Cork County Council

Ann Kilmartin

From: Sean Molloy <smolloy@jodireland.com> on behalf of Sean Molloy
Sent: Tuesday, January 26, 2021 12:15 PM
To: Ann Kilmartin
Subject: RE: 6225 GWF & 6226 IWF - Pre-Planning Mtg. with Cork County Council - Scoping Opinion
Attachments: Scoping Report Inchamore wind farm.docx; scoping report for gortyrahilly wind farm.docx; PPW 6225 Gortyrahilly WF & PPW 6226 Inchamore WF EO Advices FV.docx

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From: Thomas Watt <Thomas.Watt@CorkCoCo.ie>
Sent: Friday 22 January 2021 16:57
To: Sean Molloy <smolloy@jodireland.com>
Cc: Greg Simpson <Greg.Simpson@CorkCoCo.ie>; Carol Stack <Carol.Stack@CorkCoCo.ie>
Subject: RE: 6225 GWF & 6226 IWF - Pre-Planning Mtg. with Cork County Council - Ecology Scoping Documents

Hi Sean

Some comments following our MSTeam meeting from last Thursday, (14th). This is not exclusive list and further comments are attached, prepared by Carol Stack and initial comments of our heritage team (ecology) prior to the meeting.

I'd like to reiterate that we would be happy to meet again prior to your submission to ABP to facilitate application.

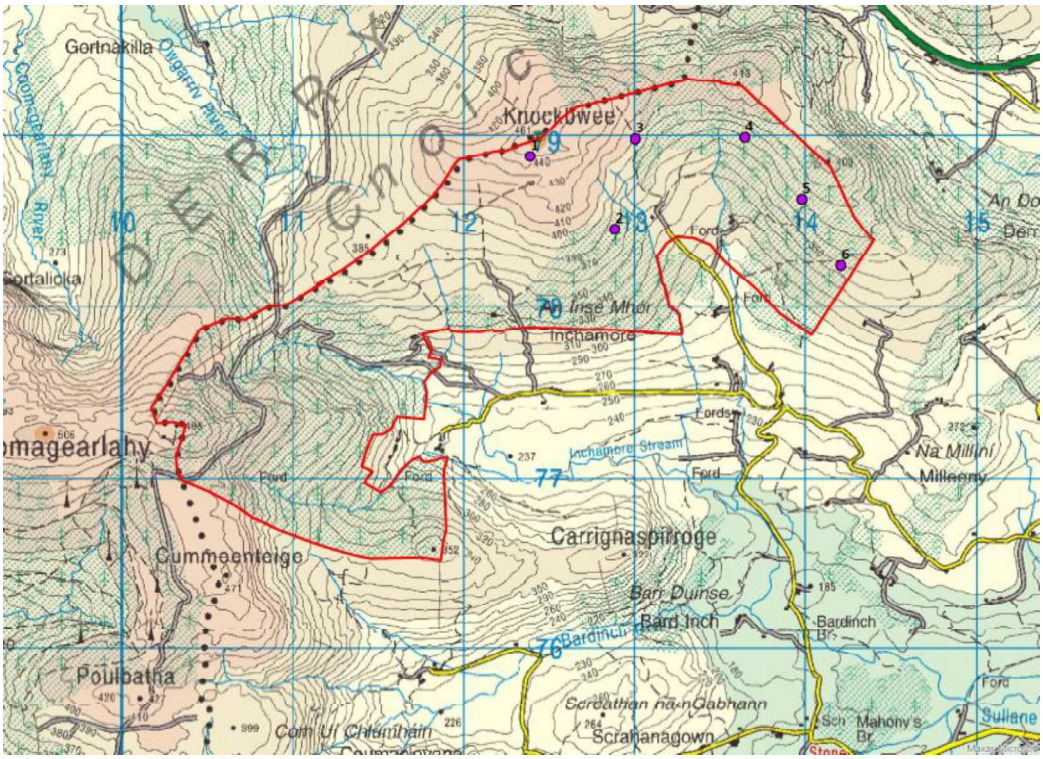
- I refer you to CDP objective HE 2- 3 Biodiversity outside protected areas and the Heritage Chapter as a whole
- Would be useful to add rationale for view point locations, some new viewing points from the new N22 would be of value
- Would be worthwhile making contact with Area Engineers listed by Greg and our archaeologist Mary Sleeman and Conservation Officer, Mona Hallinan for built heritage issues arising
- Site adjoins Kerry Co Co area identified as not be appropriate for wind farms. An exploration of how this proposal relates to this area, being so close to Co boundary. – its visual impact or potential ecological impact to National Park. Can you differentiate between the two, can you mitigate the qualifying interests which underly the KCC policy?
- Identify Met Mast and clarify height
- Ecology unit has identified some turbines they have concerns with. See attached comments.
- Determine grid connection and include same in application for turbines would be advisable
- Submit rationale for separate application processes (SID / PP), grid connection being one aspect of that judgement
- Clarify the duration of construction
- Welcome your stated approach of avoidance of bog.
- Welcome distances achieved from residential units, in line with draft national guidelines

Regards

Tom

www.corkcoco.ie

Scoping opinion on proposed Inchamore Wind Farm, Coolea.



A request for Scoping Opinion on information to be included in the preparation of an Environmental Impact Assessment (EIA) for Inchamore Wind Farm, Coolea Co. Cork was received on 13/11/20.

The purpose of the request is so that key environmental issues/concerns can be identified early and the development can be designed to avoid or minimise any potentially significant environmental effects, and that any remaining likely significant effects can be assessed appropriately

<u>The Proposed Development</u>

The Developer intends to apply to Cork County Council for planning permission for the construction of approximately 6 no. wind turbines each typically of 4.5 – 6 megawatts (MW) with a combined output of circa 30MW located approximately 6km to the west of the village of Ballyvourney in the Múscraí Gaeltacht, Co. Cork. The proposals will also include planning permission for the construction of an underground grid connection to Ballyvouskill 220kV substation, Co. Cork, located approximately 12.5km to the north east of the Development.

- 480hectares of land involved -
- 6 turbines (4.5 – 6 MW)
- Tip height – 185m
- Rotor diameter of 155m and hub height in region of 110m.
- Route options that will connect the Development to the national grid are being explored

Planning Dept. Feedback

The following should be noted:

- Site is within an area;
    - where open farms are open to consideration
    - within landscape character type 15b - 15b - Ridged and Peaked Upland
    - within transitional rural area
    - where site boundary runs along the Kerry border

- Information to be contained in EIAR – report submitted for scoping covers the various EIAR requirements already – follow all relevant guidelines including EIA guidelines, relevant Wind Energy Guidelines, EPA advice notes and relevant legislation.
- The EIAR and construction practice and methodology should take into account ground conditions onsite and best practise. Disposal or elimination of waste/surplus material from construction/site clearance, particularly significant for peatland sites should be taken into account.
- Reasonable alternatives to be considered (as per scoping doc) and must also indicate the main reasons for the option chosen taking into account the effects of the project on the environment
- Grid connection needs to be finalised - Should the grid connection not form part of the planning application, the EIAR should indicate the most likely corridor of the grid connection, its width and route and the likely nature of the connection in terms of line voltage, whether it will be underground (preferred) or over ground (including details of pole type) and any ancillary equipment (e.g. substations).
- Cumulative impacts to be considered (as per scoping doc) - include an assessment of all the existing or approved wind farm developments in the area. In addition the EIAR should also take into account any existing or approved large scale developments in the area.
- Consider transboundary effects given proximity to Kerry Border.
- Might be worthwhile including some vantage points from new Macroom bypass route in terms of potential visual impacts.

C.Stack,
Exec. Planner.
11/1/21

Ecology Office Advices - Pre-Planning / General Scoping

PPW: 6225 Gortyrahilly Wind Farm, Co. Cork and PPW: 6226 Inchamore Wind Farm, Co. Cork

These comments are made without prejudice and are based on a review of General Scoping Documents received in respect of the above mentioned windfarm sites and are also based on publicly available information. I do not have access to any site specific ecological data in relation to these sites.

At the outset, given the proximity of the two windfarm sites to one another (c.3km) and given their location within the same general area and catchment and probable use of the same grid connection infrastructure and access, the question of project splitting will need to be addressed at the outset to determine whether the two projects should be considered as a single project.

In any event both projects will need to be assessed as part of the cumulative impacts assessment together. Any cumulative impacts assessment should also consider solar projects within the area having particular regard to cumulative impacts on protected species, habitats of high natural value including peatland habitats, other upland habitats and on freshwater habitats.

Having regard to the site context, the assessment of peat stability will be an important element of these applications. Key concerns from an ecological perspective are:

- Potential for impact on sites designated or proposed to be designated for protection of biodiversity;
- Potential for impact on habitats of high natural value; and
- Potential for impact on protected species.

Aerial imagery indicates that the proposed developments comprises of areas intact peatland habitats and upland habitats of high natural value. This is a concern from an ecological perspective as it is generally recommended to **avoid intact upland habitats**, in particular peatland habitats when identifying appropriate sites for development of wind farms. For this reason, I would refer you to policy HE 2-3 of the CDP and to reconsider the positioning of some of the works (see detailed comments below in respect of sites).

Based on the mapping presented, it appears that neither of the sites overlap with the boundaries of any site which is designated or proposed to be designated for nature conservation. However, screening for Appropriate Assessment will be required to identify whether there are any potential pathways for impact linking these sites to any such site, looking in particular at potential hydrological linkages to any such site. To that end it should be noted that the site is located within the Lee - Sullane River catchment.

Without direct knowledge of the site, issues we will be likely to be looking closely at are:

- Assessment of impact on upland habitats including intact peatlands. Per above, it is recommended that development **on intact peatland habitats and upland habitats of high natural value is avoided.**
- Potential for the project to give rise to negative effects on freshwater habitats and having particular regard to potential impacts on Fresh water pearl Mussel and Salmon. To this end, there should be a focus at design stage on providing for an appropriately designed surface

water management system which minimises risk of release of contaminants to surface waters and ensures that there is no increase in surface water run-off from the site. Avoidance of disturbance of peat based habitats will greatly assist with this.

- Any species specific surveys which are deemed to be required including bird surveys must be completed by qualified and experienced practitioners following recognised best practise methods. It should be noted that up to two years' full season surveys are required for certain bird species should a potential impact on any such species be identified as a possible risk having regard to reference.
- Decommissioning and reinstatement should be considered in detail and shall include opportunities for biodiversity enhancement where possible.

The Biodiversity chapter of the EIAR should be prepared to accord with CIEEM Guidelines should be prepared taking account of National and EU Guidelines as well as recent case law.

No details of grid connection options were incorporated into the pre-planning enquiry. As per the AP's comments full details of options shall be detailed and assessed as part of the applications.

Specific Comments in relation to Inchamore Windfarm

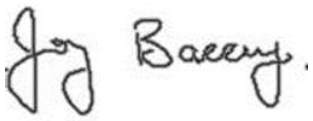
Per above comments and based on constraints mapping, it is recommended that development is avoided within areas identified as:

- 'largely intact upland blanket bog' and **'**cutaway blanket bog with intact areas' located in proximity to turbine 3 and associated developable areas within the vicinity of these habitats; and
- areas comprising of a 'Mosaic of Upland Blanket Bog and Wet Heath' in proximity to the developable area associated with turbine 1.

Specific Comments in relation to Gortyrahilly Windfarm

Per above comments and based on constraints mapping, it is recommended that development is avoided within areas identified as:

- 'blanket bog' in proximity to the developable area associated with turbine 8.



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Joy Barry
Ecology Office Planner
13/01/2020

Ecology Office Advices - Pre-Planning / General Scoping

PPW: 6225 Gortyrahilly Wind Farm, Co. Cork and PPW: 6226 Inchamore Wind Farm, Co. Cork

These comments are made without prejudice and are based on a review of General Scoping Documents and Ecology Scoping documents received in respect of the above mentioned windfarm sites and are also based on publicly available information. I do not have access to any site specific ecological data in relation to these sites.

Please note that this document was updated following receipt of Ecological Scoping Reports – text included in purple to reflect same.

At the outset, given the proximity of the two windfarm sites to one another (c.3km) and given their location within the same general area and catchment and probable use of the same grid connection infrastructure and access, the question of project splitting will need to be addressed at the outset to determine whether the two projects should be considered as a single project.

In any event both projects will need to be assessed as part of the cumulative impacts assessment together. Any cumulative impacts assessment should also consider solar projects within the area having particular regard to cumulative impacts on protected species, habitats of high natural value including peatland habitats, other upland habitats and on freshwater habitats.

Having regard to the site context, the assessment of peat stability will be an important element of these applications. Key concerns from an ecological perspective are:

- Potential for impact on sites designated or proposed to be designated for protection of biodiversity;
- Potential for impact on habitats of high natural value; and
- Potential for impact on protected species.

Aerial imagery indicates that the proposed developments comprises of areas intact peatland habitats and upland habitats of high natural value. This is a concern from an ecological perspective as it is generally recommended to **avoid intact upland habitats**, in particular peatland habitats when identifying appropriate sites for development of wind farms. For this reason, I would refer you to policy HE 2-3 of the CDP and to reconsider the positioning of some of the works (see detailed comments below in respect of sites).

Based on the mapping presented, it appears that neither of the sites overlap with the boundaries of any site which is designated or proposed to be designated for nature conservation. However, screening for Appropriate Assessment will be required to identify whether there are any potential pathways for impact linking these sites to any such site, looking in particular at potential hydrological linkages to any such site. To that end it should be noted that the site is located within the Lee - Sullane River catchment.

Without direct knowledge of the site, issues we will be likely to be looking closely at are:

- Assessment of impact on upland habitats including intact peatlands. Per above, it is recommended that development **on intact peatland habitats and upland habitats of high natural value is avoided.**

- Potential for the project to give rise to negative effects on freshwater habitats and having particular regard to potential impacts on Fresh water pearl Mussel and Salmon. To this end, there should be a focus at design stage on providing for an appropriately designed surface water management system which minimises risk of release of contaminants to surface waters and ensures that there is no increase in surface water run-off from the site. Avoidance of disturbance of peat based habitats will greatly assist with this.
- Any species specific surveys which are deemed to be required including bird surveys must be completed by qualified and experienced practitioners following recognised best practise methods. It should be noted that up to two years' full season surveys are required for certain bird species should a potential impact on any such species be identified as a possible risk having regard to reference. Ornithological summary results presented in scoping documentation dates from 2017 to 2019 and given the time lapse, supplementary surveys for the intervening period will be required. Please present mapping of any habitat loss respective to foraging and breeding sites as part of assessment.
- With regard to bat activity, if commuting and foraging routes of bats relative to proposals could be presented and if these routes could also be presented respective of habitats on site including any habitat loss associated with the development.
- Decommissioning and reinstatement should be considered in detail and shall include opportunities for biodiversity enhancement where possible.

The Biodiversity chapter of the EIAR should be prepared to accord with CIEEM Guidelines should be prepared taking account of National and EU Guidelines as well as recent case law.

No details of grid connection options were incorporated into the pre-planning enquiry. As per the AP's comments full details of options shall be detailed and assessed as part of the applications.

Specific Comments in relation to Inchamore Windfarm

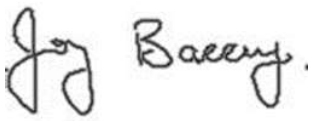
Per above comments and based on constraints mapping, it is recommended that development is avoided within areas identified as:

- 'largely intact upland blanket bog' and 'cutaway blanket bog with intact areas' located in proximity to turbine 3 and associated developable areas within the vicinity of these habitats; and
- areas comprising of a 'Mosaic of Upland Blanket Bog and Wet Heath' in proximity to the developable area associated with turbine 1.
- Ecological Scoping document acceptable in principle

Specific Comments in relation to Gortyrahilly Windfarm

Per above comments and based on constraints mapping, it is recommended that development is avoided within areas identified as:

- 'blanket bog' in proximity to the developable area associated with turbine 8.



Joy Barry
Ecology Office Planner
03/02/2020

Development Applications Unit

Department of Tourism, Culture, Arts, Gaeltacht, Sport and Media

An Roinn Turasóireachta, Cultúir,
Ealaíon, Gaeltachta, Spóirt agus Meán
Department of Tourism, Culture,
Arts, Gaeltacht, Sport and Media

Your Ref: 6226 Inchamore Wind Farm, Co. Cork
Our Ref: G Pre00233/2020
(Please quote in all related correspondence)

19 April 2021

Sarah Moore
For: Jennings O'Donovan & Partners Limited
Finisklin Business Park
Sligo
F91 RHH9

Via email: smoore@jodireland.com

Re: Request for Scoping Opinion on information to be included in the preparation of an Environmental Impact Assessment (EIA) for Inchamore Wind Farm, Coolea, County Cork

A chara

I refer to correspondence dated 12th November 2020 received in connection with the above. Outlined below are Nature Conservation observations/recommendations coordinated by the Development Applications Unit.

Nature Conservation

Thank you for your consultation letter of 12th November 2020 regarding the proposed Inchamore wind-farm as detailed in the attached Scoping Document of November 2020, and subsequent e-mail of 30th March 2021.

The following scoping is not comprehensive, and is without prejudice to any recommendations that the Department may make to a planning authority concerning a planning application on foot of information collected or collated as part of the EIA process. A number of guidance documents for professional consultants have been published on the quality of ecological data in EIA[1], and there are numerous contemporary Environmental Impact Assessment Reports (EIARs) available for wind-farm proposals in upland areas, many parts of which show good practice.

The proposed development is not within, adjacent to, or significantly upstream of a designated or proposed European site (Special Conservation Area (SAC), Candidate Special Area of Conservation (cSAC), Special Protection Area (SPA), proposed Special Protection

[1] E.g. the CIEEM guidance referred to in the Scoping Report.

Area (pSPA), Natural Heritage Area (NHA) or proposed Natural Heritage Area (pNHA). However, there are a number of protected species occurring in the area potentially impacted by the wind farm that the EIAR should fully assess:

1. There have been a number of fatalities of white-tailed sea eagles, caused by collisions with turbine blades, in wind farms to the south of the proposed developments. An understanding of current and predicted future use by white-tailed eagles of the development site would be expected of the EIAR. In particular, the EIAR should assess the locations of turbines with respect to valley and slope topography which increase the risk of collision with eagles gaining height on updrafts, based especially on published Norwegian data. Also, a programme for livestock carcass monitoring and management needs to be put in place, to avoid attracting eagles into the rotor-swept area of turbines.

2. The proposed wind farm is within the catchment of the River Sullane, which, in addition to fish species of conservation importance (please consult Inland Fisheries Ireland for scoping), contains a population of the freshwater pearl mussel. The (high) water quality requirements of this species should be taken into account in designing siltation control measures. The combination of clean water diversion, lined multicelled stone-constructed sediment ponds which can be cleaned by suction rather than excavated out, an environmental management plan, alarmed autosamplers, and previous best-practice upland construction experience indicates that a sediment control system could control sediment release such that it will not have an adverse effect on freshwater life downstream.

3. In connection with the above also, a thorough geotechnical stability risk and hydrogeological assessment needs to be carried out of areas of relatively deep peat soil, not just for turbine foundations, but also for access roads, borrow pits, drains, etc. There are a number of cases of peat slides during upland wind farm construction, and the scientific investigations of the causes of these should be taken into account in the EIAR.

4. Other protected species that require species-appropriate survey methods following published best practice are (a) red grouse, (b) merlin, (c) hen harrier, (d) golden plover, (e) curlew (f) Leisler's bat, (g) Kerry slug and (h) marsh fritillary. For red grouse, the long-term effect of increased human access (on foot, motorbike or ORV) via roadways (and potentially fox access), as well as increased perches and food for hooded crows, needs to be considered in terms of the likelihood of increased predation on this species. Note that both merlin and roosting hen harrier are often difficult to detect, and have been underestimated previously in some EIARs, so experienced observers are recommended. Golden plover must be taken into account in cumulative assessment with other wind farms in the Cork/Kerry Mountains. Leisler's bat may be more susceptible to collision or baro-trauma, so turbine locations which overlap with feeding features need to be taken into account. A licence application for addressing any direct impacts on Kerry slug habitat may be necessary.

Marsh fritillary may not be present in suitable habitat every year due to their metapopulation dynamics, so suitable habitat should also be recorded (as mentioned on page 6 of the Scoping Report).

5. There are a few upland protected plant species (including mosses and liverworts – see Statutory Instrument. No. 356 of 2015, Flora Protection Order) which need to be surveyed for if or where suitable habitat exists in the development footprint. The discovery of the small cudweed (*Filago minima*) is mentioned in the Scoping Report, and it needs to be established if this can be avoided by the development.

6. It is now well established that climate change is likely to have a considerable impact on biodiversity and wildlife, due to droughts, floods, sea level rise, changes in seasonal weather, etc. The impact of CO_2 emissions from extensive peat excavation, if this is to be carried out, needs to be fully accounted.

7. Impacts from associated works: (a) The likelihood of increases in nutrient loading of the River Sullane from forestry felling should also be assessed[2]; (b) The effect of haul road widening and bridge upgrade works on protected species (e.g. otter, Kerry slug, Daubenton's and other bat species) should also be assessed; (c) if underground cables are to transport electricity, then river/stream crossings need to be examined, especially if in designated rivers; (d) effects of any fencing, lattice anemometer towers, etc., on red grouse collisions should be assessed.

8. The focus on habitats of conservation importance which are not protected, in the Scoping Report (page 6), is welcome. It should be kept in mind that some external funding agencies at European or global level are now expecting no net loss of biodiversity as part of their funding requirements.

9. The visibility of the turbines from Killarney National Park, although not an ecological issue, needs to be assessed elsewhere in the EIAR.

10. Section 3.6 refers to assessment of ornithological impacts during construction and operation. Assessment of decommissioning, because of its often similar disturbance effects to construction, should also be assessed.

11. Finally, reliance on post-planning approval of detailed works (e.g. river crossings), and monitoring design, by the National Parks and Wildlife Service (NPWS) of the Department, should be avoided as (a) it may indicate inadequacies of assessment by the EIAR, and (b) staff may not be available to support this in the time frame of an active construction project.

[2] See, for instance, Heal, K., *et al*. (2020) Wind farm development on peatlands increases fluvial macronutrient loading. *Ambio* **49**: 442-459.

A regional officer of the NPWS Ecological Assessment Unit is available for an on-line meeting (Starleaf, Teams, preferable) to clarify any of the above, as requested. However, the detail of the scope and methodology of the EIAR surveys are a matter for the expert consultants advising the developer, who should be aware of up-to-date best-practice guidance in their respective fields.

The above observations/recommendations are based on the papers submitted to this Department on a pre-planning basis and are made without prejudice to any observations that the Minister may make in the context of any consultation arising on foot of any development application referred to the Minister, by the planning authority/ies, in their role as statutory consultee under the Planning and Development Act, 2000, as amended.

You are requested to send further communications to the Development Applications Unit (DAU) at **manager.dau@housing.gov.ie**, or to the following address:

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

Is mise, le meas

Development Applications Unit

Kerry County Council

Kerry County Council,
County Buildings, Tralee, Co. Kerry.
Tel: (066) 7183582 Fax: (066) 7120328
E-mail: plan@kerrycoco.ie;

Comhairle Chontae Chiarraí,
Aras an Chontae, Trá Lí, Co. Chiarraí.
Guthán: (066) 7183582 Faics: (066) 7120328
Web: http://www.kerrycoco.ie

Re: Pre-Planning Consultation

24th August 2021

Sean Molloy
Jennings O Donovan & Partners Ltd
Finisklin Business Park
Sligo

Dear Sir,

I am writing to you in relation to your recent Pre-Planning Application.

Details as follows

Reference Number: **PP 21/362**

Applicant Name: **Coillte CGA**

Applicant Address: Coillte Regional Office, Hartnetts Cross, Macroom, Co Cork,

Site Location: Derryreag, Cummeenavrick, Glashacormick, Clydaghroe, Cummeennabuddoge, Townlands

Please be advised of the following observations/comments by the area planner in relation to your proposed development:

- Proposed grid connection and haul route the proposed Inchamore wind farm in Cork.
- EIA. AA. Archaeology.
- TII/N22 implications.Area is zoned Secondary Special Amenity in the County Development Plan.
- It should be noted that the site is outside of the area zoned as "open to consideration" in the Renewable Energy Strategy.

Please quote reference number and include copy of this report if a planning application is to be submitted in relation to this site.

Kind Regards

ASO Planning

JENNINGS O'DONOVAN
& PARTNERS LIMITED
Finisklin Business Park, Sligo.
26 AUG 2021
Sean Molloy, Breana,
RECEIVED

Please note: The carrying out of consultations shall not prejudice the performance by a planning authority of any other of its functions under the Planning and Development Act 2001 - 2020, or any regulations made under said act and cannot be relied upon in the formal planning process or in legal proceeding.

Transport Infrastructure Ireland

Ann Kilmartin

From: INFO <Information@tii.ie>
Sent: Monday, December 7, 2020 12:05 PM
To: 'smoore@jodireland.com'
Subject: EIAR Scoping - Inchamore Wind Farm, Coolea, Co. Cork. TII Ref: TII20-111743.

Dear Ms. Moore,

Thank you for your correspondence of 16 November 2020 regarding as EIAR Scoping request for Inchamore Wind Farm, Coolea, Co. Cork. The position in relation to your enquiry is as follows.

Transport Infrastructure Ireland (TII) wishes to advise that it is not in a position to engage directly with planning applicants with respect to proposed developments. 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 '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.

TII notes that the limited consultation email and map supplied identify a site for the turbines only , to be located off a local road that connects with the N22 national primary road.

With respect to EIAR Scoping issues, the recommendations indicated below provide only general guidance for the preparation of EIAR, which may affect the National Roads Network. The developer should have regard, inter alia, to the following:

1. As set down in the 'Spatial Planning and National Roads' Guidelines, it is in the public interest, in so far as is reasonably practicable, that the national road network continues to serve its intended strategic purpose. The EIAR should identify the methods/techniques proposed for any works traversing/in proximity to the national road network, in order to demonstrate that the development can proceed complementary to safeguarding the capacity, safety and operational efficiency of that network.

2. Consultations should be had with the relevant Local Authority/National Roads Design Office, with regard to locations of existing and future national road schemes.

3. In relation to cabling and potential connection routing, the scheme promoter should note locations of existing and future national road schemes and develop proposals to safeguard proposed road schemes. As outlined above, consult with the Local Authority/National Roads Design Office in relation to any schemes in planning in the area, especially on the N22.
   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 existing national roads, alternatives to the provision of cabling along the national road network, such as alternative routing or the laying of cabling in private lands adjoining the national road, should be considered in the interests of safeguarding the investment in and the potential for future upgrade works to the national road network. The 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.

4. Clearly identify haul routes proposed and fully assess the network to be traversed. Separate structure approvals/permits and other licences may be required in connection with the proposed haul route and all structures on the haul route should be checked by the applicant/developer to confirm their capacity to accommodate any abnormal load proposed.

5. 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. TII's 'Traffic and Transport Assessment Guidelines' (2014) should be referred to in relation to proposed development with potential impacts on the national road network. The scheme promoter is also advised to have regard to Section 2.2 of the TII TTA Guidelines, which addresses requirements for sub-threshold TTA.

6. TII Standards should be consulted to determine the requirement for Road Safety Audit and Road Safety Impact Assessment.

7. Assessments and design and construction and maintenance standards and guidance are available at TII Publications, which replaced the National Road Authority (NRA) Design Manual for Roads and Bridges and the NRA Manual of Contract Documents for Road Works.

8. The developer, in conducting Environmental Impact Assessment, should have regard to TII Environment Guidelines that deal with assessment and mitigation measures for varied environmental factors and occurrences. In particular:
    a. 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' (NRA, 2006).
    b. The EIAR 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)).

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

I hope that this information is of assistance to you.

Yours sincerely,

Alban Mills
Senior Regulatory and Administration Executive

Transport Infrastructure Ireland
Parkgate Business Centre
Parkgate Street
Dublin D08 DK10

Irish Water

Jennings O'Donovan & Partners,
Finisklin Business Park,
Sligo,
F91 RHH9.

Uisce Éireann
Bosca OP 6000
Baile Átha Cliath 1
D01 WA07
Éire

Irish Water
PO Box 6000
Dublin 1
D01 WA07
Ireland

T: +353 01 89 25000
T: +353 01 89 25001
www.water.ie

2nd December 2020

Re: EIAR Scoping Request – Inchamore Wind Farm, Coolea, Co. Cork.

Dear Mrs. Kilmartin,

Irish Water (IW) acknowledges receipt of your request in respect of the Environmental Impact Assessment Report (EIAR) scoping for the proposed Inchamore Wind Farm in Coolea, Co. Cork.

Please see attached our suggested scope in relation to Water Services. On receipt of the planning referral, Irish Water will review the EIAR as part of the planning process.

Queries relating to the terms and observations above should be directed to planning@water.ie

Yours sincerely,

Signed on behalf of Irish Water:

PP: Ali Robinson

Yvonne Harris
Connections and Development Services

Response to EIAR Scoping Report Requests

IW currently does not have the capacity to advise on scoping of individual projects. However, in general we would like the following aspects of Water Services to be considered in the scope of an EIAR where relevant;

a) Impacts of the development on the capacity of water services (do existing water services have the capacity to cater for the new development if required). This is confirmed by IW in the form of a Confirmation of Feasibility (COF). If a development will require 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 IW to determine the feasibility of connection to the Irish Water network. All pre-connection enquiry forms are available from https://www.water.ie/connections/get-connected/

b) Any up-grading of water services infrastructure that would be required to accommodate the development.

c) In relation to a development that would discharge trade effluent – any upstream treatment or attenuation of discharges required prior to discharging to an IW collection network

d) In relation to the management of surface water; the potential impact of surface water discharges to combined sewer networks & potential measures to minimise/stop surface waters from combined sewers

e) Any physical impact on IW assets – reservoir, drinking water source, treatment works, pipes, pumping stations, discharges outfalls etc. including any relocation of assets

f) If you are considering a development proposal, it is best practice to contact us in advance of designing your proposal to determine the location of public water services assets. Details, where known, can be obtained by emailing an Ordinance Survey map identifying the proposed location of your intended development to datarequests@water.ie. Other indicators or methodologies for identifying infrastructure located within your lands are the presence of registered wayleave agreements, visible manholes, vent stacks, valve chambers, marker posts etc. within the proposed site.

g) Any potential impacts on the assimilative capacity of receiving waters in relation to IW discharge outfalls including changes in dispersion /circulation characterises

h) 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 IW for public supply.

i) Where a development proposes to connect to an IW network and that network either abstracts water from or discharges waste water to a “protected”/sensitive area, consideration as to whether the integrity of the site/conservation objectives of the site would be compromised.

j) Mitigation measures in relation to any of the above

This is not an exhaustive list.

Please note

- The Confirmation of Feasibility from IW, to the applicant, should be issued prior to applying for planning permission.
- Irish Water will not accept new surface water discharges to combined sewer networks

Health Service Executive

North Lee Environmental Health Service,
Floor 2, Block 1 St Finbarr's Hospital,
Douglas Road,
Cork,

Phone: 021 4921801
E-Mail: ehonl@hse.ie

Date: 10th December 2020

Name: Ms Sarah Moore, Jennings O'Donovan & Partners Limited, Finisklin Business Park, Sligo

Consultant's reference: 6226/503/SL/001/SM

Re: EIA Scoping Report

Proposed development: Proposed Inchamore Wind Farm, Coolea, Co. Cork

Applicant: Coillte Cuideachta Ghníomhaíochta Ainmnithe (Coillte CGA) and SSE Renewables Ltd

EHIS Reference: 1450

Dear Ms Moore

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

The following HSE departments were made aware of the consultation request for the proposed development on 16 November 2020

- Emergency Planning – David O'Sullivan
- Estates – Helen Maher
- Assistant National Director for Health Protection – Kevin Kelleher/ Laura Murphy
- CHO – Michael Fitzgerald

If you have any queries regarding this report the initial point of contact is Ms Catherine McCarthy, Principal Environmental Health Officer who will refer your query to the appropriate person.

Yours sincerely

Catherine McCarthy

Catherine McCarthy
Principal Environmental Health Officer.

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EMH EMERGENCY MANAGEMENT HEALTH

HSE South Emergency Management Consultation Report

Report to	**Catherine McCarthy, PEHO, Cork**	**Date**	**17th Nov., 2020**
Type of consultation: EIS □ Scoping X Screening □ EIAR □ EPA □ Other (please specify):			
Authority	**Health Service Executive**		
Authority Reference Number	**EHIS 1450**		
EM Reference Number	**EMENV 065**		
Applicant	**Jennings O'Donovan & Partners, Cons. Eng., Finisklin Business Park, Sligo, on behalf of Coillte CGA and SSE Renewables Ltd.**		
Proposal	**The Construction of 6 No. wind turbines and associated site works at Inchamore Wind Farm, Coolea, Co. Cork.**		

HSE South Emergency Management Observations:

Please be advised that the HSE South Emergency Management function does not have any specific observations to make with respect to this application. However, please note the following recommendations within the context of site operations:

1. Should an incident occur at the site and the site operator requires the assistance of the emergency services, the incident information should be provided in the `ETHANE` format (please see attached).
2. Emergency Services access to the site should be clearly identified. This should be undertaken via appropriate high visibility signage, i.e.; a green sign with a yellow border and white lettering citing the abbreviation RVP
3. The site should have a mechanism in place to account for personnel during an evacuation in order to provide the responding emergency services with an estimate of the number of people accounted and unaccounted for.
4. The site should identify any critical / vulnerable facilities within the geographical catchment area, such as hospitals, schools, nursing homes, etc, that could be directly or indirectly affected by an incident at the site.
5. Where the `off-site` impacts of an incident at the site affects a vulnerable cohort / population such as children within crèches, schools; patients / clients / residents within nursing homes, etc; the emergency services will require assistance from the site operator in determining the impact on the local community.
6. The site operator is encouraged to develop a business continuity plan that includes a plan for severe weather. For more advice on this, please see the Department of Business, Enterprise and Innovation, *Business Continuity Planning in Severe Weather.* https://dbei.gov.ie/en/Publications/Publication-files/Business-Continuity-Planning-in-Severe-Weather-Check-List-for-Businesses.pdf

All correspondence or any queries with regard to this report should be forwarded to Ms. Maryanne Horgan, Emergency Management Office, HSE South, Eye, Ear and Throat Hospital, Western Road, Cork, T12 WP62 or maryanne.horgan@hse.ie

HSE EIA Scoping

Environmental Health Service Submission Report

Date:	10.12.20
Our reference:	EHIS 1450
Report to:	Ms Sarah Moore, Jennings O'Donovan & Partners Limited, Finisklin Business Park, Sligo
Type of Consultation:	EIA Scoping
Proposed development:	Proposed Inchamore Wind Farm, Coolea, Co. Cork
Applicant:	Coillte Cuideachta Ghníomhaíochta Ainmnithe (Coillte CGA) and SSE Renewables Ltd

Proposed Development: Coillte CGA and SSE Renewables Ltd. intends to apply to Cork County Council for permission for the construction of approximately 6 No. wind turbines each typically 4.5-6 megawatts (MW) with a combined output of approximately 30MW located approximately 6km west of the village of Ballyvourney in the Múscraí Gaeltacht, Co. Cork. The proposal will also include planning permission for the construction of an underground grid connection to Ballyvouskill 220Kv substation, Co. Cork, located approximately 12.5km to the north east of the development.

General Introduction

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

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

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

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

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

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

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

Generally the Environmental Impact Assessment should examine all likely significant impacts and provide the following information for each:

a) Description of the receiving environment;

b) The nature and scale of the impact;

c) An assessment of the significance of the impact;

d) Proposed mitigation measures;

e) Residual impacts.

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

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

The HSE will consider the final EIAR accompanying the planning application and will make comments to Cork County Council on the methodology used for assessing the likely significant impacts and the evaluation criteria used in assessing the significance of the impact.

This report only comments on Environmental Health Impacts of the proposed development. It is based on details contained in correspondence submitted to this office dated 12 November 2020.

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

- Public Consultation
- Decommissioning phase
- Siting, location and details of turbines
- Opportunity for Health Gain
- Noise & Vibration
- Shadow Flicker
- Air Quality
- Surface and Groundwater Quality

• Geological Impacts

• Ancillary facilities

• Cumulative impacts

Public Consultation

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

All parties affected by the proposed development, including those who may benefit financially from the project, must be fully informed of what the proposal entails, especially with regard to potential impacts on surrounding areas.

Sensitive receptors and other stakeholders should be identified to ensure all necessary and appropriate mitigation measures are put in place to avoid any complaints about the proposed wind farm development in the future.

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

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

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

To assist with the consultation and planning process it is recommended that the applicant develops a dedicated website for the proposed wind energy project. All correspondence, maps, project updates and documentation including the EIAR should be uploaded to this site.

Decommissioning Phase

The EIAR should detail what the eventual fate of the turbines and associated material will be, i.e. will the material be recycled or how will it be disposed of.

Information should also be provided regarding the proposed methodology to be used for the disposal of the materials forming the foundations of the wind turbines.

The EIAR should indicate the proposed future use of the wind farm site at the end of the planning permission period.

Siting, Location and details of Turbines

The EIAR should include a map and a description of the proposed location of each of the wind turbines.

The Environmental Health Service expects that details (height and model) of the turbines to be installed will be available at the time planning permission is sought and will be included in the EIAR.

Details of turbine foundation structures, including depth, quantity, material to be used and method of construction should be included in the EIAR. Mitigation measures to address potential impacts of the foundations on water quality and peat stability should also be described.

Details should be provided of any proposed rock breaking or rock blasting proposed for the development of the on-site burrow pit.

Opportunity for Health Gain

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

It is noted that 'recreational community and biodiversity improvements associated with the development' are cited in the Scoping Letter. Details of proposals for this aspect of the development should be included in the EIAR.

Assessment of Consideration of Alternatives

The EIAR should consider an assessment of alternatives. The EHS recommends that alternative renewable energy options to on -shore wind farms should be assessed as part of the EIAR.

Noise & Vibration

The potential impacts for noise and vibration during the construction and operational phases of the proposed development on all noise sensitive locations must be clearly identified in the EIAR. The EIAR must also consider the appropriateness and effectiveness of all proposed mitigation measures to minimise noise and vibration.

A baseline noise monitoring survey should be undertaken to establish the existing background noise levels. Noise from any existing turbines in the area should not be included as part of the back ground levels.

In addition, an assessment of the predicted noise impacts during the construction phase and the operational phase of the proposed wind farm development must be undertaken which details the change in the noise environment resulting from the proposed wind farm development.

The Draft Revised Wind Energy Development Guidelines were published in December 2019. Whilst these have yet to be adopted, any proposed wind farm development should have consideration of the draft Guidelines.

https://www.housing.gov.ie/sites/default/files/public-consultation/files/draft_revised_wind_energy_development_guidelines_december_2019.pdf

Shadow Flicker

It is recommended that a shadow flicker assessment is undertaken to identify any dwellings and sensitive receptors which may be impacted by shadow flicker. The assessment must include all proposed mitigation measures. Dwellings should include all occupied properties and any existing or proposed properties for which planning consent has been granted for construction or refurbishment.

It is recommended that turbine selection will be based on the most advanced available technology that permits shut down during times when residents are exposed to shadow flicker. As a result no dwelling should be exposed to shadow flicker.

Air Quality

Due to the nature of the proposed construction works generation of airborne dust has the potential to have significant impacts on sensitive receptors. A Construction Environmental Management Plan (CEMP) should be included in the EIAR which details dust control and mitigation measures. Measures should include:

- Sweeping of hard road surfaces
- Provision of a water bowser on site, regular spraying of haul roads
- Wheel washing facilities at site exit
- Restrict speed on site
- Provide covers to all delivery trucks to minimise dust generation
- Inspect and clean public roads in the vicinity if necessary
- Material stockpiling provided with adequate protection from the wind
- Dust monitoring at the site boundary
- Truck inspection and maintenance plan
- Details of a road maintenance agreement between the wind farm operator and the Local Roads Authority to clarify responsibility for the upkeep and repair of access roads during the construction phase of the project.

Surface and Ground Water Quality

The proposed development has the potential to have a significant impact on the quality of both surface and ground water. All drinking water sources, both surface and ground water, must be identified. Public and Group Water Scheme sources and supplies should be identified. Measures to ensure that all sources and supplies are protected should be described.

The Environmental Health Service recommends that a walk over survey of the site is undertaken in addition to a desktop analysis of Geological Survey of Ireland data in order to identify the location of private wells used for drinking water purposes.

Any potential significant impacts to drinking water sources should be assessed. Details of bedrock, overburden, vulnerability, groundwater flows, aquifers and catchment areas should be considered when assessing potential impacts and any proposed mitigation measures.

Geological impacts

A detailed assessment of the current ground stability of the site for the proposed wind farm extension and all proposed mitigation measures should be detailed in the EIAR. The assessment should include the impact construction work may have on the future stability of ground conditions, taking into consideration extreme weather events, site drainage and the potential for soil erosion.

Reference is made to a peat slide which occurred near Ballybofey in Co. Donegal on November 13th 2020 which may have been linked to construction activity at Meenbog Wind Farm. Potential impacts on water supply associated with contamination following a peat slide include sedimentation and alteration of pH levels.

The Environmental Health Service recommends that a detailed Peat Stability Assessment should be undertaken to assess the suitability of the soil for the proposed development. The EIAR should include provision for a peat stability monitoring programme to identify early signs of potential bog slides ('pre-failure indicators' see the Scottish Government's 'Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Developments 2017) https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2017/04/peat-landslide-hazard-risk-assessments-best-practice-guide-proposed-electricity/documents/00517176-pdf/00517176-pdf/govscot%3Adocument/00517176.pdf

Ancillary Facilities

The EIAR should include details of the location of all site office, construction compound, fuel storage depot, sanitary accommodation and canteen, First Aid facilities, disposal of wastewater and the provision of a potable water supply to the site canteen.

Cumulative Impacts

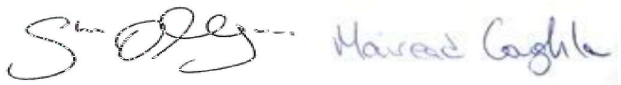
All existing or proposed wind farm developments in the vicinity should be clearly identified in the EIAR.

The Environmental Health Service notes a recent Scoping Consultation request for the proposed Gortyrahilly Wind Farm which appears to be within 10km of the proposed Inchamore Wind farm.

The impact on sensitive receptors of the proposed development combined with any other wind farm developments (existing and proposed) in the vicinity should be considered. This should include the proposed Gortyrahilly Wind Farm for which a Scoping Consultation request has recently been made.

The EIAR should include a detailed assessment of any likely significant cumulative impacts of the proposed renewable energy development.

The EIAR should state clearly if there is any future proposal to further extend the proposed Inchamore Wind Farm.



Shane O'Flynn and Máiread Coughlan
Environmental Health Officers
HSE South
North Lee Environmental Health Service
Floor 2, Block 1,
St. Finbarr's Hospital,
Douglas Road,
Cork

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

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EMH EMERGENCY MANAGEMENT HEALTH

Dial 999 / 112 – Request the service you require: An Garda Síochána, Ambulance Service and / or Fire and Rescue Service

WHEN YOU ARE CONNECTED TO THE REQUISITE SERVICE(S)

GIVE THE FOLLOWING INFORMATION **This is:_____Eircode_____** (Name, Telephone Number and Eircode Address of site) ***An incident has occurred at this site - standby for ETHANE message***	
E	
	Exact location of the incident
T	
	Type of incident, e.g.; fire, explosion, gas leak, etc
H	
	Hazards – current and potential
A	
	Access and Egress – what is the safest approach route for responding emergency services and where is your emergency services meeting point (RVP)
N	
	Number of casualties and their condition – specify adult / children if known
E	
	The emergency services present and required
N.B. If you require another emergency service stay on the line and repeat the steps again	

R.V.P. No.1

Údarás na Gaeltachta

Ann Kilmartin

From: Údarás na Gaeltachta <eolas@udaras.ie> on behalf of Údarás na Gaeltachta
Sent: Monday, November 16, 2020 11:15 AM
To: Ann Kilmartin; Dnag Suiomh Idirlion
Cc: Sarah Moore
Subject: RE: 6226 Inchamore Wind Farm, Co. Cork

Ann, a chara,
Go raibh maith agat as ucht do theachtaireacht. Thank you for your correspondence.
Your messages has been forwarded to our Corporate Services Section and appropriate members of staff for their attention .

Míle buíochas,
Dia leat,

Páid Ó Neachtain

Rannóg Cumarsáide
Údarás na Gaeltachta
Na Forbacha
Co. na Gaillimhe

Fón: 091 503100
Rphost: eolas@udaras.ie
www.udaras.ie
@UdarasnaG



From: Ann Kilmartin <akilmartin@jodireland.com>
Sent: Monday 16 November 2020 10:04
To: Dnag Suiomh Idirlion <DnagSuiomhIdirlion@udaras.ie>
Cc: Sarah Moore <smoore@jodireland.com>
Subject: 6226 Inchamore Wind Farm, Co. Cork

Dear Sirs,

Please find attached Scoping Letter in relation to the above mentioned project for your consideration.

We would be grateful if you could revert with any comments you may have on the proposed development at your earliest convenience.

Thanks and kind regards,

Ann Kilmartin

Environmental Protection Agency

Ann Kilmartin

From: Wexford Receptionist <REC_WEX@epa.ie> on behalf of Wexford Receptionist
Sent: Monday, November 16, 2020 10:25 AM
To: Ann Kilmartin
Subject: RE: 6226 Inchamore Wind Farm, Co. Cork

A Chara,

Your correspondence on November 16th has been forwarded for attention.

Kind regards,

Ruth O'Connor
Duty Receptionist/Programme Officer
Environmental Protection Agency
P.O. Box 3000
Johnstown Castle Estate
Wexford
Y35 W821

Bosca Poist 3000, Eastát Chaisleán Bhaile Sheáin, Contae Loch Garman.

Tel: 00353 53 91 60600: Fax: 00353 53 91 60699: Email: info@epa.ie web:www.epa.ie
Lo Call: 1890 33 55 99

From: Ann Kilmartin <akilmartin@jodireland.com>
Sent: 16 November 2020 10:05
To: Wexford Receptionist <REC_WEX@epa.ie>
Cc: Sarah Moore <smoore@jodireland.com>
Subject: 6226 Inchamore Wind Farm, Co. Cork

Dear Sirs,

Please find attached Scoping Letter in relation to the above mentioned project for your consideration.

We would be grateful if you could revert with any comments you may have on the proposed development at your earliest convenience.

Thanks and kind regards,

Department of Agriculture, Food and the Marine

Ann Kilmartin

From: Scully, Aaron <Aaron.Scully@agriculture.gov.ie> on behalf of Scully, Aaron
Sent: Monday, November 16, 2020 1:00 PM
To: 'akilmartin@jodireland.com'
Subject: Acknowledgment

16th November 2020

PLEASE QUOTE REF NUMBER ON ALL CORRESPONDENCE.
Our Ref: 2020/64489P /AS

Dear Ms. Kilmartin

I wish to acknowledge receipt of your recent correspondence addressed to the Minister for Agriculture, Food and the Marine, Charlie McConalogue, TD.

I will bring your correspondence to the Minister's attention as soon as possible. In the interim I have forwarded your correspondence for the attention of relevant Department officials.

Yours sincerely,

Aaron Scully

Aaron Scully
Minister's Office
Oifig an Aire

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

An Teach Talmhaíochta, Sráid Chill Dara, Baile Átha Cliath 2, D02 WK12
Agriculture House, Kildare Street, Dublin 2, D02 WK12

www.agriculture.gov.ie

Fáilte Ireland

Ann Kilmartin

From: planning applications <planning.applications@failteireland.ie> on behalf of planning applications
Sent: Monday, November 23, 2020 12:48 PM
To: Ann Kilmartin
Subject: RE: 6226 Inchamore Wind Farm, Co. Cork
Attachments: Fáilte Ireland EIAR Guidelines.pdf

Hello Ann,

Thank you for sending Fáilte Ireland the Scoping Letter/information regarding the preparation of an Environmental Impact Assessment for Inchamore Wind Farm, Coolea, Co Cork.

Please see attached a copy of Fáilte Ireland's Guidelines for the Treatment of Tourism in an EIA, which you may find informative in your site investigations for Offshore Wind proposed for east, south and west of Ireland. The purpose of this report is to provide guidance for those conducting Environmental Impact Assessment and compiling an Environmental Impact Assessment Reports (EIAR), or those assessing EIARs, where the project involves tourism or may have an impact upon tourism. These guidelines are non-statutory and act as supplementary advice to the EPA EIAR Guidelines outlined in section 2.

Regards,

Yvonne

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

From: Ann Kilmartin <akilmartin@jodireland.com>
Sent: Monday 16 November 2020 10:07
To: Reception <ReceptionAmiensStreet@failteireland.ie>; planning applications <planning.applications@failteireland.ie>
Cc: Sarah Moore <smoore@jodireland.com>
Subject: 6226 Inchamore Wind Farm, Co. Cork

Dear Sirs,

Please find attached Scoping Letter in relation to the above mentioned project for your consideration.

We would be grateful if you could revert with any comments you may have on the proposed development at your earliest convenience.

