Ayodeji Oyelami

From: Dawn Quinn <admin@batconservationireland.org>
Sent: Friday, 15 September 2023 14:24
To: Ayodeji Oyelami
Subject: RE: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

Dear Ayodeji,

Thank you for your e-mail.

Unfortunately, as Bat Conservation Ireland is a very small organisation, with limited resources, we do not have the capacity to get involved in planning issues.

Please note that Bat Conservation Ireland is concerned that a request for our input/consultation/opinion/assistance on planning applications and reports, or objections/comments on same, can sometimes imply that we have been consulted for our opinion on planning matters when Bat Conservation Ireland does not, in fact, provide opinions or comments on developments. Therefore, please note that this response should not be construed as a consultation with Bat Conservation Ireland regarding any planning or development matter or proposal. In order to avoid misunderstandings, please do not use this terminology in your reports to describe this transaction.

Thank you for your understanding.

Yours sincerely

Dawn Quinn
Administrative Manager
Bat Conservation Ireland

Postal/Registered Address: Carmichael House, 4-7, North Brunswick Street, Dublin 7, D07 RHA8.
E-mail: admin@batconservationireland.org
Website: www.batconservationireland.org
Social Media: Bat Conservation Ireland - Home | Facebook | https://twitter.com/BatConservIre

From: Ayodeji Oyelami <aoyelami@nodwyer.com>
Sent: Wednesday, September 13, 2023 11:52 AM

To: Dawn Quinn <admin@batconservationireland.org>
Subject: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

Our Project Ref. 604569

Dear Sir/Madam

Orsted have commissioned RSK Ireland as the Environmental and Planning Consultants to prepare an application for planning permission to An Bord Pleanála for a Strategic Infrastructure Development (SID). The SID is for the proposed Oatfield Wind Farm Project, located in County Clare in the townlands of Oatfield, Crag, Cloontra West, Derryvinnaan, Cloontra, Cloonsheerea, Mountrice, Cloghera, Drumsillagh (Merritt), Drumsillagh (Parker), Kyle and Gortacullin.

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If you do not have any comments to make or do not have any information relevant to the proposed Project, I would be grateful if you would please indicate same in reply to this email.

Feedback or queries can be sent by email or by post to the contact details below.

Kind regards

Ayodeji Oyelami PhD
Senior Environmental Consultant – Environment & Planning

NICHOLAS O'DWYER
an RSK company

Unit E4, Nutgrove Office Park, Nutgrove Avenue, Dublin 14
T: +353 1 296 9000
M: +353 86 1585024
E: aoyelami@nodwyer.com

www.nodwyer.com

are not the intended recipient of this e-mail please contact us at: it@nodwyer.com. We take reasonable precautions to ensure that data generated by us has been swept for viruses, but it is the responsibility of the recipient to ensure that the onward transmission, opening or use of this message and any attachments will not adversely affect its systems or data. We reserve the right to monitor and record email messages sent to and from this address for the purposes of investigating or detecting any unauthorised use of our system and ensuring its effective operation.

Ayodeji Oyelami

From: Gary Mackin (CW) <gary.mackin.cw@dublinairport.com>
Sent: Tuesday, 10 October 2023 10:47
To: Ayodeji Oyelami
Cc: Jennifer Boyle
Subject: RE: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

Good Morning Ayodeji,

As the proposed wind farm at Oatfield, Co. Clare is beyond 30 nautical miles of both Dublin and Cork Airports, daa have no comment to make in respect of the EIAR Scoping report shared previously, other than to recommend consultation with the IAA and AirNav Ireland.

Please don't hesitate to get in touch should you need anything further.

Kind Regards,
Gary

Gary Mackin, Statutory Planner, Infrastructure Division
Planning Department, Level 2, Cloghran House
Dublin Airport
E: gary.mackin.cw@daa.ie

From: Ayodeji Oyelami <aoyelami@nodwyer.com>
Sent: Wednesday 13 September 2023 12:07
To: Planning-daa <planning@daa.ie>
Subject: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

Our Project Ref. 604569

Dear Sir/Madam

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Feedback or queries can be sent by email or by post to the contact details below.

Kind regards

Ayodeji Oyelami PhD
Senior Environmental Consultant – Environment & Planning

NICHOLAS O'DWYER
an RSK company

Unit E4, Nutgrove Office Park, Nutgrove Avenue, Dublin 14
T: +353 1 296 9000
M: +353 86 1585024
E: aoyelami@nodwyer.com

www.nodwyer.com

fhaisnéis sa ríomhphost seo agus i gceangaltáin ar bith faoi rún agus tá sé d'aird agus d'úsáid an Fhreagróra (na bhFreagróirí) dá bhfuil sé ceaptha amháin. Más rud é nach tusa an freagróir (na freagróirí) dá bhfuil an ríomhphost seo ceaptha, ní cheadaítear duit an teachtaireacht, an ceangaltá(i)n nó cuid ar bith dó a úsáid, a nochtadh, a chóipeáil, a scaipeadh nó a choinneáil. Má chreideann tú go bhfuair tú an ríomhphost seo trí earráid, bheimis buíoch dá gcuirfeá é sin in iúl dúinn láithreach. Scrios gach cóip den ríomhphost seo agus ceangaltá(i)n ar bith ó chóras do ríomhaire chomh maith le do thoil. Mura bhfuil sé luaite go sainráite, níl sé beartaithe leis an ríomhphost seo caidreamh conarthach ar bith a chruthú. Murar seoladh an ríomhphost seo i gcúrsaí fhostaíocht an tseoltóra nó i gcomhlíonadh a dhualgas/a dualgas ní ghlacfaidh daa dliteanas ar bith as ábhar na teachtaireachta nó ceangaltá(i)n ar bith. daa cpt. Oifig Chláraithe: Aerfort Bhaile Átha Cliath, Co. Bhaile Átha Cliath. Uimhir Chláraithe: 9401 Éire.

Ayodeji Oyelami

From: Environmental Co-ordination (Inbox) <Environmental_Co-ordination@agriculture.gov.ie>
Sent: Tuesday, 3 October 2023 10:14
To: Ayodeji Oyelami
Subject: FW: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare
Attachments: Oatfield EIA Scoping Report.pdf; Oatfield Windfarm, Co Clare.pdf

Good morning,

Please see observations attached from our Felling Division.

Regards

Environmental Co-ordination Unit

From: Ayodeji Oyelami <aoyelami@nodwyer.com>
Sent: Wednesday, September 13, 2023 3:32 PM
To: Forestry Info <forestryinfo@agriculture.gov.ie>
Subject: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

Our Project Ref. 604569

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Kind regards

Ayodeji Oyelami PhD
Senior Environmental Consultant – Environment & Planning

NICHOLAS O'DWYER
an RSK company

Unit E4, Nutgrove Office Park, Nutgrove Avenue, Dublin 14
T: +353 1 296 9000
M: +353 86 1585024
E: aoyelami@nodwyer.com

www.nodwyer.com

Dr Ayodeji Oyelami

Unit 4, Nutugrove Office Park

Nutgrove AVE

Dublin

D14V3F6

02th October 2023

Re: **Scoping Request for proposed Oatfield Windfarm near Oatfield, Crag, Cloontara West, Derryvinnaan, Cloontara, Cloonsheerea, Mountrice, Cloghera, Drumsillagh (Merritt), Drumsillagh (Parker), Kyle and Gortacullin, Co Clare.**

Dear Sir/Madam,

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

If the proposed development will involve the felling or removal of any trees, the developer must obtain a Felling License from this Department before trees are felled or removed. A Felling Licence application form can be obtained from **Felling Section, Department of Agriculture, Food and the Marine, Johnstown Castle Estate, Co. Wexford**. Email: felling.forestservice@agriculture.gov.ie or Web gov.ie - Tree Felling Licences (www.gov.ie)

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

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

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

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

1. The interaction of these proposed works with the environment locally and more widely, in addition to potential direct and indirect impacts on designated sites and water, is assessed. Consultation with relevant environmental and planning authorities may be required where

specific sensitivities arise (e.g. local authorities, National Parks & Wildlife Service, Inland Fisheries Ireland, and the National Monuments Service);

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

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

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

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

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

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

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

   and

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

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

Yours sincerely,

_____

Catherine Boyce
Felling Section
Department of Agriculture, Food and the Marine
Johnstown Castle
Co Wexford

Ayodeji Oyelami

From: Housing Manager DAU <Manager.DAU@npws.gov.ie>
Sent: Wednesday, 13 September 2023 12:41
To: Ayodeji Oyelami
Subject: RE: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

Our Ref: G Pre00223/2023 (Please quote in all related correspondence)

A Chara

I acknowledge receipt of your recent consultation.

Please note Development Applications Unit (DAU) is the coordinating unit for the Department of Housing, Local Government and Heritage, coordinating responses/submission from National Parks and Wildlife Service, National Monuments Service, Underwater Archaeology Unit and Architectural Heritage.
All Correspondence to be issued to **Development Applications Unit**.

In the event of observations, you will receive a co-ordinated heritage-related response by email from Development Applications Unit (DAU).

The normal target turnaround for pre-planning and other general consultations is six weeks from date of receipt. In relation to general consultations from public bodies under the European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004 to 2011, the Department endeavours to meet deadline dates, where requested.

If you have not heard from DAU and wish to receive an update, please email manager.dau@npws.gov.ie.

Regards
Diarmuid

Diarmuid Buttimer
Executive Officer

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage
Aonad na nIarratas ar Fhorbairt
Development Applications Unit
Oifigí an Rialtais
Government Offices
Bóthar an Bhaile Nua, Loch Garman, Contae Loch Garman, Y35 AP90
Newtown Road, Wexford, County Wexford, Y35 AP90

—

Diarmuid.Buttimer@npws.gov.ie
Manager.DAU@npws.gov.ie

From: Ayodeji Oyelami <aoyelami@nodwyer.com>
Sent: Wednesday 13 September 2023 11:39
To: Housing Manager DAU <Manager.DAU@npws.gov.ie>
Subject: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

Our Project Ref. 604569

Dear Sir/Madam

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Kind regards

Ayodeji Oyelami PhD
Senior Environmental Consultant – Environment & Planning

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M: +353 86 1585024
E: aoyelami@nodwyer.com

www.nodwyer.com

not named above as an addressee it may be unlawful for you to read, alter, copy, distribute, disclose or otherwise use the information in this e-mail. If you are not the intended recipient of this e-mail please contact us at: it@nodwyer.com. We take reasonable precautions to ensure that data generated by us has been swept for viruses, but it is the responsibility of the recipient to ensure that the onward transmission, opening or use of this message and any attachments will not adversely affect its systems or data. We reserve the right to monitor and record email messages sent to and from this address for the purposes of investigating or detecting any unauthorised use of our system and ensuring its effective operation.

Ayodeji Oyelami

From: Customer Service <Customer.Service@decc.gov.ie>
Sent: Wednesday, 13 September 2023 16:17
To: Ayodeji Oyelami
Subject: RE: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

Thank you for contacting the Department of the Environment, Climate and Communications

Our Customer Service team will review your query and forward it to the relevant Division who can provide you with a comprehensive answer.

You should receive this response within 20 working days as stated in our Customer Service Charter. If you do not receive a response within this time, or if you have any further queries, please do not hesitate to contact us.

Go raibh maith agat as teagmháil a dhéanamh leis an Roinn Comhshaoil, Aeráide agus Cumarsáide

Athbhreithneoidh an fhoireann Seirbhíse do Chustaiméirí d'fhiosrú agus cuirfidh siad ar aghaidh chuig an Rannán ábhartha é a bheidh in ann freagra cuimsitheach a sholáthar duit.

Ba chóir go bhfaighfeá an freagra seo laistigh de 20 lá oibre mar a luaitear inár gCairt um Sheirbhís do Chustaiméirí. Mura bhfaigheann tú freagra laistigh den tréimhse seo, nó má tá tuilleadh fiosruithe agat, ná bíodh drogall ort teagmháil a dhéanamh linn.

Ayodeji Oyelami

From: Wexford Receptionist <REC_WEX@epa.ie>
Sent: Wednesday, 13 September 2023 16:02
To: Ayodeji Oyelami
Subject: RE: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

A Chara,

Your correspondence on 13/09/2023 has been forwarded for attention. Tá do chomhfhreagras 13/09/2023 seolta ar aghaidh le haghaidh aird.

Le gach dea-ghuí,

Meghann Bennett
Duty Receptionist I Organisational Services Team
Office of Communications and Corporate Services, Wexford
Fáilteoir ar Dualgas I Foireann Seirbhísí Eagraíochtúla
An Oifig Cumarsáide agus Seirbhísí Corparáideacha,Loch Garman

053-9160600 (Direct dial)
info@epa.ie
www.epa.ie

From: Ayodeji Oyelami <aoyelami@nodwyer.com>
Sent: Wednesday 13 September 2023 15:36
To: Wexford Receptionist <REC_WEX@epa.ie>
Subject: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

Our Project Ref. 604569

Dear Sir/Madam

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Feedback or queries can be sent by email or by post to the contact details below.

Kind regards

Ayodeji Oyelami PhD
Senior Environmental Consultant – Environment & Planning

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an RSK company

Unit E4, Nutgrove Office Park, Nutgrove Avenue, Dublin 14
T: +353 1 296 9000
M: +353 86 1585024
E: aoyelami@nodwyer.com

www.nodwyer.com

Ayodeji Oyelami

From: esbnetworks@esb.ie
Sent: Wednesday, 13 September 2023 16:28
To: Ayodeji Oyelami
Subject: Re: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare [# 925776]

Our Project Ref. 604569

Dear Sir/Madam

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Senior Environmental Consultant – Environment & Planning

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an RSK company

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T: +353 1 296 9000
M: +353 86 1585024
E: aoyelami@nodwyer.com

www.nodwyer.com

Ayodeji Oyelami

From: planning applications <planning.applications@failteireland.ie>
Sent: Wednesday, 20 September 2023 14:12
To: Ayodeji Oyelami
Subject: RE: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare
Attachments: Fáilte Ireland EIAR Guidelines 2023.pdf

Hello Ayodeji,

Thank you for your email and scoping letter regarding for the proposed SID Oatfield Wind Farm Project, located in County Clare.

Please see attached letter in response to the invitation to make a submission in relation to the EIAR Scoping Report for the Arklow Bank Wind Park 2. Also attached a copy of Fáilte Ireland's **(updated)** 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 & thanks,

Yvonne

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

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

Fáilte Ireland

LinkedIn | Twitter | YouTube | Facebook

From: Ayodeji Oyelami <aoyelami@nodwyer.com>
Sent: Wednesday, September 13, 2023 12:00 PM
To: planning applications <planning.applications@failteireland.ie>
Subject: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

Our Project Ref. 604569

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The site of the proposed development is located on approximately 985 hectares and comprises approximately 11 turbines, a permanent meteorological mast, an on-site 110 kV substation, along with ancillary civil and electrical infrastructure.

As part of the planning application, RSK Ireland is preparing an Environmental Impact Assessment Report (EIAR). To inform the scope of the EIAR, an EIA Scoping Consultation Report has been prepared for issue to consultees. As a valued consultee, we are writing to provide you with a copy of the EIA Scoping Consultation Document for your comments and feedback.

Additionally, we kindly request any information your agency or organisation may have that would assist us in preparing the EIAR for the proposed Project. If you can offer any information or wish to comment on the EIA Scoping Consultation Report, I would be grateful for your reply by close of business on 13th October 2023.

If you do not have any comments to make or do not have any information relevant to the proposed Project, I would be grateful if you would please indicate same in reply to this email.

Feedback or queries can be sent by email or by post to the contact details below.

Kind regards

Ayodeji Oyelami PhD
Senior Environmental Consultant – Environment & Planning

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Fáilte Ireland
Turasóireacht Náisúnta
An tÚdara Eorbartha
National Tourism
Development Authority

EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects

July 2023

An tÚdarás Náisiúnta Forbartha Turasóireachta
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Baile Átha Cliath 1
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National Tourism Development Authority
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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 Fáilte Ireland to update their EIA guidelines in line with changes in legislative and guidance requirements.

2. Background to this Document

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

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

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

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

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

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

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

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

3. Legislation and Statutory Guidance

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

Legislation

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

Statutory Guidance

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

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

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

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

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

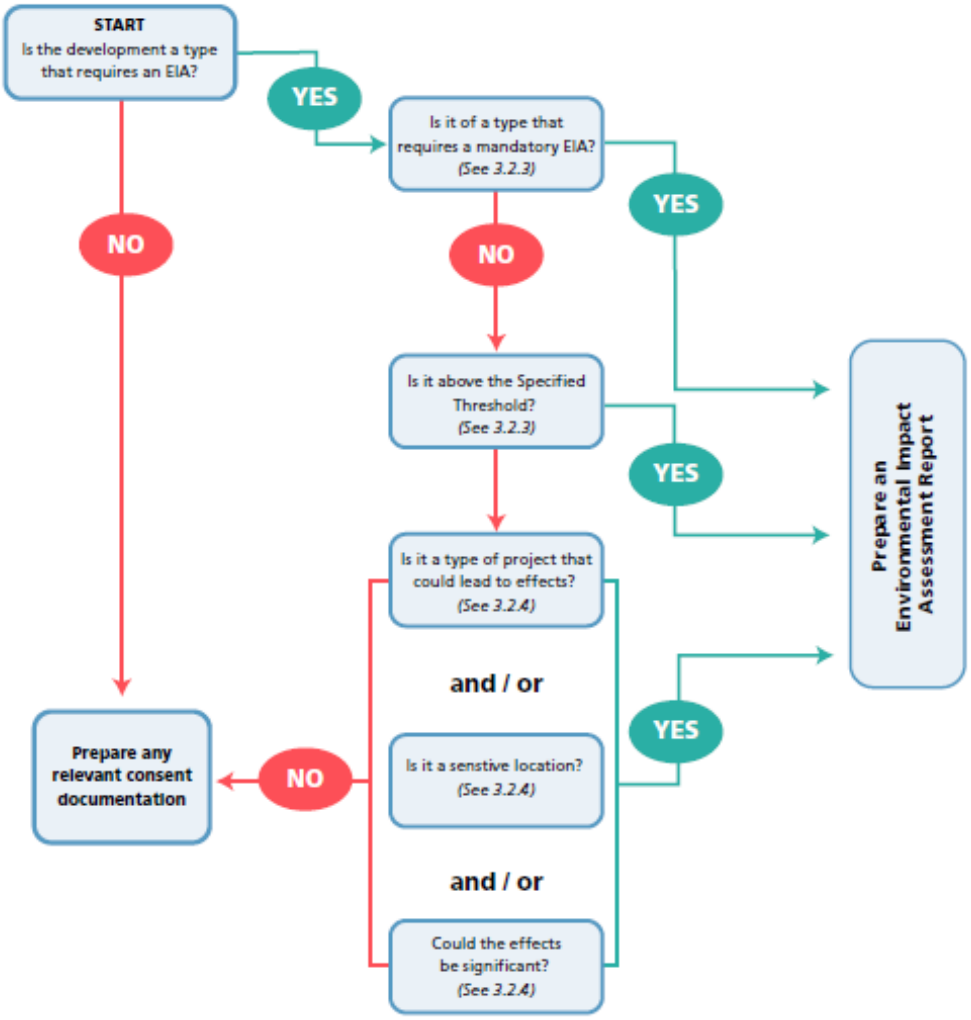
The process of EIA is set out in the EPA EIAR Guidelines, this document should be read in conjunction with and used as supplementary guidance to the EPA EIAR Guidelines. The process for ascertaining whether an EIAR is required is known as 'screening' and the process to determine the breath and scope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

Screening

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

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

Figure 1: EIAR Screening Process



(Taken from Fig 3.2 of the EPA Guidelines)

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

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

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

EIAR Scoping

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

4. Assessing Tourism

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

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

Projects which involve a tourism element

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

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

Projects which may have an impact upon tourism

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

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

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

- Pace of Life

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

5. Guiding Principles of EIAR

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

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

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

6. Consideration of Competency and Qualifications

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

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

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

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

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

7. EIAR Requirements

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

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

Project Description

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

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

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

Assessment of Alternatives

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

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

Baseline Assessment

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

For example, in a tourism context;

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

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

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

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

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

Impact Assessment

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

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

Population and Human Health

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

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

Biodiversity

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

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

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

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

Land, Soils and Geology

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

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

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

Water

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

Air Quality and Climate

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

Noise and Vibration

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

Material Assets; Traffic and Transport

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

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

Cultural Heritage

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

Archaeology

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

Material Assets; Waste Management

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

Material Assets

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

Landscape

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

Major Accident and Natural Disaster

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

Interaction of Impacts

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

Cumulative Impact

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

Transboundary Impact

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

Mitigation & Monitoring

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

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

Reduce the exposure of sensitive resources to excessive environmental impact.

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

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

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

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

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

Residual Impacts

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

8. Sources of information on Tourism

Information available online

Fáilte Ireland

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

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

Discover Ireland:

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

Tourism Ireland

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

Local Authorities

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

Regional Assemblies

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

Central Statistics Office

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

Ayodeji Oyelami

From: Networksinfo <Networksinfo@gasnetworks.ie>
Sent: Wednesday, 13 September 2023 16:26
To: Ayodeji Oyelami
Subject: Thank you for contacting Gas Networks Ireland

Go raibh maith agat as teagmháil a dhéanamh le Líonraí Gáis Éireann.

Is ó Luan go hAoine ó 8 r.n. go 8 i.n. agus Satharn ó 9 r.n.go 5.30 i.n. Uaireanta Oscailte ár nAonaid Cúraim Custaiméirí.

Má fhaigheann tú boladh gáis, cuir glaoch ar ár seirbhís éigeandála 24 uair 1800 20 50 50 láithreach.

Féach ár suíomh gréasáin gasnetworks.ie le haghaidh tuilleadh eolais.

Aimsigh ar Twitter agus Facebook muid

Thank you for contacting Gas Networks Ireland.

Our Customer Care Opening Hours are Mon-Fri 8am-8pm and Sat 9am-5.30pm.

If you smell gas, contact our 24 hour emergency service 1800 20 50 50 immediately.

See our website gasnetworks.ie for more information.

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Tá an fhaisnéis á seachadadh dírithe ar an duine nó ar an eintiteas chuig a bhfuil sí seolta amháin agus féadfar ábhar faoi rún, faoi phribhléid nó ábhar atá íogair ó thaobh tráchtála de a bheith mar chuid de. Tá aon athsheachadadh nó scaipeadh den fhaisnéis, aon athbhreithniú ar nó aon úsáid eile a bhaint as, nó aon ghníomh a dhéantar ag brath ar an bhfaisnéis seo ag daoine nó ag eintitis nach dóibh siúd an fhaisnéis seo, toirimiscthe agus féadfar é a bheith neamhdhleathach. Níl Líonraí Gáis Éireann faoi dhliteanas maidir le seachadadh iomlán agus ceart na faisnéise sa chumarsáid seo nó maidir le haon mhoill a bhaineann léi. Ní ghlacann Líonraí Gáis Éireann le haon dliteanas faoi ghnímh nó faoi iarmhairtí bunaithe ar úsáid thoirmiscthe na faisnéise seo. Níl Líonraí Gáis Éireann faoi dhliteanas maidir le seachadadh ceart agus iomlán na faisnéise sa chumarsáid seo nó maidir le haon mhoill a bhaineann léi. Má fuair tú an teachtaireacht seo in earráid, más é do thoil é, déan teagmháil leis an seoltóir agus scrios an t-ábhar ó gach aon ríomhaire.
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Thank you for your attention.

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Go raibh maith agat as d'aird a thabhairt.

Ayodeji Oyelami

From: DIG <Dig@gasnetworks.ie>
Sent: Thursday, 14 September 2023 08:41
To: Ayodeji Oyelami
Subject: RE: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare
Attachments: Safety Booklet-A5-HSQE-GU-016.pdf

Thank you for your enquiry to the Gas Networks Ireland ***Dial Before You Dig*** service.

Gas Networks Ireland has ***No recorded Gas Network*** within your area of interest.

Before you start work, you must have a current gas network map (or maps) for the work location. A current gas network map (or maps) must always be kept on site while work is under way.

The Gas Network

For an overview of the existing Gas Network, please refer to the Gas Networks Ireland safety booklet, ***Safety advice for working in the vicinity of natural gas pipelines***, available at https://www.gasnetworks.ie/home/safety/dial-before-you-dig/

Reading your Map

- High pressure transmission gas pipe is shown **Red.**
- Medium pressure distribution gas pipe is shown **Blue.**
- Low Pressure distribution gas pipe is shown **Green.**

The gas network map is indicative only. You must conform to the safety and legal notices printed on the map. For further information on reading this map refer to the ***Safety Information*** below.

Breaking Ground

- Supervision by Gas Networks Ireland is **not** required when working in the vicinity of Distribution gas pipes (unless noted otherwise). Safe digging practices **must** be followed. All work in the vicinity of a gas transmission pipeline **must** be carried out in compliance with:
    - Health and Safety Authority, ***Code of Practice for Avoiding Danger from Underground Services.***

Critical Activity

Quarrying or blasting must not be carried out within 400 m of the gas network until Gas Networks Ireland has been consulted on **1800 42 77 47**

Aurora Telecom

- Part of the Aurora Telecom Network may be present on your network map. For further information, Aurora can be contacted on **01 892 6166** (Office Hours) or auroralink@gasnetworks.ie.

Safety Information

- Before starting work any work in the vicinity of the gas network, please refer to the Gas Networks Ireland safety booklet, ***Safety advice for working in the vicinity of natural gas pipelines***, available at https://www.gasnetworks.ie/home/safety/dial-before-you-dig/

  This booklet contains important safety information, including advice on how to read the gas network maps you have requested.

If you did not request this map, please contact Customer Service on **1800 200 694**.

Thank you for your enquiry to Gas Networks Ireland.

T 1800 20 50 50 (Emergency)
T 1800 42 77 47 (Dial Before You Dig enquiries)

E dig@gasnetworks.ie

Gas Networks Ireland Networks Services Centre, St. Margaret's Road, Finglas, D11 Y895 gasnetworks.ie | Find us on Twitter

Useful Publications

- Heatlh and Safety Authority, ***Code of Practice for Avoiding Danger from Underground Services***
- Heatlh and Safety Authority, ***Guide to Safety in Excavations***

Both are available free of charge from: Health and Safety Authority on **0818 289 389** www.hsa.ie

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From: Ayodeji Oyelami <aoyelami@nodwyer.com>
Sent: Wednesday, September 13, 2023 4:26 PM
To: Networksinfo <Networksinfo@gasnetworks.ie>
Subject: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

Our Project Ref. 604569

Dear Sir/Madam

Orsted have commissioned RSK Ireland as the Environmental and Planning Consultants to prepare an application for planning permission to An Bord Pleanála for a Strategic Infrastructure Development (SID). The SID is for the proposed Oatfield Wind Farm Project, located in County Clare in the townlands of Oatfield, Crag, Cloontra West, Derryvinnaan, Cloontra, Cloonsheerea, Mountrice, Cloghera, Drumsillagh (Merritt), Drumsillagh (Parker), Kyle and Gortacullin.

The site of the proposed development is located on approximately 985 hectares and comprises approximately 11 turbines, a permanent meteorological mast, an on-site 110 kV substation, along with ancillary civil and electrical infrastructure.

As part of the planning application, RSK Ireland is preparing an Environmental Impact Assessment Report (EIAR). To inform the scope of the EIAR, an EIA Scoping Consultation Report has been prepared for issue to consultees. As a valued consultee, we are writing to provide you with a copy of the EIA Scoping Consultation Document for your comments and feedback.

Additionally, we kindly request any information your agency or organisation may have that would assist us in preparing the EIAR for the proposed Project. If you can offer any information or wish to comment on the EIA Scoping Consultation Report, I would be grateful for your reply by close of business on 13th October 2023.

If you do not have any comments to make or do not have any information relevant to the proposed Project, I would be grateful if you would please indicate same in reply to this email.

Feedback or queries can be sent by email or by post to the contact details below.

Kind regards

Ayodeji Oyelami PhD
Senior Environmental Consultant – Environment & Planning

NICHOLAS O'DWYER
an RSK company

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T: +353 1 296 9000
M: +353 86 1585024
E: aoyelami@nodwyer.com

www.nodwyer.com

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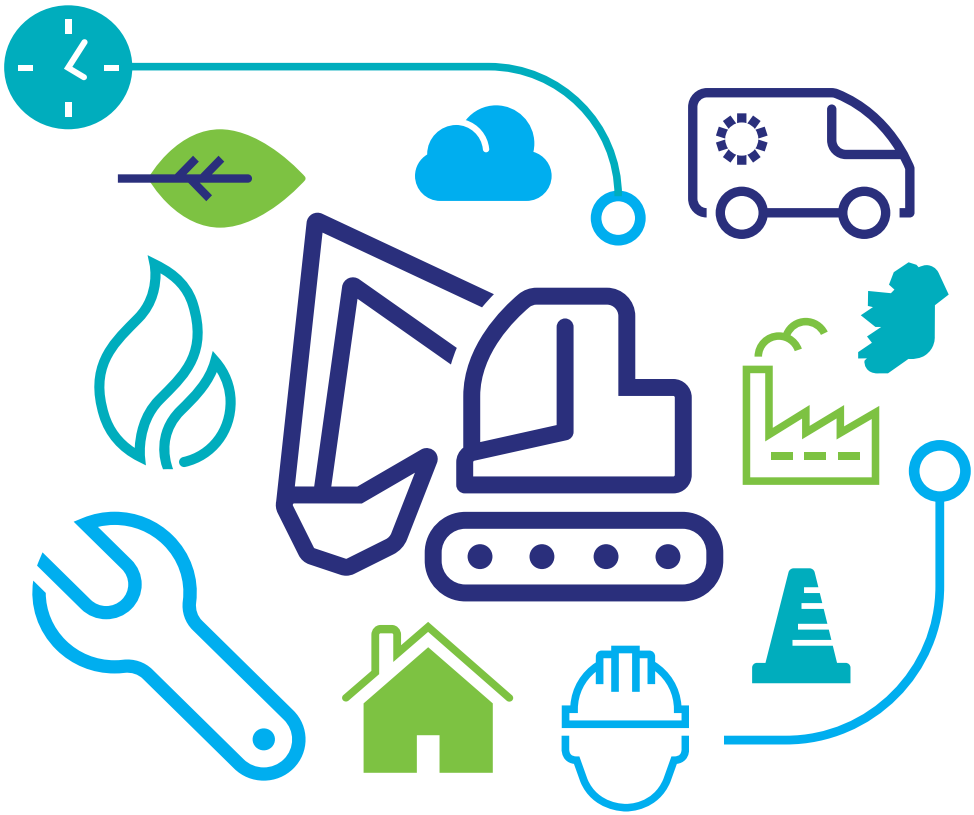
Thank you for your attention.

Gas Networks Ireland

Safety advice

for working in the vicinity of natural gas pipelines



Important safety information

When planning any excavation works dial

1800 42 77 47

to obtain up to date gas network maps.

Monday to Friday 9am – 5.30pm

Or you can sign up to DBYD online at

gasnetworks.ie/dbyd

and have access to maps 24 hours, 7 days a week

You can also contact us on

dig@gasnetworks.ie

If you have damaged a gas pipe call

1800 20 50 50

immediately, even if you do not suspect that gas is leaking

24 hours, 7 days a week

If you smell gas call

1800 20 50 50

24hr emergency service

Contents

This booklet contains important safety advice. Please read the following before you start work:

Natural gas **characteristics and behaviour**

Characteristics

Natural gas is:

- a highly flammable gas;
- lighter than air and will rise when released;
- non-toxic (but can suffocate in enclosed or confined spaces); and
- made up mostly of methane and has a smell added for safety purposes.

Behaviour

During an uncontrolled escape, natural gas will behave in the following ways:

- In open excavations, where there is a clear path to the atmosphere, natural gas will rise, dilute and disperse into the air.
- If the path to the atmosphere is blocked, the gas will travel through soil, ducts, drains, sewers and voids. It can also follow the line of other buried utility services. This can lead to gas entering a building or other confined spaces, and may lead to a fire or explosion.

Note: Never cover a damaged gas pipe; or attempt to carry out a repair. Call 1800 20 50 50 immediately.

Risks of **damaging a gas pipe**

The risks of damaging a gas pipe can be classified as:

Highest Risk

Mechanical excavators pose the highest risk and "should not be used within 500 mm of a gas distribution pipe."

(HSA Code of Practice)

Mechanical excavators must not be used within 3 metres of a Transmission pipeline.

(Refer to Code of Practice for Working in the Vicinity of the Transmission Network - AO/PR/127)

High Risk

Hand held power tools should not be used directly over the line of a gas pipe, unless the gas pipe has been positively located by hand and a safe working distance has been established.

Use of handheld power tools is not permitted within 1.5 m of a Transmission pipeline.

(Refer to Code of Practice for Working in the Vicinity of the Transmission Network - AO/PR/127)

Damage to gas pipes from power tools presents a high risk to the operatives involved in the work.

Low Risk

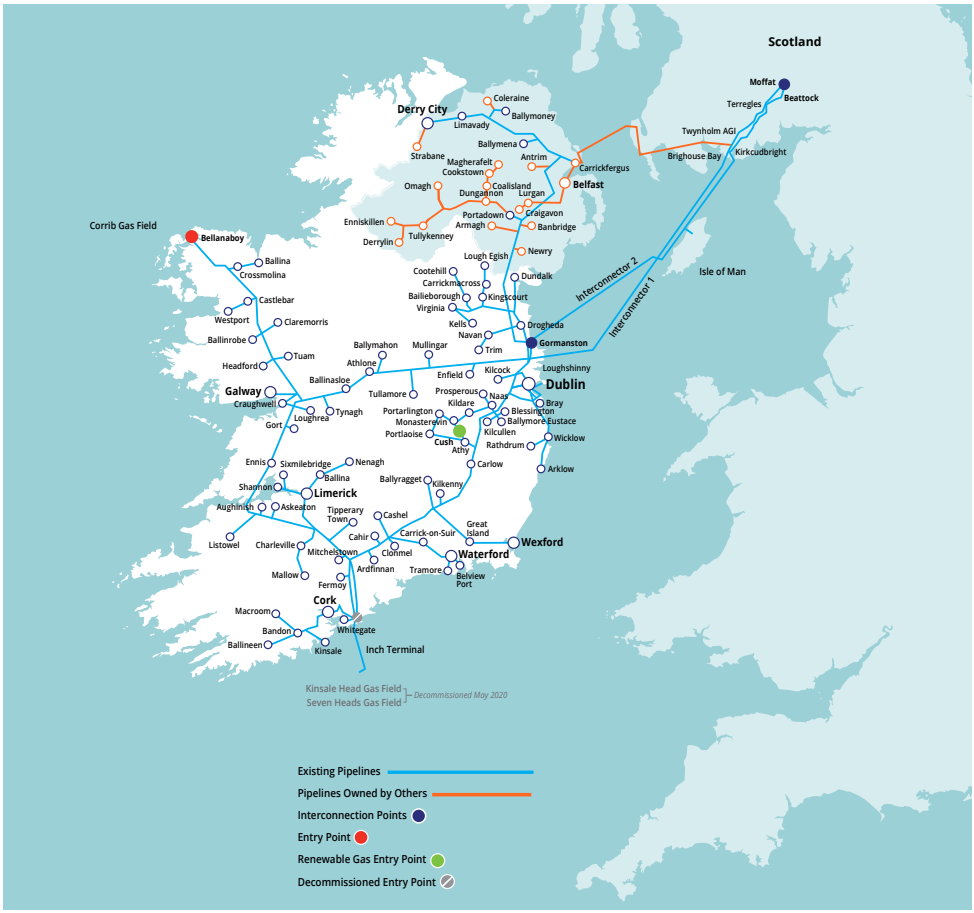
Hand digging using shovels and spades presents the lowest risk of damaging a gas pipe.

This is the method that should be used where the presence of gas pipes is suspected or close to a known gas pipe.

Risks from a **damaged gas pipe**

- Remember when gas escapes, or is released in an uncontrolled way; it can fuel a fire, give rise to an explosive atmosphere or cause asphyxiation.
- If you suspect there is a gas leak, immediately call Gas Networks Ireland's 24hr Emergency Service on **1800 20 50 50**.
- Gas can quickly fill underground cavities and travel into buildings through soil, or following the line of other buried utilities.
- Gas can only burn if exposed to an ignition source:
  - Do not turn electrical switches on or off
  - Do not operate any plant or equipment
  - Do not use naked flames, smoke or vape
  - Do not use mobile phones in the vicinity.
- Move people away from, and upwind of, the affected area.
- If gas has entered a confined space or building:
  - Open doors and windows
  - Turn off the gas supply at the meter
  - Do not expose to an ignition source.

Gas Networks Ireland **transmission network**



Gas Networks Ireland transports gas in Ireland through a network of steel and polyethylene (PE) pipes. The network operates at pressures between 20 mbar and 85 bar and is split between Transmission and Distribution pipelines.

The **Transmission** system is made up of steel pipes and operates from 7 bar to 85 bar.

The **Distribution** system is made up mostly of polyethylene pipes and operates from 20 mbar to 7 bar.

The **network**

The network is made up of three elements:

- Transmission pipes
- Distribution pipes
- Pressure Regulating Installations

Transmission pipes

These are high pressure pipelines that transfer gas across the country. They are constructed from steel, with a black, white, cream, yellow or concrete coating, and may have marker posts at intervals along their length, particularly at field boundaries and road crossings.

If a transmission pipeline is identified near intended excavations then work must not proceed until Gas Networks Ireland Transmission has been consulted on 1800 42 77 47.

Distribution pipes

These are medium or low pressure pipelines within urban areas. They are mainly constructed from Polyethylene (PE) and are predominantly yellow in colour, but may have brown or black stripes. There are two types – Mains and Services.

Mains gas pipes usually run parallel to property in the footpath, grass verge or road and range in size from 63 mm to 400 mm diameter.

Service gas pipes are connected to mains and run to a meter position at the property, and range in size from 20 mm to 63 mm diameter.

Note: There is a limited use of steel pipes in areas like bridges or where only shallow depths can be achieved.

There are still a small number of ductile and cast iron gas mains in use, ranging in size from 3 inch (75 mm) to 24 inch (600 mm) in diameter (these mains are similar in appearance to metal water mains). Steel and PE gas services are run from these metal mains to the meter location at each building.

These ductile and cast iron mains and services have been largely replaced with PE pipes. In urban areas a large number of redundant ductile or cast iron pipes are utilised as carrier pipes for new PE pipelines.

Some Distribution pipelines have been classified as strategic mains due to their pressure, diameter and/ or location and the elevated consequences if they are damaged.

If a Distribution strategic main is identified near an intended excavation then work must not proceed until Gas Networks Ireland has been consulted on 1800 42 77 47.

District Regulating Installation (DRI)

Pressure Regulating Installations

There are two types: Above Ground and Under Ground

Above Ground Installations (AGI) / District Regulating Installations (DRI)

An AGI/DRI is a fenced area containing a visible arrangement of pipework and ancillary equipment and will be clearly marked with Gas Networks Ireland signage. Some DRI's can be housed in a steel unit with no fencing surround.

Under Ground Installations (UGI /DRIug)

Gas Networks Ireland also have underground pressure regulating installations which have metal or concrete cover plates. There will be no visible arrangement of pipework etc, as this will be contained within the chamber.

If an AGI/DRI or UGI/DRIug is identified near intended works, then work must not proceed until Gas Networks Ireland has been consulted on 1800 42 77 47.

Gas Networks Ireland **construction methods**

Gas Networks Ireland use three main construction methods:

'Dig' Technique

Open Cut – installing pipe using standard trenching techniques. Pipe is laid with a sand or pea gravel surround and gas marker tape is laid above the sand.

'No-Dig' Techniques

Insertion – utilising existing metal gas mains / services as a carrier for new PE pipes. Inserted PE may be a close or loose fit. The carrier pipe is broken out at connection points, i.e. at pipe joints or where a gas service pipe is connected.

Moling/Directional Drilling – installing mains/ services where a 'moling' machine drills from one location to another pulling the pipe behind it using "no-dig" technology.

Note: Where pipe has been installed using "no-dig" techniques, the gas pipe will not have sand surround or marker tape.

Gas Networks Ireland construction – **depth of cover**

Typical service arrangement

Service Connection

Purge Point

New Mains – Normally 750 mm in roads and 600 mm in footpaths. (1.1 m in open fields)

New Services – 450 mm rising to 375 mm within 1.5 m of the building line. In some cases these depths are not achievable.

Note:

Older mains and services may have reduced cover.

Services and other connections are taken from the top of the main and will therefore have a reduced depth of cover.

Alteration since original installation – roads, footpaths and grass verges may have been altered since the gas main or service was laid and reduced the depth of cover.

Purge Points and Test Caps – Mains are laid with "purge points" and/or test caps at the ends. These may also rise above the top of the main.

Gas Valve Covers –Gas valves are a key safety component part of the gas network.

Some gas mains and services have valves installed below ground with valve covers marked "GAS".

Do not cover over or remove gas valve covers.

The risk of a gas valve cover being removed or covered over is particularly high during resurfacing or reinstatement works.

Even shallow excavation techniques such as road planing can damage gas pipelines with reduced cover.

Requesting **Gas Networks Ireland maps**

Gas Networks Ireland operates a **Dial Before You Dig** service to enable those involved in excavations to obtain natural gas network maps prior to starting work.

This service operates from 9am to 5.30pm, Monday to Friday.

Or you can sign up to DBYD online at **gasnetworks.ie/dbyd** and have access to maps 24 hours, 7 days a week.

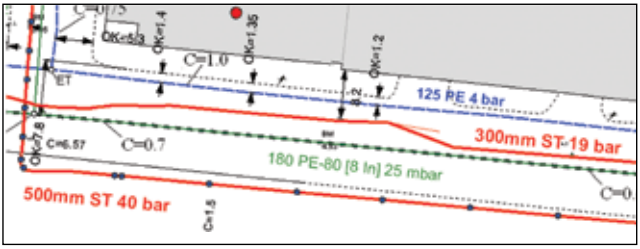
You can also email your enquiry to: **dig@gasnetworks.ie**

Maps will be sent out by post or by email where appropriate. When you contact Gas Networks Ireland to request a map, ensure you give the precise location of the intended works. You may be required to give some information regarding the nature of the planned work, i.e. start date, any high risk activity, etc.

Ensure you have allowed enough time for the maps to be obtained and to organise for the pipe location to be marked out if transmission pipelines are involved.

Note: Typical turnaround for maps is five working days when contact is made through phone or email, however using the online system will allow you instant access to up-to-date maps.

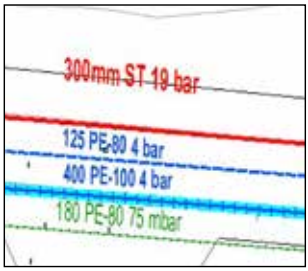
Organisers or planners of any work should ensure that the map is made available to personnel on-site.



Excerpt from a Gas Networks Ireland map.

Reading **Gas Networks Ireland maps**

Note: Natural Gas Network maps will only show mains and not services.
See page 16 for more information on service pipe locations.



The colour coding is as follows:

Red **= Transmission Main***
= 7 to 85 bar.

Blue **= Distribution Medium Pressure**
= 100 mbar to 7 bar.

Blue Buffer **=Distribution strategic main***
= 100 mbar to 7 bar.

Green **= Distribution Low Pressure**
= up to 100 mbar.

Typical AGI

Pressure regulating installations are marked as:

DRI – District Regulating Installation (Above Ground).

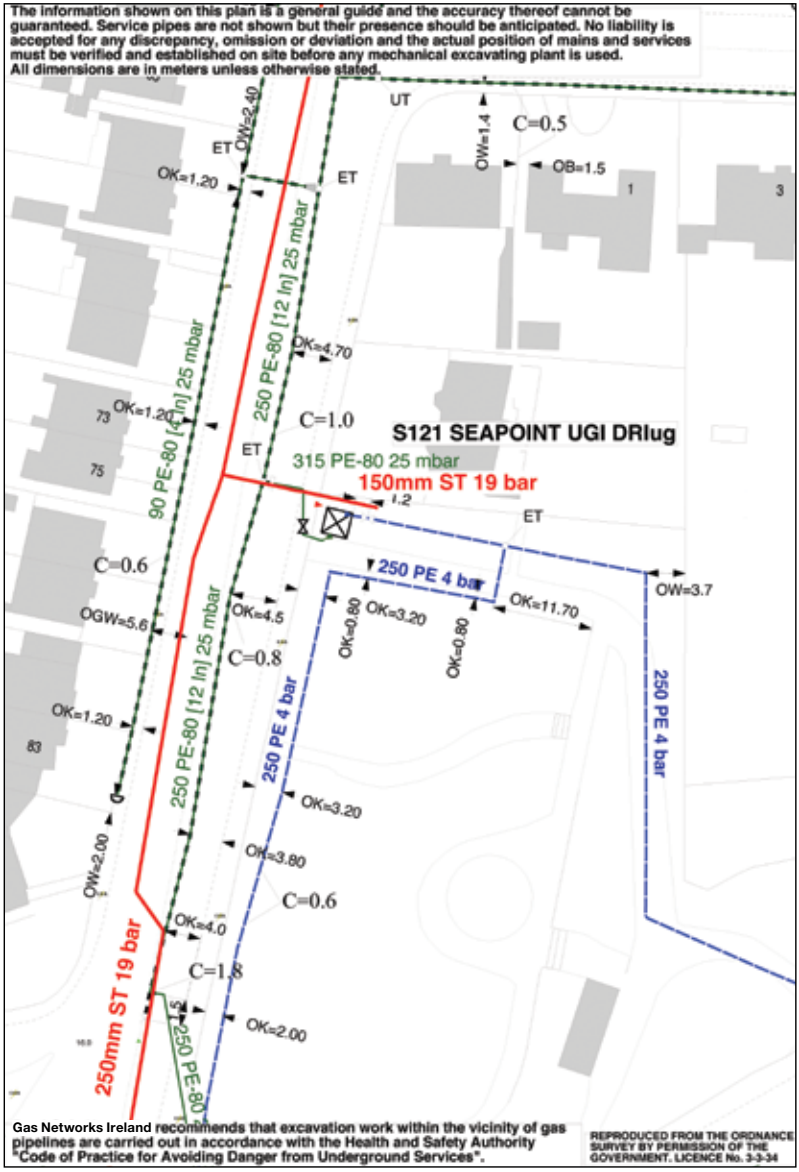
DRIug - District Regulating Installation (Under Ground).

UGI – Under Ground Installation.

AGI – Above Ground Installation.

** If you obtain a natural gas network map that shows a **red** Transmission main in the area of the proposed works or a distribution strategic main with a blue buffer, a consultation with Gas Networks Ireland **must** take place **before** starting works. Gas Networks Ireland will advise you on the safety measures required and will arrange for the location of the pipe to be marked out on site.*

Reading **Gas Networks Ireland maps**



Example of a Gas Networks Ireland map

Abbreviations

OK = Kerb, Curb
ORE = Road Edge
ORB = Rail Base
OB = Building
OW = Wall
OF = Fence
ODW = Dividing Wall
OGW = Garden Wall
RD = Road
BR = Branch
RED = Reducer
C = Cover to top of pipe
LH = Left Hand
RH= Right Hand
SWP = Sweep
CNR = Corner
S = South
N = North
E = East
W = West
No. = Number
Ctr = Centre
CL = Centre Line
Trans = Transition
DIV = Dividing
PK = Park
Conn = Connection
Opp = Opposite
Cplg = Coupling
ST = Steel
PE = Polyethylene

Gas **services**

Typical service arrangement

Service riser cover

Natural gas services are not normally identified on network maps, but their presence should be assumed. Services will normally, but not always, run at right angles from the main to the meter point.

To assist in determining the approximate position of gas services ensure you:

- Obtain a natural gas network map to identify the position of the gas main.
- Complete a site survey looking for gas meter boxes/cabinets, house entry points, service risers and gas valve covers.
- Older buildings may have no visible signs of a service, as the service may run directly into the building underground, with the meter fitted internally. In these cases a check should be made inside the building to identify the meter position.

Note: Ensure you utilise safe digging practices to locate the exact position of gas services.

Domestic meter box

Six meter cabinet

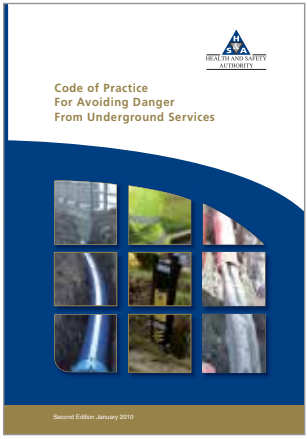
Purpose built multi-meter house (apartment complex).

Safe systems of work

Safe systems of work, as recommended by the Health and Safety Authority (HSA) should be employed on all projects.

Guidance on this can be found in the:

HSA: Code of Practice for Avoiding Danger from Underground Services.



Available from HSA website: **www.hsa.ie**

A safe system of work will include the following elements:

- Planning.
- Obtaining and using utility maps.
- Identifying pipes/services.
- Safe digging practices.
- Explosives must not be used within 30 m of any gas pipe (400 m for Transmission Pipelines), without prior consultation with Gas Networks Ireland.
- Piling, directional drilling or boring must not take place within 15 m of a gas pipe unless Gas Networks Ireland has been consulted.
- Extra care should be exercised when performing 'hot work' (such as welding) where a gaseous atmosphere could exist. If this potential exists Gas Networks Ireland must be consulted.
- Extra care should also be taken when using welding equipment, burners, torches or other heat generating equipment near pipelines (even if there is no potential for a gaseous atmosphere to exist) to ensure that the heat or sparks generated do not lead to the melting of polyethylene pipes or damage to pipeline coatings.

Contact Gas Networks Ireland for general enquiries on: 1800 464 464.

