:46:49	Ground	Leisler's bat
16/05/2021	21:46:55	Ground	Leisler's bat
16/05/2021	22:07:51	Ground	Common pipistrelle
16/05/2021	22:13:02	Ground	Soprano pipistrelle
16/05/2021	22:13:04	Ground	Soprano pipistrelle
16/05/2021	22:13:28	Ground	Soprano pipistrelle
16/05/2021	22:19:24	Ground	Common pipistrelle
16/05/2021	22:26:01	Ground	Leisler's bat
16/05/2021	22:28:26	Ground	Soprano pipistrelle
16/05/2021	22:29:05	Ground	Leisler's bat
16/05/2021	22:30:13	Ground	Leisler's bat
16/05/2021	22:30:17	Ground	Leisler's bat
16/05/2021	22:30:17	Height	Leisler's bat
16/05/2021	22:33:39	Ground	Common pipistrelle

Date	Time	Mic. level	Species
16/05/2021	22:33:41	Ground	Common pipistrelle
16/05/2021	22:42:43	Ground	Common pipistrelle
16/05/2021	22:43:24	Ground	Common pipistrelle
16/05/2021	22:44:36	Ground	Soprano pipistrelle
16/05/2021	22:47:30	Ground	Common pipistrelle
16/05/2021	22:47:50	Ground	Common pipistrelle
16/05/2021	22:49:18	Ground	Common pipistrelle
16/05/2021	22:49:26	Ground	Common pipistrelle
16/05/2021	22:50:55	Ground	Common pipistrelle
16/05/2021	22:55:14	Ground	Common pipistrelle
16/05/2021	22:56:55	Ground	Common pipistrelle
16/05/2021	22:57:13	Ground	Common pipistrelle
16/05/2021	23:06:01	Ground	Common pipistrelle
16/05/2021	23:06:09	Ground	Common pipistrelle
16/05/2021	23:11:43	Ground	Leisler's bat
16/05/2021	23:11:51	Ground	Leisler's bat
16/05/2021	23:17:17	Ground	Common pipistrelle
16/05/2021	23:20:12	Ground	Common pipistrelle
16/05/2021	23:21:52	Ground	Common pipistrelle
16/05/2021	23:51:09	Ground	Common pipistrelle
16/05/2021	23:51:12	Ground	Common pipistrelle
16/05/2021	23:53:03	Ground	Leisler's bat
17/05/2021	21:52:31	Ground	Leisler's bat
17/05/2021	22:03:30	Ground	Leisler's bat
17/05/2021	22:40:35	Ground	Leisler's bat
17/05/2021	22:42:13	Ground	Common pipistrelle
17/05/2021	22:54:06	Ground	Soprano pipistrelle
18/05/2021	00:12:43	Ground	Leisler's bat
18/05/2021	21:59:07	Ground	Leisler's bat
18/05/2021	21:59:15	Ground	Leisler's bat
18/05/2021	22:00:34	Ground	Leisler's bat
18/05/2021	22:00:50	Ground	Leisler's bat
18/05/2021	22:07:36	Ground	Leisler's bat
18/05/2021	22:12:09	Ground	Leisler's bat
18/05/2021	22:12:24	Ground	Leisler's bat
18/05/2021	22:25:05	Ground	Leisler's bat
18/05/2021	22:25:05	Height	Leisler's bat
18/05/2021	22:25:42	Ground	Soprano pipistrelle
18/05/2021	22:25:45	Ground	Soprano pipistrelle

Date	Time	Mic. level	Species
18/05/2021	22:30:21	Ground	Common pipistrelle
18/05/2021	22:30:45	Ground	Common pipistrelle
18/05/2021	22:32:20	Ground	Common pipistrelle
18/05/2021	22:33:39	Ground	Leisler's bat
18/05/2021	22:33:49	Ground	Leisler's bat
18/05/2021	22:38:56	Ground	Common pipistrelle
18/05/2021	22:39:01	Ground	Common pipistrelle
18/05/2021	22:40:31	Ground	Leisler's bat
18/05/2021	22:43:16	Ground	Common pipistrelle
18/05/2021	23:01:41	Ground	Common pipistrelle
18/05/2021	23:07:39	Ground	Common pipistrelle
18/05/2021	23:08:52	Ground	Common pipistrelle
18/05/2021	23:14:45	Ground	Soprano pipistrelle
18/05/2021	23:25:45	Ground	Leisler's bat
18/05/2021	23:33:14	Ground	Leisler's bat
19/05/2021	00:07:04	Ground	Common pipistrelle
19/05/2021	00:22:29	Ground	Common pipistrelle
19/05/2021	00:22:38	Ground	Common pipistrelle
19/05/2021	00:29:30	Ground	Common pipistrelle
19/05/2021	00:32:18	Ground	Soprano pipistrelle
19/05/2021	21:34:27	Ground	Leisler's bat
19/05/2021	22:05:10	Ground	Leisler's bat
19/05/2021	22:08:45	Ground	Common pipistrelle
19/05/2021	22:10:04	Ground	Leisler's bat
19/05/2021	22:10:12	Ground	Leisler's bat
19/05/2021	22:10:12	Height	Leisler's bat
19/05/2021	22:25:10	Ground	Common pipistrelle
19/05/2021	22:27:03	Ground	Common pipistrelle
19/05/2021	22:29:41	Ground	Soprano pipistrelle
19/05/2021	22:32:55	Ground	Common pipistrelle
19/05/2021	22:39:01	Ground	Common pipistrelle
19/05/2021	22:43:32	Ground	Common pipistrelle
19/05/2021	23:08:02	Ground	Soprano pipistrelle
19/05/2021	23:08:47	Ground	Common pipistrelle
19/05/2021	23:12:46	Ground	Common pipistrelle
19/05/2021	23:33:05	Ground	Leisler's bat
19/05/2021	23:47:15	Ground	Common pipistrelle
19/05/2021	23:56:32	Ground	Soprano pipistrelle
21/05/2021	22:40:05	Ground	Common pipistrelle

Date	Time	Mic. level	Species
21/05/2021	22:47:30	Ground	Leisler's bat
21/05/2021	23:41:49	Ground	Leisler's bat
22/05/2021	22:31:08	Ground	Common pipistrelle
22/05/2021	22:31:13	Ground	Common pipistrelle
22/05/2021	22:31:27	Ground	Common pipistrelle
23/05/2021	01:31:13	Ground	Myotis spp.
24/05/2021	00:08:35	Ground	Leisler's bat
24/05/2021	00:16:37	Ground	Soprano pipistrelle
24/05/2021	00:33:27	Ground	Leisler's bat
24/05/2021	00:41:21	Ground	Common pipistrelle
24/05/2021	04:06:12	Ground	Myotis spp.
24/05/2021	04:07:42	Ground	Common pipistrelle
24/05/2021	04:09:40	Ground	Common pipistrelle
24/05/2021	04:31:05	Ground	Common pipistrelle
24/05/2021	22:38:46	Ground	Leisler's bat
24/05/2021	22:38:49	Ground	Leisler's bat
24/05/2021	22:51:18	Ground	Soprano pipistrelle
24/05/2021	22:52:12	Ground	Soprano pipistrelle
24/05/2021	22:52:42	Ground	Common pipistrelle
24/05/2021	22:52:47	Ground	Common pipistrelle
24/05/2021	22:53:05	Ground	Soprano pipistrelle
24/05/2021	23:01:43	Ground	Soprano pipistrelle
24/05/2021	23:01:53	Ground	Common pipistrelle
24/05/2021	23:01:58	Ground	Common pipistrelle
24/05/2021	23:02:29	Ground	Common pipistrelle
24/05/2021	23:06:01	Ground	Common pipistrelle
24/05/2021	23:06:24	Ground	Soprano pipistrelle
24/05/2021	23:06:26	Ground	Soprano pipistrelle
24/05/2021	23:08:05	Ground	Common pipistrelle
24/05/2021	23:08:33	Ground	Common pipistrelle
24/05/2021	23:45:15	Ground	Common pipistrelle
24/05/2021	23:47:27	Ground	Common pipistrelle
24/05/2021	23:48:03	Ground	Common pipistrelle
24/05/2021	23:48:06	Ground	Common pipistrelle
24/05/2021	23:48:12	Ground	Common pipistrelle
24/05/2021	23:53:48	Ground	Common pipistrelle
24/05/2021	23:57:35	Ground	Common pipistrelle
24/05/2021	23:58:03	Ground	Common pipistrelle
24/05/2021	23:58:15	Ground	Common pipistrelle

Date	Time	Mic. level	Species
24/05/2021	23:58:31	Ground	Common pipistrelle
25/05/2021	22:21:20	Ground	Leisler's bat
25/05/2021	22:34:57	Ground	Leisler's bat
25/05/2021	22:35:12	Ground	Leisler's bat
25/05/2021	22:37:45	Ground	Leisler's bat
25/05/2021	22:37:48	Ground	Leisler's bat
25/05/2021	22:37:58	Ground	Soprano pipistrelle
25/05/2021	22:41:10	Ground	Common pipistrelle
25/05/2021	22:45:48	Ground	Common pipistrelle
25/05/2021	22:50:02	Ground	Common pipistrelle
25/05/2021	22:50:23	Ground	Common pipistrelle
25/05/2021	22:50:33	Ground	Common pipistrelle
25/05/2021	22:50:56	Ground	Common pipistrelle
25/05/2021	22:51:47	Ground	Common pipistrelle
25/05/2021	22:52:47	Ground	Common pipistrelle
25/05/2021	22:53:42	Ground	Common pipistrelle
25/05/2021	22:54:08	Ground	Common pipistrelle
25/05/2021	22:54:48	Ground	Leisler's bat
25/05/2021	22:56:03	Ground	Common pipistrelle
25/05/2021	22:57:27	Ground	Leisler's bat
25/05/2021	22:57:52	Ground	Leisler's bat
25/05/2021	22:58:08	Ground	Leisler's bat
25/05/2021	22:58:23	Ground	Leisler's bat
25/05/2021	22:58:34	Ground	Leisler's bat
25/05/2021	22:58:39	Ground	Leisler's bat
25/05/2021	22:58:55	Ground	Leisler's bat
25/05/2021	22:59:32	Ground	Leisler's bat
25/05/2021	22:59:35	Ground	Leisler's bat
25/05/2021	23:00:06	Ground	Leisler's bat
25/05/2021	23:00:11	Ground	Leisler's bat
25/05/2021	23:02:41	Ground	Common pipistrelle
25/05/2021	23:03:59	Ground	Common pipistrelle
25/05/2021	23:11:16	Ground	Common pipistrelle
26/05/2021	00:37:54	Ground	Leisler's bat
26/05/2021	00:38:00	Ground	Leisler's bat
26/05/2021	00:39:48	Ground	Leisler's bat
26/05/2021	00:39:48	Height	Leisler's bat
26/05/2021	00:59:36	Ground	Soprano pipistrelle
26/05/2021	01:18:47	Ground	Common pipistrelle

Date	Time	Mic. level	Species
26/05/2021	03:11:26	Ground	Myotis spp.
26/05/2021	22:03:56	Ground	Soprano pipistrelle
26/05/2021	22:03:56	Height	Leisler's bat
26/05/2021	22:20:47	Ground	Leisler's bat
26/05/2021	22:20:50	Ground	Leisler's bat
26/05/2021	22:23:25	Ground	Leisler's bat
26/05/2021	22:26:54	Ground	Leisler's bat
26/05/2021	22:26:54	Height	Leisler's bat
26/05/2021	22:33:08	Ground	Common pipistrelle
26/05/2021	22:38:34	Ground	Leisler's bat
26/05/2021	22:38:34	Height	Leisler's bat
26/05/2021	22:39:52	Ground	Leisler's bat
26/05/2021	22:39:52	Height	Leisler's bat
26/05/2021	22:40:02	Ground	Leisler's bat
26/05/2021	22:43:19	Ground	Common pipistrelle
26/05/2021	22:45:11	Ground	Soprano pipistrelle
26/05/2021	22:46:12	Ground	Leisler's bat
26/05/2021	22:47:07	Ground	Soprano pipistrelle
26/05/2021	22:53:38	Ground	Common pipistrelle
26/05/2021	22:53:48	Ground	Common pipistrelle
26/05/2021	22:57:03	Ground	Leisler's bat
26/05/2021	22:59:16	Ground	Common pipistrelle
26/05/2021	23:05:03	Ground	Common pipistrelle
26/05/2021	23:05:05	Ground	Common pipistrelle
26/05/2021	23:15:20	Ground	Common pipistrelle
26/05/2021	23:29:54	Ground	Common pipistrelle
27/05/2021	03:32:10	Ground	Common pipistrelle
27/05/2021	03:33:47	Ground	Soprano pipistrelle
27/05/2021	03:36:41	Ground	Common pipistrelle
27/05/2021	03:58:16	Ground	Soprano pipistrelle
27/05/2021	04:23:28	Ground	Leisler's bat
27/05/2021	04:27:43	Ground	Common pipistrelle
19/07/2021	00:07:54	Ground	Soprano pipistrelle
19/07/2021	00:09:06	Ground	Soprano pipistrelle
19/07/2021	00:23:37	Height	Common pipistrelle
19/07/2021	00:25:33	Ground	Leisler's bat
19/07/2021	00:25:37	Ground	Leisler's bat
19/07/2021	00:28:01	Ground	Soprano pipistrelle
19/07/2021	00:33:26	Ground	Common pipistrelle

Date	Time	Mic. level	Species
19/07/2021	00:35:01	Ground	Soprano pipistrelle
19/07/2021	00:35:39	Ground	Common pipistrelle
19/07/2021	00:39:36	Ground	Common pipistrelle
19/07/2021	00:47:50	Ground	Leisler's bat
19/07/2021	00:47:50	Height	Leisler's bat
19/07/2021	00:47:57	Ground	Soprano pipistrelle
19/07/2021	00:48:13	Ground	Leisler's bat
19/07/2021	00:54:58	Ground	Common pipistrelle
19/07/2021	00:59:22	Ground	Common pipistrelle
19/07/2021	01:01:15	Ground	Common pipistrelle
19/07/2021	01:07:34	Ground	Soprano pipistrelle
19/07/2021	01:17:15	Height	Common pipistrelle
19/07/2021	01:29:12	Ground	Common pipistrelle
19/07/2021	01:30:52	Ground	Common pipistrelle
19/07/2021	01:30:56	Ground	Common pipistrelle
19/07/2021	01:39:54	Ground	Soprano pipistrelle
19/07/2021	01:44:04	Height	Leisler's bat
19/07/2021	01:44:04	Ground	Brown long-eared bat
19/07/2021	01:44:11	Ground	Leisler's bat
19/07/2021	01:44:28	Ground	Soprano pipistrelle
19/07/2021	01:51:07	Ground	Common pipistrelle
19/07/2021	02:02:00	Ground	Soprano pipistrelle
19/07/2021	02:02:10	Ground	Soprano pipistrelle
19/07/2021	02:03:14	Ground	Soprano pipistrelle
19/07/2021	02:10:39	Ground	Common pipistrelle
19/07/2021	02:20:30	Ground	Leisler's bat
19/07/2021	02:20:30	Height	Leisler's bat
19/07/2021	02:21:58	Ground	Common pipistrelle
19/07/2021	02:27:28	Ground	Soprano pipistrelle
19/07/2021	02:28:43	Ground	Common pipistrelle
19/07/2021	02:59:28	Ground	Common pipistrelle
19/07/2021	03:04:01	Ground	Common pipistrelle
19/07/2021	03:04:08	Ground	Common pipistrelle
19/07/2021	03:04:16	Ground	Common pipistrelle
19/07/2021	03:19:11	Ground	Common pipistrelle
19/07/2021	03:37:56	Ground	Soprano pipistrelle
19/07/2021	03:41:25	Ground	Leisler's bat
19/07/2021	03:43:40	Ground	Common pipistrelle
19/07/2021	03:48:58	Height	Leisler's bat

Date	Time	Mic. level	Species
19/07/2021	04:02:38	Ground	Common pipistrelle
19/07/2021	04:07:24	Height	Leisler's bat
19/07/2021	04:47:15	Ground	Leisler's bat
19/07/2021	04:53:50	Height	Leisler's bat
19/07/2021	22:27:06	Height	Leisler's bat
19/07/2021	22:50:43	Ground	Soprano pipistrelle
19/07/2021	22:52:51	Height	Common pipistrelle
19/07/2021	22:53:18	Height	Common pipistrelle
19/07/2021	22:56:27	Height	Soprano pipistrelle
19/07/2021	23:00:29	Height	Common pipistrelle
19/07/2021	23:06:37	Height	Common pipistrelle
19/07/2021	23:08:13	Height	Common pipistrelle
19/07/2021	23:34:45	Height	Common pipistrelle
19/07/2021	23:35:01	Height	Common pipistrelle
19/07/2021	23:37:35	Ground	Common pipistrelle
19/07/2021	23:38:37	Ground	Soprano pipistrelle
19/07/2021	23:46:23	Height	Common pipistrelle
19/07/2021	23:46:33	Height	Common pipistrelle
19/07/2021	23:47:37	Height	Common pipistrelle
19/07/2021	23:47:45	Height	Common pipistrelle
19/07/2021	23:56:11	Ground	Common pipistrelle
20/07/2021	00:03:38	Ground	Soprano pipistrelle
20/07/2021	00:03:50	Ground	Soprano pipistrelle
20/07/2021	00:04:11	Ground	Common pipistrelle
20/07/2021	00:04:15	Ground	Common pipistrelle
20/07/2021	00:07:08	Ground	Common pipistrelle
20/07/2021	00:09:44	Ground	Leisler's bat
20/07/2021	00:09:56	Ground	Leisler's bat
20/07/2021	00:14:03	Ground	Common pipistrelle
20/07/2021	00:14:06	Ground	Common pipistrelle
20/07/2021	00:16:38	Ground	Soprano pipistrelle
20/07/2021	00:16:46	Ground	Soprano pipistrelle
20/07/2021	00:19:28	Ground	Common pipistrelle
20/07/2021	00:20:43	Ground	Soprano pipistrelle
20/07/2021	00:22:48	Ground	Common pipistrelle
20/07/2021	00:31:08	Ground	Common pipistrelle
20/07/2021	00:31:13	Ground	Common pipistrelle
20/07/2021	00:31:29	Ground	Common pipistrelle
20/07/2021	00:34:59	Ground	Common pipistrelle