Thanks and kind regards,

Fáilte Ireland
National Tourism Development Authority

EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects

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

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

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

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1. Introduction

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

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

This guidance document has been prepared by Cunnane Stratton Reynolds on behalf of Fáilte Ireland to update their EIA guidelines in line with changes in legislative requirements.

2. Background to this Document

Tourism is one of the largest and most important sectors of the economy, providing employment for approximately **260,000 people**, an economic contribution of **€8.4 billion**, and exchequer revenue of **€1.78 billion** in 2018, which helps fund other key public services.

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

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

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

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

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

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

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

3. Legislation and Statutory Guidance

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

Legislation

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

Statutory Guidance

In response to the changes to the EIAR requirements under Directive EU 2014/52, the Environmental Protection Agency (EPA) developed Draft guidelines on the information to be contained in Environmental Impact Assessment Reports in August 2017. At the time of this document the guidelines have not been adopted from draft.

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

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

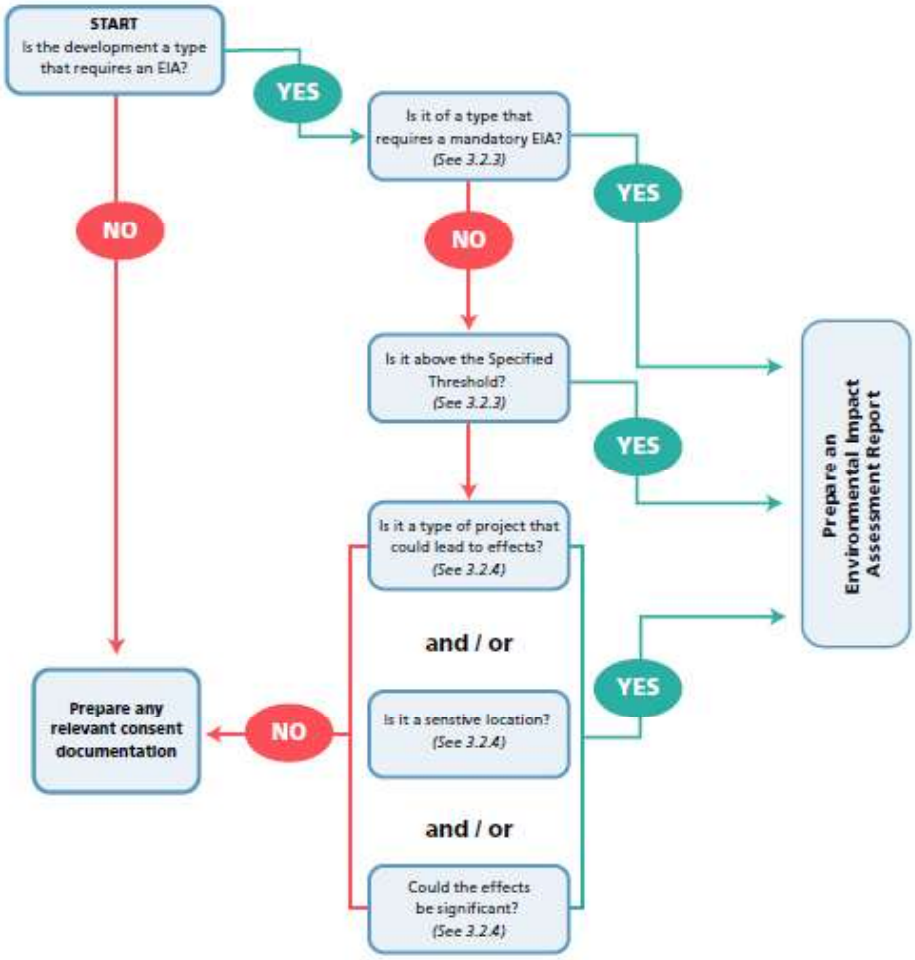
Screening

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

The prescribed development types and thresholds are set out in Annex I and II of the EIA Directive as transposed into Schedule 5 of the Planning and Development Regulations 2010-2018 (as amended). Development which do not exceed these thresholds but may require an EIAR are called sub threshold. Sub-Threshold considerations are outlined in Schedule 7 of European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018) as transposed from Annex III of the Directive. The Guidelines on Environmental Impact Assessment Reports note that projects at first glance may not appear to come under the Schedule

but on closer examination when the process is further examined, they may do so because of the sensitivity or significance of the receiving environment etc. Sub threshold developments require an EIAR if they are likely to have significant environmental impacts and must undergo assessment for likely significant impacts through an EIAR screening report. The contents of a screening report for subthreshold development are contained in Annex III of the EIA Directive.

Figure 1: EIAR Screening Process



(Taken from Fig 3.2 of the EPA Guidelines)

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

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

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

EIAR Scoping

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

4. Assessing Tourism

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

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

Projects which involve a tourism element

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

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

Projects which may have an impact upon tourism

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

According to the Fáilte Ireland Tourism Facts 2018 Report, the most important factors in determining the attractiveness of tourism destinations for visitors to Ireland are;

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

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

5. Guiding Principles of EIAR

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

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

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

6. Consideration of Competency and Qualifications

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

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

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

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

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

7. EIAR Requirements

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

- project description;
- assessment of alternatives considered;

- baseline assessment;
- impact assessment;
- cumulative impact
- interaction of impacts
- mitigation.

Project Description

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

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

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

Assessment of Alternatives

The assessment of alternatives is a requirement of EIAR

Where tourism projects are location dependent the assessment of alternatives should consider alternative methods and technologies, detail the key considerations culminating in the selection of the design, the reasoning for these and the environmental effect of these decisions. This is particularly important for tourism projects which are often location tied. The developer is expected to consider reasonable alternatives. What is considered reasonable my vary from case to case.

Baseline Assessment

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

For example, in a tourism context;

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

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

The significance of the tourism assets or activities likely to be affected should be highlighted. Reference to any existing formal or published designation or

recognition of such significance should be. Where possible the value of the contribution of such tourism assets and activities to the local economy should be provided.

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

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

Impact Assessment

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

Impact assessment should be carried out as per EPA guidelines and the best practice for that prescribed topic. It may be considered appropriate to consider impact on tourism assets under the 'material assets' topic below.

Population and Human Health

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

The impact upon tourism can be considered within this section through the sensitivities of Hospitality, Safety and Pace of Life. Changes in population can impact the perception of pace of life or safety in a particular location. Impacts upon these issues in areas which rely heavily on tourism or have a particular sensitive tourism generator should be considered in this section.

Biodiversity

Particular tourist activities can have a significant impact upon biodiversity. Landscapes which are 'unspoiled' can be attractors of tourism. However, the disturbance to ecology must be managed to minimise impact. Biodiversity is also a tourism asset and should be protected as such from other development and should be provided for in proposals where possible.

Land, Soils and Geology

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

Water

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

Air Quality and Climate

Tourism impact upon air quality is dependent on activity proposed and sensitivity of the location.

Noise and Vibration

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

Material Assets; Traffic and Transport

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

Cultural Heritage

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

Archaeology

Archaeology can be of tourism interest and can be an attractive or key component of tourism projects. Archaeology can be a tourism attractor but is generally not kept in situ except in key cases which could also be considered under cultural heritage.

Material Assets; Waste Management

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

Material Assets

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

Landscape

The visual impact of a tourism development, especially in locations which are visually sensitive or renowned for their scenic or landscape beauty, should be considered carefully. A

development intended to utilise or enjoy a particular vista or environment should minimise impact upon that environment.

Major Accident and Natural Disaster

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

Interaction of Effects

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

Mitigation

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

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

Reduce the exposure of sensitive resources to excessive environmental impact

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

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

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

Cumulative Impact

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

Transboundary Impact

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

8. Sources of information on Tourism

Information available online

Fáilte Ireland

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

Tourism Ireland

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

Local Authorities

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

Regional Authorities

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

Central Statistics Office

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

Broadcasting Authority of Ireland

Ann Kilmartin

From: Roger Woods <rwoods@bai.ie> on behalf of Roger Woods
Sent: Monday, November 16, 2020 10:31 AM
To: akilmartin@jodireland.com
Subject: RE: 6226 Inchamore Wind Farm, Co. Cork

Hi Ann

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

Regards

Roger

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

Tel: 01 6441200
Fax: 01 6441299

From: Reception BAI <reception@bai.ie>
Sent: Monday 16 November 2020 10:24
To: Roger Woods <rwoods@bai.ie>
Subject: FW: 6226 Inchamore Wind Farm, Co. Cork

From: Ann Kilmartin <akilmartin@jodireland.com>
Sent: Monday 16 November 2020 09:55
To: Reception BAI <reception@bai.ie>
Cc: Sarah Moore <smoore@jodireland.com>
Subject: 6226 Inchamore Wind Farm, Co. Cork

Dear Sirs,

Please find attached Telecoms Scoping Document in relation to the above mentioned project for your consideration.

We would be grateful if you could revert with any comments you may have on the proposed development at your earliest convenience.

Thanks and kind regards,

Ann Kilmartin

From: Roger Woods <rwoods@bai.ie> on behalf of Roger Woods
Sent: Tuesday, November 17, 2020 11:29 AM
To: Ann Kilmartin
Subject: RE: 6226 Inchamore Wind Farm, Co. Cork

HI Ann

My response is valid for both developments.

Regards

Roger

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

Tel: 01 6441200
Fax: 01 6441299

From: Ann Kilmartin <akilmartin@jodireland.com>
Sent: Tuesday 17 November 2020 11:27
To: Roger Woods <rwoods@bai.ie>
Subject: RE: 6226 Inchamore Wind Farm, Co. Cork

Hi Roger,

Thank you for your email.

Can you please confirm if your response is in relation to both of the proposed wind farm developments Gortyrahilly and Inchamore or just Inchamore?

Thanks and kind regards,

Ann

From: Roger Woods <rwoods@bai.ie>
Sent: Monday, November 16, 2020 10:31 AM
To: akilmartin@jodireland.com
Subject: RE: 6226 Inchamore Wind Farm, Co. Cork

Hi Ann

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

Regards

Roger

Senior Executive Engineer
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Sent: Monday 16 November 2020 09:55
To: Reception BAI <reception@bai.ie>
Cc: Sarah Moore <smoore@jodireland.com>
Subject: 6226 Inchamore Wind Farm, Co. Cork

Dear Sirs,

Please find attached Telecoms Scoping Document in relation to the above mentioned project for your consideration.

We would be grateful if you could revert with any comments you may have on the proposed development at your earliest convenience.

Thanks and kind regards,

Ann Kilmartin

JENNINGS O'DONOVAN & PARTNERS LIMITED
CONSULTING ENGINEERS

Head Office
Finisklin Business Park, Sligo, Ireland, F91 RHH9. MAP
Tel: +353719161416 Email: akilmartin@jodireland.com Web: www.jodireland.com

Birdwatch Ireland

Ann Kilmartin

From: info@birdwatchireland.ie
Sent: Tuesday, November 17, 2020 10:33 AM
To: Ann Kilmartin
Subject: RE: 6226 Inchamore Wind Farm, Co. Cork

Hi Ann ,
We would like to confirm receipt of your email which has been forwarded to our Policy officer .

Regards,
Michelle Kavanagh,
Membership Department.
BirdWatch Ireland
Unit 20 Block D | Bullford Business Campus | Kilcoole | Greystones | A63 RW83 | Co.Wicklow | Ireland
Tel: +353 (0)1 281 9878 email: mkavanagh@birdwatchireland.ie
Website: www.birdwatchireland.ie

'Please note that due to current Covid-19 restrictions most BirdWatch Ireland Staff will be working from their homes .Please be assured that your email will be answered as soon as possible.'

From: Ann Kilmartin <akilmartin@jodireland.com>
Sent: Monday 16 November 2020 09:45
To: info@birdwatchireland.ie
Cc: Sarah Moore <smoore@jodireland.com>
Subject: 6226 Inchamore Wind Farm, Co. Cork

Dear Sirs,

Please find attached letter and Ecology Scoping Document in relation to the above mentioned project for your consideration.

We would be grateful if you could revert with any comments you may have on the proposed development at your earliest convenience.

Thanks and kind regards,

Department of Defence

An Roinn Cosanta
Department of Defence

Ann Kilmartin
Jennings O'Dovovan
Consulting Engineers
Finiskiln Business Park
Sligo
F91 RHH9

08 December 2020

Re: 6226 Inchamore Wind Farm, Co. Cork

Dear Ms. Kilmartin,

I am writing with regard to your request for comments/observations on the Telecoms Scoping Document for a windfarm at Inchamore, Co. Cork

Following consultations with our Military colleagues at Casement Aerodrome, The Department of Defence would like to make the following observation:

In all locations where wind farms are permitted it should be a condition that they meet the following lighting requirements.

1. Single turbines or structures, or turbines delineating corners of a wind farm should be illuminated by high intensity obstacle lights.

2. Obstruction lighting elsewhere in a wind farm will be of a pattern that will allow the hazard be identified and avoided by aircraft in flight.

3. Obstruction lights used should be incandescent or of a type visible to Night Vision Equipment. Obstruction lighting fitted to obstacles must emit light at the near Infra-Red (IR) range of the electromagnetic spectrum specifically at or near 850nanometres (nm) of wavelength. Light intensity to be of similar value to that emitted in the visible spectrum of light.

The above is a separate requirement to any IAA requirement on lighting.

Bóthar an Stáisiúin, An Droichead Nua, Contae Chill Dara, W12 AD93.
Station Road, Newbridge, Co.Kildare, W12 AD93.
T +353 45 492000 | customer@defence.ie
www.defence.ie

Please don't hesitate to contact me at the details below if you require further information.

Yours faithfully,

Don Watchorn
Property Management Branch
Department of Defence
Station Road,
Newbridge
Co. Kildare W12 AD93
045 492199
don.watchorn@defence.ie

Department of Transport, Tourism and Sport

An Roinn Iompair
Department of Transport

Jennings O'Donovan & Partners Limited
Finisklin Business Park

Sligo

Ireland
F91 RHH9
25th November 2020

RE: 6226 Inchamore Wind Farm, Co. Cork

Dear Sarah,

I refer to your letter of 12th November 2020 regarding the Scoping Opinion on information to be included in the preparation of an Environmental Impact Assessment (EIA) for Inchamore Wind Farm, Coolea, Co. Cork..

In view of the need to protect the resilience of the public road network in the context of climate change pressures, it is considered that the EIAR should include information on what impact the proposed development may have on the public road network both during construction and in the longer term. The EIAR should indicate whether it is proposed to use public roads to connect the windfarm to the grid and if that is the case specify the extent of the works required including drainage, diversions, relocation of services and road re-instatement. The EIAR should also address the future maintenance requirements related to the installation of the cables in public roads and the cost implications for the relevant local authority. Consideration should also be given to how cabling needs to be organised and, where a number of cables are envisaged from existing, approved and proposed developments, rationalised into one cable or a group of cables in one trench in order to minimise the impacts on the road network and the environment along the road boundary (hedgerows). In addition the EIAR should consider the possibility of over-ground solutions for the transmission of electricity as an alternative.

Yours sincerely

Jacqui Traynor
Reform Communications Emergency Planning

An Roinn Iompair
Department of Transport

Lána Líosain, Baile Átha Cliath, D02 TR60, Éire
Leeson Lane, Dublin 2, D02 TR60, Ireland
T +353 1 6707444 | info@transport.gov.ie
www.gov.ie/transport

Eir Limited

Ann Kilmartin

From: Thomas Sheridan <thomas.sheridan@eir.ie> on behalf of Thomas Sheridan
Sent: Friday, November 27, 2020 4:39 PM
To: Ann Kilmartin
Cc: Sarah Moore
Subject: Re: 6226 Inchamore Wind Farm, Co. Cork

Dear Ann,

I don't expect this proposed windfarm development to interfere with the eircom LTD network.

Best Regards,
Thomas Sheridan

On Mon, Nov 16, 2020 at 9:57 AM Ann Kilmartin <akilmartin@jodireland.com> wrote:

> Dear Sirs,
>
> Please find attached Telecoms Scoping Document in relation to the above mentioned project for your consideration.
>
> We would be grateful if you could revert with any comments you may have on the proposed development at your earliest convenience.
>
> Thanks and kind regards,
>
> Ann Kilmartin

JENNINGS O'DONOVAN & PARTNERS LIMITED
CONSULTING ENGINEERS

Head Office
Finisklin Business Park, Sligo, Ireland, F91 RHH9. MAP

Tel: +353719161416 Email: akilmartin@jodireland.com Web: www.jodireland.com

ESB Telecoms

Ann Kilmartin

From: John Reilly <john.reilly1@esb.ie> on behalf of John Reilly
Sent: Monday, November 16, 2020 11:53 AM
To: 'akilmartin@jodireland.com'; 'smoore@jodireland.com'
Subject: RE: 6226 Inchamore Wind Farm, Co. Cork

Hello Ann, Sarah,

I have reviewed your proposed development in Inchamore, Co. Cork.
I can confirm that ESBT have no fibre based telecommunications infrastructure in this area, which could be impacted.

Regards
John

John Reilly | Infrastructure Manager | ESB Telecoms Ltd | T: +353 1 702 6819 / +353 87 966 9398 | john.reilly1@esb.ie |

Website www.esbtelecoms.ie
Join us on Linkedin

From: Info (Customer Solutions) <info@esbtelecoms.ie>
Sent: Monday 16 November 2020 11:12
To: Reilly. John (Customer Solutions) <john.reilly1@esb.ie>
Subject: FW: 6226 Inchamore Wind Farm, Co. Cork

ESB Telecoms Ltd. | House 43 Merrion Square East, Dublin 2, D02 XE0| T: +353 1 702 2254

Website www.esbtelecoms.ie

Join us on Linkedin

From: Ann Kilmartin <akilmartin@jodireland.com>
Sent: Monday 16 November 2020 09:57
To: Info (Customer Solutions) <info@esbtelecoms.ie>
Cc: Sarah Moore <smoore@jodireland.com>
Subject: 6226 Inchamore Wind Farm, Co. Cork

Dear Sirs,

Please find attached Telecoms Scoping Document in relation to the above mentioned project for your consideration.

We would be grateful if you could revert with any comments you may have on the proposed development at your earliest convenience.

Thanks and kind regards,

Ann Kilmartin

JENNINGS O'DONOVAN & PARTNERS LIMITED
CONSULTING ENGINEERS

Head Office
Finisklin Business Park, Sligo, Ireland, F91 RHH9. MAP
Tel: +353719161416 Email: akilmartin@jodireland.com Web: www.jodireland.com

NSAI ISO 9001, 14001 & BS OHSAS 18001 Certified
ACEI Design Excellence Award Winners 2018
Engineers Ireland cpd Accredited Employer

Geological Survey of Ireland /

Minister for Environment, Climate and Communications

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

Geological Survey
Suirbhéireacht Gheolaíochta
Ireland | Éireann

Sarah Moore
Jennings O'Donovan & Partners Ltd.
Finisklin Business Park
Sligo, F91 RHH9

20 November 2020

Re: Request for Scoping Opinion on information to be included in the preparation of an Environmental Impact Assessment (EIA) for Inchamore Wind Farm, Coolea, Co. Cork

Your Ref: 6226/503/SL/011/SM
Our Ref:20/291

Geological Survey Ireland is the national earth science agency and has datasets including Bedrock Geology, Quaternary Geology, Geological Heritage Sites, Mineral deposits, Groundwater Resources, Geohazards and the Irish Seabed. These comprise maps, reports and extensive databases that include mineral occurrences, bedrock/mineral exploration groundwater/site investigation boreholes, karst features, wells and springs. Please see our website for data availability and we recommend using these various data sets, when undergoing the EIAR, planning and scoping processes. Geological Survey Ireland should be referenced to as such and should any data or geological maps be used, they should be attributed correctly to Geological Survey Ireland.

Dear Sarah,

With reference to your letter dated 12 November 2020, concerning the preparation of an EIA for the proposed Inchamore Wind Farm, Coolea, Co. Cork, Geological Survey Ireland (a division of the Department of Environment, Climate and Communications) would like to make the following comments.

Geoheritage

Geological Survey Ireland is in partnership with the National Parks and Wildlife Service (NPWS, Department of Culture, Heritage and Gaeltacht), 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 (CGS), as adopted under the National Heritage Plan are now 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. The audit for Co. Cork has not yet been completed, however unaudited CGSs can be viewed online under the Geological Heritage tab on the online Map Viewer. **Our records show that there are no unaudited CGSs in the vicinity of the proposed wind farm development.**

Groundwater

Groundwater is important as a source of drinking water, and it supports river flows, lake levels and ecosystems. It contains natural substances dissolved from the soils and rocks that it flows through, and can also be contaminated by human actions on the land surface. As a clean, but vulnerable, resource, groundwater needs to be understood, managed and protected.

Through our Groundwater Programme, Geological Survey Ireland provides advice and maps to members of the public, consultancies and public bodies about groundwater quality, quantity and distribution. Geological Survey Ireland monitors groundwater nationwide by characterising aquifers, investigating karst landscapes and landforms and by helping to protect public and group scheme water supplies.

We recommend using our National Aquifer, Vulnerability and Recharge maps on our Map viewer to this end.

The Groundwater Vulnerability map indicates the proposed wind farm area is of variable vulnerability. We would therefore recommend use of the Groundwater Viewer to identify areas of High to Extreme Vulnerability and 'Rock at or near surface' which can be used to inform appropriate mitigation measures.

Our **GWFlood** project is a groundwater flood monitoring and mapping programme aimed at addressing the knowledge gaps surrounding groundwater flooding in Ireland. The project is providing the data and analysis tools required by local and national authorities to make scientifically-informed decisions regarding groundwater flooding. **Although primarily focused on karst areas, this may provide information to benefit the proposed wind farm development. We recommend using our GWFlood tools found under our programme activities (in conjunction with OPW data), to this end.**

With regards to Climate Change, there is a need to improve the monitoring capacity of groundwater levels in Ireland so that the potential impacts of climate change can be monitored and assessed. In this context the GSI has established the GWClimate project in January 2020. GWClimate will 1) establish a long-term strategic groundwater level monitoring network and 2) develop modelling and analytical approaches for evaluating the impacts of Climate Change to Irish groundwater systems. **Further information can be found on the Groundwater flooding page of the Groundwater Programme.**

Geological Mapping

Geological Survey Ireland (GSI) maintains online datasets of bedrock and subsoils geological mapping that is reliable, accessible and meets the requirements of all users including depth to bedrock and physiographic maps. These datasets include depth to bedrock data and subsoil classifications. **We would encourage you to use these data which can be found here, in your future assessments**.

Geohazards

Geohazards can cause widespread damage to landscapes, wildlife, human property and human life. In Ireland, landslides are the most prevalent of these hazards. **Landslide susceptibility in the area of the proposed wind farm is variable and is classified from Low to Moderately Low and from Moderately High to High.** Geological Survey Ireland has information available on past landslides for viewing as a layer on our Map Viewer. Geological Survey Ireland also engages in national projects such as Landslide Susceptibility Mapping and GWFlood Groundwater Flooding. 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.

Natural Resources (Minerals/Aggregates)

Geological Survey Ireland is of the view that the sustainable development of our natural resources should be an integral part of all development plans from a national to regional to local level to ensure that the materials required for our society are available when required. Geological Survey Ireland highlights the consideration of mineral resources and potential resources as a material asset which should be explicitly recognised within the environmental assessment process. 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.

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 proposed development are sustainably sourced from properly recognised and licensed facilities.

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.

The data would be added to Geological Survey Ireland's national database of site investigation boreholes, implemented to provide a better service to the civil engineering sector. Data can be sent to Beatriz Mozo, Land Mapping Unit, at Beatriz.Mozo@gsi.ie, 01-678 2795.

I hope that these comments are of assistance, and if we can be of any further help, please do not hesitate to contact me (Trish.Smullen@gsi.ie), or my colleague Clare Glanville (Clare.Glanville@gsi.ie).

Yours sincerely,

Trish Smullen
Geoheritage Programme
Geological Survey Ireland

Inland Fisheries Ireland

Iascach Intíre Éireann
Inland Fisheries Ireland

Ms Sarah Moore
Jennings and O'Donovan Consulting Engineer's,
Finisklin Business Park
Sligo,
Ireland,
F91 RHH9

23 November 2020

RE: Inchamore Windfarm- Scoping Report Consultation

Dear Sarah,

I refer to the request for scoping opinion on information to be included in the preparation of an Environmental Impact Assessment (EIA) for Inchamore Wind Farm, Co.Cork

The site of the proposed development encompasses the upper River Lee catchment and tributaries, significant salmonid fisheries. In this context IFI would ask that the following requirements should be taken into consideration.

There should be no drainage or other physical interference with the bed or bank of any watercourse without prior consultation with IFI.

Suspended solids and or hydrocarbon contaminated site run-off waters must be controlled adequately so that no pollution of surface waters can occur. More specifically IFI feels the following issues should be addressed

i. Identifying and zoning the project for environmental impact should a peat slip occur
ii. Setting out contingency plan should a peat movement occur.
iii. Setting out a plan for the control of silt in such a scenario, including measures to be put in place at the initial stages of construction.

In the event of any watercourse crossings being bridged or culverted the following general criteria should apply,

(i) The free passage of fish must not be obstructed.

(ii)The original slope of the river bed should be maintained with no sudden drops on the downstream side. Design details on any proposed crossing should be incorporated at planning stage

(iii) Bridges are preferable to culverts.

(v) All instream works should be carried out only in the May-September period.

Yours sincerely,

MMP

Michael Mc Partland.
Environmental Officer.

IFI Macroom, Sunnyside House, Macroom, Co. Cork
026-41221 macroom@fisheries.ie www.fisheriesireland.ie

Irish Aviation Authority

Irish Aviation Authority
The Times Building
11–12 D'Olier Street
Dublin 2, D02 T449,
Ireland

Údarás Eitlíochta na hÉireann
Foirgneamh na hAmanna
11–12 Sráid D'Olier
Baile Átha Cliath 2, D02 T449,
Éire

T: +353 1 671 8655
F: +353 1 679 2934
www.iaa.ie

Date 03rd December 2020

Ms. Ann Kilmartin
Jennings O Donovan & Partners Limited
Finisklin Business Park
Co Sligo
F91RHH9

***Development:* Inchamore Wind Farm, Co. Cork**

Dear Ms Kilmartin

The Irish Aviation Authority SRD Aerodromes division notes that Turbine No. 1 is approximately 30kms South East of Kerry Airport. The aerodrome operator should be contacted and requested to assess whether a preliminary screening assessment is required in relation to the potential impact on instrument flight procedures or any communication, navigation and surveillance equipment at Kerry Airport.

Subject to that being completed and no likely significant impact being noted, the Aerodromes division would likely issue the following general observation during the formal planning process:
'In the event of planning consent being granted, the applicant should be conditioned to contact the Irish Aviation Authority to:

(1) agree an aeronautical obstacle warning light scheme for the wind farm development,

(2) provide as-constructed coordinates in WGS84 format together with ground and tip height elevations at each wind turbine location

Turbine No.	*WGS-84 Co-ordinates*	*Ground elevation (Malin Head OD)*	*Blade tip elevation of turbine (Malin Head OD)*	*Height of turbine (height from ground level to blade tip)*	*Confirm if turbine has obstacle lighting.*
T1	53.346125, -6.258288	75m	225m	150m	No

(3) notify the Authority of intention to commence crane operations with at least 30 days prior notification of their erection.'"
Best Regards,

Yours sincerely

pp:
Deirdre Forrest
Corporate Affairs

JENNINGS O'DONOVAN & PARTNERS LIMITED
Finisklin Business Park, Sligo.
17 DEC 2020 scan.
Ann
RECEIVED Sean Molloy

Irish Wildlife Trust

Ann Kilmartin

From: IWT Office <office@iwt.ie> on behalf of IWT Office
Sent: Tuesday, February 16, 2021 2:29 PM
To: Ann Kilmartin
Cc: IWT Office
Subject: Re: 6226 Inchamore Wind Farm, Co. Cork

Dear Ann,

Thank you for contacting the Irish Wildlife Trust.

We do not have the capacity to consider or respond to your scoping / consultation request for this development at the moment.

Regards,
Kieran

The Irish Wildlife Trust

On Mon, 15 Feb 2021 at 12:42, Ann Kilmartin <akilmartin@jodireland.com> wrote:

> Dear Sirs,
>
> I would be obliged if you could please provide an update in relation to your feedback on the above proposed development.
>
> Thanks and kind regards,
>
> Ann
>
> On Mon, Nov 16, 2020 at 9:49 AM Ann Kilmartin <akilmartin@jodireland.com> wrote:
>
> > Dear Sirs,
> >
> > Please find attached letter and Ecology Scoping Document in relation to the above mentioned project for your consideration.
> >
> > We would be grateful if you could revert with any comments you may have on the proposed development at your earliest convenience.
> >
> > Thanks and kind regards,

RTÉ

Ann Kilmartin

From: Matthew Craig <matthew.craig@2rn.ie> on behalf of Matthew Craig
Sent: Tuesday, January 5, 2021 5:47 PM
To: Ann Kilmartin
Cc: Sarah Moore; windfarms@rte.ie; Johnny Evans
Subject: RE: 6226 Inchamore Wind Farm, Co. Cork

Hi Ann,

I had a look back for this email and couldn't find it. The addresses are correct so I'm not sure what the problem was.
The site will not affect 2RN's fixed linking, the nearest link is 750m to the south of T6.
There is however a risk that the site could cause interference to DTT viewers receiving from our site at Mullaghanish.
We would therefore ask that a protocol be signed between 2RN and the Developers should the site go ahead.

Regards

Matthew Craig

Project Engineer
Projects and Coverage Planning
2RN
Block B, Cookstown Court, Old Belgard Road, Tallaght, Dublin 24, Ireland
D24 WK28
Phone: + 353 (0) 1 2082261
Mobile: + 353 (0) 87 7509955

From: Ann Kilmartin <akilmartin@jodireland.com>
Sent: 05 January 2021 16:02
To: windfarms@rte.ie; Matthew Craig <matthew.craig@2rn.ie>
Cc: Sarah Moore <smoore@jodireland.com>
Subject: FW: 6226 Inchamore Wind Farm, Co. Cork

Hi Matthew,

Happy New Year, I hope you had a lovely Christmas and enjoyed the break.

I'm just following up on my email below, we would be grateful for your feedback at your earliest convenience.

Thanks and kind regards,

Ann

From: Ann Kilmartin <akilmartin@jodireland.com>
Sent: Monday, November 16, 2020 9:58 AM
To: 'windfarms@rte.ie' <windfarms@rte.ie>

Cc: 'matthew.craig@2rn.ie' <matthew.craig@2rn.ie>; Sarah Moore <smoore@jodireland.com>
Subject: 6226 Inchamore Wind Farm, Co. Cork

Dear Sirs,

Please find attached Telecoms Scoping Document in relation to the above mentioned project for your consideration.

We would be grateful if you could revert with any comments you may have on the proposed development at your earliest convenience.

Thanks and kind regards,

Ann Kilmartin

JENNINGS O'DONOVAN & PARTNERS LIMITED
CONSULTING ENGINEERS

Head Office
Finisklin Business Park, Sligo, Ireland, F91 RHH9. MAP
Tel: +353719161416 Email: akilmartin@jodireland.com Web: www.jodireland.com

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ACEI Design Excellence Award Winners 2018
Engineers Ireland cpd Accredited Employer

Virgin Media Television

Ann Kilmartin

From: Paul Driver <Paul.Driver@virginmedia.ie> on behalf of Civils
Sent: Monday, November 16, 2020 11:39 AM
To: Ann Kilmartin
Subject: RE: 6226 Inchamore Wind Farm, Co. Cork

Ann

I refer to your query of 16th November about the above location. Virgin Media does not have any record of underground services at this location as indicated by your drawing.

WHILST THE INFORMATION GIVEN IS BELIEVED TO BE CORRECT NO WARRANTY IS MADE AS TO ITS ACCURACY. THIS INFORMATION MUST NOT BE RELIED UPON IN THE EVENT OF EXCAVATION OR OTHER WORKS CARRIED OUT IN THE SITE AREA. NO LIABILITY OF ANY KIND WHATSOEVER IS ACCEPTED BY VIRGIN MEDIA, ITS SERVANTS OR AGENTS FOR ANY ERROR OR OMISSION IN RESPECT OF INFORMATION CONTAINED WITHIN THIS COMMUNICATION. THE ACTUAL POSITION OF UNDERGROUND SERVICES MUST BE VERIFIED AND ESTABLISHED ON SITE BEFORE ANY MECHANICAL PLANT IS USED.

Regards,

Paul Driver | Plant Protection Officer
Civil Operations
Virgin Media | Unit 7, Westgate Business Park, Ballymount, Dublin 24.
T: +353 (01) 2458586 | M: +353 (0)87 6287133
E: civils@virginmedia.ie | paul.driver@virginmedia.ie

From: Ann Kilmartin [mailto:akilmartin@jodireland.com]
Sent: 16 November 2020 09:59
To: VMTV info <VMTVInfor@virginmedia.ie>
Cc: Paul Driver <Paul.Driver@virginmedia.ie>; Sarah Moore <smoore@jodireland.com>
Subject: 6226 Inchamore Wind Farm, Co. Cork

Dear Sirs,

Please find attached Telecoms Scoping Document in relation to the above mentioned project for your consideration.

We would be grateful if you could revert with any comments you may have on the proposed development at your earliest convenience.

Thanks and kind regards,

Ann Kilmartin

Vodafone

Ann Kilmartin

From: Burke, Carla, Vodafone Ireland (External) <carla.burke@vodafone.com> on behalf of Burke, Carla, Vodafone Ireland (External)
Sent: Monday, February 15, 2021 1:18 PM
To: Ann Kilmartin; Lyons, Sean, Vodafone Ireland (External)
Subject: RE: FW: 6226 Inchamore Wind Farm, Co. Cork

Hi,

Please find links that will be effected by 6226 Inchamore Wind Farm, with reference to the PDF file:

KYIHE-CKMGH	**KYIHE**	110284.03	77194.53	**CKMGH**	121511.5	81752.15	**Freq Band**	18

Regards,
Carla.

C2 General

From: Ann Kilmartin <akilmartin@jodireland.com>
Sent: Monday 15 February 2021 12:44
To: Lyons, Sean, Vodafone Ireland (External) <sean.lyons@vodafone.com>
Cc: Burke, Carla, Vodafone Ireland (External) <carla.burke@vodafone.com>
Subject: Re: FW: 6226 Inchamore Wind Farm, Co. Cork

Hi Sean, Carla,

I would be obliged if you could please provide an update in relation to your feedback on the above proposed development.

Thanks and kind regards,

Ann

On Tue, Nov 17, 2020 at 10:15 AM Lyons, Sean, Vodafone Ireland (External) <sean.lyons@vodafone.com> wrote:

> Hi Carla,
>
> Can you please review this proposed windfarm development and send your findings to Ann/Sarah?
>
> **Sean Lyons**

Upcoming leave – Nov 26th to Dec 6th
Transmission Program Manager

Converged Transmission
Technology- NET
+353877758117
sean.lyons@vodafone.com
Vodafone Ireland Limited, Registered Office: MountainView, Leopardstown, Dublin 18, Registered in Ireland: No. 326967

vodafone.ie

The future is exciting.
Ready?

From: Ann Kilmartin <akilmartin@jodireland.com>
Sent: Monday 16 November 2020 09:59
To: Lyons, Sean, Vodafone Ireland (External) <sean.lyons@vodafone.com>
Cc: Byrne, Gavin, Vodafone Ireland <gavin.byrne@vodafone.com>; Byrne, Fiona, Vodafone Ireland (External) <fiona.byrne2@vodafone.com>; Sarah Moore <smoore@jodireland.com>
Subject: 6226 Inchamore Wind Farm, Co. Cork

Dear Sirs,

Please find attached Telecoms Scoping Document in relation to the above mentioned project for your consideration.

We would be grateful if you could revert with any comments you may have on the proposed development at your earliest convenience.

Thanks and kind regards,

Ann Kilmartin

ENET

Ann Kilmartin

From: Peter O`Brien <peter.obrien@enet.ie> on behalf of Peter O`Brien
Sent: Friday, February 19, 2021 10:29 AM
To: akilmartin@jodireland.com
Subject: RE: 6226 Inchamore Wind Farm, Co. Cork

Hi Ann,

I created the kml's myself just now and below are the links we have near these turbines:

Inchamore Wind Farm:

A-End Coordinates	A-End Antenna Height	B-End Coordinates	B-End Antenna Height	Link Frequency
51°56'26.00"N 9°18'21.00"W	15m	51°58'58.46"N 9° 8'37.17"W	13m	18GHz

Gortrahilly Wind Farm:

A-End Coordinates	A-End Antenna Height	B-End Coordinates	B-End Antenna Height	Link Frequency
51°39'56.86"N 9°26'35.11"W	15m	51°58'58.46"N 9° 8'37.17"W	15m	13GHz

Regards,
Peter

Peter O'Brien | Tx Planning Engineer
A: 15C Magna Drive, Citywest, D24 YC95
M: +353 (0) 86 7744313 | W: www.enet.ie

From: Peter O`Brien
Sent: Wednesday, February 17, 2021 8:03 AM
To: akilmartin@jodireland.com
Subject: FW: 6226 Inchamore Wind Farm, Co. Cork

Hi Ann,

Can you send the proposed wind farms to me in a Google Earth kml so that I can review against our network?

Regards,
Peter

Peter O'Brien | Tx Planning Engineer
A: 15C Magna Drive, Citywest, D24 YC95
M: +353 (0) 86 7744313 | W: www.enet.ie

From: Ger Wallace <ger.wallace@enet.ie>
Sent: Monday, February 15, 2021 1:30 PM
To: Peter O`Brien <peter.obrien@enet.ie>
Cc: Ronan McDonogh <ronan.mcdonogh@e-net.ie>; Planning <planning@enet.ie>
Subject: FW: 6226 Inchamore Wind Farm, Co. Cork

Hi Peter,

Think these should have went to you back in November. Doesn't look like they were forwarded. Can you look at them and review for this lady?

Regards,
Ger

Ger Wallace | Senior Fibre Network Planner
A: Enet House, National Technology Park, Castletroy, Co Limerick, V94 6P52
M: +353 (0) 87 6400525 | W: www.enet.ie

From: Ann Kilmartin <akilmartin@jodireland.com>
Sent: Monday 15 February 2021 12:44
To: Planning <planning@enet.ie>
Subject: Re: 6226 Inchamore Wind Farm, Co. Cork

Dear Sirs,

I would be obliged if you could please provide an update in relation to your feedback on the above proposed development.

Thanks and kind regards,

Ann

On Mon, Nov 16, 2020 at 10:02 AM Ann Kilmartin <akilmartin@jodireland.com> wrote:

> Dear Sirs,
>
> Please find attached Telecoms Scoping Document in relation to the above mentioned project for your consideration.
>
> We would be grateful if you could revert with any comments you may have on the proposed development at your earliest convenience.
>
> Thanks and kind regards,
>
> Ann Kilmartin

JENNINGS O'DONOVAN & PARTNERS LIMITED
CONSULTING ENGINEERS

Head Office
Finisklin Business Park, Sligo, Ireland, F91 RHH9. MAP

Tel: +353719161416 Email: akilmartin@jodireland.com Web: www.jodireland.com

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ACEI Design Excellence Award Winners 2018
Engineers Ireland cpd Accredited Employer

Tetra Ireland

Ann Kilmartin

From: Thomas Barry <Tom.Barry@TETRAIRELAND.IE> on behalf of Thomas Barry
Sent: Wednesday, December 9, 2020 6:54 AM
To: Ann Kilmartin
Subject: RE: EXTERNAL MAIL:- 6226 Inchamore Wind Farm, Co. Cork

Ann,

We anticipate no impact from the development as proposed. Can you ensure the proposal is also reviewed by eir.

Regards,
Tom

From: Ann Kilmartin [mailto:akilmartin@jodireland.com]
Sent: Monday 16 November 2020 10:00
To: Thomas Barry
Cc: Sarah Moore
Subject: EXTERNAL MAIL:- 6226 Inchamore Wind Farm, Co. Cork

Dear Sirs,
??
Please find attached Telecoms Scoping Document in relation to the above mentioned project for your consideration.
??
We would be grateful if you could revert with any comments you may have on the proposed development at your earliest convenience.
??
??
Thanks and kind regards,
??
Ann Kilmartin
??
??

JENNINGS O'DONOVAN & PARTNERS LIMITED
CONSULTING ENGINEERS

??
Head Office
Finisklin Business Park, Sligo, Ireland, F91 RHH9.?? MAP
Tel: +353719161416???????????? Email: akilmartin@jodireland.com????????????? Web: www.jodireland.com

Kerry Airport

Ann Kilmartin

From: Howard Jones <howard.jones@kerryairport.ie> on behalf of Howard Jones
Sent: Tuesday, April 18, 2023 9:48 AM
To: Sarah Moore
Cc: Sean Molloy; Shirley Bradley; John Mulhern; James Doody
Subject: RE: Proposed Inchamore Wind Farm

Follow Up Flag: Follow up
Flag Status: Flagged

Hello Sarah,

Thanks for the assessment report, my comments are as follows:

1. Section 2.2 as the proposed development penetrates the Annex 15 Aerodrome surfaces, the developer must ensure the development does not impact or increase current published operating minima associated with Kerry Airport.
2. Section 2.3 MSA's- any development must ensure that there is no impact on the current published MSA's associated with Kerry Airport.
3. Section 2.8- Obstacle warning lights- the developer should liaise with the Aviation Authority to ensure that the development is included on maps and lighted in the interest of aviation safeguarding.
4. The assessment and planning should include the assessment of the construction phase as part of planning to ensure cranes or other equipment involved in the development do not impact on Aviation safety during the construction phase.

Regards,

Howard Jones
Chief Operating Officer
KERRY AIRPORT IRELAND
email: howard.jones@kerryairport.ie
WILD ATLANTIC KERRY
Farranfore, Killarney, Co. Kerry, Ireland. V93 KH67
tel: (0)66 976 4644 | fax: (0)66 976 4134 | www.kerryairport.ie
RYANAIR Aer Lingus WILD ATLANTIC WAY

Proud Supporters of pieta

From: Sarah Moore <smoore@jodireland.com>
Sent: Monday 17 April 2023 10:12
To: Howard Jones <howard.jones@kerryairport.ie>

Cc: Sean Molloy <smolloy@jodireland.com>; Shirley Bradley <sbradley@jodireland.com>; John Mulhern <john.mulhern@kerryairport.ie>
Subject: RE: Proposed Inchamore Wind Farm

Hi Howard,
I'm following up on your previous email to see you had any comments on the aviation impact assessment.
Kind Regards
Sarah

From: Howard Jones < howard.jones@kerryairport.ie >
Sent: Friday, March 31, 2023 2:20 PM
To: Sarah Moore < smoore@jodireland.com >
Cc: Sean Molloy < smolloy@jodireland.com >; Shirley Bradley < sbradley@jodireland.com >; John Mulhern < john.mulhern@kerryairport.ie >
Subject: RE: Proposed Inchamore Wind Farm
Hello Sarah,
Thank you for forwarding the report, I will review same over the coming days and revert back in due course.
Regards,

Howard Jones
Chief Operating Officer
KERRY AIRPORT IRELAND
email: howard.jones@kerryairport.ie
WILD ATLANTIC KERRY
Farranfore, Killarney, Co. Kerry, Ireland. V93 KH67
tel: (0)66 976 4644 | fax: (0)66 976 4134 | www.kerryairport.ie
RYANAIR Aer Lingus WILD ATLANTIC WAY

Proud Supporters of pieta

From: Sarah Moore < smoore@jodireland.com >
Sent: Friday 31 March 2023 11:31
To: Howard Jones < howard.jones@kerryairport.ie >
Cc: Sean Molloy < smolloy@jodireland.com >; Shirley Bradley < sbradley@jodireland.com >; John Mulhern < john.mulhern@kerryairport.ie >
Subject: RE: Proposed Inchamore Wind Farm

Howard,
Please find attached the aviation impact assessment completed by AiBridges for the proposed Inchamore Wind Farm.
Can you confirm you are happy with the findings of the report.
Kind Regards
Sarah Moore

JENNINGS O'DONOVAN & PARTNERS LIMITED
CONSULTING ENGINEERS

Head Office
Finisklin Business Park, Sligo, Ireland, F91 RHH9. MAP
Tel: +353719161416 Email: smoore@jodireland.com Web: www.jodireland.com

From: Howard Jones < howard.jones@kerryairport.ie >
Sent: Wednesday, March 8, 2023 7:19 PM
To: Sarah Moore < smoore@jodireland.com >
Cc: Sean Molloy < smolloy@jodireland.com >; Shirley Bradley < sbradley@jodireland.com >; John Mulhern < john.mulhern@kerryairport.ie >
Subject: RE: Proposed Inchamore Wind Farm
Hello Sarah,
Thank you for sending on the google maps positions of the proposed turbines.
From an initial review the development would appear to be outside Kerry Airports 15Km OLS area.
However as you have highlighted in your scoping document section 4.2, the development has potential to impact on aviation coverage, and
as such I would recommend that this be investigated further to confirm the development will not impact on the safe operation of aircraft and maintain current aviation associated coverage such as radio, radar, navigational aids etc.
The requirements for lighting and inclusion of the structures on associated maps etc will I am sure be addressed by the IAA.
If you have any further questions or require clarification on any of the above please let me know,
Regards,

Howard Jones
Chief Operating Officer
KERRY AIRPORT IRELAND
email: howard.jones@kerryairport.ie
Farranfore, Killarney, Co. Kerry, Ireland. V93 KHF7
tel: (0)66 976 4644 | fax: (0)66 976 4134 | www.kerryairport.ie

From: Sarah Moore < smoore@jodireland.com >
Sent: 08 March 2023 12:58
To: Howard Jones < howard.jones@kerryairport.ie >
Cc: Sean Molloy < smolloy@jodireland.com >; Shirley Bradley < sbradley@jodireland.com >
Subject: Proposed Inchamore Wind Farm

APPENDIX 1.2
GLOSSARY OF COMMON ACRONYMS

Acronym	Term
AA	Appropriate Assessment
AADT	Annual Average Daily Traffic
AAR	Average Annual Rainfall
ABP	An Bord Pleanála
ACA	Architectural Conservation Areas
ADT	Average Daily Traffic
AGL	Above Ground Level
ALRA	Abnormal Load Route Assessment
ALV	Abnormal Load Vehicle
AM	Amplitude Modulation
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
As	Arsenic
ASSET	Aeronautical Surfaces Screening Evaluation Tool
ASSI	Area of Special Specific Interest
ATC	Automatic Traffic Count
BAP	Biodiversity Action Plan
BCI	Bat Conservation Ireland
BPG	Best Practice Guide
BSBI	Botanical Society of Britain and Ireland
BSI	British Standards Institution
BSL	Bird Surveyors Limited
BTO	British Trust for Ornithology
CA	Competent Authority
CAA	Civil Aviation Authority
CAFE	Clean Air For Europe
CAPEX	Capital Expenditure
CCC	Cork County Council
CCDP	Cork County Development Plan
Cd	Cadmium
CDP	County Development Plan
CEDaR	Centre for Environmental Data and Reporting
CEMP	Construction Environmental Management Plan
CEN2003	Comité Européen de Normalisation
CHP	Combined Heat and Power
CIEEM	Chartered Institute of Ecology and Environmental Management
CIfA	Chartered Institute for Archaeologists
CIRIA	The Construction Industry Research and Information Association
CJEU	Court of Justice of the European Union
CO	Carbon Monoxide
CO_2	Carbon Dioxide

Acronym	Term
CRM	Collision Risk Modelling
CRU	Commission for Regulation of Utilities
cSAC	Candidate Special Area of Conservation
CSO	Central Statistics Office
DA	Drainage Assessment
DAERA	Department of Agriculture, Environment and Rural Affairs
DAFM2018	Department of Agriculture, Food and the Marine
DAU	Development Applications Unit
dB	Decibel
dB(A)	A weighted decibel
DBERR	Department for Business, Enterprise and Regulatory Reform
DBEIS	Department of Business, Energy & Industrial Strategy
DCAN	Development Control Advice Note
DCCAE	Department of Communications, Climate Action and Environment
DCEMP	Decommissioning / Construction Environmental Management Plan
DCHG	Department of Culture, Heritage and Gaeltacht (Ireland)
DCO	District Conservation Officer
DED	District Electoral Division
DETI	Department for Enterprise, Trade and Investment
DfC	Department for Communities
DfI	Department for Infrastructure
DHPLG	Department of Housing, Planning and Local Government
DMRB	Design Manual for Roads and Bridges
DMURS	Design Manual for Urban Roads and Streets
DoE	Department of Environment
DoEHLG	Department of the Environment, Heritage and Local Government
DoHPCLG	Department of Housing, Planning, Community and Local Government
DPMP	Decommissioning Phase Management Plan
DSM	Digital Surface Model
DTI	Department of Trade and Industry
DTT	Digital Terrestrial Television
DWI	Drinking Water Inspection
EcIA	Ecological Impact Assessment
ECoW	Ecological Clerk of Works
ED	Electoral Division
EEA	European Environmental Agency
EHO	Environmental Health Officer
EHSA	Especially High Scenic Amenity
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EIS	Environmental Impact Statement
ELC	European Landscape Convention
ELF	Extremely Low Frequency
EMF	Electromagnetic Field