Safe systems of work

Planning

- Early contact should be made with Gas Networks Ireland to obtain a Natural Gas Network map.
  Dial Before You Dig 1800 42 77 47
  or visit **gasnetworks.ie/dbyd**
- Work involving piling, demolition, directional drilling, use of explosives or 'hot works' should be mentioned, as this may necessitate a site visit from Gas Networks Ireland personnel.
- Ensure you have allowed enough time to obtain the maps.

Maps

- Gas Networks Ireland will issue maps as outlined in this booklet. It is imperative that these maps are available for the operatives on-site for the duration of any works.
  The responsible person should ensure that operatives on-site understand the maps.

Identifying Pipes

- Steel, cast iron and ductile iron gas pipes can usually be traced using a conventional pipe/cable locating device set to "R" (Radio) mode.
- Polyethylene mains and services cannot be traced using conventional devices, so it is essential that maps are used and site surveys for meter boxes, valve covers, service risers, reinstatement scarring and other signs are completed.
- During the progress of works ensure no gas valve covers or markers are covered over.
- The position of gas mains and services should be marked out as they are located.

Note: Transmission pipelines pipelines and Distribution strategic mains must be marked out by a Gas Networks Ireland inspector.

Safe systems of work

Safe Digging Practices:

- As per the HSA Code of Practice, gas mains and services should be located by digging trial holes by hand. Mechanical excavators should not be used within 500 mm of any gas main.
  Mechanical excavators MUST NOT be used within 3 m of a Transmission pipeline.
  (Refer to Code of Practice for Working in the Vicinity of the Transmission Network - AO/PR/127)
- Never use hand held power tools directly over gas pipes unless precautions to prevent damage have been made and the pipe has been positively located.
  Use of handheld power tools is not permitted within 1.5 m of a Transmission pipeline.
  (Refer to Code of Practice for Working in the Vicinity of the Transmission Network - AO/PR/127)
- Do not leave a polyethylene gas pipe exposed.
- Provide adequate support for any gas pipe uncovered during the work.
- Report any damage, no matter how minor it may appear, to **1800 20 50 50.**
- If you have any concerns regarding safety around gas pipes contact Gas Networks Ireland for advice on **1800 464 464**.

What to do if a gas pipeline is damaged

(or if you smell gas in the area)

- Do not turn any electrical switches on or off, e.g. ignition switches.
- Do not operate any plant or equipment.
- Move people away from, and upwind of, the affected area. Restrict employee and public access to the affected area.
- Prevent smoking, vaping, the use of naked flames, the use of mobile phones and other ignition sources in the vicinity of the leak.
- Report the leak/damage immediately to: **Gas Networks Ireland 24hr Emergency Service on 1800 20 50 50.**
- Provide accurate information on your location and the nature of the incident.
- Do not attempt to repair the damage.
- Do not cover up a damaged main or service, this may lead to the gas travelling through soil, ducts, sewers, chambers or voids and potentially building up inside a premises or confined space.
- Do not turn off any gas valves in the road or footpath (you may be causing further problems by doing so).
- Assist Gas Networks Ireland emergency personnel as required.
- Remember any damage to gas pipes, even if the pipe does not appear to be leaking, must be reported to Gas Networks Ireland.

If you smell gas call

1800 20 50 50

24hr emergency service

Gas Networks Ireland contacts

The main contact numbers for Gas Networks Ireland are

24hr Emergency Service
1800 20 50 50
24 hours, 7 days a week

Dial Before You Dig
1800 42 77 47
Monday to Friday 9am – 5.30pm

or sign up to DBYD online
gasnetworks.ie/dbyd

General Enquiries
1800 464 464
Monday to Friday 8am – 8pm
Saturday 9am – 5.30pm

gasnetworks.ie

For "Dial Before You Dig" posters or stickers for your workplace call: **1800 464 464**

Other useful publications

HSA: Code of Practice for Avoiding Danger from Underground Services

HSA: Guide to Safety in Excavations

both are available free of charge from:
Health and Safety Authority on **01 614 7000**
www.hsa.ie

ESB Networks: How you can avoid hitting electrical cables when digging and drilling

available free of charge from:
ESB Networks on **1800 372 757**
esb.ie/esbnetworks

Gas Networks Ireland

The main contact details for
Gas Networks Ireland are:

General Enquiries
1800 464 464

Dial Before You Dig
1800 42 77 47

24hr Emergency Service
1800 20 50 50

networksinfo@gasnetworks.ie

gasnetworks.ie

Guideline No: HSQE/GU/016 Rev 2 Date: November 2020

Ayodeji Oyelami

From: GSI Planning <GSIPlanning@GSI.ie>
Sent: Monday, 9 October 2023 14:28
To: Ayodeji Oyelami
Cc: GSI Planning; Planning Advisory
Subject: RE: EIS 23/263 - Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co Clare
Attachments: 23_263 Oatfield Wind Farm Co Clare.pdf; GSI datasets relevant to EIA & SEA_ 20210421.pdf

Dear Ayodeji,
With reference to your email received on the 14 September 2023, concerning the Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co Clare, please find attached response and dataset sheet from Geological Survey Ireland.

Yours sincerely,
Trish Smullen

From: GSI Planning <GSIPlanning@GSI.ie>
Sent: Thursday, September 14, 2023 12:50 PM
To: Trish Smullen <Trish.Smullen@gsi.ie>
Cc: GSI Planning <GSIPlanning@GSI.ie>; Planning Advisory <PlanningAdvisory@decc.gov.ie>
Subject: EIS 23/263 - Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co Clare

EIS 23/263

Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co Clare. Request for observations by Nicholas O'Dwyer by 13 October 2023. Scoping report is enclosed.

Regards,

John

From: Ayodeji Oyelami <aoyelami@nodwyer.com>
Sent: Wednesday, September 13, 2023 3:37 PM
To: GSI Planning <GSIPlanning@GSI.ie>
Subject: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

Our Project Ref. 604569

Dear Sir/Madam

Orsted have commissioned RSK Ireland as the Environmental and Planning Consultants to prepare an application for planning permission to An Bord Pleanála for a Strategic Infrastructure Development (SID). The SID is for the proposed Oatfield Wind Farm Project, located in County Clare in the townlands of Oatfield, Crag, Cloontra West, Derryvinnaan, Cloontra, Cloonsheerea, Mountrice, Cloghera, Drumsillagh (Merritt), Drumsillagh (Parker), Kyle and Gortacullin.

The site of the proposed development is located on approximately 985 hectares and comprises approximately 11 turbines, a permanent meteorological mast, an on-site 110 kV substation, along with ancillary civil and electrical infrastructure.

As part of the planning application, RSK Ireland is preparing an Environmental Impact Assessment Report (EIAR). To inform the scope of the EIAR, an EIA Scoping Consultation Report has been prepared for issue to consultees. As a valued consultee, we are writing to provide you with a copy of the EIA Scoping Consultation Document for your comments and feedback.

Additionally, we kindly request any information your agency or organisation may have that would assist us in preparing the EIAR for the proposed Project. If you can offer any information or wish to comment on the EIA Scoping Consultation Report, I would be grateful for your reply by close of business on 13th October 2023.

If you do not have any comments to make or do not have any information relevant to the proposed Project, I would be grateful if you would please indicate same in reply to this email.

Feedback or queries can be sent by email or by post to the contact details below.

Kind regards

Ayodeji Oyelami PhD
Senior Environmental Consultant – Environment & Planning

NICHOLAS O'DWYER
an RSK company

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T: +353 1 296 9000
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E: aoyelami@nodwyer.com

www.nodwyer.com

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

Geological Survey
Suirbhéireacht Gheolaíochta
Ireland | Éireann

Ayodeji Oyelami
Nicholas O'Dwyer
Nutgrove Office Park
Nutgrove Avenue
Dublin 14

09 October 2023

Re: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co Clare
Your Ref: 604569
Our Ref: 23/263

Dear Ayodeji,

Geological Survey Ireland is the national earth science agency and is a division of the Department of the Environment, Climate and Communications. We provide independent geological information and 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'.

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

With reference to your email received on the 14 September 2023, concerning the Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co Clare, Geological Survey Ireland would encourage use of and reference to our datasetsPlease 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 and following sections provide more detail on some of these datasets.

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. Clare was completed in 2005. The full report details can be found here. **Our records show that there is a CGS in the vicinity of the proposed wind farm site layout.**

> **Ballyvorgal South**, Co. Clare (GR 151261, 168493), under IGH theme: IGH 2 Precambrian to Devonian Palaeontology. The Ballyvorgal site is an unusual Irish occurrence of an assemblage of deep-water fossils now found all over the world in rocks of Upper Ordovician age. Ballyvorgal is an important site for understanding and dating the rocks of the Slieve Bernagh Inlier. This site is the type locality for five species of trilobite. The gorse, bramble and other vegetation overgrowing the stream banks means there are currently only three small exposures of the brown mudstones, and no clear section of the trilobite bed. Whilst it would be necessary for some clearance to take place for any future study, if the landowner was to undertake any drainage work in the immediate vicinity of the stream, then a geological investigation should be made at the same time. Equally any major forestry work (felling/gripping/planting) in the adjacent western bank of the stream (not included within the site boundary) should be notified so that investigation may also occur of fresh exposures. Link to Site Report: CE006.

While it is recognised that the area occupies an important place in the development of Ireland's renewable energy industry, any future wind-farm development and access road construction in the surrounding area poses a threat to the integrity of the site. This site should be assessed as an environmental constraint. Ideally, the site should not be damaged or integrity impacted or reduced in any manner due to the proposed construction and modification of access roads, from traffic due to access road construction and turbine installation. This would include impacts that may be related to altered drainage patterns, changes in soil profiles and structures etc. However, this is not always possible, and in this situation appropriate mitigation measures should be put in place to minimize or mitigate potential impacts.

Where the integrity cannot be preserved we would ask that careful consideration be given in design to accommodating preservation of exposures and access to the site during construction to record the exposures to strengthen our knowledge and datasets. It is quite possible that any groundworks exposing or encountering bedrock could provide important opportunity to record the geology and further our knowledge of this important fossil locality. We would request that both Geological Survey Ireland be notified of any ground works and provided the opportunity to attend the site and record any necessary data.

We would also ask that the design of any future development considers the use of information panels as appropriate to highlight the significance of the impacted CGS. Please contact GSI Planning at GSIPlanning@gsi.ie) for further information and possible mitigation measures if applicable.

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 aquifers classed as a 'Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones' and a 'Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones' underlie the proposed wind farm development.

The Groundwater Vulnerability map indicates the range of groundwater vulnerabilities within the area covered is variable. We would therefore recommend use of the Groundwater Viewer to identify areas of High to Extreme Vulnerability and 'Rock at or near surface' in your assessments, as any groundwater-surface water interactions that might occur would be greatest in these areas.

GWClimate is a groundwater monitoring and modelling project that aims to investigate the impact of climate change on groundwater in Ireland. This is a follow on from a previous project (GWFlood) and the data may be useful in relation to Flood Risk Assessment (FRA) and management plans. Maps and data are available on the Map viewer.

Geological Survey Ireland has completed Groundwater Protection Schemes (GWPSs) in partnership with Local Authorities, and there is now national coverage of GWPS mapping. A Groundwater Protection Scheme provides guidelines for the planning and licensing authorities in carrying out their functions, and a framework to assist in decision-making on the location, nature and control of developments and activities in order to protect groundwater. **The Groundwater Protection Response overview and link to the main reports is here: https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/projects/protecting-drinking-water/what-is-drinking-water-protection/county-groundwater-protection-schemes/Pages/default.aspx**

Geological Mapping
Geological Survey Ireland maintains online datasets of bedrock and subsoils geological mapping that are reliable and accessible. We would encourage you to use these data which can be found here, in your future assessments.

Please note we have recently launched QGIS compatible bedrock (100K) and Quaternary geology map data, with instructional manuals and videos. This makes our data more accessible to general public and external stakeholders. QGIS compatible data can be found in our downloadable bedrock 100k .zip file on the Data & Maps section of our website.

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 wind farm 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 Map indicates there are some areas of Moderately High to High Landside Susceptibility in the wind farm site boundary area.**

Geological Survey Ireland also engaged in a national project on Groundwater Flooding. The data from this project may be useful in relation to Flood Risk Assessment (FRA) and management plans, and is described in more detail under 'Groundwater' above.

Natural Resources (Minerals/Aggregates)
Geological Survey Ireland provides data, maps, interpretations and advice on matters related to minerals, their use and their development in our Minerals section of the website. The Active Quarries, Mineral Localities and the Aggregate Potential maps are available on our Map Viewer.

We would recommend use of the Aggregate Potential Mapping viewer to identify areas of High to Very High source aggregate potential within the area. In keeping with a sustainable approach we would recommend use of our data and mapping viewers to identify and ensure that natural resources used in the wind farm developemnt are sustainably sourced from properly recognised and licensed facilities, and that consideration of future resource sterilization is considered.

Guidelines
The following guidelines may also be of assistance:

- Institute of Geologists of Ireland, 2013. Guidelines for the Preparation of the Soils, Geology and Hydrogeology Chapters of Geology in Environmental Impact Statements.

- EPA, 2022. Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)

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. Should any significant bedrock cuttings be created, we would ask that they will be designed to remain visible as rock exposure rather than covered with soil and vegetated, in accordance with safety guidelines and engineering constraints. In areas where natural exposures are few, or deeply weathered, this measure would permit on-going improvement of geological knowledge of the subsurface and could be included as additional sites of the geoheritage dataset, if appropriate. Alternatively, we ask that a digital photographic record of significant new excavations could be provided. Potential visits from Geological Survey Ireland to personally document exposures could also be arranged.

I hope that these comments are of assistance, and if we can be of any further help, please do not hesitate to the Geological Survey Ireland Planning Team at GSIPlanning@gsi.ie.

Yours sincerely,

Geoheritage and Planning Programme

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 / Limitations	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.

Ayodeji Oyelami

From: IE CustomerCare <CustomerCare@irishrail.ie>
Sent: Wednesday, 13 September 2023 12:32
To: Ayodeji Oyelami
Subject: RE: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

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Yours Sincerely,

Iarnród Éireann Irish Rail,
Customer Care Team.

Beimid i dteagmháil

Go raibh maith agat as teagmháil a dhéanamh le Cúram Custaiméirí Iarnród Éireann.

Is mór againn do chuid aiseolais agus tabharfaidh an fhoireann Chúram Custaiméirí freagra ar do ríomhphost chomh luath agus is féidir. 08:30 go 18:00 ó Luan go hAoine na gnáthuaireanta oibre atá againn. De ghnáth, déileáiltear le gach aiseolas laistigh de thrí lá oibre, ach d'fhéadfadh tuilleadh ama a bheith i gceist más gá saincheist a fhiosrú tuilleadh.

Cuirimid béim ar iarracht a dhéanamh a chinntiú go mbeidh taithí an chustaiméara sásúil i gcónaí, gach uair a bhíonn teagmháil ag custaiméir le hIarnród Éireann.

Le meas,

Foireann Chúram Custaiméirí
Iarnród Éireann.

Ayodeji Oyelami

From: No Reply <noreplynta@nationaltransport.ie>
Sent: Wednesday, 13 September 2023 12:10
To: Ayodeji Oyelami
Subject: Your enquiry has been received. Case reference #: CAS-140084-C7H3C7 NTA:00000080000221421

CASE REFERENCE #: CAS-140084-C7H3C7

Please note that the Irish version of this message is below

Thank you for contacting the National Transport Authority. We have received your enquiry and will respond as soon as possible. We aim to respond within 15 working days. A copy of your enquiry is displayed below.

Description: **CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe. Our Project Ref. 604569 Dear Sir/Madam Orsted have commissioned RSK Ireland as the Environmental and Planning Consultants to prepare an application for planning permission to An Bord Pleanála for a Strategic Infrastructure Development (SID). The SID is for the proposed Oatfield Wind Farm Project, located in County Clare in the townlands of Oatfield, Crag, Cloontra West, Derryvinnaan, Cloontra, Cloonsheerea, Mountrice, Cloghera, Drumsillagh (Merritt), Drumsillagh (Parker), Kyle and Gortacullin. The site of the proposed development is located on approximately 985 hectares and comprises approximately 11 turbines, a permanent meteorological mast, an on-site 110 kV substation, along with ancillary civil and electrical infrastructure. As part of the planning application, RSK Ireland is preparing an Environmental Impact Assessment Report (EIAR). To inform the scope of the EIAR, an EIA Scoping Consultation Report has been prepared for issue to consultees. As a valued consultee, we are writing to provide you with a copy of the EIA Scoping Consultation Document for your comments and feedback. Additionally, we kindly request any information your agency or organisation may have that would assist us in preparing the EIAR for the proposed Project. If you can offer any information or wish to comment on the EIA Scoping Consultation Report, I would be grateful for your reply by close of business on 13th October 2023. If you do not have any comments to make or do not have any information relevant to the proposed Project, I would be grateful if you would please indicate same in reply to this email. Feedback or queries can be sent by email or by post to the contact details below. Kind regards Ayodeji Oyelami PhD Senior Environmental Consultant – Environment Planning Unit E4, Nutgrove Office Park, Nutgrove Avenue, Dublin 14 T: +353 1 296 9000 M: +353 86 1585024 E: aoyelami@nodwyer.com www.nodwyer.com Nicholas O'Dwyer Ltd. Consulting Engineers CONFIDENTIALITY, COPYRIGHT AND DISCLAIMER NOTICE This email is confidential and may contain copyrighted or legally privileged information. If you are not named above as an addressee it may be unlawful for you to read, alter, copy, distribute, disclose or otherwise use the information in this e-mail. If you are not the intended recipient of this e-mail please contact us at: it@nodwyer.com. We take reasonable precautions to ensure that data generated by us has been swept for viruses, but it is the responsibility of the recipient to ensure that the onward transmission, opening or use of this message and any attachments will not adversely affect its systems or data. We reserve the right to monitor and record email messages sent to and from this address for the purposes of investigating or detecting any unauthorised use of our system and ensuring its effective operation.**
Subject: **Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare**
Contact Name: **aoyelami@nodwyer.com**
Email Address: **aoyelami@nodwyer.com**

Please note that this email was sent from a notification only address that cannot accept incoming emails. Please do not reply to this message, however, if you still require assistance please contact us here: **General enquiries - National Transport**

Kind regards,
National Transport Authority

Go raibh maith agat as teagmháil a dhéanamh leis an Údarás Náisiúnta Iompair. Tá do cheist faighte againn agus tabharfaimid freagra uirthi a luaithe is féidir. Féachaimid le freagra a thabhairt laistigh de 15 lá oibre. Tá cóip de do cheist ar taispeáint thíos.

Tabhair faoi deara gur seoladh an ríomhphost seo ó sheoladh fógra amháin nach bhfuil in ann glacadh le ríomhphoist isteach. Ná tabhair freagra ar an teachtaireacht seo, áfach, má tá cúnamh fós uait déan teagmháil linn anseo: **Fiosrúcháin ghinearálta - Iompar Náisiúnta**

Le dea-ghuí,
An t-Údarás Náisiúnta Iompair

Ayodeji Oyelami

From: Info Opw <info@opw.ie>
Sent: Wednesday, 13 September 2023 16:14
To: Ayodeji Oyelami
Subject: Automatic reply: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

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Ba chóir ceisteanna meáin a sheoladh trí ríomhphost chuig pressoffice@opw.ie

Is freagra uathoibrithe é seo. Ná seol freagra ar an ríomhphost seo le do thoil.

Communications

Oifig na nOibreacha Poiblí
Office of Public Works

Sráid Jonathan Swift, Baile Átha Troim, Co na Mí, C15 NX36
Jonathan Swift Street, Trim, Co Meath, C15 NX36

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Oatfield Wind Farm

Aviation Impact Assessment

Date: 15 August 2017
Author: Steve Hyam
Revision: Issue 4
Osprey Ref: 71025 001

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Approval Level	Authority	Name
Author	Osprey CSL	Steve Hyam
Internal Approval	Osprey CSL	Richie Hinchcliffe
Client 1 Approval	Brookfield Renewable	Tom O'Donnell

Executive Summary

Brookfield Renewable (Brookfield) is proposing the development of the Oatfield Wind Farm. The development is expected to consist of up to twenty-six Wind Turbine Generators (WTG) of a maximum potential blade tip height of 150 metres (m) above ground level (agl). The site is approximately 5 kilometres (km) southwest of Broadford, Co Clare in the Republic of Ireland.

In 2008, consultation with the Irish Aviation Authority (IAA) regarding a meteorological mast at the site resulted in the IAA stating that an objection would be raised on any future wind farm planned for the site. In subsequent consultation, the IAA listed more detailed potential for effects the Wind Farm would have on flight operations at Shannon Airport including:

- Potential interference to the Airport radar installations;
- Obstacle Limitation Surfaces (OLS) - Runway 24 Approach Surface; and
- Potential interference of the Runway 24 Instrument Landing System (ILS) approach aid.

Brookfield contracted Osprey to complete an Aviation Impact Assessment (AIA) to assess whether the effects identified by the IAA would present unmanageable impacts on IAA and Shannon Airport flight operations. In addition, Osprey considered that analysis was required to establish whether the development would present an effect on the radar system in operation at the Airport and to assess the potential for a physical obstruction effect on established Instrument Flight Procedures (IFP).

Radar Line of Sight (LOS) Analysis

LOS analysis was completed between the proposed WTG parameters and the Primary Surveillance Radar (PSR) at Shannon Airport.

At 150 m agl, all of the proposed WTG, except Turbine 17 (T17), are considered theoretically detectable by the Shannon PSR system and would present an area of clutter approximately 22.68 km^2 (6.55 NM^2) on Air Traffic Control (ATC) radar display systems and desensitise the radar at the location of the Wind Farm. At 125 m agl, the majority of the WTGs except T17 (not detectable), T18 (intermittently detectable) and T19 (where detection cannot be ruled out), would be considered theoretically detectable by the Airport PSR system.

Operational Effects of WTG PSR Detectability

Current generation PSR systems cannot distinguish between returns from WTG's (unwanted returns, or 'clutter') and those from aircraft; therefore, ATC is required to assume that actual aircraft targets could be lost over the location of a wind farm, and identification of aircraft under control could be lost or confused.

Technical PSR Mitigation Capability

There are a number of mitigation options available for the effects of WTGs on the Shannon Airport PSR system including the upgrade of the existing system or the development of a strategy for the procurement of a system with WTG mitigation capability.

Operational Effect of WTG SSR Detectability

The effects on SSR by WTG are due to the physical blanking and diffracting effects of the turbine towers. The effects can manifest as 2D positional inaccuracies or false target reports. WTG may have an effect at close range to an SSR facility (Eurocontrol[1] advises that effects are manageable beyond a specified range from the SSR i.e. WTGs located within 16 km of the SSR require assessment). The proposed development, at its closest point, is approximately 5.3 km from the Woodcock Hill SSR facility. In accordance with Eurocontrol guidance, the proposed development is within safeguarding Zone 2 (500 m - 16 km) requiring detailed assessment.

The results of the LOS analysis indicate that all proposed Oatfield WTG are theoretically in line of sight of the Woodcock Hill SSR facility, concluding that the proposed development is highly likely to have an effect on this system.

Shannon Airport Obstacle Limitation Surfaces (OLS)

Obstacles inside and outside an aerodrome boundary can affect flight operations, including take-off and landing, and procedures designed to facilitate these activities at an aerodrome. Regulatory guidance states that certain areas of local airspace are defined to assess the significance of existing or proposed obstacles close to an aerodrome; these are OLS. The OLS are determined according to the classification of the aerodrome and its runway length.

Analysis of the Wind Farm in relation to the established Outer Horizontal Surface (OHS) and Approach Surface indicated that the closest WTG to the OHS was T1 that would be located approximately 570 m outside the lateral extent of the OHS. In addition, analysis concluded that the closest WTGs to the lateral extent of the Approach Surface (T1 and T2) were located approximately 334 m and 340 m respectively outside the lateral extent of the Runway 24 Approach Surface. Consequently, the proposed Wind Farm will not breach the Airport OHS and the Runway 24 Approach Surface.

Instrument Flight Operations

Instrument Flight Procedures (IFP) are in place at airports to describe the standard routes for aircraft to follow on approach to and departure from the airport. The procedures allow aircraft to accurately line up (in 3-Dimensions) with the runway and descend safely and to allow aircraft to depart the airport on prescribed routes that allow them to integrate into the en-route structure. The following established Shannon IFP were considered for analysis:

- Runway 24: Instrument Landing System (ILS) or Localiser (LLZ) Category (CAT) I or II Approach;
- Runway 24: VHF Omni-Range (VOR) Approach; and
- Runway 06: TOMTO 2A Area Navigation (RNAV) Standard Departure.

Aircraft that would utilise the remaining IFPs were considered to be sufficiently displaced from the development that they were unlikely to be affected.

Runway 24 ILS (or LLZ) and Runway 24 VOR Approaches

The ILS (or LLZ) and VOR procedures follow similar track and descent profiles whereby an aircraft would start either procedure by overflying the Shannon VOR located 1 NM to the northeast of the airport at the Minimum Sector Altitude of 3,400 ft amsl. The aircraft would then fly outbound on a magnetic bearing of 076° (smaller, more manoeuvrable aircraft would fly on a bearing of 070°), whilst descending to 3,000 ft amsl, before turning left on to the final

[1] EUROCONTROL Guidelines for Assessing the Potential Impact of Wind Turbines on Surveillance Sensors, September 2014, ISBN number: 978-2-87497-043-6

approach. As the maximum blade tip height of the development is anticipated to be no higher than 1,375 ft amsl, more than 1,000 ft obstacle clearance exists between aircraft operating on this section of these IFPs and the WTG; therefore, the Wind Farm would not present as a physical obstruction on this downwind section of these IFP.

The aircraft would then start the final descent from 3,000 ft down to the runway when it passes the Final Approach Fix (FAF) for both IFP's. The development area is considered to be in the containment area of the Final Approach Track for each IFP. Consequently, the Wind Farm would present a physical obstruction effect on the Final Approach Tracks of these IFPs.

Runway 06 TOMTO 2A RNAV Standard Departure

On climb-out from the airport, aircraft utilising this departure procedure must be in the climb and no lower than 2,000 ft amsl above the OL (Oscar Lima) Locator beacon that is located on a bearing of 058° and at a distance of 2.8 NM from the Airport. Aircraft would therefore be approximately 625 ft above the maximum height of the proposed Wind Farm at this point and continuing a climb to their en-route cruising altitude. Osprey considers that aircraft would therefore be greater than 3,000 ft when flying above the proposed Wind Farm; consequently, Osprey considers that the Wind Farm would not present as a physical obstruction to aircraft utilising this procedure.

Minimum Sector Altitude

The Wind Farm is within 25 NM from the VOR/DME navigation facility at Shannon Airport. The Wind Farm is located within a 3,400 ft above mean sea level (amsl) MSA sector. Analysis concludes that there is over 1,000 ft between the highest point of the proposed development and the MSA altitude. Therefore, the proposed development will not affect the established Shannon Airport MSA relating to the VOR/DME.

Aviation Obstruction Lighting

The Wind Farm would be considered as an en-route obstacle and therefore the IAA may require the marking and/or lighting of these obstacles in the interest of aviation safety. Specifically, for obstacles outside the aerodrome boundary, the responsibility rests with the IAA and the owners of the structures.

Flight Calibration Systems Ltd ILS Modelling

The analysis regarding the modelling of the site against the ILS at the Airport to demonstrate any potential for effects on the Localiser and the Glidepath elements of the ILS system has been outsourced to Flight Calibration Systems Ltd (FCSL).

The Localiser approach simulation results show insignificant levels of interference at ranges up to 20 NM from the Localiser antenna. In addition, the Glidepath simulation results also predict insignificant levels of interference to the Glidepath guidance signal.

The predicted levels of interference are well within ICAO Cat II ILS limits; FCSL therefore conclude that the proposed Oatfield Wind Farm will not have any effect on the Runway 24 ILS Localiser guidance and Glidepath signals.

Recommendations

The following recommendations should be considered:

Consultation with the IAA and Shannon Airport should include discussions on the following subjects:

- Development of a strategy for implementation of technical mitigation of the Shannon Airport PSR system;
- Details of its consideration of the specific effect of the development on the Woodcock Hill SSR system and the manageability of effects on the system and consideration of the availability of a technical mitigation strategy; and
- Consideration of the anticipated physical obstruction effects on Runway 24 Instrument Approach Procedures.

Consultation with the IAA should also include:

- Detail the conclusions of the ILS Modelling analysis indicating a negligible effect of the proposed development on the Shannon Airport Runway 24 ILS; and
- Discussions regarding IAA WTG lighting requirements.

Table of Contents

Table of Figures

Table of Tables

1 Introduction

This section introduces the background, purpose and scope of this Aviation Impact Assessment for the proposed Oatfield Wind Farm.

1.1 Overview

Brookfield Renewable (Brookfield) is proposing the development of the Oatfield Wind Farm. The development is expected to consist of up to twenty-six wind turbine generators (WTG) of a maximum potential blade tip height of 150 metres (m) above ground level (agl). The site is located approximately 5 kilometres (km) southwest of Broadford, Co Clare, Republic of Ireland.

1.2 Aviation Stakeholder Consultation

In 2008 (and in relation to an unrelated proposed development) another developer requested consent for the construction of a Meteorological Mast within the development area to which the Irish Aviation Authority (IAA) had the following observation [Reference 1]:

- *''We have recently advised at a pre-planning inquiry that we would recommend to the planning authority not to grant permission for wind farm developments at the above site because of potential interference from there to our radar installations operated by Shannon Airport Traffic Control".*

In 2016, a consultation response to Brookfield from the IAA indicated the following [Reference 2]:

- *''This proposed windfarm is directly under the main 24 Approach into Shannon Airport and at its nearest it is 13 km from the 24 Threshold at Shannon. The proposed windfarm would significantly penetrate the approach surface for this runway and would be a significant obstacle and would seriously affect flights into and out of Shannon Airport. It also has the potential to interfere with ILS and radar signals associated with Shannon Airport. The IAA would object again to any development on the proposed site".*

Brookfield have consequently requested that Osprey complete an Aviation Impact Assessment (AIA) for the development and also review the issues raised by the IAA in order to establish validity and to understand whether the effects identified by the IAA would present unmanageable impacts on the IAA and Shannon Airport flight operations.

This AIA references Eurocontrol Guidelines '' How to Assess the Potential Impact of Wind Turbines - Surveillance Sensors'' [Reference 3].

1.3 Background

The effects of WTGs on aviation interests have been widely publicised but the primary concern is one of safety. There are innumerable subtleties in the actual effects; there are two dominant potential objections from aviation stakeholders:

1. Physical Obstruction: WTGs can present a physical obstruction at or close to an aerodrome or in the military Low Flying environment; and
2. Radar/Air Traffic Services: WTG clutter appearing on radar display can affect the safe provision of air traffic services as it can mask unidentified aircraft from the air traffic controller and/or prevent him from accurately identifying aircraft under control. In some cases, radar reflections from the turbines can affect the performance of the radar system itself.

1.4 Purpose and Scope

The purpose of this AIA is to identify any effects of the proposed Wind Farm, which could potentially present a physical obstruction to aviation, including aviation operations at Shannon Airport. Osprey uses a number of resources, including IAA Aeronautical Charts and the Irish Integrated Aeronautical Information Package (IIAIP) [Reference 4], and begins with the consultation zones for various airfield types in accordance with the IAA guidance documents Aerodrome Licensing Manual [Reference 5] and Licensing Requirements for Private Aerodromes [Reference 6].

This AIA considers the impact of the WTGs once they are fully installed and operational. Osprey recommends that the Developer consider the following information when assessing the safety of any installation, construction or decommissioning phases with respect to aviation interests.

Tall slender constructions such as WTGs, despite their size, can be difficult to see from the air in certain weather conditions. The IAA, through Statutory Instrument (SI) publications has issued guidance: S.I 215 Obstacles to Aircraft in Flight [Reference 7] and S.I 423 En-route Obstacles to Air Navigation [Reference 8], which recommends that to facilitate safe visual flight, day or night, in the vicinity of obstacles:

- Appropriate information about the construction and any associated lighting (where applicable) should be promulgated in the IIAIP [Reference 4] and applicable aviation publications, with notification at least 30 days prior to obstacle construction.
    - Data should include location, height, date of erection, date of removal and lighting type (none, infra-red or lighting brightness); and
    - Local aerodromes identified during consultation (typically with a 10 km radius) should be notified, particularly any police helicopter or air ambulance unit.

1.4.1 Instrument Landing System Modelling

IAA consultation has indicated that the proposed site also has the potential to infringe the safeguarded area of the Instrument Landing System (ILS) in operation at Shannon Airport and interfere with radio beams emanating from the system. This individual work stream will be outsourced to Flight Calibration Systems Ltd (FCSL)

to conduct the modelling to demonstrate any potential for effects on the Localiser and the Glidepath elements of the ILS system. This work stream has been completed at Brookfield's request [Reference 16]. A summary of the conclusions reached within the ILS modelling analysis is provided in Section 8.

1.5 Document Structure

The report utilises the following structure:

- Section 1 (this section) introduces the report;
- Section 2 introduces the Oatfield Wind Farm and its parameters;
- Section 3 provides a summary of the Shannon Airport radar line of sight (LOS) analysis;
- Section 4 outline of Shannon Airport, its established Controlled Airspace (CAS) in support of flight operations;
- Section 5 provides a high-level outline of the technical mitigation options that would be available for the Shannon Airport PSR system;
- Section 6 provides conclusions from the analysis the potential for the development to breach the established OLS Shannon Airport;
- Section 7 provides analysis and conclusions regarding the potential for the development to affect flight operations at Shannon Airport; and
- Section 8 provides a summary of the conclusions reached by FCSL relating to the effect of the proposed development on the Shannon Airport ILS;
- Section 9 details the references used throughout the analysis.

2 Oatfield Wind Farm

This section provides an indicative overview of the parameters of the proposed Oatfield Wind Farm.

2.1 Overview

Brookfield is proposing the development of the Oatfield Wind Farm. The development is expected to consist of up to twenty-six WTGs of a maximum blade tip height of 150 m agl.

2.2 Radar Footprint

The physical size of the Oatfield Wind Farm on the ground is approximately 2.6 km (north to south) by 7.9 km (east to west). Assuming a nominally accepted 100 m wide[2] margin for unwanted radar returns either side of a single turbine, the potential size of the Wind Farm footprint as represented on a typical PSR display system is approximately 2.8 km by 8.1 km. Therefore, the radar footprint would equal an approximate total area of 22.68 km^2 (6.55 Nautical Miles (NM)^2).

[2] This is an estimate; the size of the clutter will depend on range and the specific operating parameters of the radar (e.g. range-azimuth cell size) i.e. the clutter could appear larger at a greater range from the radar.

The individual turbine coordinates and Above Ordnance Datum (AOD) of the proposed Oatfield WTGs are provided in Table 1.

Turbine Reference	Easting	Northing	AOD (m)	Turbine Reference	Easting	Northing	AOD (m)
1	151354.354	168746.2393	230	**14**	156158.3618	170130.1792	220
2	151822.006	168988.995	240	**15**	156263.5339	169542.1416	227
3	152335.2987	168949.3074	268	**16**	156320.4194	170634.2115	212
4	152800.9663	168748.2236	238	**17**	156675.6232	171534.4581	130
5	153912.2185	168536.5566	210	**18**	156836.7653	170984.4536	200
6	154351.4277	168822.3071	212	**19**	156887.0362	170449.9942	182
7	154208.5524	169298.5581	240	**20**	157016.6823	169783.2429	161
8	153711.1348	168986.3491	243	**21**	157024.6198	169248.7835	160
9	154548.7659	170166.2949	255	**22**	156590.7023	168963.0329	178
10	154738.8694	169675.3596	239	**23**	158228.4764	169785.8887	196
11	155180.7244	169944.5736	269	**24**	158720.6024	169979.0349	172
12	155324.2612	169420.433	250	**25**	159159.8116	169672.1177	168
13	155694.0171	169849.0589	261	**26**	158942.8528	169201.1584	189

Table 1 Oatfield Wind Farm Indicative Turbine Coordinates and AOD

3 Radar Line of Sight Analysis

This section presents the results of the Osprey Radar Line of Sight (LOS) Analysis.

3.1 Caveat on Radar Line of Sight Analysis

Osprey used the ATDI ICS LT (Version 3.9.92) tool to model the terrain elevation profile between the Shannon Airport Primary Surveillance Radar (PSR) system and the proposed Oatfield development. Otherwise known as a point-to-point Line of Sight (LOS) analysis, the result is a graphical representation of the intervening terrain and the direct signal LOS (taking into account earth curvature and radar signal properties).

This is a limited and theoretical desk based study; in reality there are unpredictable levels of signal diffraction and attenuation within a given radar environment that can influence the probability of a turbine being detected. Our analysis is designed to give an indication of the likelihood of the turbines being detected such that the operational significance of the Oatfield Wind Farm relative to the PSR can be assessed. A LOS analysis was undertaken from the Shannon Airport PSR system to the WTG's at the blade tip height of 150 m and 125 m agl.

The qualitative definitions utilised in our LOS assessment are defined in Table 2.

Result	Definition
Yes	the turbine is highly likely to be detected by the radar: direct LOS exists between the radar and the turbine
Likely	the turbine is likely to be detected by the radar at least intermittently
Unlikely	the turbine is unlikely to be detected by the radar but cannot rule out occasional detection
No	the turbine is unlikely to be detected by the radar as significant intervening terrain exists

Table 2 Qualitative Definitions of LOS results

3.2 Shannon Airport PSR System LOS Analysis

3.2.1 150 m Blade tip height WTG

Figure 1 presents the radar LOS terrain elevation profile between the Shannon Airport PSR (left of the diagram) and the blade tip height of 150 m agl for WTG 11 (T11) of the proposed Oatfield layout (right of the diagram). The straight light blue line is the direct line of sight (which takes into account earth curvature). The darker

blue ellipse around this straight line is the 1st Fresnel Zone – this is a zone around the direct line of sight where the signal remains strong and Osprey takes into consideration the degree of terrain intrusion into this zone when assessing line of sight. The red and green curved lines on the upper part of the graph are not relevant to this type of assessment.

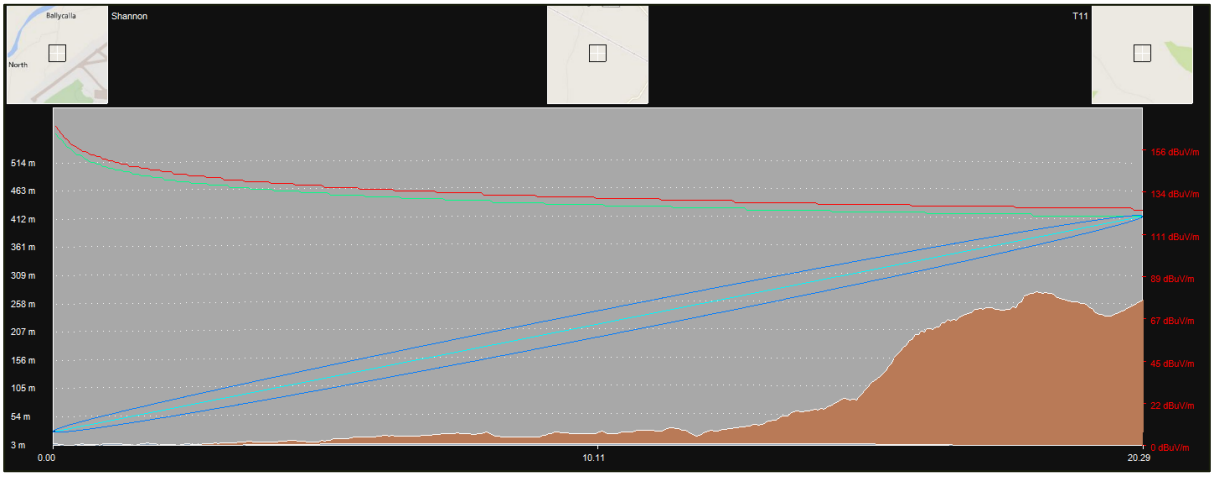


Figure 1 Terrain Elevation Profile – Shannon Airport PSR to Oatfield T6 at 150 m

Figure 1 indicates that Oatfield T11 at a 150 m blade tip height the WTG is **highly likely** to be detected by the radar: direct line of sight exists between the radar and the turbine. The result is indicative of the results of LOS assessments for the majority of the proposed WTG locations.

The results of the LOS analysis at the proposed 150 m agl blade tip height are contained in Table 3.

Turbine Reference	LOS Result	Turbine Reference	LOS Result	Turbine Reference	LOS Result
1	Yes	10	Yes	19	Yes
2	Yes	11	Yes	20	Yes
3	Yes	12	Yes	21	Yes
4	Yes	13	Yes	22	Yes
5	Yes	14	Yes	23	Yes
6	Yes	15	Yes	24	Yes
7	Yes	16	Yes	25	Yes
8	Yes	17	No	26	Yes
9	Yes	18	Yes		

Table 3 Oatfield Radar LOS Analysis Results for Shannon Airport PSR at 150 m

As shown in Table 3, barring T17, the other Oatfield WTG's are considered theoretically detectable by the Shannon PSR system and would present an area of clutter of a size of approximately 22.68 km² (6.55 NM²) on Air Traffic Control (ATC) radar display systems and desensitise the radar at the location of the Wind Farm. Osprey considers that the peak of Knockaphunta blocks the radar signal between the radar and T17.

3.2.2 125 m Blade tip Height WTG

Analysis of the proposed Oatfield Wind Farm was also completed for WTG at a blade tip height of 125 m agl. The results of the LOS analysis at this height are contained in Table 4.

Turbine Reference	LOS Result	Turbine Reference	LOS Result	Turbine Reference	LOS Result
1	Yes	10	Yes	19	Likely
2	Yes	11	Yes	20	Yes
3	Yes	12	Yes	21	Yes
4	Yes	13	Yes	22	Yes
5	Yes	14	Yes	23	Yes
6	Yes	15	Yes	24	Yes
7	Yes	16	Yes	25	Yes
8	Yes	17	No	26	Yes
9	Yes	18	Unlikely		

Table 4 Oatfield Radar LOS Analysis Results for Shannon Airport PSR at 125 m

As shown in Table 4, the conclusions indicate that the majority of the proposed WTG at a 125 m agl blade tip height would be theoretically detectable by the Shannon Airport PSR system. T17, T18 and T19 to various degrees benefit from some terrain shielding from the peak of Knockaphunta.

3.3 Woodcock Hill Secondary Surveillance Radar

As Secondary Surveillance Radar (SSR) relies on signals received from a transponder on-board an aircraft, clutter is not generated by turbines. The effects can manifest as 2D aircraft positional inaccuracies or false/duplicate targets. The Woodcock Hill SSR is a Thales manufactured RSM970S CIRIUS Mode S SSR system.

Figure 2 presents the radar LOS terrain elevation profile between the Woodcock Hill SSR (left of the diagram) and the blade tip height of 150 m agl for WTG 12 (T12) of the proposed Oatfield layout (right of the diagram).

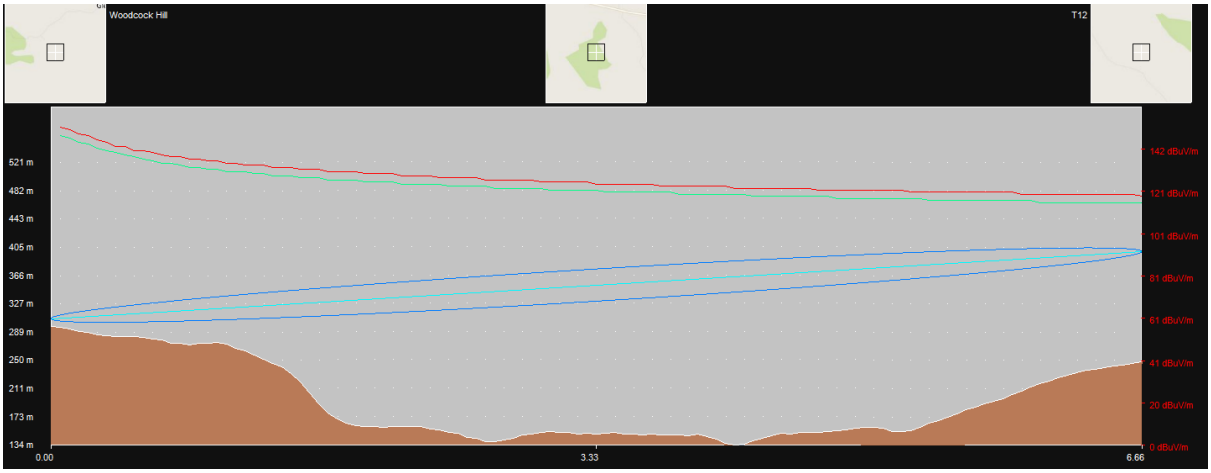


Figure 2 Terrain Elevation Profile – Woodcock Hill SSR to Oatfield T12 at 150 m

Figure 2 indicates that Oatfield T12 at a 150 m blade tip height the WTG is theoretically within line of sight of the radar: direct line of sight exists between the radar and the turbine. The result is indicative of the results of LOS assessments for all of the proposed WTG locations.

The effects on SSR by WTG are due to the physical blanking and diffracting effects of the turbine towers. Eurocontrol guidance states that WTG may have an effect at close range to an SSR facility advises that effects are manageable beyond a specified range from the SSR i.e. WTGs located within 16 km of the SSR require assessment) [Reference 3]. The proposed development, at its closest point, is approximately 5.3 km from the Woodcock Hill SSR facility. In accordance with Eurocontrol guidance, the proposed development is within safeguarding Zone 2 (500 m - 16 km) requiring detailed assessment.

The proposed development is inside the range at which effects on the SSR require assessment, and the results of the LOS analysis indicate that all proposed Oatfield WTG are theoretically in line of sight to the Woodcock Hill SSR facility. The development is highly likely to have an effect on the system. Consultation with the IAA should include its consideration of the effect of the development on the Woodcock Hill SSR system and an understanding on the availability of a technical mitigation strategy.

4 Shannon Airport Airspace and Flight Operations

This Section provides a brief outline of Shannon Airport, its established Controlled Airspace (CAS) in support of flight operations.

4.1 Overview

Shannon Airport was opened in 1945 and is located on the north bank of the Shannon estuary in County Clare on the west coast of Ireland, approximately 20 km west-northwest of the city of Limerick. The operator of the airport is the Shannon Airport Authority Ltd and major passenger service operations include those of Aer Lingus, Aer Lingus Regional, Delta Air Lines, Ryanair, Travel Choice and United Airlines.

4.2 Airspace

Shannon Airport is a licenced aerodrome with a main runway length of 3,199 m that is orientated southwest/northeast. The runways are designated 06/24 (magnetic bearings – 052.22°/232.22°).

The Airport is located within its surrounding Control Zone (CTR) of radius 15 nautical miles (NM) centred on the Aerodrome Reference Point (ARP) that has a vertical extent from the surface up to 5,000 feet (ft) above mean sea level (amsl). In addition, above the CTR and with the same lateral dimension, a Control Area (CTA) is established from 5,000 ft amsl up to Flight Level (FL) 245 (approximately 24,500 ft). The CTR and CTA are designated as Class C Controlled Airspace (CAS) established to provide protection to aircraft operating into and out of the Airport.

Figure 3 below shows the published extent of the established CAS at Shannon Airport.

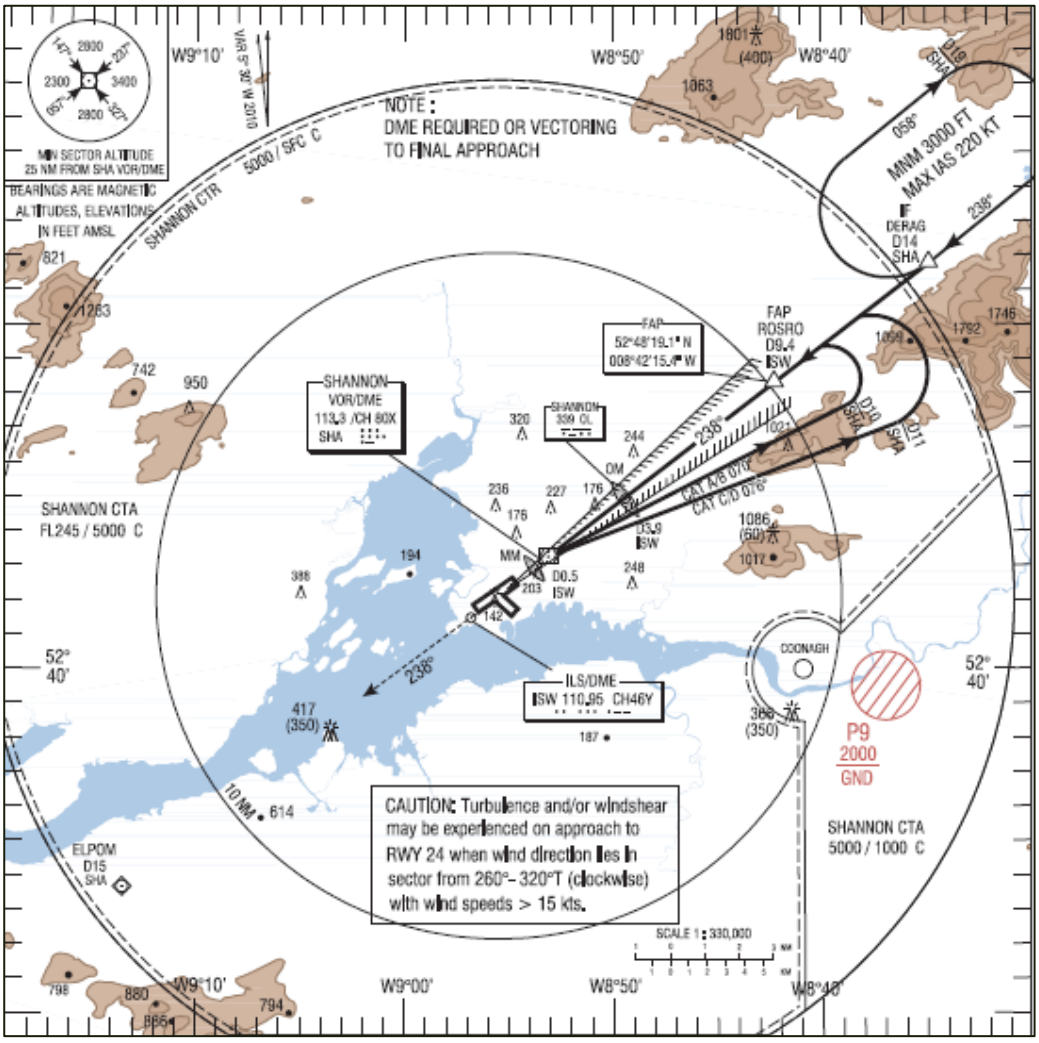


Figure 3 Shannon Airport Established Controlled Airspace

Note: The Shannon CTR has a small sector to the southeast of the Airport that has a base altitude of 1,000 ft amsl.