Date	Time	Mic. level	Species
20/07/2021	00:35:58	Height	Leisler's bat
20/07/2021	00:35:58	Ground	Leisler's bat
20/07/2021	00:36:13	Height	Leisler's bat
20/07/2021	00:36:37	Height	Leisler's bat
20/07/2021	00:36:37	Ground	Leisler's bat
20/07/2021	00:36:47	Height	Leisler's bat
20/07/2021	00:36:47	Ground	Leisler's bat
20/07/2021	00:36:52	Height	Leisler's bat
20/07/2021	00:36:52	Ground	Leisler's bat
20/07/2021	00:36:57	Ground	Leisler's bat
20/07/2021	00:36:57	Height	Leisler's bat
20/07/2021	00:37:03	Ground	Leisler's bat
20/07/2021	00:37:11	Ground	Leisler's bat
20/07/2021	00:37:23	Ground	Soprano pipistrelle
20/07/2021	00:37:39	Ground	Soprano pipistrelle
20/07/2021	00:40:55	Ground	Soprano pipistrelle
20/07/2021	00:43:27	Ground	Common pipistrelle
20/07/2021	00:51:19	Ground	Common pipistrelle
20/07/2021	00:53:33	Ground	Common pipistrelle
20/07/2021	00:55:23	Ground	Soprano pipistrelle
20/07/2021	01:28:45	Ground	Common pipistrelle
20/07/2021	01:28:56	Ground	Common pipistrelle
20/07/2021	01:29:12	Ground	Common pipistrelle
20/07/2021	01:29:28	Ground	Common pipistrelle
20/07/2021	01:29:44	Ground	Common pipistrelle
20/07/2021	01:30:00	Ground	Common pipistrelle
20/07/2021	01:30:16	Ground	Common pipistrelle
20/07/2021	01:30:32	Ground	Common pipistrelle
20/07/2021	01:30:48	Ground	Common pipistrelle
20/07/2021	01:31:20	Ground	Common pipistrelle
20/07/2021	01:32:46	Ground	Common pipistrelle
20/07/2021	01:33:52	Ground	Common pipistrelle
20/07/2021	01:34:03	Ground	Common pipistrelle
20/07/2021	01:34:18	Ground	Common pipistrelle
20/07/2021	01:37:34	Ground	Soprano pipistrelle
20/07/2021	01:37:55	Ground	Soprano pipistrelle
20/07/2021	01:38:04	Ground	Soprano pipistrelle
20/07/2021	01:38:26	Ground	Soprano pipistrelle
20/07/2021	01:38:53	Ground	Soprano pipistrelle

Date	Time	Mic. level	Species
20/07/2021	01:39:08	Ground	Soprano pipistrelle
20/07/2021	01:51:12	Ground	Common pipistrelle
20/07/2021	01:51:34	Ground	Soprano pipistrelle
20/07/2021	02:13:43	Ground	Common pipistrelle
20/07/2021	02:15:03	Ground	Soprano pipistrelle
20/07/2021	02:15:09	Ground	Soprano pipistrelle
20/07/2021	02:16:37	Ground	Soprano pipistrelle
20/07/2021	02:21:41	Ground	Common pipistrelle
20/07/2021	02:21:43	Ground	Common pipistrelle
20/07/2021	02:35:42	Ground	Common pipistrelle
20/07/2021	02:36:27	Height	Leisler's bat
20/07/2021	02:36:36	Ground	Leisler's bat
20/07/2021	02:36:36	Height	Leisler's bat
20/07/2021	03:00:13	Ground	Common pipistrelle
20/07/2021	03:17:45	Ground	Common pipistrelle
20/07/2021	03:27:21	Ground	Common pipistrelle
20/07/2021	03:27:26	Ground	Common pipistrelle
20/07/2021	03:42:37	Height	Leisler's bat
20/07/2021	03:42:37	Ground	Leisler's bat
20/07/2021	03:48:47	Ground	Common pipistrelle
20/07/2021	04:00:45	Ground	Common pipistrelle
20/07/2021	04:02:06	Ground	Leisler's bat
20/07/2021	04:09:02	Height	Leisler's bat
20/07/2021	04:09:56	Ground	Soprano pipistrelle
20/07/2021	04:11:09	Ground	Common pipistrelle
20/07/2021	04:33:21	Ground	Soprano pipistrelle
20/07/2021	22:26:29	Height	Leisler's bat
20/07/2021	22:26:29	Ground	Leisler's bat
20/07/2021	22:26:45	Height	Leisler's bat
20/07/2021	22:26:45	Ground	Leisler's bat
20/07/2021	22:56:26	Ground	Common pipistrelle
20/07/2021	22:57:48	Height	Leisler's bat
20/07/2021	22:57:57	Ground	Leisler's bat
20/07/2021	22:57:57	Height	Leisler's bat
20/07/2021	22:58:13	Ground	Leisler's bat
20/07/2021	22:58:13	Height	Leisler's bat
20/07/2021	22:58:29	Ground	Leisler's bat
20/07/2021	23:09:48	Ground	Soprano pipistrelle
20/07/2021	23:11:00	Ground	Common pipistrelle

Date	Time	Mic. level	Species
20/07/2021	23:11:05	Ground	Common pipistrelle
20/07/2021	23:13:22	Ground	Leisler's bat
20/07/2021	23:13:22	Height	Leisler's bat
20/07/2021	23:13:30	Ground	Leisler's bat
20/07/2021	23:18:19	Height	Leisler's bat
20/07/2021	23:18:23	Ground	Leisler's bat
20/07/2021	23:31:15	Ground	Soprano pipistrelle
20/07/2021	23:38:21	Ground	Leisler's bat
20/07/2021	23:38:21	Height	Leisler's bat
20/07/2021	23:41:43	Ground	Soprano pipistrelle
20/07/2021	23:44:25	Ground	Soprano pipistrelle
20/07/2021	23:47:23	Ground	Common pipistrelle
20/07/2021	23:47:25	Ground	Common pipistrelle
20/07/2021	23:54:19	Height	Leisler's bat
20/07/2021	23:54:19	Ground	Leisler's bat
20/07/2021	23:54:36	Height	Leisler's bat
20/07/2021	23:54:36	Ground	Common pipistrelle
20/07/2021	23:55:42	Ground	Soprano pipistrelle
20/07/2021	23:56:50	Ground	Soprano pipistrelle
20/07/2021	23:56:54	Ground	Soprano pipistrelle
20/07/2021	23:58:31	Ground	Common pipistrelle
20/07/2021	23:59:46	Ground	Common pipistrelle
21/07/2021	00:01:26	Ground	Common pipistrelle
21/07/2021	00:01:30	Ground	Common pipistrelle
21/07/2021	00:03:46	Ground	Common pipistrelle
21/07/2021	00:04:00	Ground	Common pipistrelle
21/07/2021	00:05:27	Ground	Soprano pipistrelle
21/07/2021	00:05:29	Ground	Soprano pipistrelle
21/07/2021	00:14:58	Ground	Common pipistrelle
21/07/2021	00:18:08	Ground	Soprano pipistrelle
21/07/2021	00:18:17	Ground	Soprano pipistrelle
21/07/2021	00:19:57	Ground	Common pipistrelle
21/07/2021	00:20:26	Ground	Common pipistrelle
21/07/2021	00:22:23	Ground	Common pipistrelle
21/07/2021	00:22:51	Ground	Common pipistrelle
21/07/2021	00:23:00	Ground	Common pipistrelle
21/07/2021	00:26:41	Ground	Soprano pipistrelle
21/07/2021	00:32:17	Ground	Common pipistrelle
21/07/2021	00:32:21	Ground	Common pipistrelle

Date	Time	Mic. level	Species
21/07/2021	00:37:49	Height	Leisler's bat
21/07/2021	00:37:57	Ground	Leisler's bat
21/07/2021	00:37:57	Height	Leisler's bat
21/07/2021	00:44:57	Ground	Common pipistrelle
21/07/2021	00:46:15	Ground	Leisler's bat
21/07/2021	00:46:15	Height	Leisler's bat
21/07/2021	00:48:13	Ground	Soprano pipistrelle
21/07/2021	00:48:17	Ground	Soprano pipistrelle
21/07/2021	00:54:44	Ground	Soprano pipistrelle
21/07/2021	00:54:48	Ground	Soprano pipistrelle
21/07/2021	00:56:39	Ground	Soprano pipistrelle
21/07/2021	00:56:47	Ground	Leisler's bat
21/07/2021	00:56:52	Ground	Soprano pipistrelle
21/07/2021	00:57:08	Ground	Soprano pipistrelle
21/07/2021	00:57:24	Ground	Brown long-eared bat
21/07/2021	00:57:38	Ground	Leisler's bat
21/07/2021	01:09:47	Ground	Common pipistrelle
21/07/2021	01:10:31	Ground	Common pipistrelle
21/07/2021	01:12:52	Ground	Soprano pipistrelle
21/07/2021	01:13:58	Ground	Common pipistrelle
21/07/2021	01:25:47	Ground	Common pipistrelle
21/07/2021	01:43:14	Ground	Soprano pipistrelle
21/07/2021	01:51:52	Ground	Common pipistrelle
21/07/2021	01:55:55	Ground	Common pipistrelle
21/07/2021	01:56:01	Ground	Common pipistrelle
21/07/2021	01:56:27	Ground	Common pipistrelle
21/07/2021	01:56:54	Ground	Common pipistrelle
21/07/2021	02:09:13	Ground	Common pipistrelle
21/07/2021	02:12:08	Ground	Common pipistrelle
21/07/2021	02:13:01	Ground	Common pipistrelle
21/07/2021	02:13:21	Ground	Common pipistrelle
21/07/2021	02:13:42	Ground	Common pipistrelle
21/07/2021	02:13:48	Ground	Common pipistrelle
21/07/2021	02:13:56	Ground	Common pipistrelle
21/07/2021	02:14:06	Ground	Common pipistrelle
21/07/2021	02:14:17	Ground	Common pipistrelle
21/07/2021	02:14:25	Ground	Common pipistrelle
21/07/2021	02:15:37	Ground	Common pipistrelle
21/07/2021	02:15:43	Ground	Common pipistrelle

Date	Time	Mic. level	Species
21/07/2021	02:16:11	Ground	Common pipistrelle
21/07/2021	02:17:20	Ground	Common pipistrelle
21/07/2021	02:18:06	Ground	Common pipistrelle
21/07/2021	02:18:16	Ground	Common pipistrelle
21/07/2021	02:18:23	Ground	Common pipistrelle
21/07/2021	02:18:28	Height	Leisler's bat
21/07/2021	02:18:28	Ground	Common pipistrelle
21/07/2021	02:19:33	Ground	Common pipistrelle
21/07/2021	02:29:22	Ground	Common pipistrelle
21/07/2021	02:29:31	Ground	Common pipistrelle
21/07/2021	02:29:38	Ground	Common pipistrelle
21/07/2021	02:29:44	Ground	Common pipistrelle
21/07/2021	02:29:58	Ground	Common pipistrelle
21/07/2021	02:30:22	Ground	Common pipistrelle
21/07/2021	02:30:33	Ground	Common pipistrelle
21/07/2021	02:47:00	Ground	Brown long-eared bat
21/07/2021	02:57:22	Ground	Common pipistrelle
21/07/2021	03:06:31	Ground	Soprano pipistrelle
21/07/2021	03:19:03	Ground	Common pipistrelle
21/07/2021	03:30:41	Ground	Leisler's bat
21/07/2021	03:30:41	Height	Leisler's bat
21/07/2021	03:30:57	Ground	Leisler's bat
21/07/2021	03:31:02	Ground	Leisler's bat
21/07/2021	03:32:13	Ground	Common pipistrelle
21/07/2021	03:36:55	Height	Common pipistrelle
21/07/2021	03:37:03	Height	Common pipistrelle
21/07/2021	03:37:18	Height	Common pipistrelle
21/07/2021	03:37:22	Height	Common pipistrelle
21/07/2021	03:37:38	Height	Common pipistrelle
21/07/2021	03:37:54	Height	Common pipistrelle
21/07/2021	03:45:50	Ground	Leisler's bat
21/07/2021	03:46:27	Ground	Leisler's bat
21/07/2021	03:46:27	Height	Leisler's bat
21/07/2021	03:46:35	Ground	Leisler's bat
21/07/2021	03:48:06	Ground	Soprano pipistrelle
21/07/2021	03:53:02	Height	Leisler's bat
21/07/2021	03:53:02	Ground	Leisler's bat
21/07/2021	03:53:08	Height	Leisler's bat
21/07/2021	03:53:13	Height	Leisler's bat

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Date	Time	Mic. level	Species
21/07/2021	04:06:40	Ground	Soprano pipistrelle
21/07/2021	04:06:43	Ground	Soprano pipistrelle
21/07/2021	04:14:34	Ground	Soprano pipistrelle
21/07/2021	04:20:14	Ground	Soprano pipistrelle
21/07/2021	04:23:13	Ground	Soprano pipistrelle
21/07/2021	22:42:23	Ground	Soprano pipistrelle
21/07/2021	22:44:13	Ground	Common pipistrelle
21/07/2021	22:49:44	Height	Leisler's bat
21/07/2021	22:49:44	Ground	Leisler's bat
21/07/2021	22:54:09	Height	Leisler's bat
21/07/2021	22:54:15	Ground	Leisler's bat
21/07/2021	22:55:43	Height	Common pipistrelle
21/07/2021	22:56:12	Height	Common pipistrelle
21/07/2021	22:56:15	Height	Common pipistrelle
21/07/2021	22:58:06	Ground	Soprano pipistrelle
21/07/2021	22:59:58	Height	Leisler's bat
21/07/2021	23:01:05	Ground	Leisler's bat
21/07/2021	23:04:25	Ground	Common pipistrelle
21/07/2021	23:10:52	Ground	Common pipistrelle
21/07/2021	23:11:59	Ground	Common pipistrelle
21/07/2021	23:15:04	Ground	Soprano pipistrelle
21/07/2021	23:16:41	Ground	Soprano pipistrelle
21/07/2021	23:16:47	Ground	Soprano pipistrelle
21/07/2021	23:18:13	Ground	Common pipistrelle
21/07/2021	23:18:58	Ground	Common pipistrelle
21/07/2021	23:19:20	Ground	Soprano pipistrelle
21/07/2021	23:21:26	Ground	Soprano pipistrelle
21/07/2021	23:27:32	Height	Common pipistrelle
21/07/2021	23:29:51	Ground	Soprano pipistrelle
21/07/2021	23:31:40	Ground	Common pipistrelle
21/07/2021	23:32:19	Height	Common pipistrelle
21/07/2021	23:32:22	Height	Common pipistrelle
21/07/2021	23:35:39	Ground	Soprano pipistrelle
21/07/2021	23:43:44	Ground	Soprano pipistrelle
21/07/2021	23:44:25	Ground	Soprano pipistrelle
21/07/2021	23:44:31	Ground	Soprano pipistrelle
21/07/2021	23:47:40	Ground	Common pipistrelle
21/07/2021	23:47:50	Ground	Common pipistrelle
21/07/2021	23:49:16	Ground	Leisler's bat

Date	Time	Mic. level	Species
21/07/2021	23:49:16	Height	Leisler's bat
21/07/2021	23:49:26	Ground	Leisler's bat
21/07/2021	23:49:56	Ground	Myotis spp.
21/07/2021	23:53:01	Height	Common pipistrelle
22/07/2021	00:12:20	Ground	Soprano pipistrelle
22/07/2021	00:14:55	Ground	Soprano pipistrelle
22/07/2021	00:16:15	Ground	Common pipistrelle
22/07/2021	00:19:58	Ground	Common pipistrelle
22/07/2021	00:22:05	Ground	Soprano pipistrelle
22/07/2021	00:22:33	Ground	Common pipistrelle
22/07/2021	00:31:49	Ground	Soprano pipistrelle
22/07/2021	00:51:06	Ground	Common pipistrelle
22/07/2021	00:53:46	Ground	Soprano pipistrelle
22/07/2021	00:58:56	Ground	Common pipistrelle
22/07/2021	00:59:36	Ground	Soprano pipistrelle
22/07/2021	00:59:56	Ground	Soprano pipistrelle
22/07/2021	01:00:15	Ground	Soprano pipistrelle
22/07/2021	01:00:31	Ground	Soprano pipistrelle
22/07/2021	01:00:37	Ground	Soprano pipistrelle
22/07/2021	01:10:46	Height	Common pipistrelle
22/07/2021	01:10:56	Height	Common pipistrelle
22/07/2021	01:11:16	Height	Common pipistrelle
22/07/2021	01:20:00	Ground	Common pipistrelle
22/07/2021	01:23:26	Ground	Soprano pipistrelle
22/07/2021	01:23:42	Height	Common pipistrelle
22/07/2021	02:11:35	Ground	Soprano pipistrelle
22/07/2021	02:11:37	Ground	Soprano pipistrelle
22/07/2021	02:24:18	Ground	Common pipistrelle
22/07/2021	02:31:36	Ground	Common pipistrelle
22/07/2021	02:33:08	Ground	Common pipistrelle
22/07/2021	02:35:07	Ground	Common pipistrelle
22/07/2021	02:35:12	Ground	Common pipistrelle
22/07/2021	02:35:19	Ground	Common pipistrelle
22/07/2021	02:35:23	Ground	Common pipistrelle
22/07/2021	02:35:41	Ground	Soprano pipistrelle
22/07/2021	02:35:46	Ground	Soprano pipistrelle
22/07/2021	02:37:47	Ground	Soprano pipistrelle
22/07/2021	02:43:48	Ground	Common pipistrelle
22/07/2021	02:43:54	Ground	Common pipistrelle

Date	Time	Mic. level	Species
22/07/2021	02:46:33	Ground	Soprano pipistrelle
22/07/2021	02:46:39	Ground	Soprano pipistrelle
22/07/2021	02:46:56	Ground	Soprano pipistrelle
22/07/2021	02:49:15	Ground	Soprano pipistrelle
22/07/2021	02:50:14	Ground	Common pipistrelle
22/07/2021	02:51:48	Ground	Soprano pipistrelle
22/07/2021	02:51:56	Ground	Soprano pipistrelle
22/07/2021	02:53:51	Height	Leisler's bat
22/07/2021	02:55:34	Ground	Soprano pipistrelle
22/07/2021	03:09:59	Ground	Common pipistrelle
22/07/2021	03:21:07	Height	Leisler's bat
22/07/2021	03:21:17	Ground	Leisler's bat
22/07/2021	03:21:17	Height	Leisler's bat
22/07/2021	03:25:54	Ground	Common pipistrelle
22/07/2021	03:29:44	Ground	Leisler's bat
22/07/2021	03:34:28	Ground	Common pipistrelle
22/07/2021	03:54:50	Ground	Common pipistrelle
22/07/2021	04:07:07	Ground	Common pipistrelle
22/07/2021	04:07:55	Ground	Common pipistrelle
22/07/2021	04:15:07	Ground	Leisler's bat
22/07/2021	04:20:58	Height	Leisler's bat
22/07/2021	04:21:02	Ground	Leisler's bat
22/07/2021	22:34:04	Ground	Soprano pipistrelle
22/07/2021	22:37:33	Ground	Common pipistrelle
22/07/2021	23:06:30	Ground	Common pipistrelle
22/07/2021	23:07:41	Height	Common pipistrelle
22/07/2021	23:10:22	Ground	Soprano pipistrelle
22/07/2021	23:14:20	Ground	Common pipistrelle
22/07/2021	23:14:29	Ground	Common pipistrelle
22/07/2021	23:14:40	Ground	Common pipistrelle
22/07/2021	23:14:55	Ground	Common pipistrelle
22/07/2021	23:15:04	Ground	Common pipistrelle
22/07/2021	23:15:17	Ground	Common pipistrelle
22/07/2021	23:15:24	Ground	Common pipistrelle
22/07/2021	23:16:54	Ground	Common pipistrelle
22/07/2021	23:21:54	Ground	Common pipistrelle
22/07/2021	23:25:26	Height	Leisler's bat
22/07/2021	23:45:03	Ground	Common pipistrelle
22/07/2021	23:49:17	Ground	Common pipistrelle