Acronym	Term
EMI	Electromagnetic Interference
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EPA 1990	Environmental Protection Act 1990
EQ	Equivalent
ES	Environmental Statement
ESB	Electricity Supply Board
EU	European Union
F	Frequency
FMP	Forestry Management Plan
FPM	Freshwater Pearl Mussel
FRV	Floating River Vegetation
ft	Feet
FTE	Full time equivalent
GAC	Granular Activated Carbon
GHG	Greenhouse Gases
GIS	Geographical Information System
GLVIA	Guidelines for Landscape and Visual Impact Assessment
GPG	The Good Practice Guide
GPP	Guidance for Pollution Prevention
GPR	Ground Penetrating Radar
GRC	Grid Route Connection
GSI	Geological Survey Ireland
GVA	Grass Value Added
GW	Gigawatt
GWDTE	Groundwater Dependent Terrestrial Ecosystems
ha	Hectare
HB	Historic Building
HDD	Horizontal Directional Drilling
HDPE	High Density Polyethylene
HED	Historic Environment Division
HEP	Habitat Enhancement Plan
HGV	Heavy Goods Vehicle
HMP	Habitat Management Plan
HPPE	High Performance Polyethylene
HSA	High Scenic Amenity
HVL	High Value Landscapes
Hz	Hertz
H&S	Health and Safety
IAA	Irish Aviation Authority
ICAO	International Civil Aviation Organisation
ICNIRP	International Commission on Non-Ionising Radiation Protection
ICOMOS	International Council on Monuments and Sites
IEF	Important Ecological Feature

Acronym	Term
IEMA	Institute of Environmental Management and Assessment
IFI	Inland Fisheries Ireland
IGI	Institute of Geologists of Ireland
IGR	Irish Grid Reference
IHR	Industrial Heritage Record
IMQS	Irish Mining and Quarrying Society
INSN	Irish National Seismic Network
IOA	Institute of Acoustics
ISEE	International Society of Explosives Engineers
ITM	Irish Transverse Mercator
IWEA	Irish Wind Energy Association
JCA	John Cronin and Associates
JNCC	Joint Nature Conservation Committee
JOD	Jennings O'Donovan & Partners Limited
km	Kilometres
kV	KiloVolts
LA90,t	A weighted background noise level for a period of time
LAeq,t	A weighted equivalent continuous sound pressure level for a period of time
LCA	Landscape Character Assessment
LCEP	Local Economic and Community Plan
LCOE	Levelised Cost of Energy
LCRE	Low Carbon Renewable Energy
LCT	Landscape Character Type
LCU	Life Cycle Unit
LCDP	Local County Development Plan
LIA	Landscape Impact Assessment
LV	Lower Voltage
LVIA	Landscape and Visual Impact Assessment
LW or LWA	Sound Power Level
m	Metres
m^2	Metres squared
m^3	Cubic metres
m AOD	Metres above Ordnance Datum
mbGL	Metres Below Ground Level
mg/l	Milligrams per litre
ms^{-1}	Meters per second
MD	Municipal Division
MEC	Maximum Export Capacity
MEL	Minerex Environmental Limited
mm	Millimetre
MSA	Medium Scenic Amenity
MSDS	Material Safety Data Sheet
MV	Medium Voltage
MW	Megawatt

Acronym	Term
MWh	Megawatt hour
NAM	Normal Amplitude Modulation
NAP	Northern Area Plan
NBAP	National Biodiversity Action Plan
NBDC	National Biodiversity Data Centre
NCEP	National Energy and Climate Plan
NCR	National Cycle Route
NDP	National Development Plan
NECP	National Energy and Climate Plan
NED	Natural Environment Division
NHA	Natural Heritage Area
NHMRC	National Health and Medical Research Council
NIAH	National Inventory of Architectural Heritage
NIS	Natura Impact Statement
NLS	National Landscape Strategy
NMI	National Museum of Ireland
NMP	National Mitigation Plan
NMS	National Monuments Service
NNR	National Nature Reserve
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NPF	National Planning Framework
NPWS	National Parks and Wildlife Services
NRA	National Roads Authority
NREAP/NEEAP	National Energy Efficiency and Renewable Energy Action Plans
NRFA	National River Flow Archive
NSO	National Strategic Outcomes
NSS	National Spatial Strategy
NTA	National Transport Authority
NTS	Non-Technical Summary
NVC	National Vegetation Classification System
OAM	Other Amplitude Modulation
OHL	Overhead Line
OMS	Operations, Maintenance and Services
OPEX	Operational Expenditure
OPW	Office of Public Works
OSi	Ordnance Survey Ireland
O&M	Operation and Maintenance
PAH	Polycyclic Aromatic Hydrocarbon
PAN	Planning Advice Note
PID	Public Information Day
PM	Particulate Matter
PMP	Peat Management Plan
pNHA	Proposed Natural Heritage Area

Acronym	Term
PPA	Power Purchase Agreement
PPE	Personal Protective Equipment
PPG	Pollution Prevention Guidelines
PPP	Pollution Prevention Plan
PPS	Planning Policy Statement
PPV	Peak Particle Velocity
pSPA	Proposed Special Protection Area
PSRA	Peat Slide Risk Assessment
PV	Photovoltaic
PWS	Private Water Supplies
QI	Qualifying Interest
RAMS	Risk Assessment and Method Statement
RDS	Regional Development Strategy
RESS	Renewable Electricity Support Scheme
RHM	Register of Historical Monuments
RoW	Right of Way
RMP	Record of Monuments and Places
RPM	Revolutions Per Minute
RPS	Record of Protected Structures
RSA	Road Safety Audits
RSES	Regional Spatial and Economic Strategy
RSIA	Road Safety Impact Assessment
RTC	Road Traffic Collisions
RTU	Remote Telemetry Unit
SAC	Special Areas of Conservation
SCADA	Supervisory Control and Data Acquisition
SCI	Statement of Community Interest also Site of Community Importance
SDG	Sustainable Development Goals
SDL	Settlement Development Limit
SDS	Safety Data Sheet
SEA	Strategic Environmental Assessment
SEAI	Sustainable Energy Authority of Ireland
SEF	Strategic Energy Framework
SEPA	Scottish Environment Protection Agency
SFA	Société Française d'Acoustique / French Acoustical Society
SFRA	Site Specific Flood Risk Assessment
SGN	Supplementary Guidance Note
SI	Statutory Instrument
SID	Strategic Infrastructural Development
SIS	Soil Information System
SLNCI	Sites of Local Nature Conservation Importance
SMR	Sites and Monuments Record
SNH	Scottish Natural Heritage
SO_2	Sulphur Dioxide

Acronym	Term
SPA	Special Protection Areas
SPG	Supplementary Planning Guidance
SPPR	Specific Planning Policy Requirement
SRA	Southern Regional Assembly
SSRS	Small Streams Risk Assessment
STE	Serrations Trailing Edge
SuDS	Sustainable Drainage Systems
SW	Surface Water
SWC	Surface Water Crossing
SWMP	Surface Water Management Plan
T	Tonnes
TA	Transport Assessment
TENT-T	Trans European Transport Network
TES	Trailing Edge Serrations
TIA	Traffic Impact Assessment
TII	Traffic Infrastructure Ireland
TMP	Traffic Management Plan
TMS	Telemetric Monitoring Stations
TSO	Transmission System Operator
TSS	Total Suspended Solids
TTA	Traffic and Transport Assessment
TVI	Theoretical Zone of Visibility
UCS	Unconfined Compressive Strength
UGC	Underground Cable
UGL	Underground Line
UK	United Kingdom
UNFCC	United Nations Framework Convention on Climate Change
V	Volts
VIA	Visual Impact Assessment
VP	Viewpoint
VRP	Viewshed Reference Points
WADT	Weekly Average Daily Traffic
WDC	Western Development Commission
WEDG	Wind Energy Development Guidelines
WEI	Wind Energy Ireland
WFD	Water Framework Directive
WHO	World Health Organisation
WMO	World Meteorological Organisation
WMP	Waste Management Plan
WTG	Wind Turbine Generators
WQMP	Water Quality Monitoring Plan
ZOI	Zone of Influence
ZTV	Zone of Theoretical Visibility

Community Engagement

Inse Mhór
Wind Farm

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1 Introduction

The proposed Inse Mhór Wind Farm (Inchamore Wind Farm) is a co-development between FuturEnergy Ireland and SSE Renewables. FuturEnergy Ireland is a joint venture company owned on a 50:50 basis by Coillte and ESB. The Coillte project portfolio and renewable energy team transitioned to FuturEnergy Ireland when the company launched in November 2021.

The co-development between FuturEnergy Ireland and SSE Renewables is seeking planning permission from Cork County Council and Kerry County Council to construct and operate a commercially viable wind farm project on lands located within an agricultural and forested landscape west of Ballyvourney and northwest of Coolea in Co. Cork. The total land parcel extends to approximately 167 hectares, of which a significant area is commercial forest owned by Coillte. The remaining land is third-party property in Co. Cork.

From the outset, the project team consulted with the local community and commenced this engagement prior to the start of the project design and environmental assessment. Our objective was to ensure that the views and concerns of all members of the local community were considered as part of the project design and the Environmental Impact Assessment process.

In relation to national guidance on community engagement and consultation for wind energy developments, the *Wind Energy Development Guidelines* (Department of Environment, Heritage, and Local Government, 2006) state that:

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

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

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

The *Draft Revised Wind Energy Guidelines* (Department of Housing, Planning and Local Government, 2019) has retained this position, stating:

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

2 Background

This Community Report outlines engagement and liaison with the community local to the An Inse Mhór area and the proposed wind farm.

FuturEnergy Ireland has a long history of working with communities and our experience around the country has generated an inherent understanding of the communities in which we operate. We aspire to work **with** the communities surrounding our energy sites and wish to build projects that are good for us as a commercial company, good for our neighbours, and that contribute to the fulfilment of national and global climate change objectives.

FuturEnergy Ireland has developed four wind farms in Ireland over the past decade and has learnt many valuable lessons in relation to working with local communities and the importance of including local people in decisions that affect them. In 2017, the Coillte Renewable Energy Team undertook a review of our Community Engagement process and embarked on the design of a radically enhanced approach with the support of AstonEco Management.

The key elements of this approach, referred to as our 'Fair Play" model, are:

- Detailed and systematic engagement with all close neighbours to the project (within 2km) from a very early stage of project design.
- Open, transparent dialogue and communications.
- Creating opportunities for open, two-way dialogue on key issues.
- Involvement of the local community at all stages of the project design process.
- Empowering local communities to be part of project discussions that affect them.
- Ensuring that the local community have access to all relevant information as soon as it is available, in an understandable format.

This approach emphasises a focus on the residents of dwellings within 2km of the initial proposed 6 turbine layout as they will be closest and will therefore be most sensitive to any potential effects caused by the development.

In the past, engagement has commenced when the project is almost fully designed and being prepared for planning submission. In our 'Fair Play' approach we start engagement as soon as a site has been identified as suitable for detailed environmental studies within the FuturEnergy Ireland internal screening process. This approach also recognises the need to keep people who live further away from the development informed about the project as details become more defined.

In order to build better projects, we recognise the imperative of enabling meaningful engagement between the project team and the local residents. This engagement has to pass beyond just information provision to become open, transparent dialogue and involve people in decisions that affect them, to move towards a more collaborative approach to infrastructure design that has a national interest but a local impact.

What are our external drivers for stakeholder engagement?

- Actively engaging in the conversation helps raise awareness and provides insight that can ensure successful project outcomes for everyone.
- Active and open dialogue with our community stakeholders is essential for the success of our projects. It is through two-way dialogue that FuturEnergy Ireland can responsibly partner with local communities.
- FuturEnergy Ireland is committed to strengthening partnerships with local communities.
- Public support is achieved by actively working with communities towards mutually desirable goals. Meaningful communication with stakeholders creates trust and mutual respect, as well as a shared understanding and vision of what a successful project can look like.
- Timely, proactive, open and honest communication is a cornerstone of our Engagement Charter. This approach helps to minimise possible adverse impacts on our neighbours and contributes towards achieving positive social, economic and environmental outcomes.
- In line with national policy, FuturEnergy Ireland is committed to meaningful consultation, which brings about constructive local dialogue, as well as mutual trust and understanding.

3 FuturEnergy Ireland resources

In order to implement this 'Fair Play' approach, FuturEnergy Ireland has resourced this project with a number of dedicated staff from the outset. The following key personnel have been involved in Community Engagement on the proposed Inse Mhór Wind Farm from within FuturEnergy Ireland and SSE Renewables:

David Heelan of FuturEnergy Ireland is the lead project manager for the proposed Inse Mhór Wind Farm development. David has worked in the renewables and industrial production sectors throughout Ireland and the UK since 2008 with a more recent focus on asset management and performance optimisation. He believes that our work will deliver tangible benefits to the Irish energy sector and directly reduce the country's reliance on imported and expensive fossil fuels.

Garry Brides of SSE Renewables is the assistant project manager for the proposed Inse Mhór Wind Farm development. Garry has extensive experience in the development, construction, and acquisition phases of large-scale energy projects from onshore wind to open cycle gas turbines. He has broad knowledge of the complexities involved and understands the importance of meeting different stakeholder's requirements throughout the project lifecycle.

Brendan Twomey is Community Liaison Officer (CLO) for the proposed Inse Mhór Wind Farm development. Brendan enjoys working with people and brings many years of experience across different business sectors. Brendan is the local contact for the proposed project at An Inse Mhór.

Shane Lowry of FuturEnergy Ireland is the stakeholder manager for the proposed Inse Mhór Wind Farm development. As a former Community Liaison Officer on other company projects, Shane works closely with local CLOs to optimise communication and engagement.

Janine Thomas of FuturEnergy Ireland is communications and media manager for the proposed Inse Mhór Wind Farm development. Janine worked as a journalist for various national newspapers for over 15 years before joining the team. She brings her extensive media and communications experience to this project.

Sean Molloy is a senior associate and senior project manager in the renewable energy department at Jennings O'Donovan & Partners. Sean is a chartered engineer with 14 years' professional experience, which includes managing Environmental Impact Assessments, Civil and Environmental Design, preparation of Planning Documentation and Technical Reports and Stakeholder Consultation.

4 Summary of community engagement carried out

Before commencing community engagement, we needed to identify the 2km zone. As outlined above, FuturEnergy Ireland emphasises a focus on the residents of dwellings within 2km of the site because these people will be closest to the development and will be most sensitive to any potential effects caused by the proposed development.

This was achieved by taking the initial turbine layout and applying a 2km buffer. Within this area all dwellings — lived in, vacant and with the potential to be occupied — were mapped. As the design progressed, we established a "buildable" or more accurate developable area. We then applied a 2km buffer and began engagement with the residents within this area.

The Inse Mhór project appointed Brendan Twomey as the Community Liaison Officer (CLO) in summer 2020. The project Community Liaison Officer's initial engagement commenced in July/August 2020 when he began calling to designated houses within the community to arrange agreement for and the placing of noise monitoring units around these dwellings that bordered the project perimeter.

Initial engagement

The role of a Community Liaison Officer (CLO) is to introduce and communicate key project information, timelines, updates, activities, benefits and proposals through direct and indirect community engagement, meetings and events with the project's near neighbours and the wider community throughout the project lifecycle.

Initially, the CLO's direct engagement focused on calling to all the houses within 2km of the study area. In September 2020, CLO Brendan Twomey hand-delivered Newsletter 1 to those who live within 2km of the proposed project study area.

At FuturEnergy Ireland, we believe that it is important to give out accurate, up-to-date information in print to each household in a timely manner - within about three days – to ensure all local households receive this at the same time. The CLO was on hand to discuss any queries, comments or concerns that residents may have had and to take back queries to the project managers. These initial conversations and questions highlighted topics that helped to inform the second newsletter.

The CLO's work also included Saturdays and some evenings to try and meet residents unavailable during weekdays in an effort to reach out to all.

Early in the engagement process, the CLO contacted local interest groups from the wider community and local elected representatives and then kept them up-to-date and informed about this project. This commitment continued throughout the whole engagement process and will continue throughout the project's life cycle.

At all stages of the project's engagement cycle from 2020 to 2023, all our communications material included the CLO's contact mobile phone number, the project email and postal address.

After the distribution and communication of updates in Newsletter 2 in March 2021, the dedicated project website address was also included. From this time onward, all project updates and newsletters were uploaded to the project website www.inchamorewindfarm.ie.

To acknowledge the region's Gaeltacht culture and heritage, the majority of our communications were provided in both Irish and English.

The project team replied to queries and questions that arose during the engagement lifecycle. Some requests for information were logged so that when the information became available it would be provided.

Next phase engagement

CLO Brendan hand-delivered Newsletter 3 in September 2021, which enabled socially distanced, outdoor conversations to be held during the pandemic. In November 2021, Brendan distributed a project update letter informing stakeholders that over the coming weeks, weather permitting, a 100-metre met mast for measuring wind speeds would be installed at Inchamore. This was followed in December 2021 by a letter from CEO Peter Lynch introducing FuturEnergy Ireland, which was distributed to near neighbours.

In March/April 2022 the Community Liaison Officer hand-delivered a project update letter, which gave him further opportunity to discuss the project with homeowners. Another project update letter followed in November 2022 to keep near neighbours, interest groups and elected representatives updated on progress.

In March 2023 a media release was distributed to local and regional journalists to mark the launch of Inse Mhór Wind Farm's detailed project brochure and Virtual Tour exhibition.

In tandem, the detailed 36-page project brochures with an accompanying invitation to the Virtual Tour were distributed to near neighbours and the wider community, special interest groups and local elected representatives.

The Virtual Tour is accessible to all via the project website www.inchamorewindfarm.ie. It provides a project overview, timeframes, site maps, team biographies, a summary of archaeology and cultural heritage, ecology, noise, landscape and visuals, a full set of photomontages, Community Benefit Fund information and a downloadable copy of the project brochure.

In April 2023, advertisements were placed in local newspapers with an invitation to attend an Inse Mhór Wind Farm local on-site community engagement clinic held in Arus Éamon Mac Suibhne, Cúil Aodh, Co Chorcaí, P12 HY57, on Thursday April 20th and Friday April 21st.

In early April a letter of invitation to the community engagement clinic was distributed to the project's near neighbours, interest groups and local elected representatives. Posters were placed in local shops, the post office, the local Co-Op store, the filling station and in the local pub and posted on the local community Facebook page.

Queries and questions arose at the two-day community engagement clinic and the project team responded to these. Some requests for information were logged so that when the information became available it would be provided.

Our intention during May 2023 is to distribute a "Notice to submit into planning" letter to the project's nearest neighbours to keep them informed. In tandem, advertisements giving notice of the planning submission will be placed in a regional and national newspaper. Site notices in Irish and English will also be erected around the proposed project.

**(please see appendix for copies or a link to all communications materials provided)*

Covid-19

The Covid-19 pandemic resulted in protective restrictions of varying levels to reduce the spread and impact of the virus, from strict lockdowns through the gradual easing of restrictions to free movement and social interactions again. Our interaction adhered to Covid-19 guidelines at all stages of the engagement programme.

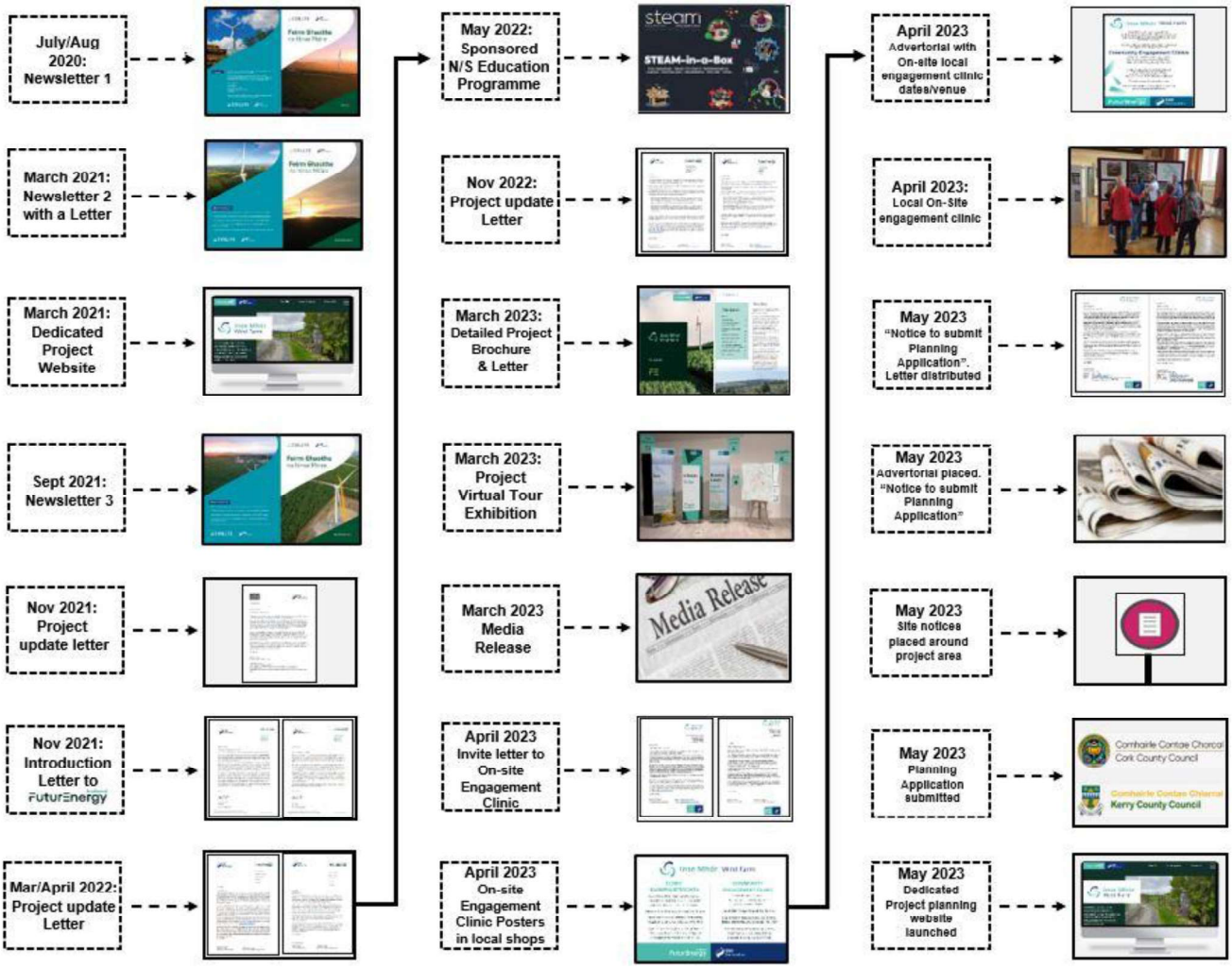
At varying stages, Covid-19 restrictions impacted our face-to-face engagement to differing degrees. However, we remained committed to keeping our neighbours informed about the progress of the project during these times through the use of mail drops/posting of newsletters, individual phone calls, emails, texts and letters to keep everyone updated.

At all stages of the engagement cycle, our communications material included our contact number, project email and postal address. After the distribution and communication of updates in Newsletter 2 in March 2021, our dedicated project website address was also included. From this time onward, all project updates and newsletters were continuously uploaded to the dedicated project website. In our communications we always included an invitation to make contact with any queries and questions.

As Covid-19 restrictions eased, where requested further liaison/communication was carried out individually or in small groups outdoors in line with the applicable public health policy in place. This allowed the project team to engage directly with residents and address their queries regarding the project design, which was beneficial to all parties.

When restrictions lifted, we commenced face-to-face engagement, culminating in a two-day local community engagement clinic, which was very well attended. Multiple hand sanitisers were made available at the entrance and at other locations. Signs encouraging social distancing and hand sanitising were on display around the room. Access to fire doors was left unobstructed and freely accessible. Windows were open to encourage ventilation. If someone came in wearing a mask we asked at the entrance if they would like us to wear one; this question was only necessary to ask once, and the stakeholder said it was unnecessary.

5 Infographic summary of community engagement 2020/2023



6 Detailed summary of community engagement 2020/2023

Newsletter 1: July/August 2020.	An Irish and English version of an **Introductory Newsletter 1** was distributed to all houses within 2km of the project area by our Community Liaison Officer. This included door-to-door calls, and call-backs to houses where nobody was at home. If no one was at home the second time of calling, the CLO left a letter with an invitation to contact us. The newsletter showed a map of the proposed project area, site location, contact number, project email and postal address. It also provided the opportunity for the project's Community Liaison Officer to introduce himself and the project to the near neighbours. The Newsletter was either emailed/delivered/posted to interest groups and local elected representatives to keep them informed. The project team replied to queries and questions that arose from near neighbours and the wider community. The engagement included evening and weekend calls to premises where nobody was at home during the day, in an effort to reach out to all. **(please see appendix for a link to a copy of Newsletter 1)*
Newsletter 2 with accompanying letter: March 2021.	An Irish and English version of **Newsletter 2** was posted due to ongoing Covid-19 restrictions to the near neighbours adjacent to the project. The newsletter contained project updates, charted progress and addressed some of the concerns raised when consulting with homeowners during the delivery of the Introductory Newsletter 1. The project contact number, email and postal address, along with contact details for the newly launched **project website** were included in this newsletter. From this time onward, all project updates and newsletters were uploaded to the dedicated project website. Newsletter 2 was either emailed/delivered/posted to interest groups and local elected representatives to keep them informed and up to date. Queries and questions that arose from near neighbours and the wider community were replied to by the project team. **(please see appendix for a link to a copy of Newsletter 2 and Letter)*

Newsletter 3: September 2021.	Due to ongoing Covid-19 restrictions, **Newsletter 3** was distributed through letter-box drops. Meanwhile, consultations with near neighbours were restricted to outdoor one-to-one meetings with social distancing to keep everyone safe. The newsletter contained project updates, details of surveys and studies being carried out on site on topics such as Hydrology & Geology, Ornithology, Biodiversity and Noise. It also included the project's direct contact number, email address, postal address and website details. Newsletter 3 was uploaded to the project website and was either emailed/delivered/posted to interest groups and local elected representatives to keep them informed and up to date. Queries and questions that arose from near neighbours and wider community were replied to by the project team. **(please see appendix for a link to a copy of Newsletter 3)*
Project update Letter: November 2021.	In November 2021, Brendan distributed a **Project Update Letter** informing stakeholders that over the coming weeks, weather permitting, a 100-metre met mast for measuring wind speeds would be installed at Inchamore. The project update letter was uploaded to the project website. Queries and questions that arose from near neighbours and wider community were replied to by the project team. **(please see appendix for a link to a copy of the project update letter)*
Company update Letter: December 2021.	An Irish & English **introductory letter to FuturEnergy** Ireland from our CEO was distributed to the near neighbours adjacent to the project. The letter was also uploaded to the project website. Queries and questions that arose from near neighbours and wider community were replied to by the project team. **(please see appendix for a link to a copy of the letter)*
Project update Letter: March/April 2022.	An Irish & English version of a **Project Update Letter** was distributed to the near neighbours adjacent to the project providing project updates, next steps, expected timelines, a contact number, project email, postal address, website details and an invitation to contact us. The letter was uploaded to the project website and was either emailed/delivered/posted to interest groups and local elected representatives to keep them informed and up to date. The project team replied to queries and questions that arose from near neighbours and the wider community.

	**(please see appendix for a link to a copy of the project update letter)*
Local Sponsored Educational Programme: May 2022.	FuturEnergy Ireland **sponsored** and arranged an Educational Programme about "Climate Change" for Six local national schools around the wider project area, which was well received. The schools involved were Cúil Aodh, Baile Mhuirne, Beal Áthan Ghaorthaidg, Cill na Martra, Inchigeelagh and Réidh na Ndoiri. **(please see appendix for a copy of related material)*
Project update Letter: November 2022.	An Irish & English version of a **Project Update Letter** was distributed to the near neighbours adjacent to the project providing project updates, next steps, expected timelines, a contact number, project email, postal address, website details and an invitation to contact us. The letter was uploaded to the project website and was either emailed/delivered/posted to interest groups and local elected representatives to keep them updated. The project team replied to queries and questions that arose from near neighbours and the wider community. **(please see appendix for a link to a copy of the project update letter)*
Media Press Release: Week of 27th March 2023.	To keep the local and wider communities informed, a **Media Release** was sent to local and regional newspaper/radio journalists, which provided information on the project and where interested parties could access all project information issued to date. This included the recently launched project brochure and the Virtual Tour. **(please see Table 3 - Media Report for details)*
Detailed Brochure with accompanying Letter. **Virtual Tour Exhibition:** Week 27th March 2023 onwards.	A detailed 36-page **Project Brochure** and accompanying **letter** in Irish & English that invited the reader to the new Virtual Tour exhibition on the project website were distributed to the local and wider community of project area. This provided another opportunity to hold conversations and listen to feedback and answer questions that arose. The detailed Project Brochure was uploaded to the project website. It was also either emailed/delivered/posted to interest groups and local elected representatives to keep them informed and up to date. Queries and questions that arose from near neighbours and wider community were replied to by the project team.

	**(please see appendix for a link to a copy of the detailed project brochure and accompanying letter)*
Note	**As part of our engagement commitment, included in the letter that accompanied the project brochure, we asked anyone requiring any assistance navigating the Virtual Tour, to please contact us. For those who did not have internet access, we requested that they please get in touch, and we will provide answers to any questions, and hard copies of information that features on the Virtual Tour as required. Our contact details were included in all communications.*
Virtual Tour Exhibition: Week 27th March 2023	The **Virtual Tour Exhibition**, which is accessible via the project website, was launched. It provides a project overview, timeframes, team biographies, site maps, and details of Archaeology and Cultural Heritage, Ecology, Noise, and Landscape and Visuals, a full set of photomontages, Community Benefit Fund information and an e-copy of the 36 - page detailed project brochure. **(please see appendix for a link to the Virtual Tour Exhibition)*
Invitation Letter to two-day on-site community engagement clinic: Week 3rd April 2023 onwards	After the distribution of the detailed project brochure and accompanying letter to the local and wider community, the Community Liaison Officer called back to the project's nearest neighbours to answer any questions that may have arisen If there was no one home he left a **invite letter** *(in Irish and English)* to the on-site comunity engagement clinic with a request to call him back to arrange a suitable appointment time if they so chose to do so. The invitation letter was uploaded to the dedicated project website and was either emailed/delivered/posted to interest groups and local elected representatives. This included evening and weekend calls to premises where nobody was at home during the day, in an effort to reach out to all. **(please see appendix for a copy)*
Note:	All our communications materials, which were distributed to the local and wider community during the week commencing 27th of March 2023, included full contact details and a letter inviting interested parties to contact us with any queries or requests for information. Since the initial launch of the project in September 2020, we have been continuously logging feedback, concerns,

	requests for information and project updates, and replying to all queries as the information became available. Due to the detailed nature of the information provided in the project's last round of engagement, further valuable feedback was provided, concerns were acknowledged, and where we were able to provide immediate replies to questions, we did so. Some requests for information were logged so that when the information becomes available it will be provided. We invited and encouraged interested parties to contact us, or attend the upcoming project local community engagement clinic to meet the team and discuss any queries or questions that they may have had.
Clinic Posters displayed locally: Week 10th April 2023.	To keep the local and wider community informed, **posters** were placed in local shops, the post office, the local Co-Op store, the filling station and in the local pub and posted on the local community Facebook page that provided dates, times and locations for the on-site community clinic. **(please see appendix for a copy)*
Adversisments: 2 day on-site local Community Engagement Clinic Week 10th April 2023.	To keep the wider and local communities informed, **advertisements** were placed in local and regional newspapers providing dates, times, contact details and locations for the on-site community engagement clinic. **(please see Table 3 - Media Report for details)*
2 day on-site local Community Engagement Clinic: 20th/21th April 2023.	A **2 day Local Community Engagement Clinic** was held in Arus Éamon Mac Suibhne, Cúil Aodh,, Co Chorcaí. P12 HY57 which is located within the local community adjacent to the proposed project area. 30 attendees over the two days met the project team and asked questions that were pertinent to them. Requests for further information were followed up and provided. • 4 live within 1km of the project site, • 6 live in the 1 to 2km of the project site, • 4 live within the 2 to 3km of the project site, • 5 live 3 to 4km mainly south of the proposed site, • 5 were representatives of community organisations, • 1 is a landowner, • 2 live 4 to 5km south of the Inchamore site and are 1 to 2 km from the proposed Gortyrahilly wind farm project. • The remaining were from the wider community. • 30 + primary school students from Scoil Chuil Aodha Barr D Inse attended and participated in an informal presentation and Q&A.
Notice to submit Letter:	The Community Liaison Officer will distribute an Irish and English version of a **letter** to the project's nearest

Our intention during May 2023	neighbours informing them of a Notice to Submit the project into planning. **(please see appendix for a copy)*
Advertorials: Our intention during May 2023	**Advertorials** are placed in The Corkman and The Kerryman newspaper, with a notice to submit the project into planning. **(please see Table 3 - Media Report for details)*
Site Notices: Our intention during May 2023	**Site Notices** in Irish and English are placed around the proposed project site. **(please see appendix for a copy)*
Our intention during May 2023	The **planning application is submitted** to Cork County Council and Kerry County Council and when subsequently validated, the project's planning application will be simultaneously uploaded to the project website www.inchamorewindfarm.ie for the public to review.

6.1 Statistics for Virtual Tour Exhibition visits, On-Site Clinic attendance

Summary	Numbers
Virtual Tour Hits: *March 27th, 2023 - April 30th, 2023*	83
2 day On-Site clinic attendees numbers:	30
Sponsored National School Education Program:	6 Schools participated

6.2 Media Report

Date	Paper On-line Radio	Activities	Details
Our intention during May 2023	Print Media	Adverts will be placed in The Kerryman and The Corkman newspapers.	Notice to submit into planning.
Week 10th April 2023	Social Media	Community Liaison Officer arranged for a poster to be provided to a Community Facebook page.	To keep the local and wider community informed, a poster was provided to a local community Facebook page which was subsequently uploaded. The poster provided dates, times, and locations for the on-site community engagement clinic.
Week 10th April 2023	Posters in local shops	Community Liaison Officer arranged for posters to be displayed.	To keep the local and wider community informed, posters were placed in local shops, the Post office, the local Co-Op store, the filling station and in the local pub that provided dates, times, and locations for the on-site community engagement clinic.
Week 10th April 2023	Print Media	FEI Media Advertorial placed in the • The Corkman, • Southern Star • The Kerryman	Invitation to attend the projects 2-day on-site community engagement clinic. **(see appendix below for copy)*

Date	Paper On-line Radio	Activities	Details
6th April 2023	Radio	Raidio na Gaeltachta	Direct call to CLO who provided information requested and email reply by Comms Manager. 7th April Radio na Gaeltachta news today featured Inchamore a few times.
29th March 2023	Radio	C103 Radio	*Report on Inchamore Wind Farm's public consultation program with information from the press release.*
Week 28th March 2023	Print Media	FEI media release sent to reporters in <u>Regional papers:</u> • Irish Examiner. • The Corkman/Kerryman • Southern Star. <u>Radio:</u> • Raidio na Gaeltachta • 96FM	To inform the local and wider community of the newly launched detailed project brochure, the Virtual Tour, how and where to access information and to give our contact details.
March 23rd 2023	Radio	Raidio na Gaeltachta	6.30pm news
March 22nd 2023	Radio	Raidio na Gaeltachta	12 noon, 1pm, 5pm news
20th March 2023	Radio	Raidio na Gaeltachta	Direct call to CLO who provided information requested and email reply by Comms Manager.
4th March 2023	Print Media	The Echo Newspaper	*Céim dheiridh an chomhairliúcháin phoiblí ar fheirm ghaoithe beartaithe do Mhúscraí* *The final stage of the public consultation on a wind farm proposed for Múscraí.*

7 Dwellings within 2km of initial proposed 6 turbine layout

Distance from Turbines	No of Dwellings
750m – 1Km	17
1 – 2Km	28
Total	**45**

** The above figures are for occupied dwellings and dwellings that are liveable but may be unoccupied and excludes derelict houses, farm buildings and sheds.*

8 Dwellings within 2km of proposed final 5 turbine layout

Distance from Turbines	No of Dwellings
750m – 1Km	8
1 – 2Km	26
Total	**34**

** The above figures are for occupied dwellings and dwellings that are liveable but may be unoccupied and excludes derelict houses, farm buildings and sheds.*

9 Key concerns raised during the course of engagement:

Topics	Issues raised
Traffic/Transport/Construction Management	Traffic disruption during construction to and from the site and along the grid route and how that is managed and how issues would be resolved. Previous experiences have been very negative and disruptive to the local community. Safety and potential damage arising from the use of local roads during construction by large trucks on narrow roads. How will this be managed and who is liable for any potential property and road damage during construction and for works carried out along the grid route? What guarantees are there that damage to property or roads will be reinstated to their previous condition? Will there be a liaison officer or individual point of contact during the construction phase?
Community Benefit Fund	Transparency around access to and involvement in directing funding within the local community was expressed based on previous and existing experiences. The appointment process of an Adminstrator and the potential for having a suitably qualified local Adminstrator being appointed.
Noise	Concerns that the proposed project will be as noisy as adjacent wind farms, some built 20 + years ago. Is the project going to generate more noise and how will the project be cumulatively assessed in terms of noise? How will the Developers ensure that the wind farm will not breach noise limits/ impact upon residential amenity?

Topics	Issues raised
Visual impact	Will I be able to see what the proposed wind farm will look like from my property in advance of planning being submitted? Negative impact on residential amenity - direct views from residents' homes (windows) to turbines. There are enough wind farms in the locality already and concerns on the number of wind farms that are being proposed for development in the locality. Why is the area being considered in the first place? Concerns over visual impact of red aviation lights at night.
Landslide	Is there a potential for a landslide?
Future employment and skills development	Potential employment opportunities for local people long term.
Shadow flicker	How can the Developers ensure that shadow flicker won't occur from the project?
Water disruption and contamination	We have wells in the area, could the construction disrupt the water quality and supply from the sources? What happens if there is contamination or disruption to the water supply?

As outlined in the detailed summary of community engagement between 2020/2023 above, the engagement process undertaken has given the project team a detailed appreciation of the issues and concerns of the near neighbours.

This close working relationship has facilitated the evolution of the project design to understand and alleviate the concerns expressed as far as possible.

These themes were discussed throughout the engagement process and were answered in a transparent and open manner. Ultimately not all themes could be or were addressed to the satisfaction of all, but the project team remains open in trying to find fair and equitable solutions for everyone, including sharing information sources at our disposal. All of the above themes are also addressed clearly in the EIAR.

It is to be noted that our Community Liaison Officer Brendan Twomey was treated with respect in the vast majority of cases. While some neighbouring households were not pleased with what they were hearing, we were thanked at times for bringing the information to them. The long timeframe for this engagement has allowed people to digest the information provided, consult, discuss among themselves, and reach out to the project team on any items that they felt needed further clarification.

10 Influence of engagement - evolution of the wind farm design

As outlined above in the list of key concerns raised during the course of engagement.

The main concerns of local residents include Traffic/Transport/Construction Management, Safety, communication and resolving issues flagged, potential damage to property and roads, management of the associated Community Benefit Fund, noise, visual impact, shadow flicker, any landslide potential, water disruption and contamination.

The engagement process undertaken on the proposed project has given the project team a detailed appreciation of the issues and concerns of the near neighbours. This close working relationship has facilitated the evolution of the project design to understand and alleviate the concerns expressed as far as possible.

The mains concerns expressed together with their impact on the design evolution are set out below.

10.1 Impacts associated with traffic/transport/construction management.

Concerns were raised directly with the Community Liaison Officer and with the Team at the on-site local community engagement clinic about the potential disruption of traffic and construction and the potential of damaging existing roads, properties adjacent to roads and follow-up repairs not taking place. This was informed by negative experiences with another wind farm development.

Undertakings have been provided to stakeholders with concerns about cabling works. In advance of any potential cabling works along their road, we will undertake a record of condition survey of the road, a copy of which will be provided to them. After the works are completed, we will again survey this section of road in consultation with and any possible damage caused as a direct result of the works will be made good and repairs completed. It was mentioned that prior to any cabling works taking place, we will draft a traffic management plan for approval by Cork County Council and, as part of that process we will consult with the community/local road users, well in advance.

Six months prior to the commencement of construction, we will initiate the set-up of a liaison group and a dedicated community liaison contact. The project will meet with this group monthly or as required to prepare for the construction phase and monitor activities during construction. This group will develop plans on communicating effectively with residents directly impacted by construction activities and deliveries, especially traffic planning to minimise disruption.

The noise assessment considered all construction-related noise associated with machinery and traffic and all site activities and found that the proposed layout complies with all relevant regulations.

Further details can be found in the noise and vibration and traffic and transport assessments chapters in the EIAR respectively.

10.2 Community benefit fund.

There were concerns expressed based on existing experience with a particular community benefit fund around the potential lack of communication, transparency around access to the fund and involvement in directing funding within the local community.

There were informative discussions around the Government's 'Good Practice Principles for Community Benefit Funds', which provides full details on how the fund is to be governed and requires local community participation in all decisions regarding how the funding should be used.

Also discussed were timelines and next steps. Should the project receive a positive planning outcome, the project team and the local community will work together to develop an appropriate local structure that would design the Inse Mhór Wind Farm Community Benefit Fund. This group will make decisions on funding allocations and, with the assistance of an administrator, manage the fund, ensuring transparency and good governance.

The first is a participatory design process for the Inse Mhór Community Benefit Fund (CBF) that will take place 6 – 8 months prior to any construction work starting.

The team will start a process of reaching out initially to residents within the 2km zone and then slightly further afield, in order to bring together a small group of people who are interested in working on the design and structure of a community-based entity that would ultimately run this Community Benefit Fund. This process will start with a scoping exercise followed by a series of facilitated workshops. It is hoped that representatives involved in existing local development initiatives will be stakeholders in this process and will therefore contribute to this strategy.

Another query arose concerning the appointment process of an Administrator and the potential for having a locally based and suitably qualified Administrator appointed. A question was asked about the criteria and skills required for an Administrator. It was discussed that this process begins around 6 – 9 months prior to any construction. A suggested list of skills and qualifications and experience are being forwarded as requested.

The second piece of work is to explore the potential for community investment in the project as outlined in the new Renewable Energy Support Scheme (RESS). This will most likely follow on from the CBF workstream and will look at the best ways to promote awareness about this opportunity in advance of it coming online.

10.3 Future employment and skills.

There was a question around what type of skills, education, qualifications and careers would be required and how the project might develop long-term employment for local stakeholders and their families, thereby rejuvenating this rural community and keeping families in the area.

A suggested list of skills, education, qualifications, and careers in the renewable sector is being forwarded with a suggestion that a presentation on the above to nearby secondary school TY students would be beneficial and informative.

10.4 Potential for a landslide.

A question around the potential for a landslide in the project area was discussed between the stakeholders and the project team at the on-site community engagement clinic.

The layout has been developed taking into consideration peat depths and strengths across the site, the turbine layout and associated ancillary infrastructure has been placed in the optimal locations to avoid the risk of landslide being caused by the development. A specialist consultancy RSK Ireland was employed by the project to provide environmental services in the form of hydrological, hydrogeological advice and undertook a peat stability risk assessment.

Further details on this can be found in Chapter 8 Soils and Geology assessment chapter of the EIAR.

10.5 Impacts associated with noise and visual impact.

Noise and visual impacts were addressed as part of the layout design process. A decision was made early in the design process to ensure that a minimum distance of 4 x tip height would be maintained between nearest dwellings and turbines. This is more than the current recommended setback of 500m as set out in the Wind Energy Development Guidelines 2006. The setback of 4 times tip height also complies with the Draft Wind Energy Development Guidelines 2019, which are not, as of the time of writing this report, official policy and may change in the final form.

Various configurations and layouts were considered as part of the initial design process based on a detailed visual impact assessment undertaken as part of the environmental impact assessment.

When a final design turbine layout was confirmed, a set of photomontages was prepared and made available to the public.

First, a photomontage selection was available within the detailed 36-page project brochure that was distributed to the wider community around the proposed site.

Second, through the Virtual Tour at www.inchamorewindfarm.ie, the public could access the interactive photomontage viewer, which presents 25 viewpoints around the project area so they could judge the visual impact of the project from these selected locations.

Link to the Virtual Exhibition and photomontages:

Inse Mhór Wind Farm - Virtual Public Exhibition | Innovision

Third, a hard copy of the photomontages presenting the 25 viewpoints around the project area from the Virtual Tour were available for viewing at the on-site community engagement clinic for attendees to view and discuss with the project team.

The photomontages are not intended to show the view from every dwelling but to be representative of local, regional and sensitive views in a wide area around the project.

There were requests from a few stakeholders for views from their houses. This is being arranged and once available will be forwarded on as requested.

The number of flashing red lights was highlighted as a concern. It was confirmed that the project must adhere to EASA (EU Aviation Safety Agency rules\Regulations) regarding lighting required along the perimeter of a wind farm project and spacing subject to a safety assessment. Ultimately the EASA is the governing body regarding this matter.

The layout was subject to a detailed noise impact assessment. It was determined that the proposed layout would meet the noise requirements set out in the Wind Energy Development Guidelines 2006 and relevant current guidance and best practice. The noise assessment also involved working with community members to compile background noise levels where noise monitors were placed at local residences surrounding the study area.

At the on-site community engagement clinic, accumulative noise assessment was explained along with the difference between 20-year-old wind turbines, 2006 guidelines and present-day technology, post commissioning noise monitoring, adherence to the planning application and mitigation measures that can be used. These discussions seemed very informative and helpful to attending stakeholders.

A review of the literature relating to health effects associated with wind turbine noise finds no evidence of any significant health effects associated with low frequency noise or infrasound. There is no evidence to support increased likelihood of significant health issues associated with noise-sensitive medical conditions. Amplitude modulation is a rare occurring event that is not possible to predict and can be managed through adjustment of turbine operations where it does occur.

Further details on this can be found in the Noise and Vibration Chapter, Population, Human Health, and Material Assets Chapter and Landscape and Visual Impact Assessment Chapter of the EIAR.

10.6 Impacts associated with potential shadow flicker.

Concerns were raised directly with the project's Community Liaison Officer and with the Team at the on-site local community engagement clinic from a few households about the potential impact of shadow flicker from the turbines. Shadow flicker was considered as part of the Environmental Impact Assessment process. The proposed layout conforms with the Wind Energy Development Guidelines 2006 of a maximum 30 minutes of shadow flicker per day or 30 hours per annum at any sensitive receptor through the management of the turbine operations during periods when there is a potential for shadow flicker to occur.

Any queries around shadow flicker were explained in detail at the on-site community engagement clinic, which seemed to allay concerns.

Further to this, in accordance with emerging best practice and the draft Wind Energy Development Guidelines 2019, the project is committed to the elimination of shadow flicker through the daily management of turbine operations.

Further details on this can be found in the Shadow Flicker Chapter of the EIAR.

10.7 Impact on water supply and quality

Concerns were raised about the potential for impacts on the water table associated with drawdown of water from dewatering of site excavations and on pollution of the water supply from site activities. Many properties have local wells.

After conversations with local stakeholders, the project team has agreed and committed to appoint an independent hydrologist to the project, the CV of whom will be shared. The project hydrologist will be asked to take samples on or near the designated property adjacent to the project in consultation with stakeholders prior to construction to determine a baseline sample, another during the construction period and another sample after up to two years of wind farm operations. Water samples will be sent to an independent lab. The lab name and location will be consulted upon, and we are happy to share results.

Further details on this can be found in the Hydrology and Hydrogeology assessment Chapter of the EIAR.

11 Summary of community engagement in the wider area

All project communications materials and updates that were distributed were uploaded as they became available to www.inchamorewindfarm.ie to include Newsletter 1, Newsletter 2, Newsletter 3, all project update letters, a detailed 36-page project brochure and access to the projects Virtual Tour Exhibition.

All our contact details are available on the project website and contained in all our distributed communications materials.

The above project information was either emailed/delivered/posted to interest groups and local elected representatives to keep them informed and up-to-date throughout the project.

Week 27th March 2023: The detailed 36-page Project Brochure and accompanying letter in Irish and English with an invitation to the Virtual Tour exhibition on the project website was distributed to more than 300 houses to include nearest neighbours adjacent to the project and out to 4 - 5km of the project area to include local public representatives and community groups. This provided an opportunity to hold conversations, listen to feedback and answer questions that arose.

Week 27th March 2023: To keep the local and wider communities informed, a Media Release was sent to local and regional newspapers and radio station journalists, which provided information on the project and where interested parties could access all project information issued to date. This included the recently launched detailed project brochure and the Virtual Tour.

April 2023: Posters were placed in local shops, Post office, local Co-Op store, filling station and in the local pub advertising the project's up and coming 2-day local on-site community engagement clinic.

- Ó Luasa Shop & Post Office Ballymakeera.
- Darygold Co-Op superstoor, Ballymakeera,
- Ó Scanaill's Bar Ballymakeera,
- Luceys Service station Ballymakeera,
- Arus Éamon Mac Suibhne, Cúil Aodh

April 2023: A poster that provided dates, times, and locations for the on-site community engagement clinic was provided and uploaded to Chomharcumann Forbartha Mhuscarai Teo Facebook page.

April 2023: To keep the wider and local communities informed, advertisements were placed in local and regional newspapers providing dates, times, contact details and locations for the community engagement clinic.

April 2023: The week leading up to the community engagement clinic, an invitation letter that provided dates, times, contact details and location of the local 2-day community clinic was delivered to homeowners around the project area and to local elected representatives.