4.3 Operational Effects Analysis of PSR Detectability of WTGs

As current generation PSR systems cannot distinguish between returns from WTG's (unwanted returns, or 'clutter') and those from aircraft, the air traffic controller is required to assume that actual aircraft targets could be lost over the location of a wind farm, and identification of aircraft under control could be lost or confused.

PSR relies on reflected electromagnetic radiation, and does not require any cooperation by the target under surveillance. The radar sends out a signal, times how long it takes the signal to reflect back, and calculates the distance of an object from the radar.

The amount of energy that an object reflects is related to the object's Radar Cross Section (RCS). In terms of WTGs, generally, the larger a turbine is, the larger its RCS

will be, which will result in more reflected energy and an increased chance of it creating unwanted returns (non-aircraft), known as 'clutter'. This issue is compounded by increasing numbers of WTGs that cause a cumulative effect of greater areas and densities of clutter. Generalised effects on PSR systems are as follows:

- Twinkling appearance/blade flash effect;
- Masking of true aircraft targets by increased clutter on display;
- Increase in unwanted targets or false aircraft tracks;
- Receiver saturation;
- Receiver desensitisation causing loss of targets that are of a small RCS;
- Loss of targets due to Adaptive Moving Target Indication (AMTI) techniques;
- Shadowing behind the turbines caused by physical obstruction (blocking of radar transmitted signal);
- Degradation of tracking capabilities; and
- Degradation of target processing capability.

As a consequence, Shannon Airport ATC would be highly likely to experience loss of radar contact with aircraft that transit above, or in proximity to the expected radar clutter that would be associated with, the Oatfield Wind Farm.

5 PSR Generic Technical Mitigation Capability

This Section provides a high-level outline of the technical mitigation options that would be available for Shannon Airport.

5.1 Overview

There is currently intense activity by a number of potential mitigation providers, and radar manufacturers, to bring solutions to the UK market, and many of these will deliver not only in demonstration programmes, but also in integration into real-time ATC environments within the next 12 to 18 months. There are a number of mitigation options available for the effects of Wind Energy developments on the Shannon Airport PSR system, all at varying degrees of maturity, complexity and cost. They are:

- Radar Blanking;
- Radar Blanking with Blocking Infill;
- Radar Display Enhancements (including manipulation of radar or display data to remove unwanted returns;
- Upgrade of the current PSR system;
- Total replacement of a PSR system; and
- Integration of a supplementary PSR source into the existing surveillance system (Resolution Infill).

5.2 Radar Blanking

This type of mitigation option would involve applying a software update to the Shannon PSR, which effectively places a 'patch' over a wind farm preventing any radar returns from originating from within the blanked area on the display screen. This method removes wind farm clutter from ATC radar displays in the blanked area; however, and more importantly, it also removes any PSR aircraft returns in the blanked areas from the radar display.

This mitigation option has a limited application, as reducing the effectiveness of radar coverage in any particular area may render the radar unusable due to the cumulative effect of introducing multiple blanked areas in close proximity to each other and specifically in areas where aircraft routinely operate. Consequently, radar blanking is not generally considered as a viable mitigation option in the aerodrome/airport environment, other than non-operationally critical airspace.

5.3 Radar Blanking with Blocking Infill

Blocking infill uses an additional alternative PSR sensor, located remotely from the effected PSR. This strategy uses 'terrain shielding' such that the remote sensor

cannot see the wind farm due to intervening terrain providing a 'Blocking Point' and hence can provide clutter-free returns from the area above the Wind Farm. This clutter free data can then be used to replace the area affected by wind farm clutter on the affected ATC radar display system ('Cut and Paste').

The mitigation would most likely be dependent on a third party system providing radar data. It is considered that there are no other PSR systems in the area that would provide a low enough base of coverage to support Shannon Airport flight operations above development area.

5.4 Radar Display Enhancements

These technologies can be either software or hardware enhancements that utilise processing techniques to block identified (wind farm) clutter from being presented on ATC radar displays:

- Non Automatic Initiation Zones (NAIZ): A NAIZ can be implemented as a software function that would prevent the radar from automatically creating tracks from any targets that originate within the confines of the NAIZ. In creating an NAIZ around a wind farm, none of the turbine-generated returns are processed, thereby significantly reducing the possibility of false tracks. Tracks that have been formed from returns originating outside the NAIZ would still be tracked if it enters the defined NAIZ (e.g. an aircraft transiting over the NAIZ area).
    - London Southend Airport has employed a NAIZ as an expedient interim measure in mitigation of a wind farm adjacent to the approach/departure at the airport.
- The Thales Star 2000 PSR system in operation at the Airport may have the capability to include this mitigation over defined areas. Discussions with the manufacturer and the Airport authority are key to confirming this capability.
- Thruput Midas System: This system is a hardware-based solution designed to distinguish aircraft targets from known WTG generated (clutter) returns, and is reported as being able to remove this WTG clutter from ATC displays.

5.5 Upgrade of the Current PSR System

Thales, the manufacturer of the existing PSR at Shannon, announced the launch of a new PSR system at the Paris Air Show in June 2015, the 'STAR NG'. Of significant note is that the STAR NG is reported to provide increased mitigation (resilience) of wind farm effects [Reference 9].

Indications are that STAR NG technology can be utilised to upgrade legacy PSR systems such as the STAR 2000 system currently employed at Shannon Airport [Reference 10]. Further evaluation of this specific capability and its applicability to the STAR 2000 system in operation at Shannon is yet to be determined.

5.6 Total Replacement of the PSR System

The use of new radar systems, specifically designed to mitigate the effects of WTGs on ATC radars, has been considered by some airports across the UK in wind farm mitigation procurement activities during 2015/16. If any new system proved capable of meeting both regulatory requirements and the local Operational

Requirement (OR) at Shannon, and available within economic constraints, then this may be considered a viable option. Candidates for a total replacement of the PSR system would include:

- Terma Scanter 4002: An X-band radar that is used as an air surveillance radar with the benefit of providing inter-turbine visibility and the ability to track aircraft inside and around wind farms. Trial data has shown that the system was able to detect and track a variety of aircraft with a track probability of 98% above a wind farm area and 99% outside of a wind farm area.
    - Edinburgh Airport is in a process of implementing this system as technical mitigation for multiple wind farms that are, and will be operating within their Area of Operation (AOR) regarding provision of Air Traffic Services (ATS) to aircraft. UK National Air Traffic Services (NATS) have announced encouraging results from a trial of the system[3]. Initial results indicating that the system was *"not only capable of mitigating the effects of wind turbines, but could also detect aircraft through wind farm locations, even at ranges beyond 40 NM".*
- Cassidian ASR NG: This PSR system, developed by Airbus Defence & Space, is reported to include developed algorithm technology that allows for safe guidance of aircraft near WTGs [Reference 11].
- BAE Systems Watchman PSR: BAE Systems has developed an upgrade to its benchmark Watchman PSR system, providing a wind farm resilient signal processor designed to replace the current signal processor in the Watchman PSR in operation.
- Raytheon ASR-10SS: This capability was designed as a technical solution for mitigating the effects through a combination of software and hardware solutions similar to the Project Raytheon Modification (Project RM) mitigation capability utilised by NATS in the UK on their long range radar systems (Great Dun Fell and Lowther Hill).
    - Raytheon have delivered ASR-10SS wind farm mitigation technology to a Dutch Military Airfield. High-detection probability and low false alarm rate leading to the effects of wind farms on operations being successfully mitigated [Reference 12].

5.7 Integration of a Supplementary PSR Source – Resolution Infill

The principle behind 'Resolution Infill' is that the sensor will be capable of resolving targets (clutter) from WTGs, thus not presenting the unwanted 'clutter' returns emanating from these structures onto a PSR display. However, the OR of the Safeguarding Process at Shannon Airport might preclude a resolution infill capable of replacing the Airport PSR entirely, due to limitations on range or perhaps other technical or commercial aspects. Integration will be required with the existing surveillance system to provide the controllers with a 'cleaned' picture that is free from the unwanted returns and other detrimental effects that may be presented by WTGs.

[3] NATS Media Centre new airport radar to mitigate impact of wind turbines. http://www.nats.aero/news/new-airport-radar-mitigate-impact-wind-turbines/

Resolution Infill candidates are as follows:

- Aveillant Holographic Radar™: This is a 3D radar, providing altitude as well as range and azimuth information. Initially developed as a short-range sensor to be located within the wind farm, the technology has advanced and a 40 NM range radar is currently undergoing development.
    - In Q2 2015, Aveillant delivered the world's first 3D holographic radar unit at a two-turbine Severn Trent Water wind project near Derby, England. The system has a range of 5 NM and was designed to deliver clutter free coverage on ATC radar display systems at nearby East Midlands Airport.
    - A major UK airport in the northwest of England is also delivering an Aveillant system solution as a technical mitigation for a large wind farm located to the south of the Airport.
- C Speed LightWave Radar: LightWave is a PSR system designed to provide in fill data to existing systems. In its High Pulse Repetition Frequency (PRF) configuration it is reported as capable of mitigating the radar clutter effects produced by WTGs.
- Terma Scanter 4002: In addition to its potential to be utilised as a standalone PSR system, data can be used as infill in areas of turbine clutter.
    - Edinburgh Airport are understood to be utilising their procured Terma system to infill data into existing ATC radar display systems.

6 Obstacle Limitation Surfaces

This Section outlines the generic Obstacle Limitation Surfaces (OLS) that are established at a major airport and analyses the potential for the development to breach the established OLS Shannon Airport.

6.1 Overview

The proposed Wind Farm is near the Obstacle Limitation Surfaces (OLS) established in support of flight operations at Shannon Airport and as such, Osprey has completed an analysis in regard to the OLS applicable to the Airport, to ascertain whether the proposed WTGs would be within the lateral confines of, and present a breach of the Airport OLS.

Obstacles inside and outside an aerodrome boundary can affect flight operations, including take-off and landing, and procedures designed to facilitate these activities at an aerodrome. Regulatory guidance states that certain areas of local airspace close to an airport are defined to assess the significance of existing or proposed obstacles near an aerodrome; these are OLS. The OLS are determined according to the classification of the aerodrome and its runway length. The IAA issues regulatory guidance on how aerodromes should manage operations in relation to obstacles and the licensing of an aerodrome depends on the extent to which these areas are free from current or new obstacles. The guidance is contained within Reference 2.

6.2 Shannon Airport OLS

Aerodromes are required to define a number of complex OLS that are particular in most cases to the main runway, its length and intended use. The safeguarded areas are represented by a number of 2-D planes and 3-D shapes around the airport, which describe the limits of any obstacles in the aerodrome vicinity. The absence of obstacles within these areas contributes to the safety of both visual and instrument based flight operations near the airport.

The dimensions of the OLS at any aerodrome are determined by the aerodrome reference code. This code is determined by the IAA in consultation with the aerodrome and is made up of two elements: a code number and a code letter. In calculating dimensions of the OLS, the code number is the primary reference.

The aerodrome reference code is assigned based on the Take-Off Distance Available (TODA) and Accelerate Stop Distance Available (ASDA) of an aerodrome's longest runway, as detailed in the IAA Aerodrome Licensing Manual [Reference 5]. For runways 06/24, that have a TODA of 3,260 m, the assumed aerodrome reference code at Shannon Airport is a code of 4 (instrument).

The lateral constraints for the Code 4 runway at Shannon Airport are provided in Table 5.

OLS	Lateral Extension (m)	Measurement Reference
Take-Off Climb Surfaces (TOCS)	15,000	Clearway or 60 m from end of take-off run
Approach Surfaces	15,000	60 m before the landing threshold
Inner Horizontal Surface	4,000	Runway Strip-ends
Conical Surface	2,100	Inner Horizontal Surface Outer Edge
Outer Horizontal Surface	15,000	Aerodrome Reference Point

Table 5 Shannon Airport Obstacle Limitation Surfaces

The proposed Wind Farm at its closest point (WTG 1), is located at a distance of 15.57 km from the Shannon Airport ARP. The relative location of the Wind Farm to the established Shannon Airport OLS is shown below in Figure 4.

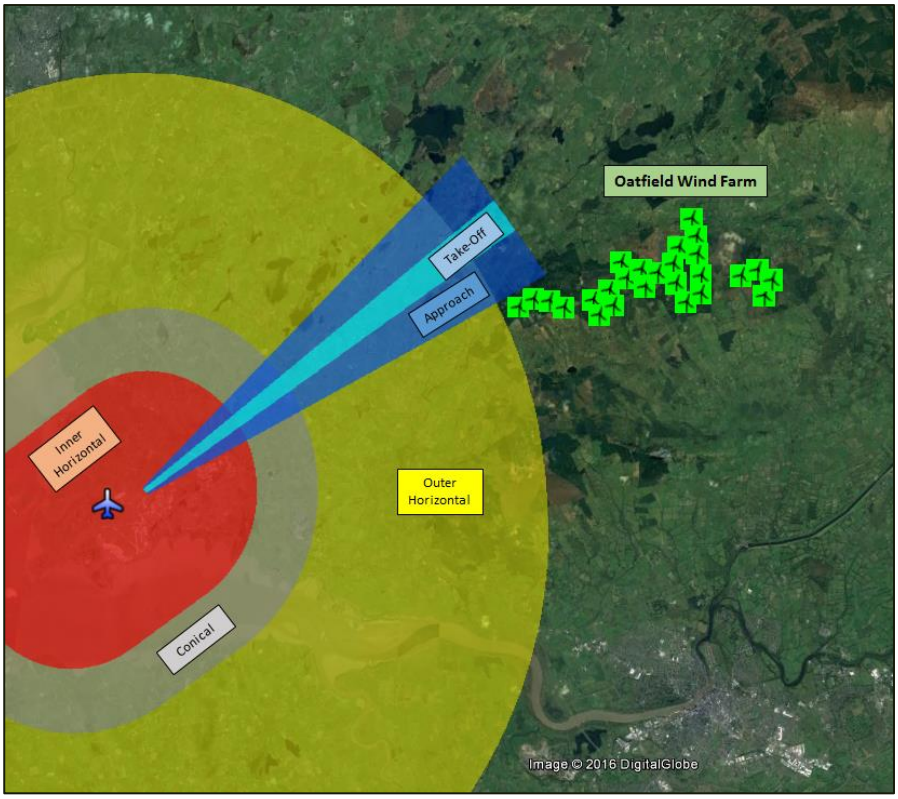


Image © 2016 Google, Digital Globe

Figure 4 Oatfield Wind Farm in relation to Shannon Airport OLS (not to scale)

Osprey considered that the defining OLS, due to the proximity of the development Wind Farm, were the Outer Horizontal Surface (OHS) and the Approach Surface.

6.2.1 Outer Horizontal Surface

The OHS is a specified portion of a horizontal plane around an aerodrome beyond the limits of the conical surface. It represents the level above which consideration needs to be given to the control of new obstacles in order to facilitate practicable and efficient instrument approach procedures, and together with the conical and inner horizontal surfaces to ensure safe visual manoeuvring near an aerodrome [Reference 2].

Analysis of the Wind Farm in relation to the established OHS indicated that the closest WTG (Turbine 1) was located approximately 570 m outside the lateral extent of the surface. Consequently, the proposed Wind Farm will not breach the Airport OHS.

6.2.2 Approach Surface

The Approach Surface is an inclined plane or combination of planes preceding the threshold, and is established for each runway direction intended to be used for the landing of aircraft.

Analysis of the Wind Farm in relation to the established Approach Surface for Runway 24 at the Airport indicated that the closest WTGs (Turbines 1 and 2) were located approximately 334 m and 340 m respectively outside the lateral extent of the surface. Consequently, the proposed Wind Farm will not breach the Runway 24 Approach Surface.

Figure 5 provides a more detailed close-up diagram of the Wind Farm in relation to the Shannon Airport OHS and Approach Surfaces.

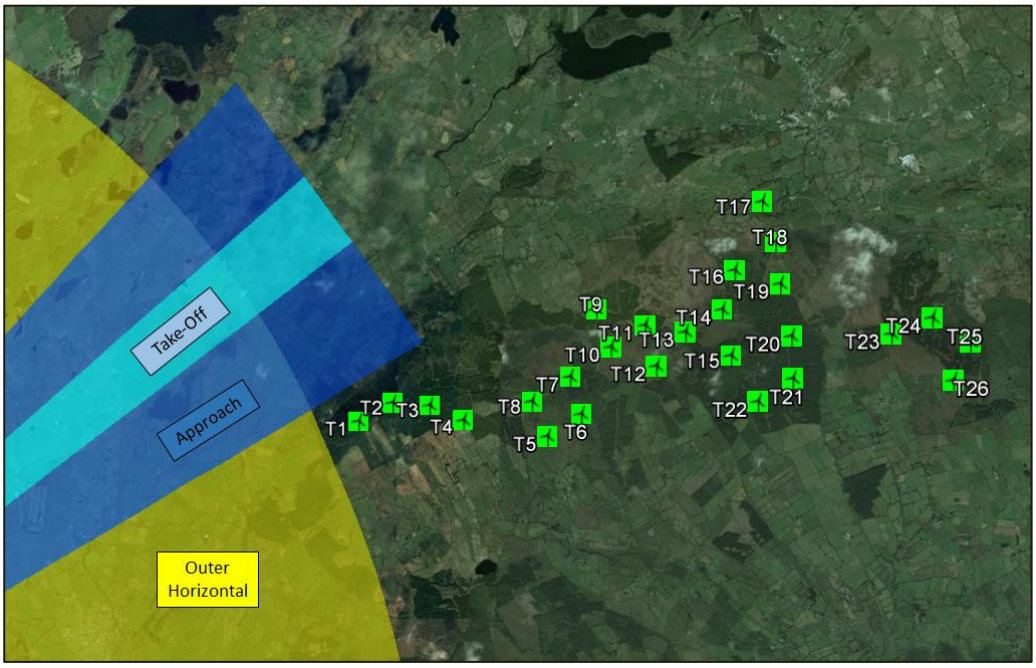


Figure 5 Close-up of Oatfield Wind Farm in relation to Shannon OLS (not to scale)

7 Instrument Flight Operations Analysis

This section provides analysis and conclusions regarding the potential for the development to affect flight operations at Shannon Airport.

7.1 Instrument Flight Procedures

Instrument Flight Procedures (IFP) are in place at airports to describe the standard routes for aircraft to follow on approach to and departure from the airport. The procedures, protected by 'containment' volumes, allow aircraft to accurately line up (in 3-Dimensions) with the runway and descend safely and to allow aircraft to depart the airport on prescribed routes that allow them to integrate into the en-route structure.

Wind energy developments can present a physical obstruction to the containment areas for IFPs. The IAA issues regulatory guidance on how aerodromes should manage operations in relation to obstacles and the licensing of an aerodrome depends on the extent to which these areas are free from current or new obstacles. Obstacle clearance is a primary safety consideration in developing IFPs, and because of variable factors such as terrain, aircraft characteristics and pilot ability, the detailed procedures are based on present standard equipment and practices.

Shannon Airport has a responsibility to safeguard their operations to the dimensions detailed in International Civil Aviation Organisation (ICAO) Document 8168 [Reference 13]. This document is an international document that details the criteria for building flight procedures in terms of aircraft and equipment performance, safety performance and obstacle safeguarding. Should the wind farm fall within IFP obstacle containment areas, adjustment of the existing procedures or the development of alternative procedures would be required.

Shannon Airport has a number of published IFPs established for aircraft on departure from and arrival to the airport. The following arrival and departure procedures, are potentially affected by the proposed development:

- Runway 24: Instrument Landing System (ILS) or Localiser (LLZ) Category (CAT) I or II Approach;
- Runway 24: VHF Omni-Range (VOR) Approach; and
- Runway 06: TOMTO 2A Area Navigation (RNAV) Standard Departure.

The Wind Farm has the potential to fall within the obstacle containment area that would be designed to safeguard these IFPs from physical obstructions. Such procedures require a minimum obstacle clearance of 1,000 ft above physical obstructions.

7.1.1 Runway 24 ILS (or LLZ) Approach Analysis

Figure 6~~Figure 6~~ shows an extract from a chart depicting the Runway 24 ILS (or Localiser (LLZ)) CAT I or II Approach Procedure. The figure shows the approximate location of the Wind Farm (red outlined shape).

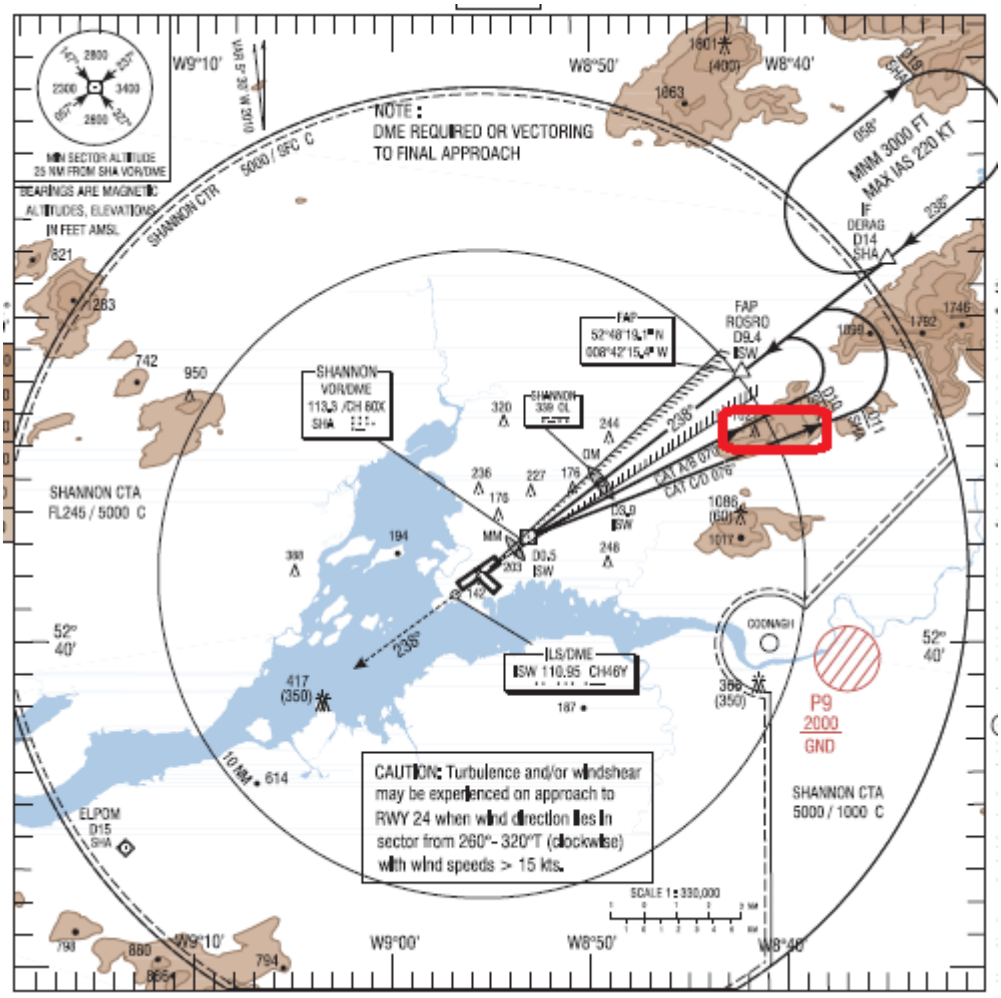


Figure 6 Runway 24 ILS Approach procedure showing approximate Oatfield Development Area (red outline)

This procedure involves an aircraft overflight of the Shannon VOR/DME beacon located 1 NM to the northeast of the airport at the Minimum Sector Altitude of 3,400 ft amsl. The aircraft would then fly outbound from the beacon on a magnetic bearing of 076° (smaller, more manoeuvrable aircraft would fly on a bearing of 070°), whilst descending to 3,000 ft amsl, before turning left on to the final approach. As the maximum blade tip height of the development is anticipated to be no higher than 1,375 ft amsl (Blade tip height of 150 m + maximum AOD of 269 m (T11)), more than 1,000 ft obstacle clearance exists between aircraft operating on the IFP and the WTG. Consequently, the Wind Farm would not present a physical obstruction effect on this downwind section of the IFP.

On passing the Final Approach Fix (FAF in Figure 6~~Figure 6~~), an aircraft would commence the descent from 3,000 ft amsl toward the runway; an aircraft would then pass abeam the WTGs. A number of the proposed WTG are located within the secondary containment area of the Final Approach Track of this IFP; consequently, the WTG would present a physical obstruction effect on this IFP.

7.1.2 Runway 24 VOR Approach Analysis

Figure 7~~Figure 7~~ below shows an extract from a chart depicting the Runway 24 VOR Approach Procedure. The figure also shows the approximate location of the Wind Farm (red outlined shape).

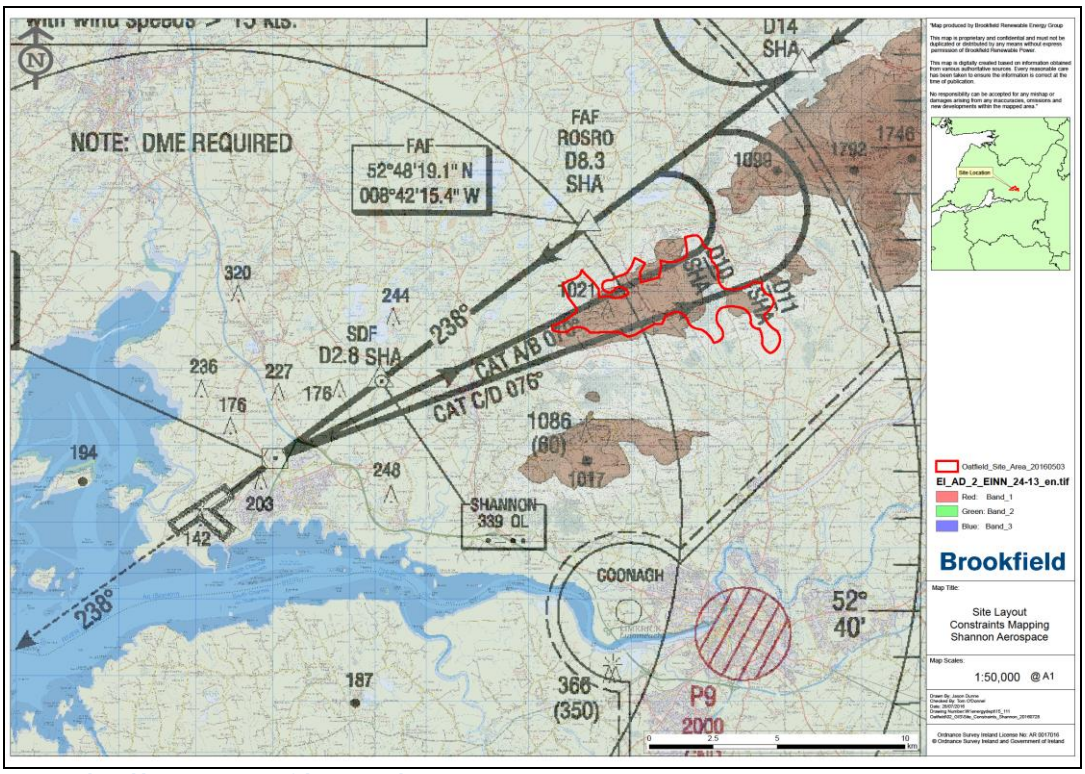


Figure 7 Runway 24 VOR Approach Procedure showing Oatfield Development Area (red outline)

As concluded with the Runway 24 ILS Procedure, the Wind Farm would not present a physical obstruction effect on the downwind section of the IFP. On passing the Final Approach Fix, an aircraft would commence the descent from 3,000 ft amsl toward the runway. The initial descent profile is for aircraft to descend to be no lower than 1,290 ft amsl until passing the point 'SDF'. During this section of the approach, aircraft would then pass abeam the WTG; similarly, the WTG would present a physical obstruction effect on this IFP. On passing 'SDF' aircraft would then continue descent toward the runway.

7.1.3 Runway 06 TOMTO 2A (RNAV) Standard Departure Analysis

Figure 8~~Figure 8~~ below shows an extract from a chart depicting the TOMTO 2A RNAV Departure. The figure also shows the approximate location of the Wind Farm (red outlined shape).

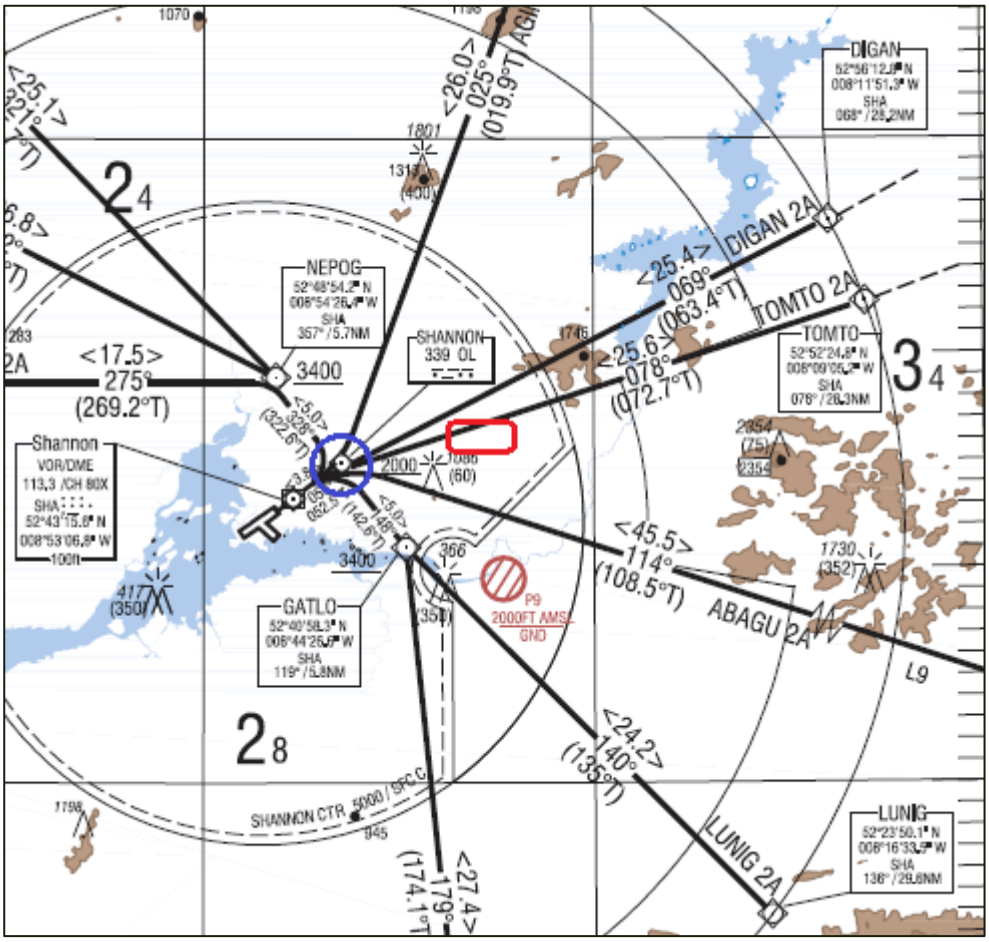


Figure 8 Runway 06 TOMTO 2A RNAV Standard Departure showing approximate Oatfield Development Area (red outline)

On climb-out from the airport, aircraft utilising this departure procedure must be in the climb and no lower than 2,000 ft amsl above the OL (Oscar Lima) Locator beacon that is located on a bearing of 058° and at a distance of 2.8 NM from the Airport (OL location circled in blue in Figure 8~~Figure 8~~). An aircraft would therefore be approximately 625 ft above the maximum height of the Wind Farm at this point and continuing a climb to their en-route cruising altitude. Osprey considers that aircraft would therefore be greater than 3,000 ft in altitude when flying above the Wind Farm; consequently, Osprey considers that the Wind Farm would not present as a physical obstruction to aircraft utilising this procedure.

7.2 Minimum Sector Altitude

The Minimum Sector Altitude (MSA) is the lowest altitude which ATC may descend aircraft, without visual contact with the ground, thus providing a minimum clearance of 1,000 ft above all known objects/obstacles located in the area contained within a sector of a circle of 46 km (25 NM) radius centred on a significant radio aid to navigation. The MSA is not constant in every direction and many sectors are created

in order to set appropriate altitudes in all directions surrounding the navigation facility.

Shannon Airport has a number of IFPs established which allow aircraft operating under Instrument Flight Rules (IFR) to use the Airport in poor weather conditions without the provision of support from radar.

The Wind Farm is within 25 NM from the VOR/Distance Measuring Equipment (DME) navigation facility at Shannon Airport. The Wind Farm is located within a MSA sector that is 3,400 ft above mean sea level (amsl).

The maximum anticipated blade tip height within the Wind Farm is no higher than 1,375 ft (419 m) (amsl); consequently, there is over 1,000 ft between the highest point of the proposed development and the MSA altitude. Therefore, the proposed development will not affect the established Shannon Airport MSA relating to the VOR/DME. Figure 9 provides a diagrammatical representation of the approximate location of the Wind Farm in relation to the VOR/DME MSA at Shannon Airport.

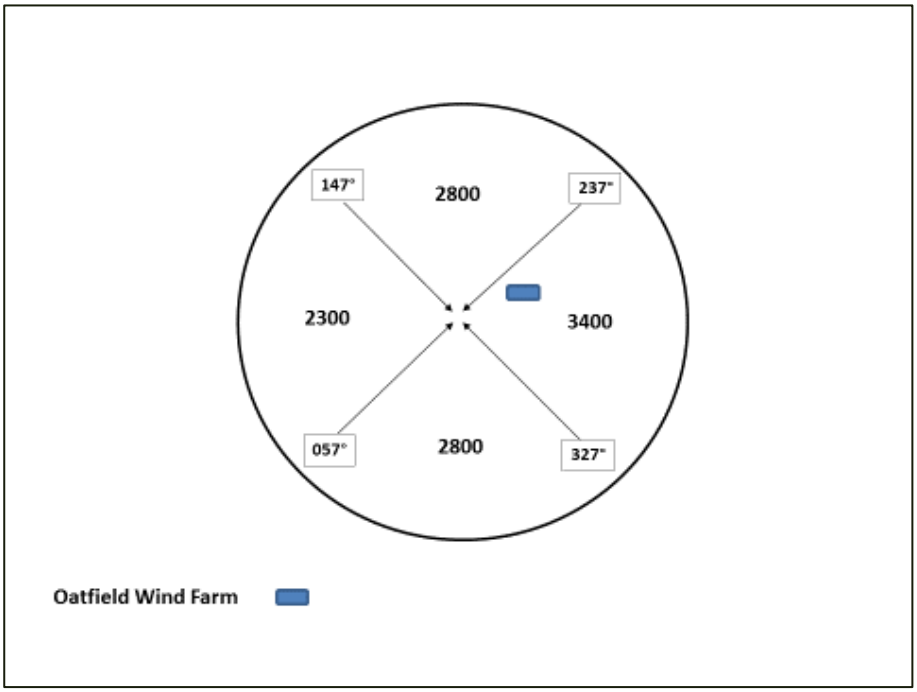


Figure 9 Oatfield in Relation to Shannon Airport VOR/DME MSA (not to scale)

7.3 Aviation Obstruction Lighting

The proposed development might be considered as an en-route obstacle; as such the IAA may require the marking and/or lighting of the obstacle in the interest of aviation safety. Specifically, for obstacles outside the aerodrome boundary, the responsibility rests with the IAA and the owners of the structures [Reference 14]. Subject to consultation with the IAA, Brookfield should give consideration to fit appropriate aviation obstruction lighting to the development.

8 ILS Modelling Conclusions Summary

This Section provides a summary of the ILS modelling analysis completed by FCSL and includes a brief system summary and aircraft operational usage.

8.1 Overview

IAA consultation has indicated that the proposed site also has the potential to infringe the safeguarded area of the ILS in operation at Shannon Airport and interfere with radio beams emanating from the system. This analysis work stream was be outsourced from Osprey to FCSL to conduct modelling to demonstrate any potential for effects on the Localiser and the Glidepath elements of the Shannon Airport Runway 24 ILS.

International standards and recommended practices for ground based air navigation services, such as ILS, are defined in ICAO Annex 10 Volume I that provides recommendations regarding technical and operational requirements [Reference 15].

A summary of the conclusions is provided here, with the full report [Reference 16] provided to Brookfield Renewable Ltd.

8.2 Brief System Summary

An ILS is a ground based radio navigation system designed to provide accurate radio guidance along a prescribed approach path to a runway. The system enables aircraft to descend on a precision instrument approach to a runway, without visual reference to the ground. The major constituent parts of the system are as follows:

- Localiser transmitter with a horizontal antenna array; and
- Glidepath transmitter with a vertical stacked antenna array.

The Localiser element provides the azimuth guidance along the extended runway centreline that lines aircraft up to the runway, whilst the Glidepath element defines the approach angle in the vertical plane down to the touchdown point (generally a glidepath of 3°, which equates to 300 ft descent per nautical mile).

Note: Some systems include a Distance Measuring Equipment (DME) element that provides distance from touchdown information. The ILS on Runway 24 at Shannon Airport operates with an associated DME; however, the DME equipment is considered not to be affected by the proposed development.

8.2.1 Potential System Effects

Signals from an ILS are prone to interference from reflections and/or diffractions from large obstacles such as buildings, hangars and aircraft, resulting in multipath propagation. The ILS signals are particularly susceptible to multipath interference resulting in unequal propagation of the constituent signal components towards an approaching aircraft, causing the phenomenon known as "beam bend".

8.3 FCSL Conclusions Summary

The properties of generic wind turbine parameters of the size anticipated for development at the site were utilised for the ILS modelling assessment.

The Localiser approach simulation results in Reference 16 show insignificant levels of interference at ranges up to 20 NM from the Localiser antenna. The Glidepath simulation results shown in Reference 16 predict insignificant levels of interference to the Glidepath guidance signal.

The predicted levels of interference are well within ICAO Cat II ILS limits; FCSL therefore conclude that the proposed Oatfield Wind Farm will not have any effect on the Runway 24 Localiser guidance and Glidepath signals.

9 References

Reference	Name	Origin
1	Correspondence to Clare County Council from the IAA regarding 70 m high Meteorological Mast at Oatfield site (Planning Ref: P08/1028) dated 29th July 2008	Irish Aviation Authority
2	Consultation Response from the IAA dated 19th July 2016	Irish Aviation Authority
3	Eurocontrol Guidelines: How to Assess the Potential Impact of Wind Turbines - Surveillance Sensors Edition 1.2 Dated September 2014	Eurocontrol
4	Irish Integrated Aeronautical Information Package (IIAIP) Amended to AIRAC 09/2016	Irish Aviation Authority
5	Aerodrome Licensing Manual – Number 002 Dated January 2014	Irish Aviation Authority
6	Licensing Requirements for Private Aerodromes Dated February 2014	Irish Aviation Authority
7	Statutory Instrument 215: Obstacles to Aircraft in Flight Order, 2005	Irish Aviation Authority
8	Statutory Instrument 423: En-route Obstacles to Air Navigation Order, 1999	Irish Aviation Authority
9	Thales Group Press Release https://www.thalesgroup.com/en/worldwide/press-release/thales-launches-star-ng-revolutionary-new-atc-radar-specific-dual Dated 15th June 2015	Thales Group
10	Thales Group https://www.thalesgroup.com/sites/default/files/asset/document/star_ng_datasheet_final.pdf	Thales Group
11	Airbus Defence & Space: News Release http://airbusdefenceandspace.com/wp-content/uploads/2015/03/el-07-2015-n-10032015-eng.pdf	Airbus Defence & Space

	Dated 10th March 2015	
12	Raytheon UK Ltd: News Release http://www.raytheon.co.uk/rtnwcm/groups/gallery/documents/digitalasset/rtn_228419.pdf	Raytheon UK Ltd
13	ICAO Document 8168: Aircraft Operations Volume II Construction of Visual and Instrument Flight Procedures Fifth Edition - 2006	International Civil Aviation Authority
14	IAA Policy: Land Use Planning and Offshore Development Version 1 Dated 10th December 2014	Irish Aviation Authority
15	ICAO Annex 10 Aeronautical Telecommunications: Volume I Radio Navigation Aids Sixth Edition July 2006	International Civil Aviation Organisation
16	Shannon Airport Oatfield Wind Farm NAVAID Simulation Issue 1 FCSL 0127 dated 22nd November 2016	Flight Calibration Services Ltd

Table 6 Table of References

A1 FCSL Modelling Analysis Report

SHANNON AIRPORT

Oatfield Wind Farm

Navaid Simulation

Prepared For:	Osprey Consulting Services Ltd
Author:	John Wilson
Reviewed by:	David Bartlett
Reference:	FCSL 0127
Issue:	1
Date:	22.11.16

Shannon Airport - Oatfield Wind Farm

Navaid Simulation

TABLE OF CONTENTS

Abbreviations

AOD	Above Ordnance Datum
DDM	Difference in Depth of Modulation
DME	Distance Measuring Equipment
FCSL	Flight Calibration Services Ltd
ICAO	International Civil Aviation Organisation
ILS	Instrument Landing System
NM	Nautical Miles
OUNPPM	Ohio University Navigation Performance Prediction Model
RF	Radio Frequency
UHF	Ultra High Frequency
VHF	Very High Frequency

1. INTRODUCTION

Oatfield Wind Farm is proposed for construction approximately 13 km (7 NM) north east of Shannon Airport. Due to the proposed site's proximity to the runway 24 approach path, there is potential for the wind farm to cause interference to the Instrument Landing System (ILS) on runway 24.

Flight Calibration Services Ltd (FCSL) has been commissioned to undertake computer simulations to assess the potential interference to the runway 24 ILS Localiser and Glide Path facilities.

ILS Localiser simulations have been performed using the Ohio University Navaids Performance Prediction Model (OUNPPM) simulation program. The OUNPPM program has been developed by Ohio University Avionics Engineering Center. ILS Glide Path simulations have been performed using the AXIS ILS simulation program. The AXIS simulation program is a further development of the VLOC program originally developed by Marconi Research Centre in the 1970s.

The ILS Localiser and Glide Path simulations have been conducted by qualified and experienced personnel using the latest versions of ILS simulation software.

The results of the ILS simulations are summarised in the following report.

2. ILS BRIEF DESCRIPTION

2.1 System Overview

An Instrument Landing System (ILS) is a ground based radio navigation system designed to provide accurate radio guidance along a prescribed approach path to a runway (see Figure 2.1). The system enables aircraft to descend on a precision instrument approach to a low level altitude, without visual reference to the ground. The ILS ground equipment consists of:

- A Localiser transmitter with a horizontal antenna array;
- A Glide Path transmitter with a vertical stacked antenna array; and
- A Distance Measuring Equipment (DME) transponder with omnidirectional antenna.

The Localiser and Glide Path antenna arrays are set up accurately on the ground with the Localiser normally installed on the extended runway centreline and the Glide Path positioned beside the runway close to the aircraft touchdown point.

The Localiser provides the azimuth guidance along the extended runway centreline. The Glide Path defines the approach angle (normally set to 3 degrees) in the vertical plane and the DME provides accurate distance information.

The airborne receivers (Localiser and Glide Path) measure each signal and provide information of the aircraft's displacement from the ILS centreline and the angle of approach. This information is coupled to an ILS visual display unit, a flight director and the autopilot. The DME interrogator provides an accurate range from the runway threshold which is input to a visual digital display and the flight director.

The VHF Localiser and the UHF Glide Path radiate complex signals generated by the transmitters. Each signal is made up of two components:

(i) An RF carrier modulated equally with two tones - 90 Hz and 150 Hz.

(ii) A signal comprising of 90 Hz and 150 Hz RF sidebands only.

The carrier is radiated by a single main lobe along the required approach path and the sideband only signal is radiated by a twin lobe pattern with the null between the lobes set up on the required approach path. The resultant signal in space is one that has zero difference in depth of modulation (DDM) along the approach path and a DDM which increases as the aircraft deviates from the approach path.

The Localiser provides azimuth guidance along the extended runway centreline with 90 Hz predominant to the left and 150 Hz to the right of the approach path (see Figure 2.2).

The Glide Path defines the approach angle (normally set to 3 degrees) in the vertical plane with 90 Hz tone predominant above and 150 Hz tone predominant below the glide path (see Figure 2.3).

A DME enables aircraft to measure the exact range to the ground transponder. The DME is normally set up on the ground to read zero at the runway threshold when co-located with an ILS.

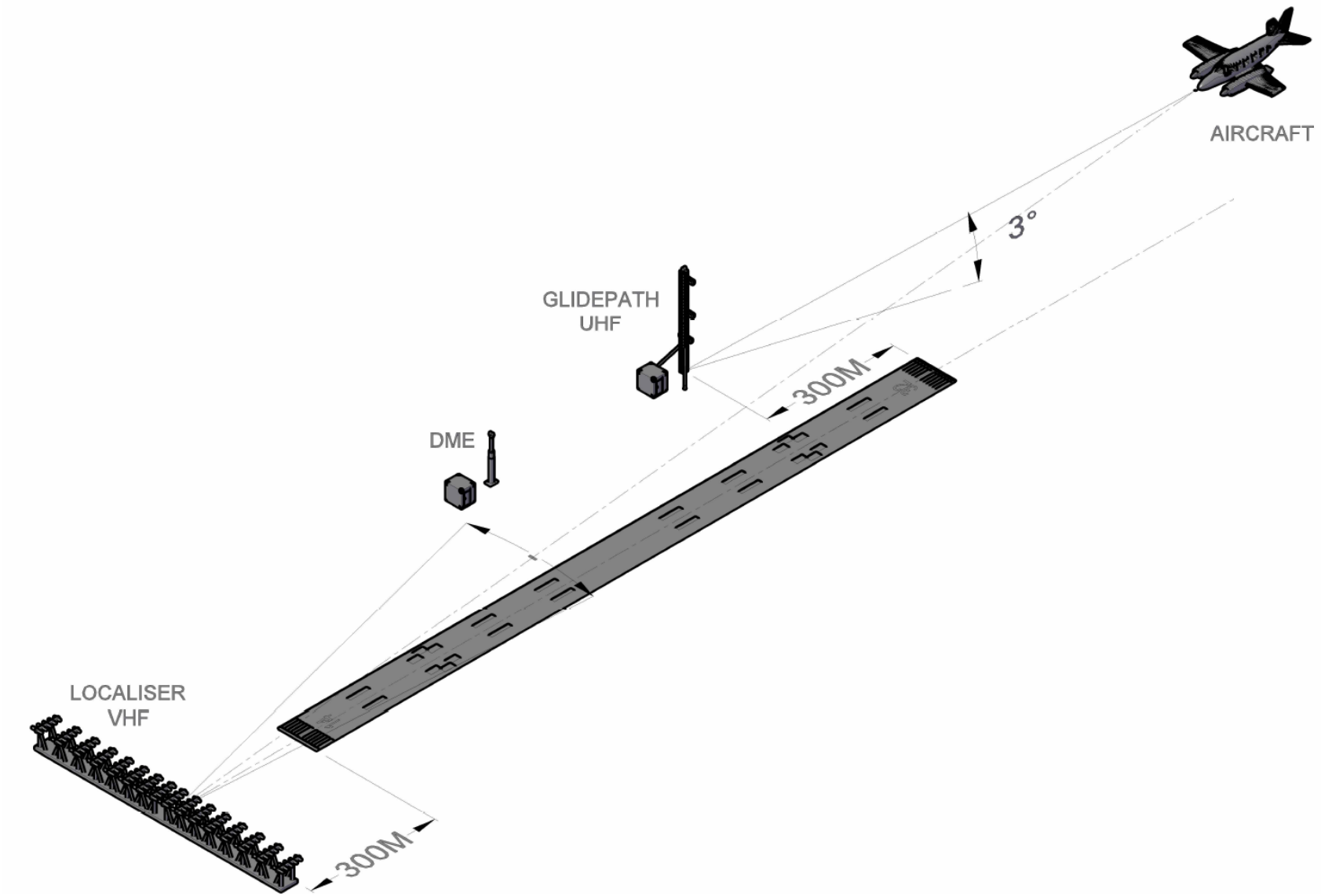


Figure 2.1: ILS Configuration for a Runway

2.2 ICAO Requirements and Categories

International standards and recommended practices for ground based air navigation services, such as ILS, are defined in the International Civil Aviation Organisation (ICAO) document known as Annex 10. ICAO Annex 10 Volume I specifies and recommends the technical and operational requirements for:

(i) The signal performance;

(ii) Coverage (see Figures 2.4 & 2.5);

(iii) Siting; and

(iv) The ILS Critical and Sensitive Areas

It is noted that the ILS signal performance at Shannon Airport complies with Category II requirements for runway 24.