Date	Time	Mic. level	Species
22/07/2021	23:49:50	Height	Leisler's bat
22/07/2021	23:49:50	Ground	Leisler's bat
22/07/2021	23:50:14	Ground	Leisler's bat
22/07/2021	23:56:18	Ground	Soprano pipistrelle
22/07/2021	23:57:14	Ground	Soprano pipistrelle
23/07/2021	00:04:30	Ground	Common pipistrelle
23/07/2021	00:04:33	Ground	Common pipistrelle
23/07/2021	00:05:04	Ground	Soprano pipistrelle
23/07/2021	00:05:54	Ground	Soprano pipistrelle
23/07/2021	00:06:00	Ground	Soprano pipistrelle
23/07/2021	00:08:14	Height	Leisler's bat
23/07/2021	00:08:14	Ground	Common pipistrelle
23/07/2021	00:08:20	Height	Leisler's bat
23/07/2021	00:08:20	Ground	Common pipistrelle
23/07/2021	00:09:10	Ground	Common pipistrelle
23/07/2021	00:09:30	Ground	Common pipistrelle
23/07/2021	00:11:26	Ground	Common pipistrelle
23/07/2021	00:11:55	Ground	Common pipistrelle
23/07/2021	00:13:14	Ground	Soprano pipistrelle
23/07/2021	00:13:18	Ground	Soprano pipistrelle
23/07/2021	00:13:40	Ground	Common pipistrelle
23/07/2021	00:13:44	Ground	Common pipistrelle
23/07/2021	00:17:29	Ground	Common pipistrelle
23/07/2021	00:22:28	Ground	Common pipistrelle
23/07/2021	00:25:30	Ground	Soprano pipistrelle
23/07/2021	00:25:42	Ground	Common pipistrelle
23/07/2021	00:27:21	Ground	Common pipistrelle
23/07/2021	00:27:27	Ground	Common pipistrelle
23/07/2021	00:30:47	Ground	Soprano pipistrelle
23/07/2021	00:30:58	Ground	Soprano pipistrelle
23/07/2021	00:32:29	Ground	Soprano pipistrelle
23/07/2021	00:39:00	Ground	Common pipistrelle
23/07/2021	00:39:03	Ground	Common pipistrelle
23/07/2021	00:41:35	Ground	Common pipistrelle
23/07/2021	00:44:43	Ground	Common pipistrelle
23/07/2021	00:45:29	Ground	Common pipistrelle
23/07/2021	00:49:14	Ground	Common pipistrelle
23/07/2021	00:52:15	Ground	Common pipistrelle
23/07/2021	00:52:18	Ground	Common pipistrelle

Date	Time	Mic. level	Species
23/07/2021	00:54:14	Ground	Common pipistrelle
23/07/2021	00:56:00	Ground	Common pipistrelle
23/07/2021	00:56:39	Ground	Common pipistrelle
23/07/2021	01:00:49	Ground	Common pipistrelle
23/07/2021	01:00:52	Ground	Common pipistrelle
23/07/2021	01:06:18	Ground	Common pipistrelle
23/07/2021	01:06:35	Ground	Common pipistrelle
23/07/2021	01:18:00	Ground	Common pipistrelle
23/07/2021	01:37:32	Ground	Common pipistrelle
23/07/2021	01:37:37	Ground	Common pipistrelle
23/07/2021	01:44:45	Ground	Common pipistrelle
23/07/2021	01:49:49	Ground	Common pipistrelle
23/07/2021	01:55:14	Ground	Common pipistrelle
23/07/2021	01:55:53	Ground	Soprano pipistrelle
23/07/2021	01:57:42	Ground	Common pipistrelle
23/07/2021	02:03:34	Ground	Common pipistrelle
23/07/2021	02:05:17	Ground	Soprano pipistrelle
23/07/2021	02:05:43	Ground	Common pipistrelle
23/07/2021	02:06:03	Ground	Common pipistrelle
23/07/2021	02:06:07	Ground	Common pipistrelle
23/07/2021	02:08:45	Height	Common pipistrelle
23/07/2021	02:09:35	Ground	Leisler's bat
23/07/2021	02:09:35	Height	Leisler's bat
23/07/2021	02:19:58	Ground	Common pipistrelle
23/07/2021	02:20:41	Ground	Common pipistrelle
23/07/2021	02:22:27	Ground	Common pipistrelle
23/07/2021	02:22:38	Ground	Common pipistrelle
23/07/2021	02:28:41	Ground	Common pipistrelle
23/07/2021	02:33:06	Ground	Soprano pipistrelle
23/07/2021	03:31:38	Ground	Leisler's bat
23/07/2021	03:31:38	Height	Leisler's bat
23/07/2021	03:31:46	Ground	Leisler's bat
23/07/2021	03:31:46	Height	Leisler's bat
23/07/2021	03:36:05	Ground	Common pipistrelle
23/07/2021	03:55:09	Ground	Common pipistrelle
23/07/2021	03:55:15	Ground	Soprano pipistrelle
23/07/2021	03:57:50	Ground	Common pipistrelle
23/07/2021	04:06:42	Ground	Common pipistrelle
23/07/2021	04:06:45	Ground	Common pipistrelle
23/07/2021	04:12:08	Ground	Leisler's bat
23/07/2021	04:23:09	Ground	Common pipistrelle
23/07/2021	04:24:17	Height	Leisler's bat
23/07/2021	04:38:37	Height	Leisler's bat
23/07/2021	04:38:37	Ground	Leisler's bat
23/07/2021	22:28:31	Ground	Leisler's bat
23/07/2021	22:28:31	Height	Leisler's bat
23/07/2021	22:31:33	Ground	Soprano pipistrelle
23/07/2021	22:31:35	Ground	Common pipistrelle
23/07/2021	22:47:13	Ground	Common pipistrelle
23/07/2021	22:48:58	Ground	Common pipistrelle
23/07/2021	22:51:37	Ground	Soprano pipistrelle
23/07/2021	22:52:07	Height	Common pipistrelle
23/07/2021	22:52:14	Height	Common pipistrelle
23/07/2021	23:02:00	Ground	Leisler's bat
23/07/2021	23:02:49	Ground	Soprano pipistrelle
23/07/2021	23:07:29	Ground	Common pipistrelle
23/07/2021	23:10:08	Ground	Common pipistrelle
23/07/2021	23:12:49	Ground	Common pipistrelle
23/07/2021	23:19:03	Ground	Common pipistrelle
23/07/2021	23:19:07	Ground	Common pipistrelle
23/07/2021	23:20:21	Ground	Soprano pipistrelle
23/07/2021	23:20:51	Ground	Soprano pipistrelle
23/07/2021	23:20:56	Ground	Soprano pipistrelle
23/07/2021	23:21:05	Ground	Leisler's bat
23/07/2021	23:24:35	Height	Leisler's bat
23/07/2021	23:24:35	Ground	Leisler's bat
23/07/2021	23:29:37	Ground	Common pipistrelle
23/07/2021	23:29:42	Ground	Common pipistrelle
23/07/2021	23:34:41	Ground	Common pipistrelle
23/07/2021	23:34:47	Ground	Common pipistrelle
23/07/2021	23:35:14	Ground	Common pipistrelle
23/07/2021	23:36:39	Ground	Common pipistrelle
23/07/2021	23:38:09	Ground	Leisler's bat
23/07/2021	23:38:19	Ground	Common pipistrelle
23/07/2021	23:38:34	Ground	Leisler's bat
23/07/2021	23:38:50	Ground	Leisler's bat
23/07/2021	23:39:18	Ground	Leisler's bat
23/07/2021	23:39:34	Ground	Brown long-eared bat

Date	Time	Mic. level	Species
23/07/2021	23:39:50	Ground	Leisler's bat
23/07/2021	23:43:29	Ground	Common pipistrelle
23/07/2021	23:43:35	Ground	Common pipistrelle
23/07/2021	23:43:56	Ground	Common pipistrelle
23/07/2021	23:43:59	Ground	Common pipistrelle
23/07/2021	23:46:21	Ground	Common pipistrelle
23/07/2021	23:48:30	Ground	Leisler's bat
23/07/2021	23:48:30	Height	Leisler's bat
23/07/2021	23:48:40	Ground	Leisler's bat
23/07/2021	23:49:01	Ground	Common pipistrelle
23/07/2021	23:51:36	Ground	Common pipistrelle
23/07/2021	23:55:34	Ground	Common pipistrelle
23/07/2021	23:56:26	Ground	Common pipistrelle
24/07/2021	00:09:54	Ground	Common pipistrelle
24/07/2021	00:12:32	Ground	Common pipistrelle
24/07/2021	00:50:31	Ground	Common pipistrelle
24/07/2021	01:00:29	Ground	Soprano pipistrelle
24/07/2021	01:00:46	Ground	Common pipistrelle
24/07/2021	01:13:27	Ground	Myotis spp.
24/07/2021	01:14:21	Ground	Common pipistrelle
24/07/2021	01:15:38	Height	Leisler's bat
24/07/2021	01:21:34	Ground	Common pipistrelle
24/07/2021	01:40:05	Ground	Leisler's bat
24/07/2021	01:43:45	Ground	Soprano pipistrelle
24/07/2021	02:29:06	Height	Leisler's bat
24/07/2021	02:37:49	Ground	Leisler's bat
24/07/2021	02:37:49	Height	Leisler's bat
24/07/2021	02:39:09	Ground	Leisler's bat
24/07/2021	02:39:09	Height	Leisler's bat
24/07/2021	02:41:59	Ground	Leisler's bat
24/07/2021	02:44:21	Height	Leisler's bat
24/07/2021	02:44:37	Height	Leisler's bat
24/07/2021	02:50:06	Ground	Leisler's bat
24/07/2021	02:50:06	Height	Leisler's bat
24/07/2021	03:42:51	Height	Leisler's bat
24/07/2021	03:45:13	Ground	Soprano pipistrelle
24/07/2021	04:32:58	Height	Leisler's bat
24/07/2021	04:33:02	Height	Leisler's bat
24/07/2021	22:42:05	Height	Leisler's bat
24/07/2021	22:42:11	Height	Leisler's bat
24/07/2021	22:42:27	Height	Leisler's bat
24/07/2021	22:43:57	Ground	Leisler's bat
24/07/2021	22:50:10	Ground	Common pipistrelle
24/07/2021	22:50:13	Ground	Common pipistrelle
24/07/2021	22:51:20	Height	Leisler's bat
24/07/2021	22:51:20	Ground	Leisler's bat
24/07/2021	22:57:05	Ground	Common pipistrelle
24/07/2021	22:59:10	Ground	Common pipistrelle
24/07/2021	23:01:50	Ground	Common pipistrelle
24/07/2021	23:02:44	Ground	Common pipistrelle
24/07/2021	23:06:59	Ground	Common pipistrelle
24/07/2021	23:07:08	Ground	Common pipistrelle
24/07/2021	23:09:49	Ground	Soprano pipistrelle
24/07/2021	23:10:17	Ground	Common pipistrelle
24/07/2021	23:15:20	Ground	Common pipistrelle
24/07/2021	23:16:17	Ground	Common pipistrelle
24/07/2021	23:18:19	Ground	Common pipistrelle
24/07/2021	23:18:22	Ground	Common pipistrelle
24/07/2021	23:18:48	Ground	Common pipistrelle
24/07/2021	23:31:06	Ground	Common pipistrelle
24/07/2021	23:31:14	Ground	Common pipistrelle
24/07/2021	23:34:23	Ground	Leisler's bat
24/07/2021	23:34:23	Height	Leisler's bat
24/07/2021	23:34:34	Ground	Leisler's bat
24/07/2021	23:34:52	Ground	Common pipistrelle
24/07/2021	23:34:56	Ground	Common pipistrelle
24/07/2021	23:35:59	Ground	Common pipistrelle
24/07/2021	23:36:04	Ground	Common pipistrelle
24/07/2021	23:36:59	Ground	Common pipistrelle
24/07/2021	23:37:04	Ground	Common pipistrelle
24/07/2021	23:41:02	Ground	Soprano pipistrelle
24/07/2021	23:43:02	Ground	Soprano pipistrelle
24/07/2021	23:49:09	Height	Leisler's bat
24/07/2021	23:49:14	Height	Leisler's bat
24/07/2021	23:49:23	Height	Leisler's bat
24/07/2021	23:58:02	Ground	Common pipistrelle
25/07/2021	00:04:53	Ground	Common pipistrelle
25/07/2021	00:08:53	Ground	Soprano pipistrelle

Date	Time	Mic. level	Species
25/07/2021	00:21:33	Height	Leisler's bat
25/07/2021	00:25:42	Ground	Soprano pipistrelle
25/07/2021	00:26:03	Ground	Soprano pipistrelle
25/07/2021	00:33:38	Ground	Common pipistrelle
25/07/2021	00:35:02	Ground	Common pipistrelle
25/07/2021	00:41:52	Ground	Common pipistrelle
25/07/2021	01:10:45	Ground	Common pipistrelle
25/07/2021	01:26:52	Ground	Common pipistrelle
25/07/2021	01:27:03	Ground	Common pipistrelle
25/07/2021	01:34:25	Ground	Common pipistrelle
25/07/2021	01:36:06	Ground	Common pipistrelle
25/07/2021	01:45:41	Ground	Leisler's bat
25/07/2021	02:01:00	Ground	Soprano pipistrelle
25/07/2021	02:02:31	Ground	Leisler's bat
25/07/2021	02:02:31	Height	Leisler's bat
25/07/2021	02:23:23	Ground	Leisler's bat
25/07/2021	02:23:23	Height	Leisler's bat
25/07/2021	02:34:38	Ground	Soprano pipistrelle
25/07/2021	02:34:45	Ground	Soprano pipistrelle
25/07/2021	02:42:50	Ground	Common pipistrelle
25/07/2021	02:48:58	Ground	Soprano pipistrelle
25/07/2021	02:49:06	Ground	Soprano pipistrelle
25/07/2021	02:49:44	Ground	Soprano pipistrelle
25/07/2021	02:55:08	Height	Leisler's bat
25/07/2021	02:55:08	Ground	Leisler's bat
25/07/2021	02:55:28	Height	Leisler's bat
25/07/2021	02:57:58	Ground	Leisler's bat
25/07/2021	02:57:58	Height	Leisler's bat
25/07/2021	02:59:12	Ground	Soprano pipistrelle
25/07/2021	02:59:24	Ground	Soprano pipistrelle
25/07/2021	02:59:57	Ground	Soprano pipistrelle
25/07/2021	03:02:45	Ground	Leisler's bat
25/07/2021	03:02:45	Height	Leisler's bat
25/07/2021	03:21:00	Ground	Leisler's bat
25/07/2021	03:21:05	Ground	Leisler's bat
25/07/2021	03:27:10	Ground	Soprano pipistrelle
25/07/2021	03:31:39	Ground	Common pipistrelle
25/07/2021	03:32:22	Ground	Soprano pipistrelle
25/07/2021	03:45:36	Height	Leisler's bat

Date	Time	Mic. level	Species
25/07/2021	04:00:56	Ground	Soprano pipistrelle
25/07/2021	04:10:05	Height	Leisler's bat
25/07/2021	04:10:13	Height	Leisler's bat
25/07/2021	04:12:57	Ground	Leisler's bat
25/07/2021	04:12:57	Height	Leisler's bat
25/07/2021	04:13:04	Height	Leisler's bat
25/07/2021	04:13:04	Ground	Leisler's bat
25/07/2021	04:13:16	Ground	Leisler's bat
25/07/2021	04:13:23	Height	Leisler's bat
25/07/2021	04:15:36	Ground	Leisler's bat
25/07/2021	04:15:36	Height	Leisler's bat
25/07/2021	04:34:51	Ground	Soprano pipistrelle
25/07/2021	04:37:05	Height	Leisler's bat
25/07/2021	04:37:05	Ground	Leisler's bat
25/07/2021	04:38:18	Ground	Leisler's bat
25/07/2021	04:40:53	Height	Leisler's bat
25/07/2021	04:41:59	Ground	Leisler's bat
25/07/2021	04:41:59	Height	Leisler's bat
25/07/2021	04:58:53	Ground	Soprano pipistrelle
25/07/2021	05:06:52	Ground	Leisler's bat
25/07/2021	05:06:52	Height	Leisler's bat
25/07/2021	22:34:33	Ground	Leisler's bat
25/07/2021	22:34:46	Ground	Leisler's bat
25/07/2021	22:38:04	Ground	Soprano pipistrelle
25/07/2021	22:42:03	Ground	Leisler's bat
25/07/2021	22:42:11	Ground	Leisler's bat
25/07/2021	22:46:31	Ground	Soprano pipistrelle
25/07/2021	22:48:24	Ground	Common pipistrelle
25/07/2021	22:48:29	Ground	Common pipistrelle
25/07/2021	22:48:42	Height	Leisler's bat
25/07/2021	22:48:53	Ground	Common pipistrelle
25/07/2021	22:49:42	Height	Leisler's bat
25/07/2021	22:49:42	Ground	Common pipistrelle
25/07/2021	22:56:22	Ground	Leisler's bat
25/07/2021	22:56:22	Height	Leisler's bat
25/07/2021	22:57:38	Ground	Common pipistrelle
25/07/2021	22:57:40	Ground	Common pipistrelle
25/07/2021	23:01:55	Ground	Common pipistrelle
25/07/2021	23:07:24	Ground	Common pipistrelle

Date	Time	Mic. level	Species
25/07/2021	23:11:41	Ground	Common pipistrelle
25/07/2021	23:15:13	Ground	Common pipistrelle
25/07/2021	23:22:24	Ground	Leisler's bat
25/07/2021	23:23:34	Ground	Leisler's bat
25/07/2021	23:23:52	Ground	Common pipistrelle
25/07/2021	23:23:59	Ground	Common pipistrelle
25/07/2021	23:28:18	Ground	Common pipistrelle
25/07/2021	23:29:40	Ground	Common pipistrelle
25/07/2021	23:29:48	Ground	Common pipistrelle
25/07/2021	23:43:13	Ground	Common pipistrelle
25/07/2021	23:54:17	Ground	Common pipistrelle
25/07/2021	23:54:58	Ground	Common pipistrelle
26/07/2021	00:08:45	Ground	Common pipistrelle
26/07/2021	00:14:40	Ground	Common pipistrelle
26/07/2021	00:18:30	Ground	Soprano pipistrelle
26/07/2021	00:20:17	Ground	Soprano pipistrelle
26/07/2021	00:23:56	Ground	Common pipistrelle
26/07/2021	00:27:14	Ground	Common pipistrelle
26/07/2021	00:34:36	Ground	Common pipistrelle
26/07/2021	00:38:30	Ground	Common pipistrelle
26/07/2021	01:25:58	Ground	Soprano pipistrelle
26/07/2021	01:26:00	Ground	Soprano pipistrelle
26/07/2021	01:31:10	Ground	Soprano pipistrelle
26/07/2021	01:36:43	Ground	Common pipistrelle
26/07/2021	01:36:49	Ground	Common pipistrelle
26/07/2021	01:40:43	Ground	Common pipistrelle
26/07/2021	01:58:49	Ground	Common pipistrelle
26/07/2021	02:02:06	Height	Leisler's bat
26/07/2021	02:10:16	Ground	Soprano pipistrelle
26/07/2021	02:13:36	Ground	Soprano pipistrelle
26/07/2021	02:24:45	Ground	Soprano pipistrelle
26/07/2021	02:46:29	Ground	Myotis spp.
26/07/2021	02:47:09	Ground	Common pipistrelle
26/07/2021	03:04:13	Ground	Common pipistrelle
26/07/2021	03:06:04	Ground	Common pipistrelle
26/07/2021	03:06:22	Ground	Common pipistrelle
26/07/2021	03:15:53	Ground	Soprano pipistrelle
26/07/2021	04:11:56	Ground	Common pipistrelle
26/07/2021	04:14:58	Ground	Soprano pipistrelle