April 20th/21st: A community engagement clinic was held in Arus Éamon Mac Suibhne, Cúil Aodh,, Co Chorcaí. P12 HY57, which is located within the local community adjacent to the proposed project area.

- 4 live within 1km of the project site.
- 6 live in the 1 to 2Km of the project site.
- **4 live within the 2 to 3km of the project site.**
- **5 live 3 to 4km mainly south of the proposed site.**
- **5 were representatives of community organisations.**
- 1 is a landowner.
- **2 live 4 to 5km south of the Inchamore site** and are 1 to 2 km from the proposed Gortyrahilly wind farm project.
- **The remaining attendees were from the wider community.**
- 30 + primary school students from Scoil Chuil Aodha Barr D Inse attended and participated in an informal presentation and Q& A afterwards.

The project team listened to feedback and replied to queries and questions that arose from near neighbours and the wider community and will continue to do so into the future.

12 Infographic summary of engagement with the wider community 2020/2023

Wider Community Engagement:

July/Aug 2020 to 2023

Local elected representatives and interest groups were kept up to date.

March 2023:

The 36-page Project Brochure & letter, including an invite to the project's Virtual Tour Exhibition, was distributed to the wider community.

April Week 10th/17th 2023:

Invite letter to the 2-day Local Community Engagement clinic was distributed to homeowners around the project area and to the local

Keeping the wider Community Informed through the Media:

Week 27th March 2023: Media releases to launch the Project Brochure and Virtual Tour Exhibition and inform the wider community were sent to:

Regional newspapers:
Irish Examiner, The Corkman, Southern Star.

Radio Stations:
Radio Na Gaeltacht, 96FM,

Week 10th April 2023: Posters were placed locally in shops advertising the times and location of the up-and-coming project on-site local community engagement clinic.

A copy of the poster was uploaded to a community Facebook page.

Week 10th April 2023: Advertisements were place in local newspapers to inform the wider community with the times and location of the up-and-coming project on-site local community engagement Clinic:

Regional newspapers:
The Corkman, Southern Star, The Kerryman.

May 2023: Advertisements of a "Notice to Submit into planning" are placed in:

Regional newspapers:
The Kerryman and The Corkman

Please see media report for more details:

Local Interest Groups contacted and kept up to date.

Colaiste Gobnaitan	Post primary School Ballyvourney
Abán Naofa	Primary school Ballyvourney
Scoil Cúil Aodh Barr I'Nse	Primary school Coolea.
Comhaltas Cosanta Chúil Aodh	Development Commitee Coolea
Comharchumann Forbatha Mhuscraí	Muskery Development Regional Development
Bol Cumman Cúil Aodh/Baile Múirne	Road Bowling
Coiste Bailte Slachtmhara.	Tidy Towns Ballyvourney
Comhlacht Tithe Sóisealta & Forbait an tSúláin Teo.	Community Housing Ballyvourney / Coolea
Aisling Geal	Sean-Nós Singing training
Éigse Diarmuid Ó Shúilleabhain.	Shean-Nós singing event
Ionadh Áise	Community Centre
Colaiste Gobnaitan	Post primary School Ballyvourney
Leach Fhinín	Journalist
Coiste Bailte Slachtmhara Cúil Aodh.	Tidy Towns Coolea
Buíon Phíobairí	Pipe Band
Cork Limousine Club	Youth Branch Cattle Breeders
Taispeantas Baile Mhuirne / Cúil Aodha	Ballyvourney / Coolea Agricultural Show
Slí Gaeltachta Mhuscaraí	Beara Breifney Way trail
Peiladóir an tSuláin	Sullane FC
Naomh Abhan Gaa.	Ballyvourney/ Coole Gaa footbal club
Leach Fhinín	Journalist
Coiste Bailte Slachtmhara Cúil Aodh.	Tidy Towns Coolea
Buíon Phíobairí	Pipe Band
Cork Limousine Club	Youth Branch Cattle Breeders

13 Potential enduring benefits of this project

Inse Mhór Wind Farm has the potential to bring significant positive benefit to the local community. The project will create sustainable local employment, it will contribute annual rates to the local authority, provide a local community benefit fund in line with the new Renewable Energy Support Scheme. A Community Benefit Fund will be put in place for the RESS period to provide direct funding to those areas surrounding the project.

13.1 Community Benefit Fund

There are two important government policy developments that will have a bearing on the establishment of future community benefit funds. The first is the Renewable Energy Support Scheme, and its terms and conditions which have been published by the Department of Environment, Climate and Communications. The second is the updated Wind Energy Guidelines, which have yet to be released. Both sets of policies specify government requirements on future community benefit funds for renewable energy projects The project partners confirm that these important policies will be fully adopted and integrated in our design and establishment of the An Inse Mhór Community Benefit Fund.

Based on RESS, for each megawatt hour (MWh) of electricity produced by the wind farm, the project will contribute €2 into a community fund for the RESS period i.e., 15 years of operation. If this project is constructed as currently designed, we estimate that a total of 7.5 million euro will be available in the local area for community funding over the RESS period of 15 years. The above figure is indicative only and will be dependent on the generation capacity of the wind farm which is influenced by a number of factors including:

1. Number of wind turbines.
2. Capacity and availability of energy production of those turbines.
3. Quantity of wind.

The Inse Mhór Wind Farm, if constructed as proposed, has the potential to produce between 85,000 and 100,000 MWh of clean electricity a year. This means that the project could provide between €170,000 to €200,000 per annum to the Community Benefit Fund, depending on the size of the permitted scheme and the wind resource which varies from year to year, for the first 15 years of its operational life.

RESS guidelines for the annual distribution of this fund are as follows:

- A minimum of €1,000 shall be paid to each household located within a distance of a 1 kilometre radius from the nearest turbine.
- A minimum of 40% of the funds shall be paid to not-for-profit community enterprises whose primary focus or aim is the promotion of initiatives towards the delivery of the UN Sustainable Development Goals, in particular Goals 4, 7, 11 and 13, including education, energy efficiency, sustainable energy, and climate action initiatives.
- A maximum of 10% on administration.
- The balance of the funds shall be spent on initiatives successful in the annual application process, as proposed by clubs and societies and similar not-for profit entities, and in respect of Onshore Wind RESS 1 Projects, on "near neighbour payments" for households located outside a 1 kilometre, but within a distance of 2 kilometres from such RESS 1 Project.

How the fund works

The Government's 'Good Practice Principles for Community Benefit Funds' provides full details on how the fund is to be governed and requires local community participation in all decisions regarding how the funding should be used. The fund is open to individuals, and not-for-profit groups such as community and voluntary groups, charities, social enterprises and clubs and societies. High quality administration, local where possible, is also a key expectation. Further details can be found at https://www.gov.ie/en/pub1ication/5f12f-community-projects-and-benefit-funds-ress/

It is envisaged that, should the project receive a positive planning outcome, the project team and the local community will work together to develop an appropriate local structure that would design the Inse Mhór Wind Farm Community Benefit Fund. This group will make decisions on funding allocations and, with the assistance of an administrator, manage the fund, ensuring transparency and good governance.

13.2 Community Investment Opportunity

What is meant by community investment?

The proposed Renewable Energy Support Scheme (RESS) sets out that future renewable energy project proposals enable the possibility for local communities to invest in projects in a meaningful way as a means to directly gain from the financial dividends that a project can provide should it be consented, built, and operated.

In response to this, FuturEnergy Ireland has been working hard with external agencies to develop workable models of community investment. At the time of writing, the details of a Community Investment Scheme continue to be worked through by the Department of Environment, Climate and Communications. We look forward to its publication in due course and promoting this innovative offering to the community.

13.3 Employment Opportunities

According to The Economic Impact of Onshore Wind in Ireland study by KPMG in 2021, 5,130 people nationally are directly supported by onshore wind. To meet the Government's onshore wind target of 8,200 MW by 2030, the industry will need to grow its workforce.

By 2030, total direct and indirect employment is projected at approximately 7,000, an increase of 35%. The proposed development will make a material contribution to employment growth within this sector and provide demand for a wide range of products and services in the local area.

The proposed Inse Mhór Wind Farm brings employment opportunities. At peak construction, up to 25 people would be directly employed. During construction, additional employment will be created in the region through the supply of services and materials to the development. In addition to this, there will also be income generated by local employment from the purchase of local services i.e., travel and lodgings. One long-term, technical employee is also required to run the wind farm. Demand for a wide range of products and services will create indirect employment.

13.4 Local County Council Rates

Annual rates paid to Cork County Council are in the range of €280,000 to €330,000 annually for the lifetime of the project, which is 35 years. An important future contributor to Cork County Council's exchequer funding. This could positively impact local infrastructure and amenities such as roads, public lighting, street cleaning, libraries, fire services and public amenities. on-site recreational amenities and employment.

13.5 Recreation

The developers are committed to working with and building relationships with the local community to discuss a recreational offering if it is of interest to them. If the project progresses to development, we are committed to explore possibilities that would benefit all concerned.

14 Ongoing liaison and contact

A number of phases have been detailed below with differing levels of engagement anticipated depending on the level of project activity. Underpinning all the engagement below will be a dedicated Community Liaison Officer for the project who is contactable by email and mobile phone. These details will remain on the project website, which will be in place for the duration of the project. As the project progresses, regular updates will be posted to this website.

Post planning submission until 6 months pre-construction

During this period of approximately 24 – 36 months, if the proposed project receives a favourable planning decision and has progressed successfully through the next stages of project development, a number of key community-related activities will continue to be progressed. The first is a participatory design process for the Inse Mhór Community Benefit Fund (CBF) that will take place 6 – 8 months prior to any construction work starting.

The team will start a process of reaching out initially to residents within the 2km zone and then slightly further afield, in order to bring together a small group of people who are interested in working on the design and structure of a community-based entity that would ultimately run this Community Benefit Fund. This process will start with a scoping exercise followed by a series of facilitated workshops. It is hoped that representatives involved in existing local development initiatives will be stakeholders in this process and will therefore contribute to this strategy.

The second piece of work is to explore the potential for community investment in the project as outlined in the new Renewable Energy Support Scheme (RESS). This will probably follow on from the CBF workstream and will look at the best ways to promote awareness about this opportunity in advance of it coming online.

Pre- Construction and Construction phase

Six months prior to the commencement of construction we will initiate the set-up of a liaison group. The project will meet with this group on a monthly basis to prepare for the construction phase and monitor activities during construction. This group will develop plans on communicating effectively with residents directly impacted by construction activities and deliveries, especially traffic planning to minimise disruption.

The project will also engage with local suppliers prior to the construction phase in order to outline the future needs and promote the use of local suppliers and service providers wherever possible. This may take the form of a “meet the buyer” event.

Operational Phase

The project will continue with a proposed annual meeting with the liaison group to update them on project performance and address any issues identified. The Community Liaison Officer will also be available throughout this period to directly address any issues raised by local residents. The project website will also be maintained as a method of providing regular, up-to-date information. There will be regular updates on performance of the Community Benefit Fund and regular calls for proposals for funding.

Decommissioning Phase

A year prior to the commencement of decommissioning of the project, the project team will engage with the established liaison group as well as all residents within the 2km zone to outline the decommissioning plan and address any issues identified at that time.

In line with the Government's Code of Practice 2016, the project will publish an annual report of all engagement activities on the project website.

15 Conclusion / Commitment

As outlined throughout this Community Report, there has been very active engagement on the project throughout the planning and design phase to date. Many of our neighbours are supportive of the project, while others wish that the project doesn't proceed. We have achieved much in terms of making the proposed development a better project for all through our engagement.

We fully recognise, however, that development of a proposed wind farm is a long and complex process and that there is ample time to jointly develop our community offerings with our near neighbours and other stakeholders. We will be progressing these throughout the planning adjudication and decision phases as well as in the pre-construction phase should the project receive planning consent.

16 Project literature: newsletters - letters – brochures - other information

All Project newsletters, letters, brochures, online seminar information, other information are accessible from the project website http://www.inchamorewindfarm.ie

Date: September 2020 - Newsletter 1 (Project Introduction) in Irish and English. **Link:** https://inchamorewindfarm.ie/wp-content/uploads/2022/11/Inchamore-A5-Leaflet1_Gaeilge.pdf **Link**: https://inchamorewindfarm.ie/wp-content/uploads/2022/11/Inchamore-A5-Leaflet1_English.pdf
Date: March 2021 - Newsletter 2 in Irish and English. **Link:** https://inchamorewindfarm.ie/wp-content/uploads/2022/11/Inchamore-A5-Leaflet_Irish_March2021.pdf **Link:** https://inchamorewindfarm.ie/wp-content/uploads/2022/11/Inchamore-A5-Leaflet_English_March2021.pdf
Date: March 2021 – Project update Letter sent with Newsletter 2 in Irish and English. **Link:** https://inchamorewindfarm.ie/wp-content/uploads/2023/01/Inchamore-Update-letter-with-Newsletter-2-03032021_Gaeilge.pdf **Link:** https://inchamorewindfarm.ie/wp-content/uploads/2023/01/Inchamore-Update-letter-with-Newsletter-2-03032021_English.pdf
Date: September 2021 - Newsletter 3 in Irish and English. **Link:** https://inchamorewindfarm.ie/wp-content/uploads/2022/11/Inchamore-Irish-Leaflet-3.pdf **Link:** https://inchamorewindfarm.ie/wp-content/uploads/2022/11/Inchamore-English-Leaflet-3.pdf
Date: November 2021 – Project update Letter. **Link:** https://inchamorewindfarm.ie/wp-content/uploads/2022/11/Inchamore-project-update-Letter-November-2021-English-version.pdf
Date: November/December 2021 - Introduction Letter to FuturEnergy Ireland in Irish and English. **Link:** https://inchamorewindfarm.ie/wp-content/uploads/2022/11/Introduction-to-FuturEnergy-Ireland-Letter-Irish-version.pdf **Link**: https://inchamorewindfarm.ie/wp-content/uploads/2022/11/Introduction-to-FuturEnergy-Ireland-Letter-English-version.pdf
Date: March 2022 - Project update Letter in Irish and English. **Link**: https://inchamorewindfarm.ie/wp-content/uploads/2022/11/Inchamore-Project-update-Letter-Irish-version.pdf **Link**: https://inchamorewindfarm.ie/wp-content/uploads/2022/11/Inchamore-Project-update-Letter-English-version.pdf
Date: April/May 2022 - FuturEnergy Ireland sponsored and arranged an Educational Program around "Climate Change" for 5 local National schools around the project area. **(Image located below)*
Date: November 2022 - Project update Letter in Irish and English. **Link**: Inchamore-Project-update-letter-Gaeilge-version-November-2022.pdf (inchamorewindfarm.ie) **Link**: https://inchamorewindfarm.ie/wp-content/uploads/2022/12/Inchamore-Project-update-letter-English-version-November-2022.pdf
Date: November 2022 – Specific Project update Letter in Irish and English sent to local elected representatives. **(Copies located below).*
Date: March 2023 - Detailed Project Brochure with an Introduction in Irish and the main body in English. **Link:** 230328_FINAL_FEI-Inchamore-brochure-for-web.pdf (inchamorewindfarm.ie)
Date: March 2023 - Accompanying letter with detailed Project Brochure in Irish and English. **(Copy located below).*
Date: March 2023 - Accompanying letter and project summary letter that was sent with the detailed project brochure to local elected representatives. **(Copies located below).*
Date: March 2023 – Project Virtual Tour. **Link:** Inse Mhór Wind Farm - Virtual Public Exhibition | Innovision
Date: April 2023 – Copy of Invite letter in Irish and English to the 2-day local on-site community engagement clinic. **(Copy located below).*
Date: April 2023 – Invite letter in Irish and English to the 2-day local on-site community engagement clinic sent to local elected representatives. **(Copy located below).*
Date: April 2023 - Posters in Irish and English displayed in local community settings advertising the 2-day on-site community engagement clinic and uploaded to community Facebook page. **(Copy located below).*
Date: April 2023 - Advertisements placed in local newspapers for the 2-day on-site community engagement clinic. **(Copy located below).*
Date: May 2023 – "Notice to Submit" Letter in Irish and English distributed to the projects nearest neighbours informing them of the project being submitted into planning. **(Copy located below).*

Date: **May 2022** - FuturEnergy Ireland sponsored and arranged an Educational Programme around “Climate Change” for five national schools around the project area.

November 2022 - Specific Project update Letter in Irish and English sent to local elected representatives.

sse Renewables

FuturEnergy Ireland

f.ch. Oifig Choilite,
Crosaire Uí Airtnéide,
Maigh Chromtha,
Co. Chorcaí
P12 XA50

Samhain 2022

[Teachta Dála, Cllr, Insert Name], a chara,

Tá súil agam go bhfuil tú go maith. Táim ag dul i dteagmháil leat le nuashonrúcháin a thabhairt duit maidir le tionscadal Feirme Gaoithe na hInse Móire atá beartaithe do cheantar na hInse Móire laistiar de Chúil Aodha, ar comhfhorbairt i idir FuturEnergy Ireland agus SSE Renewables.

Tá an nuachtlitir seo á scaipeadh ar chónaitheoirí áitiúla in aice leis an tionscadal. Beidh a thuilleadh eolais á chur ar fáil againn agus neart deiseanna chun dul i dteagmháil leis an bhfoireann sna seachtainí agus mionna amach romhainn.

Mar Oifigeach Idirchaidreamh Poiblí, is é an ról atá agam-sa ná a chinntiú go bhfaigheann tusa an t-eolas a theastaíonn uait agus freagraí a sholáthar d'aon cheisteanna a bheadh agat. Mínítear sa liosta 'na chéad chéimeanna eile' na nithe ar féidir leat bheith ag súil leo ina dhiaidh seo:

- **Bróisiúr tionscadail agus taispeántas fíorúil:** I mí Eanáir, déanfaidh mé tionscadal mionsonraithe a sheachadadh bróisiúr chugat, ina mbeidh suíomh Gréasáin nasc chuig taispeántas fíorúil. Tá fuilleach eolais sa bhróisiúr agus sa taispeántas araon ar nós cur i láthair ó speisialtóirí comhshaoil , fótamontáisí ag taispeáint láithreacha na dtuirbíní agus léarscáil leagan amach deiridh na dtuirbíní.
- **Clinicí Rannpháirtíochta Pobail:** Le linn mhí Feabhra, beidh deis ann chun bualadh le foireann tionscadail na hInse Móire agus aon cheisteanna a bheidh agat a chur orthu. A luaithe is a bheidh an t-ionad agus an dáta deimhnithe againn beimid ar ais i dteagmháil leat agus mineoimid duit conas coinne a dhéanamh linn.

Cúpla seachtaine tar éis na Clinicí Rannpháirtíochta Pobail, bheimis ag súil le hiarratas a sheoladh isteach go Comhairle Contae Chorcaí. Bí cinnte go gcuirfimid in iúl duit i bhfad roimh ré nuair a bheidh sé in am againn iarratas le cur isteach.

Idir an dá linn, más mian leat teagmháil a dhéanamh liom chun aon ghné den tionscadal a phlé nó chun cruinniú a shocrú liom, tá mo shonraí teagmhála thíos ar bun. Nó más fearr leat, is féidir leat rphost, glaoch gutháin nó téacs a chur chugam ag iarraidh orm tú a choimeád cothrom le dáta maidir leis an tionscadal. Le teacht ar gach eolas a eisíodh go dtí seo a bhaineann leis an bhFeirm Ghaoithe atá beartaithe don Inse Mhór, lena n-áirítear liosta Ceisteanna Coitianta (CCanna) agus nuachtlitreacha go dtí seo, téigh le do thoil go dtí www.inchamorewindfarm.ie.

Is mise le meas,

Breandán ó Tuama,
Oifigeach Idirchaidreamh Poiblí

Guthán: 087 971 2151
R-phost: inchamore@futurenergyireland.ie

sse Renewables

FuturEnergy Ireland

c/o Coillte Office,
Hartnetts Cross,
Macroom,
Co. Cork
P12 XA50

November 2022

Dear [Deputy, Cllr - Name],

I hope this letter finds you well. I am contacting you with an update on the proposed Inchamore Wind Farm project in the Inchamore, Coolea area, a FuturEnergy Ireland and SSE Renewables co-development.

This newsletter is being distributed to local residents adjacent to the project. We will be offering additional information and plenty of opportunities to engage with the team in the coming weeks and months.

As Community Liaison Officer, my role is to ensure you receive all the information you require and answer any queries that arise. The following 'next steps' list explains what you can expect next:

- **Project brochure and virtual exhibition:** In January, I will deliver a detailed project brochure to you, which will include a website link to a virtual exhibition. Both the brochure and exhibition contain a wealth of information such as presentations from environmental specialists, photomontages showing turbine locations and a proposed final turbine layout map.
- **Community Engagement Clinic:** During February, there will be an opportunity to meet the Inchamore project team and ask any questions you may have. Once we have a location and a date has been confirmed we will be back in touch to let you know how to book an appointment.

A few weeks after the Community Engagement Clinic, we expect to submit a planning application to Cork County Council. Be assured that we will let you know well in advance of when an application is due for submission.

In the meantime, if you would like to contact me to discuss any aspect of the project or to arrange a meeting, please find my details below. Alternatively, you can email, call or text us and request being kept up to date on the project. For all information issued to date about the proposed Inchamore Wind Farm, including a list of Frequently Asked Questions (FAQs) and all previous newsletters, please visit www.inchamorewindfarm.ie.

Yours sincerely,

Brendan Twomey
Community Liaison Officer

Phone: 087 971 2151
Email: inchamore@futurenergyireland.ie

Date: March 2023 - Accompanying letter with detailed Project Brochure in Irish and English.

Inse Mhór Wind Farm

Márta 2023

A Úinéir Tí, a chara,

Thar aon ní eile, tá súil agam go bhfuil tú slán agus sábháilte. Ar eagla nach raibh tú ar an eolas faoi, ba mhaith liom a chur in iúl duit go bhfuil FuturEnergy Ireland (darbh ainm 'Fuinneamh In-Athnuaite Coillte' tráth), i bpáirtnéireacht le SSE Renewables, go gníomhach ag fiosrú deise maidir le feirm ghaoithe a fhorbairt ar an Inse Mhór in iarthar pharóiste Bhaile Bhuirne, Co. Chorcaí.

Tá an tionscadal beartaithe maidir le Feirm Ghaoithe na hInse Móire ag an gcéim anois ina bhfuil na sonraí timpeallachta ar fad bailithe agus sainscagtha chun teacht ar leagan amach beartaithe. Iniata leis an litir seo tá bróisiúr ina leagtar amach go mionsonraithe gach gné den bhforbairt atá beartaithe maidir le Feirm Ghaoithe na hInse Móire. Ina theannta is féidir féachaint ar Thuras Fíorúil ag www.inchamorewindfarm.ie, lena n-áirítear breis sonraí suirbhéireachta agus grianghrafanna den gceantar.

Má tá aon chúnamh uait conas an Turas Fíorúil a úsáid, níl ort ach teagmhail a dhéanamh liom agus cabhróidh mé leat. Dóibh siúd nach bhfuil teacht acu ar an idirlíon, déanaigí teagmháil liom, le bhur dtoil, agus cuirfidh mé freagraí ar fáil ar aon cheisteanna a bheidh agaibh, chomh maith le crua chóipeanna de na sonraí atá sa Turas Fíorúil de réir mar a theastóidh. Mar Oifigeach Idirchaidreamh Pobail, táim sásta cabhrú leat in aon slí gur féidir liom.

D'fhéadfadh ceisteanna a bheith agat tar éis duit an bróisiúr a léamh nó an Turas Fíorúil a thabhairt. Go luath i mí Feabhra beimid ag reáchtáil clinic rannpháirtíochta ar an láthair sa cheantar áitiúil chun deis a thabhairt duit bualadh le foireann an tionscadail agus aon cheisteanna atá agat a chur. Idir an dá linn, má tá aon ghné in aonchor den tionscadal ar mian leat a phlé níos mine, tar i dteagmháil liom le do thoil ar 087 9712151 nó ar Inchamore@futurenergyireland.ie.

Is mise le meas,

Breandán ó Tuama
Oifigeach Idirchaidreamh Pobail

Teileafón díreach: 087 971 2151
R-phost: inchamore@futurenergyireland.ie
Suíomh Gréasáin: www.inchamorewindfarm.ie
Post: Faoi chúram: Breandán ó Tuama, FuturEnergy Ireland, The Rhubicon Centre, Baile an Easpaig, Cathair Chorcaí, Co. Chorcaí, T12 Y275

Inse Mhór Wind Farm

March 2023

Dear Homeowner,

First and foremost, we hope this finds you safe and well. As you may be aware, FuturEnergy Ireland (formerly Coillte Renewable Energy), in partnership with SSE Renewables, is actively exploring a wind farm development opportunity close to An Inse Mhór west of Ballyvourney, Co. Cork.

The proposed Inse Mhór Wind Farm project is at a stage where all the environmental assessment data has been gathered and collated to inform a proposed layout. The brochure enclosed sets out a detailed overview of all aspects of the proposed Inse Mhór Wind Farm development. It is accompanied by an online Virtual Tour to view at www.inchamorewindfarm.ie, which includes survey reports and photomontages of the area

If you require any assistance navigating the Virtual Tour, please do not hesitate to contact me. For those who do not have internet access, please get in touch and I will provide answers to any of your questions, and hard copies of information that features on the Virtual Tour as required. As Community Liaison Officer, I am happy to help in any way I can.

Questions may arise after you have read the brochure enclosed and completed the Virtual Tour. In early February we will hold an on-site engagement clinic in the local area to give you the opportunity to meet the project team and ask any questions you may have. In the meantime, if there are any areas of the project you wish to discuss further, please contact me on 087 971 2151 or at Inchamore@futurenergyireland.ie.

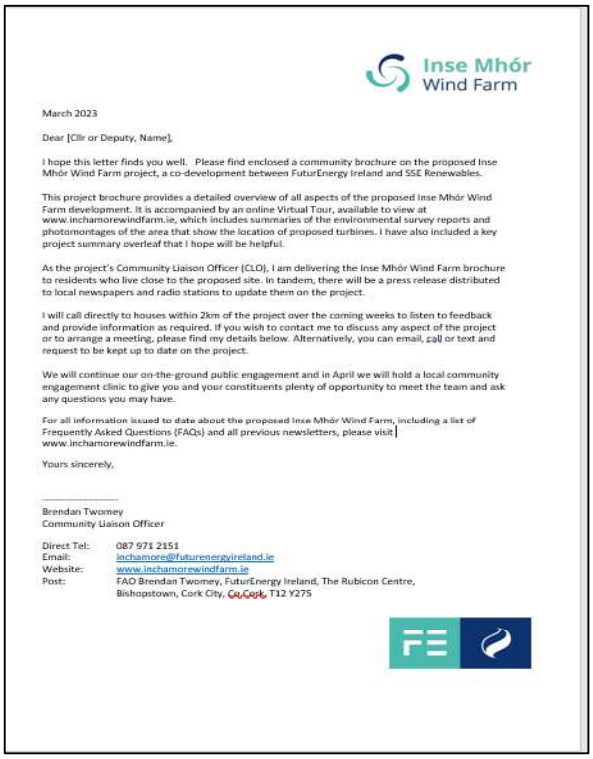
Yours sincerely,

Brendan Twomey
Community Liaison Officer

Direct Tel: 087 971 2151
Email: inchamore@futurenergyireland.ie
Website: www.inchamorewindfarm.ie

Post: FAO Brendan Twomey, FuturEnergy Ireland, The Rhubicon Centre, Bishopstown, Cork City, Co.Cork, T12 Y275

Date: March 2023 – copy of accompanying letter and project summary letter that was sent with the detailed project brochure to local elected representatives.



Inse Mhór Wind Farm

March 2023

Dear [Cllr or Deputy, Name],

I hope this letter finds you well. Please find enclosed a community brochure on the proposed Inse Mhór Wind Farm project, a co-development between FuturEnergy Ireland and SSE Renewables.

This project brochure provides a detailed overview of all aspects of the proposed Inse Mhór Wind Farm development. It is accompanied by an online Virtual Tour, available to view at www.inchamorewindfarm.ie, which includes summaries of the environmental survey reports and photomontages of the area that show the location of proposed turbines. I have also included a key project summary overleaf that I hope will be helpful.

As the project's Community Liaison Officer (CLO), I am delivering the Inse Mhór Wind Farm brochure to residents who live close to the proposed site. In tandem, there will be a press release distributed to local newspapers and radio stations to update them on the project.

I will call directly to houses within 2km of the project over the coming weeks to listen to feedback and provide information as required. If you wish to contact me to discuss any aspect of the project or to arrange a meeting, please find my details below. Alternatively, you can email, call or text and request to be kept up to date on the project.

We will continue our on-the-ground public engagement and in April we will hold a local community engagement clinic to give you and your constituents plenty of opportunity to meet the team and ask any questions you may have.

For all information issued to date about the proposed Inse Mhór Wind Farm, including a list of Frequently Asked Questions (FAQs) and all previous newsletters, please visit www.inchamorewindfarm.ie.

Yours sincerely,

Brendan Twomey
Community Liaison Officer

Direct Tel: 087 971 2151
Email: inchamore@futurenergyireland.ie
Website: www.inchamorewindfarm.ie
Post: FAO Brendan Twomey, FuturEnergy Ireland, The Rubicon Centre, Bishopstown, Cork City, Co.Cork, T12 Y275

Inse Mhór Wind Farm

Márta, 2023

[Cllr or Deputy] [Insert Name], a dhuine uasail,

Tá súil agam go bhfuil tú go maith. Tá bróisiúr pobail faoi iamh atá dírithe ar tionscadal Feirme Gaoithe na hInse Móire, comhfhorbairt idir FuturEnergy Ireland agus SSE Renewables.

Leagtar amach go sonrach sa bhróisiúr tionscadail seo gach gné den bhforbairt atá beartaithe maidir le Feirm Ghaoithe na hInse Móire. Ina theannta is féidir féachaint ar Thuras Fíorúil ag www.inchamorewindfarm.ie, ina bhfuil achoimrí ar thuarascálacha suirbhé timpeallachta agus fótamontáisí den cheantar a thaispeánann suíomh na dtuirbíní atá beartaithe. Tá achoimre eochair-thionscadail faoi iamh chomh maith agus súil agam go mbeidh sé ina chabhair duit.

Mar Oifigeach Idirchaidrimh Pobail (CLO) an tionscadail, tá bróisiúr maidir le Feirm Ghaoithe na hInse Móire á scaipeadh agam ar chónaitheoirí a bhfuil cónaí orthu in aice leis an suíomh atá beartaithe. Ina theannta sin, scaipfear preaseisiúint ar nuachtáin áitiúla agus ar stáisiúin raidió chun iad a choimeád cothrom le dáta maidir leis an tionscadal.

Glaofaidh mé go díreach ar thithe atá laistigh de 2km den tionscadal sna seachtainí atá romhainn chun éisteacht le haiseolas agus faisnéis a sholáthar de réir mar is gá. Más mian leat teagmháil a dhéanamh liom chun aon ghné den tionscadal a phlé nó chun cruinniú a shocrú, tá mo chuid sonraí thíos. Nó más fearr leat, is féidir leat rphost, glaoch gutháin nó téacs a chur chugam ag iarraidh orm tú a choimeád cothrom le dáta maidir leis an tionscadal.

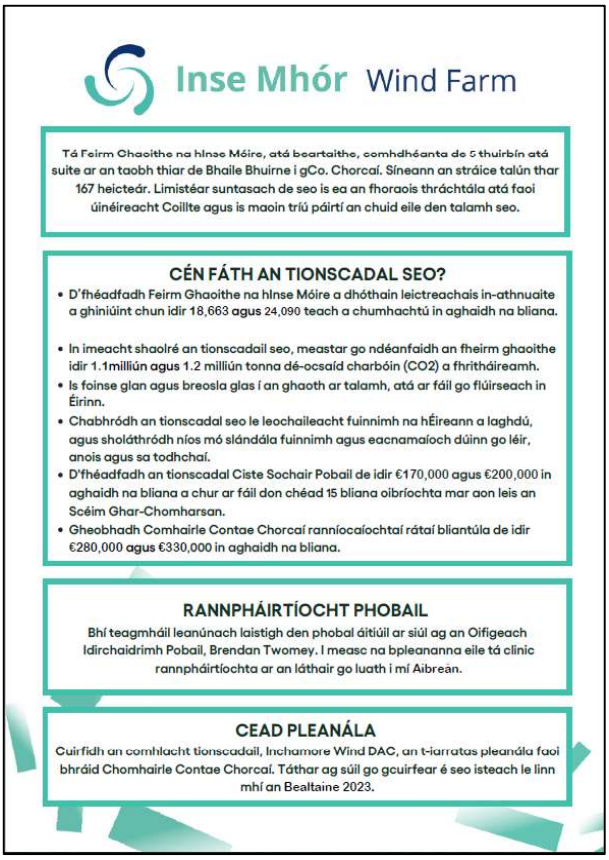
Leanfaimid lenár rannpháirtíocht phoiblí ar an talamh agus i mí Aibreán reáchtálfaimid clinic áitiúil rannpháirtíochta pobail chun neart deiseanna a thabhairt duitse agus do dhaoine sa dáilcheantar bualadh leis an bhfoireann agus aon cheisteanna atá agat a chur.

Le teacht ar gach eolas a eisíodh go dtí seo maidir le Feirm Ghaoithe na hInse Móire atá beartaithe, lena n-áirítear liosta Ceisteanna Coitianta (CCanna) agus gach nuachtlitir roimhe seo, téigh go dtí www.inchamorewindfarm.ie.

Is mise le meas,

Breandán ó Tuama
Oifigeach Idirchaidreamh Pobail

Teileafón díreach: 087 971 2151
R-phost: inchamore@futurenergyireland.ie
Post: Faoi chúram: Breandán ó Tuama, Oifig Choillte, Crosaire Uí Airtnéide, Maigh Chromtha, Co. Chorcaí, P12 XA5



Date: April 2023 - Invite letter in Irish and English to the 2-day local on-site community engagement clinic distributed to the projects nearest neighbours:

Date: April 2023 - Invite Letter to the 2-day local onsite community engagement clinic sent to local elected representatives.

Inse Mhór Wind Farm

Feirm Ghaoithe na hInse Móire
FuturEnergy Ireland
The Rubicon Centre
Baile an Easpaig
Corcaigh, T12 Y275

Aibreán, 2023

[Deputy, Cllr - Name], a dhuine uasail,

Tá súil agam go bhfuil tú go maith.

Ba mhaith linn cuireadh a thabhairt duit chuig Clinic Rannpháirtíochta Pobail maidir le Feirm Ghaoithe na hInse Móire sa halla i gCúil Aodha. Ára Éamonn Mac Suibhne, Cúil Aodha, Maigh Chromtha, Co. Chorcaí, P12 HY57, ar an Déardaoin 20 Aibreán ó 12:00 meán lae go 20:00 agus ar an Aoine 20 Aibreán ó 12:00 meán lae go 18:00. Tá súil againn tú a fheiceail ag an gclinic, áit ar féidir leat bualadh le foireann Fheirm Ghaoithe na hInse Móire go pearsanta, féachaint ar fhaisnéis an tionscadail agus aon cheisteanna atá agat a chur.

Fógrófar an t-eolas comhairliúcháin poiblí thuas go háitiúil agus sna nuachtáin chomh maith sna laethanta amach romhainn.

Munar féidir leat bheith páirteach sa chlinic pearsanta, is féidir leat ríomhphost, glaoch nó téacs a chur chun freagraí a fháil ar do cheisteanna nó iarraidh orm go gcoimeádfaí suas chun dáta tú maidir leis an tionscadal fuinnimh in-athnuaite seo.

Le teacht ar gach eolas a eisíodh go dtí maidir leis an bhFeirm Ghaoithe atá beartaithe don Inse Mhór, lena n-áirítear liosta Ceisteanna Coitianta (CCanna) agus gach nuachtlitir go dtí seo agus nuashonruchain, agus rochtain ar Chur i Láthair Físiúil an tionscadail, tabhair cuairt le do thoil ar www.inchamorewindfarm.ie.

Is mise le meas,

Breandán O Tuama
Oifigeach Idirchaidreamh Pobail

Teileafón díreach: 087 971 2151
R-phost:inchamore@futurenergyireland.ie

Inse Mhór Wind Farm

Inse Mhór Wind Farm
FuturEnergy Ireland
The Rubicon Centre
Bishopstown
Cork, T12 Y275

April 2023

Dear [Deputy, Cllr - Name],

I hope this letter finds you well.

The project team would like to invite you to the Inse Mhór Wind Farm Community Engagement Clinic in Coolea Community Hall, Árus éamonn mac suibhne, Cúil aodha, Maigh chromtha, Co. Chorcaí, P12 HY57. The clinic will run on Thursday April 20 from 12noon to 8pm and Friday April 21 from 12noon to 8pm.

The above public consultation information will also be advertised locally and in the press over the coming days.

We hope to see you at the clinic, where you can meet the Inse Mhór Wind Farm team in person, view the project information and ask any questions you may have. If you cannot attend, you can email, call or text and get your questions answered or request to be kept up to date on this renewable energy project.

For all information issued to date about the proposed Inse Mhór Wind Farm, including a list of Frequently Asked Questions (FAQs), all previous newsletters and updates, and access to the Virtual Exhibition, please visit www.inchamorewindfarm.ie.

Yours sincerely,

Brendan Twomey
Community Liaison Officer

Phone: 087 971 2151
Email: inchamore@futurenergyireland.ie

Date: April 2023 - Posters displayed in local community settings advertising the 2-day local onsite community engagement clinic and uploaded to community Facebook page.

Inse Mhór Wind Farm

CLINIC
RANNPHÁIRTÍOCHTA

Buail lenár bhfoireann go pearsanta,
tuilleadh a fhoghlaim faoin tionscadal
agus do cheisteanna a chur orainn

Aibreán 20th 12-8pm & Aibreán 21st 12-6pm

**Árus éamonn mac suibhne, Cúil aodha,
Maigh chromtha, Co. Chorcaí, P12 HY57**

R-phost: inchamore@futurenergyireland.ie
Glaoigh ar: Brendan Twomey, Oifigeach
Idirchaidreamh Pobail, on 087 971 2151

COMMUNITY
ENGAGEMENT CLINIC

Meet the team in person,
learn more about the project
and ask your questions

April 20th 12-8pm & April 21st 12-6pm

**Árus éamonn mac suibhne, Cúil aodha,
Maigh chromtha, Co. Chorcaí, P12 HY57**

Email: inchamore@futurenergyireland.ie
Call: Community Liaison Officer
Brendan Twomey on 087 971 2151

Ireland FuturEnergy

sse Renewables

Date: **April 2023** - Advertisement placed in local newspapers promoting the 2-day local onsite community engagement clinic:

Inse Mhór Wind Farm

Inse Mhór Wind Farm is a proposed co-development between FuturEnergy Ireland and SSE Renewables located near Ballyvourney and Coolea in Co. Cork.

You are invited to meet the team, learn more about the project and ask your questions.

Community Engagement Clinics

April 20th 12-8pm & April 21st 12-6pm
Árus éamonn mac suibhne, Cúil aodha,
Maigh chromtha, Co. Chorcaí, P12 HY57

Email: inchamore@futurenergyireland.ie
Call: Community Liaison Officer
Brendan Twomey on 087 971 2151
Text: 087 971 2151 and request a call back

We look forward to hearing from you

For more information on the project, please visit
www.inchamorewindfarm.ie

Ireland FuturEnergy

sse Renewables

Date: May 2023 – Copy of a “Notice to submit” Letter in Irish and English distributed to the projects nearest neighbours informing them of the project being submitted into planning.

Inse Mhór Wind Farm

Bealtaine 2023

A Uinéir Tí, a chara,

Tá súil agam go bhfuil tú go maith.

Tá fógra le hiarratas pleanála a chur isteach le haghaidh Feirm Ghaoithe na Inse Móire atá beartaithe curtha sa nuachtán 'Réalt an Deiscirt/The Southern Star'. Feicfidh tú chomh maith fógraí pleanála á gcur suas agus á dtaispeáint timpeall shuíomh an tionscadail don chomhfhorbairt seo de chuid FuturEnergy Ireland agus SSE Renewables. Táthar ag súil go gcuirfidh Inchamore Wind DAC an t-iarratas isteach go Comhairle Contae Chorcaí go luath.

Tá iarratas pleanála á chur isteach go Comhairle Contae Chorcaí maidir leis na gnéithe den tionscadal atá laistigh de bhailte fearainn na hInse Móire, na Millíní agus Dhoirín Alainn, Co. Chorcaí. Cuimsíonn an fhorbairt seo 167.3 ha den fhorbairt iomlán (170.1 ha) lena n-áirítear cúig (5 Uimhir) tuirbín gaoithe, cáblaí faoi thalamh, bóithre rochtana suímh agus na hoibreacha gaolmhara go léir a bhfuil cead pleanála á lorg ina leith. Tá Tuarascáil ar Mheasúnú Tionchair Timpeallachta agus Ráiteas Tionchair Natura ag gabháil leis an iarratas ar leith seo.

Cuirfear iarratas pleanála isteach freisin go Comhairle Contae Chiarraí maidir leis na gnéithe den tionscadal atá laistigh de bhailte fearainn Dhoire Aimhréidh agus Choimín an Bhroic, Co. Chiarraí. Cuimsíonn an fhorbairt seo 2.8 ha den fhorbairt iomlán (170.1 ha) agus áirítear léi oibreacha cáblaithe, oibreacha uasghrádaithe bóthair agus bealach isteach chuig an suíomh ón N22 a bhfuil cead pleanála á lorg ina leith. Cuirfear an fógra chun an t-iarratas pleanála seo a chur isteach i nuachtán an *Kerryman*, sula gcuirfear an t-iarratas faoi bhráid Chomhairle Contae Chiarraí go luath.

Nuair a bheidh an t-iarratas pleanála faighte agus bailíochtaithe ag Comhairle Contae Chorcaí agus ag Comhairle Contae Chiarraí, déanfar an tsraith iomlán de dhoiciméid an iarratais phleanála a uaslódáil agus beidh siad ar fáil le féachaint orthu ar www.inchamorewindfarm.ie chomh maith le www.corkcoco.ie agus www.kerrycoco.ie . Beidh cóip chrua den iarratas pleanála ar fáil chomh maith in oifigí Chomhairle Contae Chorcaí agus in oifigí Chomhairle Contae Chiarraí.

Tá treoir ar rannpháirtíocht an phobail ar shuíomhanna Gréasáin Chomhairle Contae Chorcaí agus Chomhairle Contae Chiarraí araon. Féadfaidh aon duine nó comhlacht a dtuairimí a thabhairt ar an tionscadal feirme ghaoithe, le linn an ama go mbeidh na doiciméid ar fáil le féachaint orthu, tar éis don iarratas a bheith curtha isteach. Is é an fráma ama chun tuairimí a thabhairt ná cúig seachtaine.

Coimeádfaidh mé suas chun dáta tú faoi aon nuacht eile.

Le dea-mhéin agus le meas,

Breandán ó Tuama
Oifigeach Idirchaidreamh Pobail

Teileafón díreach: 087 971 2151
R-phost: inchamore@futurenergyireland.ie
Suíomh Gréasáin: www.inchamorewindfarm.ie
Post: Faoi chúram: Breandán ó Tuama, FuturEnergy Ireland, The Rhubicon Centre, Baile an Easpaig, Cathair Chorcaí, Co. Chorcaí, T12 Y275

Inse Mhór Wind Farm

May 2023

Dear Homeowner

I hope this letter finds you well.

A notice to submit a planning application for the proposed Inse Mhór Wind Farm has been placed in the Southern Star. You will also see planning notices being erected and displayed around the project site for this FuturEnergy Ireland and SSE Renewables co-development. The application is expected to be submitted by Inchamore Wind DAC to Cork County Council shortly.

A planning application is being lodged with Cork County Council in relation to the elements of the project that are within the townlands of Inchamore, Mileeny and Dereenaling, Co. Cork. This development comprises 167.3 ha of the overall development (170.1 ha) and includes five (5 No.) wind turbines, underground cabling, site access roads and all associated works for which planning permission is being sought. This separate application is accompanied by an Environmental Impact Assessment Report and a Natura Impact Statement.

A planning application will also be lodged with Kerry County Council in relation to the elements of the project that are within the townlands of Derryreag and Cummeenavrick, Co. Kerry. This development comprises 2.8 ha of the overall development (170.1 ha) and includes cabling works, road upgrade works and site entrance off the N22 for which planning permission is being sought. The notice to submit this planning application will be placed within the Kerryman newspaper prior to the application being lodged with Kerry County Council shortly.

When Cork County Council and Kerry County Council have received and validated the planning applications, the full suite of planning application documentation, will be uploaded and available to view at www.inchamorewindfarm.ie and at www.corkcoco.ie and www.kerrycoco.ie. A hard copy of the planning application will also be available at the offices of both Cork County Council and Kerry County Council.

Both Cork County Council and Kerry County Council websites have guidance on public participation. Any person or body may make observations on the project wind farm, while the documents are available for viewing, after the application has been submitted. The timeframe to make an observation is five weeks.

I will keep you up to date with any further news.