Instrument Landing System (ILS)

Localiser Beam Structure

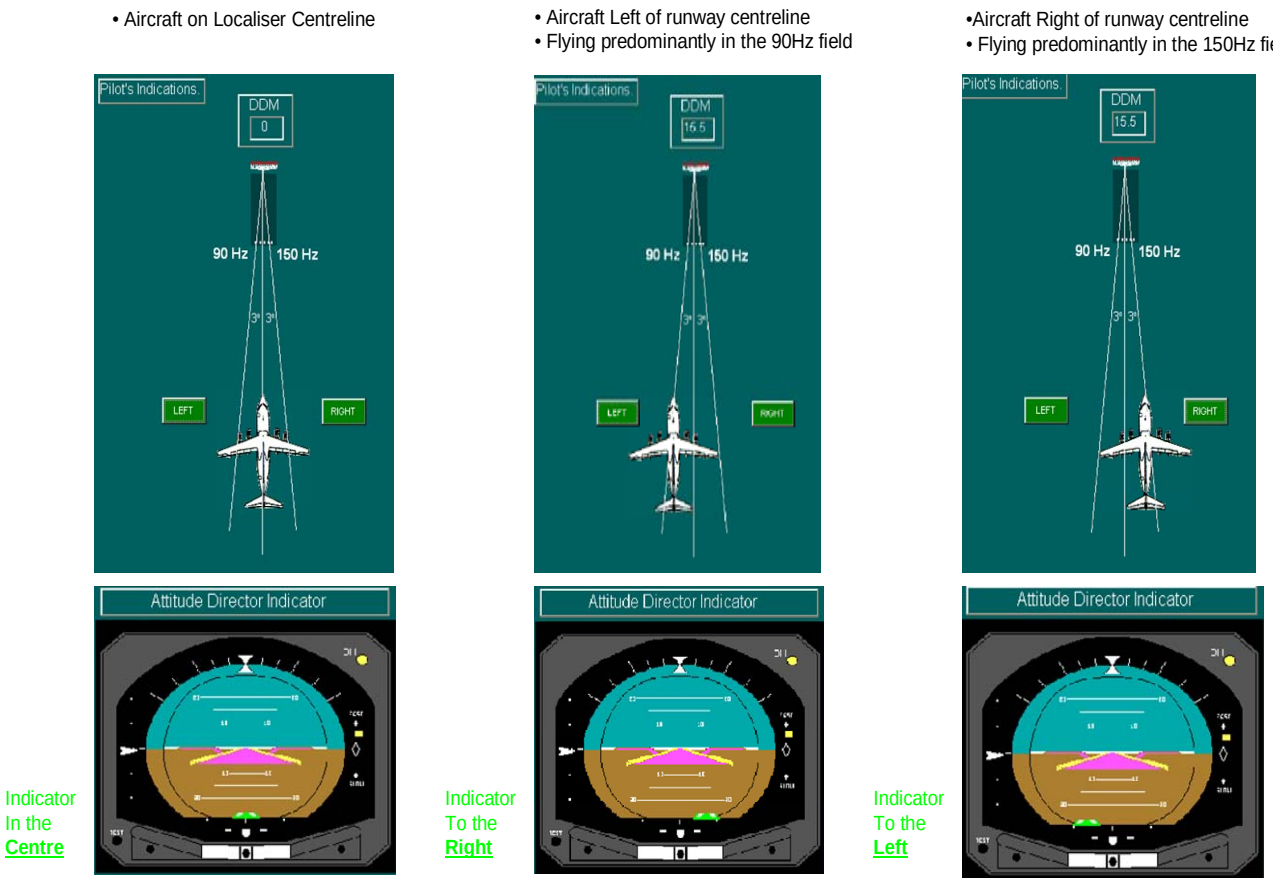
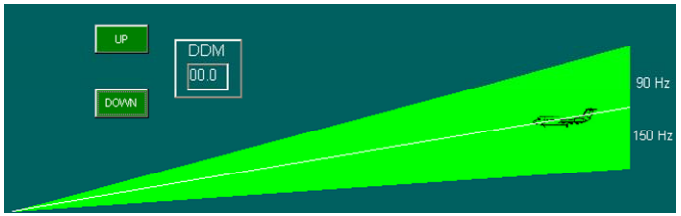


Figure 2.2: Localiser Guidance

Instrument Landing System (ILS)

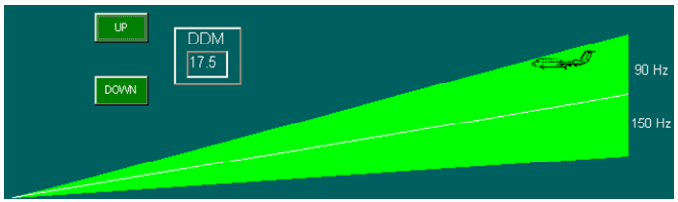
Glidepath Beam Structure

- Aircraft on Glidepath



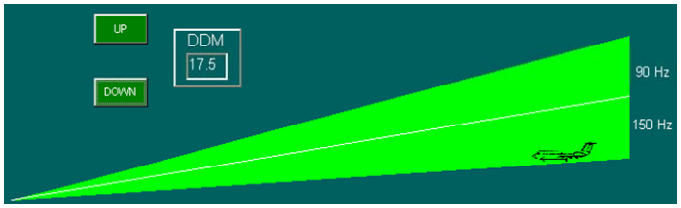
Indicator is centralised

- Aircraft above the Glidepath
- Flying predominantly in the 90Hz field



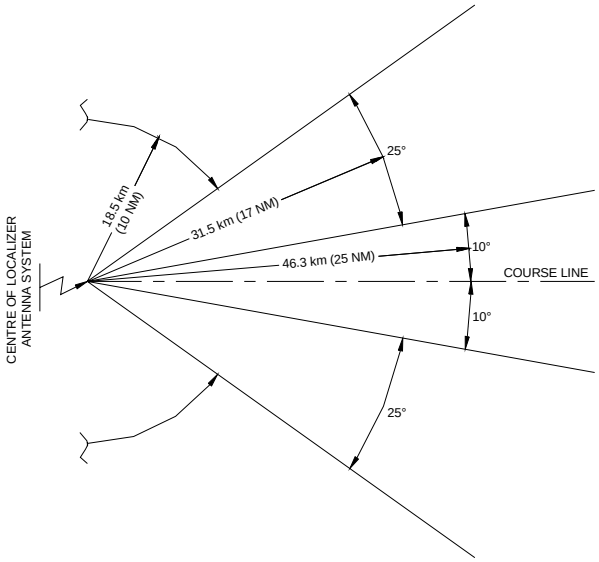
Indicator is At the Bottom

- Aircraft below the Glidepath
- Flying predominantly in the 150Hz field

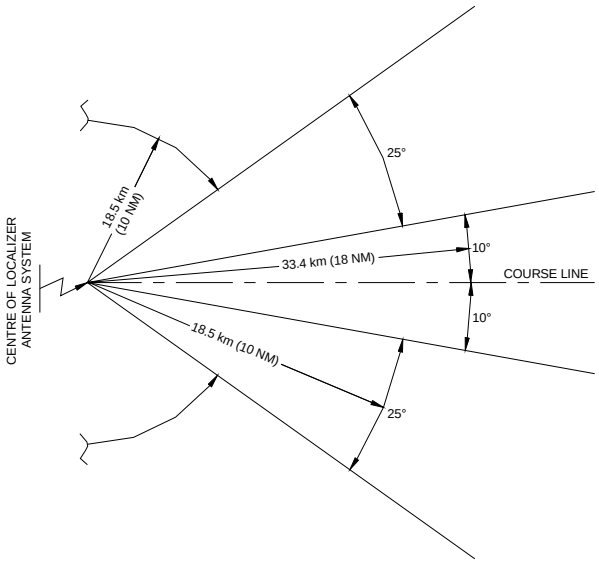


Indicator is At the Top

Figure 2.3: Glide Path Guidance



WHEN TOPOGRAPHICAL FEATURES DICTATE OR OPERATIONAL REQUIREMENTS AND ALTERNATIVE NAVIGATION FACILITIES PERMIT, THE FOLLOWING COVERAGE MAY BE PROVIDED.



NOTE : IF COVERAGE AS PRESCRIBED IN CHAPTER 3, 3.1.3.3.1 IS REQUIRED OUTSIDE THE PLUS OR MINUS 35-DEGREE SECTOR, THIS IS PROVIDED TO 18.5 km (10 NM), AS INDICATED BY THE BROKEN ARC ABOVE.

AvionicsService01/Drawings/General/Gen-006

Figure 2.4: ILS Localiser Coverage Requirements

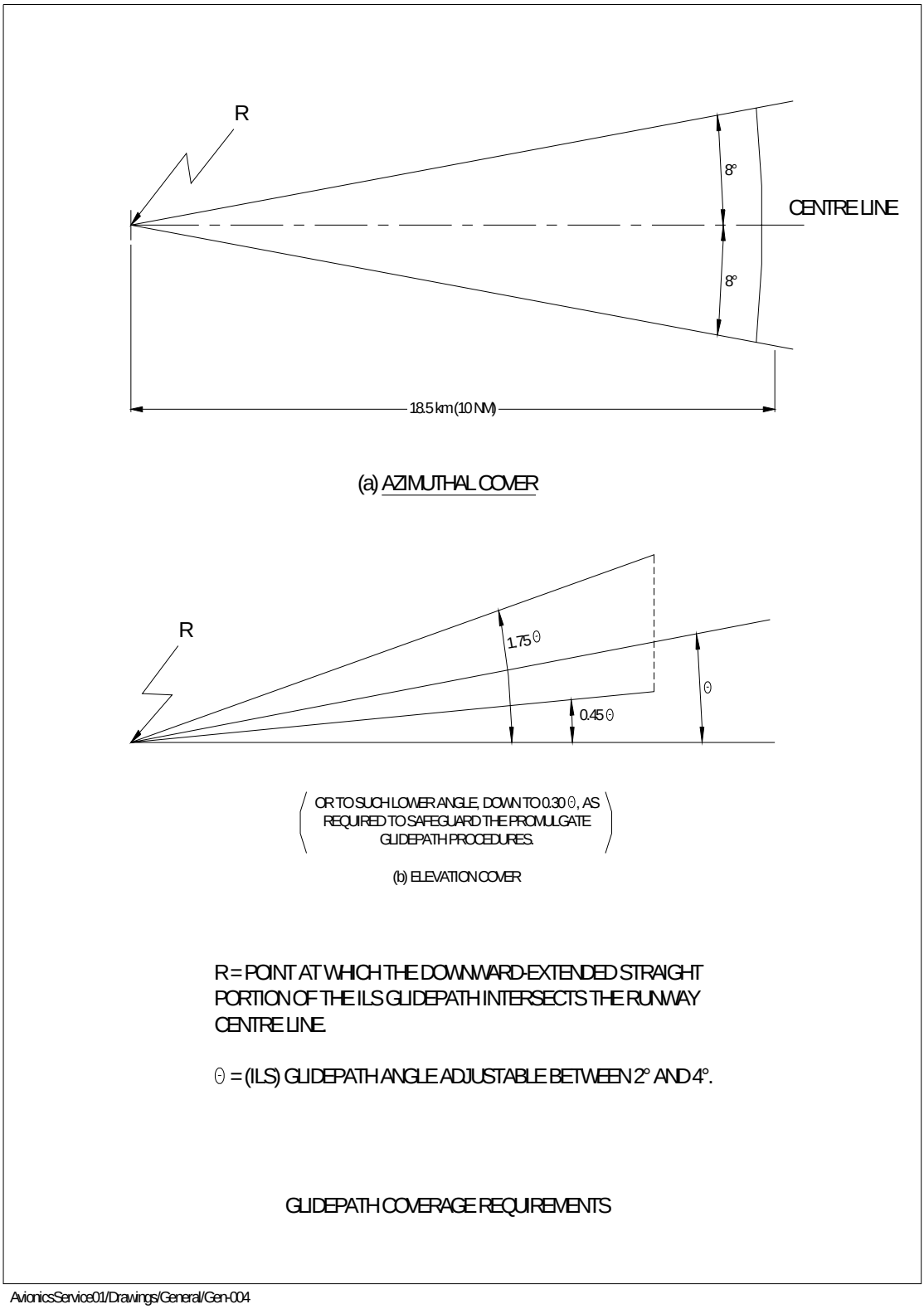


Figure 2.5: ILS Glide Path Coverage Requirements

3. ILS INTERFERENCE

VHF and UHF signals are prone to interference from reflections and/or diffractions from large obstacles such as buildings, hangars and aircraft, resulting in multipath propagation. ILS Localiser and Glide Path signals are particularly susceptible to multipath interference resulting in unequal propagation of the constituent signal components towards an approaching aircraft, causing the phenomenon known as "beam bend".

Since the incident signal has modulation content appropriate to the azimuth angle at which the reflecting object lies in the transmitted radiation pattern, the reflected signal containing the same modulation will, if of sufficient strength, provide spurious guidance to the approaching aircraft.

3.1 Localiser

The maximum tolerable levels of Localiser interference for CAT I and CAT II/III operations are defined in ICAO Annex 10 Volume I Chapter 3.1.

For CAT I operations, the maximum allowed bend amplitude limit narrows linearly from 30 µA to 15 µA between ILS Point A (7.3 km from the runway threshold) and Point B (1,050 m from threshold) and maintains 15 µA down to the ILS Point C (approximately 300 m from runway threshold).

For CAT II/III operations, the maximum allowed bend amplitude limit narrows linearly from 30 µA to 5 µA between ILS Point A (7.3 km from the runway threshold) and Point B (1,050 m from threshold) and maintains 5 µA down to the ILS Point D (900 m beyond runway threshold).

3.2 Glide Path

The maximum tolerable levels of Glide Path interference for CAT I and CAT II/III operations are defined in ICAO Annex 10 Volume I Chapter 3.1.

For CAT I operations, the maximum bend amplitude limit on the approach to the runway shall not exceed 30 µA from the outer coverage commencing 10 NM from the runway threshold to ILS Point B (1,050 m from runway threshold).

For CAT II/III operations, the maximum allowed bend amplitude limit narrows linearly from 35 µA to 20 µA between ILS Point A (7.3 km from the runway threshold) and Point B (1,050 m from threshold) and maintains 20 µA down to the ILS Point T (runway threshold).

Note: ILS Points A, B, C, D, E & T are defined in ICAO Annex 10 Attachment C to Part 1, Figure C-1.

ICAO ILS system error limits are shown in Figure 3.1 below.

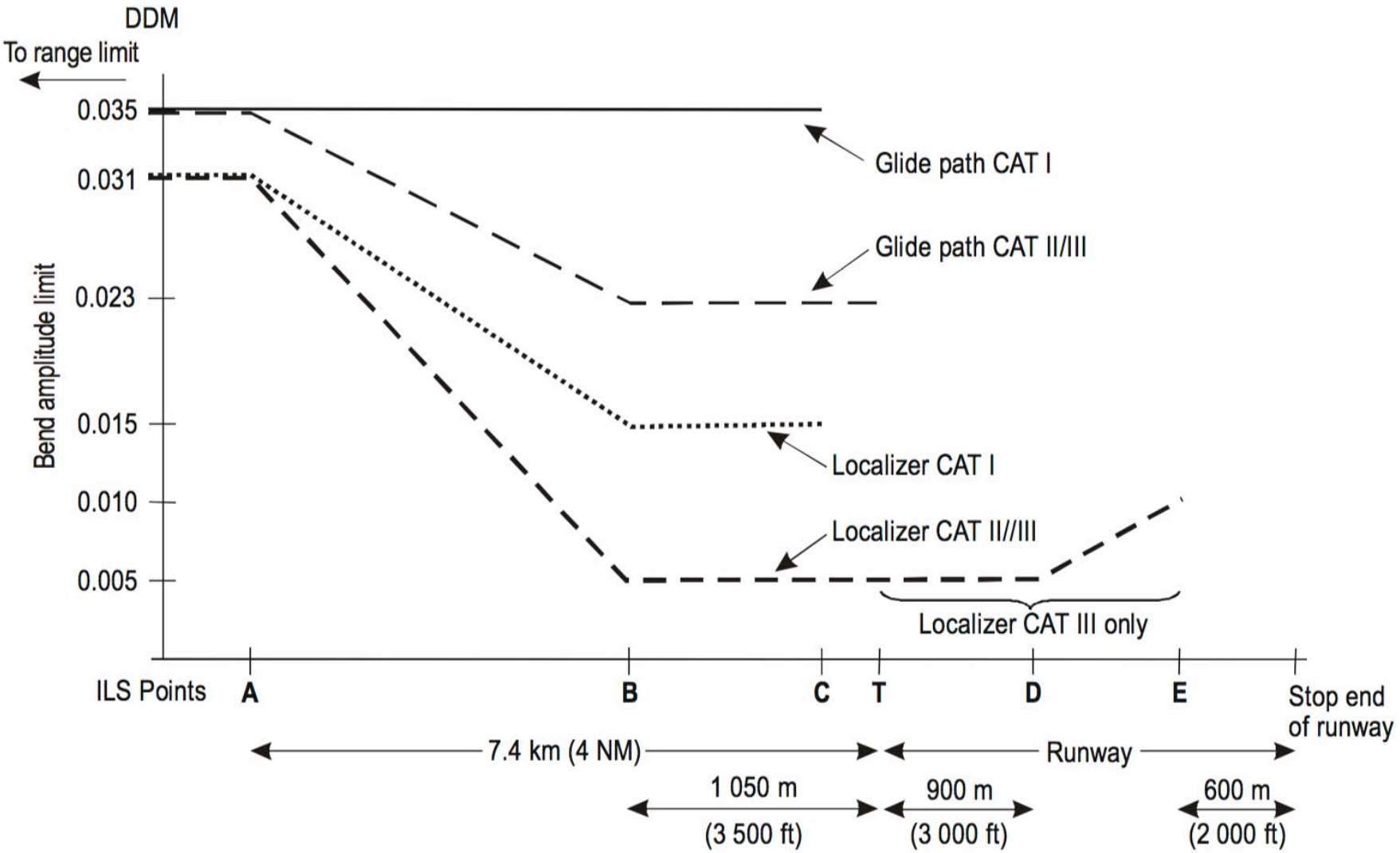


Figure 3.1: ICAO ILS System Error Limits

4. SITE DETAILS

4.1 General

The main runway 06/24 at Shannon Airport has dimensions 3199 m x 45 m.

Runway 24 is fitted with a Navia 7000 ILS comprising a 24-element Localiser antenna and M-array Glide Path antenna. A DME transponder collocated with the Glide Path antenna provides distance information for approaches to Runway 24.

4.2 ILS Configuration

4.2.1 ILS 24

The Runway 24 ILS consists of the following sub-systems:

(i) Localiser

Dual frequency transmitter system configured with a 24-element antenna array. The antenna array is installed on the extended runway centreline approximately 3360 m from Threshold 24 with a total backset distance of 305 m from Threshold 06. Localiser operating frequency is 110.95 MHz.

(ii) Glide Path

Dual frequency transmitter system configured with an M-array antenna array. The antenna mast is located 130 m offset to the north of the runway centreline and 360 m backset from Threshold 24. Glide Path operating frequency is 330.65 MHz and the nominal Glide Path angle is 3.0°.

4.2.2 DME

The DME transponder is collocated with the Runway 24 Glide Path antenna with a transponder time delay adjustment to indicate range from Runway 24 threshold. The DME operates on DME Channel 46Y (1070/1133 MHz).

5. DESCRIPTION OF THE WIND FARM

The proposed Oatfield Wind Farm will comprise 26 wind turbines with a typical hub height of 100 m and maximum turbine blade lengths of 50 m, - ie a total potential height of 150 m. Side and front elevation views of a typical wind turbine are shown in Figure 5.1 below.

The location and layout of the proposed wind farm are shown in Figures 5.2 and 5.3 respectively.

Coordinates and height AOD for each wind turbine are shown in Table 5.1 below.

The wind turbine closest to the runway (Turbine 01) is approximately 13,900 m (7.5 NM) from runway threshold (in the direction of the approach) and 2,600 m (1.4 NM) from the extended runway centreline. Turbine 01 will therefore be at an azimuth angle of 10.6 degrees with respect to Glide Path antenna boresight.

The maximum blade tip height of the highest wind turbine (Turbine 11) is 419 m AOD which is 414.4 m above Runway 24 threshold. The maximum blade tip height for Turbine 11 will therefore be at an elevation angle of 1.63° with respect to the base of the Runway 24 Glide Path antenna.

	Irish Grid Reference		WGS-84		
ID	Easting	Northing	Latitude N	Longitude W	Elevation AOD (m)
1	151354.354	168746.2393	52.76792932	8.72142343	230
2	151822.006	168988.995	52.77015243	8.71453141	240
3	152335.2987	168949.3074	52.76984136	8.70692141	268
4	152800.9663	168748.2236	52.76807548	8.69999377	238
5	153912.2185	168536.5566	52.76626954	8.68350193	210
6	154351.4277	168822.3071	52.76887436	8.67703556	212
7	154208.5524	169298.5581	52.77314149	8.67921873	240
8	153711.1348	168986.3491	52.77029383	8.68654421	243
9	154548.7659	170166.2949	52.78096704	8.67429867	255
10	154738.8694	169675.3596	52.77657185	8.67141376	239
11	155180.7244	169944.5736	52.77902765	8.66490368	269
12	155324.2612	169420.433	52.77433	8.66270526	250
13	155694.0171	169849.0589	52.77821178	8.65728488	261
14	156158.3618	170130.1792	52.78077562	8.65044209	220
15	156263.5339	169542.1416	52.77550047	8.64880506	227
16	156320.4194	170634.2115	52.78531762	8.64810792	212
17	156675.6232	171534.4581	52.79343519	8.64296301	130
18	156836.7653	170984.4536	52.78850616	8.64050188	200
19	156887.0362	170449.9942	52.78370791	8.6396864	182
20	157016.6823	169783.2429	52.77772731	8.63767757	161
21	157024.6198	169248.7835	52.77292566	8.63748983	160
22	156590.7023	168963.0329	52.7703234	8.64388077	178
23	158228.4764	169785.8887	52.77784617	8.61972221	196
24	158720.6024	169979.0349	52.77961949	8.61245447	172
25	159159.8116	169672.1177	52.77689514	8.60590793	168
26	158942.8528	169201.1584	52.77264695	8.60906362	189

Table 5.1: Wind Turbine Coordinates and Ground Heights

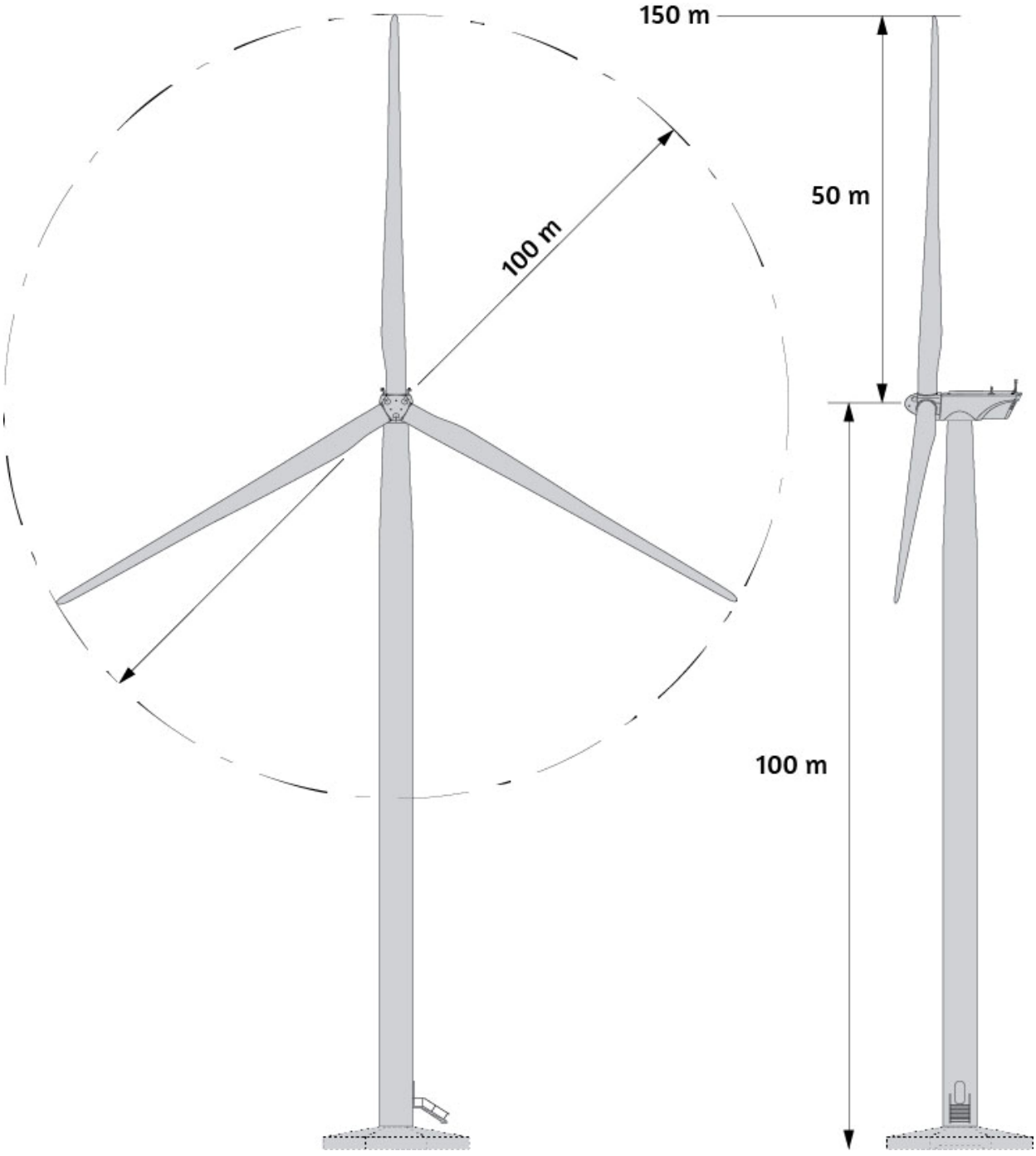


Figure 5.1: Wind Turbine Elevation Views

Figure 5.2: Oatfield Wind Farm Location

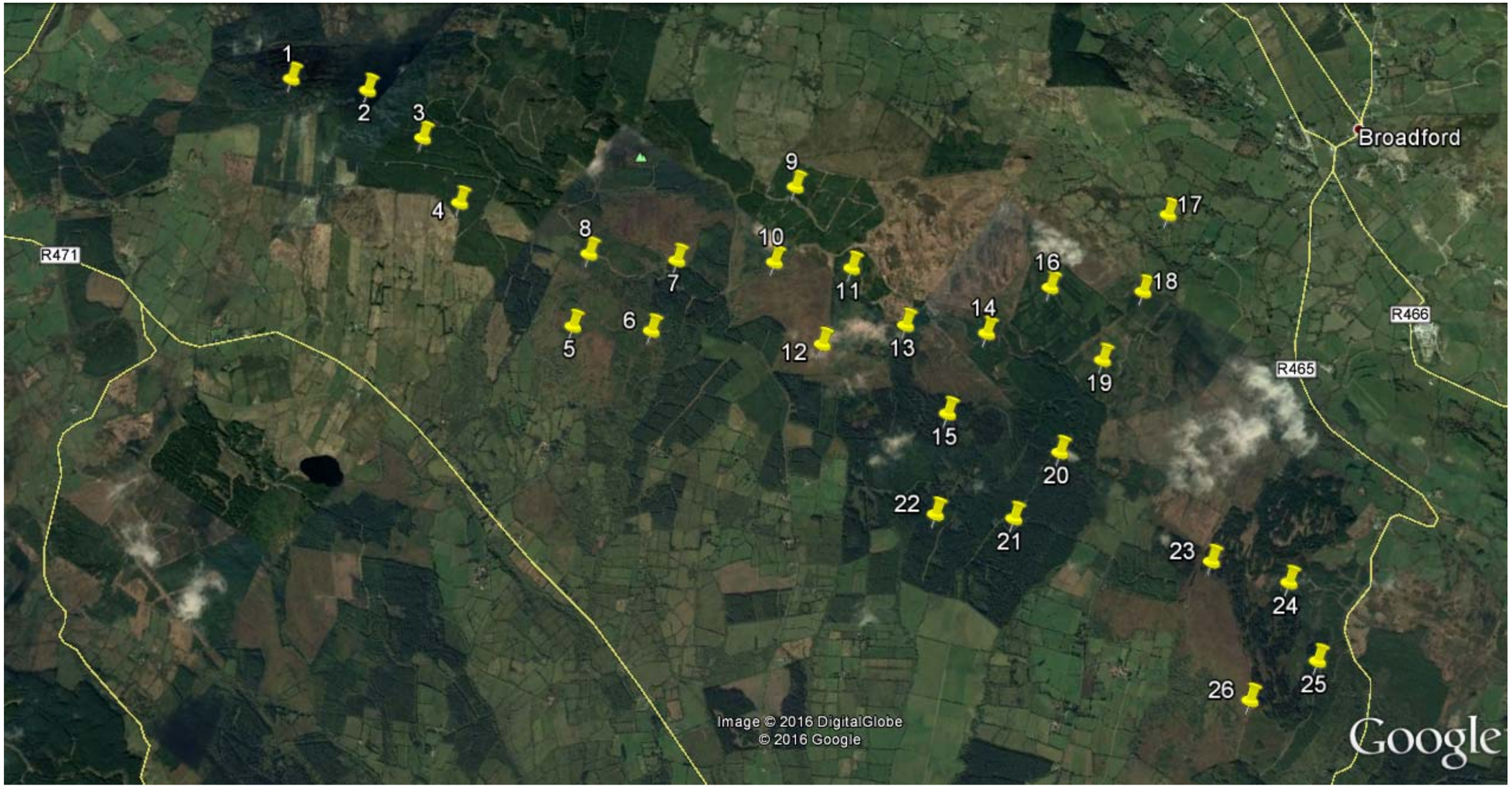


Figure 5.3: Oatfield Wind Farm Site Layout

6. MODELLING METHODOLOGY

In order to model and assess a 'worst case' scenario, it has been assumed that the wind turbines are comprised of smooth reflecting planes with a reflection coefficient of 1.

6.1 Localiser

ILS Localiser simulations have been performed using the OUNPPM simulation program. Table 6.1 and Figure 6.1 below show wind turbine dimensions used in the Localiser simulations.

Parameter	Dimension (m)
Base top width	5
Base bottom width	5
Base height	100
Nacelle length	15
Nacelle radius	2
Base offset	6
Blade length	50
Blade width	4

Table 6.1: Turbine Model Dimensions

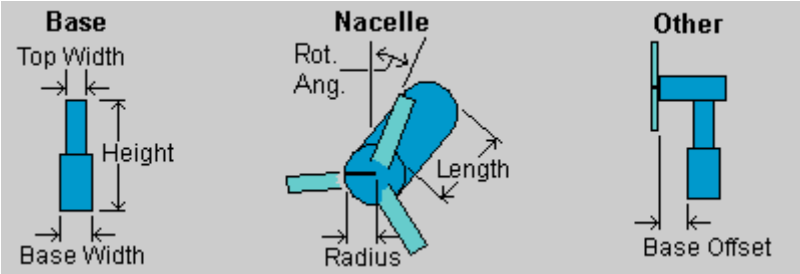


Figure 6.1: Turbine Model Dimensions

Figure 6.2 below shows the wind turbine 3D model used in the ILS Localiser simulations. Figures 6.3 and 6.4 below show the 3D model of the wind farm looking towards and from behind the runway 24 Localiser antenna.

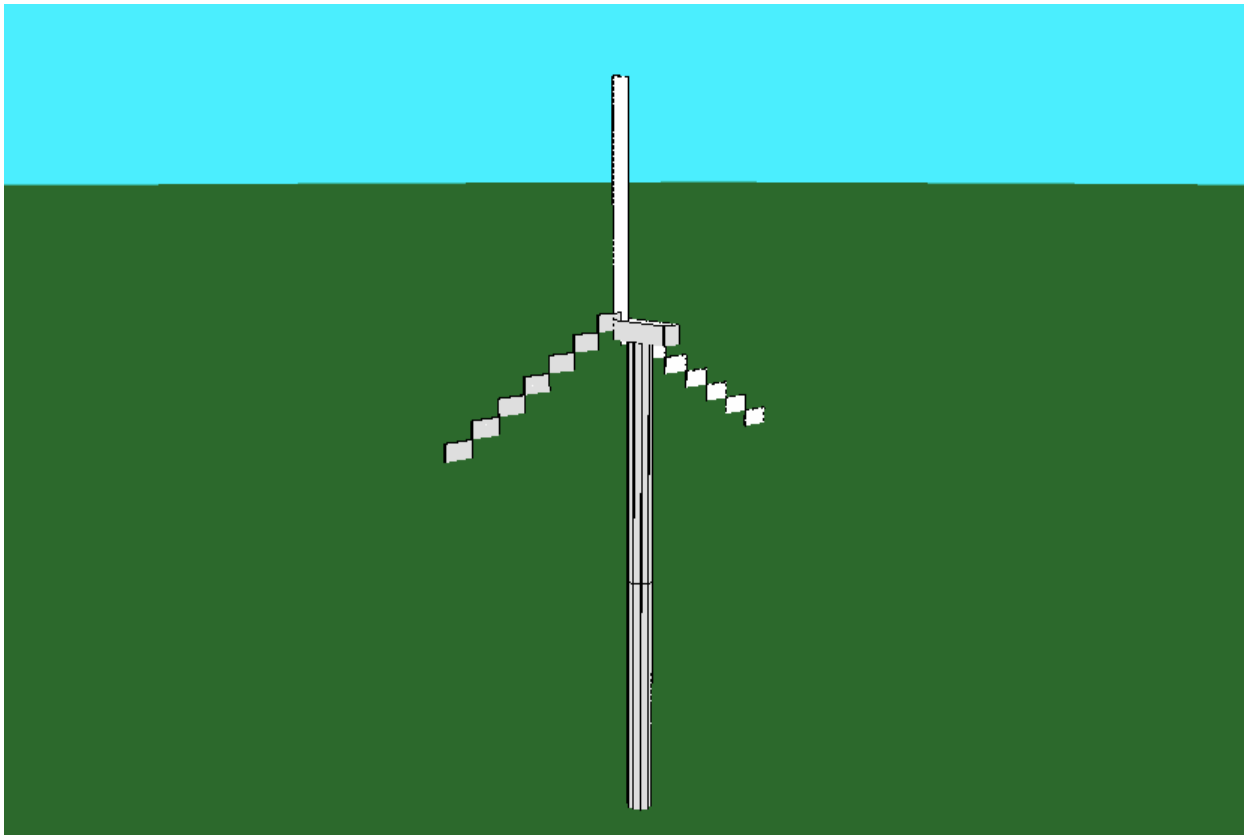


Figure 6.2: Wind Turbine – 3D Model

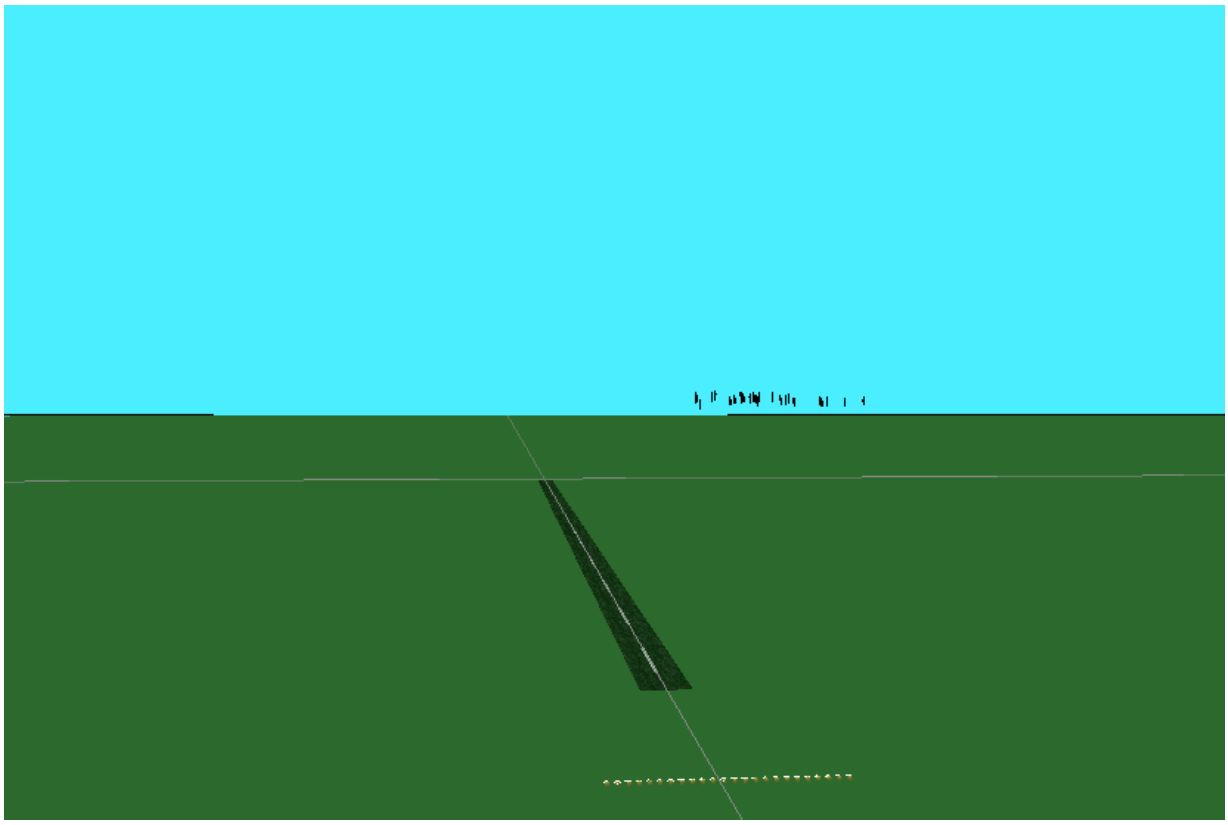


Figure 6.3: Wind Farm – 3D Model
Looking From Behind 24 Localiser Antenna

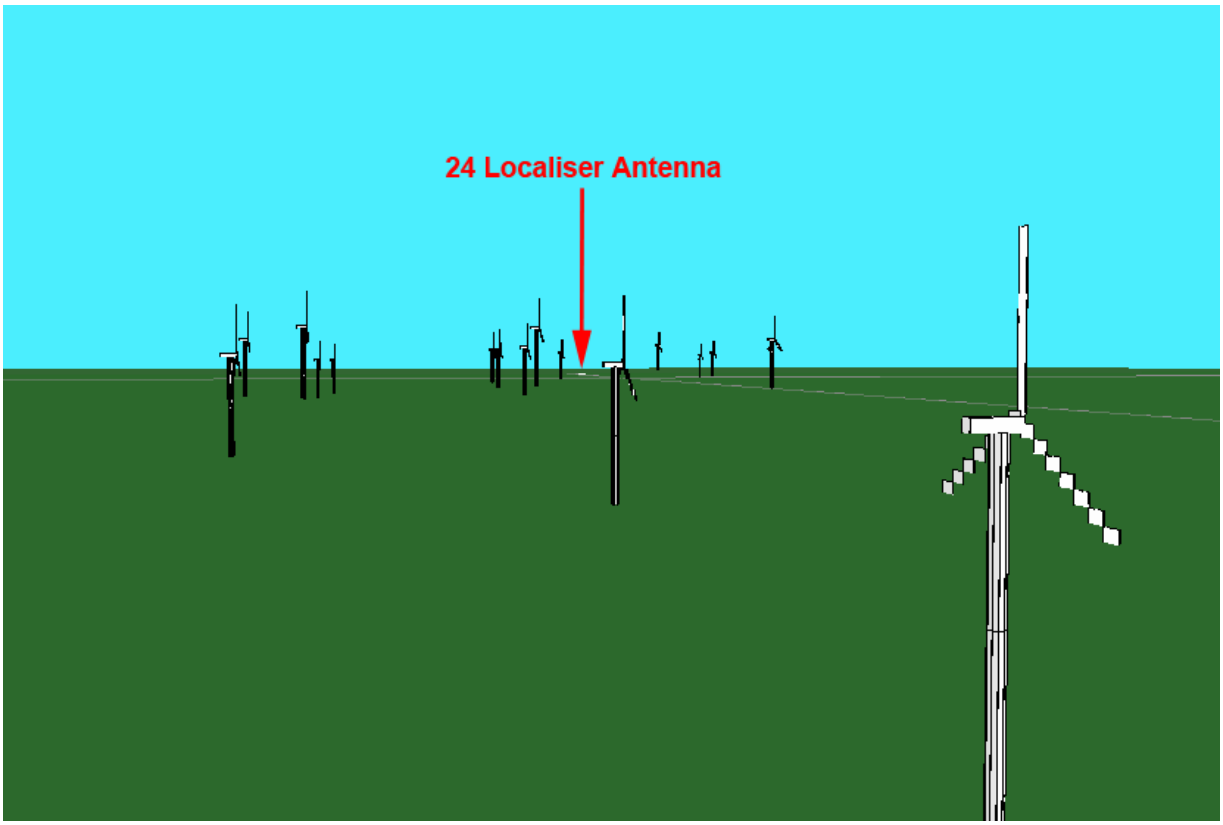


Figure 6.4: Wind Farm – 3D Model
Looking Towards 24 Localiser Antenna

6.2 Glide Path

ILS Glide Path simulations have been performed using the AXIS ILS simulation program. As the AXIS simulation program can only model flat plate structures and a maximum of 10 reflecting objects, only the 10 wind turbine structures closest to the runway threshold have been modelled (see Figure 5.3 above). Each wind turbine structure has been modelled as a single vertical flat sheet, 50 m wide and 150 m tall.

7. COMPUTER SIMULATIONS

Computer simulations are used to provide accurate predictions of potential interference patterns; however, ultimately a flight inspection is the only true method of establishing the actual amplitude and frequency of any multipath interference.

A computer program (Ohio University Navaids Performance Prediction Model - Version 112915) has been used to analyse the impact of the proposed wind turbines on the performance of the runway 24 ILS Localiser facility.

A computer program (AXIS - Version R44) has been used to analyse the impact of the proposed wind turbines on the performance of the runway 24 ILS Glide Path facility.

Localiser and Glide Path approach simulations were performed with the wind turbines rotated from 0 to 90 degrees in 10 degree steps (see Figures 7.1 to 7.10 and 7.19 to 7.28 below).

Localiser part orbit simulations were also performed at ranges of 4 NM, 10 NM, 20 NM and 25 NM from runway threshold (see Figures 7.11 to 7.18 below) at a height of 1500 ft with the wind turbines rotated at 0 degrees and 90 degrees.