Date	Time	Mic. level	Species
26/07/2021	04:15:12	Ground	Leisler's bat
26/07/2021	04:15:12	Height	Leisler's bat
26/07/2021	04:41:07	Ground	Common pipistrelle
26/07/2021	05:01:17	Height	Leisler's bat
26/07/2021	05:08:17	Ground	Leisler's bat
26/07/2021	05:08:24	Ground	Leisler's bat
26/07/2021	05:12:41	Height	Leisler's bat
26/07/2021	22:00:48	Height	Leisler's bat
26/07/2021	22:00:48	Ground	Leisler's bat
26/07/2021	22:00:56	Height	Leisler's bat
26/07/2021	22:20:53	Height	Common pipistrelle
26/07/2021	22:25:31	Ground	Leisler's bat
26/07/2021	22:25:40	Ground	Leisler's bat
26/07/2021	22:35:34	Ground	Leisler's bat
26/07/2021	22:35:34	Height	Common pipistrelle
26/07/2021	22:47:42	Ground	Common pipistrelle
26/07/2021	22:49:32	Ground	Soprano pipistrelle
26/07/2021	23:22:09	Ground	Common pipistrelle
26/07/2021	23:32:10	Ground	Common pipistrelle
26/07/2021	23:35:44	Ground	Common pipistrelle
27/07/2021	00:18:33	Height	Leisler's bat
27/07/2021	00:30:58	Ground	Soprano pipistrelle
27/07/2021	02:09:19	Ground	Common pipistrelle
27/07/2021	02:22:14	Ground	Soprano pipistrelle
27/07/2021	03:13:26	Ground	Soprano pipistrelle
27/07/2021	03:18:21	Ground	Soprano pipistrelle
27/07/2021	03:22:32	Ground	Soprano pipistrelle
27/07/2021	03:35:25	Ground	Soprano pipistrelle
27/07/2021	04:09:02	Height	Leisler's bat
27/07/2021	04:09:02	Ground	Leisler's bat
27/07/2021	04:11:56	Ground	Common pipistrelle
27/07/2021	04:12:33	Height	Leisler's bat
27/07/2021	04:12:38	Height	Leisler's bat
27/07/2021	04:12:38	Ground	Leisler's bat
27/07/2021	04:32:48	Height	Leisler's bat
27/07/2021	22:28:56	Ground	Common pipistrelle
27/07/2021	22:34:01	Ground	Soprano pipistrelle
27/07/2021	22:36:11	Ground	Common pipistrelle
27/07/2021	22:57:45	Ground	Common pipistrelle

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Date	Time	Mic. level	Species
27/07/2021	22:58:48	Ground	Common pipistrelle
27/07/2021	23:15:55	Ground	Common pipistrelle
27/07/2021	23:39:06	Ground	Soprano pipistrelle
27/07/2021	23:42:56	Ground	Common pipistrelle
27/07/2021	23:48:01	Ground	Common pipistrelle
28/07/2021	04:45:12	Height	Leisler's bat
28/07/2021	22:24:18	Height	Leisler's bat
28/07/2021	22:24:18	Ground	Soprano pipistrelle
28/07/2021	22:32:36	Ground	Soprano pipistrelle
28/07/2021	22:36:43	Ground	Common pipistrelle
28/07/2021	22:49:21	Ground	Soprano pipistrelle
29/07/2021	00:27:40	Ground	Soprano pipistrelle
29/07/2021	01:14:29	Ground	Common pipistrelle
29/07/2021	01:14:33	Ground	Common pipistrelle
29/07/2021	01:40:43	Ground	Soprano pipistrelle
29/07/2021	02:43:25	Ground	Common pipistrelle
29/07/2021	03:23:26	Ground	Soprano pipistrelle
29/07/2021	03:23:28	Ground	Soprano pipistrelle
29/07/2021	03:28:37	Ground	Soprano pipistrelle
29/07/2021	03:55:42	Ground	Common pipistrelle
29/07/2021	04:10:58	Ground	Common pipistrelle
29/07/2021	04:11:01	Ground	Common pipistrelle
29/07/2021	04:40:42	Ground	Soprano pipistrelle
29/07/2021	04:45:24	Ground	Soprano pipistrelle
29/07/2021	21:32:08	Height	Leisler's bat
29/07/2021	21:32:24	Height	Leisler's bat
29/07/2021	21:32:35	Height	Leisler's bat
29/07/2021	21:35:43	Ground	Leisler's bat
29/07/2021	22:13:10	Ground	Common pipistrelle
29/07/2021	22:15:07	Ground	Common pipistrelle
29/07/2021	22:23:33	Ground	Common pipistrelle
29/07/2021	22:26:41	Ground	Soprano pipistrelle
29/07/2021	22:28:24	Ground	Common pipistrelle
29/07/2021	22:28:38	Ground	Common pipistrelle
29/07/2021	22:28:48	Ground	Soprano pipistrelle
29/07/2021	22:31:20	Ground	Common pipistrelle
29/07/2021	22:31:59	Ground	Common pipistrelle
29/07/2021	22:32:25	Ground	Common pipistrelle
29/07/2021	22:33:08	Ground	Common pipistrelle

Date	Time	Mic. level	Species
29/07/2021	22:33:22	Ground	Common pipistrelle
29/07/2021	22:33:31	Ground	Common pipistrelle
29/07/2021	22:35:29	Height	Leisler's bat
29/07/2021	22:38:19	Ground	Common pipistrelle
29/07/2021	22:39:52	Ground	Common pipistrelle
29/07/2021	22:40:50	Ground	Common pipistrelle
29/07/2021	22:41:50	Ground	Leisler's bat
29/07/2021	22:42:27	Ground	Common pipistrelle
29/07/2021	22:42:44	Ground	Common pipistrelle
29/07/2021	22:42:50	Ground	Common pipistrelle
29/07/2021	22:43:27	Ground	Soprano pipistrelle
29/07/2021	22:45:06	Ground	Common pipistrelle
29/07/2021	22:53:04	Ground	Soprano pipistrelle
29/07/2021	22:56:05	Ground	Common pipistrelle
29/07/2021	22:56:08	Ground	Common pipistrelle
29/07/2021	23:03:01	Ground	Common pipistrelle
29/07/2021	23:14:03	Ground	Common pipistrelle
29/07/2021	23:35:44	Ground	Common pipistrelle
29/07/2021	23:54:42	Ground	Soprano pipistrelle
29/07/2021	23:54:45	Ground	Soprano pipistrelle
29/07/2021	23:56:12	Ground	Common pipistrelle
29/07/2021	23:59:07	Ground	Common pipistrelle
30/07/2021	00:02:02	Ground	Common pipistrelle
30/07/2021	00:53:29	Ground	Common pipistrelle
30/07/2021	01:10:05	Height	Soprano pipistrelle
30/07/2021	01:34:13	Ground	Soprano pipistrelle
30/07/2021	03:38:10	Ground	Soprano pipistrelle
30/07/2021	03:40:58	Ground	Common pipistrelle
30/07/2021	03:43:19	Ground	Common pipistrelle
30/07/2021	04:10:58	Ground	Leisler's bat
30/07/2021	04:27:32	Ground	Common pipistrelle
30/07/2021	04:31:17	Height	Leisler's bat
30/07/2021	04:32:03	Height	Leisler's bat
30/07/2021	04:37:38	Ground	Soprano pipistrelle
30/07/2021	04:40:25	Height	Leisler's bat
30/07/2021	22:17:47	Ground	Soprano pipistrelle
30/07/2021	22:26:31	Ground	Soprano pipistrelle
30/07/2021	22:38:43	Ground	Leisler's bat
30/07/2021	22:55:52	Ground	Soprano pipistrelle

Date	Time	Mic. level	Species
15/09/2021	20:55:41	Ground	Common pipistrelle
15/09/2021	20:56:20	Ground	Common pipistrelle
15/09/2021	20:59:17	Ground	Common pipistrelle
15/09/2021	21:03:44	Ground	Soprano pipistrelle
15/09/2021	21:05:44	Ground	Common pipistrelle
15/09/2021	21:12:25	Ground	Common pipistrelle
15/09/2021	21:14:09	Ground	Common pipistrelle
15/09/2021	21:17:08	Ground	Common pipistrelle
15/09/2021	21:32:12	Ground	Soprano pipistrelle
15/09/2021	22:29:42	Ground	Soprano pipistrelle
15/09/2021	22:43:08	Ground	Brown long-eared bat
15/09/2021	22:57:51	Ground	Soprano pipistrelle
16/09/2021	04:47:59	Ground	Common pipistrelle
16/09/2021	21:04:25	Ground	Soprano pipistrelle
16/09/2021	21:36:23	Ground	Common pipistrelle
17/09/2021	02:31:58	Ground	Myotis spp.
17/09/2021	20:34:41	Ground	Soprano pipistrelle
17/09/2021	22:14:43	Ground	Leisler's bat
17/09/2021	22:52:38	Ground	Myotis spp.
17/09/2021	22:53:42	Ground	Myotis spp.
18/09/2021	05:53:34	Ground	Soprano pipistrelle
18/09/2021	20:43:44	Ground	Common pipistrelle
18/09/2021	21:40:53	Ground	Soprano pipistrelle
18/09/2021	21:48:18	Ground	Brown long-eared bat
18/09/2021	21:57:26	Ground	Common pipistrelle
18/09/2021	22:21:19	Ground	Soprano pipistrelle
18/09/2021	22:51:15	Ground	Common pipistrelle
19/09/2021	02:43:30	Ground	Common pipistrelle
19/09/2021	03:37:11	Ground	Leisler's bat
19/09/2021	03:44:30	Ground	Myotis spp.
19/09/2021	20:05:13	Ground	Leisler's bat
19/09/2021	20:53:18	Ground	Common pipistrelle
19/09/2021	21:47:12	Ground	Soprano pipistrelle
19/09/2021	23:41:06	Ground	Soprano pipistrelle
20/09/2021	03:46:28	Ground	Soprano pipistrelle
20/09/2021	20:23:05	Ground	Soprano pipistrelle
20/09/2021	20:25:12	Ground	Soprano pipistrelle

Date	Time	Mic. level	Species
20/09/2021	20:26:50	Ground	Common pipistrelle
20/09/2021	20:33:00	Ground	Leisler's bat
20/09/2021	20:38:26	Ground	Leisler's bat
20/09/2021	20:41:01	Ground	Leisler's bat
20/09/2021	20:41:11	Ground	Leisler's bat
20/09/2021	20:42:06	Ground	Leisler's bat
20/09/2021	20:44:58	Ground	Leisler's bat
20/09/2021	20:51:29	Ground	Leisler's bat
20/09/2021	21:34:43	Ground	Common pipistrelle
20/09/2021	22:45:15	Ground	Common pipistrelle
20/09/2021	23:54:41	Ground	Myotis spp.
21/09/2021	02:48:17	Ground	Soprano pipistrelle
21/09/2021	03:07:54	Ground	Soprano pipistrelle
21/09/2021	20:06:52	Ground	Common pipistrelle
21/09/2021	20:10:51	Ground	Soprano pipistrelle
21/09/2021	20:12:38	Ground	Soprano pipistrelle
21/09/2021	20:41:37	Ground	Soprano pipistrelle
21/09/2021	21:40:30	Ground	Common pipistrelle
21/09/2021	21:53:28	Ground	Soprano pipistrelle
22/09/2021	20:27:07	Ground	Common pipistrelle
23/09/2021	00:51:13	Ground	Soprano pipistrelle
23/09/2021	20:19:30	Ground	Common pipistrelle
23/09/2021	20:27:25	Ground	Soprano pipistrelle
23/09/2021	20:45:45	Ground	Soprano pipistrelle
23/09/2021	23:23:00	Ground	Myotis spp.
24/09/2021	01:35:41	Ground	Soprano pipistrelle
24/09/2021	04:06:56	Ground	Soprano pipistrelle
24/09/2021	20:46:35	Ground	Soprano pipistrelle
24/09/2021	21:08:33	Ground	Common pipistrelle
25/09/2021	20:01:06	Ground	Soprano pipistrelle
25/09/2021	20:53:24	Ground	Soprano pipistrelle
25/09/2021	21:31:17	Ground	Soprano pipistrelle
25/09/2021	22:17:17	Ground	Common pipistrelle
25/09/2021	22:55:01	Ground	Leisler's bat
26/09/2021	04:49:24	Ground	Soprano pipistrelle
26/09/2021	20:16:25	Ground	Soprano pipistrelle
27/09/2021	21:45:30	Ground	Brown long-eared bat

APPENDIX 5

OVERALL SITE RISK ASSESSMENT

Planning and Environmental Consultants

Bat Survey Report

Appendix 5 – Overall Risk Assessment (Table 3b, NatureScot, 2021)

Table 3b: *Stage 2 - Overall risk assessment*

Site risk level (from Table 3a)	Ecobat activity category (or equivalent justified categorisation)					
	Nil (0)	Low (1)	Low-moderate (2)	Moderate (3)	Moderate-high (4)	High (5)
Lowest (1)	0	1	2	3	4	5
Low (2)	0	2	4	6	8	10
Med (3)	0	3	6	9	12	15
High (4)	0	4	8	12	15	18
Highest (5)	0	5	10	15	20	25

The scores in the table are a product of multiplying site risk level and the Ecobat activity category (or equivalent). The activity categories equate to those given in Table 1 for high collision risk species. Nil (0) means no bat activity was recorded across the whole site, but caution is needed here, because although the values given in this column are "0", at sites where pre-construction surveys found no bat activity, there remains the possibility that new turbines could attract some bat species, thereby altering the level of risk that applies in reality.

Overall assessment:

Low (green)	0-4
Medium (amber)	5-12
High (red)	15-25

It is important to have an understanding of both "typical" and unusually high levels of bat activity at a site so that potentially important peaks in activity are not overlooked. It is therefore recommended that both the highest Ecobat activity category and the most frequent activity category (i.e. the median) are assessed separately in Table 3b and presented in the overall risk assessment. A judgement can then be made on which is the most relevant. It should be noted that presenting mean activity levels can be highly misleading where the data are highly skewed, as is frequently the case with bat activity at wind turbines (Lintott & Mathews, 2018).

APPENDIX 7.1

SPECIES LIST

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Table 7 - 1 - 1 All species recorded during surveys

Species Name	Scientific Name
Barn Swallow	*Hirundo rustica*
Barnacle Goose	*Branta leucopsis*
Black Guillemot	*Cepphus grylle*
Blackbird	*Turdus merula*
Blackcap	*Sylvia atricapilla*
Black-headed Gull	*Chroicocephalus ridibundus*
Black-throated Diver	*Gavia arctica*
Blue Tit	*Cyanistes caeruleus*
Brent Goose	*Branta bernicla*
Bullfinch	*Pyrrhula pyrrhula*
Buzzard	*Buteo buteo*
Chaffinch	*Fringilla coelebs*
Chiffchaff	*Phylloscopus collybita*
Coal Tit	*Periparus ater*
Collared Dove	*Streptopelia decaocto*
Common Gull	*Larus canus*
Coot	*Fulica atra*
Cormorant	*Phalacrocorax carbo*
Crossbill	*Loxia curvirostra*
Cuckoo	*Cuculus canorus*
Curlew	*Numenius arquata*
Dipper	*Cinclus cinclus*
Dunlin	*Calidris alpina*
Dunnock	*Prunella modularis*
Eider	*Somateria mollissima*
Fieldfare	*Turdus pilaris*
Fulmar	*Fulmarus glacialis*
Gadwall	*Mareca strepera*
Gannet	*Morus bassanus*
Goldcrest	*Regulus regulus*
Golden Plover	*Pluvialis apricaria*
Goldfinch	*Carduelis carduelis*
Grasshopper Warbler	*Locustella naevia*
Great Black-backed Gull	*Larus marinus*
Great Northern Diver	*Gavia immer*
Great Tit	*Parus major*
Greenfinch	*Chloris chloris*
Greenland White-fronted Goose	*Anser albifrons flavirostris*
Greenshank	*Tringa nebularia*
Grey Heron	*Ardea cinerea*
Grey Wagtail	*Motacilla cinerea*
Guillemot	*Uria aalge*
Hen Harrier	*Circus cyaneus*
Herring Gull	*Larus argentatus*
Hooded Crow	*Corvus cornix*
House Martin	*Delichon urbicum*
Jackdaw	*Coloeus monedula*
Jay	*Garrulus glandarius*

Species Name	Scientific Name
Kestrel	*Falco tinnunculus*
Kingfisher	*Alcedo atthis*
Kittiwake	*Rissa tridactyla*
Knot	*Calidris canutus*
Lapwing	*Vanellus vanellus*
Lesser Black-backed Gull	*Larus fuscus*
Lesser Redpoll	*Acanthis flammea*
Linnet	*Linaria cannabina*
Little Grebe	*Tachybaptus ruficollis*
Long-tailed Duck	*Clangula hyemalis*
Magpie	*Pica pica*
Mallard	*Anas platyrhynchos*
Manx Shearwater	*Puffinus puffinus*
Meadow Pipit	*Anthus pratensis*
Mediterranean Gull	*Ichthyaetus melanocephalus*
Merlin	*Falco columbarius*
Mistle Thrush	*Turdus viscivorus*
Moorhen	*Gallinula chloropus*
Mute Swan	*Cygnus olor*
Oystercatcher	*Haematopus ostralegus*
Peregrine	*Falco peregrinus*
Pheasant	*Phasianus colchicus*
Pied Wagtail	*Motacilla alba*
Purple Sandpiper	*Calidris maritima*
Raven	*Corvus corax*
Razorbill	*Alca torda*
Red Grouse	*Lagopus lagopus*
Red Kite	*Milvus milvus*
Red-breasted Merganser	*Mergus serrator*
Redshank	*Tringa totanus*
Red-throated Diver	*Gavia stellata*
Redwing	*Turdus iliacus*
Reed Bunting	*Emberiza schoeniclus*
Ringed Plover	*Charadrius hiaticula*
Robin	*Erithacus rubecula*
Rook	*Corvus frugilegus*
Sanderling	*Calidris alba*
Sedge Warbler	*Acrocephalus schoenobaenus*
Shag	*Phalacrocorax aristotelis*
Shoveler	*Spatula clypeata*
Siskin	*Spinus spinus*
Skylark	*Alauda arvensis*
Snipe	*Gallinago gallinago*
Song Thrush	*Turdus philomelos*
Sparrowhawk	*Accipiter nisus*
Starling	*Sturnus vulgaris*
Stonechat	*Saxicola rubicola*
Storm Petrel	*Hydrobates pelagicus*
Swift	*Apus apus*