Kind regards,

Brendan Twomey
Community Liaison Officer

Direct Tel: 087 971 2151
Email: inchamore@futurenergyireland.ie
Website: www.inchamorewindfarm.ie
Post: FAO Brendan Twomey, FuturEnergy Ireland, The Rubicon Centre, Bishopstown, Cork City, Co.Cork, T12 Y275

Inchamore Wind Farm

Appendix 2.2 – Wind Farms within 20 km of the Development

Wind Farm	Status	No. of Turbines	Approximate Distance to the Site Boundary	Direction from the Development
Barnastooka	Operational	14	7.50 km	South-West
Caherdowney	Operational	4	10.19 km	North-East
Carriganimmy Macroom (Bawnmore)	Operational	6	15.48 km	North-East
Cleanrath (11 consented, nine constructed and operational)	Operational	9	9.93 km	South-East
Clydaghroe, Clonkeen	Operational	4	6.05 km	North-East
Coolea	Permitted	1	3.17 km	South-West
Coolknoohil Inchee	Permitted	2	3.94 km	South-West
Coolknoohil Kilgarvan (Everwind)	Operational	11	4.40 km	South-West
Coomacheo	Operational	15	9.02 km	North-East
Coomagearlahy Kilgarvan	Operational	15	2.70 km	South-West
Cummeennabuddoge	Pre-Planning/ Concept Stage	17	4.72 km	North-East
Cummeennabuddoge, Clydaghroe, Cloonkeen	Operational	2	7.23 km	North-East
Curraglass	Permitted	7	14.97 km	South-West
Derragh	Operational	6	7.52 km	South
Drishane Millstreet (Curragh Mountain/Coomacheo 2)	Operational	8	10.47 km	North-East
Glanlee I (Midas)	Operational	6	4.87 km	South-West
Gneeves	Opertional	11	10.16 km	North-East
Gneeves Millstreet	Permitted	4	10.20 km	North-East
Gortnakilla, Clonkeen Killarney	Permitted	4	1.87 km	West
Gortyrahilly	Proposed/SID project pending decision from An Bord Pleanála	14	4.95 km	South
Grousemount	Operational	24	7.38 km	South-West
Inchee, Poulbatha & Foilgreana (Midas)	Operational	6	3.30 km	South-West
Inchincoosh Kilgarvan	Operational	6	4.51 km	West
Knocknamork	Permitted	7	4.42 km	North-East
Rosseightragh, Lettercannon, Kilgarvan	Operational	7	5.23 km	South-West
Shehy More	Operational	11	15.71 km	South
Sillahertane Kilgarvan	Operational	10	7.03 km	South-West

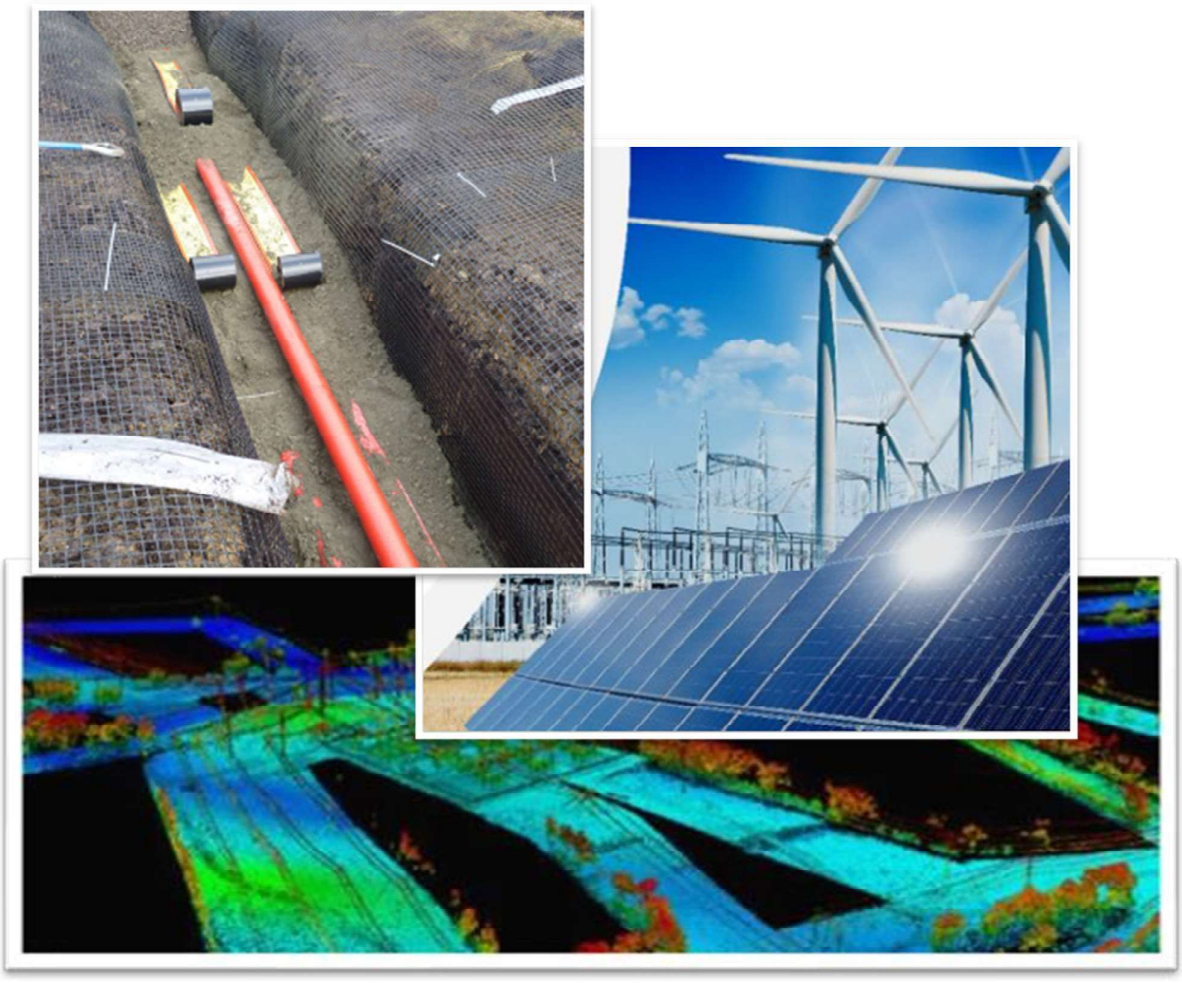
Inchamore WF - 38kV Grid Connection

Route Summary & Joint Bay Locations
(28.10.22)

Section From	*Section To*	*Section Length*	*Bonding Arrangement*	*No. of Watercourses*	*Watercourses*	*No. of Culverts*	*No. of Service Crossings*	*Comments*
Ballyvouskill SS	JB-01	1098.7	Bonded Both Ends			-	1	*110kV Cable crossing and laid in parallel to Garrow UGC*
JB-1	JB-2	1039.6	Bonded Both Ends			9		*38kV laid in parallel to Garrow UGC*
JB-2	JB-3	1102.2	Bonded Both Ends			7		*38kV laid in parallel to Garrow UGC*
JB-3	JB-4	1096.5	Bonded Both Ends			12		*38kV laid in parallel to Garrow UGC*
JB-4	JB-5	1031.6	Bonded Both Ends	1	Str. 1 - Valley	10	2	*38kV laid in parallel to 20kV UGC, 20kV UG Cable Crossing, 1x HDD Crossing*
JB-5	JB-6	1098.9	Bonded Both Ends			11	2	*38kV laid in parallel to 20kV UGC, 20kV UG Cable Crossing, 38kV laid in parallel to 38kV UGC, 38kV UG Cable Crossing*
JB-6	JB-7	1090.9	Bonded Both Ends			-		
JB-7	JB-8	1059.0	Bonded Both Ends			4		
JB-8	JB-9	1174.3	Bonded Both Ends	2	Str.2, Str.3	10		
JB-9	JB-10	1015.2	Bonded Both Ends			8		
JB-10	JB-11	1158.0	Bonded Both Ends			11		
JB-11	JB-12	1182.9	Bonded Both Ends			9		
JB-12	JB-13	1093.4	Bonded Both Ends			9	1	*38kV UG Cable Crossing, 38kV laid in parallel to 38kV UGC*
JB-13	JB-14	1163.3	Bonded Both Ends			3		*38kV laid in parallel to 38kV UGC*
JB-14	JB-15	576.6	Bonded Both Ends			2		*38kV laid in parallel to 38kV UGC*
JB-15	JB-16	1160.0	Bonded Both Ends			2		*N22 HDD*
JB-16	JB-17	1122.0	Bonded Both Ends			5		
JB-17	JB-18	1183.6	Bonded Both Ends			1		
JB-18	WF SS	292.0	Bonded Both Ends			-		
	Total:	**18,348**		**3**		**113**	**6**	

Outline Construction Methodology

Inchamore Wind Farm 38kV
Grid Connection



Report Ref: 05934-R01-03

Client: Inchamore Wind DAC

Revision:	Author:	Checked:	Date:	Notes:
00	POS	DB	14.11.22	Issued for Planning
01	POS	DB	22.11.22	Issued for Planning
02	POS	DB	09.12.22	Correction to Typo Error
03	POS	DB	17.04.23	Revised as per Clients Comments

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1.0 Introduction

The purpose of this document is to outline and explain the construction techniques and methodologies which will be implemented during construction of the Inchamore Wind Farm 38kV grid connection to the existing Ballyvouskil 220kV substation. The grid connection will consist entirely of underground cabling (UGC) with the majority of the UGC to be installed within internal forestry road networks.

The UGC works will consist of the installation of 4 No. ducts in an excavated trench to accommodate 3 No. power cables and 1 No. fibre communications cable to allow communications between the Inchamore Wind Farm Substation and Ballyvouskil 220kV substation.

This document is intended to be used as an aid to understand the methodologies to be employed during construction and should be read in conjunction with all other specialist reports which accompany the planning application. In addition, this document is in outline form only and will be revised and updated prior to the commencement of any construction activities, detailed Method Statements will be prepared in respect of each aspect of the development.

2.0 38kV Underground Cable Route

The UGC route is approximately 19.872km in length and traverse in an east to south easterly direction from the existing Ballyvouskil 220kV substation to the Inchamore Wind Farm substation location utilising public local road networks, existing access tracks and private forestry access tracks.

The cable location will take into consideration Cork County Council, Kerry County Council and all other relevant stakeholders' requirements. Installation of the cable will consider all environmental protection measures forming part of the planning application for the development at Inchamore wind farm and accompanying technical reports.

Figure 1 outlines the UGC route, with the total length of each road type detailed in Table 1.

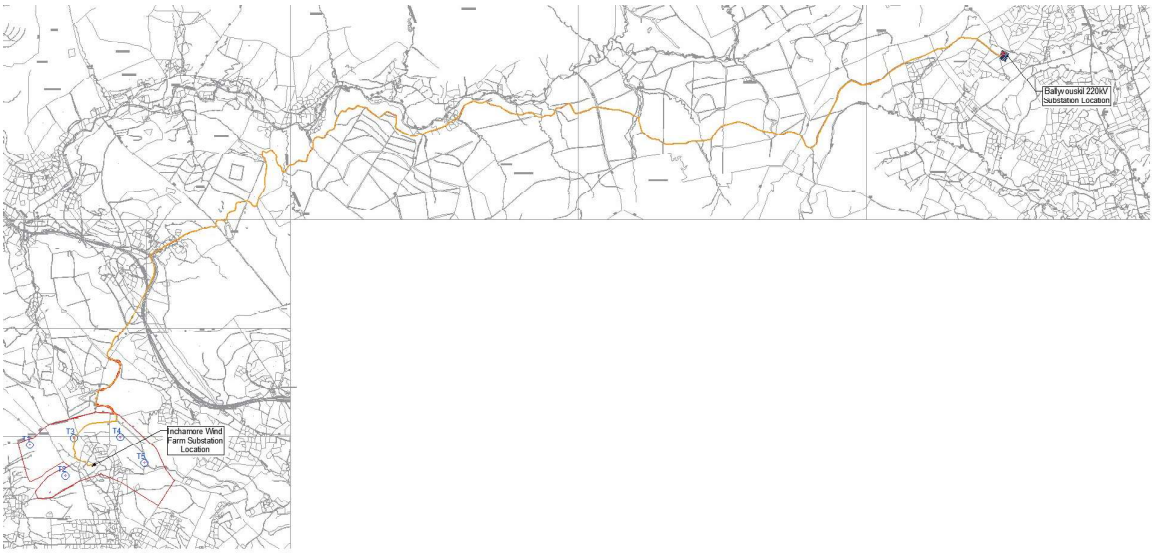


Figure 1 - Grid Connection Route Layout Plan

Table 1 – Approximate UGC Route Location of Preliminary Design:	
Wind Farm Site/Forestry Roads	**ESB Access Track**
18.8km	1km

Table 1: Inchamore Wind Farm to Ballyvouskil 220kV Substation – UGC Route Location Summary

Table 2 separates the UGC route into a number of sections and describes the specific construction requirements of each individual section along with assessment of access routes to the work areas.

Table 2 - Summary of Grid Connection Design Route	
Section	**Description**
Section 1 UGC	**UGC from Ballyvouskil 220kV substation to N22 Road HDD Crossing (Chainage 17150m)** The underground cable route initially begins within the townland of Caherdowney, Co. Cork where from Ballyvouskil 220kV substation compound, the UGC departs the substation on the north western boundary, converging onto a permanent access track to be constructed as part of this development within agricultural lands and traverses on an upward trajectory for approximately 950m prior to entering into forested plantations propertied by Coillte. The UGC will establish a route for the majority within existing forestry access tracks and will traverse adjacent to existing ESB utility infrastructure that reside within these forestry tracks. The UGC remains within these tracks for the majority of the grid connection route, carrying for an approximate length of 15.7km whilst sporadically crossing between Cork county and Kerry county boundaries through denoted townlands Cummeenabuddogue, Clydaroe, Knocknagowen, Glashacormick across this plantation coverage. Subsequent to crossing through the forestry properties, the UGC will leave the forestry access track on the south westerly side within the townland of Cummeenavrick, Co. Kerry and converges onto first, a section of redundant regional roadway, adjacent to the N22 National carriageway prior to accessing consented third-party property (KY30186F). The UGC will traverse this parcel within a permanent access road to be constructed as part of this development. This access road entails a 4m wide track with load bearing capacity of 10 tonne to allow for Horizontal Directional Drilling (HDD) activities commence to drill beneath approximately 70m of the N22 carriageway with the remainder of the drill shot equating to approximately 580m. ***Features*** ***Section 1 contains 15 No. joint bays***. Joint bays will be located below ground and finished/reinstated as per Forestry Road Manual (Guidelines for the design, construction and management of forest road) and as per private landowner reinstatement requirements. Joint bays will have associated communication chambers which will have a surface access hatch which will match existing ground levels.

- Joint Bay 01 (JB-01) will be located within a permanent access track at *Chainage – 1100m*
- Joint Bay 02 (JB-02) will be located south west of JB-01 positioning the joint bay within a widened verge to the existing forestry track. *[Chainage – 2150m]*
- Joint Bay 03 (JB-03) will be located south west of JB-02 positioning the joint bay within a widened verge to the existing forestry track. *[Chainage – 3250m]*
- Joint Bay 04 (JB-04) will be located south west of JB-03 positioning the joint bay within a widened verge to the existing forestry track *[Chainage – 4350m]*
- Joint Bay 05 (JB-05) will be located south west of JB-04 positioning the joint bay within a widened verge to the existing forestry track *[Chainage – 5400m]*
- Joint Bay 06 (JB-06) will be located north west of JB-05 positioning the joint bay within a widened verge to the existing forestry track. *[Chainage – 6500m]*
- Joint Bay 07 (JB-07) will be located south west of JB-06 positioning the joint bay at receptor location for the HDD activities required to cross stream 1. *[Chainage – 7550m]*
- Joint Bay 08 (JB-08) will be located north west of JB-07 positioning the joint bay within a widened verge to the existing forestry track. *[Chainage – 8650m]*
- Joint Bay 09 (JB-09) will be located north west of JB-08 positioning the joint bay within a widened verge to the existing forestry track. *[Chainage – 9800m]*
- Joint Bay 10 (JB-10) will be located west of JB-09 positioning the joint bay within a widened verge to the existing forestry track. *[Chainage –10800m]*
- Joint Bay 11 (JB-11) will be located west of JB-10 positioning the joint bay within a widened verge to the existing forestry track. *[Chainage – 11950m]*
- Joint Bay 12 (JB-12) will be located west of JB-11 positioning the joint bay within a widened verge to the existing forestry track. *[Chainage – 13150m]*
- Joint Bay 13 (JB-13) will be located south of JB-12 positioning the joint bay within a widened verge to the existing forestry track. *[Chainage – 14250m]*
- Joint Bay 14 (JB-14) will be located north west of JB-13 positioning the joint bay within a widened verge to the existing forestry track. *[Chainage – 15400m]*
- Joint Bay 15 (JB-15) will be located south west of JB-14, within a new permanent access road to be constructed to allow HDD activities on the eastern side of the N22 *[Chainage – 16000m]*
- Joint Bay 16 (JB-16) will be located south west of JB-15 positioning the joint bay within a widened verge to the existing forestry track. *[Chainage – 17150m]*

Section 1 has 3 No. watercourse crossings:

- Stream 1 has been surveyed with the result of insufficient clearance existing within this structure. To cross this stream, it will be required to utilise a Horizontal Directional Drill within the existing forestry track to cross beneath with a satisfactory clearance to the waterway. *[Chainage 5200m]*
- Stream 2 has been surveyed with the result of insufficient clearance existing within this structure. To cross this culvert, it will be required to utilise a Horizontal Directional Drill within the existing forestry track to cross beneath with a satisfactory clearance to the waterway. *[Chainage 9200m]*
- Stream 3 has been surveyed with the result of insufficient clearance existing within this structure. To cross this culvert, it will be required to utilise a Horizontal Directional Drill within

	the existing forestry track to cross beneath with a satisfactory clearance to the waterway. *[Chainage 9750m]* ***Section 1 will require 6 No. service crossings:*** Existing ESBN infrastructure will be encountered and the crossing schedules will be prepared at detailed design to identify under or over methods to cross these existing buried services. ***Section 1 has 107 No. culvert crossings:*** See section 8 of this report for Culvert crossing methods and drawings 05934-DR-217-P1 & 05934-DR-218-P1 for further details.
Section 2 UGC	**N22 Road HDD Crossing to Inchamore Windfarm site location (Chainage 19850m)** The receptor pit from the drill shot will be located, again within Folio KY30186F on the opposite side of the N22 carriageway within the townland of Derryreag. From here the UGC route travels south within an existing forestry track through lands propertied by Coillte for approx. 1500m. The UGC will establish the remainder of the route within the designation of county Cork, traveling through the townland of Derreenaling and Inchamore, mainly southwest for a further approx. 1200m where the UGC route enters into the proposed onsite 38kV substation for Inchamore Wind Farm. ***Features*** ***Section 2 contains 2 No. joint bays***. Joint bays will be located below ground and finished/reinstated as per Forestry Road Manual (Guidelines for the design, construction and management of forest road), finished/reinstated to the required roads specification and reinstated to landowner preference where applicable. Joint bays will have associated communication chambers which will have a surface access hatch which will match existing ground levels. • Joint Bay 17 (JB-17) will be located south of JB-16 positioning the joint bay within a widened verge to the existing forestry track. *[Chainage – 18250m]* • Joint Bay 18 (JB-18) will be located south of JB-17, within consented third-party lands *[Chainage – 19400m]* ***Section 2 has 6 No. culvert crossings:*** See section 8 of this report for Culvert crossing methods and drawings 05934-DR-217-P1 & 05934-DR-218-P1 for further details.

3.0 Access Routes to Work Area

The majority of the underground cable route will be installed within existing forestry access track networks and therefore will be accessed via the existing road network. Where the cable route is located on private lands, contractor(s) will be required to utilise the local public road network in the vicinity of the work area and from there utilise private access tracks, where appropriate.

A detailed Traffic Management Plan has been prepared as part of the EIAR (Environmental Impact Assessment Report). Some work areas will require a road closure where it is not possible to safely implement a Stop/Go system. Where road closures are necessary, a suitable diversion will be implemented using appropriate signage, following consultation with Cork County Council

Careful and considered local consultation will be carried out, to minimise the amount of disturbance caused during works. Prior to the commencement of construction, the contractor will assess all access routes and determine any additional access requirements which will be incorporated as part of the method statement. All plant and equipment employed during the works (e.g. diggers, tracked machines, footwear etc.) will be inspected prior to arrival on site and on leaving site and cleaned where necessary to prevent the spread of invasive aquatic / riparian species.

4.0 Traffic Management

Traffic management and road signage will be in accordance with the Department of Transport: Traffic Signs Manual - Chapter 8: Temporary Traffic Measures and Signs for Road Works and in agreement with both Cork County Council and Kerry County Council. All work on public roads will be subject to the approval of a road opening license application by both Cork County Council and Kerry County Council. The contractor will submit the traffic management plan for inclusion as part of the road opening applications. Where road widths allow, the UGC installation works will allow for one side of the road to be open to traffic at all times by means of a 'Stop/Go' type traffic management system, where a minimum 2.5m roadway will be maintained at all times.

Where it is not possible to implement a 'Stop/Go' system a full road closure will be required. Temporary traffic signals will be implemented to allow road users safely pass through the works area by channelling them onto the open side of the road. Typically, the UGC will be installed in 150m sections, and no more than 100m will be excavated without the majority of the previous section being reinstated. Where the construction requires the crossing of a road, works on one carriageway will be completed before the second carriageway is opened, to maintain traffic flows.

All construction vehicles will be parked within the works area so as not to cause additional obstruction or inconvenience to road users or residents. The traffic signals will be in place prior to the works commencing and will remain in place until after the works are completed. The public road will be checked regularly and maintained free of mud and debris. Road sweeping will be carried out as appropriate to ensure construction traffic does not adversely affect the local road condition.

In the event of emergency; steel plates, which will be available on site, can be put in place across the excavation to allow traffic to flow on both sides of the road. All traffic management measures will comply with those outlined within the accompanying EIAR (Environmental Impact Assessment Report) and will be incorporated into a detailed Traffic Management Plan to be prepared, in consultation with both Cork County Council and Kerry County Council, prior to the commencement of UGC construction.

5.0 Road Opening Licence

The UG grid connection works will require a road opening licence under Section 254 of the Planning and Development Act 2000-2015 from both Cork County Council and Kerry County Council. A Traffic Management Plan (TMP) will be agreed with both Cork County Council and Kerry County Council prior to the commencement of the development. The TMP will outline the location of traffic management signage, together with the location of any necessary road closures and the routing of appropriate diversions. Where diversions are required, these will be agreed with both Cork County Council and Kerry County Council in advance of the preparation of the Traffic Management Plan (TMP).

6.0 UGC Construction Methodology

The UGC will consist of 3 No. 110mm diameter HDPE power cable ducts and 1 No. 110mm diameter HDPE communications duct to be installed in an excavated trench, typically 600mm wide by 1,220mm deep, with variations on this design to adapt to bridge crossings, service crossings and watercourse crossings, etc. The power cable ducts will accommodate 1 No. power cables per duct. The communications duct will accommodate a fibre cable to allow communications between the Inchamore Wind Farm substation and Ballyvouskil 220kV substation. The ducts will be installed, the trench reinstated in accordance with the Forestry Road Manual (Guidelines for the design, construction and management of forest road), private third-party landowners and both Cork, Kerry County Council specifications. Once all are satisfied, then the electrical cabling/fibre cable is pulled through the installed ducts in approximately 1000/1200m sections. Construction method statements and templates will be implemented to ensure that the UGC is installed in accordance with the correct requirements, materials, and specifications of ESBN and EirGrid.

6.1 Trenching Methodology

The following section outlines the methodology to be followed during trenching works:-

- The Contractor, and their appointed Site Manager, will prepare a targeted Method Statement concisely outlining the construction methodology and incorporating all mitigation and control measures included within the EIAR and as required by planning conditions where relevant;
- All existing underground services along the UGC route shall be confirmed prior to the commencement of construction works;
- At watercourse crossings, the contractor will be required to adhere to the environmental control measures outlined within the EIAR, the detailed Construction Environmental Management Plan (CEMP) and best practice construction methodologies;
- Where the cable route intersects with culverts, the culvert will remain in place (where possible) and the ducting will be installed either above or below the culvert to provide minimum separation distances in accordance with ESB and Irish Water specifications;
- Traffic management measures will be implemented in accordance with those included in the EIAR, and a detailed Traffic Management Plan will be prepared and agreed with both Cork, Kerry County Councils;
- Excavated material will be temporarily stockpiled onsite for re-use during reinstatement. Stockpiles will be restricted to less than 2m in height. Stockpiles will be located a minimum of 50m from surface water features and all stockpiling locations will be subject to approval by the Site Manager and Project Ecological Clerk of Works (ECoW);
- Excavated material shall be employed to backfill the trench where appropriate and any surplus material will be transported to the on-site borrow pit;

- Any earthen (sod) banks to be excavated will be carefully opened with the surface sods being stored separately and maintained for use during reinstatement;
- Where required, grass will be reinstated by either seeding or by replacing with grass turves;
- No more than a 100m section of trench will be opened at any one time. The second 100m will only be excavated once the majority of reinstatement has been completed on the first;
- The excavation, installation and reinstatement process will take on average of 1 no. day to complete a 100m section;
- Where the cable is being installed in a roadway, temporary reinstatement may be provided to allow larger sections of road to be permanently reinstated together;
- Following the installation of ducting, pulling the cable will take approximately 1 no. day between each joint bay, with the jointing of cables taking approximately 1 week per joint bay location.

Figure 2 - Typical 38kV Underground Duct Installation

6.2 Ducting Installation Methodology

For the trenching and ducting works the following step by step methodology will apply:

1. Grade, smooth and trim trench floor when the required 1220mm depth and 600mm width have been obtained.
2. Place bedding layer of Cement Bound Granular Mixture B (CBGM B) material in accordance with the specification and compact it so that the compacted thickness is as per the drawings.
3. Lay the bottom row of ducts in trefoil formation as detailed on the design drawings. Use spacers as appropriate to establish horizontal duct spacing. Fit a secure cap / bung to the end of each duct run to prevent the ingress of dirt or water.
4. Carefully surround and cover ducts with CBGM B in accordance with the design drawings and specifications and thoroughly compact without damaging ducts.
5. Place cable protection strips on compacted CBGM B directly over the ducts.
6. Lay the top row of ducts onto the freshly compacted CBGM B including the cable protection strips above the bottom row of ducts. Place a secure cap at the end of each duct to prevent the ingress of dirt or water.

7. Carefully surround and cover ducts with CBGM B material in accordance with the drawings and thoroughly compact without damaging ducts.
8. Place red cable protection strip on top of compacted CBGM B over each set of ducts as shown on the drawings.
9. Place and thoroughly compact CBGM B material or Clause 804 backfill or soil backfill as specified and place warning tape at the depth shown on the drawings.
10. For concrete and asphalt/bitmac road sections, carry out immediate permanent reinstatement in accordance with the specification and to the approval of the local authority and/or private landowners, unless otherwise agreed with local authorities *(*Figure 3*).*
11. For unsurfaced/grass sections, backfill with suitable excavated material to ground level leaving at least 100 mm topsoil or match existing level at the top to allow for seeding or replace turves as per the specification of the local authority or landowner *(*Figure 4*).*
12. Clean and test the ducts in accordance with the specification by pulling through a brush and mandrel. Install 12 mm polypropylene draw rope in each duct and seal all ducts using robust duct end seals fitted with rope attachment eyes in preparation for cable installation at a later date. All the works should be witnessed by ESBN Clerk of Works (CoW) as required.

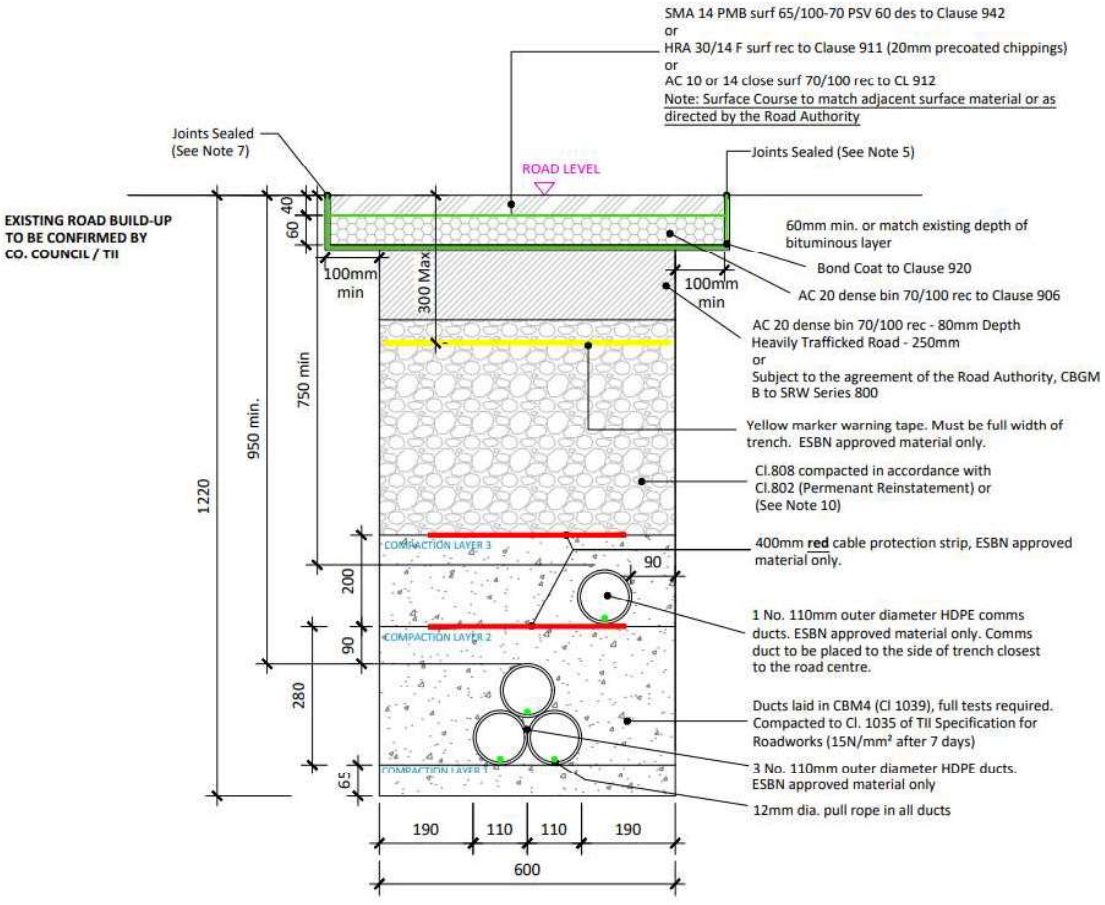


Figure 3 - Typical Trench in Roadway

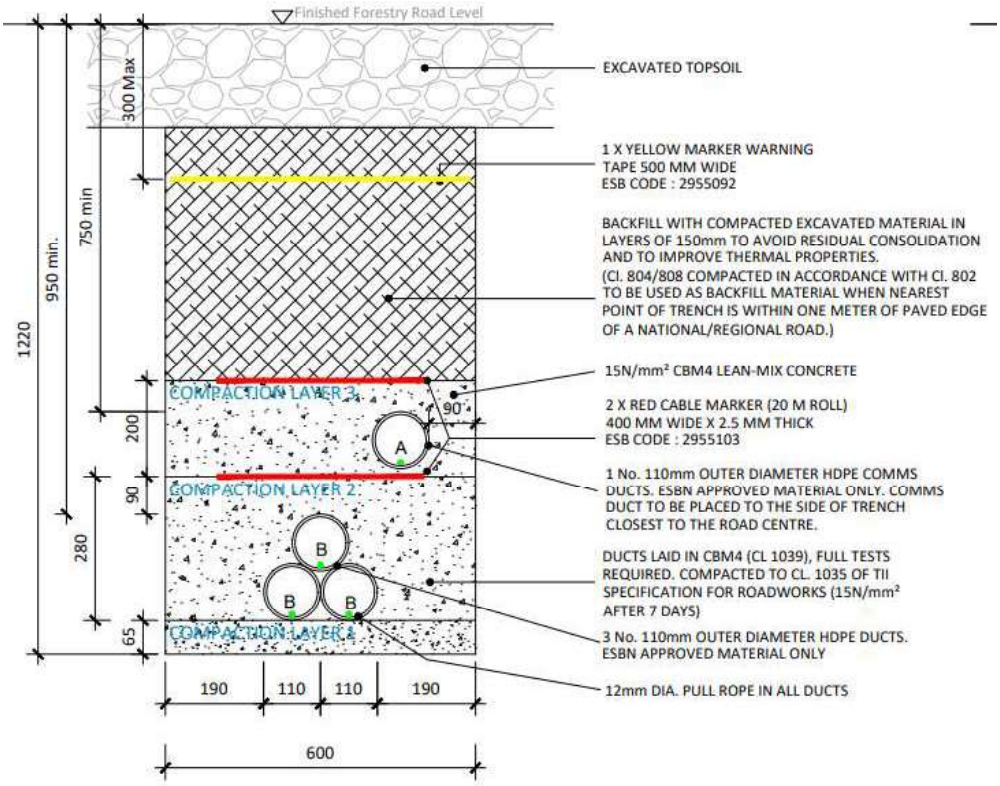


Figure 4 - Typical Trench in Forestry Road Section

6.2.1 UGC Installation on Public Road

Where the ducting is installed within public road carriages and where applicable the trench will be installed in the non-trafficked strip between the wheel marks on the road. The cable will be micro-sited based on the presence of exiting utilities and the nature of the road and the adjoining terrain. It is preferable to excavate a trench within the middle of the lane, or the middle of the roadway to reduce load on the cable.

6.2.2 UGC Installation on Tracks

The majority of the 38kV route is located within existing forestry access tracks. The location where the cable is laid will depend on several factors such as; width of track, bends along the track and crossings. Where the track needs to be widened, stone will be brought in to build up the area to the same level of the track. The excess material from the track will be used elsewhere on reinstatement works.

6.3 Marker posts

Surface cable markers will be placed along the route where cable depth is unavoidably shallow, due to constraints such as existing services, to indicate the precise location of the UGC. These markers will be metallic plates in accordance with ESBN and EirGrid standards.

Marker posts will be used on non-roadway routes to delineate the cable route and joint bay positions. Corrosion proof aluminium triangular danger sign, with 700mm base, and with centred lightning symbol, on engineering grade fluorescent yellow background shall be installed in adequately sized concrete foundations. Marker post shall also be placed in the event that burial depth is not to standard. Siting of marker posts to be dictated by ESBN as part of the detailed design process *(*Figure 5*)*.

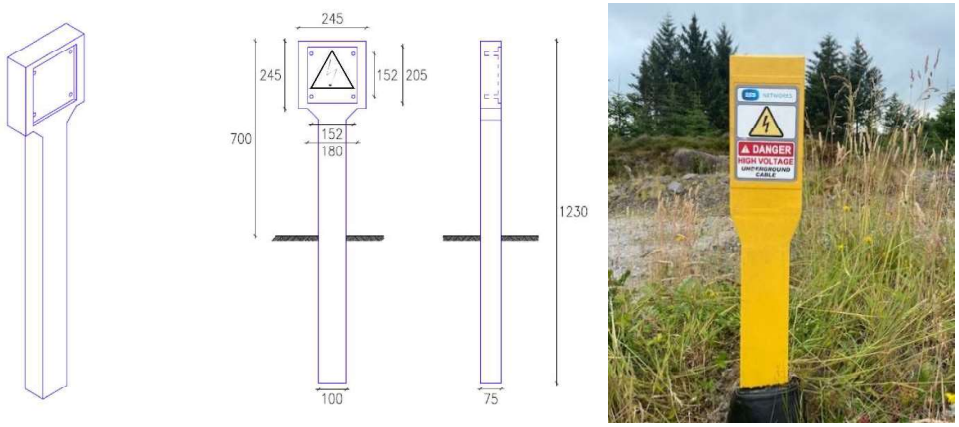


Figure 5 - Typical ESB Marker Posts Example

6.4 Managing Excess Material from Trench

All excavated material will be temporarily stored adjacent to the trench prior to re-use in the trench reinstatement (where applicable). Stockpiles will be restricted to less than 2m in height. Where excess material exists, it may be used in the reinstatement of the borrow pit as part of the Inchamore Wind Farm. Excavated tar from the public road network will be transported off site by an appropriately authorised waste collector and disposed of at an appropriately licenced waste facility.

6.5 Storage of Plant and Machinery

All plant, machinery and equipment will be stored on site within the UGC works area or within the temporary construction compounds to be located within the Inchamore Wind Farm. Oils and fuels will be stored in an appropriately bunded area within the temporary construction compounds.

6.6 Joint Bays and Associated Chambers

Joints Bays are to be installed approximately every 1000m - 1200m along the UGC route to facilitate the jointing of 2 No. lengths of UGC. Joint Bays are typically 4.5m x 2.03m x 1.475m pre-cast concrete structures installed below finished ground level. Joint Bays will be located in the non-wheel bearing strip of roadways, however given the narrow profile of local roads this may not always be possible.

In association with Joint Bays, Communication Chambers are required at every joint bay location to facilitate communication links between Inchamore Wind Farm substation and the existing 220kV node at Ballyvouskil.

The precise siting of all Joint Bays and Communication Chambers is subject to approval by ESBN. Marker posts will be used on non-roadway routes to delineate the duct route and joint bay positions.

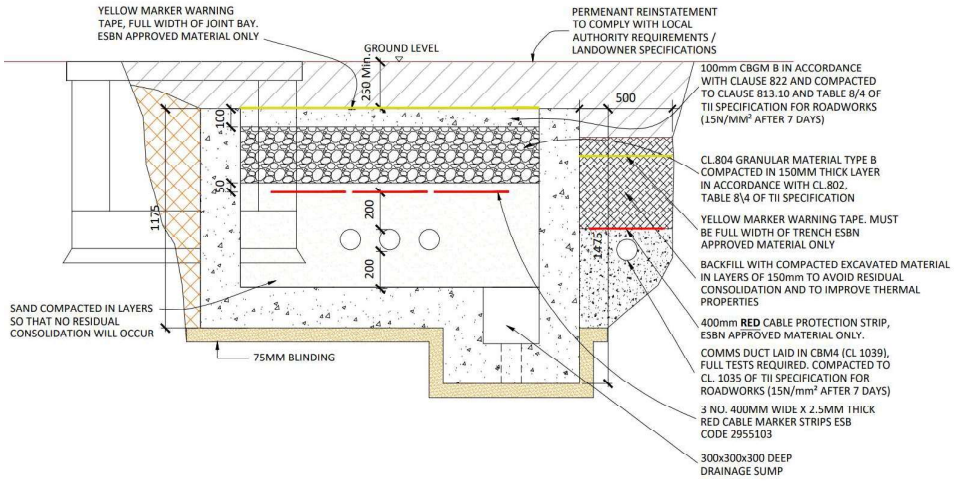


Figure 6 - Typical Section through Joint Bay

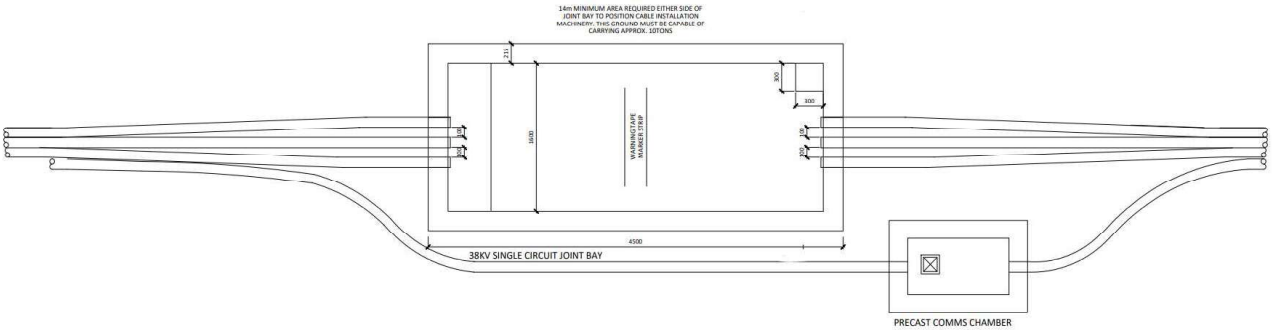


Figure 7 - 38kV Joint Bay Plan Layout

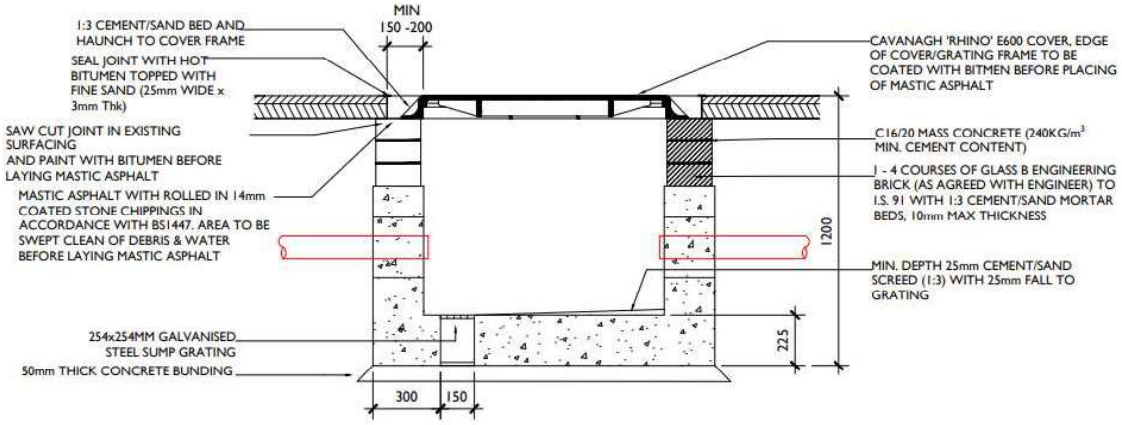


Figure 8 - Typical Section through Communications Chamber

6.7 Joint Bay Construction and Cable Installation

Before starting construction, the area around the edge of the joint bay which will be used by heavy vehicles will be surfaced with a terram cover (if required) and stone aggregate to minimise ground damage. Any roadside drains within the temporary works area will be culverted and check dams made from stone or sandbags covered with terram will be inserted upstream and downstream of these culverts to intercept any solids generated during the insertion or which wash out during the works. If the ground slopes from the working area toward a watercourse or if there is evidence of solids washing off the works area toward nearby watercourses or drains, a silt fence with straw bales, will be interposed between the works area and the watercourse.

All excavated material will be stored near the excavations and reused for reinstatement works. Any soil required for reinstatement that will be temporarily stockpiled on site will be placed at least 15m back from the nearest watercourse on level ground and will be ringed at the base by silt fencing and be regularly monitored by a designated competent person for signs of solids escape. In which case an additional line of silt fencing with straw bales will be added in line with the relevant environmental control measures.

If the joint bay needs to be dewatered, this will be pumped to a percolation area if the soil is not saturated, otherwise a settlement tank will be used to remove any solids from the dewatering process to comply with the environmental control measures.

The risk of concrete reaching surface waters is considered very low given that all concrete will be poured into the pit excavated for the joint bay so that spills will be contained. The basic requirement therefore is that all pouring operations be constantly supervised to prevent accidental spillages occurring outside the pit.

Temporary storage of cement bound sand (if required) will be on hardstand areas only where there is no direct drainage to surface waters and where the area has been bunded e.g. using sand-bags and geotextile sheeting or silt fencing to contain any solids in run-off.

Equipment:

- 2-3 General Operatives
- 1 Excavator Operator
- 360˚ tracked excavator (13 ton normally, 22 ton for rock breaker)
- 1 no. tracked dumper or tractor and trailer

Materials:

- Sand for pipe bedding
- Blinding Concrete where necessary
- Clause 804 Material
- 125mm diameter HDPE ducting
- Precast Chamber Units / Relevant construction materials for chambers

7.0 Relocation of Existing Services

In order to facilitate the installation of the underground cable, it may be necessary to relocate existing underground services within the curtilage of the road such as water mains, telecom networks or existing cables. In advance of any construction activity, the contractor will undertake detailed surveys and scans of the UGC route to confirm the presence or otherwise of any services. If found to be present, the relevant service provider will be consulted with in order to determine the requirement for specific excavation or relocation methods and to schedule a suitable time to carry out works.

8.0 Major Watercourse Crossings

The cable route will involve 3 No. waterbody crossings. Where the cable route intersects with existing watercourses, a detailed construction method statement will be prepared by the Contractor prior to the commencement of construction and is to be approved by the Local Authority and relevant environmental agencies.

Crossing existing culverts will be implemented using open trenching with either an undercrossing or an overcrossing, depending on the depth of the culvert. The cable route will involve 3 No. culvert crossings locations which will require the mobilisation of HDD. The culvert crossing methods are detailed in Figure 9 and Figure 10 below with more detail seen in 05934-DR-217-P1 & 05934-DR-218-P1.

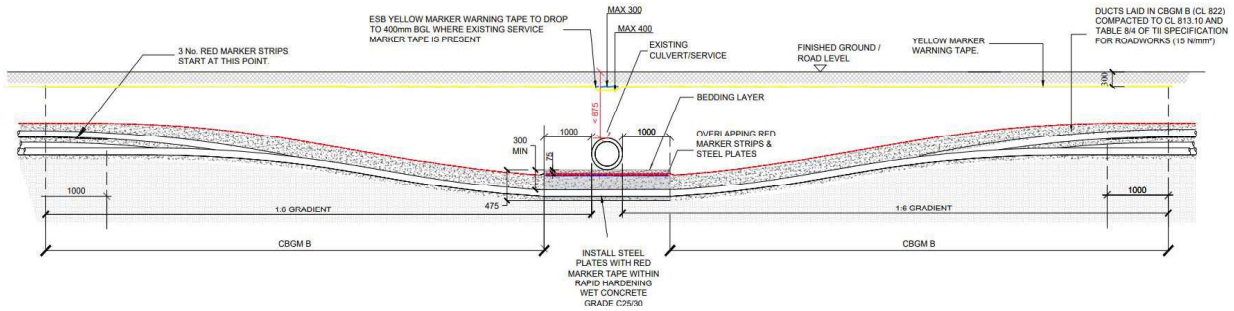


Figure 9 - 38kV UGC Culvert Undercrossing

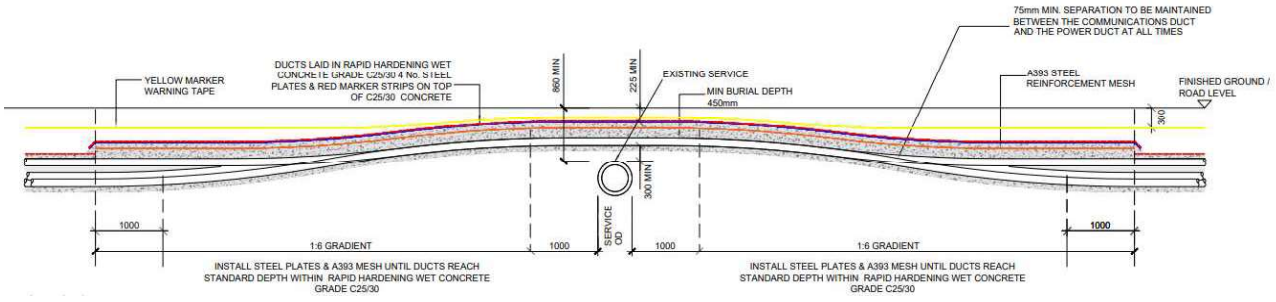


Figure 10 - 38kV UGC Culvert Overcrossing

Inland Fisheries Ireland have published guidelines relating to construction works along water bodies entitled 'Requirements for the Protection of Fisheries Habitats during Construction and Development Works at River Sites", and these guidelines will be adhered to during the construction of the development.

8.1 Stream 1 - Horizontal Directional Drilling

ITM Coordinates: 521705.04, 583153.2

Stream 1 is located approx. 174m east of JB05 crossing over a large stream within a valley. This steam flows in a northern direction. Horizontal directional drilling (HDD) will be implemented to bore approximately 1500mm beneath the waterway. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. Drilling will take place from the forestry access track carriageway. The methodology for HDD is outlined in Section 9 below. Ref drawing 05934-DR-222.

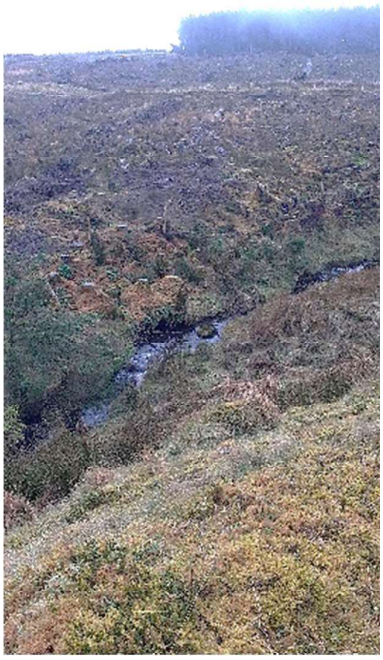


Figure 11 - Stream 1 Valley Crossing

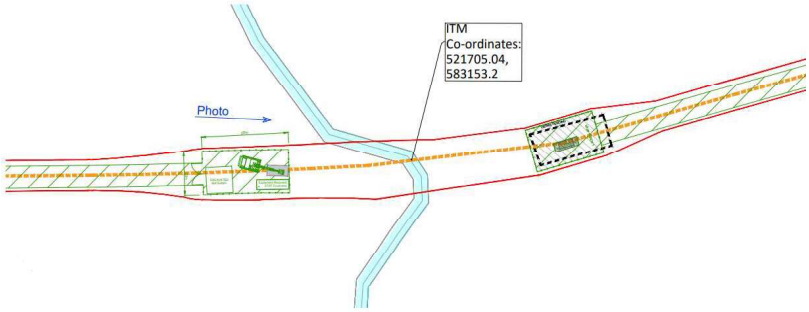


Figure 12 - Stream 1 Valley Crossing on OSI Background

8.2 Stream 2 (Culvert 56 & Culvert 57) - Horizontal Directional Drilling

ITM Coordinates: 518279.2, 583469.4

Stream 2 is located on a forestry access track approx. 580m east of JB09 crossing over a large Stream. This steam flows in a north direction and into the River Clydagh. This stream also flows into Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (Special Area of Conservation).

Horizontal directional drilling (HDD) will be implemented to bore approximately 1500mm beneath the waterway. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. Drilling will take place from the forestry access track carriageway. The methodology for HDD is outlined in Section 9 below. Ref drawing 05934-DR-223.

Figure 13 - Stream 2

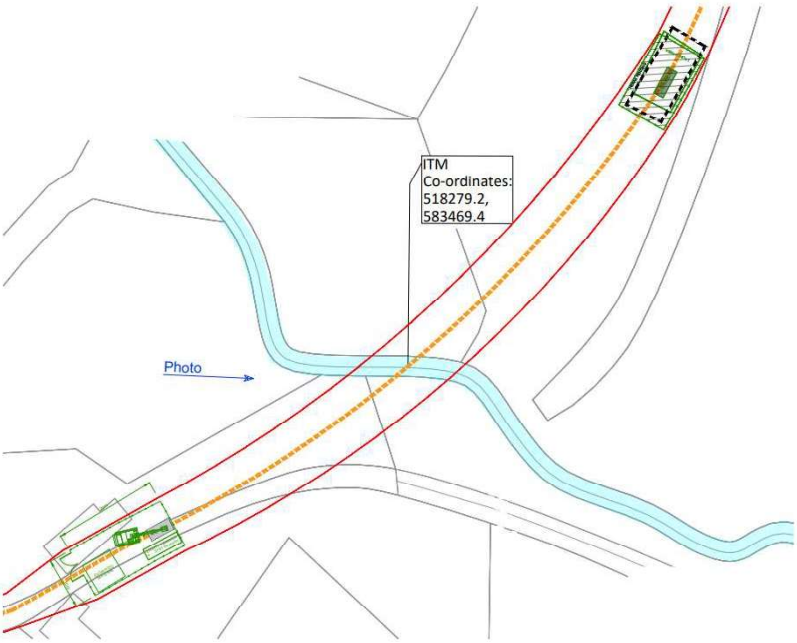


Figure 14 - Stream 2 within Forestry Road on OSI Background

8.3 Stream 3 (Culvert 59 to 63) - Horizontal Directional Drilling

ITM Coordinates: 517802.26, 583246.3

Stream 3 is located on a forestry access track approx. 44m east of JB09 crossing over a large Stream. This steam flows in a north direction and into the River Clydagh. This stream also flows into Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (Special Area of Conservation).

Horizontal directional drilling (HDD) will be implemented to bore approximately 1500mm beneath the waterway. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. Drilling will take place from the forestry access track carriageway. The methodology for HDD is outlined in Section 9 below. Ref drawing 05934-DR-224.