7.1 Localiser 24 Approach Simulation (OUNPPM)

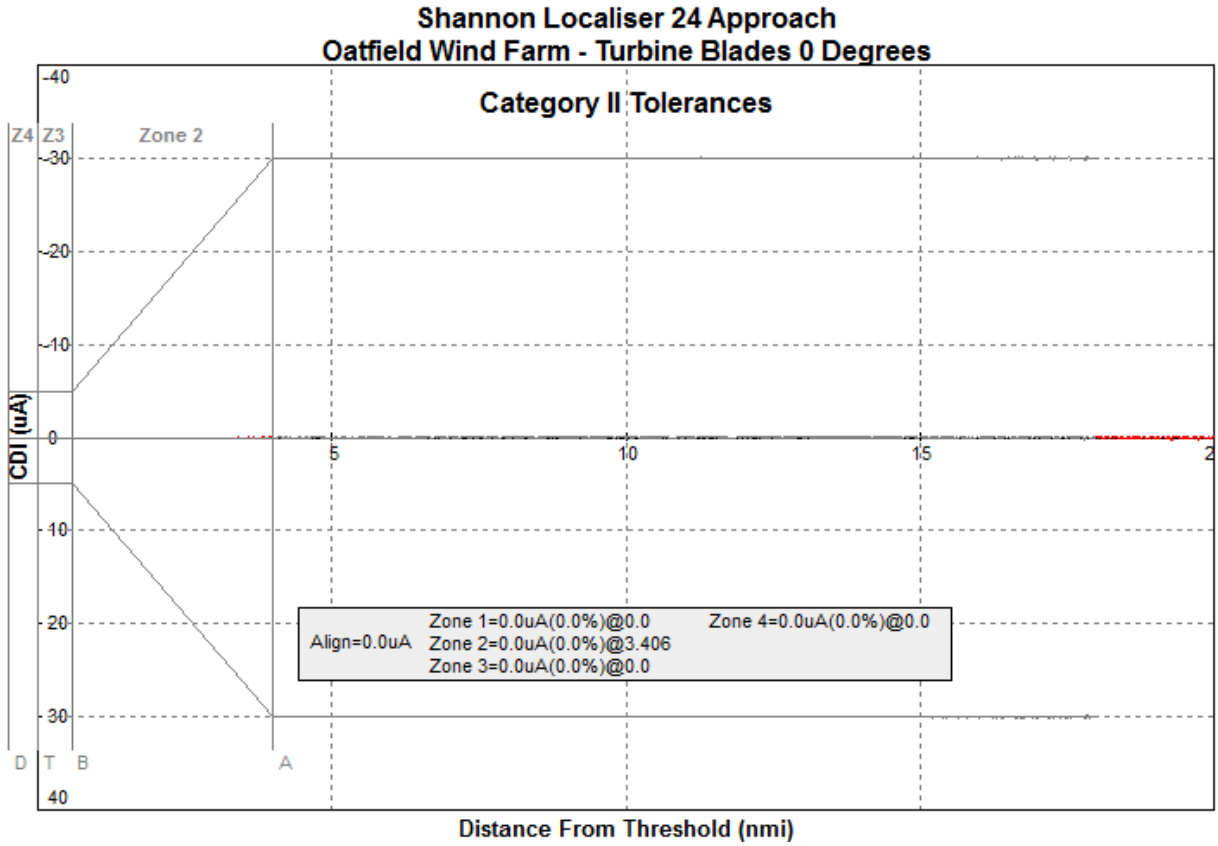


Figure 7.1: Localiser 24 Approach Simulation – Turbine Blades 0 Degrees

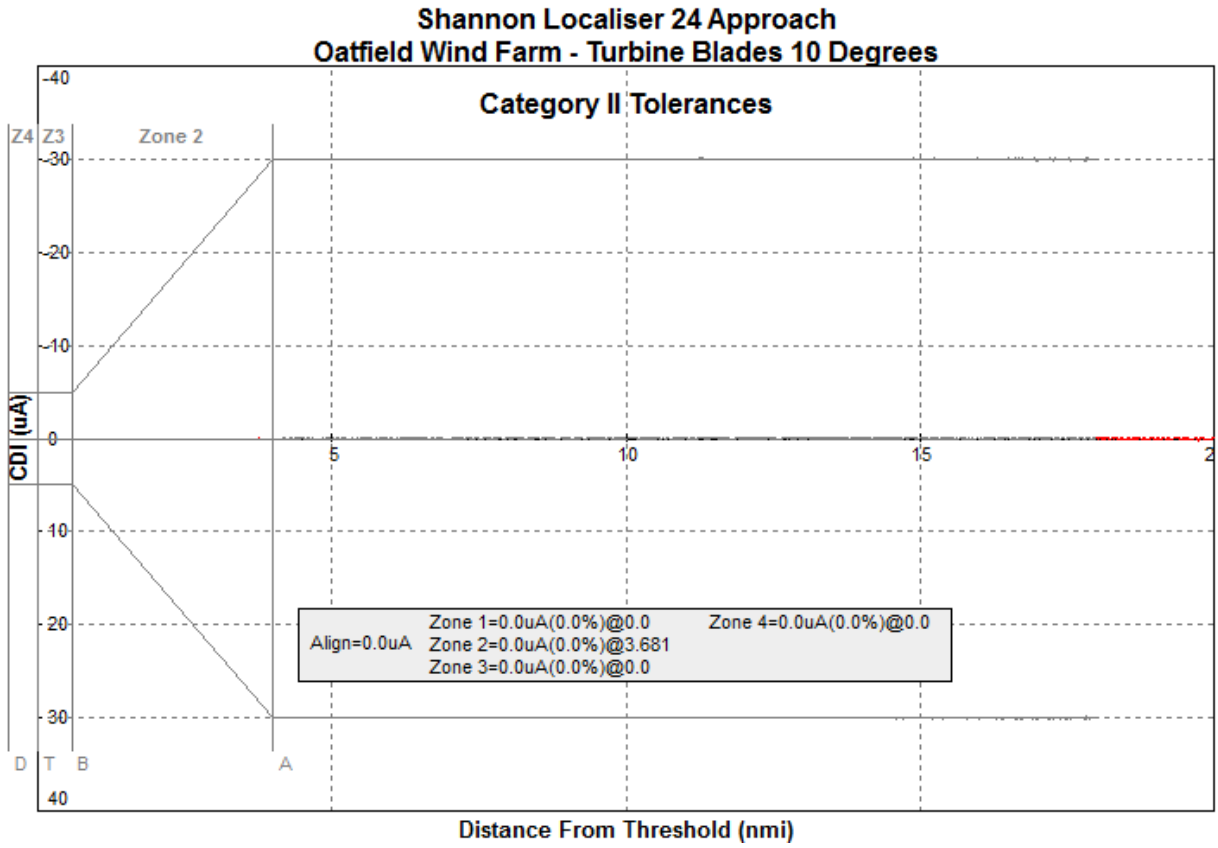


Figure 7.2: Localiser 24 Approach Simulation – Turbine Blades 10 Degrees

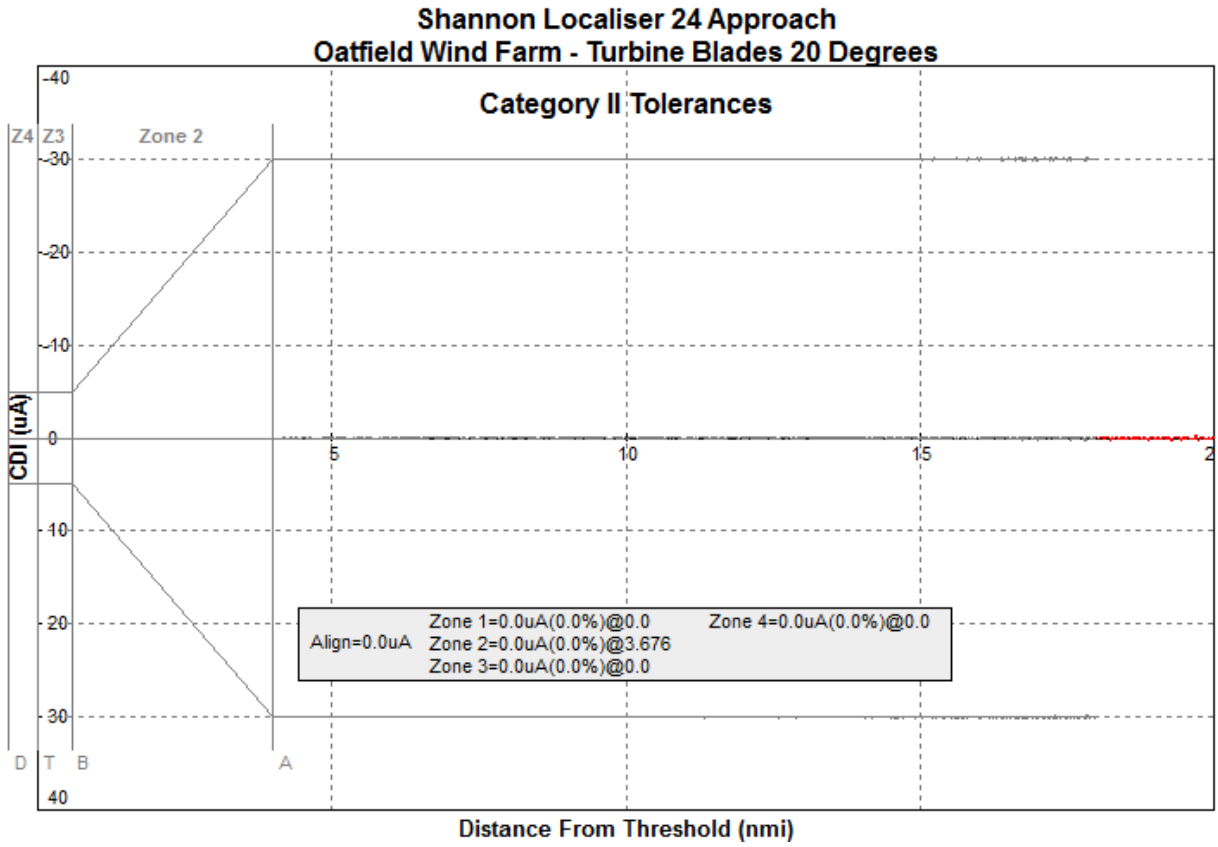


Figure 7.3: Localiser 24 Approach Simulation – Turbine Blades 20 Degrees

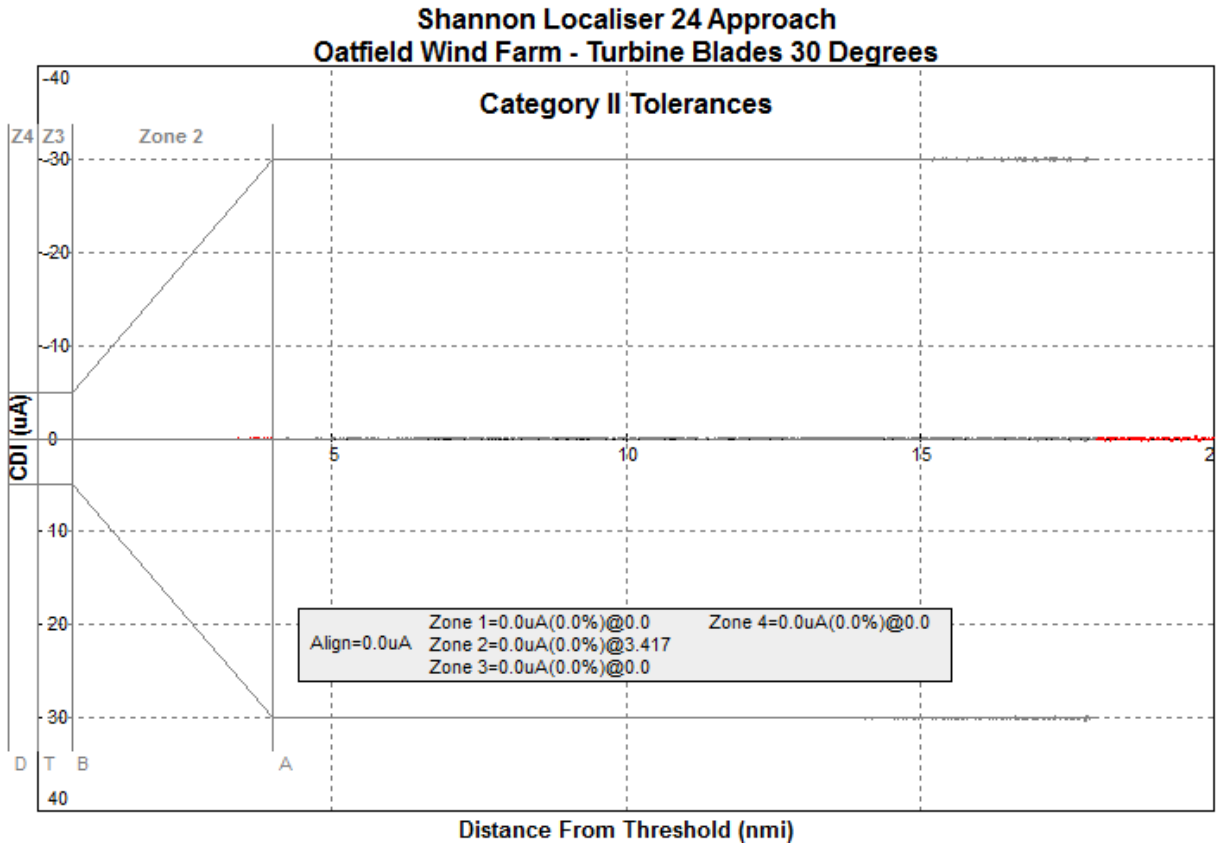


Figure 7.4: Localiser 24 Approach Simulation – Turbine Blades 30 Degrees

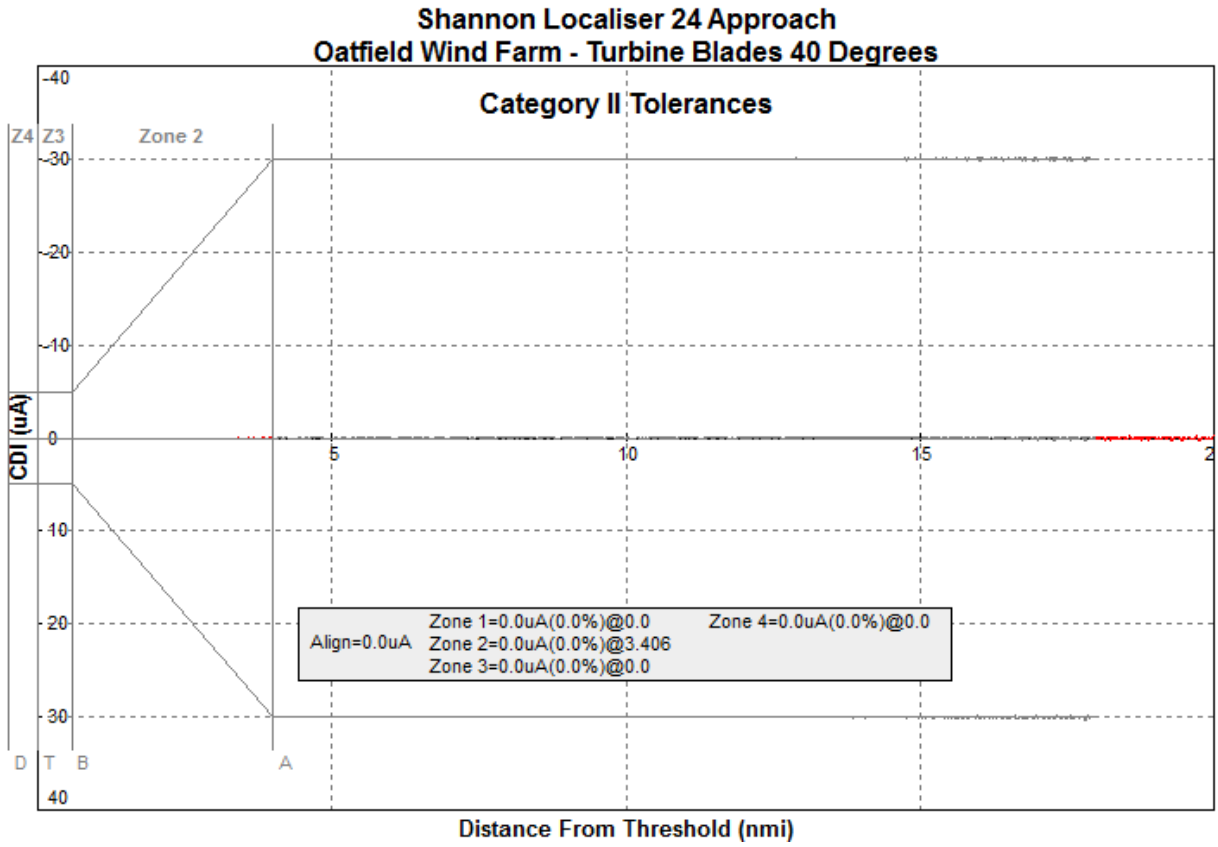


Figure 7.5: Localiser 24 Approach Simulation – Turbine Blades 40 Degrees

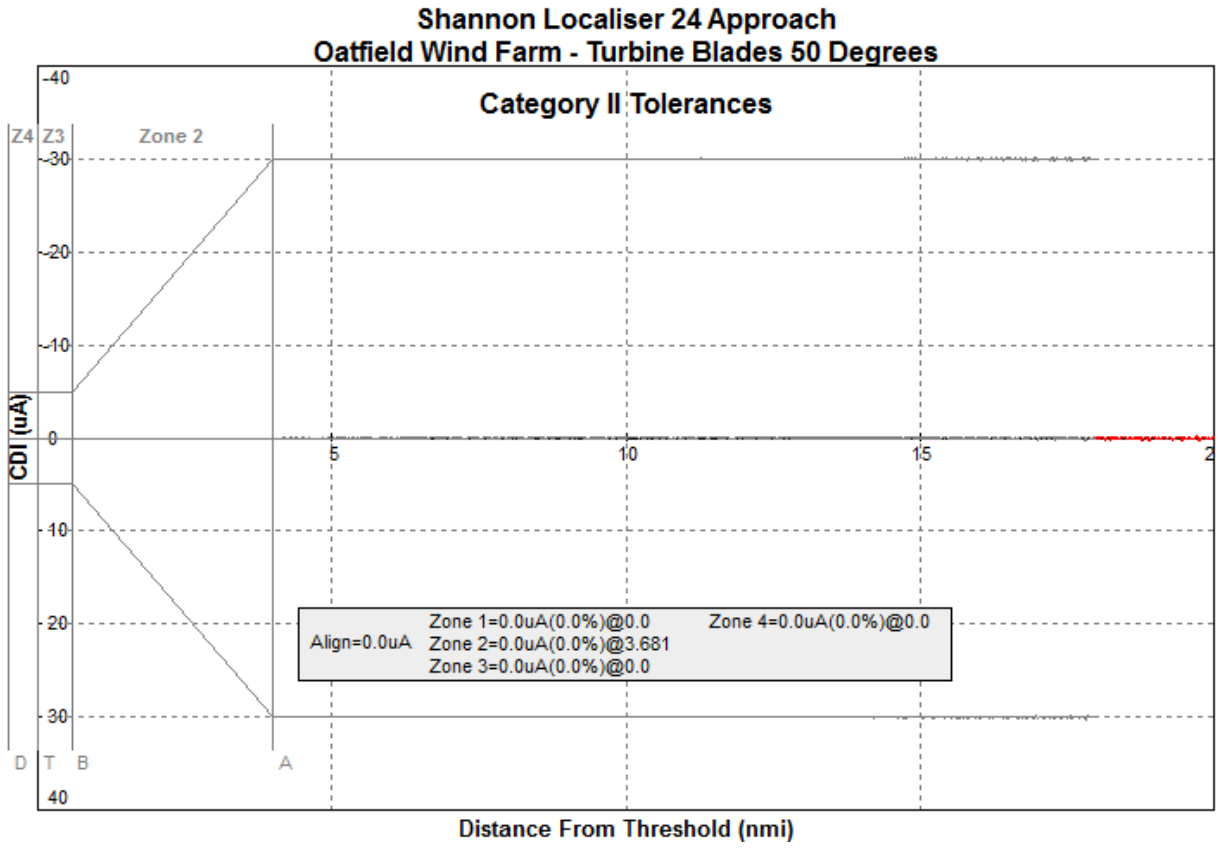


Figure 7.6: Localiser 24 Approach Simulation – Turbine Blades 50 Degrees

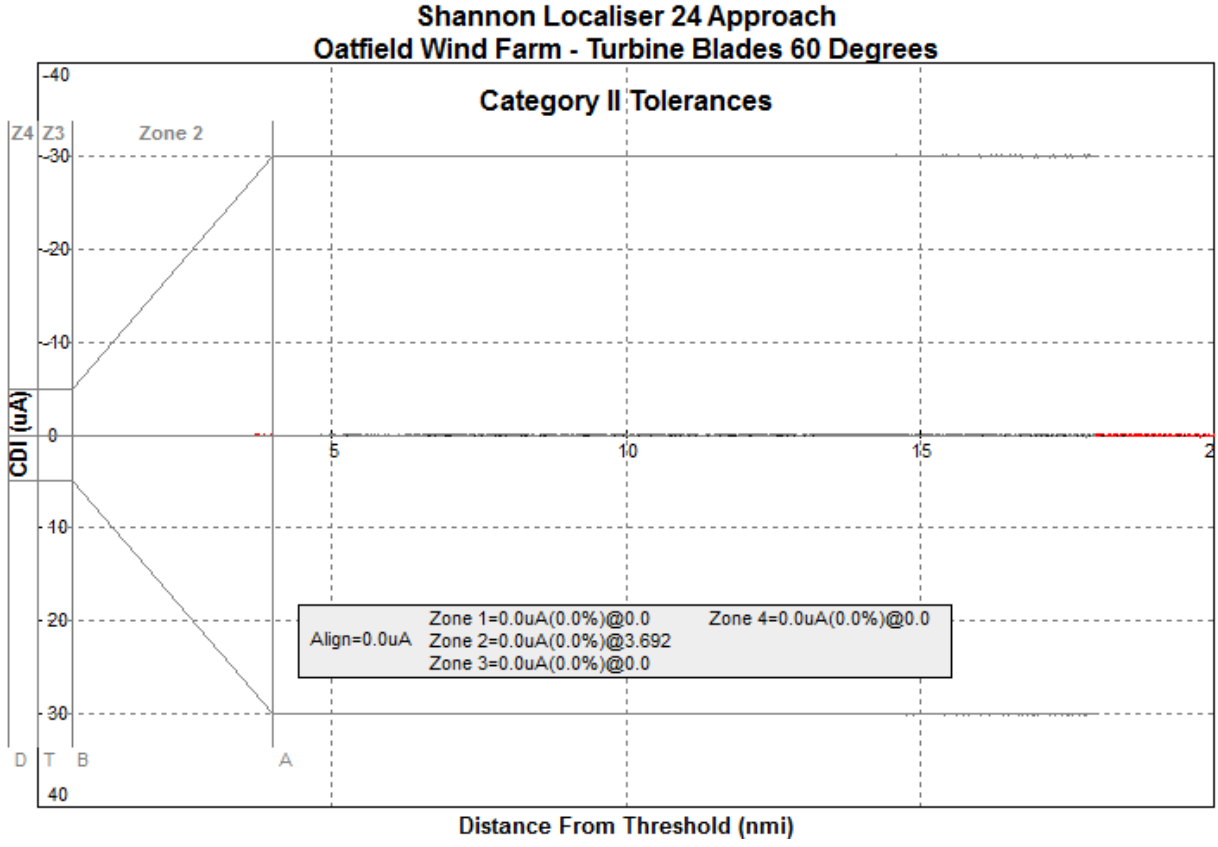


Figure 7.7: Localiser 24 Approach Simulation – Turbine Blades 60 Degrees

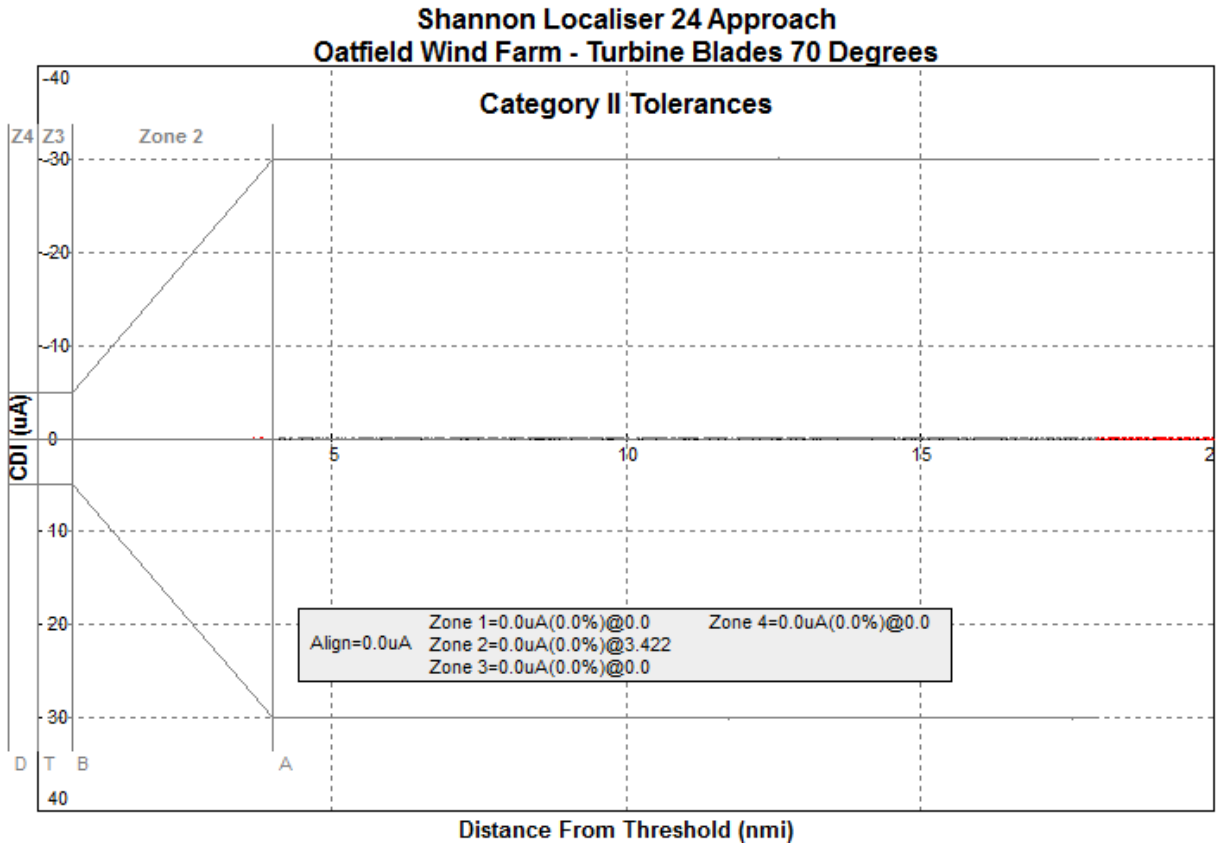


Figure 7.8: Localiser 24 Approach Simulation – Turbine Blades 70 Degrees

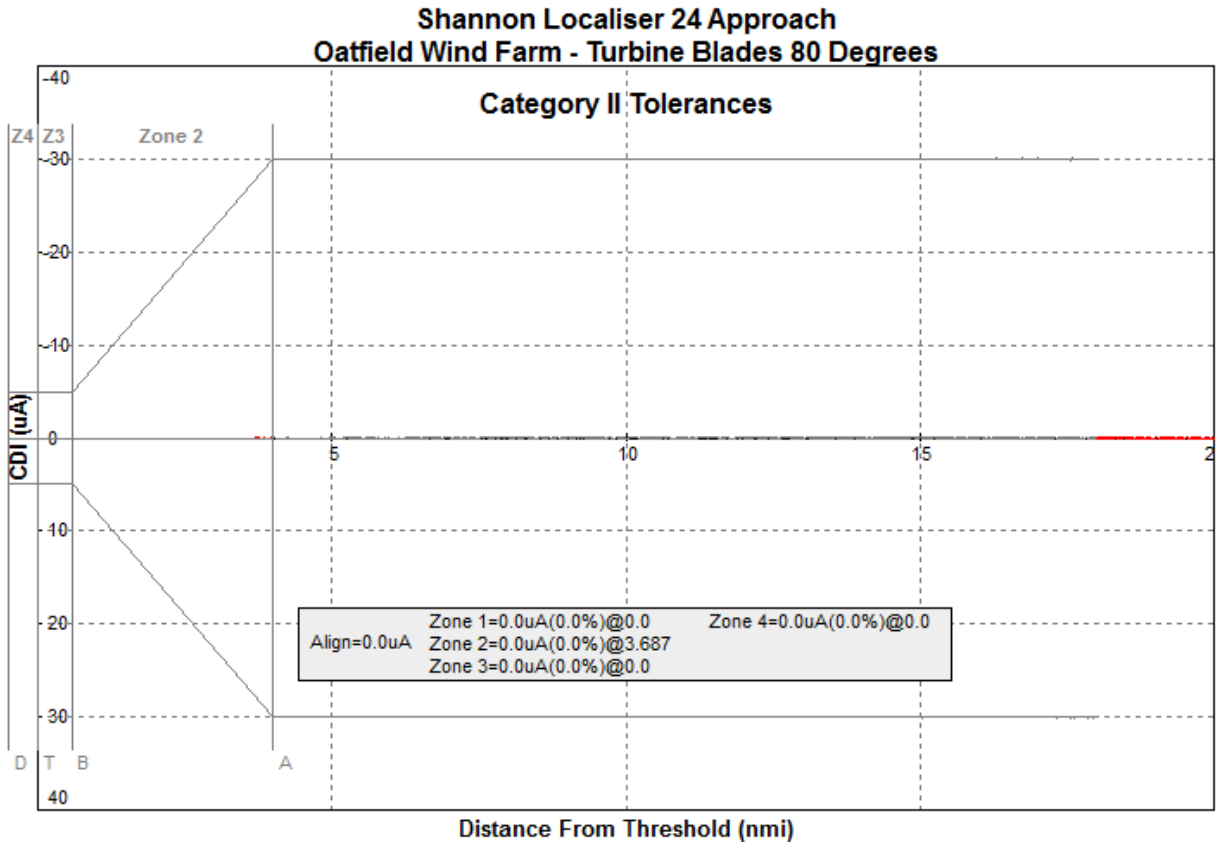


Figure 7.9: Localiser 24 Approach Simulation – Turbine Blades 80 Degrees

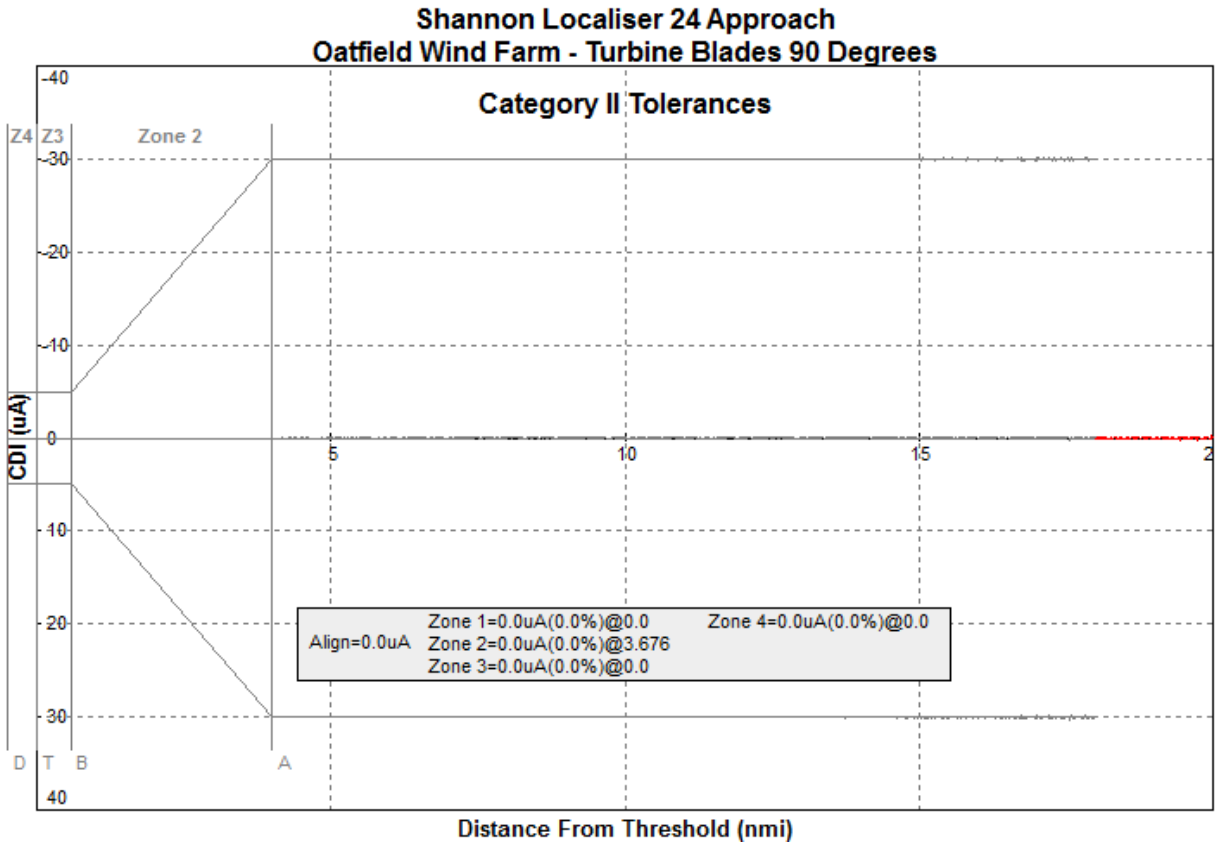


Figure 7.10: Localiser 24 Approach Simulation – Turbine Blades 90 Degrees

7.2 Localiser 24 Part Orbit Simulation (OUNPPM)

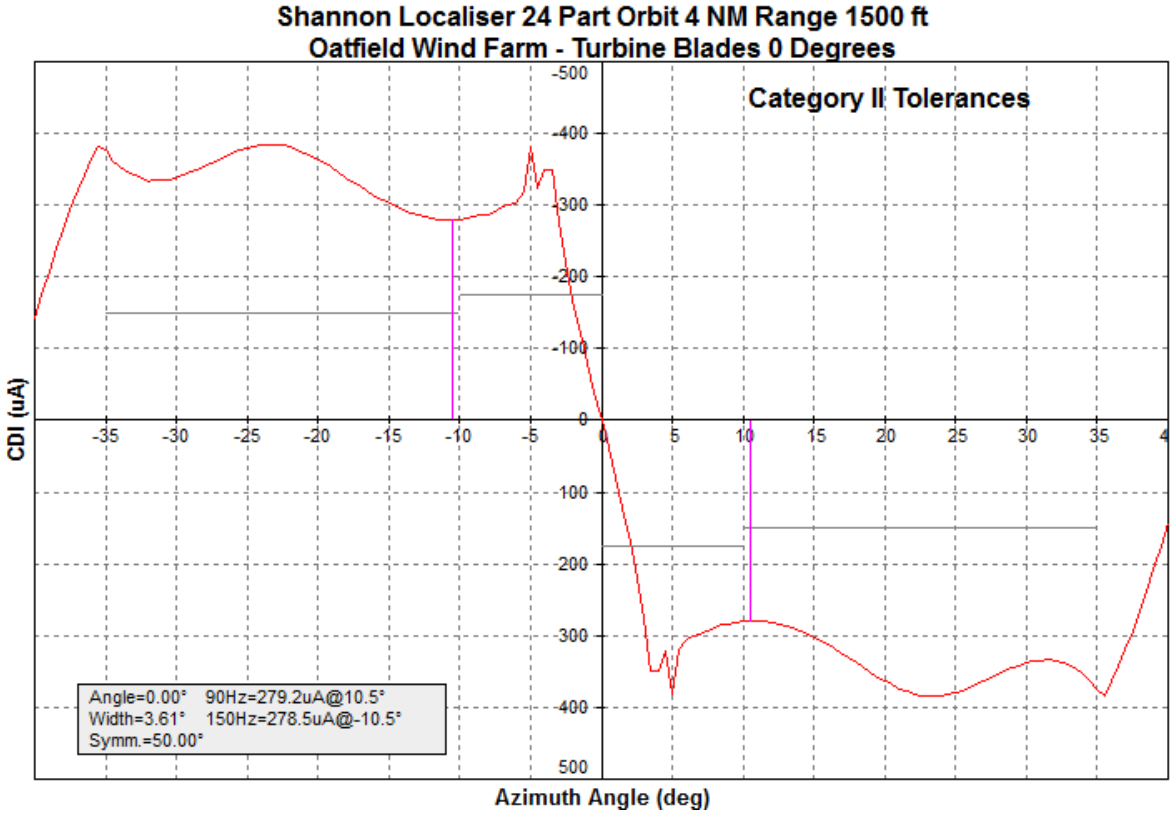


Figure 7.11: Localiser 24 Part Orbit Simulation 4 NM Range – Turbine Blades 0 Degrees

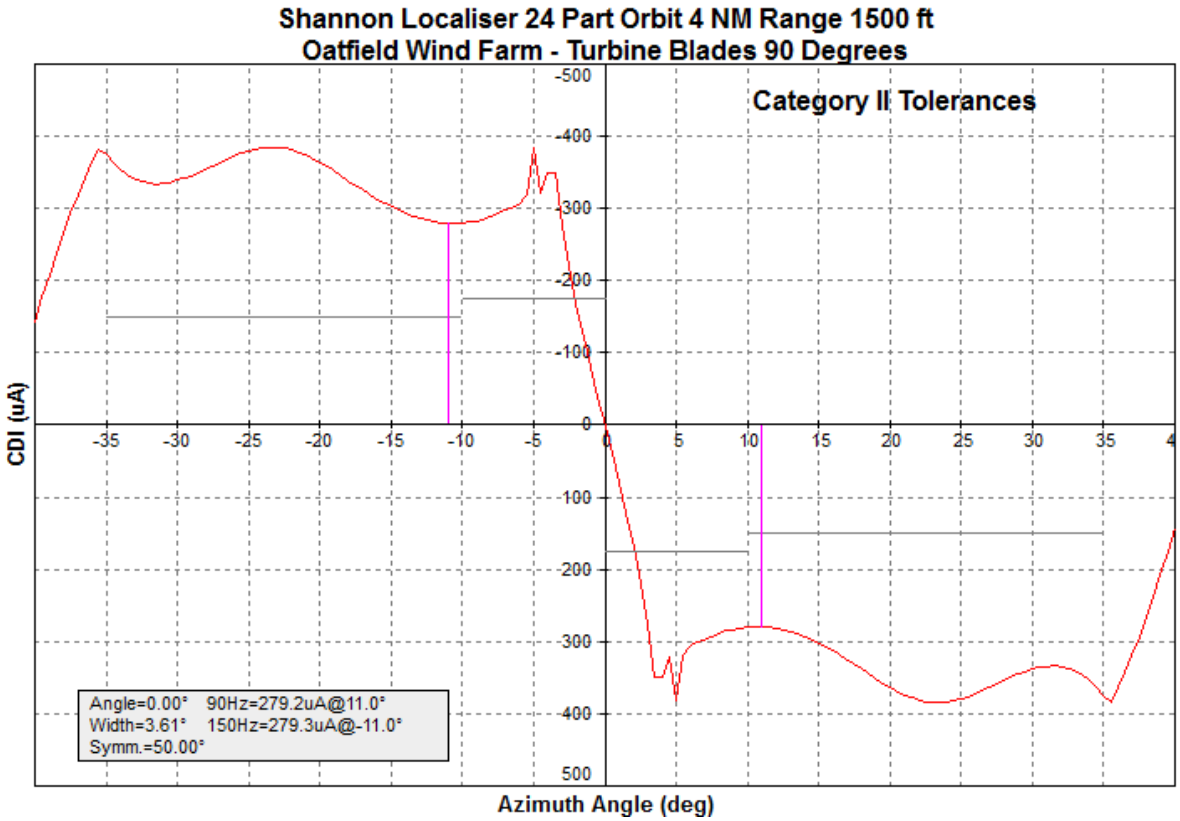


Figure 7.12: Localiser 24 Part Orbit Simulation 4 NM Range – Turbine Blades 90 Degrees

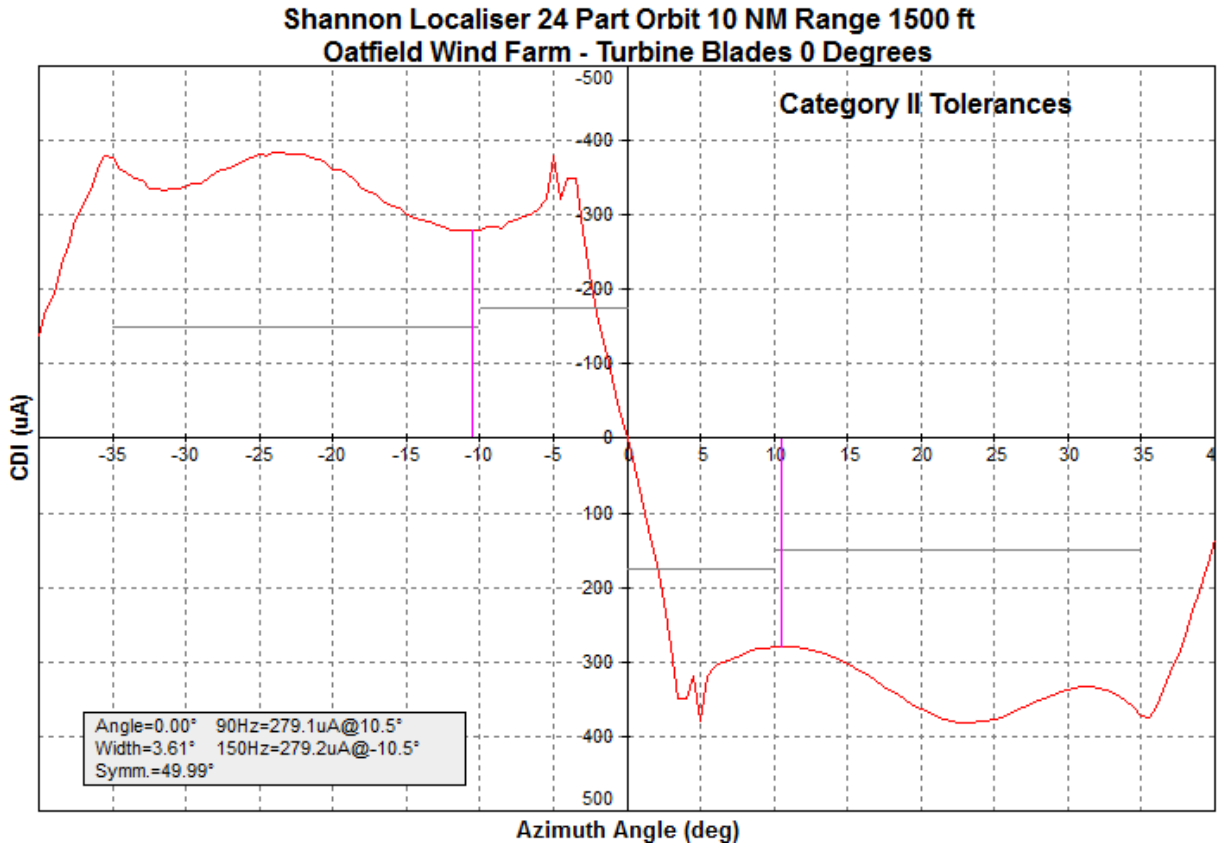


Figure 7.13: Localiser 24 Part Orbit Simulation 10 NM Range – Turbine Blades 0 Degrees

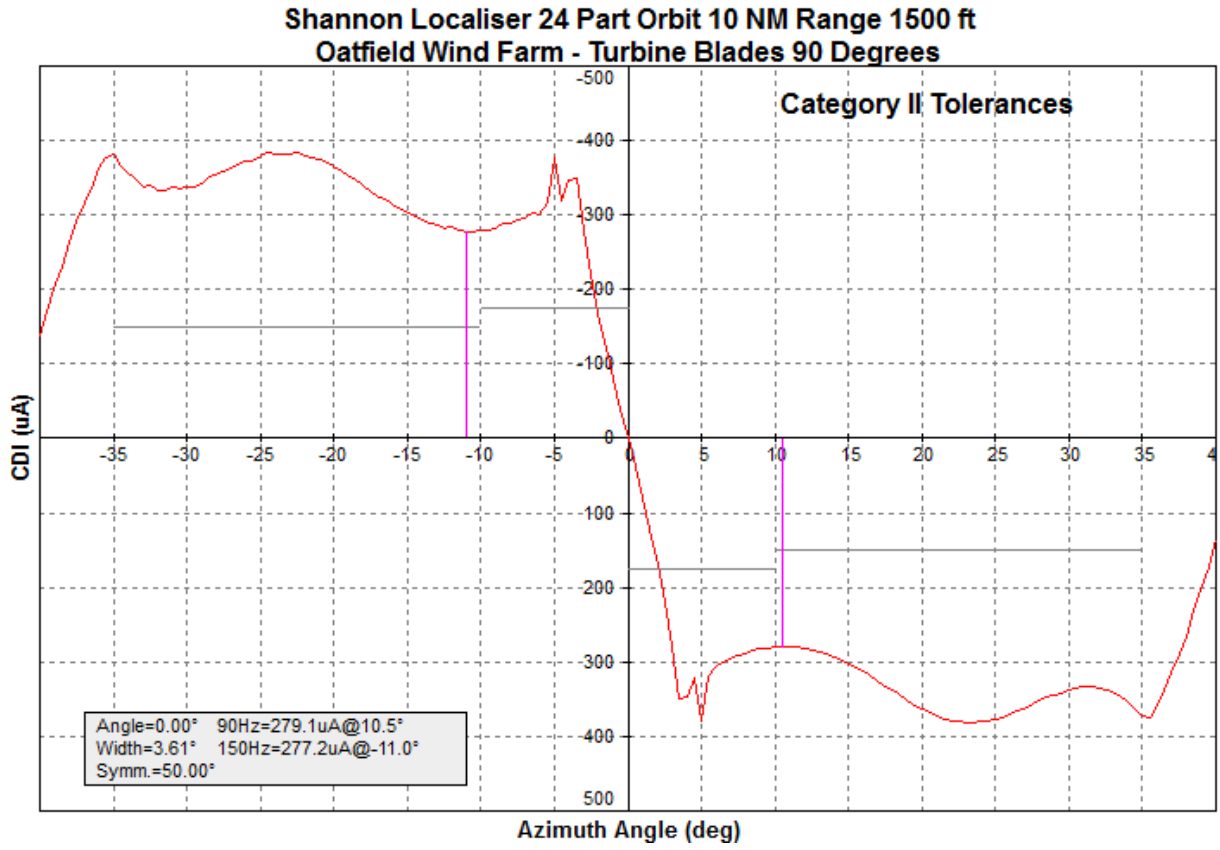


Figure 7.14: Localiser 24 Part Orbit Simulation 10 NM Range – Turbine Blades 90 Degrees

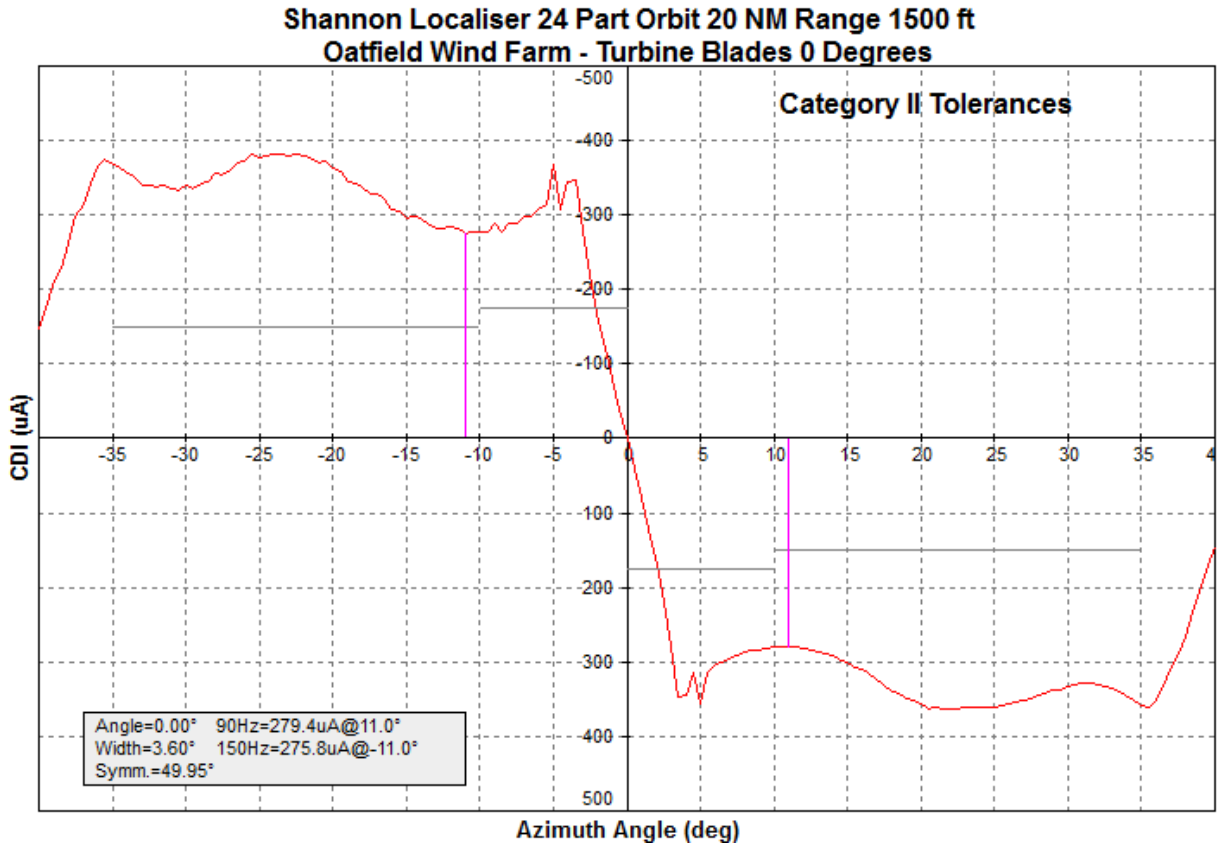


Figure 7.15: Localiser 24 Part Orbit Simulation 20 NM Range – Turbine Blades 0 Degrees

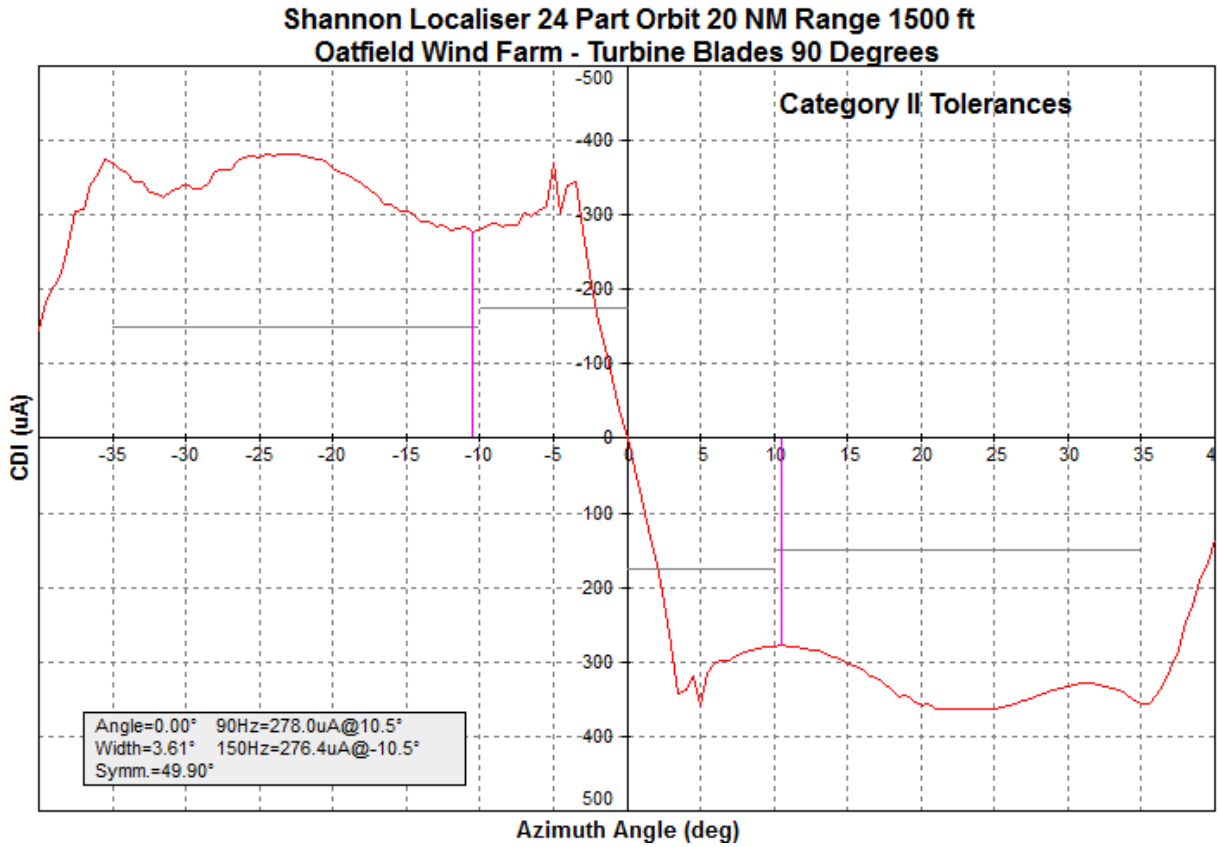


Figure 7.16: Localiser 24 Part Orbit Simulation 20 NM Range – Turbine Blades 90 Degrees

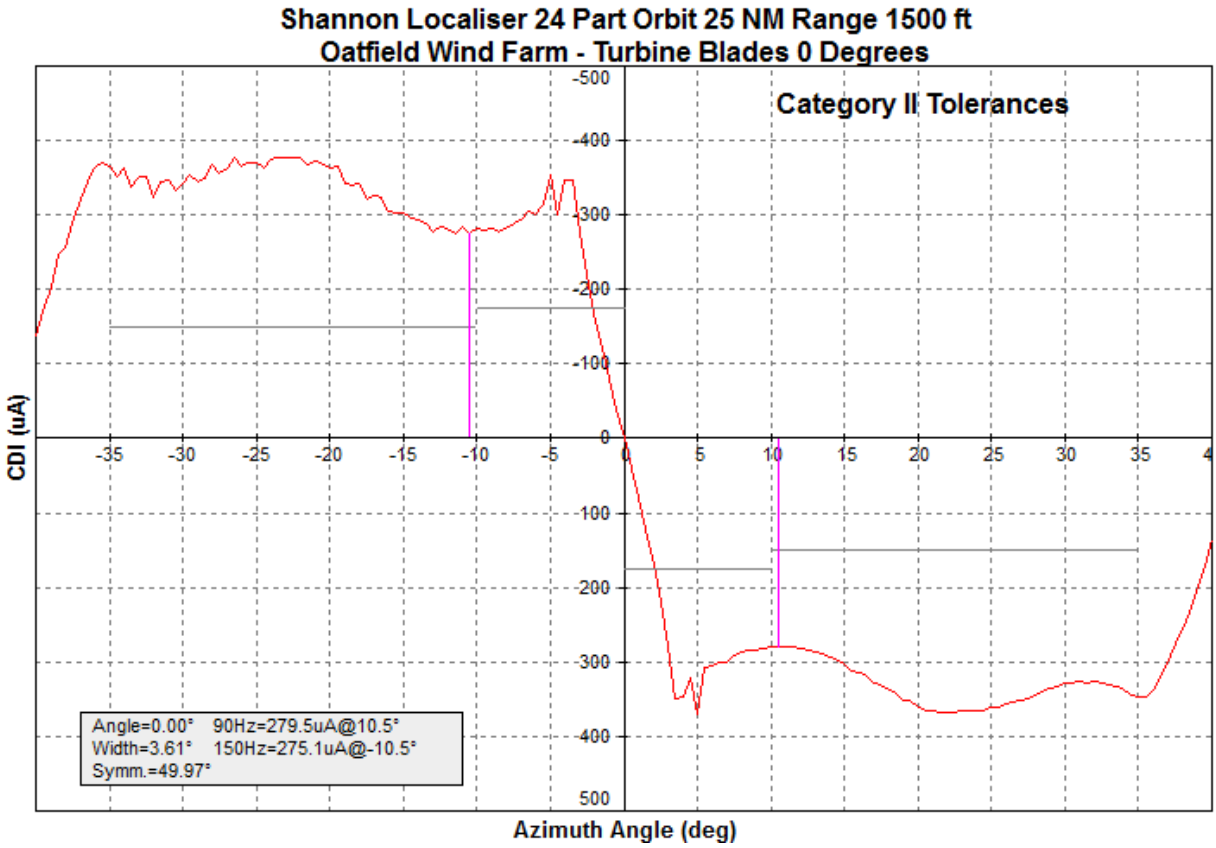


Figure 7.17: Localiser 24 Part Orbit Simulation 25 NM Range – Turbine Blades 0 Degrees

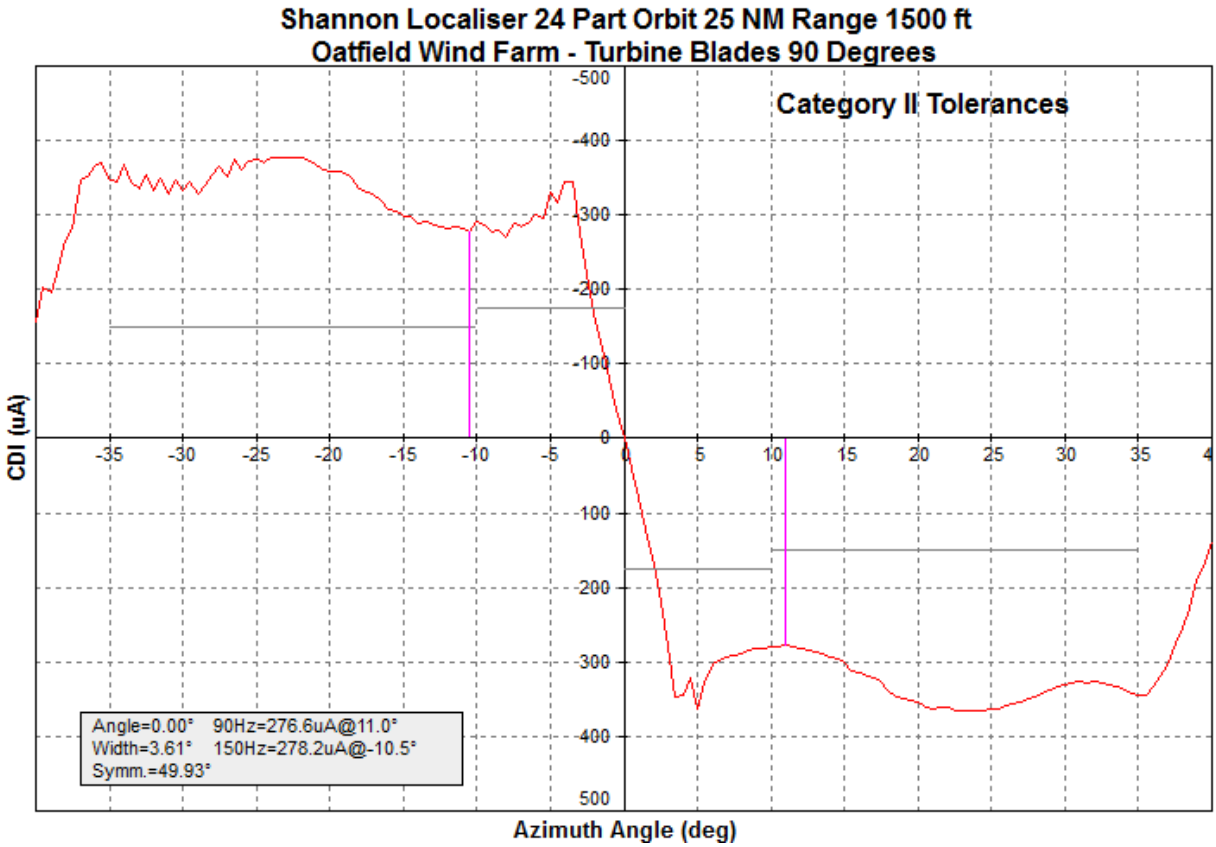


Figure 7.18: Localiser 24 Part Orbit Simulation 25 NM Range – Turbine Blades 90 Degrees

7.1.1 Localiser 24 Summary

The Localiser approach simulation results shown in Figures 7.1 – 7.10 above show insignificant levels of interference at ranges up to 20 NM from the Localiser antenna. The predicted levels of interference are well within ICAO Cat II limits.