Species Name	Scientific Name
Teal	*Anas crecca*
Turnstone	*Arenaria interpres*
Wheatear	*Oenanthe oenanthe*
Whinchat	*Saxicola rubetra*
Whitethroat	*Sylvia communis*
Whooper Swan	*Cygnus cygnus*
Wigeon	*Mareca penelope*
Willow Warbler	*Phylloscopus trochilus*
Woodcock	*Scolopax rusticola*
Woodpigeon	*Columba palumbus*
Wren	*Troglodytes troglodytes*
Yellowhammer	*Emberiza citrinella*

Table 7 - 1 - 2 Target species recorded during surveys

Species Name	Scientific Name	Rationale
Barnacle Goose	*Branta leucopsis*	Annex I of Birds Directive
Black-throated Diver	*Gavia arctica*	Annex I of Birds Directive
Brent Goose	*Branta bernicla*	SCI of Ballysadare Bay SPA
Buzzard	*Buteo buteo*	Schedule 4 of Wildlife Acts (1976-2021)
Curlew	*Numenius arquata*	Red List with respect to breeding and wintering populations
Dunlin	*Calidris alpina*	Annex I of Birds Directive, SCI of Ballysadare Bay SPA and Red List with respect to breeding and wintering populations
Eider	*Somateria mollissima*	Red List with respect to breeding and wintering populations
Golden Plover	*Pluvialis apricaria*	Annex I of Birds Directive and Red List with respect to breeding and wintering populations
Great Northern Diver	*Gavia immer*	Annex I of Birds Directive
Greenland White-fronted Goose	*Anser albifrons flavirostris*	Annex I of Birds Directive
Grey Wagtail	*Motacilla cinerea*	Red List with respect to breeding population
Hen Harrier	*Circus cyaneus*	Annex I of Birds Directive and Schedule 4 of Wildlife Acts
Kestrel	*Falco tinnunculus*	Red List with respect to breeding population and Schedule 4 of Wildlife Acts (1976-2021)
Kingfisher	*Alcedo atthis*	Annex I of Birds Directive
Kittiwake	*Rissa tridactyla*	SCI of Aughris Head SPA
Lapwing	*Vanellus vanellus*	Red List with respect to breeding and wintering pouplations
Long-tailed Duck	*Clangula hyemalis*	Red List with respect to wintering population
Meadow Pipit	*Anthus pratensis*	Red List with respect to breeding population
Mediterranean Gull	*Ichthyaetus melanocephalus*	Annex I of Birds Directive
Merlin	*Falco columbarius*	Annex I of Birds Directive and Schedule 4 of Wildlife Acts
Oystercatcher	*Haematopus ostralegus*	Red List with respect to breeding and wintering populations
Peregrine	*Falco peregrinus*	Annex I of Birds Directive and Schedule 4 of Wildlife Acts

Species Name	Scientific Name	Rationale
Purple Sandpiper	*Calidris maritima*	Red List with respect to wintering population
Razorbill	*Alca torda*	Red List with respect to breeding population
Red Grouse	*Lagopus lagopus*	Red List with respect to breeding population
Red Kite	*Milvus milvus*	Annex I of Birds Directive, Red List with respect to breeding populations and Schedule 4 of Wildlife Acts
Knot	*Calidris canutus*	Red List with respect to wintering population
Redshank	*Tringa totanus*	SCI of Ballysadare Bay SPA and Red List with respect to breeding and wintering populations
Red-throated Diver	*Gavia stellata*	Annex I of Birds Directive
Redwing	*Turdus iliacus*	Red List with respect to wintering population
Shoveler	*Spatula clypeata*	Red List with respect to breeding and wintering populations
Snipe	*Gallinago gallinago*	Red List with respect to breeding and wintering populations
Sparrowhawk	*Accipiter nisus*	Schedule 4 of Wildlife Acts (1976-2021)
Storm Petrel	*Hydrobates pelagicus*	Annex I of Birds Directive
Swift	*Apus apus*	Red List with respect to breeding population
Whinchat	*Saxicola rubetra*	Red List with respect to breeding population
Whooper Swan	*Cygnus cygnus*	Annex I of Birds Directive
Woodcock	*Scolopax rusticola*	Red List with respect to breeding population
Yellowhammer	*Emberiza citrinella*	Red List with respect to breeding population

Table 7 - 1 - 3 Non-target species recorded during surveys

Species Name	Scientific Name
Barn Swallow	*Hirundo rustica*
Black Guillemot	*Cepphus grylle*
Blackbird	*Turdus merula*
Blackcap	*Sylvia atricapilla*
Black-headed Gull	*Chroicocephalus ridibundus*
Blue Tit	*Cyanistes caeruleus*
Bullfinch	*Pyrrhula pyrrhula*
Chaffinch	*Fringilla coelebs*
Chiffchaff	*Phylloscopus collybita*
Coal Tit	*Periparus ater*
Collared Dove	*Streptopelia decaocto*
Common Gull	*Larus canus*
Coot	*Fulica atra*
Cormorant	*Phalacrocorax carbo*
Crossbill	*Loxia curvirostra*
Cuckoo	*Cuculus canorus*
Dipper	*Cinclus cinclus*
Dunnock	*Prunella modularis*
Fieldfare	*Turdus pilaris*
Fulmar	*Fulmarus glacialis*
Gadwall	*Mareca strepera*
Gannet	*Morus bassanus*
Goldcrest	*Regulus regulus*
Goldfinch	*Carduelis carduelis*

Species Name	Scientific Name
Grasshopper Warbler	*Locustella naevia*
Great Black-backed Gull	*Larus marinus*
Great Tit	*Parus major*
Greenfinch	*Chloris chloris*
Greenshank	*Tringa nebularia*
Grey Heron	*Ardea cinerea*
Guillemot	*Uria aalge*
Herring Gull	*Larus argentatus*
Hooded Crow	*Corvus cornix*
House Martin	*Delichon urbicum*
Jackdaw	*Coloeus monedula*
Jay	*Garrulus glandarius*
Lesser Black-backed Gull	*Larus fuscus*
Lesser Redpoll	*Acanthis flammea*
Linnet	*Linaria cannabina*
Little Grebe	*Tachybaptus ruficollis*
Magpie	*Pica pica*
Mallard	*Anas platyrhynchos*
Manx Shearwater	*Puffinus puffinus*
Mistle Thrush	*Turdus viscivorus*
Moorhen	*Gallinula chloropus*
Mute Swan	*Cygnus olor*
Pheasant	*Phasianus colchicus*
Pied Wagtail	*Motacilla alba*
Raven	*Corvus corax*
Red-breasted Merganser	*Mergus serrator*
Reed Bunting	*Emberiza schoeniclus*
Ringed Plover	*Charadrius hiaticula*
Robin	*Erithacus rubecula*
Rook	*Corvus frugilegus*
Sanderling	*Calidris alba*
Sedge Warbler	*Acrocephalus schoenobaenus*
Shag	*Phalacrocorax aristotelis*
Siskin	*Spinus spinus*
Skylark	*Alauda arvensis*
Song Thrush	*Turdus philomelos*
Starling	*Sturnus vulgaris*
Stonechat	*Saxicola rubicola*
Teal	*Anas crecca*
Turnstone	*Arenaria interpres*
Wheatear	*Oenanthe oenanthe*
Whitethroat	*Sylvia communis*
Wigeon	*Mareca penelope*
Willow Warbler	*Phylloscopus trochilus*
Woodpigeon	*Columba palumbus*
Wren	*Troglodytes troglodytes*

APPENDIX 7.2

SURVEY EFFORT

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Table 7 - 2 - 1 Survey Effort

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
27/01/2021	Hen Harrier Roost Survey	HHVP1	2:00 starting at 15:30	Visibility: good; Wind speed and direction: light breeze NW; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none	No hen harrier sighted	CH
27/04/2021	Breeding Raptor Survey	2km radius	7:30 starting at 09:30	Visibility: good; Wind speed and direction: moderate breeze NE; Cloud cover and height: 33-66% >500m; Rain: drizzle; Frost: none; Snow: none	Mild (7 - 11˚C). Moderate N - NE throughout day with stronger gusts at times which made it feel colder in exposed areas, but humid and warm in sheltered places (within forestry areas). Long periods of clear and dry conditions mixed with scattered showers throughout the day. Fair and settled by late afternoon.	NM
28/04/2021	Breeding Walkover Survey	500m	3:00 starting at 11:32	Visibility: good; Wind speed and direction: gentle breeze NW; Cloud cover and height: 0-33% 150-500m; Rain: none; Frost: none; Snow: none	A bright, sunny day, with a coll north-westerly breeze. A pair of Buzzards were seen hunting over the edge of upland moor, in flight together. A Lesser Black Backed Gull was seen on Lough Nafulllow, before flying away - with a drake Mallard also nearby on the water.	LD

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
28/04/2021	Breeding Walkover Survey	500m	3:13 starting at 14:32	Visibility: good; Wind speed and direction: moderate breeze NW; Cloud cover and height: 33-66% 150-500m; Rain: none; Frost: none; Snow: none		LD
29/04/2021	Breeding Raptor Survey	2km radius	9:45 starting at 07:45	Visibility: good; Wind speed and direction: moderate breeze N; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Clear ajnd bright with widespread and frequent sunny spells (4 - 12°C). High drifting clouds with moderate N breeze.	NM
29/04/2021	Breeding Raptor Survey	2km radius	2:00 starting at 09:26	Visibility: good; Wind speed and direction: gentle breeze NW; Cloud cover and height: 33-66% 150-500m; Rain: heavy showers; Frost: none; Snow: none	A moderate breeze, with heavy showewrs in the morning, which cleared. A Buzzard was seen hunting from VP1 awy to the east. Another Buzzard was seen hunting twice from VP2, which was being mobbed initially and then put up a Sparrowhawk from the tree's. There were also three gulls in flight from the upland, in closer to the VP.	LD
29/04/2021	Breeding Raptor Survey	2km radius	4:34 starting at 11:26	Visibility: good; Wind speed and direction: moderate breeze NW; Cloud cover and height: 33-66% 150-500m; Rain: none; Frost: none; Snow: none		LD

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
24/05/2021	Breeding Woodcock Survey	T1	2:30 starting at 20:30	Visibility: good; Wind speed and direction: fresh breeze NW; Cloud cover and height: 66-100% >500m; Rain: drizzle; Frost: none; Snow: none	Sunset: 21:49. 9 - 11°C. Fresh, consistent NW wind throughout survey period but was considerably more sheltered within forestry tracks. Reasonably mild overall but wind made it cooler in open areas. Brief and occasional clear patches with clouds racing rapidly across the sky due to fresh NW breeze. Occasional light drizzle, wet underfoot. Clouding over entirely at sunset - clouds descending in height at that time.	NM
25/05/2021	Breeding Raptor Survey	2km radius	8:30 starting at 09:15	Visibility: good; Wind speed and direction: moderate breeze NW; Cloud cover and height: 33-66% >500m; Rain: drizzle; Frost: none; Snow: none	S + E sides of site and within 2km buffer. Mild with moderate NW breeze, 9 - 13°C. Brief but regular patches of sunshine with high cover of clouds, but bright overall. Occasional light showers which ceased after 1pm. Clearing up with a reduction in cloud after 1pm - prolonged periods of brighter spells and patches of sunshine.	NM

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
25/05/2021	Breeding Woodcock Survey	T2	2:30 starting at 20:40	Visibility: good; Wind speed and direction: fresh breeze NW; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	8 - 11°C. Fresh NW breeze but relatively sheltered within forestry and sheltered tracks. Relatively clear with no rain - scattered cloudy and sunny patches	NM
26/05/2021	Breeding Walkover Survey	500m Radius	9:15 starting at 08:00	Visibility: good; Wind speed and direction: moderate breeze NW; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Clear, bright and sunny with occasional cloudy patches early on - but mostly clear and bright, 7 - 14°C. Almost no cloud after lunch. Good visibility but heat haze hampered visibility.	NM
27/05/2021	Vantage Point Survey	VP1	1:00 starting at 04:30	Visibility: good; Wind speed and direction: light breeze SE; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none		CD
27/05/2021	Vantage Point Survey	VP1	1:00 starting at 05:30	Visibility: good; Wind speed and direction: light breeze SE; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none		CD
27/05/2021	Vantage Point Survey	VP1	1:00 starting at 06:30	Visibility: good; Wind speed and direction: light air SE; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none		CD
27/05/2021	Vantage Point Survey	VP1	1:00 starting at 10:00	Visibility: good; Wind speed and direction: gentle breeze S; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none		CD
27/05/2021	Vantage Point Survey	VP1	1:00 starting at 11:00	Visibility: good; Wind speed and direction: gentle breeze S; Cloud cover and height: 66-100% >500m; Rain: drizzle; Frost: none; Snow: none		CD
27/05/2021	Vantage Point Survey	VP1	1:00 starting at 12:00	Visibility: good; Wind speed and direction: gentle breeze S; Cloud cover and height: 66-100% >500m; Rain: light showers; Frost: none; Snow: none		CD

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
27/05/2021	Breeding Raptor Survey	2km radius	10:00 starting at 06:00	Visibility: good; Wind speed and direction: gentle breeze S; Cloud cover and height: 66-100% 150-500m; Rain: light showers; Frost: none; Snow: none	Grey and overcast with mid-height cloudy skies, mild with gentle S breeze: 8 - 13°C. No sun emerging at all throughout survey. Overcast sky turning to drizzle at 14:30 with occasional heavy showers.	NM
28/05/2021	Vantage Point Survey	VP2	1:00 starting at 04:30	Visibility: poor; Wind speed and direction: light air N; Cloud cover and height: 66-100% <150m; Rain: none; Frost: none; Snow: none		CD
28/05/2021	Vantage Point Survey	VP2	1:00 starting at 05:30	Visibility: good; Wind speed and direction: light air N; Cloud cover and height: 0-33% 150-500m; Rain: none; Frost: none; Snow: none		CD
28/05/2021	Vantage Point Survey	VP2	1:00 starting at 06:30	Visibility: good; Wind speed and direction: light air N; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none		CD
28/05/2021	Vantage Point Survey	VP2	1:00 starting at 11:20	Visibility: good; Wind speed and direction: light breeze N; Cloud cover and height: 66-100% 150-500m; Rain: none; Frost: none; Snow: none		CD
28/05/2021	Vantage Point Survey	VP2	1:00 starting at 12:20	Visibility: good; Wind speed and direction: light breeze N; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none		CD
28/05/2021	Vantage Point Survey	VP2	1:00 starting at 13:20	Visibility: good; Wind speed and direction: light air N; Cloud cover and height: 33-66% >500m; Rain: none; Frost: none; Snow: none		CD

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
28/05/2021	Breeding Raptor Survey	2km radius	11:35 starting at 05:40	Visibility: good; Wind speed and direction: moderate breeze NW; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Fresh NW breeze but not nearly as strong as earlier in the week, 6 - 14˚C. Mostly clear and bright with high drifting cloud. Wind made it feel cooler in open and higher areas. Good visibility but occasionally hazy. Misty patches early on but it wasn't long burning off. Wet underfoot due to previous rain.	NM
09/06/2021	Breeding Woodcock Survey	T1	2:30 starting at 20:50	Visibility: good; Wind speed and direction: fresh breeze S; Cloud cover and height: 66-100% 150-500m; Rain: drizzle; Frost: none; Snow: none	Sunset: 22:07 Fresh S breeze - may have hampered survey due to WK disliking very windy conditions, close and shletered within forestry however. Mild: 12 - 16˚C. Overcast with threatening clouds and occasional drizzle - clouds were being blown across rapidly by wind, some occasional brighter patches but cloud cover remained entire.	NM

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
10/06/2021	Breeding Woodcock Survey	T2	2:22 starting at 20:45	Visibility: good; Wind speed and direction: fresh breeze SW; Cloud cover and height: 33-66% 150-500m; Rain: drizzle; Frost: none; Snow: none	Started off reasonably clear with some sunny spells and low cloud, but consistent drizzle then blew in from the S and the cloud cover increased and descended. 12 - 16°C. Visibility reduced slightly due to drizzle and strong wind. Fresh SW breeze - not so apparent within forestry.	NM
11/06/2021	Vantage Point Survey	VP2	3:00 starting at 09:30	Visibility: good; Wind speed and direction: fresh breeze SW; Cloud cover and height: 66-100% 150-500m; Rain: drizzle; Frost: none; Snow: none	Fresh SW breeze - made it feel colder (13 - 15°C). Scattered showers of drizzle and turbulent rain blowing in with the wind but largely clear. Consistent meadow pipit activity in open grassland and bog just below VP location (immediately N) - calling, chasing and parachuting over open areas.	NM
11/06/2021	Vantage Point Survey	VP2	3:15 starting at 13:00	Visibility: good; Wind speed and direction: fresh breeze SW; Cloud cover and height: 66-100% 150-500m; Rain: drizzle; Frost: none; Snow: none	Similar conditions continued with sporadic blustery showers.	NM
17/06/2021	Vantage Point Survey	VP1	1:00 starting at 10:00	Visibility: good; Wind speed and direction: moderate breeze W; Cloud cover and height: 33-66% >500m; Rain: none; Frost: none; Snow: none		CD
17/06/2021	Vantage Point Survey	VP1	1:00 starting at 11:00	Visibility: good; Wind speed and direction: gentle breeze NW; Cloud cover and height: 33-66% >500m; Rain: drizzle; Frost: none; Snow: none		CD

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
17/06/2021	Vantage Point Survey	VP1	1:00 starting at 12:00	Visibility: good; Wind speed and direction: gentle breeze NW; Cloud cover and height: 66-100% >500m; Rain: light showers; Frost: none; Snow: none		CD
17/06/2021	Vantage Point Survey	VP1	1:00 starting at 13:00	Visibility: good; Wind speed and direction: gentle breeze NW; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none		CD
17/06/2021	Vantage Point Survey	VP1	1:00 starting at 14:00	Visibility: good; Wind speed and direction: gentle breeze NW; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none		CD
17/06/2021	Vantage Point Survey	VP1	1:00 starting at 15:00	Visibility: good; Wind speed and direction: gentle breeze NW; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none		CD
21/06/2021	Breeding Raptor Survey	2km radius	1:00 starting at 13:00	Visibility: good; Wind speed and direction: fresh breeze NW; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Crowagh	CD
21/06/2021	Breeding Raptor Survey	2km radius	1:00 starting at 14:00	Visibility: good; Wind speed and direction: fresh breeze NW; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Crowagh	CD
21/06/2021	Breeding Raptor Survey	2km radius	1:00 starting at 15:00	Visibility: good; Wind speed and direction: fresh breeze NW; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Buncrowney Stream	CD
21/06/2021	Breeding Raptor Survey	2km radius	1:00 starting at 16:00	Visibility: good; Wind speed and direction: fresh breeze NW; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Buncrowney Stream	CD
21/06/2021	Breeding Raptor Survey	2km radius	1:00 starting at 17:00	Visibility: good; Wind speed and direction: fresh breeze NW; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Lough Nafullow	CD
21/06/2021	Breeding Raptor Survey	2km radius	1:00 starting at 18:00	Visibility: good; Wind speed and direction: fresh breeze NW; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Lough Nafullow	CD