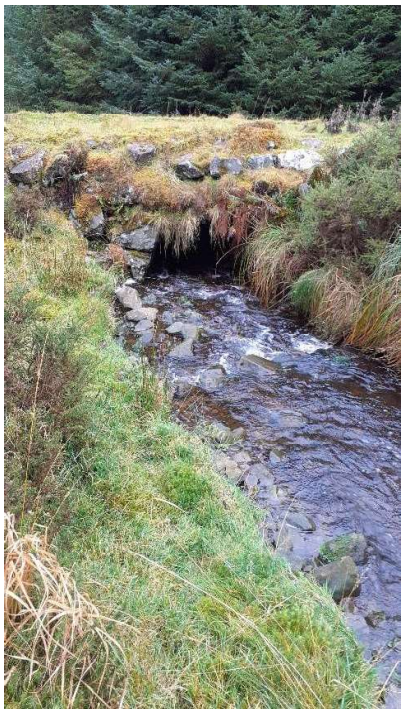


Figure 15 - Stream 3

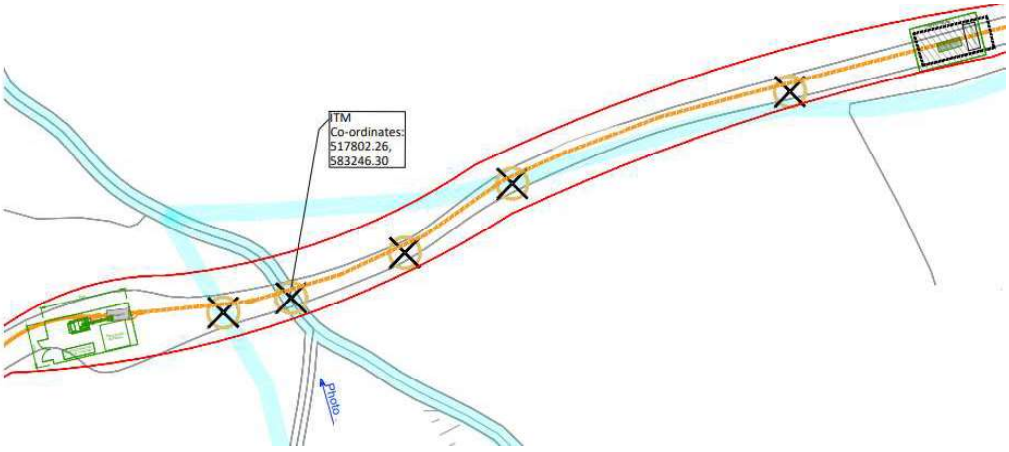


Figure 16 - Stream 3 within Forestry Road on OSI Background

9.0 Horizontal Direction Drilling (HDD)

Horizontal Direction Drilling (HDD) is a method of drilling under obstacles such as bridges, railways, water courses, etc. in order to install cable ducts under the obstacle. This method is employed where installing the ducts using standard installation methods is not possible. The drilling methodology is as follows: -

1. A works area of circa. 40m^2 will be fenced on both sides of the river crossing,
2. The drilling rig and fluid handling units will be located on one side of the bridge and will be stored on double bunded 0.5mm PVC bunds which will contain any fluid spills and storm water run-off.
3. Entry and exit pits (1m x 1m x 2m) will be excavated using an excavator, the excavated material will be temporarily stored within the works area and used for reinstatement or disposed of to a licensed facility.
4. A 1m x 1m x 2m steel box will be placed in each pit. This box will contain any drilling fluid returns from the borehole.
5. The drill bit will be set up by a surveyor, and the driller will push the drill string into the ground and will steer the bore path under the watercourse.
6. A surveyor will monitor drilling works to ensure that the modelled stresses and collapse pressures are not exceeded.
7. The drilled cuttings will be flushed back by drilling fluid to the steel box in the entry pit.
8. Once the first pilot hole has been completed a hole-opener or back reamer will be fitted in the exit pit and will pull a drill pipe back through the bore to the entry side.
9. Once all bore holes have been completed, a towing assembly will be set up on the drill and this will pull the ducting into the bore.
10. The steel boxes will be removed, with the drilling fluid disposed of to a licensed facility.
11. The ducts will be cleaned and proven and their installed location surveyed.
12. The entry and exit pits will be reinstated to the specification of ESBN, EirGrid and Cork County Council.
13. A transition coupler will be installed at either side of the bridge/ following the horizontal directional drilling as per ESB and EirGrid requirements, this will join the HDD ducts to the standard ducts.

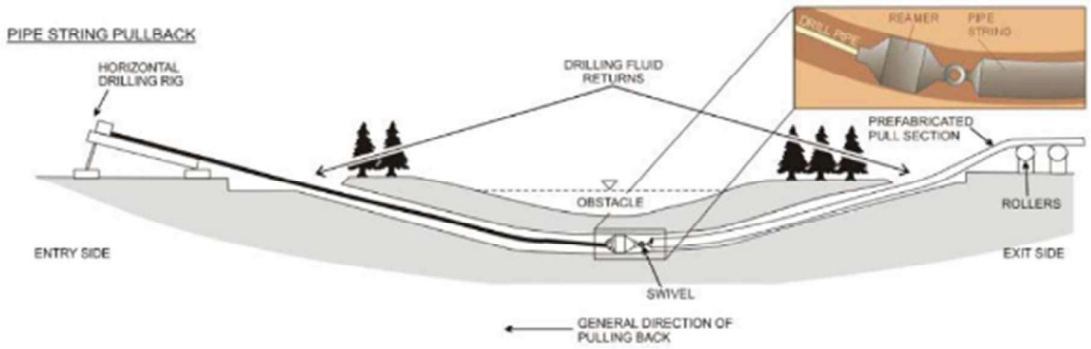


Figure 17 - Typical HDD Installation

10.0 Reinstatement of Private Land

Once all construction works are complete, the work areas will be reinstated with excavated soil and either seeded out with native species, allowed to vegetate naturally or reinstated with excavated grass turves and will be restored to their original condition. This work will be carried out in in consultation with the landowner and in line with any relevant measures outlined in the planning application, CEMP and planning conditions.

11.0 Best Practice Design and Construction & Environmental Management Methodology

Prior to commencement of construction works the contractor will draw up detailed Method Statements which will be informed by this Outline Construction Methodology, environmental protection measures included within the EIAR, measures within the CEMP, and the guidance documents and best practice measures listed below. This method statement will be adhered to by the contractors and will be overseen by the Project Manager, Environmental Manager and ECoW where relevant.

The following documents will contribute to the preparation of the method statements in addition to those measures below: -

- Inland Fisheries Ireland (2016) *Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters*. Inland Fisheries Ireland*, Dublin,*
- *National Roads Authority (2008) Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*. National Roads Authority, Dublin;
- E. Murnane, A. Heap and A. Swain. (2006) *Control of water pollution from linear construction projects.* Technical guidance (C648). CIRIA;
- E. Murnane et al., (2006) *Control of water pollution from linear construction projects*. Site guide (C649). CIRIA.
- Murphy, D. (2004) Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites. Eastern Regional Fisheries Board, Dublin;
- H. Masters-Williams et al (2001) *Control of water pollution from construction sites. Guidance for consultants and contractors* (C532);
- Enterprise Ireland (unknown). *Best Practice Guide (BPGCS005) Oil storage guidelines;*
- Law, C. and D'Aleo, S. (2016) *Environmental good practice on site pocket book*. (C762) 4th edition. CIRIA;
- CIRIA *Environmental Good Practice on Site (fourth edition) (C741) 2015*.

The works will be carried out by employing accepted good work practices during construction, and environmental management measures such as those discussed below. Please note that the following measures will be supplemented by further specific environmental protection measures that will be included in method statements prepared for specific tasks during the works and will form part of the detailed CEMP.

- All materials shall be stored at the temporary compound within the Inchamore Wind Farm site and transported to the works zone immediately prior to construction;
- Where drains and watercourses are crossed with underground cables, the release of sediment will be prevented through the implementation of best practice construction methodologies.
- Weather conditions will be considered when planning construction activities to minimise risk of run off from site;
- Provision of 50m exclusion zones and barriers (silt fences) between any excavated material and any surface water features to prevent sediment washing into the receiving water environment;

- If dewatering is required as part of the works e.g. in trenches for underground cabling or in wet areas, water must be treated prior to discharge;
- The contractor shall ensure that silt fences are regularly inspected and maintained during the construction phase;
- If very wet ground must be accessed during the construction process bog mats/aluminium panel tracks will be used to enable access to these areas by machinery. However, works will be scheduled to minimise access requirements during winter months;
- The contractor shall ensure that all personnel working on site are trained in pollution incident control response. A regular review of weather forecasts of heavy rainfall is required, with the Contractor required to prepare a contingency plan for before and after such events;
- The contractor will carry out visual examinations of local watercourses from the works during the construction phase to ensure that sediment is not above baseline conditions. In the unlikely event of water quality concerns, the Environmental Manager and ECoW will be consulted;
- Excavations will be left open for minimal periods to avoid acting as a conduit for surface water flows.
- Only emergency breakdown maintenance will be carried out on site. Emergency procedures and spillage kits will be available and construction staff will be familiar with emergency procedures.
- Appropriate containment facilities will be provided to ensure that any spills from vehicles are contained and removed off site. Adequate stocks of absorbent materials, such as sand or commercially available spill kits shall be available;
- Concrete or potential concrete contaminated water run-off will not be allowed to enter any watercourses. Any pouring of concrete (delivered to site ready mixed) will only be carried out in dry weather. Washout of concrete trucks shall be strictly confined to a designated and controlled wash-out area within the Inchamore Wind Farm site; remote from watercourses, drainage channels and other surface water features;
- Entry by plant equipment, machinery, vehicles and construction personnel into watercourses or wet drainage ditches shall not be permitted. All routes used for construction traffic shall be protected against migration of soil or waste water into watercourses;
- Cabins, containers, workshops, plant, materials storage and storage tanks shall not be located near any surface water channels and will be located beyond the 50m hydrological buffer at all times.

12.0 Implementation of Environmental Protection Measures

All environmental protection measures contained within the EIAR (Environmental Impact Area Report) and NIS (Natura Impact Statement) which accompanies the planning application will be incorporated into the final CEMP (Construction Environmental Management Plan) and construction method statements prior to the commencement of development and will be implemented in full during the construction phase. The proposed UGC grid route does not form part of the wind farm planning application but is being assessed as part of the EIAR and NIS. The Project Manager and Site Manager will be responsible for the implementation of measures following consultation with the Environmental Manager and ECoW where necessary.

13.0 Invasive Species Best Practice Measures

Invasive species can be introduced into a location by contaminated plant, machinery, and equipment which were previously used in locations that contained invasive species. Good site organisation and hygiene management shall be maintained always on-site, and best practice measures will be implemented, as follows:

- The contractor will prepare an Invasive Species Action Plan to be implemented during construction, and all personnel will be made aware of the requirements contained within;
- Plant and machinery will be inspected upon arrival and departure from the site and cleaned/washed as necessary to prevent the spread of invasive aquatic/ riparian species such as Japanese knotweed *Fallopia japonica* and Himalayan Balsam *Impatiens glandulifera*. A sign off sheet will be maintained by the contractor to confirm the implementation of measures;
- Site hygiene signage will be erected in relation to the management of non-native invasive material.

14.0 Waste Management

All waste products (general waste, plastic, timber, etc.) arising during the construction phase will be managed and disposed of in accordance with the provisions of the Waste Management Act 1996 and associated amendments and regulations, and a Waste Management Plan will be prepared by the contractor before the commencement of construction. All waste material will be disposed of at a fully licensed facility.

15.0 Archaeology

The following are the mitigation measures which will be carried out during construction where required;

- Any specific mitigation measures outlined in the Cultural Heritage Report will be adopted.
- If required a project archaeologist will be appointed to oversee the project.
- Demarcation of protective buffer zones around cultural heritage sites where there is a potential for disturbance during the construction phase and inclusion of the same in site induction.

Instruction

Technical Lead:	Ruairi Geary - TLI Group
Date of Writing:	07.11.2022
Scope of Note:	Review of the 38kV grid connection cable loading based on the proposed MEC for the project.
Documents & Data Issued for Review:	n/a

Overview

TLI Group (the Consultant) were engaged by Future Energy Ireland ("the Client") on the development of Inchamore Windfarm in counties Cork and Kerry. The Consultant was engaged to assist the Client in selecting and preparing a planning application for the 38kV grid connection for Inchamore Windfarm. The Client is currently working on the development of the windfarm.

The proposed grid connection will be a 38kV UGC from the existing Ballyvouskil 220kV Substation to a new 38kV substation serving Inchamore Windfarm which will consist of an approximate grid connection length of 19.3km. This cable rating study was completed to assess the suitability of the proposed cable size and cable trench designs for the 38kV UGC grid connection circuit.

The cable ratings which have been completed as part of this study include:

- Standard Trefoil Trench Design
- Flat Formation Trench Design
- HDD Crossings – Direct Buried Trefoil Formation (Depth 5000mm)
- Parallel Trench Design

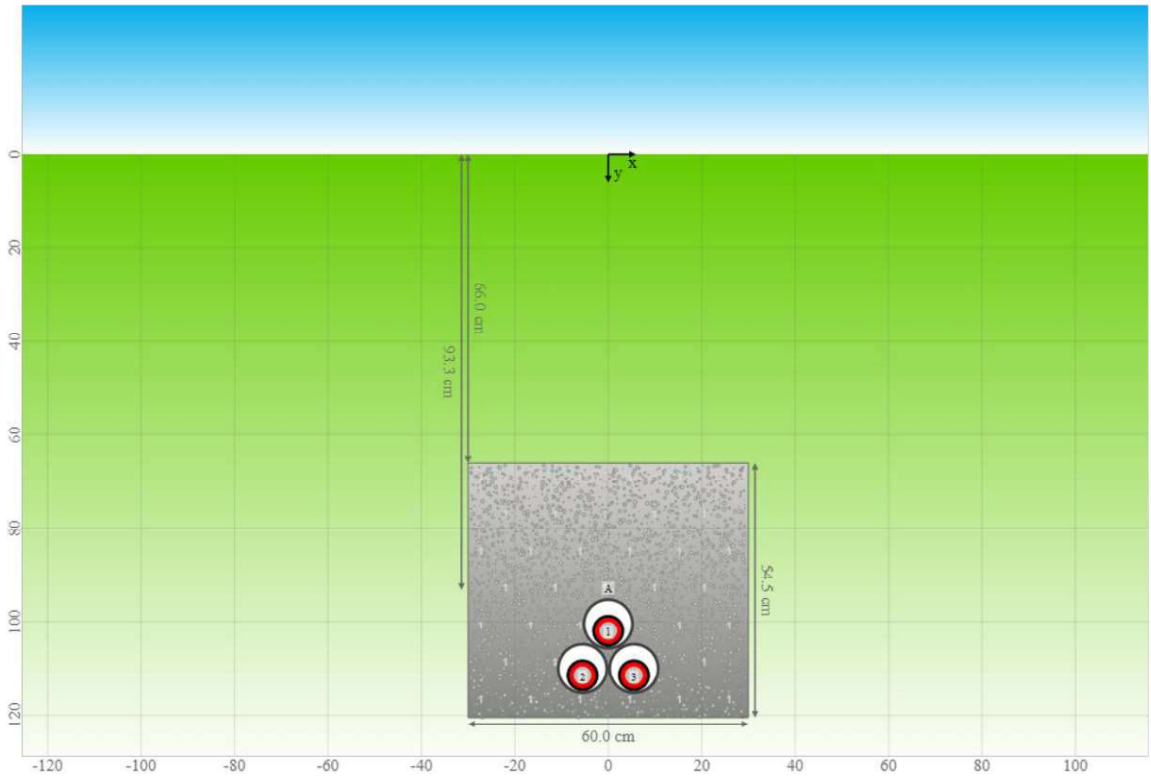
Table 1 - Cable Study General Parameters

Cable Study Parameters	
Cable Size:	1000mm^2 Al Cable
Nominal Voltage:	38kV assumed *(Range 30kV to 52kV)*
Power:	Required 39.6 MW
Power Factor:	0.95 assumed *(Range 0.85 lag to 0.93 lead)*
Avg. Cable Section Length:	1000/1200m *(trefoil), 100m (flat)*
Cable Trench Design:	See Appendix A
Ambient Temp (Soil)	20˚C *(Summer rating)*
Soil Thermal Resistivity	1.2 K·m/W *(Summer rating)*
Backfill Thermal Resistivity	1 K·m/W *(Summer rating)*
Cable Screen Bonding:	Bonded Both Ends
Power Duct Size:	110mm

Cable Study Analysis

1000mm² Al Cable - 38kV Standard Trefoil Trench (Depth 950mm) Design:

A cable rating study was completed for a **SolidAl 1000mm² AL XLPE (38kV) UGC** over a distance of 1km using the **standard trefoil trench design in 110mm ducts** as detailed in Appendix A. Using this arrangement, the circuit is capable of carrying a maximum full load current of **758.4A** without exceeding the cables max insulative property of 90°C. Therefore, 1000mm² Al XLPE (38kV) UGC when installed using the standard trefoil trench design is capable of achieving the required maximum full load (39.6 MW).



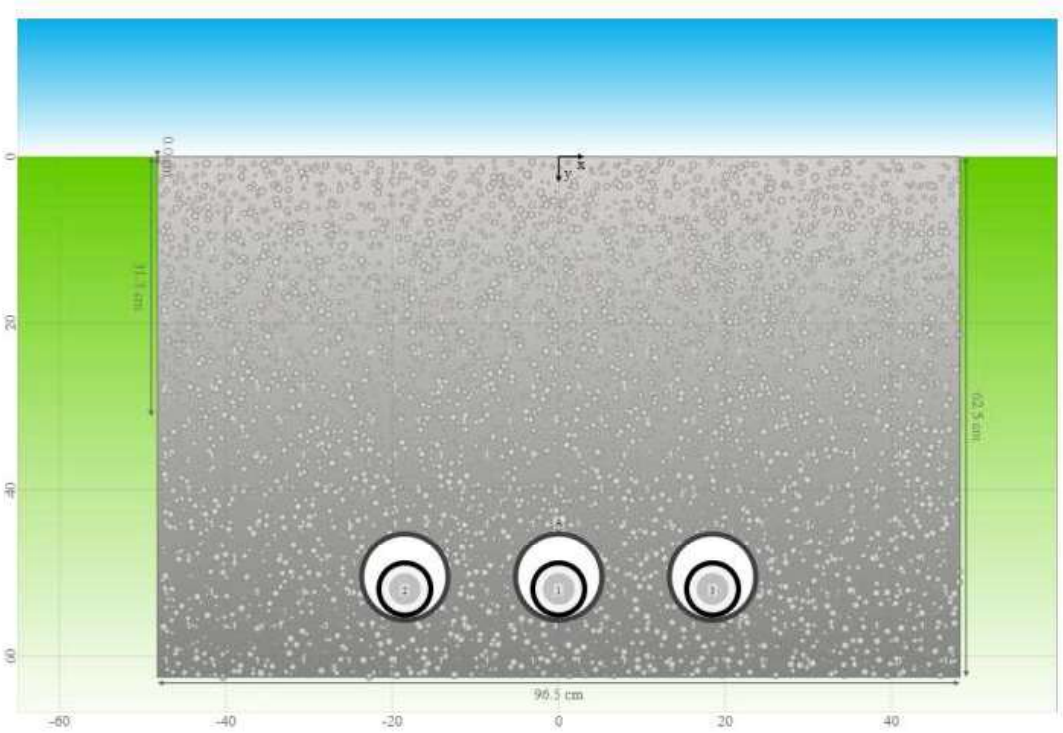
Following systems are active in the arrangement:

System	Object	Current I_c [A]	max Temp. θ_c | θ_e (θ_{de}) [°C]	Losses W_{sys} [W/m]
System A	SolidAl 1000mm2 Al XLPE (38kV)	758.4	90.0 | 82.4 (69.8)	87.7

Figure 1 - Cable Rating Model, Standard Trench Design, 1000mm.sq Al

1000mm² Al Cable - 38kV Flat Formation Trench (Depth 450mm) Design*:*

A cable rating study was completed for a **SolidAl 1000mm² AL XLPE (38kV)** over a distance of 100m using the **Flat Formation Trench design in 110mm ducts** as detailed in Appendix B. Using this arrangement, the circuit is capable of carrying a maximum full load current of **778A** without exceeding the cables max insulative property of 90°C. Therefore, 1000mm² Al XLPE (38kV) UGC when installed using the standard trefoil trench design is capable of achieving the required maximum full load (39.6 MW).



Following systems are active in the arrangement:

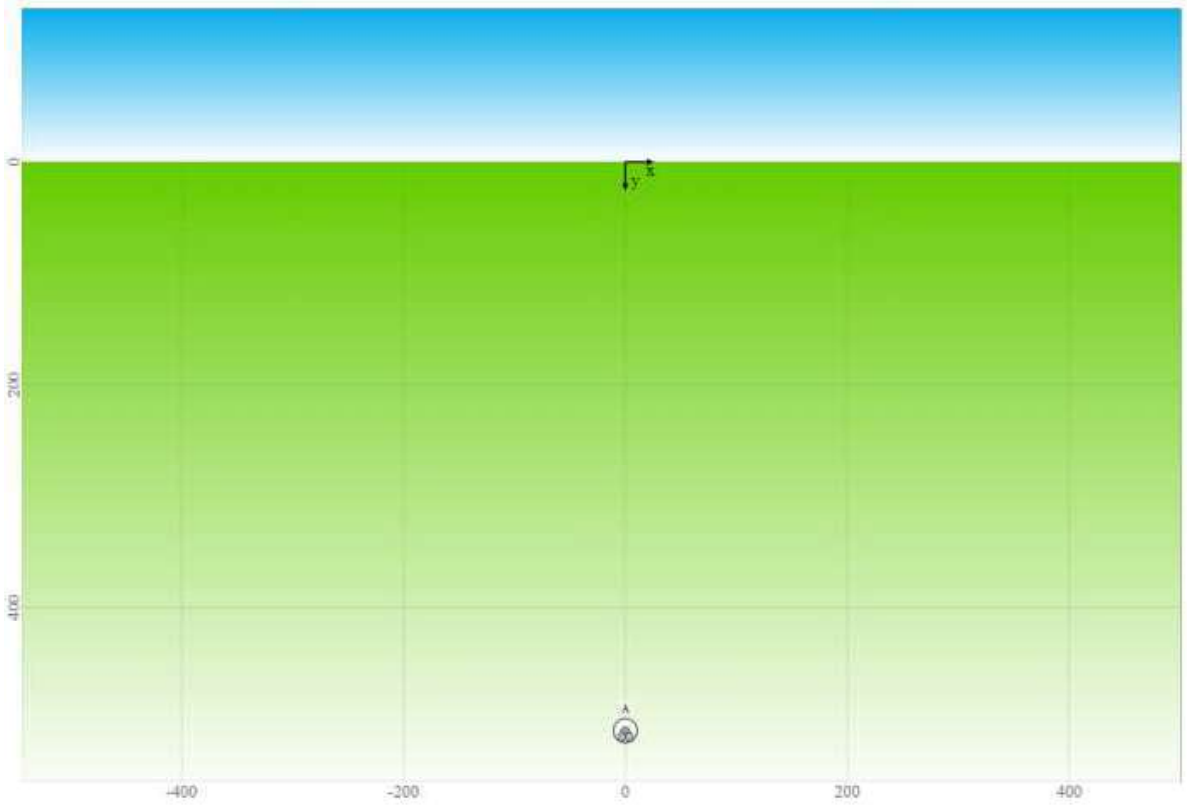
System	Object	Current I_c [A]	max Temp. θ_c | θ_e (θ_{de}) [°C]	Losses W_{sys} [W/m]
System A	SolidAl 1000mm2 Al XLPE (38kV)	778.0	90.0 | 81.3 (61.2)	120.0

Figure 2: Cable Study Results – 38kV 1000mm.sq Al Flat Formation (450mm Depth)

Horizontal Directional Drill - Trefoil Formation (Depth 5000mm):

A cable rating study was completed for a **SolidAl 1000mm² AL XLPE (38kV)** over a distance of 200m utilising a HDD in a trefoil formation, at a **depth of 5000m**. It should be noted that 180mm or 225mm ducts (SDR = 11) will be utilised for HDD crossings.

Using this arrangement, the circuit is capable of carrying a maximum full load current of **692.2A** without exceeding the cables max insulative property of 90°C. Therefore, 1000mm² Al XLPE (38kV) UGC when installed using this HDD trench design is capable of achieving the required maximum full load (39.6 MW).



Following systems are active in the arrangement:

System	Object	Current I_c [A]	max Temp. θ_c | θ_e (θ_{de}) [°C]	Losses W_{sys} [W/m]
System A	SolidAl 1000mm2 Al XLPE (38kV)	1x 692.2	90.0 | 83.7 (67.0)	65.5

Figure 3: Cable Study Results – 38kV 1000mm.sq Al HDD Formation (5000mm Depth)

Inchamore WF 38kV Trefoil parallel run Ballyvouskill – Garrow 110kV Trefoil Formation (Separation 2000mm duct to duct) Design*:*

A cable rating study was completed for the parallel run of an existing **1000mm² Cu XLPE (110kV) UGC** in operation to conduct flow between Garrow GIS to Ballyvouskil Node ***(System A).*** Running parallel with ***(System B – Ballyvouskil to Inchamore WF 38kV UGC)*** over a distance of 1000m whilst implementing a trefoil formation trench arrangement with a separation of 2000mm between duct to edge of duct trenches and supplying a load without compromising the insulative properties of the selected cable.

The consultant believes that the use of **1000mm² AL XLPE (38kV)** should be sufficient to be installed at 38kV - 110kV parallel intervals to achieve the 178MVA rating for 110kV UGC and the desired MEC of Inchamore WF (39.6MW). As seen below in Figure 5, System B (Inchamore to Ballyvouskil) will conduct in excess of full load carrying capacity.

Following systems are active in the arrangement:

System	Object	Current I_c [A]	max Temp. θ_c | θ_e (θ_{de}) [°C]	Losses W_{sys} [W/m]
System A	SolidAl 1000mm2 Al XLPE (38kV)	731.8	90.0 | 83.0 (71.2)	81.6
System B	NKT 1600mm2 Al XLPE (110kV)	935.0	82.9 | 74.1 (65.2)	77.6

Figure 4: Cable Study Results – 38kV 1000mm.sq Al trefoil formation parallel 110kV 1000mm.sp Cu trefoil formation

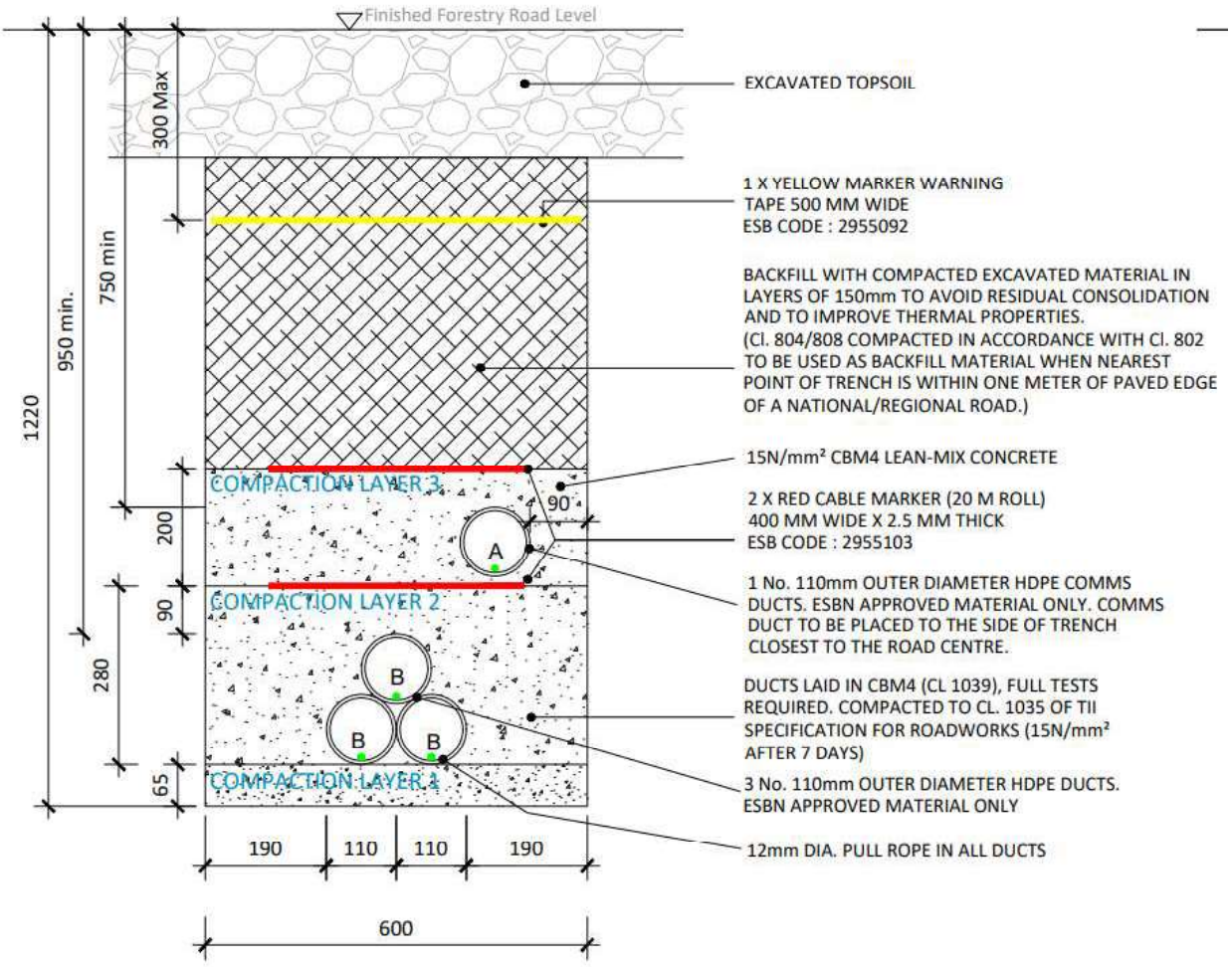
Cable Study Results Summary

The Cable Rating Study Checks completed have indicated that it should be possible to carry the maximum export capacity of the cable at ***39.6MW*** on a standard 38kV single circuit **1000mm^2 Al cable** for the majority of the grid connection without exceeding the proposed recommended maximum conductor temperature of 90˚C when using the proposed trench designs with the exception of the existing cable crossing intervals and HDDs at a depth greater than 5000mm.

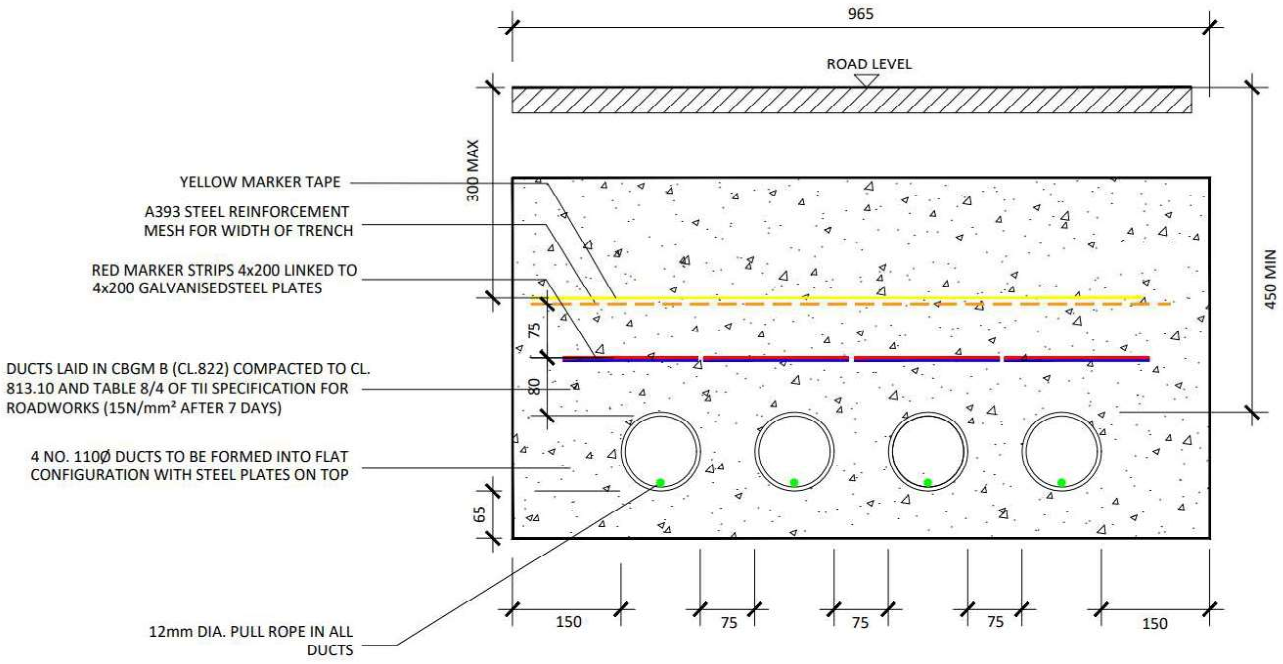
It should be noted that any crossings or parallel runs with other underground cable MV/HV circuits or other services may result in a derating of the Inchamore Grid Connection Cable. This derating effect will further decrease the available loading capacity of the cable. Two further existing service routes, both a 38kV UGC circuit and a 20kV cable route exist within forestry access tracks west of Garrow GIS substation but a derating study hasn't been concluded on these circuit owing to minimal circuit rating information.

All results at this stage are indicative only, further analysis will be required at the detailed design phase in order to accurately calculate the final loading on the cables.

Appendix A – Standard 38kV Trench Trefoil Design (110mm Ducts)



Appendix B – Flat Formation 38kV Trench Design (110mm Ducts – 450mm Depth)



Proposed Inchamore Wind Farm, Co. Cork.

Schedule of Developments in the vicinity of the Development

Cork County Council

Planning Ref. No.	Description	Final Grant	Distance (TDR = Turbine Delivery Route) (GCR = Grid Connection Route)	Notes
174167	A solar photovoltaic panel array consisting of up to 37,800 m2 of solar panels on ground mounted steel frames, 2 no. electricity control cabins, underground cables & ducts, inverter units, hardstanding area, boundary security fence, CCTV, all associated site works and services.	01-11-17	3.91 km from centre of Site	Large Scale Development
215127	The erection of a temporary 100m high lattice type meteorological mast for a period of 5 years. The structure will be fixed to ground anchors by stay wires and will include instruments for measuring local climate conditions and all ancillary works.	31-08-21	0.49 km from centre of Site	Large Scale Development
224724	The development will consist of a soil recovery facility for greenfield soil and stones with smaller quantities of concrete, bricks, tiles, and ceramics (the concrete, bricks, tiles, and ceramics will be used for internal road building). The proposed development will involve the remediation by infilling of existing agricultural land which was historically excavated in the past. The site comprises 1.58 hectares, of which 1.09ha will be fill area. The proposed development incorporates improving the existing site entrance, and all ancillary works associated with the development.	24-01-23	1.86 km from centre of Site	
217318	Erecting a 30m high latticework telecommunications structure together with antennas, dishes and associated telecommunications equipment enclosed by security fencing and all associated site works with an extension to the existing access track.	15-02-22	1.5 km from centre of Site	Large Scale Development
224455	Permission for new two storey dwelling with attached garage, sewerage system, site entrance and all associated works.	25-04-22	2.82 km from centre of Site	
196555	Reclamation of land for agricultural use by filling low lying area with imported fill.	16-04-20	3.59 km from centre of Site	

Planning Ref. No.	Description	Final Grant	Distance (TDR = Turbine Delivery Route) (GCR = Grid Connection Route)	Notes
166754	To alter condition no. 2 of previous planning ref 15/5991 from “the maximum number of loads delivered to the site each day shall be 4 loads” to a maximum of 11 loads per day.	22-12-16	3.61 km from centre of Site	
155991	Reclamation of land for agricultural use by filling low lying area with imported fill.	17-02-16	3.54 km from centre of Site	
146165	Dwellinghouse, garage and septic tank, extension of duration to permission granted under Planning Ref. no. 09/4190	of duration by CCC 0	3.44 km from centre of Site	
165208	Permission for construction of a single storey extension with attached lean-to structure for domestic storage to rear, and porch extension to side of dwellinghouse, and Permission for retention of minor alterations to elevations (changes to doors and windows from that permitted under Planning Reg. No. 01/5772 to include: a door in place of the permitted window on rear eastern elevation, omission of window on rear elevation, inclusion of bathroom window on eastern elevation, and 1 no. larger window in place of 2 no. permitted smaller windows on western elevation. (Cead do sineadh aon stoir ar teach, le claonseantain ceangailte leis le haghaidh storala tis ar chuil, agus sineadh poirse ar taobh an ti, agus cead coinneala le haghaidh athruithe beaga ar na ingearchlonna (athruithe ar doirse agus fuinneoga o na cinn a bhi ceadaithe faoi Tag Pleanala Uimh 01/5772, a n-airitear doras in ionad an fhuinneog ceadaithe ar ingearchlo thoir cuil, fuinneog a fhagail ar lar on ingearchlo cuil, fuinneog folctha sa bhreis ar an ingearchlo thoir, agus 1 fuinneog mor in ionad 2 fuinneoga nios lu ar an ingearchlo thiar)	11-05-17	1.27 km from centre of Site	
216559	Permission for the retention of existing as built residential unit.	12-01-22	3.21 km from centre of Site	
164268	Change of use of silage shed to cubicle house, construct a slatted house, silage base, and associated site works.	05-04-16	2.61 km from centre of Site	
204959	(A) Demolition of existing calf house (B) Construction of milking parlour, handling facilities, waiting yard and associated slatted tank (C) Erection of meal bin (D) Construction of calf house and all associated siteworks.	11-08-20	2.61 km from centre of Site	
214587	The construction of a new dwelling house, domestic garage and associated site works.	30-04-21	2.49 km from centre of Site	

Planning Ref. No.	Description	Final Grant	Distance (TDR = Turbine Delivery Route) (GCR = Grid Connection Route)	Notes
186505	Construction of a dwellinghouse, the change of use of an existing semi-derelict dwellinghouse to domestic store, a new wastewater treatment system with tertiary filter, enhanced site landscaping, vehicular access via an existing site entrance and all ancillary infrastructure and associated site development works above and below ground level at a site of approximately 1.346 ha.	13-11-18	2.91 km from centre of Site	
184273	Construction of a dwelling and detached domestic garage and carrying out of all associated site works, including the installation of a treatment unit and soil polishing filter.	27-03-18	2.95 km from centre of Site	
156009	Construction of a dwellinghouse, domestic garage and associated site woks.	19-01-16	3.46 km from centre of Site	
145105	Dwelling, domestic garage and proprietary treatment unit.	21-07-14	3.72 km from centre of Site	
196056	Chun “Slatted House" a thógáil comh maith le hoibreacha laithreáin a bhaineann leis. / To construct a new “Slatted House” and associated site works.	11-11-19	3.79 km from centre of Site	
225591	Chun suíomh athbhreithnithe an “Slatted House” nua a choinneáil, comh maith le hoibreacha laithreáin a bhaineann leis, a fuar chead pleanála uimhir 19/06056 roimhe. / Permission for retention of revised location of new slatted house and associated site works previously granted planning permission number 19/06056.	11-11-19	3.81 km from centre of Site	
185390	The construction of a two storey dwelling, garage, wastewater treatment system and ancillary site works.	22-08-18	3.69 km from centre of Site	
146835	Change of use of disused school building to dwellinghouse and installation of domestic waste water treatment unit and associated site works.	26-02-15	3.37 km from centre of Site	
216559	Permission for the retention of existing as built residential unit.	03-12-21	3.19 km from centre of Site	
216769	Permission to raise the level of permitted Astro turf playing pitch along with perimeter fencing and entrance gates together with all other ancillary site works to that permitted under planning reference number 20/6706.	03-12-21	4.23 km from centre of Site	
116580	Construction of a single storey extension to existing primary school and associated works, relocation of the existing portacabin classroom and retention of the existing portacabin classroom	09-02-12	4.18 km from centre of Site	

Planning Ref. No.	Description	Final Grant	Distance (TDR = Turbine Delivery Route) (GCR = Grid Connection Route)	Notes
206706	Cead pleanála iomlán a lorg chun páirc astro-turf a thógaint, chomh maith le claí fan imeall na páirce agus geataí iontrála, mar aon leis na hoibreacha suímh foghabhálacha. - Seek full planning permission for the construction of an astro-turf park, as well as a field edge fence and entrance gates, together with ancillary site works.	04-02-21	4.17 km from centre of Site	
205603	Cead pleanála iomlán le haghaidh athrú agus sineadh a chur ar an scoil. Is seo a leanas a bheidh ann: an seomra réamhdhéanta atá ann a chur i suíomh difriúil. Gnáth sheomra ranga seomra oideachas speisialta, díolcheantar agus clós spraoi clúdaithe, a bheidh ceangailte leis an síneadh nua, a thógail chomh maith le fosheirbhisí eile. (Full planning permission for alterations, and construction of extension to the school. - This will be as follows: relocation of the existing prefabricated room. Normal classroom, Special education room, circulation area and covered playground, attached to the new extension, along with other ancillary services)	13-10-20	4.22 km from centre of Site	
194972	Renewable energy development consisting of the provision of a 7 turbine wind farm, solar photovoltaic array, electricity substation, battery storage compound and all associated works consisting of the following, i. Up to 7 wind turbines with an overall blade tip height of up to 150 metres and all associated foundations and hard-standing areas; ii. Up to 70,000sq.m solar photovoltaic array, with up to 17 associated inverters and 2 no. control cabins; iii. 1 no. borrow pit, iv. 1 No. permanent meteorological mast with a maximum height of up to 100 meters; v. Upgrade of existing and provision of new site access roads, vi. 1 no. 38kV electrical substation with 1 no. control building with welfare facilities, associated electrical plant and equipment security fencing and waste water holding tank; vii battery storage compound accommodating 4 no. battery storage containers, security fencing, and associated electrical plant and equipment, viii. Forestry felling ix. 1 no. temporary construction compound, x. Site drainage xi. All associated internal underground cabling; xii. 38kV underground grid connection cabling; xiii. All associated site development and ancillary works. The proposed development will have an operational life of 30 years from the date of commissioning of the development and the application seeks a ten year planning permission. An Environmental Impact Assessment Report (EIAR) and a Natura Impact Statement (NIS) have been prepared in respect of the proposed development.	18-11-19	5.25 from centre of Site	Large Scale Development

Planning Ref. No.	Description	Final Grant	Distance (TDR = Turbine Delivery Route) (GCR = Grid Connection Route)	Notes
234455	Alterations to the dimensions of the 7 no. wind turbines permitted as part of the Knocknamork Renewable Energy development (planning reference 19/4972). The proposed development includes the provision of 7 no. wind turbines with an overall ground to blade tip height of 175m (an increase of 25m, from 150m), a rotor blade length of 75m and a hub height of 100m, and all associated site development and ancillary works, an operational period and planning permission duration to align with the existing permission (planning reference no. 19/4972) is sought. An Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) have been prepared in respect of the proposed development and accompany this application	08-05-23	5.23 km from centre of Site	Large Scale Development
195250	To construct a two-storey dwelling with domestic waste water treatment system and percolation area, a detached garden store, new site entrance onto existing private road with walls and piers and all associated site works	11-07-19	4.9 km from centre of Site	
185008	“Slatted House” nua a thógáil comh maith le hoibreacha laithreáin a bhaineann leis. (Construction of slatted house along with associated site works	13-06-18	5.0 km from centre of Site	
234370	The importation of soil and stone for the raising of an agricultural field in order to improve the agricultural output of the field, the construction of a new temporary entrance and a new temporary haul road for the duration of the land improvement works. The entrance will be closed and the haul road removed once works are complete. Extension of Duration to Permission granted under Planning Ref. No. 17/5212 & PL04.249314	25-04-23	4.7 km from centre of Site	
234358	Construction of grass mounds, erection of sculptures and all associated works	25-04-23	0.04 km from TDR	
205840	Renovations and alterations to existing community centre building, including installation of 22no. 275W 60 cell roof mounted P.V. panels and ancillary site works.	05-10-20	0.01 km from TDR	
214439	Construction of a two-storey mixed-use development, namely; ground floor retail premises, and first floor residential (2no. apartments), along with associated site works.	16-04-21	0.01 km from TDR	
225444	Permission for the construction of a grass mound and erection of a commemorative sculpture and all associated works.	15-08-22	0.01 km from TDR	

Planning Ref. No.	Description	Final Grant	Distance (TDR = Turbine Delivery Route) (GCR = Grid Connection Route)	Notes
194640	A residential development of 30 no. dwellings and all ancillary site development works. The proposed development consists of 29 no. two-storey townhouses comprising of 4 no. 2 bedroom dwellings and 25 no. 3 bedroom dwellings and 1 no. 2 bedroom bungalow. Vehicular and pedestrian access to the proposed development will be via a new entrance off Warren's Court and makes provision for the upgrade of the existing access road, the provision of a public footpath, public lighting and upgrades to the junction with the N28.	10-07-19	Roadside from TDR	
224577	Removal of external inclined conveyer system to warehouse as permitted under Cork County planning Ref. 06/13900 and replacement with vertical elevator and associated pit and a horizontal enclosed conveyor with supporting bridge structure and all associated site works.	11-07-22	0.05km from TDR	
205207	The construction of a 1 storey water treatment & electrical building and a 2 storey electrical room extension to the existing finished goods building at the production facility. The site currently operates under an Industrial Emissions (IE) license (P0013-04) under part IV of the Environmental Protection Agency Act 1992 (as amended for the Protection of the Environment Act, 2003). The new development is on a site to which the Chemical Act (Control of Major Accident Hazards Involving Dangerous Substances) regulations 2015 (S.I. 209 of 2015) applies.	31-07-20	0.01 km from TDR	
184414	Construction of a sub-station at production facility. The proposed development is covered by an existing Industrial Emissions Licence No. P0013-04. The development refers to a modification to an establishment to which the Major Accident directive applies.	27-03-18	0.01 km from TDR	
186595	The construction of a ground floor extension to the rear of the existing Engineering Building and a one storey electrical building to the north west of the existing Engineering Building at their production facility. The proposed development is covered by an existing Industrial Emissions Licence No. P0013-04. The development refers to a modification to an establishment to which the Major Accident Directive applies.	19-11-18	0.01 km from TDR	
206995	Works involving the replacement of approximately 80m of existing 2.4m high chainlink fence and associated gates with new 2.4m high green palisade security fencing/gates and all associated works at an existing Above Ground Natural Gas Installation.	17-02-21	0.05 km from TDR	

Planning Ref. No.	Description	Final Grant	Distance (TDR = Turbine Delivery Route) (GCR = Grid Connection Route)	Notes
224629	The construction of a two storey value added seafood factory building with R&D and ancillary office accommodation to the first floor, complete with the following (i) signage (ii) car, cycle and motorcycle parking; (iii) internal access roadways, yard area with dock levellers, w.c. and shower facilities, back-up generators, and bunded fuel tanks (iv) fire water storage tank and associated pumps; (v) substation; (vi) security gates and fencing (vii) 1 no. access to the estate road; (viii) underground storm water attenuation, and all associated site development and landscaping works.	05-08-22	0.01 km from TDR	
216106	Decommission existing septic tank system and install a new treatment plant and soil polishing filter in its place to serve existing dwellinghouse (as currently being extended under Planning Ref. 20/4005).	02-09-21	0.03 km from TDR	
204005	Alterations and extensions to an existing dwelling, decommissioning of an existing septic tank, a new connection to the mains foul sewer on the public road and all other associated site works. Permission is further sought for retention of an existing temporary habitable structure (mobile home) on the site which is to be used by the applicant during the course of the proposed works and is to be removed on completion of same.	11-02-20	0.03 km from TDR	
215418	The construction of a temporary 290-space car park, with associated bus turning and set-down area, and site lighting. The car park will operate for a period of up to 24 months.	16-07-21	0.03 km from TDR	
196166	Change of use of existing creche/montessori to a proposed dwellinghouse with no external alterations.	02-12-19	0.03 km from TDR	
216509	Alterations, including partial demolition, and new extension to dwelling incorporating a granny flat, demolition of existing shed and associated site works.	16-03-22	0.04 km from TDR	
185229	Permission for the retention of i) a single storey extension to the front, ii) elevational changes, iii) the conversion of a garage and store to habitable rooms and iv) for permission for the installation of a proprietary treatment unit and soil polishing filter, at the existing residential care unit.	02-07-18	0.01 km from TDR	

Planning Ref. No.	Description	Final Grant	Distance (TDR = Turbine Delivery Route) (GCR = Grid Connection Route)	Notes
195428	Permission to install a fire escape window in existing loft space to accommodate a habitable room (complete with louvres to prevent overlooking), two proposed rooflights and all associated works. Retention is also sought for minor alterations to elevations and rooflights and minor alterations to internal layout to that granted under planning permission reference 15/04795 relating to existing split-level dwelling house.	22-07-19	0.01 km from TDR	
194301	Modifications and elevational changes to an existing retail unit (Protected Structure). The proposed development includes the partial demolition and reconstruction of the north-western corner of the building to improve vehicular and pedestrian access within the Mills complex; the closure of an existing pedestrian entrance on northern elevation and relocation of existing signage on the northern elevation; the provision of a revised entrance and new ancillary signage on the western elevation; a new fire escape on the eastern elevation and all ancillary development including the demolition of a ESB substation.	28-05-19	0.01 km from TDR	
194036	A part single-storey, part two-storey building (c. 4,378m2 in area) with ancillary workshop and offices. The building is to be constructed in two phases, with Phase 1 comprising part single-storey, part two-storey building (c. 1,929m2) to be used for the hire and sale of plant and/ or machinery and/or tools; and Phase 2 comprising a single-storey building to be used as a warehouse (c.2449m2). The proposed development also includes an external yard for the storage of plant/machinery; palisade fence/wall to boundaries; signage, including stand-alone totem sign; car parking; replacement new access from Blackash Road; and all associated site development, drainage and landscaping works. A Natura Impact Statement (NIS) will be submitted to the Planning Authority with the application.	30-07-19	0.01 km from TDR	
184243	The development will comprise of one no. light industrial/warehouse building (5459 sqm) (capable of subdivision upto three no. units) including ancillary office space, car parking, 10m high site signage substation and associated site works. The proposed building will be capable of accommodating warehousing/distribution (logistics)/light industrial.	24-05-18	0.01 km from TDR	