The 1500 ft part orbit simulation results shown in Figures 7.11 – 7.18 above show insignificant levels of interference at ranges of 4, 10, 20 and 25 NM range from threshold. The predicted levels of interference are well within ICAO Cat II limits.

It should be noted that the ILS Localiser simulations have been run as ‘worst case’ scenarios i.e. the proposed wind turbines have been assessed as comprising of flat metal sheets acting as perfect reflectors. In reality the wind turbines will comprise multiple curved reflecting surfaces that will tend to scatter Localiser energy in different directions resulting in smaller levels of interference than those predicted in the simulations.

7.3 Glide Path 24 Approach Simulation (AXIS)

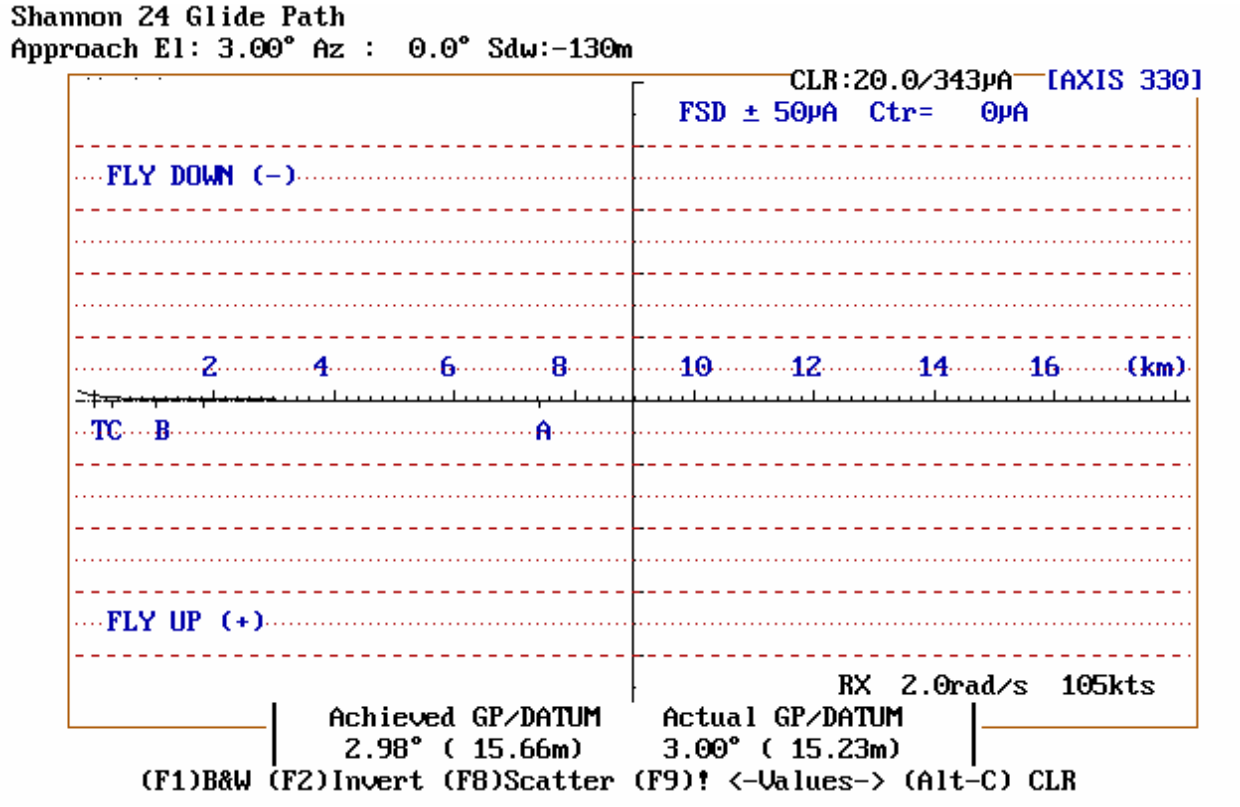


Figure 7.19: Glide Path 24 Approach Simulation – Turbine Blades 0 Degrees

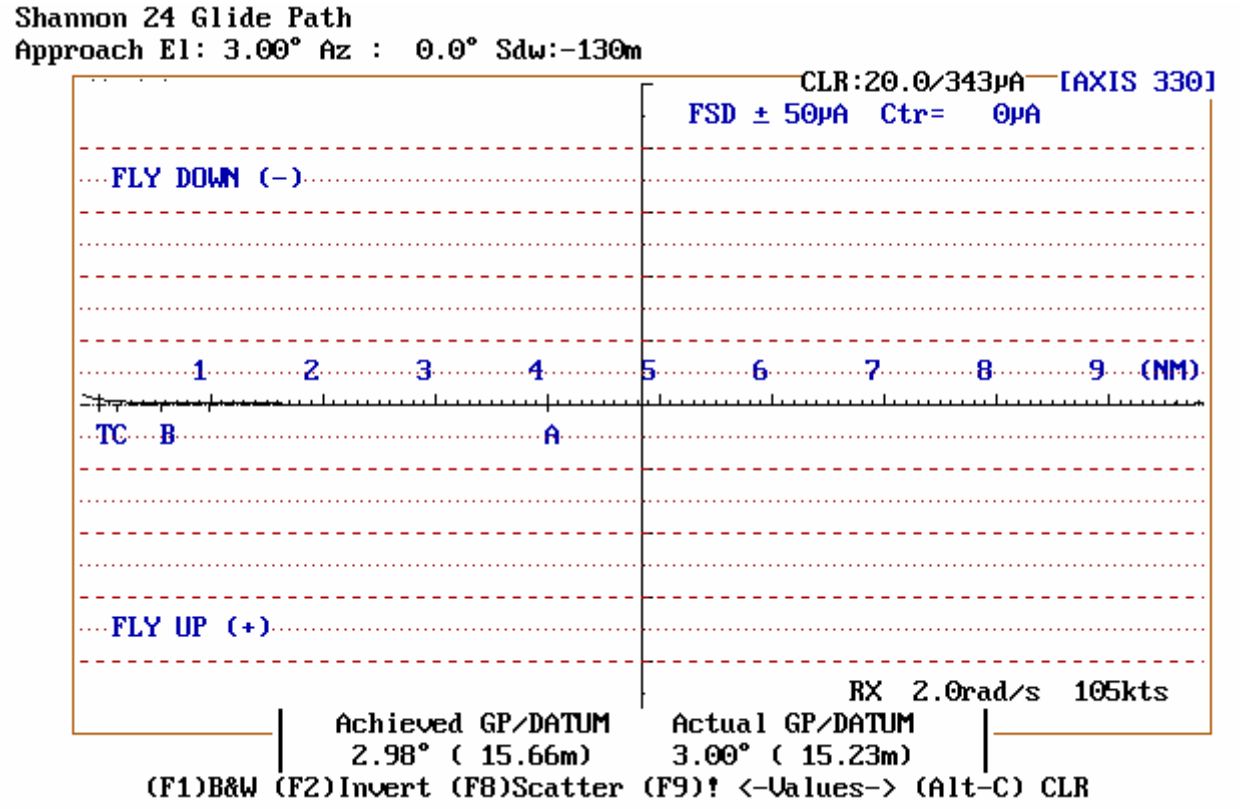


Figure 7.20: Glide Path 24 Approach Simulation – Turbine Blades 10 Degrees

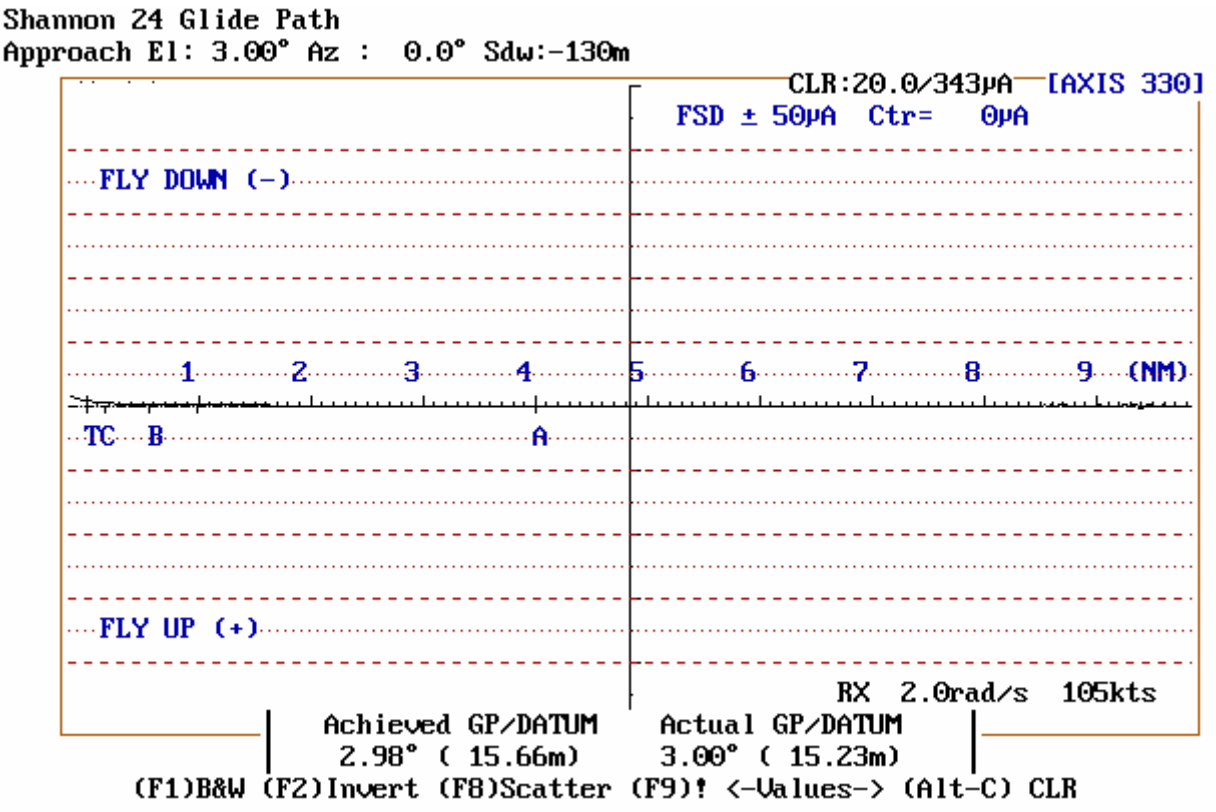


Figure 7.21: Glide Path 24 Approach Simulation – Turbine Blades 20 Degrees

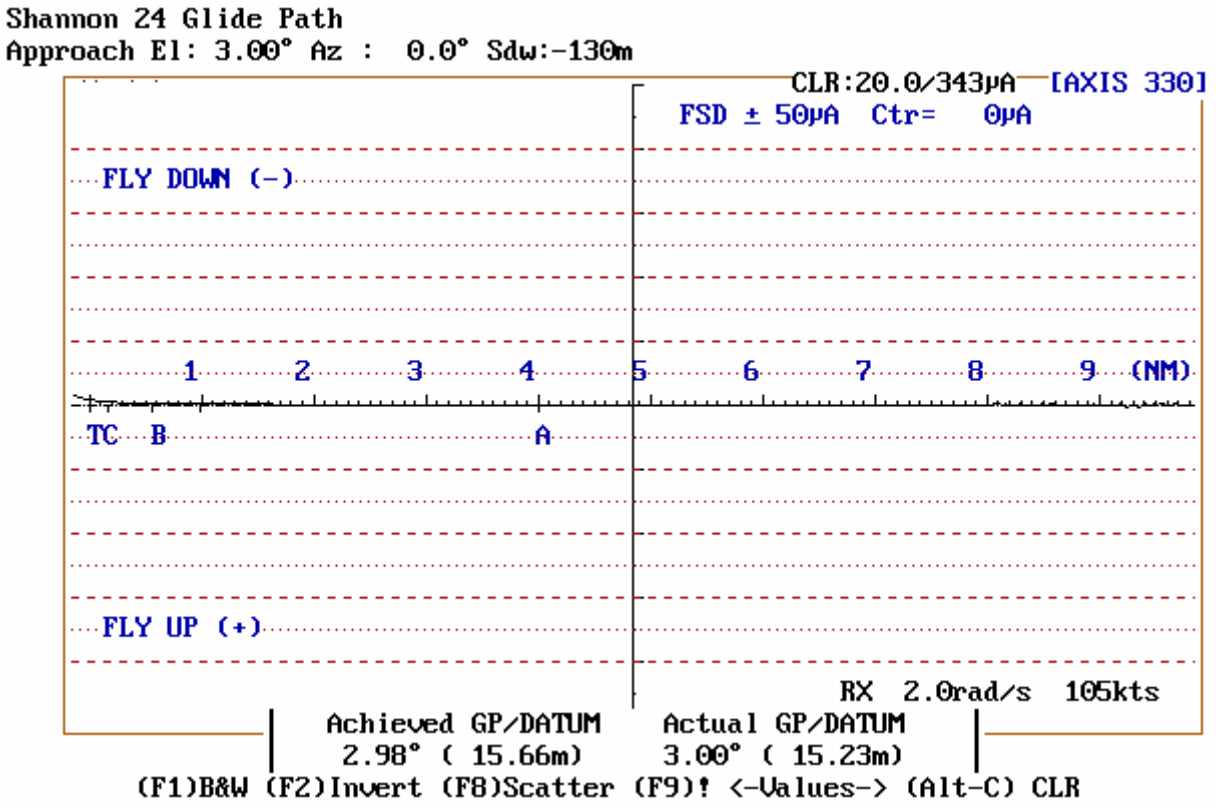


Figure 7.22: Glide Path 24 Approach Simulation – Turbine Blades 30 Degrees

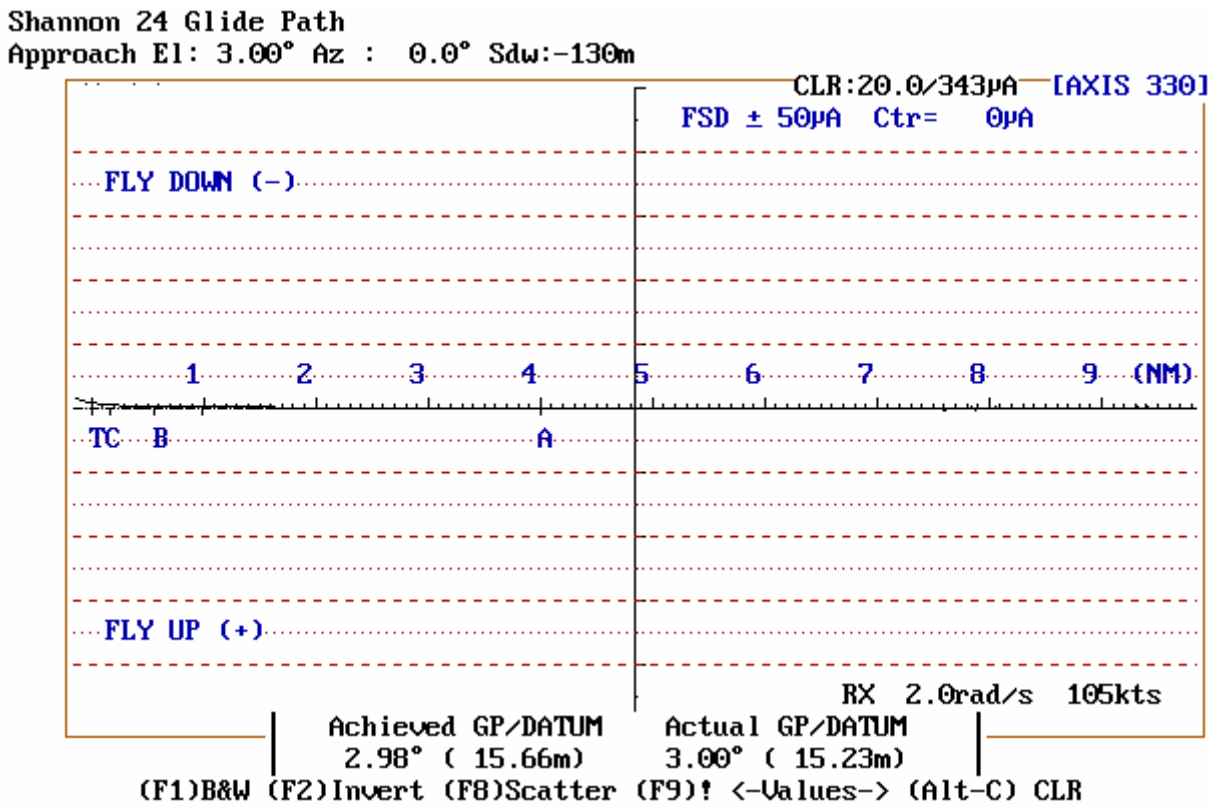


Figure 7.23: Glide Path 24 Approach Simulation – Turbine Blades 40 Degrees

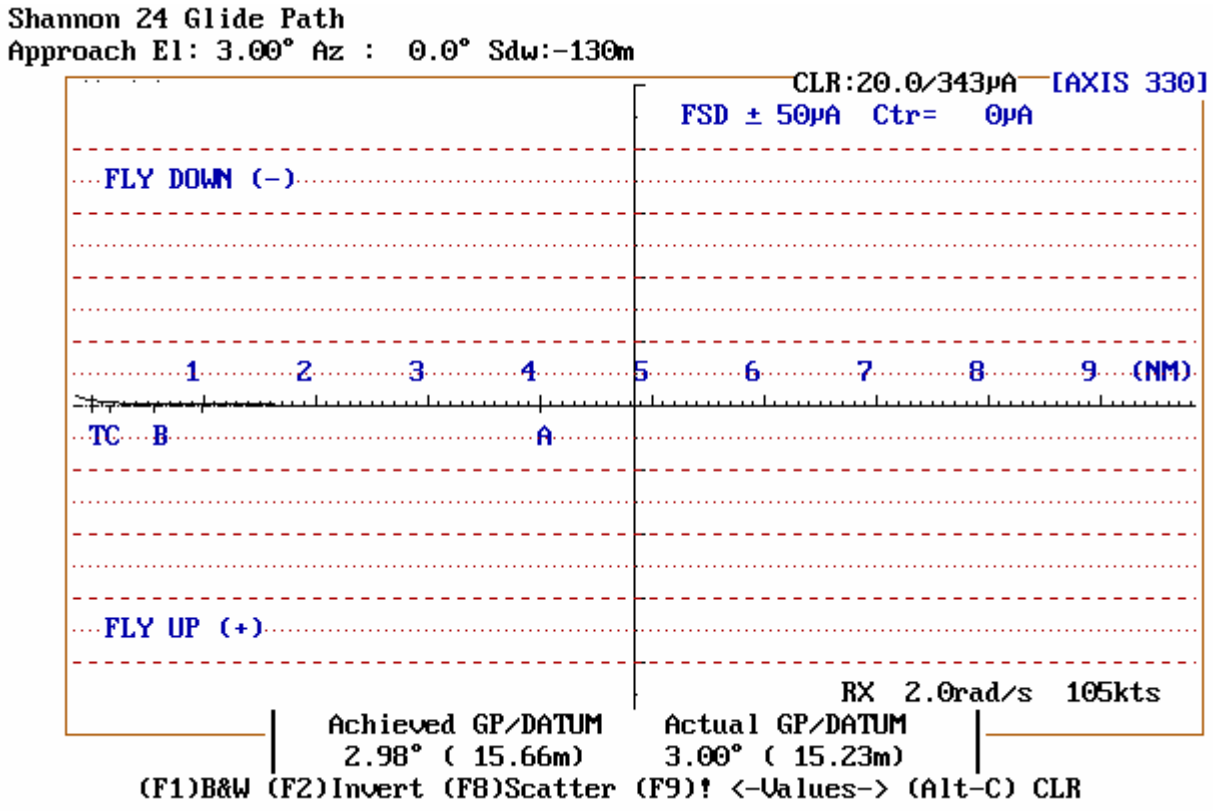


Figure 7.24: Glide Path 24 Approach Simulation – Turbine Blades 50 Degrees

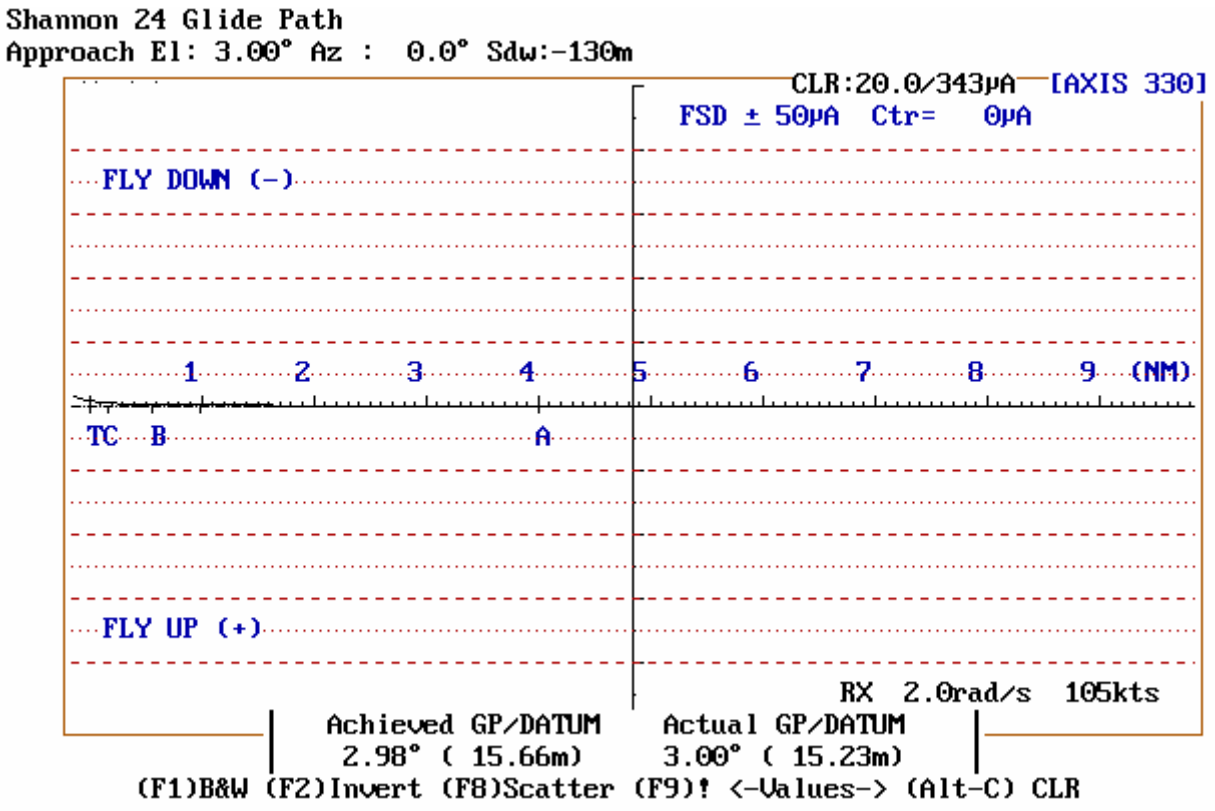


Figure 7.25: Glide Path 24 Approach Simulation – Turbine Blades 60 Degrees

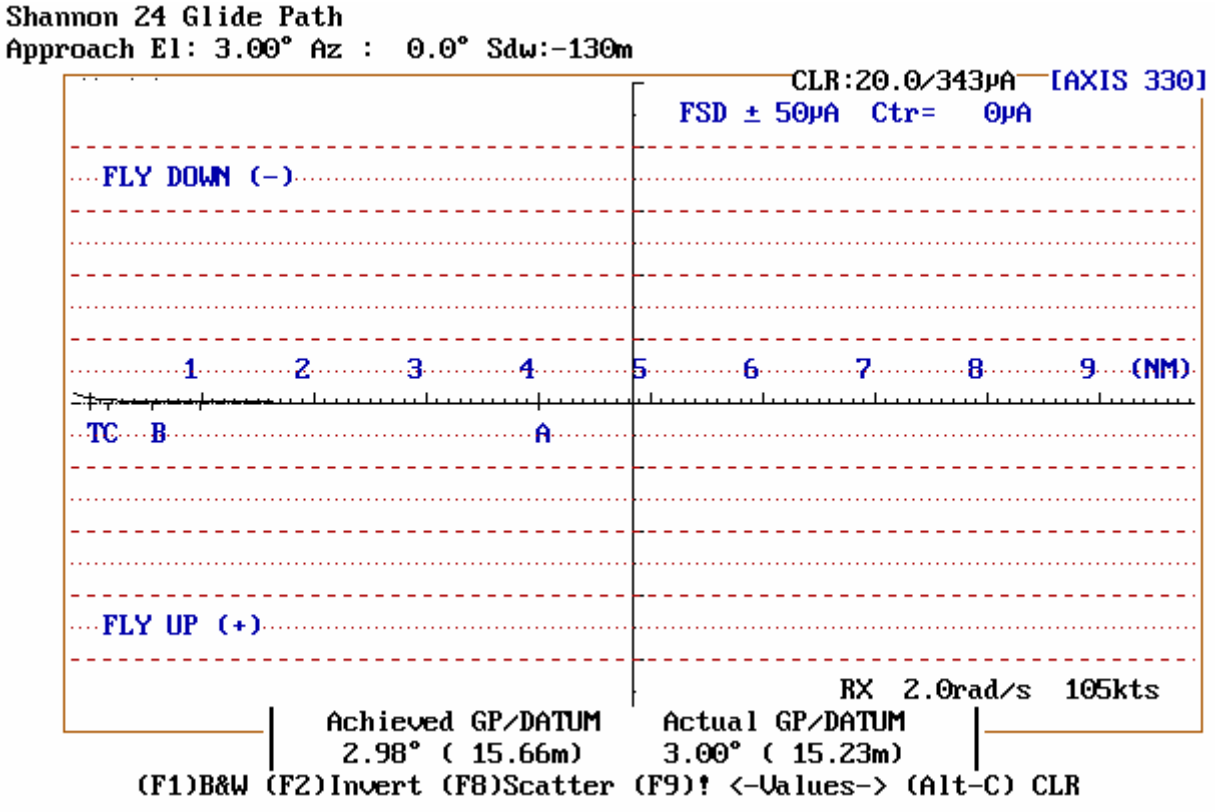


Figure 7.26: Glide Path 24 Approach Simulation – Turbine Blades 70 Degrees

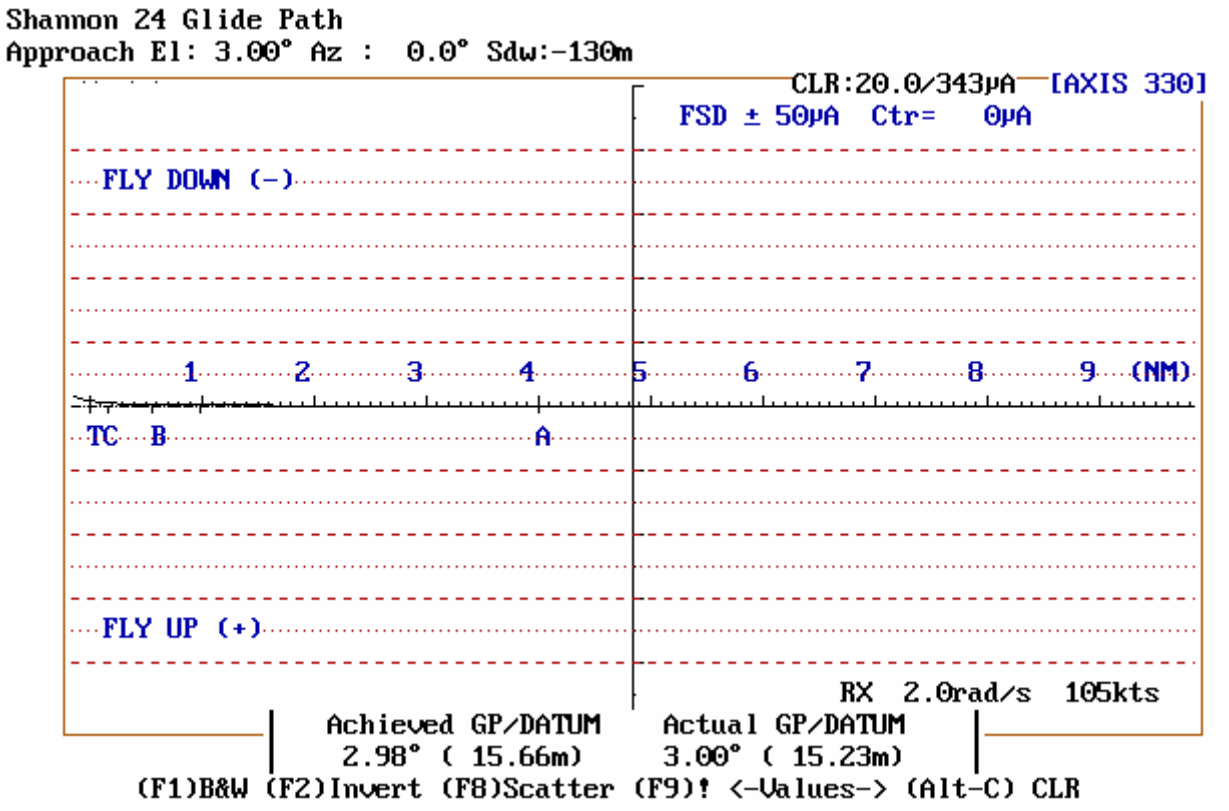


Figure 7.27: Glide Path 24 Approach Simulation – Turbine Blades 80 Degrees

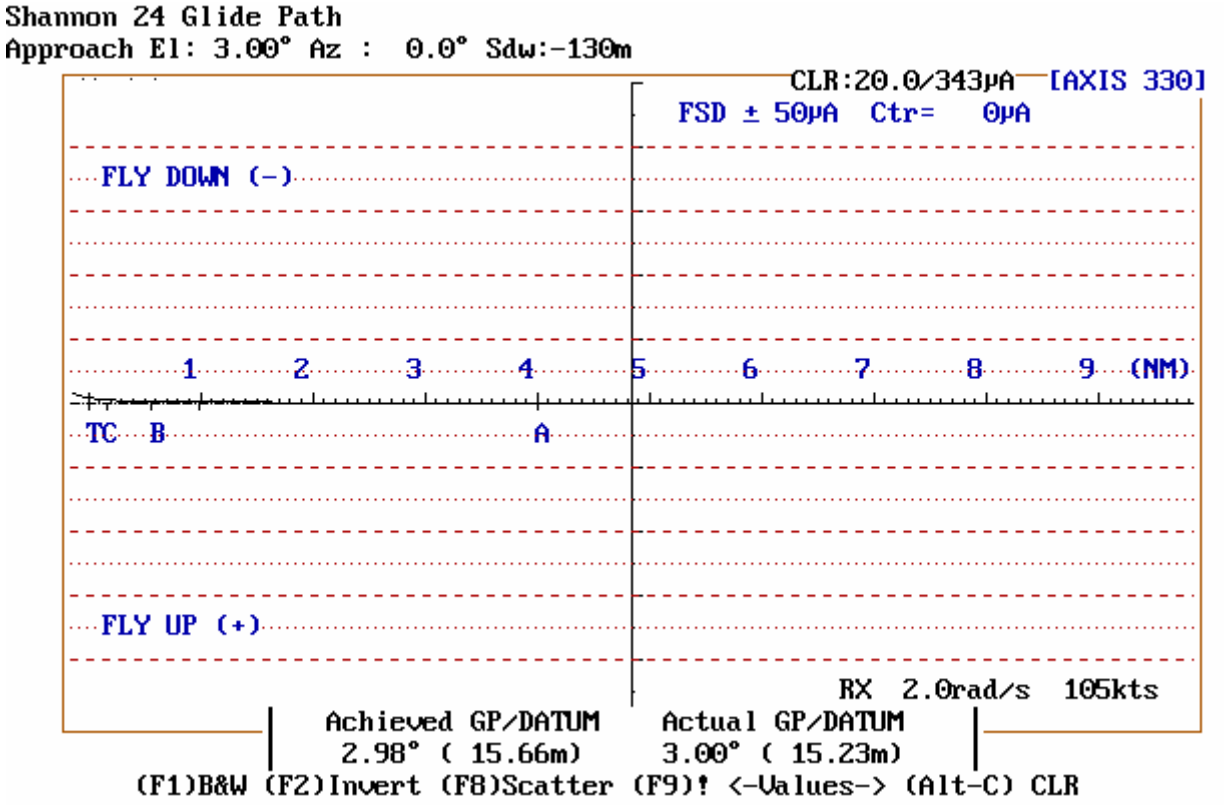


Figure 7.28: Glide Path 24 Approach Simulation – Turbine Blades 90 Degrees

7.2.1 Glide Path 24 Summary

The Glide Path simulation results shown in Figures 7.19 – 7.28 above predict insignificant levels of interference to the Glide Path guidance signal.

It should be noted that the ILS Glide Path simulations have been run as 'worst case' scenarios i.e. the proposed wind turbines have been assessed as single vertical flat metal sheets acting as perfect reflectors. In reality the wind turbines will comprise multiple curved reflecting surfaces that will tend to scatter Glide Path energy in different directions resulting in smaller levels of interference than those predicted in the simulations.

8 CONCLUDING SUMMARY

The "worst case" OUNPPM computer simulation for the Localiser has predicted negligible levels of interference along the approach path within Localiser coverage. It is therefore concluded that the proposed Oatfield Wind Farm will not have any effect on the Runway 24 Localiser guidance signal.

The "worst case" AXIS computer simulation for the Glide Path has predicted negligible levels of interference along the approach path within Glide Path coverage. It is therefore concluded that the proposed Oatfield Wind Farm will not have any effect on the Runway 24 Glide Path guidance signal.

Recommendations:

If construction of the Oatfield Wind Farm is to proceed, large cranes exceeding the height of the wind turbines may be used to erect the turbine structures. Depending on the type of cranes to be used, some further computer simulations may be required to assess the effect of cranes on the ILS Localiser and Glide Path guidance signals.

It is further recommended that a full ILS flight inspection is performed after construction of the wind farm is completed to assess the actual levels of interference caused by the wind turbine structures.

PAGERPOWER

Secondary Surveillance Radar Technical Assessment

Prepared for:

Brookfield Renewable UK Limited

March, 2017

www.pagerpower.com

ADMINISTRATION PAGE

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EXECUTIVE SUMMARY

Purpose of this Report

This report has assessed the potential impact of the Oatfield Project – which is a proposed wind farm comprising 26 turbines – on the Woodcock Hill Secondary Surveillance Radar (hereafter referred to as the Woodcock Hill Radar). The assessment methodology is based on Eurocontrol guidance, which is understood to be a requirement for the Irish Aviation Authority. This report has considered previous aviation analysis undertaken by Osprey CSL.

Woodcock Hill Radar

The Secondary Surveillance Radar at Woodcock Hill is understood to be a Thales RSM970S. This is a Mode-S capable radar that is likely to be operating Mode-S. This is a sophisticated operating mode that increases a radar's tolerance to wind farm interference. Furthermore, the radar is a Monopulse Secondary Surveillance Radar, which increases its tolerance to wind turbine interference further. The radar type is discussed further in Section 2 of this report.

Report Findings

Radar Line of Sight

- All the wind turbines would be in radar line of sight to the Woodcock Hill radar. The turbines would at ranges between 5.3km and 9.3km from the radar.

Reduced Probability of Detection

- There would be some shadowing beyond the wind turbines, caused by a weakening of the radar signal in the shadow of the towers. Aircraft located within the shadow zones would be less likely to be detected by the radar than they currently are.
    - The horizontal length of the shadow zones would be between 1.5km and 1.8km.
    - The altitude of the shadow zones would be between 920ft and 1,490ft above mean sea level.
- Aircraft would be unlikely to fly within the shadow zones associated with the wind turbines. Significant technical impacts on probability of detection are not predicted in practice.

False Target Reports

- Reflections of a radar signal by wind turbines can lead to false targets being displayed on the radar screen. The assessment methodology within the Eurocontrol guidelines has been followed. This approach was specifically designed for Mode A and Mode C operation – whilst the Woodcock Hill radar has capability for the more advanced Mode S operation.
- Four turbines have the potential to cause false targets based on the Eurocontrol methodology. In practice, false returns are unlikely to be an issue because:
    - The calculation methodology is conservative, in particular because it considers a peak radar cross section value rather than an average one.
    - The radar is advanced and has various processing capabilities that would minimise effects.

2D Position Accuracy

- If the path difference between the direct signal from the aircraft transponder and the reflected signal from the wind turbine is small, the apparent position of the aircraft can be displayed incorrectly.
- The Eurocontrol guidelines derive a minimum distance of 5.016 km between a turbine and a Secondary Surveillance Radar to avoid 2D position accuracy issues, although it is noted that the methodology is based on a single turbine.
- The proposed turbines are all more than 5.3 km from the radar. Significant 2D position accuracy concerns are not predicted.

Conclusions

The proposed development has been assessed in accordance with the Eurocontrol guidelines. All technical assumptions are set out within the report, but these are considered reasonable based on the radar type.

The assessment has concluded that significant impacts on the Woodcock Hill radar are not predicted. The shadow zones associated with the wind turbines do not extend into operationally significant airspace when considered in three dimensions.

False targets are theoretically possible for four of the turbines based on the Eurocontrol calculation methodology. Significant effects are unlikely in practice because:

- The calculation method is conservative.
- The radar has at least two sophisticated features (monopulse and Mode S operation) that reduce the likelihood of interference.

Next Steps

- Engagement with the IAA following the results of this assessment is recommended.

LIST OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABOUT PAGER POWER

Pager Power is a dedicated consultancy company based in Suffolk, UK. The company has undertaken projects in 43 countries within Europe, Africa, America, Asia and Australia.

The company comprises a team of experts to provide technical expertise and guidance on a range of planning issues for large and small developments.

Pager Power was established in 1997. Initially the company focus was on modelling the impact of wind turbines on radar systems. Over the years, the company has expanded into numerous fields including:

- Renewable energy projects.
- Building developments.
- Aviation and telecommunication systems.

Pager Power prides itself on providing comprehensive, understandable and accurate assessments of complex issues in line with national and international standards. This is underpinned by its custom software, longstanding relationships with stakeholders and active role in conferences and research efforts around the world.

Pager Power's assessments withstand legal scrutiny and the company can provide support for a project at any stage.

1 BACKGROUND

1.1 Introduction

Brookfield Renewable UK Limited is proposing to develop a wind farm known as Oatfield, located approximately 16.5km east-northeast of Shannon. This report has assessed the potential impacts of the development on the Woodcock Hill Monopulse Secondary Surveillance Radar (MSSR).

The assessment has been conducted in accordance with the Eurocontrol guidelines[1], which is understood to be a requirement of the Irish Aviation Authority.

All coordinates within this report are Irish National Grid (ING) Eastings and Northings.

1.2 Wind Development Details

Table 1 below shows the assessed turbine coordinates. The assessed hub height is 100 metres above ground level and the assessed tip height is 150 metres above ground level.

Turbine	Easting	Northing	Turbine	Easting	Northing
01	151354	168746	14	156158	170130
02	151822	168989	15	156264	169542
03	152335	168949	16	156320	170634
04	152801	168748	17	156676	171534
05	153912	168537	18	156837	170984
06	154351	168822	19	156887	170450
07	154209	169299	20	157017	169783
08	153711	168986	21	157025	169249
09	154549	170166	22	156591	168963
10	154739	169675	23	158228	169786
11	155181	169945	24	158721	169979
12	155324	169420	25	159160	169672
13	155694	169849	26	158943	169201

Table 1 *Proposed turbine details*

[1] Eurocontrol, 2014, How to assess the potential impact of wind turbines on surveillance sensors – guidelines, Edition 1.2

2 WOODCOCK HILL RADAR ISSUES

2.1 Overview – Wind Turbines and Secondary Surveillance Radar

An SSR functions by means of 'interrogation and response'. This means that the radar itself sends out radio pulses which are received by a transponder on board an aircraft. The aircraft then sends a reply signal containing information, which is received by the SSR and subsequently displayed on the controller's radar screen.

The bearing of the aircraft is determined from the bearing the antenna at the time of transmitting and receiving. The range of the aircraft is determined from the time it takes a radio signal to get back to the radar after transmission. Altitude and identification data can be encoded within the response transmitted from the aircraft's transponder.

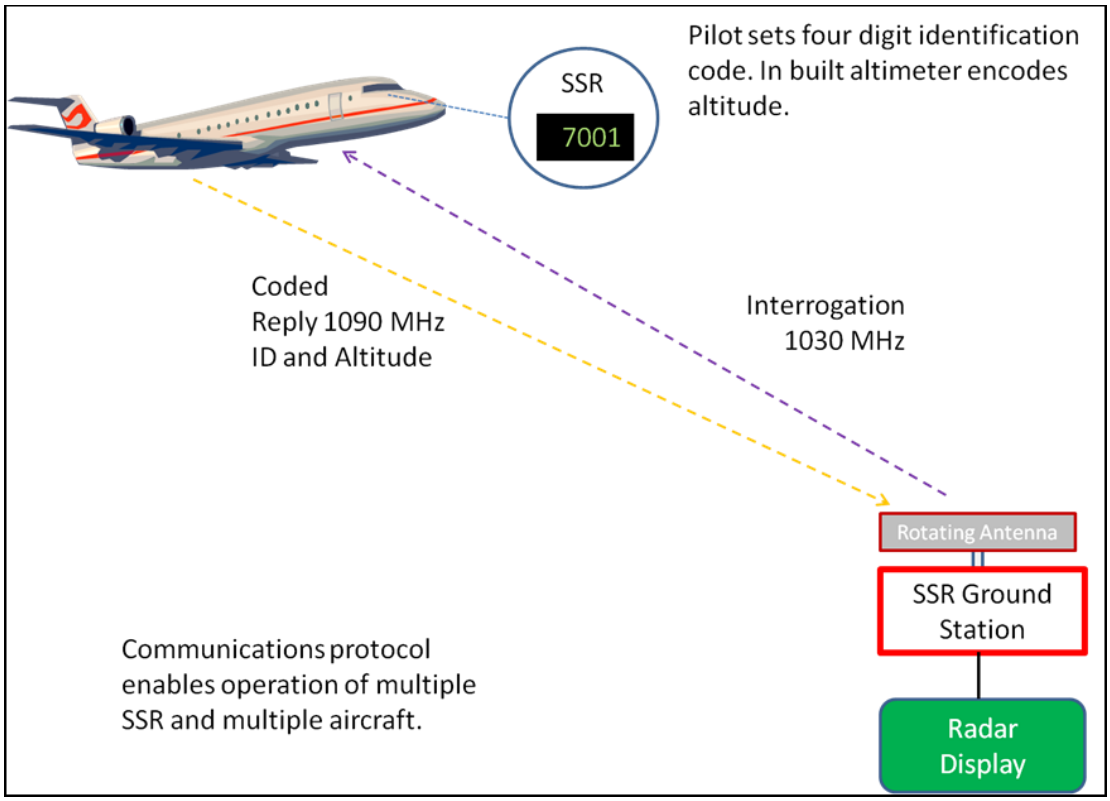

Figure 1 Principles of SSR Operation

If the transponder is not switched on, or does not exist, no detection will take place. All SSR and transponders operate to the same standards worldwide and all use the same frequencies. There is a complex coding protocol used to ensure that transmissions from multiple radar stations and aircraft do not get misinterpreted.

2.2 Woodcock Hill MSSR

The Woodcock Hill radar is a Thales RSM970S. This is a Monopulse SSR or MSSR. In such a system the angle to a target is evaluated by comparison of signals received from two (or more) simultaneous beams. This requires two antenna patterns to be operated in the down link path, each with its own receiver. The signal received by the antenna is passed simultaneously to both receiver outputs, which are compared to determine the azimuth.

The term originates due to a single pulse being able to determine the angle to the target. The main benefit of a Monopulse system is increased azimuth accuracy. Furthermore, its accuracy is not affected by fluctuations in amplitude of the received signal.

In general, MSSR is more wind turbine tolerant than other SSR systems.

2.3 SSR Modes

There are a number of SSR operating modes. The most important modes are outlined in Table 2 below.

Mode	ID available	Altitude Available	Individual addressing and extended data	Capacity Limitations
A	Yes (limited)	No	No	Yes
C	Yes (limited)	Yes (100 feet)	No	Yes
S	Yes	Yes (25 feet)	Yes	No

Table 2 *SSR Modes*

Mode S, which stands for 'mode select', is the most sophisticated mode of operation for an SSR. It is an improved data packet protocol which offers a number of benefits, including the ability to interrogate one target at a time by selecting a particular transponder with which to communicate. Mode S also allows increased azimuth accuracy and a more robust protocol than alternative modes.

Mode S radars are more wind turbine tolerant than alternative modes. The Woodcock Hill radar is a Mode S capable radar and is likely to be operating Mode S.

2.4 SSR Antennae

Aircraft antennae are omnidirectional meaning that they broadcast in all directions simultaneously and receive from all directions simultaneously.

Ground based antennae are highly directional horizontally, focussing almost all energy into a vertical beam that is approximately 2.5 degrees wide. These antennae also have a vertical beam pattern that minimizes ground reflections whilst maximizing performance at long range.

The ground based antenna also transmits a weak control signal at all horizontal bearings except straight ahead. This control signal stops false interrogations occurring outside the desired beam.

Modern Monopulse radar antennae also have a difference pattern. This enables more accurate bearing resolution as returns to the left and right sides of the main beam are eliminated.

Wind turbines are large structures that can reflect radio waves. In the case of Primary Surveillance Radar (PSR), there is a potential concern returns from wind turbines can appear on the radar screen to be returns from an aircraft. This is not the case for SSR, because the reflected radar signal from the turbine will not be mistaken for a signal from a transponder. However, turbines can cause issues with regard to SSR. This is discussed in the following section.

3 EUROCONTROL GUIDELINES

3.1 Overview

Eurocontrol is an international organisation composed of Member States from the European Region. Eurocontrol has produced a document titled *Guidelines on How to Assess the Potential Impact of Wind Turbines on Surveillance Sensors*[2]. Eurocontrol states that:

'This document provides an approach based on an early and constructive dialogue promoting reciprocal transparency between Air Navigation Service Providers (ANSP) and wind energy developers to maintain the necessary levels of safety and efficiency of surveillance Air Traffic Services whilst supporting the development of wind energy.'