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
22/06/2021	Breeding Raptor Survey	2km radius	1:00 starting at 11:20	Visibility: good; Wind speed and direction: gentle breeze W; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none	Doonbeakin	CD
22/06/2021	Breeding Raptor Survey	2km radius	1:00 starting at 12:20	Visibility: good; Wind speed and direction: gentle breeze W; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none	Doonbeakin	CD
22/06/2021	Breeding Raptor Survey	2km radius	1:00 starting at 13:20	Visibility: good; Wind speed and direction: gentle breeze W; Cloud cover and height: 66-100% >500m; Rain: light showers; Frost: none; Snow: none	Kings Mountain	CD
22/06/2021	Breeding Raptor Survey	2km radius	1:00 starting at 14:20	Visibility: good; Wind speed and direction: gentle breeze W; Cloud cover and height: 66-100% >500m; Rain: light showers; Frost: none; Snow: none	Kings Mountain	CD
22/06/2021	Breeding Raptor Survey	2km radius	1:00 starting at 15:20	Visibility: good; Wind speed and direction: gentle breeze W; Cloud cover and height: 66-100% >500m; Rain: light showers; Frost: none; Snow: none	Dunowla	CD
22/06/2021	Breeding Raptor Survey	2km radius	1:00 starting at 16:20	Visibility: good; Wind speed and direction: gentle breeze W; Cloud cover and height: 66-100% >500m; Rain: light showers; Frost: none; Snow: none	Dunowla	CD
22/06/2021	Breeding Woodcock Survey	T1	1:00 starting at 21:10	Visibility: good; Wind speed and direction: gentle breeze W; Cloud cover and height: 66-100% <150m; Rain: drizzle; Frost: none; Snow: none	south-east. No woodcock	CD
22/06/2021	Breeding Woodcock Survey	T1	1:00 starting at 22:10	Visibility: moderate; Wind speed and direction: gentle breeze W; Cloud cover and height: 66-100% <150m; Rain: drizzle; Frost: none; Snow: none	heavy mist, no woodcock	CD
23/06/2021	Breeding Walkover Survey	500m Radius	1:00 starting at 11:00	Visibility: good; Wind speed and direction: light breeze W; Cloud cover and height: 66-100% 150-500m; Rain: none; Frost: none; Snow: none	South	CD
23/06/2021	Breeding Walkover Survey	500m Radius	1:00 starting at 12:00	Visibility: good; Wind speed and direction: light breeze W; Cloud cover and height: 66-100% 150-500m; Rain: none; Frost: none; Snow: none		CD

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
23/06/2021	Breeding Raptor Survey	2km radius	1:00 starting at 13:00	Visibility: poor; Wind speed and direction: light breeze W; Cloud cover and height: 66-100% <150m; Rain: none; Frost: none; Snow: none	1 hour breeding raptor survey at Lough Easkey Nature Reserve	CD
23/06/2021	Breeding Walkover Survey	500m Radius	1:00 starting at 14:00	Visibility: poor; Wind speed and direction: light breeze W; Cloud cover and height: 66-100% <150m; Rain: none; Frost: none; Snow: none		CD
23/06/2021	Breeding Raptor Survey	2km radius	1:00 starting at 15:00	Visibility: poor; Wind speed and direction: light air W; Cloud cover and height: 66-100% <150m; Rain: none; Frost: none; Snow: none	Grange More South. poor visibility	CD
23/06/2021	Breeding Raptor Survey	2km radius	1:00 starting at 16:00	Visibility: poor; Wind speed and direction: light air W; Cloud cover and height: 66-100% <150m; Rain: none; Frost: none; Snow: none	Grange More South	CD
23/06/2021	Breeding Woodcock Survey	T2	1:00 starting at 21:00	Visibility: moderate; Wind speed and direction: light air W; Cloud cover and height: 66-100% 150-500m; Rain: none; Frost: none; Snow: none	north. very humid, no woodcock	CD
23/06/2021	Breeding Woodcock Survey	T2	1:00 starting at 22:00	Visibility: moderate; Wind speed and direction: light air W; Cloud cover and height: 66-100% 150-500m; Rain: none; Frost: none; Snow: none		CD
24/06/2021	Breeding Raptor Survey	2km radius	1:00 starting at 12:20	Visibility: moderate; Wind speed and direction: light breeze W; Cloud cover and height: 66-100% <150m; Rain: heavy showers; Frost: none; Snow: none	Cloghabracka	CD
24/06/2021	Breeding Raptor Survey	2km radius	0:30 starting at 13:20	Visibility: moderate; Wind speed and direction: light breeze W; Cloud cover and height: 66-100% <150m; Rain: heavy showers; Frost: none; Snow: none	Cloghabracka	CD
24/06/2021	Breeding Raptor Survey	2km radius	1:00 starting at 13:50	Visibility: moderate; Wind speed and direction: light breeze W; Cloud cover and height: 66-100% <150m; Rain: heavy showers; Frost: none; Snow: none	Cloghabracka East	CD
24/06/2021	Breeding Raptor Survey	2km radius	0:30 starting at 14:50	Visibility: moderate; Wind speed and direction: light breeze W; Cloud cover and height: 66-100% <150m; Rain: heavy showers; Frost: none; Snow: none	Cloghabracka East	CD

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
24/06/2021	Breeding Walkover Survey	500m Radius	1:00 starting at 15:20	Visibility: moderate; Wind speed and direction: light breeze W; Cloud cover and height: 66-100% <150m; Rain: heavy showers; Frost: none; Snow: none	North. Wet	CD
24/06/2021	Breeding Walkover Survey	500m Radius	1:00 starting at 16:20	Visibility: moderate; Wind speed and direction: light breeze W; Cloud cover and height: 66-100% <150m; Rain: heavy showers; Frost: none; Snow: none		CD
24/06/2021	Breeding Walkover Survey	500m Radius	1:00 starting at 17:20	Visibility: moderate; Wind speed and direction: light breeze W; Cloud cover and height: 66-100% <150m; Rain: persistent; Frost: none; Snow: none		CD
16/07/2021	Vantage Point Survey	VP1	3:00 starting at 07:30	Visibility: good; Wind speed and direction: light air N; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Relatively cool to start with, but heating up rapidly burning off any mistly and hazy cloud which existed overhead. Very hot day with barely a cloud in the sky - VP location was sheltered (extremely hot and oppresive, 12 - 26°). Almost no wind at all. Heat haze was apparent at distance. Very quiet in terms of bird activity.	NM
16/07/2021	Vantage Point Survey	VP1	2:00 starting at 11:00	Visibility: good; Wind speed and direction: light air N; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Coolness of early morning was rapidly replaced by searing heat. Almost no wind at all - dead heat with plaguing insects. Very quiet in terms of bird activity	NM

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
17/07/2021	Vantage Point Survey	VP2	3:00 starting at 08:00	Visibility: good; Wind speed and direction: light air NW; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Cool to start off with but rapidly increasing in temperature. By 8am it was already very hot and bright with a clear blue sky and no clouds (13 - 28˚C). The VP location was reasonaly exposed with meant that occasional light gusts of wind made it slightly bareable but these light gusts were few and far between. Heat haze apparent at distance.	NM
17/07/2021	Vantage Point Survey	VP2	3:15 starting at 11:30	Visibility: good; Wind speed and direction: light air NW; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Wind completely disappeared leaving dead heat.	NM
20/07/2021	Breeding Raptor Survey	2km radius	10:15 starting at 07:00	Visibility: good; Wind speed and direction: light air SE; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Bright and clear all day especially in morning, with very few clouds. Some high and sparse clouds emerging in afernoon but no no bearing on sunshine or sweltering heat. Very hot throughout and quite torturous (15 - 30˚C). SW and W area of site surveyed.	NM

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
21/07/2021	Breeding Walkover Survey	500m Radius	8:15 starting at 04:45	Visibility: good; Wind speed and direction: light breeze W; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Beautifully cool early in the morning with some mist and dew on the ground - cool breeze particularly apparent at this time. Began to rapidly warm up from 07:30 onwards until it became warm and oppressively hot again with very little wind (12 - 29°C). Almost no wind nor clouds - complete dead heat (especially in areas sheltered with vegetation).	NM
21/07/2021	Vantage Point Survey	VP1	3:00 starting at 16:00	Visibility: good; Wind speed and direction: light breeze W; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	April VP (dusk). Very warm and clear throughout survey (17 - 29°C), with very light W breeze which emerged with occasional fresher gusts (but never very strong). Occasional clouds scudding across sky which gave a brief repsite from the heat.	NM
21/07/2021	Vantage Point Survey	VP1	3:25 starting at 19:20	Visibility: good; Wind speed and direction: light breeze W; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Became cooler towards sunset - only started to become cooler at 20:30, remenants of sun's heat continued well into evening. Hazy clouds emerged at sunset which caused a hazy sunset purple sunset. Cooler and calmer after sunset.	NM

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
22/07/2021	Breeding Raptor Survey	2km radius	7:30 starting at 07:00	Visibility: good; Wind speed and direction: light breeze NW; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Similar hot and oppresive weather from previous days continued (15 - 30°C). N and E of site.	NM
26/07/2021	Breeding Raptor Survey	2km radius	10:45 starting at 06:00	Visibility: good; Wind speed and direction: gentle breeze N; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none	Largely overcast throughout the day with gentle N breeze. Remained mild and close with heavy grey sky (12 - 17°C). Threatening to rain throughout with occasional drizzly patches around late morning. Heavier showers started in mid-afternoon along with an increase in wind speed (also changing to NW breeze). S of site.	NM
28/07/2021	Vantage Point Survey	VP2	3:00 starting at 15:00	Visibility: poor; Wind speed and direction: gentle breeze NE; Cloud cover and height: 33-66% 150-500m; Rain: persistent; Frost: none; Snow: none	April VP. Persistent rain throughout survey. Occasional brief stoppage but very much relentless and without mercy (11 - 16°C)	NM
28/07/2021	Vantage Point Survey	VP2	3:45 starting at 18:00	Visibility: poor; Wind speed and direction: gentle breeze NE; Cloud cover and height: 33-66% 150-500m; Rain: persistent; Frost: none; Snow: none	Rain continued to persist into evening. It gradually eased off just before sunset. Damp evening.	NM
12/08/2021	Waterbird Distribution Survey	8km radius	11:30 starting at 07:00	Visibility: good; Wind speed and direction: moderate breeze SW; Cloud cover and height: 33-66% >500m; Rain: heavy showers; Frost: none; Snow: none	Warm and humid but with moderate SW breeze which was quite strong at times (12 - 16°C). Frequent heavy showers early in the day but also with frequent clearences	NM

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
					and sunny spells. 5km radius surveyed	
13/08/2021	Waterbird Distribution Survey	8km radius	11:30 starting at 07:00	Visibility: moderate; Wind speed and direction: fresh breeze W; Cloud cover and height: 66-100% 150-500m; Rain: light showers; Frost: none; Snow: none	Wild, moist and windy day with fresh W breeze - especially apparent on upper site on open blanket bog. Overcast with clouds drifting across all day - dark clouds, 85% cover. Cool early but turning mild for the day and remaining that way. Pretty much consistent light and misty rain which hampered visibility at times, with some heavier blustery showers. Light drizzle mostly with occasional clearer and brighter patches. 5km radius surveyed	NM
24/08/2021	Vantage Point Survey	VP1	3:00 starting at 12:15	Visibility: good; Wind speed and direction: light breeze N; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Clear and bright with sunshine throughout survey (18 - 25°C). Light N breeze at times but effect was felt little in areas sheltered by forestry (where heat was tough to deal with). High drifting clouds which were sparse and widely spread - 10% cover. Heat haze at distance.	NM

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
24/08/2021	Vantage Point Survey	VP1	3:15 starting at 15:45	Visibility: good; Wind speed and direction: light breeze N; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Conditions did vary greatly throughout	NM
25/08/2021	Waterbird Distribution Survey	8km radius	10:45 starting at 06:00	Visibility: good; Wind speed and direction: gentle breeze NW; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	North of site. Day starting off cool with striking bright sunrise. Heating up rapidly (13 - 27°C). Heat in middle of day explained apparent lack of bird activity. Breeze was greatly appreciated in open areas but had little effect within forestry and shaded area. 5km radius surveyed	NM
26/08/2021	Waterbird Distribution Survey	8km radius	6:00 starting at 06:00	Visibility: good; Wind speed and direction: calm NW; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	South of site. Day started of cool and bright but heated up rapidly towards mid-morning (14 - 29°C). Almost no wind which created extremely hot and oppressive conditions up on the high bog -> the hottest part of the day was skipped, 4 hr respite was taken and the day was split in two. Heat haze at distance. 5km radius surveyed	NM

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
26/08/2021	Waterbird Distribution Survey	8km radius	4:15 starting at 16:45	Visibility: good; Wind speed and direction: calm N; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	As evening approached, hazy cloud began to emerge which dampened intense sunshine. Still remained bright and hot however but cooling down nicelyh as the sun descended (29 - 16°C). Haze impeded visibility at distance. Sunset was an orange haze.	NM
27/08/2021	Vantage Point Survey	VP2	3:00 starting at 06:30	Visibility: poor; Wind speed and direction: light air N; Cloud cover and height: 66-100% <150m; Rain: none; Frost: none; Snow: none	Heavy mist and fog throughout morning which created very poor visibility - not more than 10m. As a result of this conditions were cooler. Mist started to burn off rapidly as mid-morning approached and sun rose in intensity.	NM
27/08/2021	Vantage Point Survey	VP2	3:00 starting at 10:00	Visibility: good; Wind speed and direction: light breeze N; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Mist burnt off rapidly created very clear and bright conditions with not a cloud to be seen. Light N breeze at times but remained rather dead and very hot once again (16 - 25°C). Heat haze at distance.	NM
07/09/2021	Vantage Point Survey	VP1	7:00 starting at 14:30	Visibility: good; Wind speed and direction: gentle breeze SW; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Gentle but refreshing SW breeze but was not very apparent due to sheltered nature of VP. Warm (17 - 26°C and clear with bright sun. Good visibility but very hazy at distance. Sunset - 20:05	NM

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
08/09/2021	Waterbird Distribution Survey	8km radius	7:40 starting at 07:50	Visibility: poor; Wind speed and direction: gentle breeze NE; Cloud cover and height: 66-100% <150m; Rain: light showers; Frost: none; Snow: none	Consistent light rain with occasional heavier showers - persistent throughout and did not stop. Becoming very heavy by mid-afternoon - survey abandoned. Mild and humid (13 - 19°C).	NM
09/09/2021	Waterbird Distribution Survey	8km radius	12:00 starting at 07:00	Visibility: good; Wind speed and direction: gentle breeze N; Cloud cover and height: 66-100% 150-500m; Rain: none; Frost: none; Snow: none	Scattered light showers early on in the day but these did not persist. Almost entirely overcast with some thinning patches were the sun was attempting to burn through. High ground enveloped by drifting cloud. Mild with gentle N breeze (13 - 21°C).	NM
10/09/2021	Vantage Point Survey	VP2	7:00 starting at 14:30	Visibility: good; Wind speed and direction: gentle breeze S; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	Bright and clear with barely a cloud in the sky. Gentle S breeze but VP was sheltered (15 - 25°C).	NM

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
21/09/2021	Waterbird Distribution Survey	8km radius	11:15 starting at 08:30	Visibility: good; Wind speed and direction: fresh breeze W; Cloud cover and height: 33-66% >500m; Rain: none; Frost: none; Snow: none	Bright and clear early with clear skies and occasional cloud, but cover sporadically increased and decreased throughout the day (~40% on average). Fresh W breeze, 13 - 16˚C. Becoming coudier by late afternoon and evening with cooler and higher wind - more apparent in open coastal and upland areas. Aughris head cliffs were almost completely abandoned -> stark contrast to busy breeding colony during summer.	NM
22/09/2021	Waterbird Distribution Survey	8km radius	11:15 starting at 07:30	Visibility: moderate; Wind speed and direction: strong breeze SW; Cloud cover and height: 66-100% 150-500m; Rain: none; Frost: none; Snow: none	Strong W breeze which was especially apparent in open areas (12 - 17˚C). Largely overcast with clearences and random patches of blue sky drifting across. Light but persistent rain started at ~16:30 with the strong SW breeze blowing sheets across. Visibility greatly reduced, persisted until the end of the survey.	NM
06/10/2021	Waterbird Distribution Survey	8km radius	6:00 starting at 13:00	Visibility: moderate; Wind speed and direction: strong breeze S; Cloud cover and height: 66-100% <150m; Rain: persistent; Frost: none; Snow: none		AOD
07/10/2021	Waterbird Distribution Survey	8km radius	6:00 starting at 13:00	Visibility: poor; Wind speed and direction: light breeze S; Cloud cover and height: 66-100% <150m; Rain: heavy showers; Frost: none; Snow: none		AOD

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
20/10/2021	Hen Harrier Roost Survey	HHVP1	2:05 starting at 16:55	Visibility: good; Wind speed and direction: moderate breeze W; Cloud cover and height: 33-66% >500m; Rain: none; Frost: none; Snow: none	No hen harrier sighted	CH
22/10/2021	Vantage Point Survey	VP2	3:00 starting at 07:15	Visibility: moderate; Wind speed and direction: moderate breeze W; Cloud cover and height: 66-100% 150-500m; Rain: light showers; Frost: none; Snow: none	Dry spells between light rain.	CH
22/10/2021	Vantage Point Survey	VP2	3:00 starting at 10:45	Visibility: good; Wind speed and direction: moderate breeze W; Cloud cover and height: 33-66% >500m; Rain: light showers; Frost: none; Snow: none	Two light showers	CH
26/10/2021	Vantage Point Survey	VP1	3:00 starting at 07:26	Visibility: good; Wind speed and direction: strong breeze SW; Cloud cover and height: 66-100% >500m; Rain: light showers; Frost: none; Snow: none	3-4 short light showers	CH
26/10/2021	Vantage Point Survey	VP1	3:00 starting at 10:56	Visibility: good; Wind speed and direction: strong breeze SW; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none	one heavy shower 12:55-13:25	CH
26/10/2021	Waterbird Distribution Survey	8km radius	6:00 starting at 11:30	Visibility: moderate; Wind speed and direction: strong breeze S; Cloud cover and height: 66-100% <150m; Rain: heavy showers; Frost: none; Snow: none		AOD
27/10/2021	Waterbird Distribution Survey	8km radius	6:00 starting at 12:00	Visibility: good; Wind speed and direction: gentle breeze S; Cloud cover and height: 66-100% 150-500m; Rain: none; Frost: none; Snow: none		AOD
29/10/2021	Winter Walkover Survey	T1	0:40 starting at 11:45	Visibility: good; Wind speed and direction: light breeze S; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none		CH
29/10/2021	Winter Walkover Survey	T2	0:17 starting at 12:30	Visibility: good; Wind speed and direction: light breeze S; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none		CH
29/10/2021	Winter Walkover Survey	T3	0:30 starting at 13:10	Visibility: good; Wind speed and direction: light breeze S; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none		CH