Planning Ref. No.	Description	Final Grant	Distance (TDR = Turbine Delivery Route) (GCR = Grid Connection Route)	Notes
186402	Construction of 10 no. dwellinghouses and all associated ancillary development works including car parking, access, landscaping and amenity areas (the proposed development will replace 21 no. apartments previously permitted under Planning Reg. No. 00/3131 and An Bord Pleanala Ref. PL04.130788) Extension Of Duration of Permission granted under planning 13/4773.	26-10-18	0.05 km from TDR	
225656	Intend to apply for 10 year planning permission. Underground electricity grid connection cabling, substation and ancillary site works. The development will comprise (1) a grid connection consisting of medium voltage cables and ducting in a excavated trench with a total length of c.1194 meters which will be installed on private land and public roads (L-2216 & L-22161); (2) control/switching substation consisting of either (i) single storey block building or (ii) 2 no. modular units; (3) cable beam over grange hill stream; (4) provision of ring main unit (RMU); (5) and all associated site development and reinstatement works. The proposed development includes minor revisions to the approved layout of the solar farm previously permitted under Cork County Council planning reference 18/5760 comprising omission of substation and satellite mast, and provision of the above referenced RMU, and the addition of a cable beam and underground cabling. The purpose of the proposed development is to connect the permitted solar farm under reference 18/5760 to the national grid at the existing Ballincollig 38Kv substation.	10-11-22	0.01 km from TDR	
224769	Demolition of existing dwelling, construction of two storey dwelling, sewerage system, upgrade to site entrance and all associated works (change of design to previously permitted under Planning Ref. 19/6060)	15-11-22	0.03 km from TDR	
196060	Demolition of existing dwelling, construction of new dormer type dwelling, domestic garage, waste water treatment and percolation system, relocation of site entrance and all associated site works.	10-10-19	0.03 km from TDR	
206720	Permission for 9 no. residential serviced sites and all ancillary site development works including access roads, footpaths, parking, drainage, landscaping and amenity areas.	05-02-21	0.03 km from TDR	

Planning Ref. No.	Description	Final Grant	Distance (TDR = Turbine Delivery Route) (GCR = Grid Connection Route)	Notes
214669	The proposed development will consist of the lateral extension of the Classis South Quarry (planning references 03/4253, PL04.205925 and 14/4728) for the extraction of sand and gravel (aggregate) within a ca. 15.049 ha application area. The extraction area will extend to ca. 8 ha and to a maximum depth of 13 mOD (ca. 8.6 metres below the winter water table). The aggregate will be transported by a proposed on-site temporary conveyor to the existing, authorised fixed conveyor (permission 19/4530). An initial construction phase of up to 12 weeks will include the stripping of topsoil, installation of on-site temporary welfare facilities (port-a-loo ca. 6m2 by 2.3m), two concrete parking plinths (ca. 56m2 and 36m2), concrete refuelling plinth (ca.80m2) and associated interceptor and drainage, and installation of an access road to connect the existing Classis South Quarry to the proposed extension ca.101 m long by ca. 5 m wide incorporating a culvert (ca. 4 m in height), installation of screening embankments to a height of 3.1 m, installation of fencing and all associated site works. The operational phase of up to 7 years duration will include extraction and then transport of aggregate via conveyor. The proposed development will include a rehabilitation phase of up to 2 years duration to form a water body, united with the existing Classis South Quarry water body. An Environmental Impact Assessment report and Natura Impact Statement will be submitted with the planning application.	14-12-21	0.01 km from TDR	Appealed
194530	The continuance of use of an existing conveyor system to facilitate continued transport of sand and gravel to the nearby processing plant and culvert under the N22 roadway in the townland of Knockanemore	18-04-19	across TDR	
226417	The development will consist of: a readymixed concrete plant (comprising a feed ramp, 5 no. bins, a batch conveyor, a mixer house and 2 no. cement silos) with associated concrete reclaimer unit, electricity supply and switch room building (47sqm), lab/store building (14sqm), bunded fuel tanks, hard and soft landscaping and all other site excavation, infrastructural and site development work above and below ground. The proposed development will operate from 07.00hrs to 18.30hrs Monday to Friday inclusive and from 08.00hrs to 16.00hrs on Saturdays inclusive (no operation on Sundays, Bank and Public holidays). Permission is also being sought for occasional out of hours operation, up to a maximum of 40 no. occasions per year (excluding Sundays, Bank and Public holidays), outside of normal operating hours. There is no changes proposed to the permitted pit operating hours.		0.04 km from TDR	NEW APPLICATION

Planning Ref. No.	Description	Final Grant	Distance (TDR = Turbine Delivery Route) (GCR = Grid Connection Route)	Notes
194385	(1) The construction of single storey extensions to the west and south of an existing dwelling, alterations to existing elevations, modifications to the existing internal layout and all associated site works (2) The retention of a sunroom at ground floor level and an attic conversion to bedroom accommodation including a dormer extension with window to south and first floor windows on east and west elevations of existing dwelling (3) The retention of a domestic garage.	15-04-19	0.05 km from TDR	
185155	Development consists of restoration of part (c. 6.7 ha) of existing quarry (QR19 06/11798 & PL04.225332) by importation of up to 300,000 tonnes per annum of inert soil and stones and river dredging spoil (EWC 17-05-04 and 17-05-06).The proposed soil recovery facility will utilise the permitted quarry infrastructure including internal roads, site office, welfare facilities and other ancillaries to complete the works. Access to the site will be from the permitted main entrance on the N22 National Primary Road. A wheel wash and weighbridge will be provided as part of the proposed development and the existing workshop will be utilised as a quarantine area. A hard-stand with drainage to oil interceptor will also be provided as a designated refuelling area. The total application area including the site infrastructure covers 7.9 ha of lands. The development will be subject to the requirements of the waste management licence. An Environmental Impact Assessment Report (EIAR) will be submitted to the Planning Authority with the application.	22-11-18	0.01 km from TDR	
216282	New two storey dwelling with additional attic accommodation, domestic garage, sewerage system, and all associated works – house previously permitted as part of master planning reference 16/07237 with site boundary works previously completed.	07-10-21	0.01 km from TDR	
224953	(a)sub-division of ground floor of dwelling to use as two separate (2 bed and 3 bed) apartment units (b) single storey side annex for storage/toilet/utility use. (c) new rear boundary wall and (d) general modifications to window/door opes.	27-10-22	0.02 km from TDR	
226258	Permission for construction of dwelling (change of layout and design from that previously granted under pl.reg.21/6639), propriety waste water treatment system and all associated site works at Rosemount House (a protected structure - RPS Reg. No. 00553)	19-01-23	0.01 km from TDR	

Planning Ref. No.	Description	Final Grant	Distance (TDR = Turbine Delivery Route) (GCR = Grid Connection Route)	Notes
226316	(1) the construction of a ground floor extension, (2) The conversion of the attached garage to utility/ ancillary space, (3) The replacement of an existing mono-pitch roof with a flat roof, (4) alterations to fenestration and (5) all associated site works to existing dwelling.	07-12-22	0.01 km from TDR	
184885	Retain rear extensions, domestic garage and dwelling as constructed (change of layout and design from that permitted under Planning Reg. No. S/98/1422) and permission to construct extension to rear of dwelling and all associated site works.	10-12-18	0.01 km from TDR	
196279	Retention for alterations to existing cottage including partial removal of roof tiles and removal of windows, guttering and chimney to cottage, partial removal of roadside boundary wall and widening of site entrance and excavation/alteration of existing ground levels and removal of topsoil and permission to remove remainder of out-building and construct new two storey extension to rear of existing single storey cottage, completion of roof and facade alterations to existing cottage, new domestic garage, new sewerage treatment system to replace existing system, completion of works to existing roadside boundary wall and all associated works.	09-12-19	0.02 km from TDR	
225306	4 no. residential serviced sites, construction of 2 no. new shared entrances, roadside boundary walls, 4 no. individual wastewater treatment systems and all other ancillary site works.	11-01-23	0.02 km from TDR	
225426	Permission for the construction of dwellinghouse and domestic garage, new shared entrance, wastewater treatment system, 2.4 meter high noise mitigation fencing to roadside boundary together with all other ancillary site works.	11-08-22	Roadside from TDR	
195391	Upgrading and relocation of existing septic tank serving dwellinghouse to proprietary treatment system.	17-07-19	0.01 km from TDR	
195652	Construction of dwellinghouse and domestic garage and all associated site works. Extension of Duration of Permission granted under Planning Reference: 14/5284.	14-08-19	0.01 km from TDR	

Planning Ref. No.	Description	Final Grant	Distance (TDR = Turbine Delivery Route) (GCR = Grid Connection Route)	Notes
216900	Works to existing single storey dwelling, 1) demolition of existing side extension, 2) construction of new 1 1/2 storey extension to side of existing dwelling, 3) internal and external alterations to existing dwelling, 4) new sewerage system to replace existing septic tank, 5) re-located site entrance, 6) demolition of 2 no. existing out-buildings/sheds, 7) construction of new domestic garage with loft storage and 8) all associated works.	17-12-21	0.01 km from TDR	
224173	The change of use of a site from temporary soil storage area / construction compound to that of permanently improved agricultural grassland.	28-03-22	0.02 km from TDR	
206736	The change of use from temporary soil storage area/ agricultural field to a permanent environmental berm.	02-02-21	0.02 km from TDR	
217049	The change of use of a site from temporary soil storage area / bedrock processing compound to that of permanently improved agricultural grassland.	16-05-22	0.02 km from TDR	
215453	The construction of new milking parlour and meal bin along with the construction of new agricultural cubicle house and scraping areas which will be attached to existing agricultural units together with all other ancillary siteworks.	27-08-21	0.01 km from TDR	
184581	Construction of new agricultural slatted unit which will be partly attached to existing agricultural building together with all other ancillary site works	30-05-18	0.01 km from TDR	
224994	Demolition of existing dwellinghouse, construction of new dwellinghouse and garage in lieu thereof, new entrance, wastewater treatment system, together with all other ancillary site works.	11-10-22	0.01 km from TDR	
206977	The importation of soil & stone for the raising of an agricultural field in order to improve the agricultural output of the field.	13-08-21	0.02 km from TDR	
234415	Change of use of a site from temporary soil storage area/compound to that of permanently improved agricultural grassland.		0.02 km from TDR	NEW APPLICATION
216547	Construction of a one and a halfstorey dwelling, domestic garage, sewerage system, site entrance and all associated works.	05-11-21	0.02 km from TDR	

Planning Ref. No.	Description	Final Grant	Distance (TDR = Turbine Delivery Route) (GCR = Grid Connection Route)	Notes
184182	A battery energy storage facility which will comprise of rechargeable battery units contained within up to 39 No. 40 foot containers on site and the associated development of unit substations, a 110 kV substation, security fencing, security cameras, lightning mast, new site roads and the upgrading of the existing vehicular access. The facility will connect into the adjoining Ballyvouskill ESB substation via underground cable. All associated site development, landscaping and boundary treatment works above and below ground.	30-11-18	0.01 km from GCR	
205281	Proposed modifications to the previously permitted development (planning ref: 18/06438 granted on 7th March 2019).The proposed modifications will comprise the additional construction of one (1) harmonic filter, one (1) HV circuit breaker (including CT and VT), one (1) MV disconnector and earth switch, two (2) cable sealing ends, three (3) additional lightning masts (approximately 25m high) and additional lamppost lightning. It further includes a retaining wall (approximately 2.5m high), asphalt (non-permeable) surfacing, additional permanent access road, additional fencing to match existing 2.6m high palisade, additional permanent access gate and all other ancillary site development works. The development will remain an extension to the existing substation and this extension will have an overall site area (within the planning application boundary) of 0.73ha. Access will continue to be provided via a L5226 and the R582.	17-08-20	0.01 km from GCR	
186438	The proposed development will comprise the construction of one (1) no. ± 100 Mvar STATCOM transformer, one (1) no. auxiliary transformer, three (3) no. reactors, one (1) no. outdoor cooling bank, control and valve building (268m²), underground connection to existing ESB substation. It further includes security fencing, security gate, four (4) no. 25m high lightning masts, permeable surfacing, and an internal access road. There will also be the construction of one (1) no. temporary contractors' compound. The development is an extension to the existing substation and the overall site area (within the planning application boundary) is 0.73ha. Access is provided via a local road (L5226) onto the R582.	28-01-19	0.01 km from GCR	

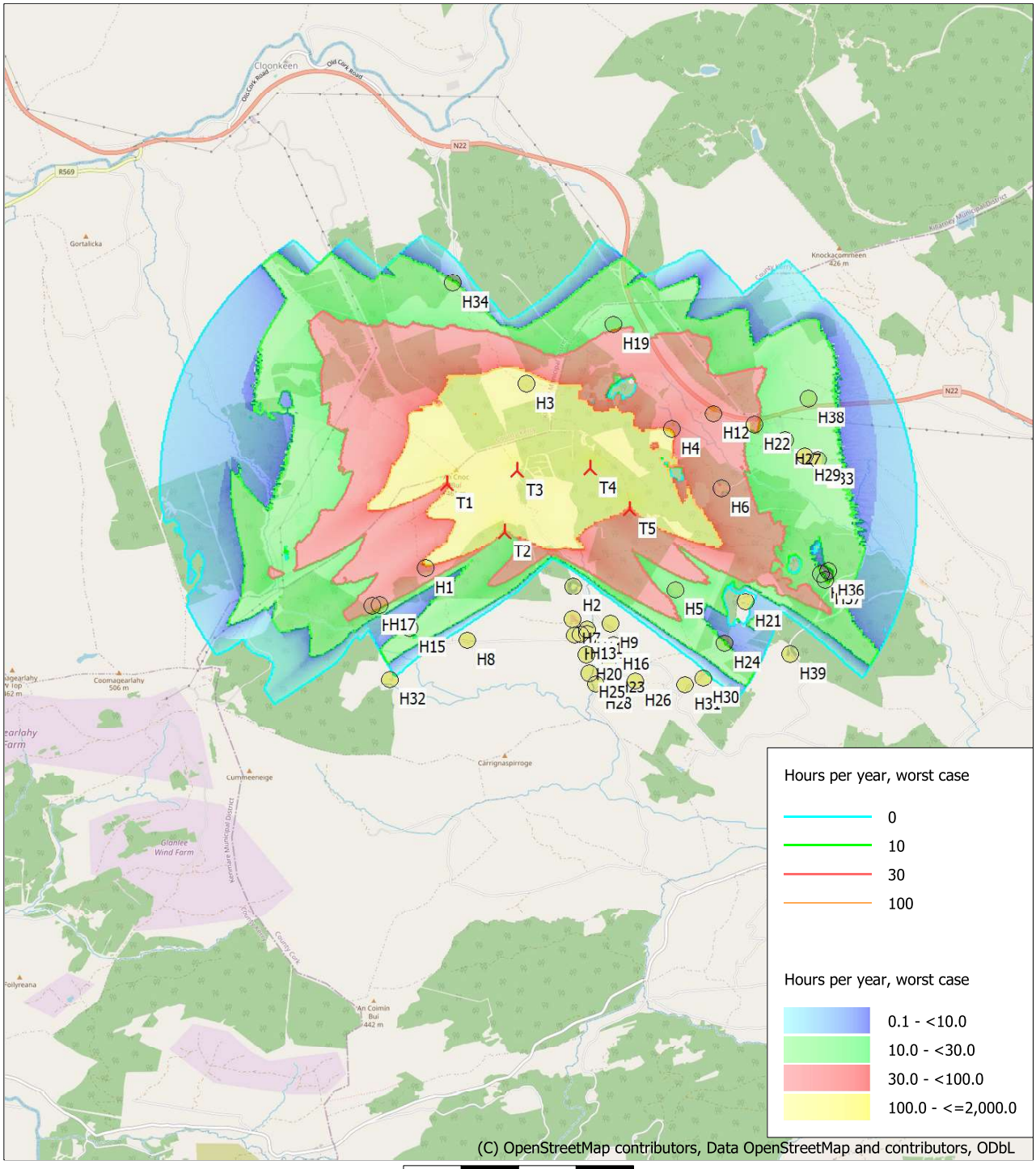
Planning Ref. No.	Description	Final Grant	Distance (TDR = Turbine Delivery Route) (GCR = Grid Connection Route)	Notes
185686	Construction of a battery storage compound including 2 no. battery storage buildings with associated plant and equipment, an ancillary 110kV electricity substation with 2 no. control buildings, associated electrical plant & equipment and fencing, underground electricity cabling, surface water drainage, site entrance and access track, security fencing and all ancillary site works.	10-01-19	0.05 km from GCR	
Kerry County Council				
21636	(1) CONSTRUCT A TWO STOREY DWELLING WITH SEPTIC TANK AND PERCOLATION AREA (2) DECOMMISSION EXISTING SEPTIC TANK AND PERCOLATION AREA (3) ANCILLARY SITE WORKS ASSOCIATED WITH (1) AND (2) (4) CONVERT EXISTING COTTAGE TO DOMESTIC STORE/GARAGE ANCILLARY TO THE PROPOSED DWELLING ON OUR SITE	44463	4.1 km from centre of Site	
22816	(I) UNDERGROUND ELECTRICAL CABLING (33KV), (II) UPGRADE OF ACCESS JUNCTIONS; (III) ACCESS ROADS (NEW AND UPGRADE OF EXISTING); (IV) TEMPORARY ACCESS ROAD; (V) BORROW PIT; (VI) SITE DRAINAGE; (VII) FORESTRY FELLING; AND (VIII) ALL ASSOCIATED SITE DEVELOPMENT ANCILLARY WORKS AND APPARATUS. THE DEVELOPMENT SUBJECT TO THIS APPLICATION FORMS OF GRID CONNECTION AND ACCESS ARRANGEMENTS WHICH WILL FACILITATE THE PERMITTED KNOCKNAMORK RENEWABLE ENERGY DEVELOPMENT, CORK COUNTY COUNCIL REF. NO. 19/4972. CONCURRENT PLANNING APPLICATIONS IN RELATION TO THE OVERALL GRID CONNECTION AND ACCESS ARRANGEMENTS WILL ALSO BE LODGED TO CORK COUNTY COUNCIL AND AN BORD PLEANÁLA. AN OPERATIONAL PERIOD AND EXTENDED PLANNING PERMISSION DURATION TO ALIGN WITH THE PERMITTED KNOCKNAMORK RENEWABLE ENERGY DEVELOPMNET, CORK COUNTY COUNCIL REF. NO. 19/4972 IS SOUGHT. AN ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) AND NATURA IMPACT STATEMENT (NIS) HAVE BEEN PREPARED IN RESPECT OF THE PROPOSED DEVELOPMENT AND ACCOMPANIES THIS APPLICATION.	FURTHER INFORMATION - Decision due 24/05/2023	2.93 km from centre of Site and along GCR	Large Scale Development

Planning Ref. No.	Description	Final Grant	Distance (TDR = Turbine Delivery Route) (GCR = Grid Connection Route)	Notes
1876	(A) INSTALL A WASTE WATER TREATMENT SYSTEM TO REPLACE SEPTIC TANK SERVING EXISTING DWELLING HOUSE (B) PERMISSION FOR CHANGE USE OF EXISTING DETACHED OUTBUILDING TO INDEPENDANT HABITABLE DWELLING UNIT/STUDIO INCLUDING REPLACEMENT OF ROOF INCLUDING NEW ROOF LIGHTS, INSTALLATION OF ROOF MOUNTED SOLAR PANELS AND INSTALLATION OF INDEPENDENT WASTEWATER TREATMENT SYSTEM.(C) RETAIN EXISTING DWELLING AND ALL ANCILLARY SITE WORKS WITHIN REVISED SITE BOUNDARIES INCLUDING SUBDIVISION TO PROVIDE SEPARATE SITE FOR SECONDARY DWELLING .	27-06-18	3.76 km from centre of Site	
201263	CONSTRUCT A 100M HIGH TEMPORARY GUYED LATTICE METEROLOGICAL MAST (MET MAST) WHICH WILL BE IN PLACE FOR 5 YEARS. THE STRUCTURE WILL BE FIXED TO GROUND ANCHORS BY GUY WIRES AND WILL INCLUDE INSTRUMENTS FOR MEARSURING LOCAL CLIMATE CONDITIONS AND ALL ANCILLARY WORKS	24-02-21	0.02 km from GCR	
20519	CONSTRUCT AN AGRICULTURAL SHED WITH ASSOCIATED YARDS AND WALLS	06-11-20	4.14 km from centre of Site	

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/02/2023 15:50/3.6.355

SHADOW - Map

Calculation: Specimen Turbine Worst Case



0 500 1000 1500 2000 m

Map: EMD OpenStreetMap , Print scale 1:50,000, Map center Irish ITM-IRENET95 (IE), geocentric, GRS80 East: 512,970 North: 578,100

New WTG Shadow receptor

Flicker map level: Elevation Grid Data Object: Inchamore_EMDGrid_3.wpg (3)

Time step: 2 minutes, Day step: 3 days, Map resolution: 10 m, Visibility resolution: 5 m, Eye height: 1.5 m

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/02/2023 14:10/3.6.355

SHADOW - Main Result

Calculation: Specimen Turbine

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

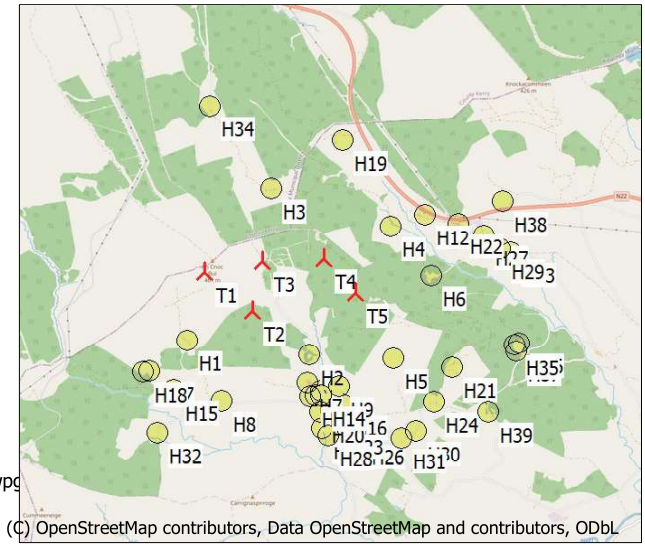
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Elevation Grid Data Object: Inchamore_EMDGrid_3.wpg
Receptor grid resolution: 1.0 m

All coordinates are in
Irish ITM-IRENET95 (IE), geocentric, GRS80



Scale 1:75,000

New WTG Shadow receptor

WTGs

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
1	512,358	578,940	448.5	T1	No	Siemens Gamesa	SG 6.0 6600-6,600	6,600	155.0	107.5	2,500	9.3
2	513,947	578,689	369.0	T5	No	Siemens Gamesa	SG 6.0 6600-6,600	6,600	155.0	107.5	2,500	9.3
3	513,613	579,050	374.1	T4	No	Siemens Gamesa	SG 6.0 6600-6,600	6,600	155.0	107.5	2,500	9.3
4	512,852	578,514	369.6	T2	No	Siemens Gamesa	SG 6.0 6600-6,600	6,600	155.0	107.5	2,500	9.3
5	512,972	579,041	400.0	T3	No	Siemens Gamesa	SG 6.0 6600-6,600	6,600	155.0	107.5	2,500	9.3

Shadow receptor-Input

No.	Name	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	H1	512,160	578,211	346.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
B	H2	513,445	578,031	285.9	2.0	2.0	0.5	90.0	"Green house mode"	2.5
C	H3	513,072	579,801	338.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
D	H4	514,329	579,384	289.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
E	H5	514,339	577,982	318.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
F	H6	514,756	578,856	262.2	2.0	2.0	0.5	90.0	"Green house mode"	2.5
G	H7	513,435	577,744	264.0	2.0	2.0	0.5	90.0	"Green house mode"	2.5
H	H8	512,511	577,570	263.5	2.0	2.0	0.5	90.0	"Green house mode"	2.5
I	H9	513,762	577,696	259.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
J	H10	513,449	577,603	249.4	2.0	2.0	0.5	90.0	"Green house mode"	2.5
K	H11	513,566	577,655	253.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
L	H12	514,700	579,510	276.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
M	H13	513,505	577,609	248.6	2.0	2.0	0.5	90.0	"Green house mode"	2.5
N	H14	513,565	577,612	248.9	2.0	2.0	0.5	90.0	"Green house mode"	2.5
O	H15	512,009	577,691	278.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
P	H16	513,794	577,514	246.6	2.0	2.0	0.5	90.0	"Green house mode"	2.5
Q	H17	511,756	577,894	314.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
R	H18	511,689	577,885	311.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
S	H19	513,838	580,300	300.4	2.0	2.0	0.5	90.0	"Green house mode"	2.5
T	H20	513,548	577,431	232.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
U	H21	514,950	577,873	283.9	2.0	2.0	0.5	90.0	"Green house mode"	2.5
V	H22	515,053	579,406	282.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
W	H23	513,747	577,308	221.7	2.0	2.0	0.5	90.0	"Green house mode"	2.5
X	H24	514,759	577,513	272.4	2.0	2.0	0.5	90.0	"Green house mode"	2.5
Y	H25	513,572	577,269	216.5	2.0	2.0	0.5	90.0	"Green house mode"	2.5
Z	H26	513,974	577,197	219.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5

To be continued on next page...

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/02/2023 14:10/3.6.355

SHADOW - Main Result

Calculation: Specimen Turbine

...continued from previous page

No.	Name	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
AA	H27	515,322	579,275	275.0	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AB	H28	513,631	577,179	207.2	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AC	H29	515,488	579,130	260.2	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AD	H30	514,568	577,209	245.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AE	H31	514,413	577,149	233.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AF	H32	511,831	577,246	253.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AG	H33	515,603	579,094	254.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AH	H34	512,444	580,689	261.7	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AI	H35	515,614	578,103	249.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AJ	H36	515,672	578,122	245.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AK	H37	515,646	578,046	243.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AL	H38	515,525	579,630	278.7	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AM	H39	515,332	577,403	242.0	2.0	2.0	0.5	90.0	"Green house mode"	2.5

Calculation Results

Shadow receptor

		Shadow, worst case			**Shadow, expected values**
No.	Name	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
A	H1	93:18	118	1:13	18:06
B	H2	0:00	0	0:00	0:00
C	H3	121:06	98	1:42	11:51
D	H4	98:51	153	0:48	11:24
E	H5	21:15	75	0:24	4:41
F	H6	49:31	102	0:42	9:56
G	H7	0:00	0	0:00	0:00
H	H8	0:00	0	0:00	0:00
I	H9	0:00	0	0:00	0:00
J	H10	0:00	0	0:00	0:00
K	H11	0:00	0	0:00	0:00
L	H12	52:06	114	0:50	6:28
M	H13	0:00	0	0:00	0:00
N	H14	0:00	0	0:00	0:00
O	H15	12:33	57	0:18	2:25
P	H16	0:00	0	0:00	0:00
Q	H17	36:13	83	0:40	6:50
R	H18	40:24	89	0:41	7:40
S	H19	27:12	86	0:26	2:28
T	H20	0:00	0	0:00	0:00
U	H21	0:00	0	0:00	0:00
V	H22	32:34	79	0:37	4:47
W	H23	0:00	0	0:00	0:00
X	H24	10:35	46	0:18	2:16
Y	H25	0:00	0	0:00	0:00
Z	H26	0:00	0	0:00	0:00
AA	H27	18:54	59	0:27	3:01
AB	H28	0:00	0	0:00	0:00
AC	H29	14:29	52	0:22	2:27
AD	H30	0:00	0	0:00	0:00
AE	H31	0:00	0	0:00	0:00
AF	H32	0:00	0	0:00	0:00
AG	H33	12:46	50	0:21	2:12
AH	H34	10:36	40	0:19	0:58
AI	H35	10:28	37	0:21	2:19
AJ	H36	9:24	35	0:21	2:05
AK	H37	10:31	39	0:21	2:19
AL	H38	13:21	54	0:20	1:52
AM	H39	0:00	0	0:00	0:00

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/02/2023 14:10/3.6.355

SHADOW - Main Result

Calculation: Specimen Turbine

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	T1	51:48	6:31
2	T5	204:51	29:03
3	T4	162:25	24:57
4	T2	108:42	21:18
5	T3	72:45	7:36

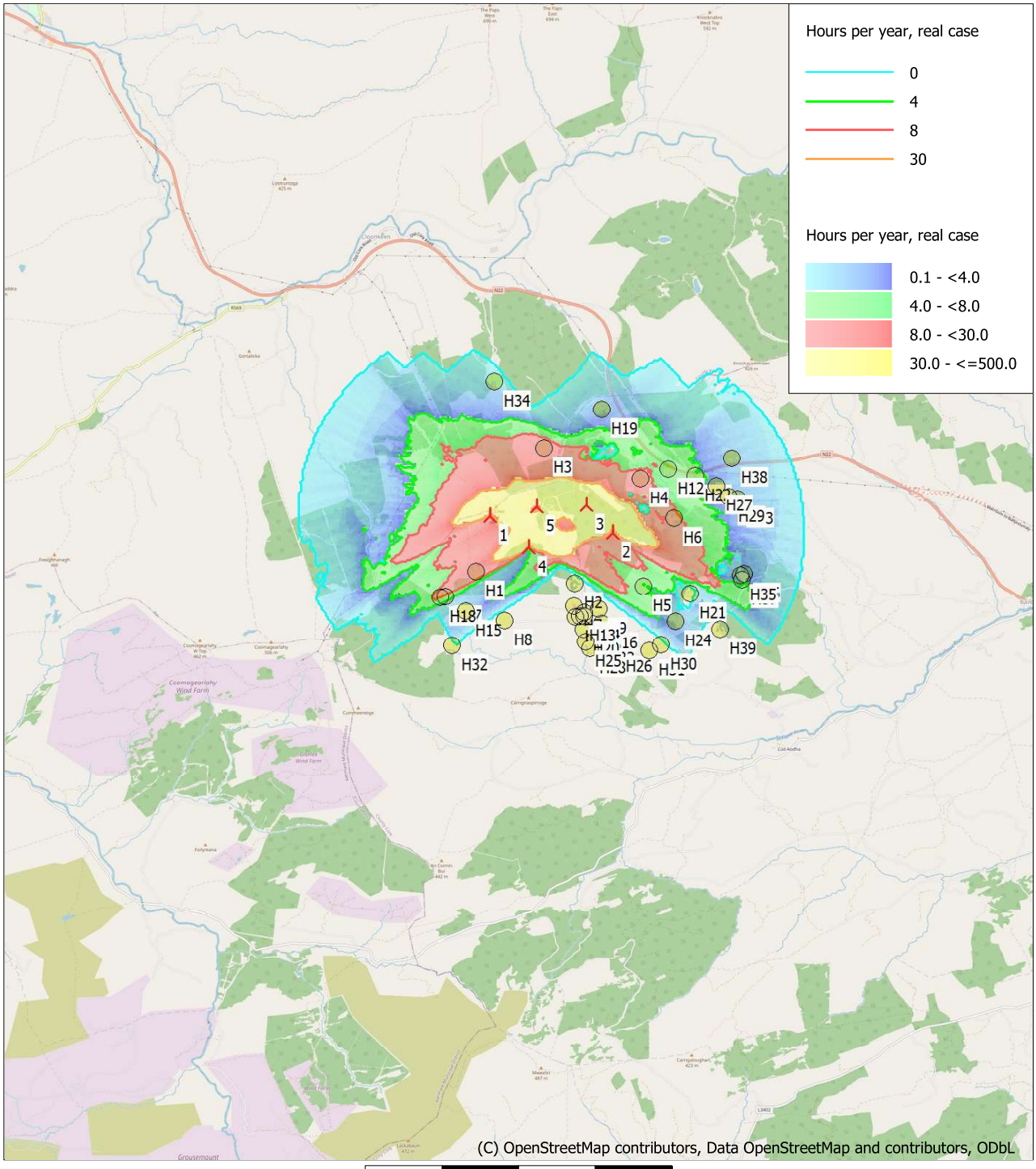
Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/02/2023 14:10/3.6.355

SHADOW - Map

Calculation: Specimen Turbine



0 1 2 3 4 km

Map: EMD OpenStreetMap , Print scale 1:75,000, Map center Irish ITM-IRENET95 (IE), geocentric, GRS80 East: 512,730 North: 578,100

New WTG Shadow receptor

Flicker map level: Elevation Grid Data Object: Inchamore_EMDGrid_3.wpg (3)

Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1.5 m

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
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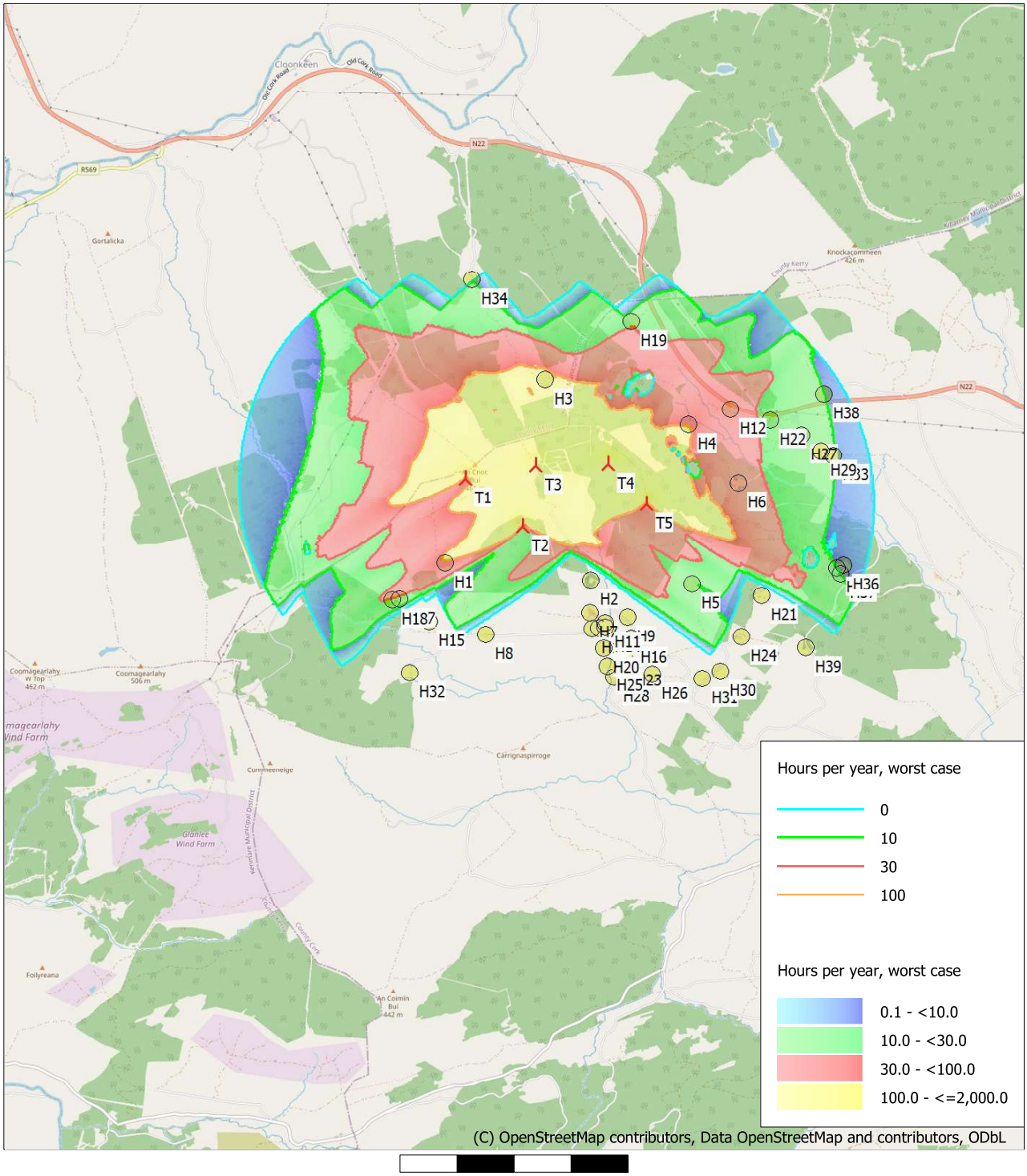
SHADOW - Map

Calculation: Alternative Scenario 1 Worst Case



0 500 1000 1500 2000 m

Map: EMD OpenStreetMap , Print scale 1:50,000, Map center Irish ITM-IRENET95 (IE), geocentric, GRS80 East: 512,770 North: 578,100

New WTG Shadow receptor

Flicker map level: Elevation Grid Data Object: Inchamore_EMDGrid_3.wpg (3)

Time step: 2 minutes, Day step: 3 days, Map resolution: 10 m, Visibility resolution: 5 m, Eye height: 1.5 m

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/02/2023 15:10/3.6.355

SHADOW - Main Result

Calculation: Alternative Scenario 1

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

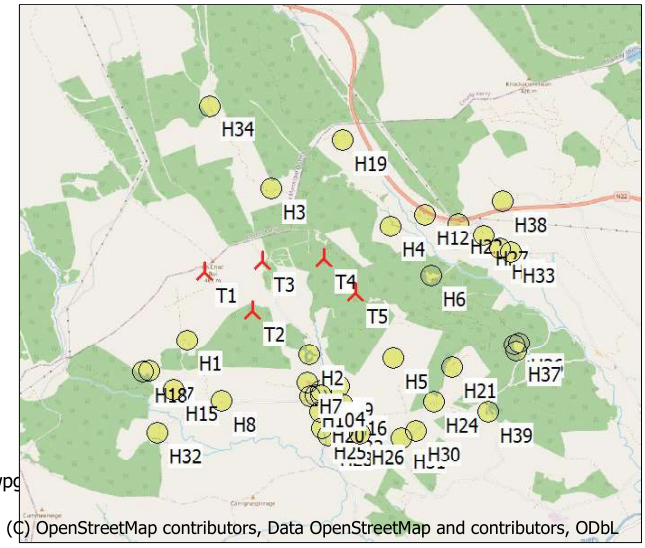
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Elevation Grid Data Object: Inchamore_EMDGrid_3.wpg
Receptor grid resolution: 1.0 m

All coordinates are in
Irish ITM-IRENET95 (IE), geocentric, GRS80



Scale 1:75,000

New WTG Shadow receptor

WTGs

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
1	512,358	578,940	448.5	T1	Yes	Siemens Gamesa	SG 6.0-155-6,600	6,600	155.0	102.5	2,007	9.3
2	513,947	578,689	369.0	T5	Yes	Siemens Gamesa	SG 6.0-155-6,600	6,600	155.0	102.5	2,007	9.3
3	513,613	579,050	374.1	T4	Yes	Siemens Gamesa	SG 6.0-155-6,600	6,600	155.0	102.5	2,007	9.3
4	512,852	578,514	369.6	T2	Yes	Siemens Gamesa	SG 6.0-155-6,600	6,600	155.0	102.5	2,007	9.3
5	512,972	579,041	400.0	T3	Yes	Siemens Gamesa	SG 6.0-155-6,600	6,600	155.0	102.5	2,007	9.3

Shadow receptor-Input

No.	Name	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	H1	512,160	578,211	346.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
B	H2	513,445	578,031	285.9	2.0	2.0	0.5	90.0	"Green house mode"	2.5
C	H3	513,072	579,801	338.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
D	H4	514,329	579,384	289.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
E	H5	514,339	577,982	318.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
F	H6	514,756	578,856	262.2	2.0	2.0	0.5	90.0	"Green house mode"	2.5
G	H7	513,435	577,744	264.0	2.0	2.0	0.5	90.0	"Green house mode"	2.5
H	H8	512,511	577,570	263.5	2.0	2.0	0.5	90.0	"Green house mode"	2.5
I	H9	513,762	577,696	259.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
J	H10	513,449	577,603	249.4	2.0	2.0	0.5	90.0	"Green house mode"	2.5
K	H11	513,566	577,655	253.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
L	H12	514,700	579,510	276.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
M	H13	513,505	577,609	248.6	2.0	2.0	0.5	90.0	"Green house mode"	2.5
N	H14	513,565	577,612	248.9	2.0	2.0	0.5	90.0	"Green house mode"	2.5
O	H15	512,009	577,691	278.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
P	H16	513,794	577,514	246.6	2.0	2.0	0.5	90.0	"Green house mode"	2.5
Q	H17	511,756	577,894	314.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
R	H18	511,689	577,885	311.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
S	H19	513,838	580,300	300.4	2.0	2.0	0.5	90.0	"Green house mode"	2.5
T	H20	513,548	577,431	232.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
U	H21	514,950	577,873	283.9	2.0	2.0	0.5	90.0	"Green house mode"	2.5
V	H22	515,053	579,406	282.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
W	H23	513,747	577,308	221.7	2.0	2.0	0.5	90.0	"Green house mode"	2.5
X	H24	514,759	577,513	272.4	2.0	2.0	0.5	90.0	"Green house mode"	2.5
Y	H25	513,572	577,269	216.5	2.0	2.0	0.5	90.0	"Green house mode"	2.5
Z	H26	513,974	577,197	219.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5

To be continued on next page...

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/02/2023 15:10/3.6.355

SHADOW - Main Result

Calculation: Alternative Scenario 1

...continued from previous page

No.	Name	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
AA	H27	515,322	579,275	275.0	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AB	H28	513,631	577,179	207.2	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AC	H29	515,488	579,130	260.2	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AD	H30	514,568	577,209	245.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AE	H31	514,413	577,149	233.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AF	H32	511,831	577,246	253.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AG	H33	515,603	579,094	254.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AH	H34	512,444	580,689	261.7	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AI	H35	515,614	578,103	249.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AJ	H36	515,672	578,122	245.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AK	H37	515,646	578,046	243.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AL	H38	515,525	579,630	278.7	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AM	H39	515,332	577,403	242.0	2.0	2.0	0.5	90.0	"Green house mode"	2.5

Calculation Results

Shadow receptor

		Shadow, worst case			**Shadow, expected values**
No.	Name	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
A	H1	94:17	120	1:12	18:19
B	H2	0:00	0	0:00	0:00
C	H3	118:24	96	1:42	11:31
D	H4	98:24	151	0:48	11:18
E	H5	11:50	40	0:24	2:38
F	H6	49:40	104	0:42	9:56
G	H7	0:00	0	0:00	0:00
H	H8	0:00	0	0:00	0:00
I	H9	0:00	0	0:00	0:00
J	H10	0:00	0	0:00	0:00
K	H11	0:00	0	0:00	0:00
L	H12	52:10	117	0:47	6:22
M	H13	0:00	0	0:00	0:00
N	H14	0:00	0	0:00	0:00
O	H15	0:00	0	0:00	0:00
P	H16	0:00	0	0:00	0:00
Q	H17	25:43	60	0:31	4:48
R	H18	28:30	66	0:30	5:22
S	H19	17:20	50	0:26	1:28
T	H20	0:00	0	0:00	0:00
U	H21	0:00	0	0:00	0:00
V	H22	24:26	71	0:28	3:30
W	H23	0:00	0	0:00	0:00
X	H24	0:00	0	0:00	0:00
Y	H25	0:00	0	0:00	0:00
Z	H26	0:00	0	0:00	0:00
AA	H27	17:24	59	0:25	2:44
AB	H28	0:00	0	0:00	0:00
AC	H29	14:31	54	0:22	2:26
AD	H30	0:00	0	0:00	0:00
AE	H31	0:00	0	0:00	0:00
AF	H32	0:00	0	0:00	0:00
AG	H33	12:52	50	0:22	2:13
AH	H34	0:00	0	0:00	0:00
AI	H35	10:22	38	0:21	2:18
AJ	H36	9:21	35	0:21	2:04
AK	H37	10:24	39	0:21	2:18
AL	H38	13:23	53	0:20	1:52
AM	H39	0:00	0	0:00	0:00

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/02/2023 15:10/3.6.355

SHADOW - Main Result

Calculation: Alternative Scenario 1

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	T1	31:23	3:09
2	T5	187:31	25:25
3	T4	158:22	24:13
4	T2	95:52	18:49
5	T3	60:03	5:43

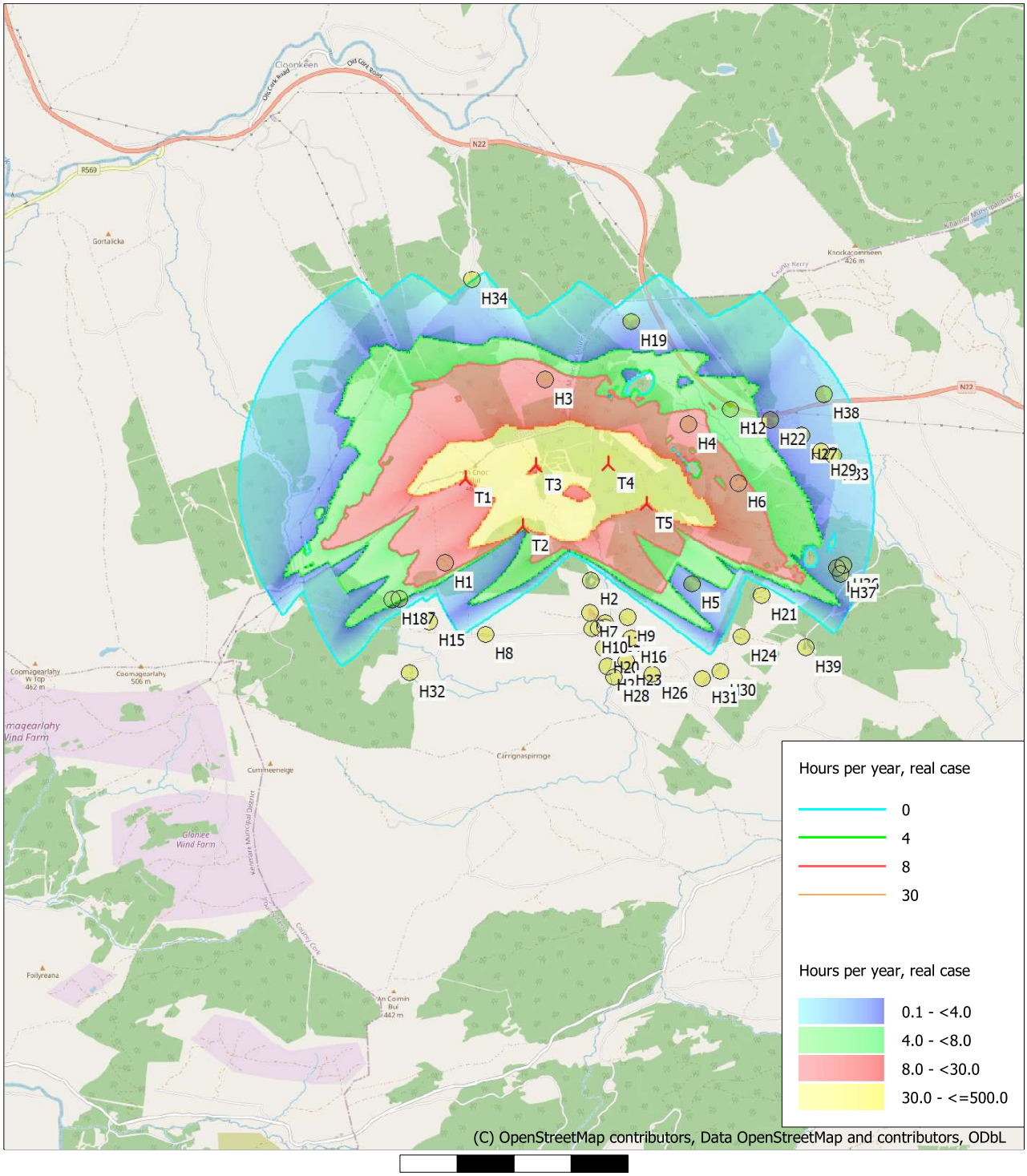
Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/02/2023 15:10/3.6.355

SHADOW - Map

Calculation: Alternative Scenario 1



0 500 1000 1500 2000 m

Map: EMD OpenStreetMap , Print scale 1:50,000, Map center Irish ITM-IRENET95 (IE), geocentric, GRS80 East: 512,770 North: 578,100