Within the guidelines it is stated that:

'The objective of this document is to provide a concise and transparent reference guide for both ANSPs and Wind Energy developers when assessing the impact of wind turbines on ATC surveillance systems.'

3.2 Relevant Sections

Table 3 on the following page sets out the relevant sections of the document with regard to the Oatfield development. The page references refer to the page numbers as shown in the footer of the Eurocontrol document.

[2] Latest edition at the time of writing this report is Edition 1.2 dated 2014

Page	Section	Extract(s)	Remarks
37	4.4.9 SSR Probability of detection and probability of Mode A and Mode C code detection	*The impact shall be calculated in the three dimensions independently for the uplink (aircraft located in the shadow region behind the wind turbine) and the downlink transmissions (SSR located in the shadow region behind the wind turbine). In the case of the downlink transmission, the aircraft position detection may not be affected whereas the Mode A or Mode C code detection may be affected.* *The detailed assessment shall address this topic and shall predict the impact in the 3 dimensions on position detection and Mode A and C code detection performance.*	This has been assessed in accordance with the methodology set out in Annex A and Annex D.
37	4.4.10 SSR False Target Reports	*… SSR false target reports may appear due to reflection on the wind turbine of the uplink signal, of the downlink signal and/or of both.* *The detailed assessment shall address this topic and shall predict where the false target reports will be located.*	This issue has been addressed using the equations provided in Annex D of the guidelines.
37 / 38	4.4.11 SSR 2D position accuracy	*This effect may occur to targets located further away than the wind turbine and in the same azimuth region.* *The detailed assessment shall address this topic and shall predict the impact in the 3 dimensions on the SSR position accuracy performance.* *It is to be noted that in case of a Mode S radar a single reply is sufficient to generate a target report.*	Assessed in line with Annex D of the guidelines.
38	4.5 Operational assessment	*Once an adverse engineering impact has been predicted, the next phase will be to assess whether this effect will be operationally tolerable or not.*	The focus is on considering any technical impact as part of an operational assessment.

Table 3 *Relevant sections of Eurocontrol guidance*

Annex A and Annex D of the Eurocontrol guidelines provide the equations that underpin the technical assessment.

Figure 2 below shows the recommended safeguarding ranges and assessment requirements for SSR installations as defined within the Eurocontrol Guidance.

Zone	Zone 1	Zone 2	Zone 4
Description	0 - 500 m	500 m - 16 km but within maximum instrumented range **and in** radar line of sight	Further than 16 km or **not** in radar line of sight
Assessment Requirements	**Safeguarding**	**Detailed assessment**	**No assessment**

Figure 2 *Eurocontrol SSR recommended safeguarding ranges*

4 ASSESSMENT

4.1 Airspace

The turbines are located within the Shannon Airport Control Area. The airspace ta the development location is controlled Class C from the surface to Flight Level 245 (approximately 24,500 feet above mean sea level).

4.2 SSR Recommended Safeguarding Ranges

The recommended safeguarding ranges are published in Section 4.2.2 of the Eurocontrol guidelines. Table 4 below summarises the radar line of sight assessment results.

Turbine	Distance from radar (km)	Within radar line of sight by:	Turbine	Distance from radar	Radar line of sight result
01	5.30	150 m	14	7.68	135 m
02	5.49	137 m	15	7.24	150 m
03	5.43	150 m	16	8.20	105 m
04	5.26	150 m	17	9.16	40 m
05	5.29	150 m	18	8.76	120 m
06	5.70	150 m	19	8.34	103 m
07	6.10	146 m	20	7.87	126 m
08	5.66	150 m	21	7.46	147 m
09	7.03	150 m	22	6.96	150 m
10	6.64	150 m	23	8.66	147 m
11	7.06	150 m	24	9.14	141 m
12	6.65	150 m	25	9.25	138 m
13	7.21	150 m	26	8.78	150 m

Table 4 *Radar line of sight results*

All of the proposed turbines are between 5.3 km and 9.3 km of the Woodcock Hill MSSR and within radar line of sight. The development lies in Zone 2 and a detailed assessment is required.

4.3 SSR Probability of Detection and Probability of Mode A and Mode C Code Detection

The method of assessment involves the construction of the shadow zones in accordance with the methodology set out in Annex A and Annex D of the Eurocontrol guidelines. The relevant equations and parameters used for the assessment are set out below.

The Shadow Length is given by Equation 29 of the guidelines within Annex D:

$$D_{wr} = \frac{D_{tw}}{\left[\frac{\lambda . D_{tw}}{S^2}\left(1 - \sqrt{PL}\right)^2 - 1\right]}$$

Where:

- D_{wr} is the shadow length.
- D_{tw} is the distance between the radar and the turbine.
- λ is the radar wavelength (based on a 1030 MHz radar beam in this analysis, typical for an SSR uplink and in line with the Eurocontrol guidelines).
- S is the turbine tower diameter (taken as 6 metres for this analysis).
- PL is the acceptable power loss (taken as 0.5 which corresponds to 3 dB for this analysis, this is the figure used in the Eurocontrol guidelines).

The shadow zone width calculation is given by Equation 4 of the guidelines within Annex A:

$$h = \sqrt{\left(\frac{\lambda}{2} + D\right)^2 - D^2}$$

Where:

- h is the shadow half-width;
- D is the distance beyond the turbine;
- λ is the radar wavelength (based on a 1030 MHz radar beam in this analysis, typical for an SSR uplink and in line with the Eurocontrol guidelines).

The shadow zone height is given by Equation 1 of the Eurocontrol guidelines provided within Annex A:

$$H_{shadow} = b' - k.R$$

Where:

- b' is the distance from the tip of the shadow zone to the earth's centre.
- k is a propagation factor (taken to be 4/3 in this analysis).
- R is the radius of the earth (taken to be 6,371 km in this analysis).
- H_{shadow} is the height of the shadow above sea level.

Table 5 shows the results for the Oatfield turbines:

Turbine	Shadow Length (m)	Shadow Height above mean sea level (m)	Shadow Width (m)
01	1710	399	44.63
02	1692	421	44.39
03	1698	449	44.46
04	1715	408	44.69
05	1712	361	44.65
06	1672	367	44.13
07	1641	396	43.71
08	1676	407	44.18
09	1585	413	42.95
10	1606	403	43.24
11	1583	437	42.93
12	1605	413	43.23

Turbine	Shadow Length (m)	Shadow Height above mean sea level (m)	Shadow Width (m)
13	1576	427	42.84
14	1555	394	42.55
15	1575	386	42.82
16	1535	361	42.28
17	1506	283	41.87
18	1517	359	42.03
19	1531	325	42.21
20	1547	314	42.45
21	1564	309	42.68
22	1588	326	43.00
23	1520	351	42.07
24	1506	333	41.88
25	1503	338	41.84
26	1517	334	42.02

Table 5 *SSR Shadow Zone Calculations*

Figure 3 on the following page shows the shadow zones for the individual turbines.

The shadow zone for the SSR would extend to a maximum of 1,715 metres beyond the turbines with a maximum altitude above mean sea level of 449 metres (1,490 feet). The width of the shadow is approximately 42 metres for all turbines[3].

Aircraft are highly unlikely to fly at such low altitudes immediately behind the wind turbines, and the effects of shadowing are likely to be insignificant.

[3] Calculated based on a 6 metre diameter at the tower base and a 3 metre diameter at the top of the tower.

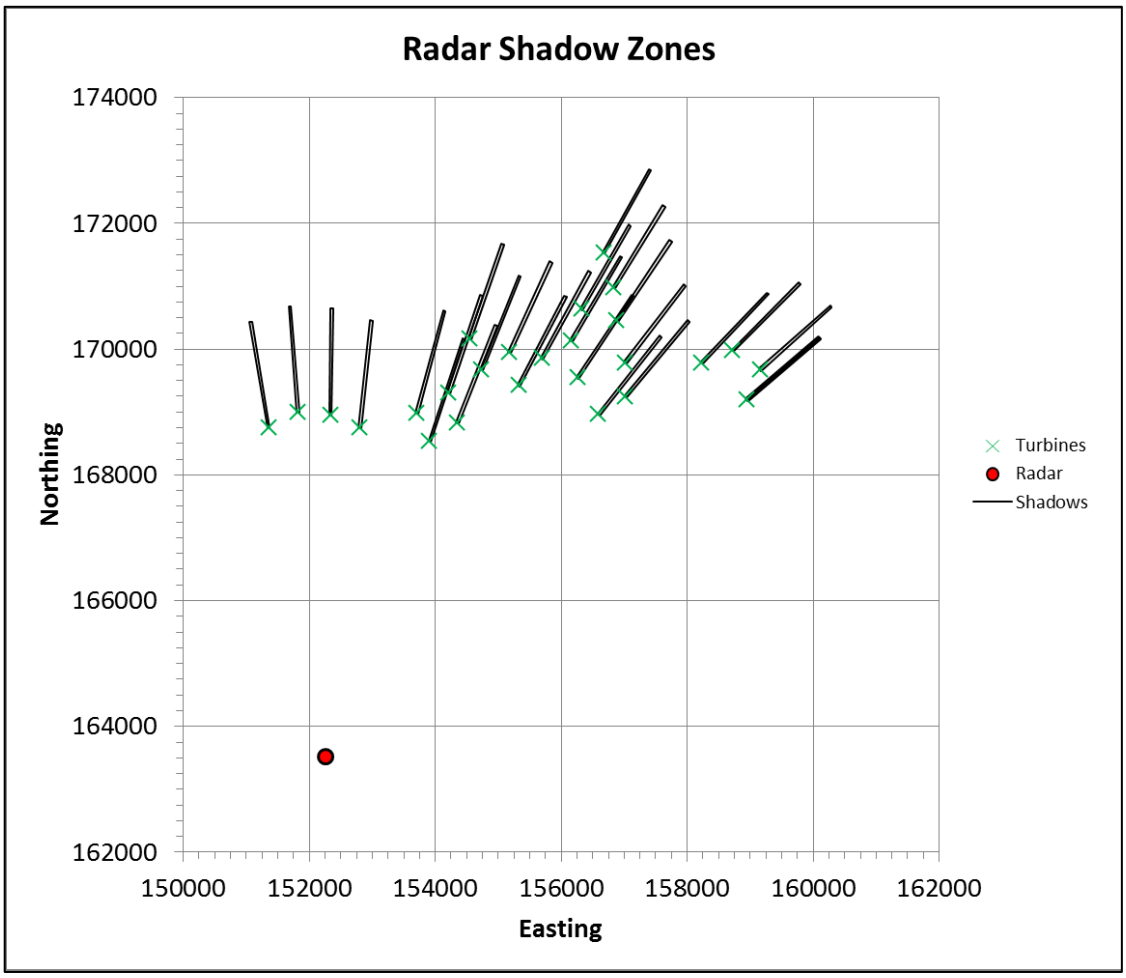

Figure 3 *Shadow Zones (chart)*

Figure 4 on the following page shows the shadow zones (red areas) overlaid on aerial imagery[4] of the region.

[4] Copyright Google and DigitalGlobe

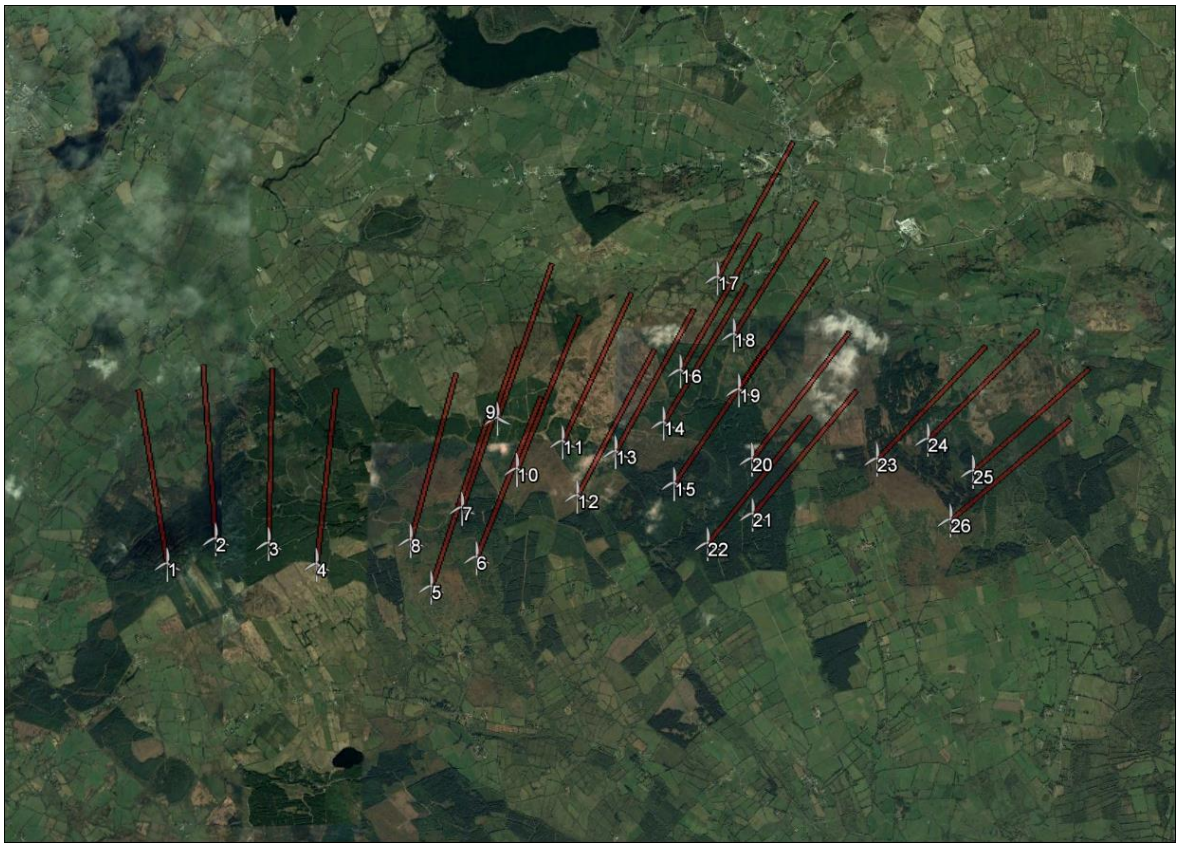

Figure 4 *Shadow Zones (map)*

4.4 SSR False Target Reports (Eurocontrol Guidelines Section 4.4.10)

Annex D of the Eurocontrol Guidelines indicates that the calculation should consider conditions to get a reply from an aircraft's transponder when the interrogating signal is reflected from a wind turbine. A transponder becomes insensitive for a period of 35 microseconds after interrogation, meaning that any subsequent interrogations in this period are ignored. Annex D goes on to explain that any aircraft transponder located closer than 5,250 metres will therefore not reply to reflected interrogations.

Equation 30 of Annex D provides the formula for calculating the distance between the aircraft transponder and the wind turbine beyond which multiple target reports will not be initiated:

$$D_{tw} = \sqrt{\frac{\sigma F_{tw} F_{wr} G_{tw} G_{wr} P_t \lambda^2}{(4\pi)^3 D_{wr}^2 P_{thresh}}}$$

Where:

- σ is the bi-static RCS of the turbine in square metres.
- F_{tw} is the terrain induced attenuation factor between the radar and the wind turbine.
- F_{wr} is the terrain induced attenuation factor between the wind turbine and the receiver.
- G_{tw} is the transmit antenna gain in the direction of the wind turbine.
- G_{rw} is the receive antenna gain in the direction of the wind turbine.
- D_{wr} is the distance between the wind turbine and the receiver in metres.
- P_t is the transmitted power in Watts.
- P_{thresh} is the radar detection threshold in Watts.

If the value of D_{tw} is greater than 5,250 metres, there is potential for a false target report.

The Woodcock Hill MSSR is a Thales RSM970S radar. Pager Power has some typical parameters relating to this radar type. These are shown in Figure 5 and have been used within this analysis.

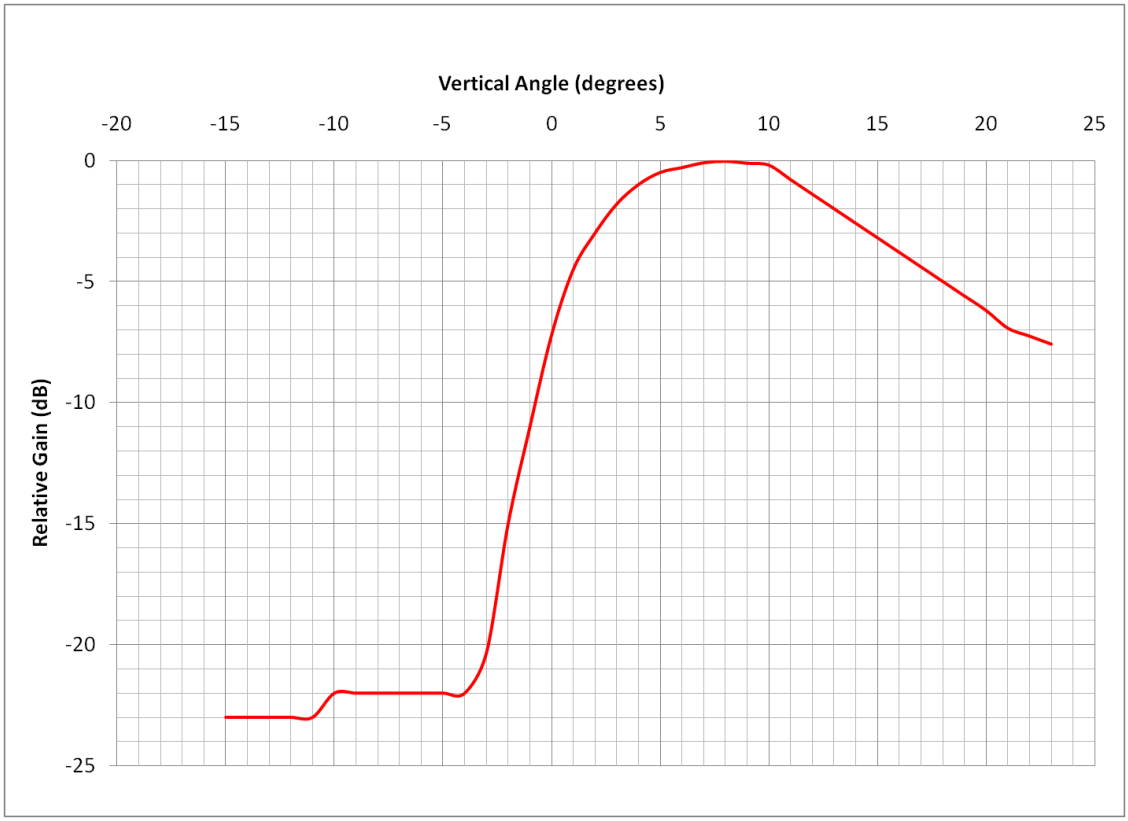

Figure 5 SSR Vertical Antenna Pattern (digitized)

Method / Parameter	Value / Description	Source / Rationale
Transmitter Power	2570W 64.1dBm	Thales Typical
Maximum Antenna Gain	27.0 dB	Thales Typical
Transmitter Antenna Vertical Gain	As per antenna pattern above to wind turbine hub	Thales Typical and Figure 3 above
Losses between transmitter output and antenna input (uplink)	4.2dB	Thales Typical
Calculation of G_{tw}	Maximum Gain + Vertical Gain – Losses	Vertical gain and connection losses need to be accounted for.

Table 6 *Typical Thales SSR parameters*

Table 7 below shows the result for the Oatfield turbines.

Turbine	D_{tw} (m)	Conclusion
01	4,988	No issue.
02	5,274	Potential issue for aircraft between 5,250 metres and 5,274 metres from T2.
03	5,651	Potential issue for aircraft between 5,250 metres and 5,651 metres from T3.
04	5,102	No issue.
05	4,415	No issue.
06	4,554	No issue.
07	4,962	No issue.
08	5,088	No issue.
09	5,148	No issue.
10	5,038	No issue.
11	5,403	Potential issue for aircraft between 5,250 metres and 5,403 metres from T11.
12	5,150	No issue.
13	5,294	Potential issue for aircraft between 5,250 metres and 5,294 metres from T13.
14	4,950	No issue.
15	4,865	No issue.
16	4,600	No issue.
17	3,856	No issue.
18	4,598	No issue.
19	4,200	No issue.
20	4,048	No issue.
21	3,962	No issue.
22	4,104	No issue.
23	4,508	No issue.
24	4,338	No issue.
25	4,388	No issue.
26	4,330	No issue.

Table 7 *SSR False Target Report Calculations*

The results in the table above are based on:

- An assumed bi-static RCS of 3162 m^2 for the turbine (this is the example figure for in the guidelines).
- A typical transmitted power of 2570 Watts (Thales typical).
- A transmit antenna gain equivalent to max gain + vertical gain at relevant angle).
- A receive antenna gain of 1 (example figure used for a different calculation within the guidelines).
- A wavelength of 0.291 metres corresponding to a frequency of 1030 MHz.
- A P_{thresh} value of 2×10^{-11} W (the example figure given in the guidelines).

- F_{tw} and F_{tr} values of 1 (this represents no losses and is reasonable based on the radar line of sight results.
- A D_{wr} value of 5250 metres (figure used in the guidelines that represents the minimum value.

The potential aircraft locations that could produce a false return, according to the calculation methodology, are relatively restricted. Furthermore, the calculation process is conservative, particularly because it considers a peak Radar Cross Section (RCS) value rather than an average RCS value.

The calculation methodology is valid for Mode A and Mode C only. It has been followed here for a Mode S radar for the sake of completeness. The Woodcock Hill radar is advanced and therefore has processing capabilities that would minimise potential effects further.

In practice, false targets are unlikely to be a significant issue for the Oatfield Project.

The proposed development is located close to an area where aircraft may turn on approach to Shannon Airport. It is therefore an area of operational importance and engagement with the IAA is recommended.

4.5 SSR 2D Position Accuracy (Eurocontrol Guidelines Section 4.4.11)

Annex D of the guidelines provides a derivation of a minimum distance that should be maintained in order to ensure there are no impacts on the 2D positional accuracy.

The derivation has not been reproduced here, however the key elements are summarised below.

- The derivation assumes:
    - The propagation losses from the radar to the turbine are the same as the losses from the radar to the aircraft transponder. In the case of Oatfield this is reasonable as losses are minimal in both cases.
    - The propagation losses between the transponder and the turbine are the same as the losses between the transponder and the radar. This is a reasonable assumption.
    - The transponder gain is the same in the direction of the turbine and the direction of the ground system. This is a reasonable assumption as the transponder antenna will most likely be omnidirectional.
    - The SSR receive gain is the same in the direction of the turbine and the transponder. This is a reasonable assumption.
    - A Carrier to Interference Ratio of 50 dB is largely sufficient to ensure good discrimination of between the direct signal and the reflected signal. This is a reasonable assumption.
- The minimum distance that should be maintained between a turbine and an SSR is 5016 metres.

All turbines are further than this from the radar, with the nearest turbine being located 5.3 km from the radar. The derivation within the Eurocontrol guidelines is based on a single turbine. The Oatfield development comprises multiple turbines, however the Woodcock Hill radar does have technical capabilities that improve azimuth accuracy. No effects with regard to SSR 2D positional accuracy are predicted.

5 EXAMPLES

5.1 Developments that Coexist with SSR Facilities

There are various examples in Europe, including Ireland, where busy airports presently operate successfully and safely with wind turbines operating within a 16km radius around secondary radar installations (16km being discussed in the Eurocontrol Guidelines for SSR assessment where turbines are within line of sight). It is therefore accepted that exceptions to the guidelines can be tolerated without jeopardising operations at the airport. A few examples have been summarised in this section of the report.

Dublin International Airport – Ireland.

Dublin Airport is located on the northern side of the City. There are 5 small scale wind turbines located at Father Collins Park, which is Irelands first wind powered public park, located in the heart of the North Fringe, close to the new communities of Clongriffen and Belmayne, between the Hole in the Wall Road and the Mayne River in Donaghmede. The turbines are EW15 50kW machines, each having a maximum blade tip height of 32.5m above ground level. The site is located approximately 7km from the airport and is located within the Dublin CTA.

Amsterdam (Schiphol) Airport – Holland.

There is a wind farm in the Amsterdam Western Harbour region which lies approximately 10km north of Schiphol Airport. This was built in 2000-2001 and consists of 14 wind turbines, each having a maximum blade tip height of 89m above ground level. The wind turbines are operational and exist within controlled airspace. They are also located beneath the final approach path for Runway 19L. It is noted that the radar at Schiphol Airport has line of sight to at least three other operational wind developments, these being Haarlem, Velsen and Flevoland. Haarlem is located approximately 15km to the north west of Schiphol Airport and has four wind turbines with a maximum blade tip height of 53m above ground level. These are located within controlled airspace. Velsen is located approximately 20km to the north west of Shiphol Airport, and consists of five wind turbines with each having a maximum blade tip height of 45m above ground level. These are located outside of controlled airspace. Flevoland is located approximately 25km east northeast of Schiphol Airport and consists of ten wind turbines, each having a maximum blade tip height of 102m above ground level. These are located outside of controlled airspace.

Copenhagen International Airport (at Kastrup) – Denmark.

Kastrup Airport is located to the south east of Copenhagen and currently has in excess of 71 wind turbines operating within 30km of the airfield. There is a wind farm called Middelgrunden which is located off of the Denmark coast line to the east northeast of Kastrup Airport. This offshore wind farm consists of 20 wind turbines, with each having a maximum blade tip height of 100m above sea level. These are located between 6.4 and 10.0km from the airfield. The wind farm started operating in 2000, and the turbines lie directly under the missed approach path for runway 04 and under the instrument approach procedures for runway 22. Other wind farms in the immediate vicinity of the airfield include the Avedore wind farm, having 15 wind turbines located between 10.4km and 13.1km to the west of the airfield, the Lynetten wind farm, having seven operational wind turbines on the edge of Copenhagen Harbour, approximately 9km north of the airfield, and the Dragør wind farm which is located on the southern boundary of the airfield, only 4km from the airports primary surveillance radar and less than 2km from its secondary surveillance radar. Dragør consists of eight wind turbines.

6 CONCLUSIONS

6.1 Report Findings

Radar Line of Sight

- All the wind turbines would be in radar line of sight to the Woodcock Hill MSSR. The turbines would at ranges between 5.3km and 9.3km from the radar.

Reduced Probability of Detection

- There would be some shadowing beyond the wind turbines, caused by a weakening of the radar signal in the shadow of the towers. Aircraft located within the shadow zones would be less likely to be detected by the radar than they are now.
    - The horizontal length of the shadow zones would be between 1.5km and 1.8km.
    - The altitude of the shadow zones would be between 920ft and 1,490ft above mean sea level.
- Aircraft would be unlikely to fly within the shadow zones associated with the wind turbines. Significant technical impacts are not predicted in practice.

False Target Reports

- Reflections of a radar signal by wind turbines can lead to false targets being displayed on the radar screen. The assessment methodology within the Eurocontrol guidelines has been followed. This approach was specifically designed for Mode A and Mode C operation – whilst the Woodcock Hill MSSR has capability for the more advanced Mode S operation.
- Reflections of a radar signal by wind turbines can lead to false targets being displayed on the radar screen. The assessment methodology within the Eurocontrol guidelines has been followed. This approach was specifically designed for Mode A and Mode C operation – whilst the Woodcock Hill radar has capability for the more advanced Mode S operation.
- Four turbines have the potential to cause false targets based on the Eurocontrol methodology. In practice, false returns are unlikely to be an issue due to the conservative calculation methodology and the capabilities of the radar itself.

2D Position Accuracy

- If the path difference between the direct signal from the aircraft transponder and the reflected signal from the wind turbine is small, the apparent position of the aircraft can be displayed incorrectly.
- The Eurocontrol guidelines derive a minimum distance of 5.016 km between a turbine and an SSR to avoid 2D position accuracy issues, although it is noted that the methodology is based on a single turbine.
- The proposed turbines are all more than 5.3 km from the radar. Significant 2D position accuracy concerns are not predicted.

6.2 Woodcock Hill MSSR

The radar installation at Woodcock Hill is advanced. In particular it is a monopulse radar with Mode S capabilities, both of which act to improve its performance and increase its robustness to interference.

6.3 Case Studies

There are examples of developments that coexist with SSR facilities within the buffer distances recommended by Eurocontrol.

6.4 Conclusion

The potential impact of the development is likely to be minimal in practice. Consultation with the IAA is recommended to move the development forward.

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ILS Calibration Flight Impact Assessment

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ADMINISTRATION PAGE

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1 EXECUTIVE SUMMARY

1.1 Background

Brookfield Renewable Energy Group is developing a proposed wind farm near Shannon which lies approximately 25 kilometres north east of Shannon Airport in the west of Ireland. Aircraft flying into Shannon will fly just north of the proposed development.

1.2 Shannon Airport

Shannon Airport has a range of radio transmitters which pilots use to navigate - one of these systems being an Instrument Landing System (ILS). The proposed wind farm will not affect aircraft using the ILS normally – however the Irish Aviation Authority (IAA) has raised concerns that the wind farm could affect periodic test flights that are used to calibrate and check the ILS.

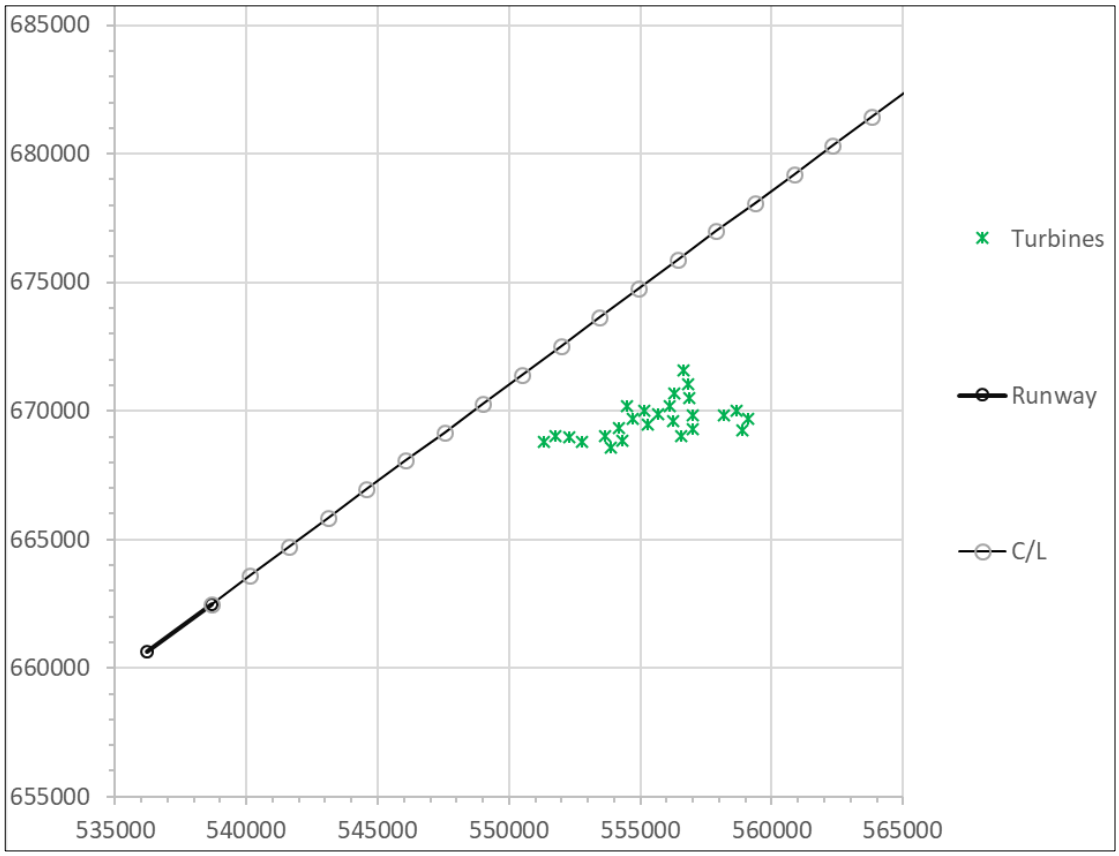


Chart showing extended centre line and turbines

1.3 Trajectories beyond 2 Nautical Miles

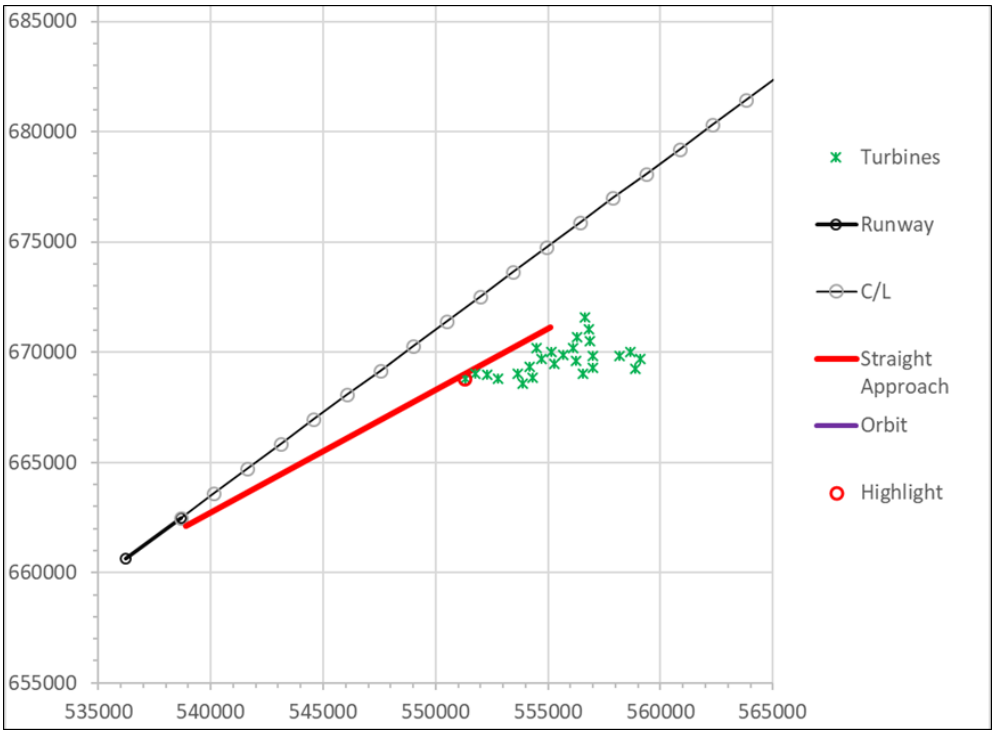
Most trajectories will not be affected by the proposed wind farm and are more than 2 nautical miles away:

- Aircraft flying approaches 8-degrees right of the runway extended centre line, commencing at 10 nautical miles or less, will be at least 2.7 nautical miles from the proposed wind farm with turbine 1 being closest.
- Aircraft flying orbits of 17 nautical miles will be at least 5.283 nautical miles from the proposed wind farm with turbine 25 being closest.
- Aircraft flying orbits of 25 nautical miles will be at least 13.28 nautical miles from the proposed wind farm with turbine 25 being closest.

1.4 Trajectories within 2 Nautical Miles

Three trajectories, however, pass less than 2 nautical miles from the proposed wind farm:

- Aircraft flying the extended runway centre-line pass 1.397 nautical miles northwest of the proposed development with turbine 1 being closest.
- Aircraft flying an eight-degree left slice approach pass 0.141 nautical miles north west of the proposed wind farm with turbine 1 being closest.



- Aircraft flying a six nautical mile orbit pass 1.634 nautical miles southwest of the proposed wind farm with turbine 1 being closest.

1.5 Vertical Clearance Calculation

Test flights will have to fly within 193 metres (this distance has been calculated including the rotor) of the turbines. The vertical analysis has been undertaken and showed that:

- Aircraft flying an 8-degree right slice approach will be flying at an altitude of 1000 feet which is below the maximum turbine tip altitude of 1371 feet. There is therefore no vertical clearance between wind the turbines and aircraft flying an 8-degree right slice approach.

1.6 Overall Impact

The horizontal clearance between aircraft flying the test trajectories and the turbines is circa 1.3 times the minimum horizontal clearance distance of 150 metres applicable for VFR flights in Ireland. The proposed turbines will therefore not directly affect aircraft flying ILS test trajectories and should be therefore tolerable.

1.7 Mitigation

Whilst the proposed development will not directly impede aircraft flying the test trajectories it is recommended that pilots of test aircraft are made fully aware of the presence of wind turbines, and any associated anemometry masts, before undertaking any test flights. The following mitigation measures are therefore recommended:

- All turbines and meteorological masts having a height of 100m or more are promulgated in the Irish Air Navigation Obstacle database
- The extremities of the wind farm are lit
- Meteorological masts are lit
- Locations of meteorological masts having a height of less than 100m are promulgated to the pilots of test aircraft[1]
- Test aircraft are fitted with Terrain Awareness and Warning System (TAWS)
- Test aircraft TAWS obstacle databases are regularly updated to ensure they contain the wind turbine locations prior to construction
- Pilots of test aircraft are briefed regarding the proximity of wind turbines to aircraft flying an 8-degree left slice.

1.8 Conclusions and Recommendations

It is recommended that this report is shared with the Irish Aviation Authority.

[1] This could be via the Aeronautical Information Publication or directly to pilots

LIST OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

2 ABOUT PAGER POWER

Pager Power is a dedicated consultancy company based in Suffolk, UK. The company specializes in assessing the impact of wind turbines on aviation and radar - having undertaken projects in 46 countries within Europe, Africa, America, Asia and Australasia.

The company comprises a team of experts to provide technical expertise and guidance on a range of planning issues for large and small developments.

Pager Power was established in 1997. Initially the company focus was on modelling the impact of wind turbines on radar systems. Over the years, the company has expanded into numerous fields including:

- Renewable energy projects.
- Building developments.
- Aviation and telecommunication systems.

Pager Power prides itself on providing comprehensive, understandable and accurate assessments of complex issues in line with national and international standards. This is underpinned by its custom software, longstanding relationships with stakeholders and active role in conferences and research efforts around the world.

Pager Power's assessments withstand legal scrutiny and the company can provide support for a project at any stage.

3 INTRODUCTION

The developer provided an indicative layout of 26 wind turbines for this assessment. Each turbine will have a tip height of 150 metres above ground level with maximum tip altitudes rising to approximately 1375 feet above mean sea level. The proposal lies north east of Shannon and its centre is 19 kilometres (10.3 nautical miles) from Shannon Airport.

Wind turbines can impact aviation. This report identifies potential impacts on flights checking the airport's Instrument Landing System (ILS).

The Scope of this report reflects the IAA Engineering requirement to confirm that aircraft flying the test trajectories will not be impeded by the proposed wind turbines.

3.1 Units of Measurement and Coordinate Systems

Units of measurement and coordinate systems normally used by the aviation and wind farm development industries differ. These differences are set out in Table 1 below:

Parameter	Aviation	Onshore wind – Ireland	Conversion
Distance	Nautical Mile (nm)	Kilometre (km)	1nm = 1.852km
Height	Feet (ft)	Metres (m)	1ft = 0.3048m
Location	WGS84 Lat/Long	ITM Eastings and Northings	Specialist tool required

Table 1 – Units of measurement and coordinate systems

4 WIND FARM INFORMATION

The proposed wind farm location and turbines layout is shown on Figure 1[2] below:

Figure 1 – Proposed wind farm and turbine location

The turbines have a height of 150m from ground to tip[3]. Almost all turbine overall tip altitudes are above 1000 feet (only turbine 17 has an overall tip altitude of 919 feet). Turbine information is shown in Table 2.

[2] Source: Google© 2019

[3] Oatfield Wind Farm – Aviation Impact Assessment, Steve Hyam, November 2016.

The provisional wind farm layout has been assessed. The wind turbine coordinates are shown in Table 2 below:

WT	ITM Easting	ITM Northing	Ground height (feet amsl)	Overall altitude (feet)	WT	ITM Easting	ITM Northing	Ground height (feet amsl)	Overall altitude (feet)
1	551317	668790	755	1247	14	556120	670173	722	1214
2	551785	669032	787	1279	15	556225	669585	745	1237
3	552298	668993	879	1371	16	556282	670677	696	1188
4	552763	668792	781	1273	17	556637	671577	427	919
5	553874	668580	689	1181	18	556798	671027	656	1148
6	554313	668866	696	1188	19	556848	670493	597	1089
7	554171	669342	787	1279	20	556978	669826	528	1020
8	553673	669030	797	1289	21	556986	669292	525	1017
9	554511	670209	837	1329	22	556552	669006	584	1076
10	554701	669719	784	1276	23	558189	669829	643	1135
11	555143	669988	883	1375	24	558682	670022	564	1056
12	555286	669464	820	1312	25	559121	669715	551	1043
13	555656	669892	856	1348	26	558904	669244	620	1112

Table 2 – Wind turbine coordinates and general information

5 SHANNON AIRPORT

5.1 Airport Information

Shannon Airport is an Irish Aviation Authority (IAA) licensed aerodrome used predominately by private and commercial jet and fixed wing propeller aircraft. An ATC Tower is present on the airport.

5.2 Runway Details

Shannon Airport has one runway 06/24 measuring 3,199m by 45m. The runway is shown on the aerodrome chart in Figure 2[4] on the following page.

[4] Source: Irish Aviation Authority IAP.

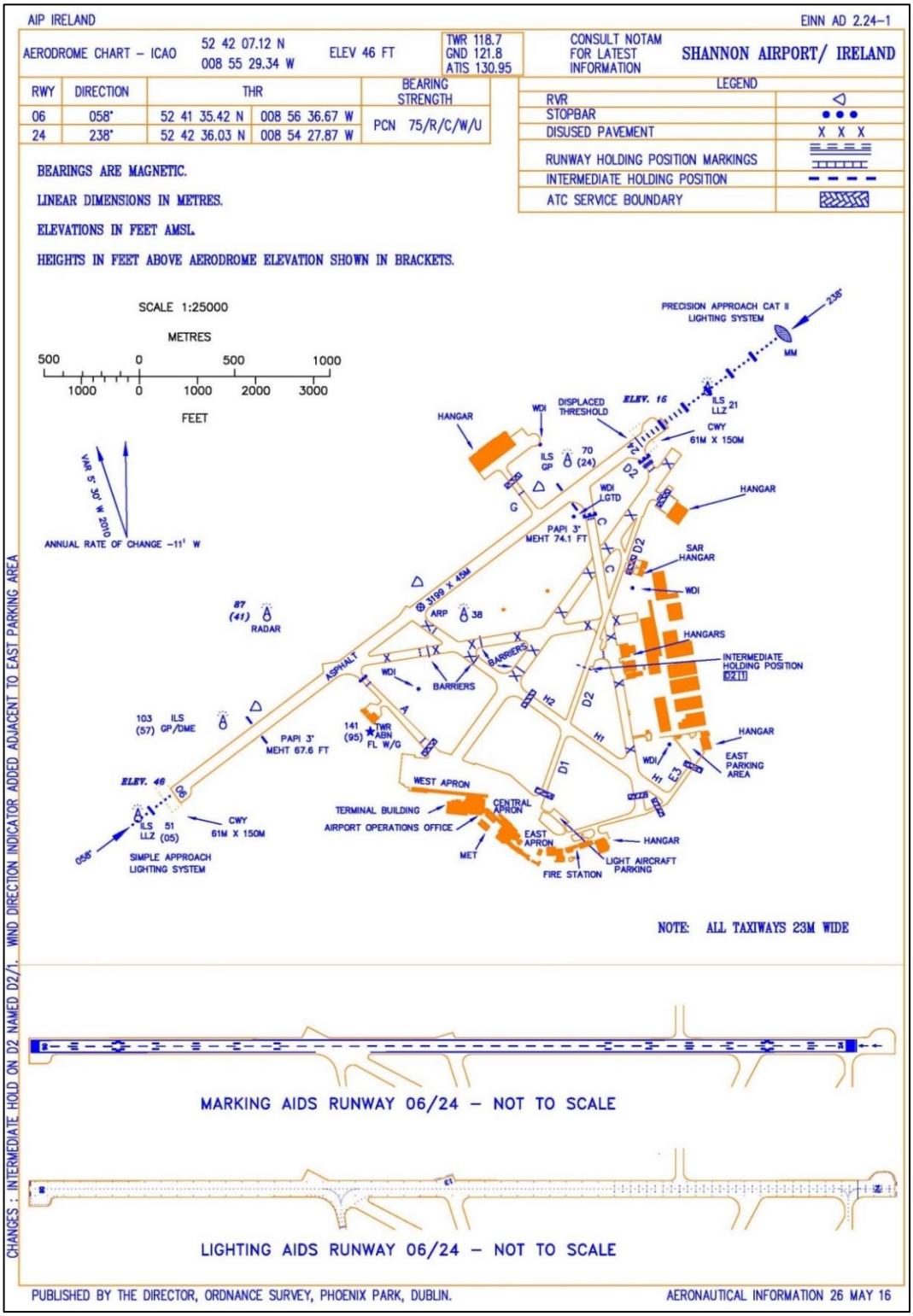


Figure 2 – *Shannon Airport aerodrome chart*

5.3 Instrument Landing System

Specific parameters pertaining to the Runway 24 Instrument Landing System are shown in the Irish Aviation Authority Aeronautical Information Publication (AIP).

Parameter	Units	Value
Designated Operational Coverage	Nautical Miles	25
ILS Category	n/a	Cat II
Slope	Degrees	3
Threshold Elevation	Feet	15
Distance to ILS Point A	Nautical Miles	4
Distance to ILS Point B	Nautical Miles	0.57
Distance to ILS Point E	Nautical Miles	-1.35[5]

Table 3 – Instrument Landing System Parameters

[5] This figure is negative because it refers to a point above the runway lying south west of the Runway 24 threshold

6 IAA FLIGHT CHECK SCHEDULE

ILS flight check profiles

4.2 Routine ILS Inspection Profile Requirements

Note: Where only 1 transmitter is checked on a routine, subsequently the other transmitter will be checked on the next routine.