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
29/10/2021	Winter Walkover Survey	T4	0:11 starting at 13:53	Visibility: good; Wind speed and direction: light breeze S; Cloud cover and height: 33-66% >500m; Rain: none; Frost: none; Snow: none	no target species	CH
29/10/2021	Winter Walkover Survey	T5	0:07 starting at 14:07	Visibility: good; Wind speed and direction: light breeze S; Cloud cover and height: 33-66% >500m; Rain: none; Frost: none; Snow: none	no target species	CH
29/10/2021	Winter Walkover Survey	T6	1:16 starting at 14:40	Visibility: good; Wind speed and direction: light breeze S; Cloud cover and height: 66-100% 150-500m; Rain: light showers; Frost: none; Snow: none		CH
29/10/2021	Hen Harrier Roost Survey	HHVP2	2:00 starting at 16:30	Visibility: good; Wind speed and direction: light breeze S; Cloud cover and height: 66-100% 150-500m; Rain: none; Frost: none; Snow: none	No hen harrier sighted	CH
01/11/2021	Hen Harrier Roost Survey	HHVP3	2:00 starting at 15:30	Visibility: good; Wind speed and direction: moderate breeze W; Cloud cover and height: 66-100% >500m; Rain: light showers; Frost: none; Snow: none	No hen harrier sighted. Very heavy shower 16:45-16:55	CH
03/11/2021	Hen Harrier Roost Survey	HHVP4	2:00 starting at 15:30	Visibility: good; Wind speed and direction: strong breeze N; Cloud cover and height: 66-100% 150-500m; Rain: none; Frost: none; Snow: none	No hen harrier sighted	CH
04/11/2021	Vantage Point Survey	VP2	1:00 starting at 11:25	Visibility: poor; Wind speed and direction: fresh breeze N; Cloud cover and height: 66-100% <150m; Rain: persistent; Frost: none; Snow: none	several heavy showers hampering visability. 8°C	CH
04/11/2021	Vantage Point Survey	VP2	2:00 starting at 12:25	Visibility: good; Wind speed and direction: moderate breeze N; Cloud cover and height: 66-100% 150-500m; Rain: none; Frost: none; Snow: none		CH
04/11/2021	Vantage Point Survey	VP2	3:00 starting at 14:55	Visibility: good; Wind speed and direction: light breeze N; Cloud cover and height: 66-100% 150-500m; Rain: none; Frost: none; Snow: none		CH

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
15/11/2021	Waterbird Distribution Survey	8km radius	8:35 starting at 07:45	Visibility: good; Wind speed and direction: moderate breeze W; Cloud cover and height: 66-100% >500m; Rain: drizzle; Frost: none; Snow: none	Relatively mild (9 - 12°C) with largely overcast sky - with some occasional brighter spells and scattered misty showers coming and going throughout the day. Moderate W breeze with occasional stronger gusts (especially in open areas). Remained largely dry, never straying below 80% cloud cover. Late afternoon saw wet conditions riding in from the NW bringing nasty squalls and showers	NM
16/11/2021	Waterbird Distribution Survey	8km radius	8:15 starting at 08:30	Visibility: moderate; Wind speed and direction: strong breeze W; Cloud cover and height: 66-100% 150-500m; Rain: light showers; Frost: none; Snow: none	Persistent drizzle and rain (with occasional heavy showers) throughout the morning with a strong W breeze - dull and entirely overcast. Very mild at times and felt very humid in sheltered areas (10 - 12°C). Visibility was poor during the entire morning. Wet conditions ceased from lunchtime onwards and remained mostly dry for remainder of the day. Brightening for periods with sporadic brighter spells and reducing cloud cover. Strong W breeze still continued with	NM

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
					some vicous squalls persiting into the evening.	
16/11/2021	Hen Harrier Roost Survey	HHVP1	2:00 starting at 07:30	Visibility: good; Wind speed and direction: fresh breeze SW; Cloud cover and height: 66-100% 150-500m; Rain: light showers; Frost: none; Snow: none	No hen harrier sighted	CH
16/11/2021	Hen Harrier Roost Survey	HHVP2	2:00 starting at 15:00	Visibility: good; Wind speed and direction: gentle breeze SW; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none	No hen harrier sighted	CH
18/11/2021	Vantage Point Survey	VP1	3:00 starting at 11:00	Visibility: good; Wind speed and direction: gentle breeze SW; Cloud cover and height: 66-100% 150-500m; Rain: light showers; Frost: none; Snow: none	13°C, one very light shower	CH
18/11/2021	Vantage Point Survey	VP1	3:00 starting at 14:30	Visibility: good; Wind speed and direction: gentle breeze SW; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none		CH

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
19/11/2021	Hen Harrier Roost Survey	HHVP4	2:00 starting at 07:40	Visibility: good; Wind speed and direction: moderate breeze SW; Cloud cover and height: 66-100% 150-500m; Rain: none; Frost: none; Snow: none	11°C, no hen harrier sighting	CH
19/11/2021	Hen Harrier Roost Survey	HHVP3	2:00 starting at 15:00	Visibility: good; Wind speed and direction: gentle breeze SW; Cloud cover and height: 66-100% 150-500m; Rain: light showers; Frost: none; Snow: none		CH
23/11/2021	Winter Walkover Survey	T1	0:37 starting at 10:35	Visibility: good; Wind speed and direction: light air SW; Cloud cover and height: 33-66% >500m; Rain: none; Frost: none; Snow: none		CH
23/11/2021	Winter Walkover Survey	T2	0:16 starting at 11:24	Visibility: good; Wind speed and direction: light air SW; Cloud cover and height: 33-66% >500m; Rain: none; Frost: none; Snow: none	no target species	CH
23/11/2021	Winter Walkover Survey	T3	0:32 starting at 12:03	Visibility: good; Wind speed and direction: light air SW; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none		CH
23/11/2021	Winter Walkover Survey	T6	0:56 starting at 12:44	Visibility: good; Wind speed and direction: light air SW; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none	no target species	CH
24/11/2021	Winter Walkover Survey	T7	0:55 starting at 10:50	Visibility: good; Wind speed and direction: light breeze NW; Cloud cover and height: 66-100% 150-500m; Rain: heavy showers; Frost: none; Snow: none		CH
24/11/2021	Winter Walkover Survey	T8	0:38 starting at 12:25	Visibility: good; Wind speed and direction: light air NW; Cloud cover and height: 66-100% 150-500m; Rain: none; Frost: none; Snow: none	no target species	CH
24/11/2021	Winter Walkover Survey	T9	0:25 starting at 13:15	Visibility: good; Wind speed and direction: light breeze NW; Cloud cover and height: 66-100% 150-500m; Rain: none; Frost: none; Snow: none	no target species	CH
24/11/2021	Winter Walkover Survey	T10	0:13 starting at 14:33	Visibility: good; Wind speed and direction: gentle breeze NW; Cloud cover and height: 66-100% 150-500m; Rain: none; Frost: none; Snow: none	no target species, 5°C	CH

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
29/11/2021	Waterbird Distribution Survey	8km radius	7:55 starting at 08:30	Visibility: good; Wind speed and direction: fresh breeze NW; Cloud cover and height: 33-66% 150-500m; Rain: drizzle; Frost: none; Snow: none	Fresh and cool NW breeze with occasional blustery showers blowing across (8 - 11˚C). Largely grey and overcast but frequent clear patches blew across throughout the day leading to occasional sunny spells. Becoming drier by mid-morning but wetter again towards evening	NM
30/11/2021	Waterbird Distribution Survey	8km radius	7:30 starting at 08:30	Visibility: moderate; Wind speed and direction: strong breeze SW; Cloud cover and height: 66-100% <150m; Rain: light showers; Frost: none; Snow: none	Grey and overcast mostly to start with with some brighter patches and occasional drizzly showers (9 - 10˚C). Cloud layer sinking as soon approached with an increase in the frequency of misty showers. Stayed largely clear until 15:30 when heavy rain began and did not let up.	NM
30/11/2021	Hen Harrier Roost Survey	HHVP1	2:00 starting at 14:55	Visibility: moderate; Wind speed and direction: moderate breeze W; Cloud cover and height: 66-100% <150m; Rain: persistent; Frost: none; Snow: none	no hen harrier sighting, 10˚C, no break in rain	CH
01/12/2021	Hen Harrier Roost Survey	HHVP4	2:00 starting at 14:55	Visibility: good; Wind speed and direction: strong breeze NNW; Cloud cover and height: 66-100% 150-500m; Rain: heavy showers; Frost: none; Snow: none	no hen harrier sighting, 5˚C	CH
02/12/2021	Hen Harrier Roost Survey	HHVP3	2:00 starting at 14:45	Visibility: moderate; Wind speed and direction: moderate breeze NNW; Cloud cover and height: 66-100% 150-500m; Rain: persistent; Frost: none; Snow: none	no hen harrier sighting; farmer herding sheep on quad with dogs in area 15:00-15:40; dry until 15:50	CH

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
05/12/2021	Vantage Point Survey	VP2	3:00 starting at 07:40	Visibility: good; Wind speed and direction: gentle breeze W; Cloud cover and height: 66-100% >500m; Rain: light showers; Frost: none; Snow: none	hail showers, 2°C	CH
06/12/2021	Waterbird Distribution Survey	8km radius	3:00 starting at 13:00	Visibility: good; Wind speed and direction: moderate breeze W; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none		CH
07/12/2021	Waterbird Distribution Survey	8km radius	2:30 starting at 13:30	Visibility: good; Wind speed and direction: light breeze W; Cloud cover and height: 66-100% 150-500m; Rain: drizzle; Frost: none; Snow: on ground	4°C, light patches of snow on high ground & some sheltered areas	CH
09/12/2021	Waterbird Distribution Survey	8km radius	6:30 starting at 09:00	Visibility: good; Wind speed and direction: moderate breeze W; Cloud cover and height: 66-100% >500m; Rain: light showers; Frost: none; Snow: none		CH
14/12/2021	Hen Harrier Roost Survey	HHVP2	2:00 starting at 14:40	Visibility: good; Wind speed and direction: fresh breeze SW; Cloud cover and height: 66-100% <150m; Rain: none; Frost: none; Snow: none	7°C, no hen harrier sighting	CH
15/12/2021	Vantage Point Survey	VP2	1:00 starting at 10:10	Visibility: poor; Wind speed and direction: moderate breeze SW; Cloud cover and height: 66-100% 150-500m; Rain: drizzle; Frost: none; Snow: none	Snipe hunters in the distance on Easky bog, 11°C	CH
15/12/2021	Vantage Point Survey	VP2	2:00 starting at 11:10	Visibility: good; Wind speed and direction: moderate breeze SW; Cloud cover and height: 66-100% 150-500m; Rain: none; Frost: none; Snow: none	Snipe hunters at a distance on Easky bog, 11°C	CH
17/12/2021	Vantage Point Survey	VP1	3:00 starting at 07:50	Visibility: good; Wind speed and direction: moderate breeze SE; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	6°C	CH
17/12/2021	Vantage Point Survey	VP1	3:00 starting at 11:20	Visibility: good; Wind speed and direction: gentle breeze SE; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	6°C	CH
21/12/2021	Waterbird Distribution Survey	8km radius	6:30 starting at 09:00	Visibility: good; Wind speed and direction: light breeze SE; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none		CH

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
22/12/2021	Waterbird Distribution Survey	8km radius	5:30 starting at 09:00	Visibility: good; Wind speed and direction: moderate breeze S; Cloud cover and height: 66-100% 150-500m; Rain: light showers; Frost: none; Snow: none		CH
06/01/2022	Waterbird Distribution Survey	8km radius	6:00 starting at 10:00	Visibility: good; Wind speed and direction: fresh breeze SW; Cloud cover and height: 66-100% 150-500m; Rain: heavy showers; Frost: none; Snow: none	3°C	CH
07/01/2022	Waterbird Distribution Survey	8km radius	6:00 starting at 10:00	Visibility: good; Wind speed and direction: light breeze N; Cloud cover and height: 33-66% 150-500m; Rain: none; Frost: none; Snow: on ground	4°C; snow on ground at Easky Lough & bog area, none elsewhere	CH
10/01/2022	Vantage Point Survey	VP1	3:00 starting at 14:35	Visibility: moderate; Wind speed and direction: fresh breeze SW; Cloud cover and height: 66-100% 150-500m; Rain: heavy showers; Frost: none; Snow: none		CH
11/01/2022	Vantage Point Survey	VP1	3:00 starting at 11:30	Visibility: good; Wind speed and direction: moderate breeze SW; Cloud cover and height: 33-66% >500m; Rain: none; Frost: none; Snow: none		CH
11/01/2022	Hen Harrier Roost Survey	HHVP4	2:10 starting at 15:05	Visibility: good; Wind speed and direction: gentle breeze SW; Cloud cover and height: 33-66% >500m; Rain: none; Frost: none; Snow: none		CH
12/01/2022	Winter Walkover Survey	T1	0:35 starting at 11:00	Visibility: good; Wind speed and direction: light breeze SW; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none		CH
12/01/2022	Winter Walkover Survey	T2	0:28 starting at 11:40	Visibility: good; Wind speed and direction: light breeze SW; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none		CH
12/01/2022	Winter Walkover Survey	T3	0:30 starting at 12:30	Visibility: good; Wind speed and direction: light breeze SW; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	no target species	CH
12/01/2022	Winter Walkover Survey	T6	0:55 starting at 13:10	Visibility: good; Wind speed and direction: light breeze SW; Cloud cover and height: 33-66% >500m; Rain: none; Frost: none; Snow: none		CH

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
13/01/2022	Hen Harrier Roost Survey	HHVP3	2:00 starting at 15:10	Visibility: good; Wind speed and direction: gentle breeze S; Cloud cover and height: 66-100% 150-500m; Rain: none; Frost: none; Snow: none	No hen harrier sighted	CH
14/01/2022	Winter Walkover Survey	T7	0:55 starting at 11:25	Visibility: good; Wind speed and direction: moderate breeze SE; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none		CH
14/01/2022	Winter Walkover Survey	T8	0:45 starting at 12:25	Visibility: good; Wind speed and direction: moderate breeze SE; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none		CH
14/01/2022	Winter Walkover Survey	T9	0:15 starting at 13:15	Visibility: good; Wind speed and direction: moderate breeze SE; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none	no target species	CH
14/01/2022	Winter Walkover Survey	T10	0:15 starting at 13:45	Visibility: good; Wind speed and direction: moderate breeze SE; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none	no target species	CH
14/01/2022	Winter Walkover Survey	T5	0:35 starting at 14:15	Visibility: good; Wind speed and direction: moderate breeze SE; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none	no target species	CH
14/01/2022	Hen Harrier Roost Survey	HHVP2	2:00 starting at 15:10	Visibility: good; Wind speed and direction: gentle breeze SE; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none	No hen harrier sighted	CH
20/01/2022	Vantage Point Survey	VP2	3:00 starting at 11:25	Visibility: good; Wind speed and direction: light air SW; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none		CH
20/01/2022	Vantage Point Survey	VP2	3:00 starting at 14:55	Visibility: good; Wind speed and direction: light air SW; Cloud cover and height: 66-100% 150-500m; Rain: light showers; Frost: none; Snow: none		CH
25/01/2022	Waterbird Distribution Survey	8km radius	2:00 starting at 10:10	Visibility: good; Wind speed and direction: gentle breeze SW; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none		CH

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
25/01/2022	Waterbird Distribution Survey	8km radius	4:00 starting at 12:30	Visibility: good; Wind speed and direction: gentle breeze SW; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none		CH
26/01/2022	Waterbird Distribution Survey	8km radius	6:00 starting at 10:30	Visibility: good; Wind speed and direction: fresh breeze SW; Cloud cover and height: 66-100% 150-500m; Rain: none; Frost: none; Snow: none		CH
02/02/2022	Vantage Point Survey	VP2	3:00 starting at 07:25	Visibility: good; Wind speed and direction: moderate breeze WSW; Cloud cover and height: 66-100% 150-500m; Rain: none; Frost: none; Snow: none	sunrise at 08:23; 7˚C	CH
02/02/2022	Vantage Point Survey	VP2	3:00 starting at 10:55	Visibility: good; Wind speed and direction: moderate breeze WSW; Cloud cover and height: 66-100% >500m; Rain: light showers; Frost: none; Snow: none	visibility moderate at times due to showers	CH
03/02/2022	Vantage Point Survey	VP1	3:00 starting at 11:10	Visibility: moderate; Wind speed and direction: fresh breeze WSW; Cloud cover and height: 66-100% >500m; Rain: light showers; Frost: none; Snow: none	no target species seen	CH
03/02/2022	Hen Harrier Roost Survey	HHVP4	2:00 starting at 15:50	Visibility: good; Wind speed and direction: fresh breeze SW; Cloud cover and height: 66-100% 150-500m; Rain: drizzle; Frost: none; Snow: none	No hen harrier sighted	CH
04/02/2022	Vantage Point Survey	VP1	3:00 starting at 07:15	Visibility: poor; Wind speed and direction: light breeze NW; Cloud cover and height: 66-100% >500m; Rain: light showers; Frost: none; Snow: falling	sunrise at 08:17, 3˚C, showers of hail and snow causing visibility to drop to poor at times	CH
07/02/2022	Hen Harrier Roost Survey	HHVP1	2:00 starting at 16:00	Visibility: moderate; Wind speed and direction: near gale W; Cloud cover and height: 66-100% <150m; Rain: light showers; Frost: none; Snow: none	sunset at 17:28, no hen harrier sighting	CH
08/02/2022	Waterbird Distribution Survey	8km radius	6:30 starting at 10:30	Visibility: good; Wind speed and direction: moderate breeze SW; Cloud cover and height: 66-100% 150-500m; Rain: light showers; Frost: none; Snow: none	very choppy at sea/storm waves	CH
09/02/2022	Waterbird Distribution Survey	8km radius	6:00 starting at 10:30	Visibility: good; Wind speed and direction: moderate breeze W; Cloud cover and height: 33-66% >500m; Rain: light showers; Frost: none; Snow: none	very choppy at sea/storm waves	CH

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
15/02/2022	Hen Harrier Roost Survey	HHVP3	2:05 starting at 16:10	Visibility: good; Wind speed and direction: fresh breeze W; Cloud cover and height: 66-100% 150-500m; Rain: light showers; Frost: none; Snow: none	No hen harrier sighted	CH
21/02/2022	Hen Harrier Roost Survey	HHVP2	2:00 starting at 16:25	Visibility: moderate; Wind speed and direction: moderate breeze W; Cloud cover and height: 66-100% >500m; Rain: light showers; Frost: none; Snow: none	No hen harrier sighted	CH
22/02/2022	Waterbird Distribution Survey	8km radius	7:00 starting at 09:00	Visibility: good; Wind speed and direction: fresh breeze WSW; Cloud cover and height: 33-66% >500m; Rain: heavy showers; Frost: none; Snow: none	hail showers, 6°C	CH
25/02/2022	Waterbird Distribution Survey	8km radius	5:30 starting at 11:00	Visibility: good; Wind speed and direction: moderate breeze SSW; Cloud cover and height: 66-100% >500m; Rain: heavy showers; Frost: none; Snow: none	6°C, tide mostly full but on the way out for WFD at coast	CH
02/03/2022	Vantage Point Survey	VP1	3:00 starting at 13:20	Visibility: moderate; Wind speed and direction: strong breeze SSE; Cloud cover and height: 66-100% <150m; Rain: heavy showers; Frost: none; Snow: none	Heavy shower 13:40 to 14:15. Lighter intermittent showers for the rest of the day.	NS
02/03/2022	Vantage Point Survey	VP1	3:00 starting at 16:50	Visibility: limited; Wind speed and direction: strong breeze SSE; Cloud cover and height: 66-100% <150m; Rain: heavy showers; Frost: none; Snow: none	View is severly limited from misty conditions.	NS
03/03/2022	Winter Walkover Survey	T1	0:35 starting at 10:25	Visibility: good; Wind speed and direction: light breeze WNW; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none		CH
03/03/2022	Winter Walkover Survey	T2	0:30 starting at 11:20	Visibility: good; Wind speed and direction: light breeze WNW; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none		CH
03/03/2022	Winter Walkover Survey	T3	0:35 starting at 12:00	Visibility: good; Wind speed and direction: gentle breeze WNW; Cloud cover and height: 33-66% >500m; Rain: none; Frost: none; Snow: none		CH
03/03/2022	Winter Walkover Survey	T6	1:15 starting at 12:45	Visibility: good; Wind speed and direction: gentle breeze WNW; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none	7°C	CH