Section	Profile	Description	Procedure	Notes	TX
9.1.1	01	Centreline Approach	10NM-Threshold 3000'	Course Structure, Alignment, GP Angle & RF measurement	1or2
9.1.3	04	Loc Orbit	6NM 1500' +35-35°	Clearance	1or2
9.1.1	05	Centreline Approach Cat III only	2NM to Point E level 50ft down runway Centreline	Loc Course Structure, Alignment	1or2
9.1.1	12	Top Edge	1 NM required between 4NM-Point B 1800'	(75µA) 90Hz width	1or2
9.1.1	13	Bottom Edge	1 NM Required between 4NM-Point B 1500'	(75µA) 150Hz width	1or2
9.1.2	14	Slice for 3° GP	0.3θ ≈12NM-Threshold 1000'	Clearance	1or2
9.1.2	15	Left Slice for 3° GP	10NM-0.45θ 1000'	Coverage 8° of Centreline Both transmitters if M Array	Alt 1or2
9.1.2	16	Right Slice for 3° GP	10NM-0.45θ 1000'	Coverage 8° of Centreline Both transmitters if M Array	Alt 1or2
	All	Ident Loc/DME	Co-Pilot listens/FI	Check ident and synchronization	1or2
9.1.1	01	DME	4NM-1NM 1500'	DME Range Error	1or2

4.3 Annual ILS Inspection Profile Requirements

Section	Profile	Description	Procedure	Notes	TX
9.1.1	01	Centreline Approach	10NM-Threshold 3000'	RF, Course Structure, Alignment Angle GP & Loc	1&2
9.1.1	01	Centreline Approach	DOC or 10NM-Threshold on GP	Course Structure, Alignment Angle GP & Loc	1or2
9.1.1	01	Centreline Approach	10-4NM on GP & Loc	Power Ratio check (Two Freq Only) Course Line TX OFF	1or2

			C/L		
9.1.3	04	Loc Orbit	6NM 1500' +35-35°	Clearance	1&2
9.1.3	04	Loc Orbit	17NM 1500' +35-35°	Clearance & Coverage	1or2
9.1.3	04	Loc Orbit	25NM 2000' +10-10°	Clearance & Coverage	1or2
9.1.2	14	Loc Range Run	DOC or 25NM 2000'	Clearance	Alt 1or2
9.1.2	14	Slice for 3° GP	0.3θ DOC or 12NM-Threshold 1000'	Course Only (Two Freq Only)	1or2
9.1.1	05	Centreline Approach Cat III only	10NM to Point E level 50ft down runway Centreline	Course Structure, Alignment, GP Angle & RF measurement	1&2
9.1.1	12	Top Edge	4NM-Point B 1800'	(75μA) 90Hz width	1or2
9.1.1	13	Bottom Edge	4NM-Point B 1500'	(75μA) 150Hz width. See Note	1or2
9.1.2	14	Slice for 3° GP	0.3θ DOC or 12NM-Threshold 1000'	Course, Clearance & Coverage	1&2
9.1.2	14	Slice for 3° GP	0.3θ DOC or 12NM-Threshold 1000'	Course Only (Two Freq Only)	1or2
9.1.2	15	Left Slice for 3° GP	10NM-0.45θ 1000'	Coverage 8° of Centreline	Alt 1or2
9.1.2	16	Right Slice for 3° GP	10NM-0.45θ 1000'	Coverage 8° of Centreline	Alt 1or2
9.1.1	11	Centreline Approach	4NM-Threshold 1500'	Low & Wide, then Low & High Angle Alarm	1or2
9.1.1	12	Top Edge	4NM-Point B 1800'	Low & Wide then Wide & Narrow Alarm	1or2
9.1.1	13	Bottom Edge	4NM-Point B 1500'	Low & Wide, then Wide & Narrow Alarm	1or2
9.1.2	14	Slice	DOC or 10-2NM @ 1000'	Low & Wide Alarm for Clearance	1or2
9.1.2	14	Slice	DOC or 10NM-THD @ 1000'	Normal	1or2

9.1.1	01 *	Centreline Approach	4NM-Threshold 1500'	Fly Left & Right Alarms	1or2
9.1.3	04 *	Loc Orbit	6NM 1500' +35-35°	Wide Alarm	1or2
9.1.3	04 *	Loc Orbit	6NM 1500' +35-35°	Narrow Alarm	1or2
9.1.3	04 *	Loc Orbit	6NM 1500' +35-35°	Normal Check	1or2
	All	Ident LOC/DME	Co-Pilot/FI listens	Check ident and synchronisation	1&2
9.1.1	01	DME	4NM-1NM 1500'	DME Range Error	1or2
9.1.4		Promulgated procedure	Procedure-Threshold	Pilot comments	1 or2
9.1.5		Promulgated procedure & DME IFPs	Procedure-Threshold	Pilot comments	1or2

4.4 Commissioning ILS Inspection Profile Requirements

Section	Profile	Description	Procedure	Notes	TX
9.1.1	01	Centreline Approach	DOC or 10NM-Threshold on GP	RF, Course Structure, Alignment Angle GP & Loc	1&2
9.1.1	01	Centreline Approach	2000' 25NM-Threshold	Course Structure, Alignment Angle GP & Loc	1or2
9.1.1	01	Centreline Approach	10-4NM on GP & Loc C/L	Power Ratio check (Two Freq Only) Course Line TX OFF	1or2
9.1.1	01*	Centreline Approach	4NM-Theshold on GP & Loc C/L	Polarisation Check Roll 20° Left & Right	1or2
9.1.1	02	Left Edge	4NM-Point B 1500'	(150µA) 90Hz course width	1&2
9.1.1	03	Right Edge	4NM-Point B 1500'	(150µA) 150Hz course width	1&2
9.1.3	04	Loc Orbit	6NM 1500' +35-35'	Clearance & Coverage	1&2
9.1.3	04	Loc Orbit	17NM 1500'	Clearance & Coverage	1or2

			+35-35°		
9.1.3	04	Loc Orbit	25NM 2000' +10-10°	Clearance & Coverage	1or2
9.1.2	14	Loc Range Run	DOC or 25NM 2000'	Clearance	Alt 1or2
9.1.1	05	Centreline Approach Cat III only	2NM to Point E level 50ft down runway Centreline	Loc Course Structure, Alignment	1&2
9.1.1	12	Top Edge	4NM-Point B 1800'	(75µA) 90Hz width	1&2
9.1.1	13	Bottom Edge	4NM-Point B 1500'	(75µA) 150Hz width	1&2
9.1.2	14	Slice for 3° GP	0.3θ DOC or 12NM-Threshold 1000'	Course, Clearance & Coverage	1&2
9.1.2	14	Slice for 3° GP	0.3θ DOC or 12NM-Threshold 1000'	Course Only (Two Freq Only)	1or2
9.1.2	15	Left Slice for 3° GP	16NM-0.45θ 1000'	Coverage 8° of Centreline	1&2
9.1.2	16	Right Slice for 3° GP	16NM-0.45θ 1000'	Coverage 8° of Centreline	1&2
9.1.1	11	Centreline Approach	4NM-Threshold 1500'	Low & Wide, then Low & High Angle Alarm	1or2
9.1.1	12	Top Edge	4NM-Point B 1800'	Low & Wide then Wide & Narrow Alarm	1or2
9.1.1	13	Bottom Edge	4NM-Point B 1500'	Low & Wide, then Wide & Narrow Alarm	1or2
9.1.2	14	Slice	DOC or 10-2NM @ 1000'	Low & Wide Alarm for Clearance	1or2
9.1.2	14	Slice	DOC or 10NM-THD @ 1000'	Normal	1or2
9.1.1	01 *	Centreline Approach	4NM-Threshold 1500'	Fly Left & Right Alarms	1or2
9.1.3	04 *	Loc Orbit	6NM 1500' +35-35°	Wide Alarm	1or2
9.1.3	04 *	Loc Orbit	6NM 1500' +35-35°	Narrow Alarm	1or2
9.1.3	04 *	Loc Orbit	6NM 1500' +35-35°	Normal Check	1or2
9.1.3	20	Orbit	5NM @1500' 360°	DME Coverage check 20° only on 2nd TX	1&2
9.1.4		Promulgated procedure	Procedure-Threshold	Pilot comments	1or2
9.1.5		Promulgated procedure	Procedure distance spot checks for:-	IFP's, Missed Approach, Direct arrivals, Hold, En-Route	1or2

4.5 Additional Commissioning ILS Inspection Profile Requirements

For Side Band Reference & M Array Glide Paths

	Profile	Description	Procedure	Notes	TX
9.1.2	14	Slice	DOC or 10-2NM @ 1000'	Dephase Upper Antenna with monitor in Alarm	1or2
9.1.2	14	Slice	DOC or 10-2NM @ 1000'	Dephase Lower Antenna with Monitor in Alarm	1or2
9.1.2	14	Slice	DOC or 10-2NM @ 1000'	Advance Middle Antenna	1or2
9.1.2	14	Slice	DOC or 10-2NM @ 1000'	Retard Middle Antenna	1or2

7 ILS ASSESSMENT AND DISCUSSION

7.1 Background

Brookfield Renewable Energy Group is developing a proposed wind farm near Shannon which lies approximately 19 kilometres north east of Shannon Airport in the west of Ireland. Aircraft flying into Shannon will fly just north of the proposed development.

7.2 Shannon Airport

Shannon Airport has a range of radio transmitters which pilots use to navigate - one of these systems being an Instrument Landing System (ILS). The proposed wind farm will not affect aircraft using the ILS normally – however the Irish Aviation Authority (IAA) has raised concerns that the wind farm could affect periodic test flights that are used to calibrate and check the ILS.

Figure 3 below shows the relative locations of the turbines; the runway and its extended centre line. The marks on the extended centre line have a spacing of 1 nautical mile.

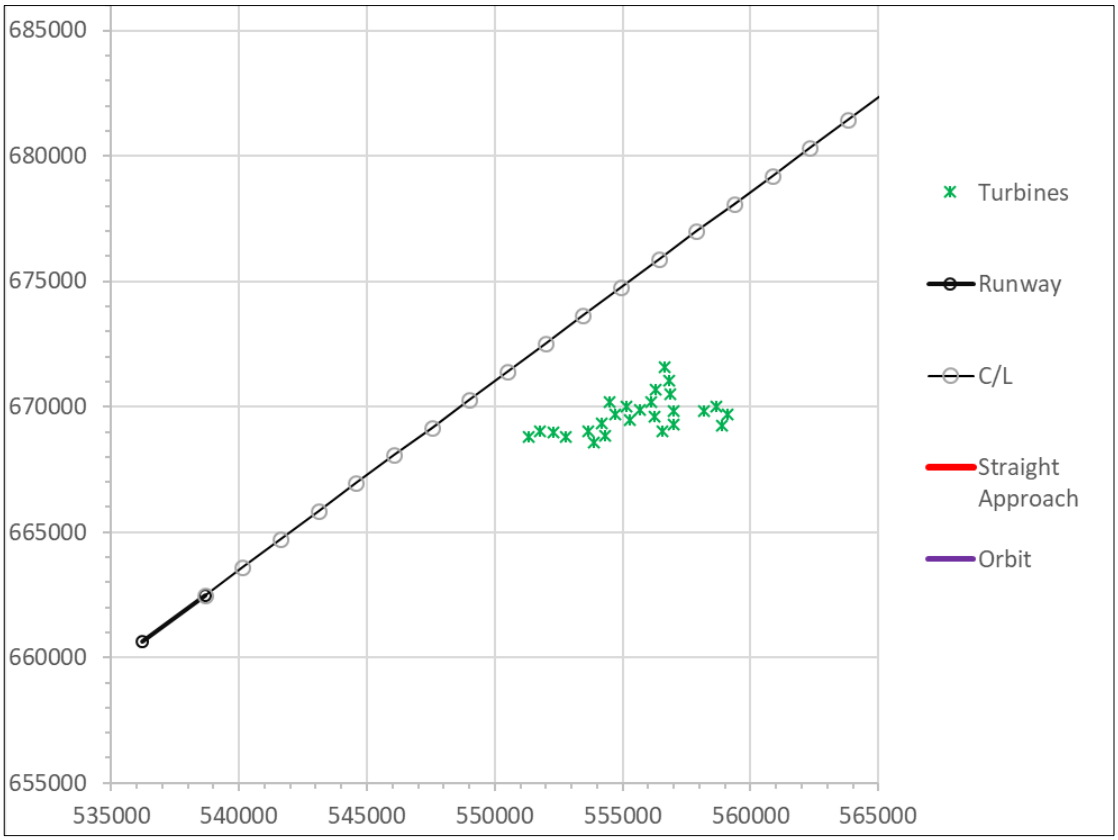


Figure 3 – Chart showing extended centre line and turbines

7.3 Test Flights

These test flights fly a range of trajectories which either fly towards the airport or in an arc, or orbit, centred on the runway threshold[6]. The IAA has provided a schedule of ILS checks and their associated flight trajectories.

7.4 Assessment

The aircraft altitude (or height) has no impact on the horizontal separation between wind turbine and aircraft. Similarly, the wind turbine altitude (or height) has no impact on horizontal separation.

In this analysis the horizontal clearance between aircraft and the turbines has been considered initially. These initial horizontal results of this analysis apply for aircraft flying at any altitude and for any turbine height.

A software tool has been used to calculate the minimum horizontal separation between each specific (horizontally defined) trajectory and the nearest wind turbine.

Where a potential horizontal conflict between trajectories and turbines is identified an analysis of vertical separation has been undertaken.

7.5 Trajectories beyond 2 Nautical Miles[7]

Most trajectories[8] will not be affected by the proposed wind farm and are more than 2 nautical miles away.

Aircraft flying approaches 8-degrees right of the runway extended centre line, commencing at 10 nautical miles or less, will be at least 2.7 nautical miles from the proposed wind farm with turbine 1 being closest.

Aircraft flying orbits of 17 nautical miles will be at least 5.283 nautical miles from the proposed wind farm with turbine 25 being closest.

Aircraft flying orbits of 25 nautical miles will be at least 13.28 nautical miles from the proposed wind farm with turbine 25 being closest.

---

[6] In practice the arcs are centred on the Runway 24 threshold which is the zero reference point for the DME (Distance Measuring Equipment) associated with the Instrument Landing System

[7] 2 nautical miles = 3.7 kilometres

[8] Plots showing these trajectories and the proposed wind turbines are available on request

7.6 Trajectories within 2 Nautical Miles

Three trajectories, however, pass less than 2 nautical miles from the proposed wind farm.

7.7 Extended Runway Centre-Line

Aircraft flying the extended runway centre-line pass 1.397 nautical miles northwest of the proposed development with turbine 1 being closest. Turbine 1 is highlighted on Figure 4 below:

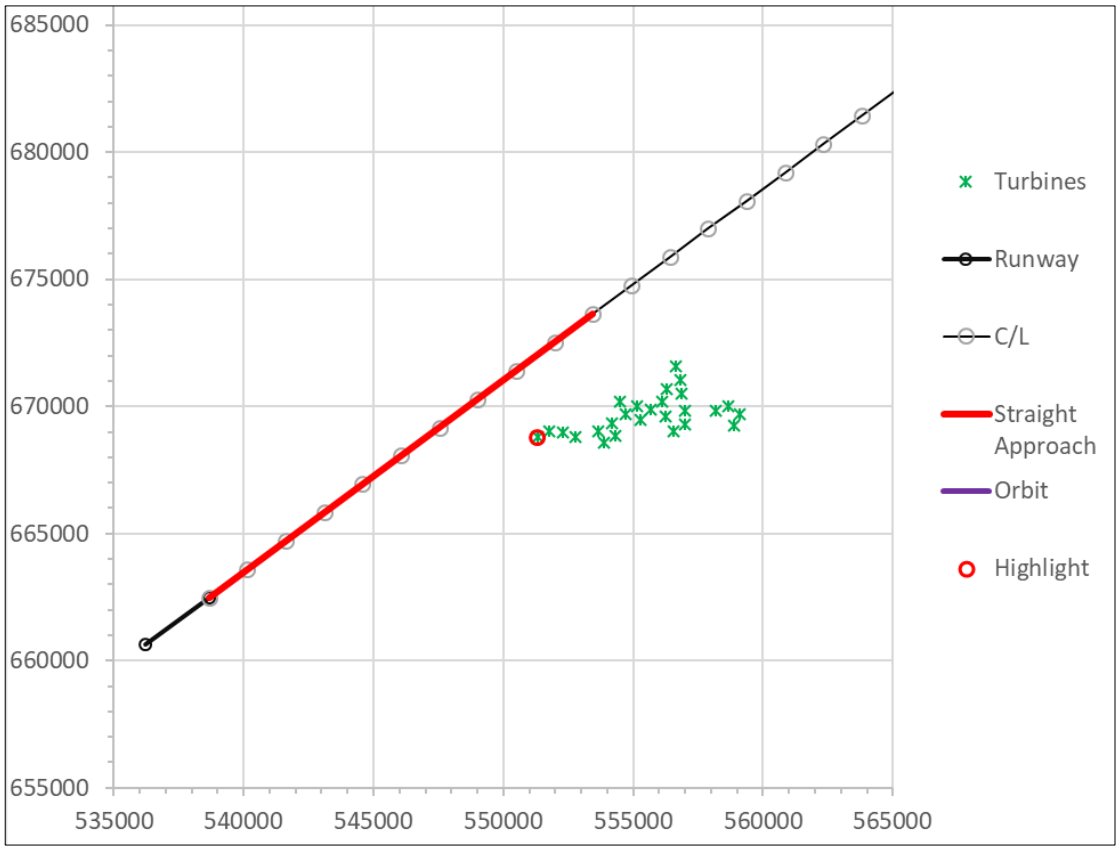


Figure 4 – Chart showing proximity of turbines to Extended Runway Centre-Line

7.8 Eight Degree Left Slice Approach

Aircraft flying an eight-degree left slice approach pass 0.141 nautical miles north west of the proposed wind farm with turbine 1 being closest. Turbine 1 is highlighted on Figure 5 below:

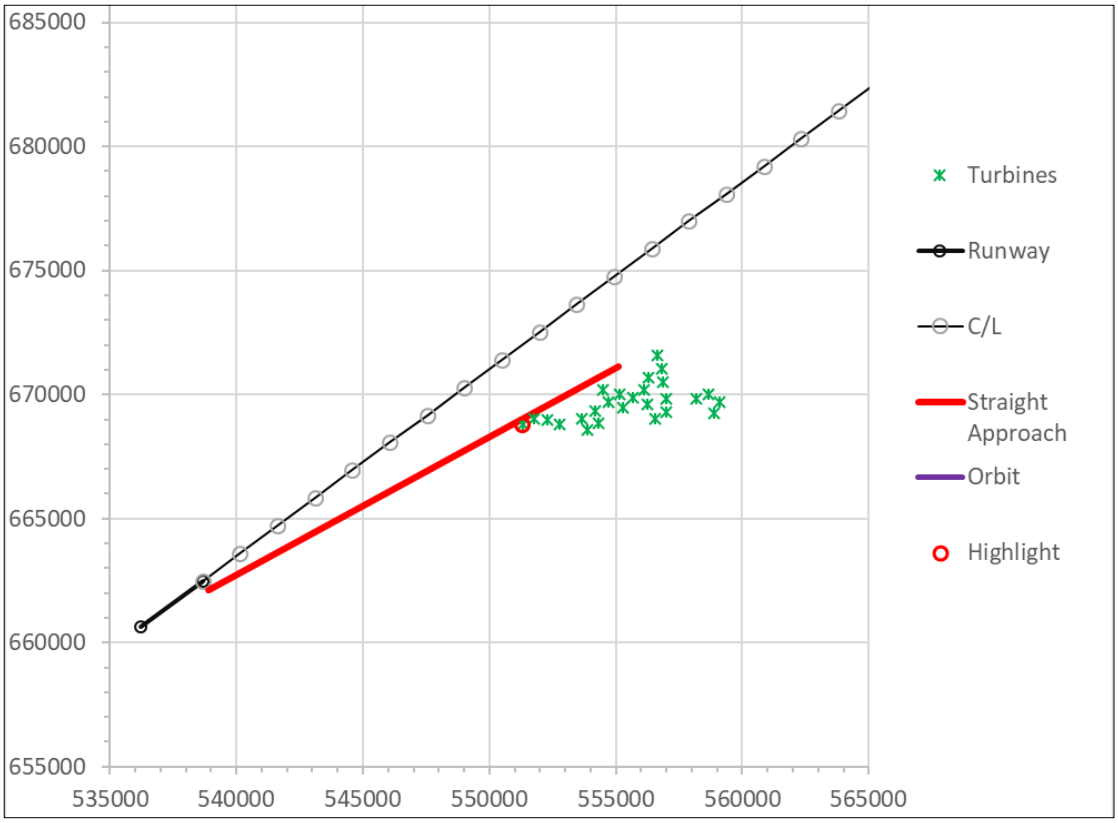


Figure 5 – Chart showing proximity of turbines to 8-degree left slice approach

7.9 Six Nautical Mile Orbit

Aircraft flying a six nautical mile orbit pass 1.634 nautical miles southwest of the proposed wind farm with turbine 1 being closest. Turbine 1 is highlighted on Figure 6 below:

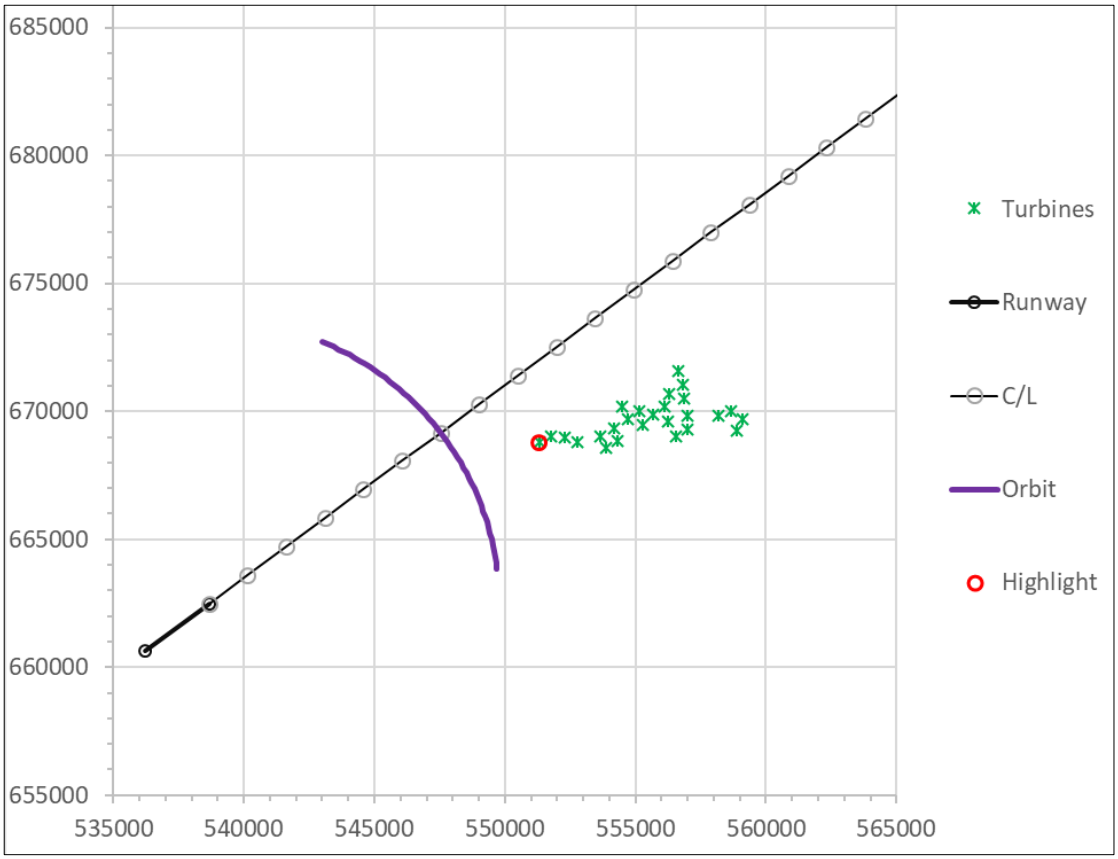


Figure 6 – Chart showing proximity of turbines to 6 nautical mile Orbit

7.10 Visual Flight Rules

Test flights are conducted under Visual Flight Rules (VFR) whereby pilots rely on their eyesight, rather than instruments[9], to avoid collisions. When flying VFR pilots must ensure that they do not fly within 150 metres of any structure[10].

Wind turbines are complex structures with large moving rotors. The clearance distances in the analysis above relate to the wind turbine bases rather than the entire wind turbine structure. It is necessary to consider the rotor radius of 68 metres when evaluating the calculated clearances.

All trajectories are 0.141 nautical miles or more from the proposed wind turbine towers. One nautical mile is 1852 metres which means that all trajectories are 261[11] metres from the proposed towers. Taking the rotor into account reduces the clearance distance between trajectory and turbine to 193[12] metres.

7.11 Vertical Clearance Calculation

As the test flights, on the current trajectory, will have to fly within 193 metres of the turbines vertical analysis has been undertaken to determine whether there will be sufficient clearance between aircraft flying an 8-degree right slice approach and the wind turbines.

Aircraft flying an 8-degree right slice approach will be flying at an altitude of 1000 feet which is below the maximum turbine tip altitude of 1371 feet. There is therefore no vertical clearance between wind the turbines and aircraft flying an 8-degree right slice approach.

7.12 Overall Impact

The horizontal clearance between aircraft flying the test trajectories and the turbines is circa 1.3 times the minimum horizontal clearance distance of 150 metres applicable for VFR flights in Ireland. The proposed turbines will therefore not directly affect aircraft flying ILS test trajectories and should be therefore tolerable.

---

[9] When relying on instruments pilots fly in accordance with Instrument Flight Rules (IFR)

[10] Irish Aviation Authority (Rules of the Air) Order, 2004 – Rule 3

[11] 0.141 x 1852 = 261.132

[12] 261.132 - 68 = 193.132

8 CONCLUSION

8.1 Mitigation

Whilst the proposed development will not directly impede aircraft flying the test trajectories it is recommended that pilots of test aircraft are made fully aware of the presence of wind turbines, and any associated anemometry masts, before undertaking any test flights. The following mitigation measures are therefore recommended:

- All turbines and meteorological masts having a height of 100m or more are promulgated in the Irish Air Navigation Obstacle database
- The extremities of the wind farm are lit
- Meteorological masts are lit
- Locations of meteorological masts having a height of less than 100m are promulgated to the pilots of test aircraft[13]
- Test aircraft are fitted with Terrain Awareness and Warning System (TAWS)
- Test aircraft TAWS obstacle databases are regularly updated to ensure they contain the wind turbine locations prior to construction
- Pilots of test aircraft are briefed regarding the proximity of wind turbines to aircraft flying an 8-degree left slice.

8.2 Conclusions and Recommendations

It is recommended that this report is shared with the Irish Aviation Authority.

[13] This could be via the Aeronautical Information Publication or directly to pilots

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Ayodeji Oyelami

From: Cathal MacCriostail <Cathal.MacCriostail@airnav.ie>
Sent: Monday, 18 September 2023 12:38
To: Ayodeji Oyelami
Cc: Paul Hennessy; Terry Symmans; Planning; Charlie O'Loughlin; Fergal Arthurs; Fergal Doyle
Subject: 230918 Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare - AirNav Response
Attachments: Oatfield EIA Scoping Report.pdf; 71025 001 Brookfield ROI Oatfield AIA Issue 4.pdf; 8870A - SSR Technical Assessment - Oatfield Project - Issue 2 - 01Mar2017.pdf; 8870C - Oatfield Project - ILS Calibration Impact Assessment.pdf

Importance: High

Dear Dr. Ayodeji,

I was forwarded your email by my SAA colleagues and have read the attached EIAR with interest. While primarily the report deals with potential environmental impacts etc, and is well constructed, from a Shannon Airport and Air Navigation Services Provider (ANSP), AirNav Ireland perspective, there are broader considerations to take account of.

This site was previously the topic of discussion with ourselves and SAA in 2018-2019 and I am attaching some of the assessment documents that resulted from our interaction.

I provided the following comments on the reports received:

1. Osprey Aviation Impact Assessment (Attachment 1):
   Section 7: Instrument Flight Operations Analysis
   - Indicates an issue with the secondary containment are for ILS RWY 24: ***This is not acceptable to the ANSP***
   - Para. 7.1.3 SIDs; these have been updated since the report was produced and therefore ***the argument is not acceptable to the ANSP***
   - Recommendations from the FCSL Report included:
     If construction of the Oatfield Wind Farm is to proceed, large cranes exceeding the height of the wind turbines may be used to erect the turbine structures. Depending on
     the type of cranes to be used, some further computer simulations may be required to assess the effect of cranes on the ILS Localiser and Glide Path guidance signals.
     It is further recommended that a full ILS flight inspection is performed after construction of the wind farm is completed to assess the actual levels of interference caused by the wind turbine structures.
     Comment: on both cases, the activity required puts a cost ion the ANSP in further assessment of IFPs and in flight Inspections.
     As no reference is made as to how this will be achieved, this is not acceptable to the ANSP. In addition, if there are issues identified after construction, this has the potential to introduce additional safety risk for the IAA to manage and is once again not acceptable.

2. Pager Power SSR Technical Assessment:
   Although I am not an expert in this domain, I can comment in my role.

- I note that examples of Wind Turbines near other airports used, relate to relatively flat topographical environments, whereas in this case the construction of the proposed farm on an elevated site is of issue to me.
- The conclusion record potential impacts on the SSR service. Even being conservative, this implies a cost on the IAA in mitigating effects and in turn carrying additional risk

3. Pager Power ILS Calibration Flight Impact Assessment:
   I have discussed this with my colleague Fergal Doyle and note that-
   - The proposed mitigations imply that associated costs if these mitigations are implemented fall to the IAA ANSP or the flight calibration company
   - In addition the ANSP will be required to carry additional risk in promulgating information on this wind farm

   For these reasons alone this cannot be supported.

The EIAR notes that 11 turbines will have a maximum blade tip height between 179 and 180metres.

When we the ANSP look at these values, we must also include the site elevation which is c. 250m. This gives us an above Mane Sea Level elevation of c. 430m. This value in the case of all turbines, penetrates our Instrument Flight Procedures (IFP) Surfaces for Shannon Airport. This would require a detailed IFP Assessment from a certified IFP designer to establish the effects of these new obstacles and to suggest possible mitigations.

We have a Surveillance Radar on Woodcock Hill, from which AirNav is responsible and is approximately 6km from the proposed wind farm. Being that the AMSL elevation of the completed turbines is higher that the elevation of this radar, we would expect that this could affect the radar's operation and would need detailed examination.

While AirNav also have responsibility for the Navigation Aids at Shannon Airport, I wouldn't expect any great issue in this area. However, as these facilities undergo half-yearly flight inspections, which are flown by a calibration aircraft.

The proposed turbines will impact the conduct of these flights.

When you have had a chance to digest all this, I'd be glad to meet with you (via Teams) if you wish, to discuss further.

Regards,

Cathal

AIRNAV IRELAND

Cathal Mac Criostail
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E: cathal.maccriostail@airnav.ie
A: The Times Building, 11-12 D'Olier Street, Dublin 2

From: Ayodeji Oyelami <aoyelami@nodwyer.com>
Sent: 13 September 2023 12:10
To: Paul Hennessy <paul.hennessy@snnairportgroup.ie>
Subject: [External] Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

Our Project Ref. 604569

Dear Sir/Madam

Orsted have commissioned RSK Ireland as the Environmental and Planning Consultants to prepare an application for planning permission to An Bord Pleanála for a Strategic Infrastructure Development (SID). The SID is for the proposed Oatfield Wind Farm Project, located in County Clare in the townlands of Oatfield, Crag, Cloontra West, Derryvinnaan, Cloontra, Cloonsheerea, Mountrice, Cloghera, Drumsillagh (Merritt), Drumsillagh (Parker), Kyle and Gortacullin.

The site of the proposed development is located on approximately 985 hectares and comprises approximately 11 turbines, a permanent meteorological mast, an on-site 110 kV substation, along with ancillary civil and electrical infrastructure.

As part of the planning application, RSK Ireland is preparing an Environmental Impact Assessment Report (EIAR). To inform the scope of the EIAR, an EIA Scoping Consultation Report has been prepared for issue to consultees. As a valued consultee, we are writing to provide you with a copy of the EIA Scoping Consultation Document for your comments and feedback.

Additionally, we kindly request any information your agency or organisation may have that would assist us in preparing the EIAR for the proposed Project. If you can offer any information or wish to comment on the EIA Scoping Consultation Report, I would be grateful for your reply by close of business on 13th October 2023.

If you do not have any comments to make or do not have any information relevant to the proposed Project, I would be grateful if you would please indicate same in reply to this email.

Feedback or queries can be sent by email or by post to the contact details below.

Kind regards

Ayodeji Oyelami PhD
Senior Environmental Consultant – Environment & Planning

NICHOLAS O'DWYER
an RSK company

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Ayodeji Oyelami

From: Paul Hennessy <paul.hennessy@snnairportgroup.ie>
Sent: Monday, 25 September 2023 10:53
To: Ayodeji Oyelami
Cc: Cathal MacCriostail
Subject: RE: [External] Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

Importance: High

Hi Dr. Ayodeji,

We acknowledge receipt of details relating to the Oatfield Wind farm development proposal.

The siting of wind turbines at this location may have implications for the operations of the communication, navigation and surveillance systems used by Air Traffic Control for the separation and safety of aircraft at Shannon Airport. The geographical siting of these turbines may also have implications for the flight paths of aircraft.

Shannon Airport Authority fully supports the position as stated by our colleagues in the Airspace & Navigation section of Air NAV Ireland whereby some of the specific concerns were already raised with you.

Shannon Airport are happy to be part of any future discussions on the matter should you deem it to be appropriate.

Brgds,

Paul

THE Shannon AIRPORT GROUP

Paul Hennessy
Safety Compliance & Environment Manager

061 712471 / 087 2382453
www.SNNAirportGroup.ie
Shannon Airport, Co. Clare, Ireland, V14 EE06

From: Ayodeji Oyelami <aoyelami@nodwyer.com>
Sent: 13 September 2023 12:10
To: Paul Hennessy <paul.hennessy@snnairportgroup.ie>
Subject: [External] Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

Our Project Ref. 604569

Dear Sir/Madam

Orsted have commissioned RSK Ireland as the Environmental and Planning Consultants to prepare an application for planning permission to An Bord Pleanála for a Strategic Infrastructure Development (SID). The SID is for the proposed Oatfield Wind Farm Project, located in County Clare in the townlands of Oatfield, Crag, Cloontra West, Derryvinnaan, Cloontra, Cloonsheerea, Mountrice, Cloghera, Drumsillagh (Merritt), Drumsillagh (Parker), Kyle and Gortacullin.

The site of the proposed development is located on approximately 985 hectares and comprises approximately 11 turbines, a permanent meteorological mast, an on-site 110 kV substation, along with ancillary civil and electrical infrastructure.

As part of the planning application, RSK Ireland is preparing an Environmental Impact Assessment Report (EIAR). To inform the scope of the EIAR, an EIA Scoping Consultation Report has been prepared for issue to consultees. As a valued consultee, we are writing to provide you with a copy of the EIA Scoping Consultation Document for your comments and feedback.

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If you do not have any comments to make or do not have any information relevant to the proposed Project, I would be grateful if you would please indicate same in reply to this email.

Feedback or queries can be sent by email or by post to the contact details below.

Kind regards

Ayodeji Oyelami PhD
Senior Environmental Consultant – Environment & Planning

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Ayodeji Oyelami

From: Kevin Treanor <opsmanager@sligoairport.com>
Sent: Wednesday, 13 September 2023 16:21
To: Ayodeji Oyelami; handling@sligoairport.com
Cc: info@sligoairport.com
Subject: RE: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

Good Afternoon Ayodeji,
Considering the location of this project it will have no bearing or affect to Sligo Airport operations.
Therefore we have no comments or observations to make.

Regards
Kevin Treanor
Operations Manager
Sligo Airport

From: Ayodeji Oyelami
Sent: Wednesday, September 13, 2023 4:15 PM
To: handling@sligoairport.com
Cc: info@sligoairport.com
Subject: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

Our Project Ref. 604569

Dear Sir/Madam

Orsted have commissioned RSK Ireland as the Environmental and Planning Consultants to prepare an application for planning permission to An Bord Pleanála for a Strategic Infrastructure Development (SID). The SID is for the proposed Oatfield Wind Farm Project, located in County Clare in the townlands of Oatfield, Crag, Cloontra West, Derryvinnaan, Cloontra, Cloonsheerea, Mountrice, Cloghera, Drumsillagh (Merritt), Drumsillagh (Parker), Kyle and Gortacullin.

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Feedback or queries can be sent by email or by post to the contact details below.

Kind regards

Ayodeji Oyelami PhD
Senior Environmental Consultant – Environment & Planning

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an RSK company

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Ayodeji Oyelami

From: Claire Breen <cbreen@southernassembly.ie>
Sent: Thursday, 14 September 2023 08:58
To: Ayodeji Oyelami
Subject: RE: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

A Chara,

I wish to acknowledge receipt of the below correspondence. This correspondence has been forwarded to the planning department for review.

Le dea-ghuí,

Claire Breen
Clerical Officer
Regional Planning
Southern Regional Assembly
Assembly House, O'Connell Street, Waterford, X91 F8PC
cbreen@southernassembly.ie | :: www.southernassembly.ie; www.eufunds.gov.ie; #EuropeInMyRegion
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From: Ayodeji Oyelami <aoyelami@nodwyer.com>
Sent: Wednesday 13 September 2023 16:14
To: info <info@southernassembly.ie>
Subject: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

Our Project Ref. 604569

Dear Sir/Madam

Orsted have commissioned RSK Ireland as the Environmental and Planning Consultants to prepare an application for planning permission to An Bord Pleanála for a Strategic Infrastructure Development (SID). The SID is for the proposed Oatfield Wind Farm Project, located in County Clare in the townlands of Oatfield, Crag, Cloontra West, Derryvinnaan, Cloontra, Cloonsheerea, Mountrice, Cloghera, Drumsillagh (Merritt), Drumsillagh (Parker), Kyle and Gortacullin.

The site of the proposed development is located on approximately 985 hectares and comprises approximately 11 turbines, a permanent meteorological mast, an on-site 110 kV substation, along with ancillary civil and electrical infrastructure.

As part of the planning application, RSK Ireland is preparing an Environmental Impact Assessment Report (EIAR). To inform the scope of the EIAR, an EIA Scoping Consultation Report has been prepared for issue to consultees. As a valued

consultee, we are writing to provide you with a copy of the EIA Scoping Consultation Document for your comments and feedback.

Additionally, we kindly request any information your agency or organisation may have that would assist us in preparing the EIAR for the proposed Project. If you can offer any information or wish to comment on the EIA Scoping Consultation Report, I would be grateful for your reply by close of business on 13th October 2023.

If you do not have any comments to make or do not have any information relevant to the proposed Project, I would be grateful if you would please indicate same in reply to this email.

Feedback or queries can be sent by email or by post to the contact details below.

Kind regards

Ayodeji Oyelami PhD
Senior Environmental Consultant – Environment & Planning

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Ayodeji Oyelami

From: INFO <Information@tii.ie>
Sent: Friday, 29 September 2023 15:40
To: Ayodeji Oyelami
Subject: TII Ref: TII23-124417 - Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare
Attachments: Oatfield EIA Scoping Report.pdf

Dear Dr. Oyelami,

Thank you for your correspondence of 13 September 2023 regarding the above. Transport Infrastructure Ireland's (TII's) position in relation to your enquiry is as follows.

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 road network. In addition, Chapter 7 'Enhanced Regional Accessibility' of the National Development Plan, 2021 – 2030, sets out the key sectoral priority of maintaining Ireland's existing national road network to a robust and safe standard for users. This requirement is further reflected in the publication of the National Investment Framework for Transport in Ireland and also the existing Statutory Section '28 Spatial Planning and National Roads Guidelines for Planning Authorities'.

With respect to EIAR scoping issues, the recommendations indicated below provide only 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:

• 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, including the potential haul route.

• 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 (NRA), 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., NRA, 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 TII's 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. It is noted that Section 3.1.2 of the 'EIAR Scoping Report' advises potential turbine component haul routes to site via the Port of Foynes or Galway Port.

In relation to the proposed haul route, where abnormal 'weight' loads are proposed, separate structure approvals/permits and other licences may be required. All national road 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.

In addition, the haul route should be assessed to confirm capacity to accommodate abnormal 'length' loads and any temporary works required are identified.

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, including delivery timetabling, etc., to ensure that the strategic function of the national road network is safeguarded.

Where temporary works within any MMaRC Contract Boundary are required to facilitate the transport of turbine components to site, the applicant/developer shall contact thirdpartyworks@tii.ie in advance, as a works specific Deed of Indemnity will be needed by TII before the works can take place.

Additionally, any damage caused to the pavement on the existing national road arising from any temporary works due to the turning movement of abnormal loads (e.g. 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.

• It is noted that potential grid connection routes are outlined in Section 3.1.3 of the EIAR Scoping Report received. Although Grid Route Option 2 (Drumline Substation) is in close proximity to the national road network, no current potential route options appear to directly interact with the strategic national road network in the area. In the event that grid connection route options further develop, please note, any 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 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 approximately 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 and therefore, avoid grid connection routing proposals along national roads.

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.

Where grid connection involves proposals to cross a motorway, Works Specific Deeds of Indemnities, arrangements for third party access or consent from TII in accordance with Section 53 of the Roads Act, 1993, is required. Arrangements for third party access are also likely to be required. Contact should be made to 'thirdpartyworks@tii.ie' to progress this element, when proposals for the crossings have been developed.

General requirements for directional drilling under a motorway include:
• The launch and reception pits for the crossing are located outside the Motorway boundary.
• The cabling will be installed at such depth so as not to conflict with the drainage for the Motorway.
• Neither the Works nor the cable crossing will damage or interfere with the Motorway.
• Any maintenance and/or future planned upgrades of the cabling at the crossing location can be carried out, without access to the motorway boundary.
• There are no bolted joints in that part of the crossing within the motorway fence-line.
• A pre and post construction survey shall be required along the length of the crossing over the extents of the motorway boundary.
• Specific requirements may also arise for these proposed works.

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 practise.

I hope that this information is of assistance to you.

Yours sincerely,

_____
Andrew Moore
Senior Regulatory & Administration Executive

From: Ayodeji Oyelami <aoyelami@nodwyer.com>
Sent: Wednesday, September 13, 2023 11:47 AM
To: Landuse Planning <LandUsePlanning@tii.ie>
Subject: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

Our Project Ref. 604569

Dear Sir/Madam

Orsted have commissioned RSK Ireland as the Environmental and Planning Consultants to prepare an application for planning permission to An Bord Pleanála for a Strategic Infrastructure Development (SID). The SID is for the proposed Oatfield Wind Farm Project, located in County Clare in the townlands of Oatfield, Crag, Cloontra West, Derryvinnaan, Cloontra, Cloonsheerea, Mountrice, Cloghera, Drumsillagh (Merritt), Drumsillagh (Parker), Kyle and Gortacullin.

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Feedback or queries can be sent by email or by post to the contact details below.

Kind regards

Ayodeji Oyelami PhD
Senior Environmental Consultant – Environment & Planning

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an RSK company

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gnáthuaireanta oibre, nílim ag súil le freagra ná le gníomh uait lasmuigh de do ghnáthuaireanta oibre féin mura bhfuil sé ráite go soiléir go bhfuil gá gníomhú go práinneach.

TII processes personal data provided to it in accordance with its Data Protection Notice available at https://www.tii.ie/about/about-tii/Data-Protection/

Próiseálann BIÉ sonraí pearsanta a sholáthraítear dó i gcomhréir lena Fhógra ar Chosaint Sonraí atá ar fáil ag https://www.tii.ie/about/about-tii/Data-Protection/?set-lang=ga

Ayodeji Oyelami

From: Cillian Claffey (C) <cillian.claffey@water.ie>
Sent: Thursday, 14 September 2023 09:15
To: Ayodeji Oyelami
Cc: Planning
Subject: RE: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare
Attachments: UisceÉireann_EIAScopingOpinion_OatfieldWindFarm.pdf

Good morning Ayodeji,

Hope you are keeping well today.

Please find attached Uisce Éireann's response to your EIA scoping request relating to Orsted Ltd.'s forthcoming planning application for a windfarm in Co. Clare.

Just to note going forward that I am the planning lead for this region (North / West) and will act as interface for Uisce Éireann on this application.

Could you please notify myself OR planning@water.ie upon submission on this application so that we can get a heads up and ensure we receive the referral in adequate time.

If you have any questions, please let me know and I will do my best to assist you with your query.

Kind regards,

Cillian Claffey
Development Management Planning

Mallow
Uisce Éireann
Teach na hAbhann Duibhe, Mala, Co. Chorcaí, P51 K3CX
Uisce Éireann
Blackwater House, Mallow, Co. Cork, P51 K3CX

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From: Ayodeji Oyelami <aoyelami@nodwyer.com>
Sent: Wednesday 13 September 2023 16:16
To: Planning <Planning@water.ie>
Subject: Consultation for an EIAR - proposed Oatfield Wind Farm, Oatfield, Co. Clare

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Senior Environmental Consultant – Environment & Planning

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data. We reserve the right to monitor and record email messages sent to and from this address for the purposes of investigating or detecting any unauthorised use of our system and ensuring its effective operation.

Is don duine amháin nó don eintiteas amháin ainmnithe ar an seoladh an fhaisnéis agus d'fhéadfadh ábhar faoi rún, faoi phribhléid nó ábhar atá íogair ó thaobh na tráchtála de a bheith mar chuid den fhaisnéis. Tá toirmeasc ar aon daoine nó aon eititis; nach dóibh siúd an fhaisnéis- aon athbhreithniú a dhéanamh, aon atarchur a dhéanamh nó aon athdháileadh a dhéanamh, nó aon úsáid eile a bhaint as an bhfaisnéis, nó aon ghníomh a bhraithfeadh ar an bhfaisnéis seo a dhéanamh agus d'fhéadfaí an dlí a shárú dá ndéanfaí sin. Séanann Uisce Éireann dliteanas as aon ghníomh agus as aon iarmhairt bunaithe ar úsáid neamhúdaraithe na faisnéise seo. Séanann Uisce Éireann dliteanas maidir le seachadadh iomlán agus ceart na faisnéise sa chumarsáid seo agus séanann Uisce Éireann dliteanas maidir le haon mhoill a bhaineann leis an bhfaisnéis a fháil. Má tá an ríomh-phost seo faighte agat trí dhearmad, déan teagmháil leis an seoltóir más é do thoil é agus scrios an t-ábhar ó gach aon ríomhaire. D'fhéadfadh ríomhphost a bheith so-ghabhálach i leith truaillithe, idircheaptha agus i leith leasuithe neamhúdaraithe. Séanann Uisce Éireann aon fhreagracht as athruithe nó as idircheapadh a rinneadh ar an ríomhphost seo nó as aon dochar do chórais na bhfaighteoirí déanta ag an teachtaireacht seo nó ag a ceangaltáin tar éis a sheolta. Tabhair faoi deara go bhféadfadh monatóireacht a bheith á dhéanamh ar theachtaireachtaí chuig Uisce Éireann agus ó Uisce Éireann d'fhonn ár ngnó a chosaint agus chun a chinntiú go bhfuiltear ag teacht le beartais agus le caighdeáin Uisce Éireann. Is cuideachta gníomhaíochta ainmnithe é Uisce Éireann atá faoi theorainn scaireanna, a bunaíodh de bhun fhorálacha na n-Achtanna um Sheirbhísí Uisce 2007-2022, a bhfuil a bpríomh-ionad gnó ag Teach Colvill, 24-26 Sráid na Talbóide, BÁC 1.

Go raibh maith agat as d'aird a thabhairt.

The information transmitted is intended only for the person or entity to which it is addressed and may contain confidential, commercially sensitive and/or privileged material. Any review, retransmission, dissemination or other use of, or taking of any action in reliance upon, this information by persons or entities other than the intended recipient is prohibited and may be unlawful. Uisce Éireann accepts no liability for actions or effects based on the prohibited usage of this information. Uisce Éireann is neither liable for the proper and complete transmission of the information contained in this communication nor for any delay in its receipt. If you received this in error, please contact the sender and delete the material from any computer. E-Mail may be susceptible to data corruption, interception and unauthorised amendment. Uisce Éireann accepts no responsibility for changes to or interception of this e-mail after it was sent or for any damage to the recipients systems or data caused by this message or its attachments. Please also note that messages to or from Uisce Éireann may be monitored to ensure compliance with Uisce Eireann's policies and standards and to protect our business. Uisce Éireann is a designated activity company limited by shares, established pursuant to the Water Services Acts 2007-2022, having its principal place of business at Colvill House, 24-26 Talbot Street, Dublin 1.

Thank you for your attention.

Uisce Éireann
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D01 WA07
Éire

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www.water.ie

For the attention of Ayodeji Oyelami
Unit E4,
Nutgrove Office Park,
Nutgrove Avenue,
Dublin 14

By Email: aoyelami@nodwyer.com

Date: 14th September 2023

Re: EIA Scoping Request – Proposed windfarm in the townlands of Oatfield, Crag, Cloontra West, Derryvinnaan, Cloontra, Cloonsheerea, Mountrice, Cloghera, Drumsillagh (Merritt), Drumsillagh (Parker), Kyle and Gortacullin.

Dear Ayodeji Oyelami,

Uisce Éireann has received notification of your Environmental Impact Assessment (EIA) scoping request relating to Orsted Ltd.'s forthcoming planning application for a windfarm in Co Clare.

Please see attached, Uisce Éireann's scoping opinion in relation to Water Services. On receipt of the planning referral, Uisce Éireann will review the finalised Environmental Impact Assessment Report (EIAR) as part of the planning process.

Queries relating to the terms and the EIA scoping opinions below should be directed to planning@water.ie

PP. *Ali Robinson*

Yvonne Harris

Connections and Developer Services

Uisce Éireann's Response to EIA Scoping Requests

At present, Uisce Éireann does not have the capacity to advise on the scoping of individual projects. However, in general the following aspects of Water Services should be considered in the scope of an EIA where relevant;

a) Where the development proposal has the potential to impact an Uisce Éireann Drinking Water Source(s), the applicant shall provide details of measures to be taken to ensure that there will be no negative impact to Uisce Éireann's Drinking Water Source(s) during the construction and operational phases of the development. Hydrological / hydrogeological pathways between the applicant's site and receiving waters should be identified as part of the report.

b) Where the development proposes the backfilling of materials, the applicant is required to include a waste sampling strategy to ensure the material is inert.

c) Mitigations should be proposed for any potential negative impacts on any water source(s) which may be in proximity and included in the environmental management plan and incident response.

d) Any and all potential impacts on the nearby reservoir as public water supply water source(s) are assessed, including any impact on hydrogeology and any groundwater/ surface water interactions.

e) Impacts of the development on the capacity of water services (*i.e. do existing water services have the capacity to cater for the new development*). This is confirmed by Uisce Éireann in the form of a Confirmation of Feasibility (COF). If a development requires a connection to either a public water supply or sewage collection system, the developer is advised to submit a Pre-Connection Enquiry (PCE) enquiry to Uisce Éireann to determine the feasibility of connection to the Uisce Éireann network.

   All pre-connection enquiry forms are available from https://www.water.ie/connections/connection-steps/.

f) The applicant shall identify any upgrading of water services infrastructure that would be required to accommodate the proposed development.

g) In relation to a development that would discharge trade effluent – any upstream treatment or attenuation of discharges required prior to discharging to an Uisce Éireann collection network.

h) In relation to the management of surface water; the potential impact of surface water discharges to combined sewer networks and potential measures to minimise and or / stop surface waters from combined sewers.

i) Any physical impact on Uisce Éireann assets – reservoir, drinking water source, treatment works, pipes, pumping stations, discharges outfalls etc. including any relocation of assets.

j) When considering a development proposal, the applicant is advised to determine the location of public water services assets, possible connection points from the applicant's site / lands to the public network and any drinking water abstraction catchments to ensure these are included and fully assessed in any pre-planning proposals. Details, where known, can be obtained by emailing an Ordnance Survey map identifying the proposed location of the applicant's intended development to datarequests@water.ie

k) Other indicators or methodologies for identifying infrastructure located within the applicant's lands are the presence of registered wayleave agreements, visible manholes, vent stacks, valve chambers, marker posts etc. within the proposed site.

l) Any potential impacts on the assimilative capacity of receiving waters in relation to Uisce Éireann discharge outfalls including changes in dispersion / circulation characterises. Hydrological / hydrogeological pathways between the applicant's site and receiving waters should be identified within the report.

m) Any potential impact on the contributing catchment of water sources either in terms of water abstraction for the development (*and resultant potential impact on the capacity of the source*) or the potential of the development to influence / present a risk to the quality of the water abstracted by Uisce Éireann for public supply should be identified within the report.

n) Where a development proposes to connect to an Uisce Éireann network and that network either abstracts water from or discharges wastewater to a "protected"/ sensitive area, consideration as to whether the integrity of the site / conservation objectives of the site would be compromised should be identified within the report.

o) Mitigation measures in relation to any of the above ensuring a zero risk to any Uisce Éireann drinking water sources (Surface and Ground water).

This is not an exhaustive list.

Please note;

- Where connection(s) to the public network is required as part of the development proposal, applicants are advised to complete the Pre-Connection Enquiry process and have received a Confirmation of Feasibility letter from Uisce Éireann ahead of any planning application.

- Uisce Éireann will not accept new surface water discharges to combined sewer networks.