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
03/03/2022	Winter Walkover Survey	T7	0:40 starting at 14:25	Visibility: good; Wind speed and direction: gentle breeze WNW; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none		CH
03/03/2022	Winter Walkover Survey	T8	0:50 starting at 15:10	Visibility: good; Wind speed and direction: gentle breeze WNW; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none		CH
03/03/2022	Winter Walkover Survey	T9	0:20 starting at 16:10	Visibility: good; Wind speed and direction: gentle breeze WNW; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none	no target species	CH
07/03/2022	Waterbird Distribution Survey	8km radius	6:00 starting at 10:30	Visibility: good; Wind speed and direction: fresh breeze SE; Cloud cover and height: 33-66% >500m; Rain: none; Frost: none; Snow: none	7°C	CH
07/03/2022	Hen Harrier Roost Survey	HHVP1	3:00 starting at 16:20	Visibility: good; Wind speed and direction: near gale WSW; Cloud cover and height: 66-100% <150m; Rain: none; Frost: none; Snow: none		NS
08/03/2022	Waterbird Distribution Survey	8km radius	6:00 starting at 10:30	Visibility: moderate; Wind speed and direction: near gale SE; Cloud cover and height: 33-66% >500m; Rain: heavy showers; Frost: none; Snow: none	4°C; falling tide; difficult to use scope in coastal areas due to wind shake	CH
11/03/2022	Breeding Red Grouse Survey	T1	1:20 starting at 13:20	Visibility: good; Wind speed and direction: moderate breeze SW; Cloud cover and height: 66-100% >500m; Rain: light showers; Frost: none; Snow: none	no red grouse sighting	CH
11/03/2022	Breeding Red Grouse Survey	T2	0:20 starting at 14:50	Visibility: good; Wind speed and direction: moderate breeze SW; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none	no red grouse sighting	CH
11/03/2022	Breeding Red Grouse Survey	T3	1:55 starting at 15:50	Visibility: good; Wind speed and direction: gentle breeze SW; Cloud cover and height: 33-66% >500m; Rain: none; Frost: none; Snow: none	no red grouse sighting	CH
14/03/2022	Breeding Red Grouse Survey	T4 & T5	1:20 starting at 09:50	Visibility: good; Wind speed and direction: moderate breeze SSW; Cloud cover and height: 66-100% 150-500m; Rain: none; Frost: none; Snow: none		CH

Date	Survey	Location	Duration (h)	Weather Conditions	Comments	Surveyor
23/03/2022	Vantage Point Survey	VP2	3:00 starting at 13:20	Visibility: good; Wind speed and direction: gentle breeze SSE; Cloud cover and height: 33-66% 150-500m; Rain: none; Frost: none; Snow: none		NS
23/03/2022	Vantage Point Survey	VP2	3:00 starting at 16:50	Visibility: good; Wind speed and direction: gentle breeze SSE; Cloud cover and height: 66-100% <150m; Rain: none; Frost: none; Snow: none		NS
28/03/2022	Hen Harrier Roost Survey	HHVP3	3:00 starting at 18:10	Visibility: good; Wind speed and direction: light breeze SSE; Cloud cover and height: 33-66% 150-500m; Rain: none; Frost: none; Snow: none		NS
29/03/2022	Hen Harrier Roost Survey	HHVP4	3:00 starting at 18:10	Visibility: good; Wind speed and direction: moderate breeze SSE; Cloud cover and height: 66-100% <150m; Rain: none; Frost: none; Snow: none		NS
30/03/2022	Waterbird Distribution Survey	8km radius	7:00 starting at 08:30	Visibility: good; Wind speed and direction: moderate breeze NE; Cloud cover and height: 66-100% >500m; Rain: none; Frost: none; Snow: none	4°C in morning, max 7°C	CH
31/03/2022	Waterbird Distribution Survey	8km radius	5:20 starting at 11:00	Visibility: good; Wind speed and direction: fresh breeze NE; Cloud cover and height: 0-33% >500m; Rain: none; Frost: none; Snow: none	7°C	CH
31/03/2022	Hen Harrier Roost Survey	HHVP2	3:00 starting at 18:10	Visibility: moderate; Wind speed and direction: fresh breeze WNW; Cloud cover and height: 33-66% <150m; Rain: none; Frost: none; Snow: none		NS

APPENDIX 7.3

SUMMARY TABLES

Table of Contents

Table 7 - 3 - 1 Summary of vantage point survey records

Species	Year	Observations.and.Flights	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Brent Goose	2021	number of observations											2		**2**
		duration of flights (seconds)											150		**150**
		bird seconds at PCH											90		**90**
	2022	number of observations													
		duration of flights (seconds)													
		bird seconds at PCH													
Buzzard	2021	number of observations					4	2	5	2	2	1	3		**19**
		duration of flights (seconds)					690	130	600	150	425	67	332		**2394**
		bird seconds at PCH					200	15	150		25		60		**450**
	2022	number of observations	6	2	1										**9**
		duration of flights (seconds)	145	180	70										**395**
		bird seconds at PCH	120	20	70										**210**
Hen Harrier	2021	number of observations											1		**1**
		duration of flights (seconds)											480		**480**
		bird seconds at PCH											20		**20**
	2022	number of observations	3												**3**
		duration of flights (seconds)	250												**250**
		bird seconds at PCH	10												**10**
Kestrel	2021	number of observations					1	1	4	1	1	2			**10**
		duration of flights (seconds)					360	220	635	200	150	30			**1595**
		bird seconds at PCH					360	50	260	80	50				**800**
	2022	number of observations	3		4										**7**
		duration of flights (seconds)	200		231										**431**
		bird seconds at PCH			197										**197**

Species	Year	Observations.and.Flights	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Lapwing	2021	number of observations								1					**1**
		duration of flights (seconds)								160					**160**
		bird seconds at PCH								30					**30**
	2022	number of observations													
		duration of flights (seconds)													
		bird seconds at PCH													
Merlin	2021	number of observations									1			1	**2**
		duration of flights (seconds)												20	**20**
		bird seconds at PCH													
	2022	number of observations													
		duration of flights (seconds)													
		bird seconds at PCH													
Red Grouse	2021	number of observations										1		1	**2**
		duration of flights (seconds)										10			**10**
		bird seconds at PCH													
	2022	number of observations			1										**1**
		duration of flights (seconds)													
		bird seconds at PCH													
Snipe	2021	number of observations							1		2	2	7		**12**
		duration of flights (seconds)							25		125	25	40		**215**
		bird seconds at PCH													
	2022	number of observations	6	1	3										**10**
		duration of flights (seconds)	80	30	17										**127**
		bird seconds at PCH													

Species	Year	Observations.and.Flights	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Sparrowhawk	2021	number of observations						2							**2**
		duration of flights (seconds)						125							**125**
		bird seconds at PCH						65							**65**
	2022	number of observations	2	2											**4**
		duration of flights (seconds)	45	255											**300**
		bird seconds at PCH	25	20											**45**
Whooper Swan	2021	number of observations												1	**1**
		duration of flights (seconds)												200	**200**
		bird seconds at PCH													
	2022	number of observations													
		duration of flights (seconds)													
		bird seconds at PCH													

Table 7 - 3 - 2 Summary of breeding and winter walkover survey records

Species	Year	Abundance	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Buzzard	2021	number of observations				1	1	1	3				1		**7**
		number of individuals				2	1	1	3				1		**8**
	2022	number of observations	3		3										**6**
		number of individuals	4		5										**9**
Dunlin	2021	number of observations							1						**1**
		number of individuals							1						**1**
	2022	number of observations													
		number of individuals													

Species	Year	Abundance	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Kestrel	2021	number of observations					1								**1**
		number of individuals					1								**1**
	2022	number of observations	1		1										**2**
		number of individuals	1		1										**2**
Snipe	2021	number of observations											1		**1**
		number of individuals											1		**1**
	2022	number of observations													
		number of individuals													
Sparrowhawk	2021	number of observations													
		number of individuals													
	2022	number of observations			1										**1**
		number of individuals			1										**1**

Table 7 - 3 - 3 Summary of waterbird distribution survey records

Species	Year	Abundance	Jan	Feb	Mar	Apr	May	Aug	Sep	Oct	Nov	Dec	Total
Barnacle Goose	2021	number of observations									1		**1**
		number of individuals									23		**23**
	2022	number of observations											
		number of individuals											
Black-throated Diver	2021	number of observations								1	2		**3**
		number of individuals								1	5		**6**
	2022	number of observations											
		number of individuals											

Species	Year	Abundance	Jan	Feb	Mar	Apr	May	Aug	Sep	Oct	Nov	Dec	Total
Brent Goose	2021	number of observations										11	**11**
		number of individuals										105	**105**
	2022	number of observations	5	4	9								**18**
		number of individuals	33	50	193								**276**
Curlew	2021	number of observations						1	1	8	11	9	**30**
		number of individuals						7	6	34	111	12	**170**
	2022	number of observations	7	6	3								**16**
		number of individuals	29	10	3								**42**
Dunlin	2021	number of observations						1	1	3			**5**
		number of individuals						1	7	19			**27**
	2022	number of observations	1	2	1								**4**
		number of individuals	16	164	250								**430**
Eider	2021	number of observations								2	1		**3**
		number of individuals								26	17		**43**
	2022	number of observations		7									**7**
		number of individuals		33									**33**
Golden Plover	2021	number of observations							2	1	1		**4**
		number of individuals							17	50	250		**317**
	2022	number of observations		3	2								**5**
		number of individuals		18	123								**141**
Great Northern Diver	2021	number of observations							1	5	5	1	**12**
		number of individuals							2	7	8	1	**18**
	2022	number of observations	5	5	2								**12**
		number of individuals	5	13	2								**20**
Greenland White-fronted Goose	2021	number of observations									1		**1**
		number of individuals									14		**14**

Species	Year	Abundance	Jan	Feb	Mar	Apr	May	Aug	Sep	Oct	Nov	Dec	Total
	2022	number of observations											
		number of individuals											
Kittiwake	2021	number of observations						1	2	4	5	2	**14**
		number of individuals						35	33	17	159	10	**254**
	2022	number of observations											
		number of individuals											
Lapwing	2021	number of observations						2	2		5	2	**11**
		number of individuals						7	19		84	73	**183**
	2022	number of observations											
		number of individuals											
Lesser Black-backed Gull	2021	number of observations									1		**1**
		number of individuals									3		**3**
	2022	number of observations											
		number of individuals											
Long-tailed Duck	2021	number of observations								1			**1**
		number of individuals								1			**1**
	2022	number of observations											
		number of individuals											
Mediterranean Gull	2021	number of observations									1		**1**
		number of individuals									6		**6**
	2022	number of observations											
		number of individuals											
Oystercatcher	2021	number of observations						2	3	10	12	19	**46**
		number of individuals						22	42	79	98	84	**325**
	2022	number of observations	19	10	12								**41**
		number of individuals	129	82	33								**244**

Species	Year	Abundance	Jan	Feb	Mar	Apr	May	Aug	Sep	Oct	Nov	Dec	Total
Purple Sandpiper	2021	number of observations										1	**1**
		number of individuals										37	**37**
	2022	number of observations	1	2									**3**
		number of individuals	1	49									**50**
Red-throated Diver	2021	number of observations						1				2	**3**
		number of individuals						1				4	**5**
	2022	number of observations	3	2	1								**6**
		number of individuals	3	2	1								**6**
Red Knot	2021	number of observations											
		number of individuals											
	2022	number of observations	2										**2**
		number of individuals	3										**3**
Redshank	2021	number of observations						2	2	2	6	7	**19**
		number of individuals						8	63	3	61	19	**154**
	2022	number of observations	7	5	2								**14**
		number of individuals	9	15	18								**42**
Shoveler	2021	number of observations											
		number of individuals											
	2022	number of observations	1										**1**
		number of individuals	9										**9**
Snipe	2021	number of observations							3	5	4	2	**14**
		number of individuals							3	17	8	4	**32**
	2022	number of observations		15	2								**17**
		number of individuals		115	3								**118**

Species	Year	Abundance	Jan	Feb	Mar	Apr	May	Aug	Sep	Oct	Nov	Dec	Total
Storm Petrel	2021	number of observations							1				**1**
		number of individuals							19				**19**
	2022	number of observations											
		number of individuals											
Whooper Swan	2021	number of observations								1	2	3	**6**
		number of individuals								2	25	17	**44**
	2022	number of observations	5	1	1								**7**
		number of individuals	12	2	1								**15**

Table 7 - 3 - 4 Summary of breeding raptor survey records

Species	Year	Abundance	Apr	May	Jun	Jul	Total
Buzzard	2021	number of observations	6	3	1	3	**13**
		number of individuals	11	5	1	5	**22**
Hen Harrier	2021	number of observations		1			**1**
		number of individuals		1			**1**
Kestrel	2021	number of observations	2	1	1	4	**8**
		number of individuals	3	1	1	4	**9**
Merlin	2021	number of observations	1	2		2	**5**
		number of individuals	1	2		2	**5**
Sparrowhawk	2021	number of observations	2			1	**3**
		number of individuals	2			1	**3**

Table 7 - 3 - 5 Summary of breeding red grouse survey records

Species	Year	Abundance	Feb	Mar	Total
Red Grouse	2022	number of observations		5	**5**
		number of individuals		5	**5**

Table 7 - 3 - 6 Summary of breeding woodcock survey records

Species	Year	Abundance	Apr	May	Jun	Jul	Total
Woodcock	2021	number of observations		1	1		**2**
		number of individuals		1	1		**2**

Table 7 - 3 - 7 Summary of non-target species records

Species	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Barn Swallow	2021					✓	✓			✓			
	2022												
Black-headed Gull	2021							✓	✓	✓	✓	✓	✓
	2022	✓	✓	✓									
Black Guillemot	2021											✓	
	2022	✓	✓										
Blackbird	2021				✓	✓	✓	✓			✓	✓	
	2022	✓	✓	✓									
Blackcap	2021					✓	✓	✓					
	2022												
Blue Tit	2021				✓	✓				✓		✓	
	2022	✓		✓									

Species	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bullfinch	2021					✓							
	2022		✓										
Chaffinch	2021				✓	✓	✓	✓					
	2022			✓									
Chiffchaff	2021						✓						
	2022												
Coal Tit	2021				✓	✓						✓	
	2022	✓	✓	✓									
Collared Dove	2021												
	2022	✓											
Common Gull	2021					✓	✓		✓	✓	✓	✓	✓
	2022	✓	✓	✓									
Coot	2021												
	2022	✓											
Cormorant	2021						✓		✓	✓	✓	✓	✓
	2022	✓	✓	✓									
Crossbill	2021					✓		✓					
	2022												
Cuckoo	2021				✓	✓							
	2022												
Dipper	2021							✓			✓		
	2022												
Dunnock	2021					✓	✓						
	2022	✓											
Fieldfare	2021												✓
	2022												

Species	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fulmar	2021								✓	✓		✓	
	2022	✓											
Gadwall	2021								✓		✓		
	2022												
Gannet	2021								✓	✓	✓	✓	✓
	2022	✓											
Goldcrest	2021					✓	✓	✓		✓		✓	
	2022			✓									
Goldfinch	2021					✓	✓			✓		✓	
	2022	✓	✓										
Grasshopper Warbler	2021							✓					
	2022												
Great Black-backed Gull	2021					✓	✓		✓	✓	✓	✓	✓
	2022	✓	✓	✓									
Great Tit	2021					✓							
	2022	✓		✓									
Greenfinch	2021						✓	✓					
	2022												
Greenshank	2021										✓	✓	✓
	2022	✓	✓	✓									
Grey Heron	2021								✓	✓	✓	✓	✓
	2022	✓		✓									
Guillemot	2021								✓	✓		✓	
	2022	✓		✓									
Herring Gull	2021					✓	✓		✓	✓	✓	✓	✓
	2022	✓	✓	✓									

Species	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hooded Crow	2021				✓	✓	✓	✓		✓	✓	✓	✓
	2022	✓	✓	✓									
House Martin	2021					✓	✓						
	2022												
Jackdaw	2021				✓	✓							
	2022	✓											
Jay	2021					✓	✓	✓				✓	
	2022	✓											
Lesser Black-backed Gull	2021				✓	✓	✓	✓	✓	✓	✓	✓	
	2022			✓									
Lesser Redpoll	2021				✓								
	2022												
Linnet	2021					✓		✓		✓			
	2022												
Little Grebe	2021									✓		✓	
	2022	✓		✓									
Magpie	2021					✓	✓	✓				✓	
	2022	✓		✓									
Mallard	2021				✓	✓		✓	✓	✓	✓	✓	✓
	2022	✓	✓	✓									
Manx Shearwater	2021									✓			
	2022												
Mistle Thrush	2021				✓	✓	✓	✓		✓	✓	✓	
	2022	✓		✓									
Moorhen	2021												✓
	2022	✓	✓	✓									

Species	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mute Swan	2021								✓			✓	✓
	2022	✓											
Pheasant	2021					✓							
	2022												
Pied Wagtail	2021				✓	✓	✓	✓				✓	
	2022	✓		✓									
Raven	2021				✓	✓	✓	✓		✓	✓	✓	✓
	2022	✓	✓	✓									
Red-breasted Merganser	2021											✓	
	2022	✓											
Reed Bunting	2021				✓								
	2022												
Ringed Plover	2021								✓	✓	✓	✓	✓
	2022	✓	✓	✓									
Robin	2021				✓	✓	✓	✓		✓	✓	✓	✓
	2022	✓	✓	✓									
Rook	2021					✓	✓	✓				✓	
	2022	✓	✓	✓									
Sanderling	2021									✓		✓	✓
	2022	✓	✓	✓									
Sedge Warbler	2021							✓					
	2022												
Shag	2021									✓	✓	✓	
	2022	✓		✓									
Siskin	2021				✓	✓	✓	✓		✓			
	2022			✓									

Species	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Skylark	2021					✓	✓	✓					
	2022			✓									
Song Thrush	2021						✓	✓				✓	
	2022	✓		✓									
Starling	2021												
	2022	✓		✓									
Stonechat	2021				✓	✓	✓	✓			✓	✓	✓
	2022			✓									
Teal	2021								✓	✓		✓	✓
	2022	✓	✓	✓									
Turnstone	2021									✓	✓	✓	✓
	2022	✓	✓	✓									
Wheatear	2021					✓							
	2022												
Whitethroat	2021							✓					
	2022												
Wigeon	2021									✓		✓	
	2022	✓											
Willow Warbler	2021					✓	✓	✓					
	2022												
Woodpigeon	2021				✓	✓	✓				✓	✓	
	2022	✓		✓									
Wren	2021				✓	✓	✓	✓		✓	✓	✓	✓
	2022	✓	✓	✓									