New WTG Shadow receptor

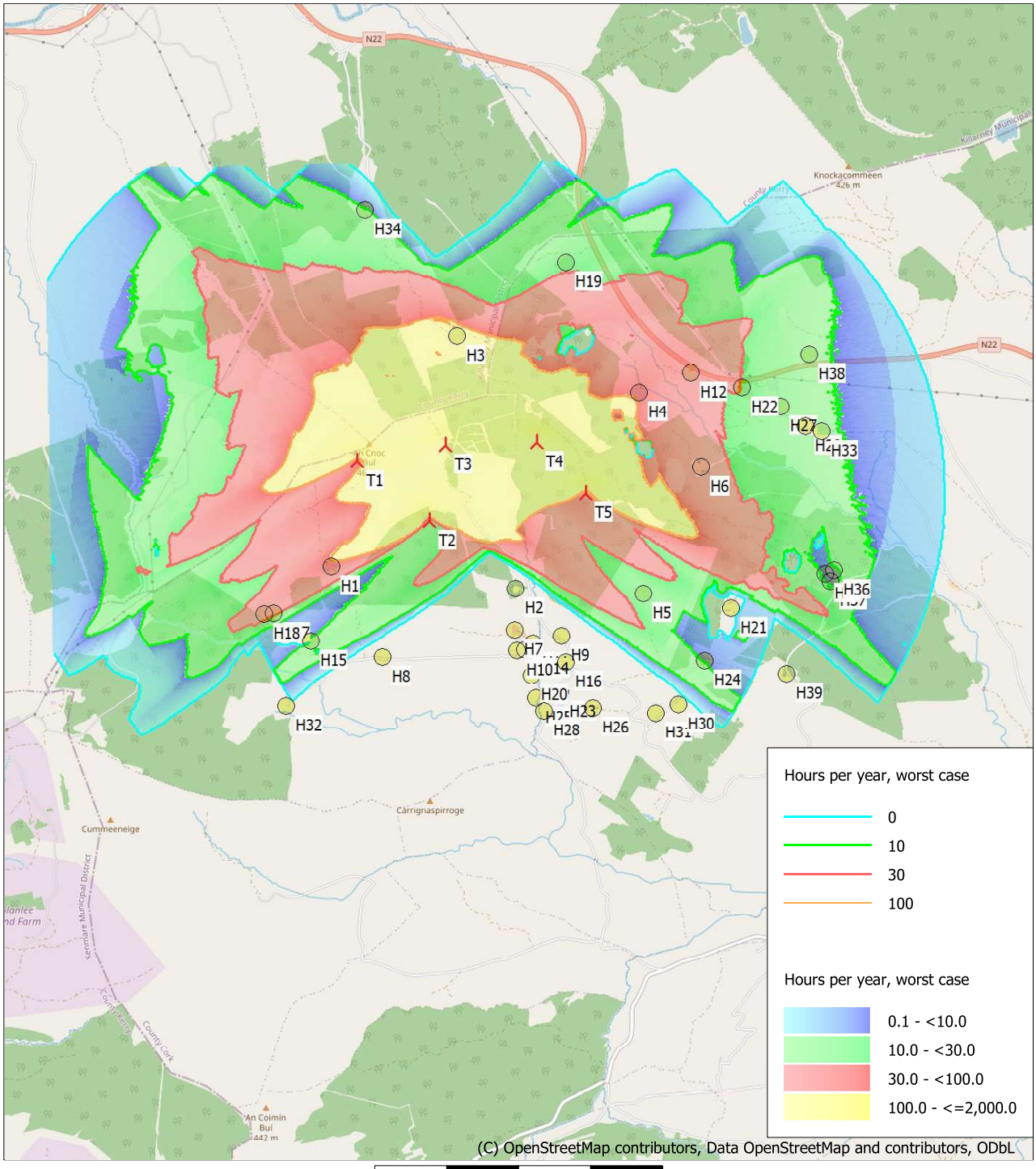
Flicker map level: Elevation Grid Data Object: Inchamore_EMDGrid_3.wpg (3)

Time step: 2 minutes, Day step: 3 days, Map resolution: 10 m, Visibility resolution: 5 m, Eye height: 1.5 m

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/02/2023 15:50/3.6.355

SHADOW - Map

Calculation: Alternative Scenario 2 Worst Case



0 500 1000 1500 2000 m

Map: EMD OpenStreetMap , Print scale 1:40,000, Map center Irish ITM-IRENET95 (IE), geocentric, GRS80 East: 513,470 North: 578,100

New WTG Shadow receptor

Flicker map level: Elevation Grid Data Object: Inchamore_EMDGrid_3.wpg (3)

Time step: 2 minutes, Day step: 3 days, Map resolution: 10 m, Visibility resolution: 5 m, Eye height: 1.5 m

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/02/2023 15:11/3.6.355

SHADOW - Main Result

Calculation: Alternative Scenario 2

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

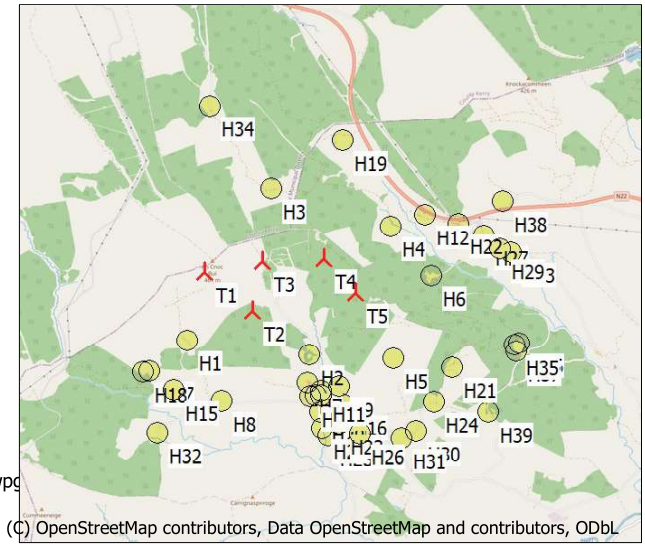
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Elevation Grid Data Object: Inchamore_EMDGrid_3.wpg
Receptor grid resolution: 1.0 m

All coordinates are in
Irish ITM-IRENET95 (IE), geocentric, GRS80



Scale 1:75,000

New WTG Shadow receptor

WTGs

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
1	512,358	578,940	448.5	T1	No	Siemens Gamesa	GS 6.0-6,600	6,600	149.0	110.5	2,500	0.0
2	513,947	578,689	369.0	T5	No	Siemens Gamesa	GS 6.0-6,600	6,600	149.0	110.5	2,500	0.0
3	513,613	579,050	374.1	T4	No	Siemens Gamesa	GS 6.0-6,600	6,600	149.0	110.5	2,500	0.0
4	512,852	578,514	369.6	T2	No	Siemens Gamesa	GS 6.0-6,600	6,600	149.0	110.5	2,500	0.0
5	512,972	579,041	400.0	T3	No	Siemens Gamesa	GS 6.0-6,600	6,600	149.0	110.5	2,500	0.0

Shadow receptor-Input

No.	Name	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	H1	512,160	578,211	346.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
B	H2	513,445	578,031	285.9	2.0	2.0	0.5	90.0	"Green house mode"	2.5
C	H3	513,072	579,801	338.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
D	H4	514,329	579,384	289.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
E	H5	514,339	577,982	318.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
F	H6	514,756	578,856	262.2	2.0	2.0	0.5	90.0	"Green house mode"	2.5
G	H7	513,435	577,744	264.0	2.0	2.0	0.5	90.0	"Green house mode"	2.5
H	H8	512,511	577,570	263.5	2.0	2.0	0.5	90.0	"Green house mode"	2.5
I	H9	513,762	577,696	259.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
J	H10	513,449	577,603	249.4	2.0	2.0	0.5	90.0	"Green house mode"	2.5
K	H11	513,566	577,655	253.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
L	H12	514,700	579,510	276.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
M	H13	513,505	577,609	248.6	2.0	2.0	0.5	90.0	"Green house mode"	2.5
N	H14	513,565	577,612	248.9	2.0	2.0	0.5	90.0	"Green house mode"	2.5
O	H15	512,009	577,691	278.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
P	H16	513,794	577,514	246.6	2.0	2.0	0.5	90.0	"Green house mode"	2.5
Q	H17	511,756	577,894	314.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
R	H18	511,689	577,885	311.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
S	H19	513,838	580,300	300.4	2.0	2.0	0.5	90.0	"Green house mode"	2.5
T	H20	513,548	577,431	232.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
U	H21	514,950	577,873	283.9	2.0	2.0	0.5	90.0	"Green house mode"	2.5
V	H22	515,053	579,406	282.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
W	H23	513,747	577,308	221.7	2.0	2.0	0.5	90.0	"Green house mode"	2.5
X	H24	514,759	577,513	272.4	2.0	2.0	0.5	90.0	"Green house mode"	2.5
Y	H25	513,572	577,269	216.5	2.0	2.0	0.5	90.0	"Green house mode"	2.5
Z	H26	513,974	577,197	219.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5

To be continued on next page...

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/02/2023 15:11/3.6.355

SHADOW - Main Result

Calculation: Alternative Scenario 2

...continued from previous page

No.	Name	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
AA	H27	515,322	579,275	275.0	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AB	H28	513,631	577,179	207.2	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AC	H29	515,488	579,130	260.2	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AD	H30	514,568	577,209	245.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AE	H31	514,413	577,149	233.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AF	H32	511,831	577,246	253.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AG	H33	515,603	579,094	254.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AH	H34	512,444	580,689	261.7	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AI	H35	515,614	578,103	249.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AJ	H36	515,672	578,122	245.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AK	H37	515,646	578,046	243.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AL	H38	515,525	579,630	278.7	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AM	H39	515,332	577,403	242.0	2.0	2.0	0.5	90.0	"Green house mode"	2.5

Calculation Results

Shadow receptor

		Shadow, worst case			**Shadow, expected values**
No.	Name	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
A	H1	88:32	115	1:12	17:08
B	H2	0:00	0	0:00	0:00
C	H3	114:36	98	1:37	11:14
D	H4	92:49	150	0:46	10:42
E	H5	19:54	72	0:23	4:24
F	H6	45:52	98	0:41	9:13
G	H7	0:00	0	0:00	0:00
H	H8	0:00	0	0:00	0:00
I	H9	0:00	0	0:00	0:00
J	H10	0:00	0	0:00	0:00
K	H11	0:00	0	0:00	0:00
L	H12	47:39	107	0:48	5:57
M	H13	0:00	0	0:00	0:00
N	H14	0:00	0	0:00	0:00
O	H15	11:39	55	0:17	2:15
P	H16	0:00	0	0:00	0:00
Q	H17	34:23	80	0:40	6:29
R	H18	38:32	87	0:40	7:18
S	H19	25:43	84	0:25	2:19
T	H20	0:00	0	0:00	0:00
U	H21	0:00	0	0:00	0:00
V	H22	30:12	77	0:36	4:27
W	H23	0:00	0	0:00	0:00
X	H24	9:51	45	0:17	2:07
Y	H25	0:00	0	0:00	0:00
Z	H26	0:00	0	0:00	0:00
AA	H27	17:43	57	0:26	2:49
AB	H28	0:00	0	0:00	0:00
AC	H29	13:26	51	0:21	2:16
AD	H30	0:00	0	0:00	0:00
AE	H31	0:00	0	0:00	0:00
AF	H32	0:00	0	0:00	0:00
AG	H33	11:55	48	0:21	2:04
AH	H34	10:14	40	0:19	0:56
AI	H35	9:45	37	0:21	2:10
AJ	H36	8:47	34	0:20	1:57
AK	H37	9:53	38	0:20	2:11
AL	H38	12:16	50	0:19	1:43
AM	H39	0:00	0	0:00	0:00

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/02/2023 15:11/3.6.355

SHADOW - Main Result

Calculation: Alternative Scenario 2

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	T1	46:59	5:59
2	T5	191:45	27:16
3	T4	153:40	23:36
4	T2	102:10	19:58
5	T3	69:58	7:16

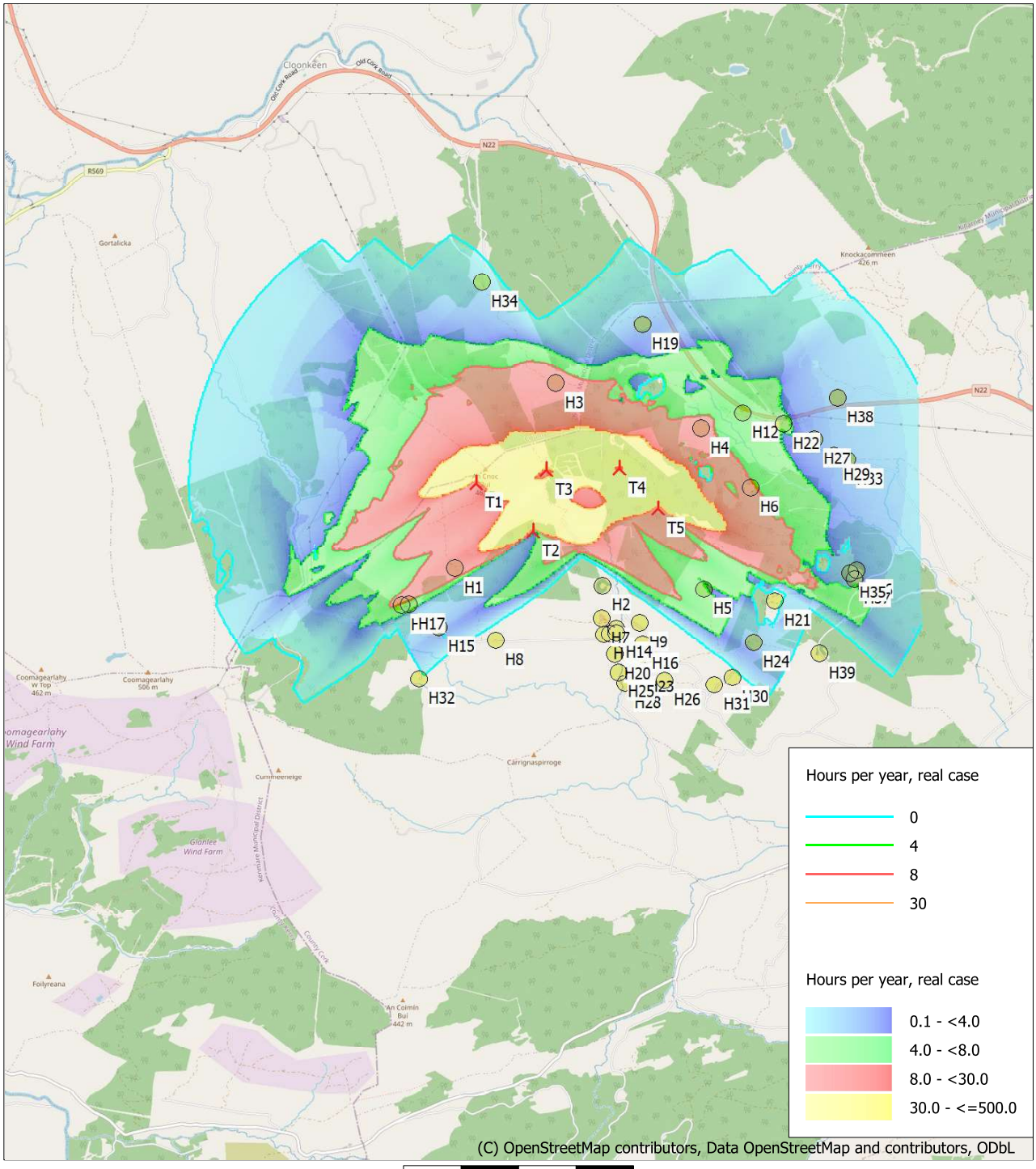
Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/02/2023 15:11/3.6.355

SHADOW - Map

Calculation: Alternative Scenario 2



0 500 1000 1500 2000 m

Map: EMD OpenStreetMap , Print scale 1:50,000, Map center Irish ITM-IRENET95 (IE), geocentric, GRS80 East: 512,720 North: 578,100

New WTG Shadow receptor

Flicker map level: Elevation Grid Data Object: Inchamore_EMDGrid_3.wpg (3)

Time step: 2 minutes, Day step: 3 days, Map resolution: 10 m, Visibility resolution: 5 m, Eye height: 1.5 m

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
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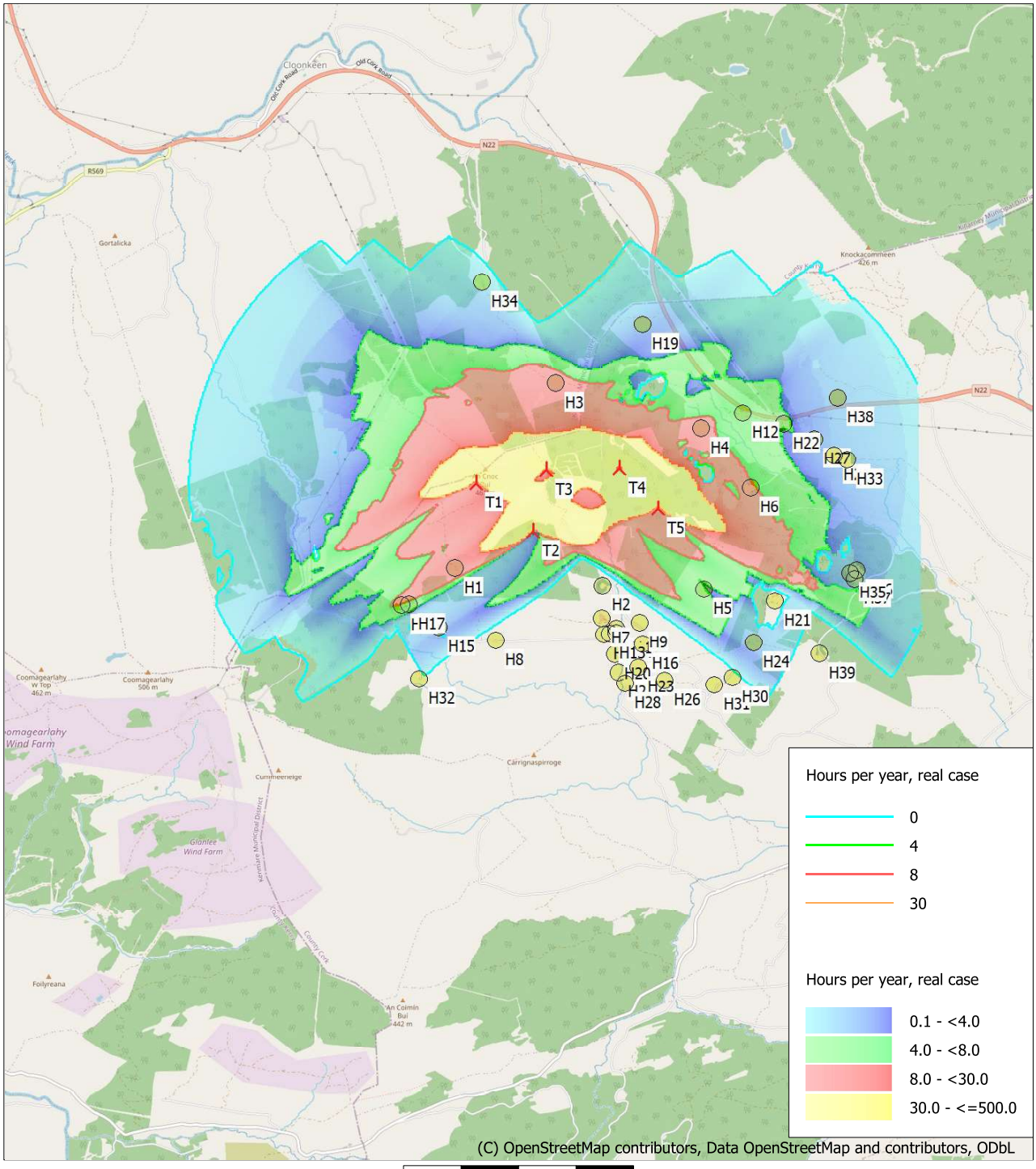
SHADOW - Map

Calculation: Alternative Scenario 3 Real Case



0 500 1000 1500 2000 m

Map: EMD OpenStreetMap , Print scale 1:50,000, Map center Irish ITM-IRENET95 (IE), geocentric, GRS80 East: 512,720 North: 578,100

New WTG Shadow receptor

Flicker map level: Elevation Grid Data Object: Inchamore_EMDGrid_3.wpg (3)

Time step: 2 minutes, Day step: 3 days, Map resolution: 10 m, Visibility resolution: 5 m, Eye height: 1.5 m

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Main Result

Calculation: Alternative Scenario 3 Real Case

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

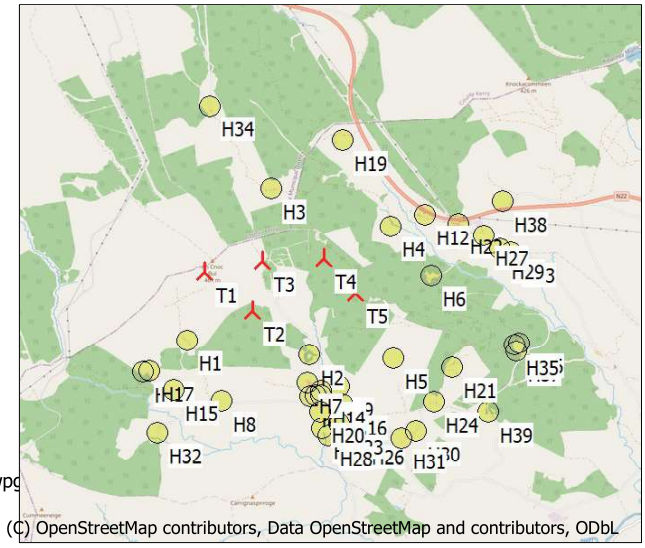
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Elevation Grid Data Object: Inchamore_EMDGrid_3.wpg
Receptor grid resolution: 1.0 m

All coordinates are in
Irish ITM-IRENET95 (IE), geocentric, GRS80



Scale 1:75,000

New WTG Shadow receptor

WTGs

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
1	512,358	578,940	448.5	T1	No	Siemens Gamesa	GS 6.0-6,600	6,600	149.0	102.5	2,500	0.0
2	513,947	578,689	369.0	T5	No	Siemens Gamesa	GS 6.0-6,600	6,600	149.0	102.5	2,500	0.0
3	513,613	579,050	374.1	T4	No	Siemens Gamesa	GS 6.0-6,600	6,600	149.0	102.5	2,500	0.0
4	512,852	578,514	369.6	T2	No	Siemens Gamesa	GS 6.0-6,600	6,600	149.0	102.5	2,500	0.0
5	512,972	579,041	400.0	T3	No	Siemens Gamesa	GS 6.0-6,600	6,600	149.0	102.5	2,500	0.0

Shadow receptor-Input

No.	Name	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	H1	512,160	578,211	346.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
B	H2	513,445	578,031	285.9	2.0	2.0	0.5	90.0	"Green house mode"	2.5
C	H3	513,072	579,801	338.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
D	H4	514,329	579,384	289.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
E	H5	514,339	577,982	318.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
F	H6	514,756	578,856	262.2	2.0	2.0	0.5	90.0	"Green house mode"	2.5
G	H7	513,435	577,744	264.0	2.0	2.0	0.5	90.0	"Green house mode"	2.5
H	H8	512,511	577,570	263.5	2.0	2.0	0.5	90.0	"Green house mode"	2.5
I	H9	513,762	577,696	259.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
J	H10	513,449	577,603	249.4	2.0	2.0	0.5	90.0	"Green house mode"	2.5
K	H11	513,566	577,655	253.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
L	H12	514,700	579,510	276.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
M	H13	513,505	577,609	248.6	2.0	2.0	0.5	90.0	"Green house mode"	2.5
N	H14	513,565	577,612	248.9	2.0	2.0	0.5	90.0	"Green house mode"	2.5
O	H15	512,009	577,691	278.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
P	H16	513,794	577,514	246.6	2.0	2.0	0.5	90.0	"Green house mode"	2.5
Q	H17	511,756	577,894	314.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
R	H18	511,689	577,885	311.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
S	H19	513,838	580,300	300.4	2.0	2.0	0.5	90.0	"Green house mode"	2.5
T	H20	513,548	577,431	232.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
U	H21	514,950	577,873	283.9	2.0	2.0	0.5	90.0	"Green house mode"	2.5
V	H22	515,053	579,406	282.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
W	H23	513,747	577,308	221.7	2.0	2.0	0.5	90.0	"Green house mode"	2.5
X	H24	514,759	577,513	272.4	2.0	2.0	0.5	90.0	"Green house mode"	2.5
Y	H25	513,572	577,269	216.5	2.0	2.0	0.5	90.0	"Green house mode"	2.5
Z	H26	513,974	577,197	219.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5

To be continued on next page...

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Main Result

Calculation: Alternative Scenario 3 Real Case

...continued from previous page

No.	Name	Easting	Northing	Z [m]	Width [m]	Height [m]	Elevation a.g.l. [m]	Slope of window [°]	Direction mode	Eye height (ZVI) a.g.l. [m]
AA	H27	515,322	579,275	275.0	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AB	H28	513,631	577,179	207.2	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AC	H29	515,488	579,130	260.2	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AD	H30	514,568	577,209	245.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AE	H31	514,413	577,149	233.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AF	H32	511,831	577,246	253.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AG	H33	515,603	579,094	254.1	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AH	H34	512,444	580,689	261.7	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AI	H35	515,614	578,103	249.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AJ	H36	515,672	578,122	245.8	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AK	H37	515,646	578,046	243.3	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AL	H38	515,525	579,630	278.7	2.0	2.0	0.5	90.0	"Green house mode"	2.5
AM	H39	515,332	577,403	242.0	2.0	2.0	0.5	90.0	"Green house mode"	2.5

Calculation Results

Shadow receptor

		Shadow, worst case			**Shadow, expected values**
No.	Name	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
A	H1	90:23	117	1:11	17:32
B	H2	0:00	0	0:00	0:00
C	H3	110:08	95	1:35	10:43
D	H4	92:31	147	0:46	10:35
E	H5	19:23	72	0:23	4:17
F	H6	45:44	98	0:41	9:07
G	H7	0:00	0	0:00	0:00
H	H8	0:00	0	0:00	0:00
I	H9	0:00	0	0:00	0:00
J	H10	0:00	0	0:00	0:00
K	H11	0:00	0	0:00	0:00
L	H12	49:03	110	0:48	6:02
M	H13	0:00	0	0:00	0:00
N	H14	0:00	0	0:00	0:00
O	H15	10:57	51	0:17	2:07
P	H16	0:00	0	0:00	0:00
Q	H17	35:23	82	0:39	6:40
R	H18	39:06	89	0:39	7:25
S	H19	24:37	84	0:24	2:13
T	H20	0:00	0	0:00	0:00
U	H21	0:00	0	0:00	0:00
V	H22	30:21	80	0:36	4:27
W	H23	0:00	0	0:00	0:00
X	H24	9:33	44	0:18	2:04
Y	H25	0:00	0	0:00	0:00
Z	H26	0:00	0	0:00	0:00
AA	H27	17:40	56	0:26	2:49
AB	H28	0:00	0	0:00	0:00
AC	H29	13:26	51	0:22	2:15
AD	H30	0:00	0	0:00	0:00
AE	H31	0:00	0	0:00	0:00
AF	H32	0:00	0	0:00	0:00
AG	H33	11:58	49	0:20	2:04
AH	H34	9:11	38	0:18	0:50
AI	H35	9:30	35	0:21	2:06
AJ	H36	8:38	34	0:20	1:55
AK	H37	9:36	37	0:20	2:07
AL	H38	12:28	53	0:20	1:45
AM	H39	0:00	0	0:00	0:00

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Main Result

Calculation: Alternative Scenario 3 Real Case

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	T1	48:44	6:04
2	T5	190:43	26:49
3	T4	151:54	23:15
4	T2	104:46	20:32
5	T3	63:32	6:38

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** A - H1

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April		May		June		July		August		September	October	November	December
1	08:46	08:19	07:25	07:15		06:10		05:25		05:22		05:59 (3)	05:58	06:32 (4)	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10		21:01	5 06:54 (2)	21:47	69 05:53 (3)	22:01	69 07:02 (4)	21:29	30 07:08 (4)	20:27	19:17	17:11	16:31
2	08:46	08:17	07:23	07:12		06:08		05:24	05:52 (3)	05:22		05:59 (3)	06:00	06:33 (4)	06:50	07:39	07:33	08:23
	16:37	17:26	18:18	20:12		21:03		21:48	70 05:53 (3)	22:00	69 07:02 (4)	21:27	28 07:08 (4)	07:01 (4)	20:24	19:15	17:09	16:30
3	08:45	08:16	07:21	07:10		06:06		05:23	05:53 (3)	05:23		05:59 (3)	06:01	06:35 (4)	06:51	07:40	07:34	08:25
	16:39	17:28	18:20	20:13		21:04		21:49	70 05:53 (3)	22:00	70 07:03 (4)	21:25	24 07:09 (4)	06:59 (4)	20:22	19:13	17:07	16:29
4	08:45	08:14	07:19	07:08		06:04		05:22	05:52 (3)	05:24		05:59 (3)	06:03	06:37 (4)	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15		21:06		21:50	71 05:53 (3)	22:00	69 07:03 (4)	21:24	20 07:08 (4)	06:57 (4)	20:20	19:10	17:06	16:29
5	08:45	08:12	07:17	07:05		06:02		05:22	05:53 (3)	05:25		05:59 (3)	06:04	06:40 (4)	06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17		21:08		21:51	70 05:53 (3)	21:59	70 07:03 (4)	21:22	14 07:09 (4)	06:54 (4)	20:18	19:08	17:04	16:28
6	08:45	08:11	07:14	07:03		06:00		05:21	05:53 (3)	05:25		05:59 (3)	06:06		06:56	07:45	07:40	08:29
	16:42	17:34	18:25	20:19		21:09		21:52	70 05:53 (3)	21:59	70 07:03 (4)	21:20			20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01		05:59	06:34 (4)	05:20	05:54 (3)	05:26		06:00 (3)	06:08		06:58	07:47	07:42	08:30
	16:43	17:35	18:27	20:20		21:11	7 06:41 (4)	21:53	70 05:54 (3)	21:58	70 07:04 (4)	21:18			20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59		05:57	06:29 (4)	05:20	05:53 (3)	05:27		06:00 (3)	06:09		06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22		21:13	16 06:45 (4)	21:54	70 05:53 (3)	21:57	70 07:03 (4)	21:17			20:11	19:01	16:59	16:27
9	08:43	08:05	07:08	06:56		05:55	06:27 (4)	05:19	05:54 (3)	05:28		06:00 (3)	06:11		07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:24		21:14	21 06:48 (4)	21:55	70 05:54 (3)	21:57	70 07:04 (4)	21:15			20:08	18:59	16:57	16:27
10	08:43	08:04	07:05	06:54		05:53	06:24 (4)	05:19	05:55 (3)	05:29		06:00 (3)	06:12		07:03	07:52	07:47	08:33
	16:47	17:41	18:32	20:25		21:16	26 06:50 (4)	21:55	69 05:54 (3)	21:56	70 07:04 (4)	21:13			20:06	18:57	16:55	16:27
11	08:42	08:02	07:03	06:52		05:52	06:22 (4)	05:18	05:54 (3)	05:30		06:01 (3)	06:14		07:04	07:54	07:49	08:35
	16:49	17:43	18:34	20:27		21:17	29 06:51 (4)	21:56	70 05:54 (3)	21:55	70 07:04 (4)	21:11			20:04	18:54	16:54	16:26
12	08:42	08:00	07:01	06:50		05:50	06:21 (4)	05:18	05:55 (3)	05:31		06:02 (3)	06:15	06:57 (2)	07:06	07:56	07:51	08:36
	16:50	17:45	18:36	20:29		21:19	32 06:53 (4)	21:57	69 05:55 (3)	21:54	69 07:04 (4)	21:09	7 07:04 (2)	20:01	18:52	16:52	16:26
13	08:41	07:58	06:58	06:47		05:48	06:19 (4)	05:18	05:55 (3)	05:32		06:03 (3)	06:17	06:55 (2)	07:07	07:57	07:52	08:37
	16:52	17:47	18:37	20:30		21:21	34 06:53 (4)	21:58	69 05:56 (3)	21:53	68 07:04 (4)	21:07	11 07:06 (2)	19:59	18:50	16:51	16:26
14	08:40	07:56	06:56	06:45		05:47	06:19 (4)	05:18	05:56 (3)	05:34		06:04 (3)	06:19	06:53 (2)	07:09	07:59	07:54	08:38
	16:53	17:48	18:39	20:32		21:22	36 06:55 (4)	21:58	69 05:56 (3)	21:53	67 07:04 (4)	21:05	14 07:07 (2)	19:57	18:48	16:49	16:26
15	08:39	07:54	06:54	06:43		05:45	06:18 (4)	05:17	05:56 (3)	05:35		06:05 (3)	06:20	06:52 (2)	07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34		21:24	38 06:56 (4)	21:59	68 05:57 (3)	21:52	66 07:04 (4)	21:03	16 07:08 (2)	19:54	18:46	16:48	16:26
16	08:38	07:52	06:52	06:41		05:44	06:17 (4)	05:17	05:57 (3)	05:36		06:06 (3)	06:22	06:51 (2)	07:12	08:02	07:58	08:39
	16:56	17:52	18:42	20:36		21:25	39 06:56 (4)	21:59	67 05:57 (3)	21:51	64 07:04 (4)	21:01	17 07:08 (2)	19:52	18:43	16:46	16:26
17	08:38	07:50	06:49	06:39		05:42	06:17 (4)	05:17	05:57 (3)	05:37		06:07 (3)	06:24	06:51 (2)	07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37		21:27	40 06:57 (4)	22:00	68 05:57 (3)	21:49	62 07:04 (4)	20:59	18 07:09 (2)	19:50	18:41	16:45	16:27
18	08:37	07:48	06:47	06:37		05:41	06:15 (4)	05:17	05:57 (3)	05:38		06:08 (3)	06:25	06:52 (2)	07:16	08:06	08:01	08:41
	17:00	17:56	18:46	20:39		21:28	42 06:57 (4)	22:00	69 07:06 (4)	21:48	61 07:10 (4)	20:57	17 07:09 (2)	19:47	18:39	16:44	16:27
19	08:36	07:46	06:45	06:34	06:58 (2)	05:39	06:15 (4)	05:17	05:57 (3)	05:40		06:10 (3)	06:27	06:54 (2)	07:17	08:08	08:03	08:42
	17:01	17:58	18:48	20:41	3 07:01 (2)	21:30	43 06:58 (4)	22:00	69 07:06 (4)	21:47	59 07:11 (4)	20:55	15 07:09 (2)	19:45	18:37	16:42	16:27
20	08:35	07:44	06:42	06:32	06:56 (2)	05:38	06:05 (3)	05:17	05:57 (3)	05:41		06:11 (3)	06:28	06:55 (2)	07:19	08:09	08:04	08:42
	17:03	18:00	18:49	20:42	6 07:02 (2)	21:31	47 06:59 (4)	22:01	68 07:06 (4)	21:46	56 07:10 (4)	20:53	13 07:08 (2)	19:43	18:35	16:41	16:28
21	08:33	07:42	06:40	06:30	06:54 (2)	05:37	06:04 (3)	05:17	05:58 (3)	05:42		06:12 (3)	06:30	06:57 (2)	07:20	08:11	08:06	08:43
	17:05	18:01	18:51	20:44	9 07:03 (2)	21:33	50 06:59 (4)	22:01	67 07:06 (4)	21:45	55 07:10 (4)	20:51	11 07:08 (2)	19:40	18:33	16:40	16:28
22	08:32	07:40	06:38	06:28	06:52 (2)	05:35	06:03 (3)	05:18	05:57 (3)	05:44		06:13 (3)	06:32	06:58 (2)	07:22	08:13	08:08	08:43
	17:06	18:03	18:53	20:46	11 07:03 (2)	21:34	53 07:00 (4)	22:01	68 07:06 (4)	21:44	52 07:09 (4)	20:49	9 07:07 (2)	19:38	18:31	16:39	16:28
23	08:31	07:38	06:35	06:26	06:50 (2)	05:34	06:01 (3)	05:18	05:58 (3)	05:45		06:15 (3)	06:33	07:00 (2)	07:24	08:15	08:09	08:44
	17:08	18:05	18:55	20:47	14 07:04 (2)	21:35	57 07:00 (4)	22:01	68 07:07 (4)	21:42	49 07:10 (4)	20:46	6 07:06 (2)	19:36	18:29	16:38	16:29
24	08:30	07:36	06:33	06:24	06:48 (2)	05:33	06:00 (3)	05:18	05:58 (3)	05:46		06:16 (3)	06:35	07:02 (2)	07:25	08:17	08:11	08:44
	17:10	18:07	18:56	20:49	15 07:03 (2)	21:37	58 07:00 (4)	22:01	69 07:07 (4)	21:41	46 07:09 (4)	20:44	3 07:05 (2)	19:33	18:27	16:37	16:30
25	08:29	07:34	06:31	06:22	06:46 (2)	05:32	05:59 (3)	05:19	05:58 (3)	05:48		06:26 (4)	06:37		07:27	07:18	08:13	08:45
	17:12	18:09	18:58	20:51	17 07:03 (2)	21:38	60 07:00 (4)	22:02	69 07:07 (4)	21:39	42 07:08 (4)	20:42			19:31	17:25	16:36	16:30
26	08:27	07:32	06:29	06:20	06:44 (2)	05:31	05:58 (3)	05:19	05:59 (3)	05:49		06:27 (4)	06:38		07:29	07:20	08:14	08:45
	17:13	18:11	19:00	20:53	18 07:02 (2)	21:39	62 07:01 (4)	22:02	67 07:07 (4)	21:38	41 07:08 (4)	20:40			19:29	17:23	16:35	16:31
27	08:26	07:30	06:26	06:18	06:44 (2)	05:29	05:57 (3)	05:19	05:58 (3)	05:51		06:27 (4)	06:40		07:30	07:22	08:16	08:45
	17:15	18:12	19:01	20:54	18 07:02 (2)	21:41	64 07:01 (4)	22:01	68 07:07 (4)	21:37	40 07:07 (4)	20:38			19:26	17:21	16:34	16:32
28	08:25	07:27	06:24	06:16	06:45 (2)	05:28	05:56 (3)	05:20	05:59 (3)	05:52		06:28 (4)	06:41		07:32	07:24	08:17	08:45
	17:17	18:14	19:03	20:56	16 07:01 (2)	21:42	65 07:01 (4)	22:01	69 07:08 (4)	21:35	38 07:06 (4)	20:36			19:24	17:19	16:33	16:32
29	08:23		07:22	06:14	06:46 (2)	05:27	05:56 (3)	05:20	05:59 (3)	05:54		06:29 (4)	06:43		07:34	07:25	08:19	08:46
	17:19		20:05	20:58	13 06:59 (2)	21:43	66 07:02 (4)	22:01	69 07:08 (4)	21:34	37 07:06 (4)	20:33			19:22	17:17	16:32	16:33
30	08:22		07:19	06:12	06:47 (2)	05:26	05:55 (3)	05:21	05:59 (3)	05:55		06:30 (4)	06:45		07:35	07:27	08:20	08:46
	17:21		20:07	20:59	10 06:57 (2)	21:44	67 07:02 (4)	22:01	69 07:08 (4)	21:32	35 07:05 (4)	20:31			19:19	17:15	16:31	16:34
31	08:20		07:17			05:25	05:54 (3)			05:57		06:36 (4)	06:46			07:29		08:46
	17:22		20:08			21:46	68 07:02 (4)			21:30	33 07:03 (4)	20:29				17:13		16:35
Potential sun hours	259	278	367	416		485		499		502		454		381	331	266	244	
Total, worst case					150		1125		2068		1807		273					
Sun reduction					0.35		0.37		0.30		0.27		0.30					
Oper. time red.					1.00		1.00		1.00		1.00		1.00					
Wind dir. red.					0.64		0.64		0.64		0.64		0.64					
Total reduction					0.23		0.24		0.19		0.17		0.19					
Total, real					34		265		394		307		52					

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** B - H2

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:15	06:10	05:24	05:22	05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01	21:47	22:01	21:29	20:27	19:17	17:11	16:31
2	08:46	08:17	07:23	07:12	06:08	05:24	05:22	06:00	06:50	07:39	07:33	08:23
	16:37	17:26	18:18	20:12	21:03	21:48	22:00	21:27	20:24	19:15	17:09	16:30
3	08:45	08:16	07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34	08:25
	16:38	17:28	18:19	20:13	21:04	21:49	22:00	21:25	20:22	19:12	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15	21:06	21:50	22:00	21:24	20:20	19:10	17:05	16:29
5	08:45	08:12	07:16	07:05	06:02	05:21	05:24	06:04	06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17	21:08	21:51	21:59	21:22	20:18	19:08	17:04	16:28
6	08:45	08:11	07:14	07:03	06:00	05:21	05:25	06:06	06:56	07:45	07:40	08:29
	16:42	17:33	18:25	20:18	21:09	21:52	21:58	21:20	20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01	05:59	05:20	05:26	06:07	06:58	07:47	07:42	08:30
	16:43	17:35	18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59	05:57	05:20	05:27	06:09	06:59	07:49	07:43	08:31
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9	08:43	08:05	07:07	06:56	05:55	05:19	05:28	06:11	07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:24	21:14	21:55	21:57	21:15	20:08	18:59	16:57	16:27
10	08:43	08:04	07:05	06:54	05:53	05:19	05:29	06:12	07:03	07:52	07:47	08:33
	16:47	17:41	18:32	20:25	21:16	21:55	21:56	21:13	20:06	18:57	16:55	16:27
11	08:42	08:02	07:03	06:52	05:52	05:18	05:30	06:14	07:04	07:54	07:49	08:34
	16:49	17:43	18:34	20:27	21:17	21:56	21:55	21:11	20:04	18:54	16:54	16:26
12	08:42	08:00	07:01	06:50	05:50	05:18	05:31	06:15	07:06	07:55	07:50	08:35
	16:50	17:45	18:35	20:29	21:19	21:57	21:54	21:09	20:01	18:52	16:52	16:26
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	16:52	17:47	18:37	20:30	21:20	21:57	21:53	21:07	19:59	18:50	16:51	16:26
14	08:40	07:56	06:56	06:45	05:47	05:18	05:33	06:19	07:09	07:59	07:54	08:37
	16:53	17:48	18:39	20:32	21:22	21:58	21:52	21:05	19:57	18:48	16:49	16:26
15	08:39	07:54	06:54	06:43	05:45	05:17	05:35	06:20	07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34	21:24	21:59	21:51	21:03	19:54	18:46	16:48	16:26
16	08:38	07:52	06:52	06:41	05:44	05:17	05:36	06:22	07:12	08:02	07:57	08:39
	16:56	17:52	18:42	20:35	21:25	21:59	21:50	21:01	19:52	18:43	16:46	16:26
17	08:37	07:50	06:49	06:39	05:42	05:17	05:37	06:23	07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37	21:27	22:00	21:49	20:59	19:50	18:41	16:45	16:27
18	08:37	07:48	06:47	06:36	05:41	05:17	05:38	06:25	07:16	08:06	08:01	08:41
	17:00	17:56	18:46	20:39	21:28	22:00	21:48	20:57	19:47	18:39	16:44	16:27
19	08:36	07:46	06:45	06:34	05:39	05:17	05:40	06:27	07:17	08:08	08:03	08:41
	17:01	17:58	18:48	20:41	21:30	22:00	21:47	20:55	19:45	18:37	16:42	16:27
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	17:03	17:59	18:49	20:42	21:31	22:01	21:46	20:53	19:43	18:35	16:41	16:27
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	17:05	18:01	18:51	20:44	21:32	22:01	21:45	20:51	19:40	18:33	16:40	16:28
22	08:32	07:40	06:38	06:28	05:35	05:18	05:44	06:32	07:22	08:13	08:08	08:43
	17:06	18:03	18:53	20:46	21:34	22:01	21:43	20:49	19:38	18:31	16:39	16:28
23	08:31	07:38	06:35	06:26	05:34	05:18	05:45	06:33	07:24	08:15	08:09	08:44
	17:08	18:05	18:54	20:47	21:35	22:01	21:42	20:46	19:36	18:29	16:38	16:29
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	17:10	18:07	18:56	20:49	21:37	22:01	21:41	20:44	19:33	18:27	16:37	16:29
25	08:29	07:34	06:31	06:22	05:32	05:18	05:48	06:36	07:27	07:18	08:13	08:45
	17:12	18:09	18:58	20:51	21:38	22:01	21:39	20:42	19:31	17:24	16:36	16:30
26	08:27	07:32	06:28	06:20	05:30	05:19	05:49	06:38	07:29	07:20	08:14	08:45
	17:13	18:10	19:00	20:52	21:39	22:01	21:38	20:40	19:29	17:22	16:35	16:31
27	08:26	07:30	06:26	06:18	05:29	05:19	05:51	06:40	07:30	07:22	08:16	08:45
	17:15	18:12	19:01	20:54	21:41	22:01	21:37	20:38	19:26	17:20	16:34	16:32
28	08:25	07:27	06:24	06:16	05:28	05:20	05:52	06:41	07:32	07:24	08:17	08:45
	17:17	18:14	19:03	20:56	21:42	22:01	21:35	20:36	19:24	17:19	16:33	16:32
29	08:23		07:21	06:14	05:27	05:20	05:54	06:43	07:34	07:25	08:19	08:45
	17:19		20:05	20:58	21:43	22:01	21:33	20:33	19:22	17:17	16:32	16:33
30	08:22		07:19	06:12	05:26	05:21	05:55	06:45	07:35	07:27	08:20	08:46
	17:21		20:06	20:59	21:44	22:01	21:32	20:31	19:19	17:15	16:31	16:34
31	08:20		07:17		05:25		05:57	06:46		07:29		08:46
	17:22		20:08		21:46		21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** C - H3

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January		February		March	April	May	June	July	August	September	October	November		December		
1	08:46		09:41 (3)		08:19	15:18 (1)	07:25	07:15	06:10	05:24	05:21	05:58	06:48	07:37	07:31		08:22		09:27 (3)
	16:36	80	13:28 (5)		17:24	27	15:45 (1)	18:16	20:10	21:01	21:47	22:01	21:29	20:27	19:17	17:11			16:31	95	15:19 (1)
2	08:46		09:42 (3)		08:17		15:19 (1)	07:23	07:12	06:08	05:24	05:22	06:00	06:50	07:39	07:33			08:23		09:28 (3)
	16:37	80	13:29 (5)		17:26	26	15:45 (1)	18:18	20:12	21:03	21:48	22:00	21:27	20:24	19:15	17:09			16:30	95	15:19 (1)
3	08:45		09:43 (3)		08:16		15:21 (1)	07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34			08:25		09:28 (3)
	16:38	82	15:24 (1)		17:28	23	15:44 (1)	18:19	20:13	21:04	21:49	22:00	21:25	20:22	19:12	17:07			16:29	94	15:18 (1)
4	08:45		09:42 (3)		08:14		15:22 (1)	07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36		15:00 (1)	08:26		09:28 (3)
	16:40	89	15:27 (1)		17:30	21	15:43 (1)	18:21	20:15	21:06	21:50	22:00	21:24	20:20	19:10	17:05	4	15:04 (1)	16:29	95	15:17 (1)
5	08:45		09:43 (3)		08:12		15:24 (1)	07:16	07:05	06:02	05:21	05:24	06:04	06:54	07:44	07:38		14:56 (1)	08:27		09:29 (3)
	16:41	90	15:29 (1)		17:32	17	15:41 (1)	18:23	20:17	21:08	21:51	21:59	21:22	20:18	19:08	17:04	13	15:09 (1)	16:28	93	15:17 (1)
6	08:45		09:43 (3)		08:11		15:27 (1)	07:14	07:03	06:00	05:21	05:25	06:06	06:56	07:45	07:40		14:53 (1)	08:29		09:29 (3)
	16:42	93	15:30 (1)		17:33	12	15:39 (1)	18:25	20:18	21:09	21:52	21:59	21:20	20:15	19:06	17:02	18	15:11 (1)	16:28	93	15:16 (1)
7	08:44		09:44 (3)		08:09			07:12	07:01	05:59	05:20	05:26	06:07	06:58	07:47	07:42		14:52 (1)	08:30		09:30 (3)
	16:43	93	15:32 (1)		17:35			18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00	21	15:13 (1)	16:27	90	15:16 (1)
8	08:44		09:44 (3)		08:07			07:10	06:59	05:57	05:20	05:27	06:09	06:59	07:49	07:43		14:51 (1)	08:31		09:30 (3)
	16:45	95	15:33 (1)		17:37			18:28	20:22	21:13	21:54	21:57	21:17	20:11	19:01	16:59	23	15:14 (1)	16:27	89	15:15 (1)
9	08:43		09:45 (3)		08:05			07:08	06:56	05:55	05:19	05:28	06:11	07:01	07:50	07:45		14:50 (1)	08:32		09:31 (3)
	16:46	94	15:35 (1)		17:39			18:30	20:24	21:14	21:55	21:57	21:15	20:08	18:59	16:57	25	15:15 (1)	16:27	83	15:13 (1)
10	08:43		09:45 (3)		08:04			07:05	06:54	05:53	05:19	05:29	06:12	07:03	07:52	07:47		14:49 (1)	08:33		09:31 (3)
	16:47	95	15:36 (1)		17:41			18:32	20:25	21:16	21:55	21:56	21:13	20:06	18:57	16:55	27	15:16 (1)	16:26	80	13:18 (5)
11	08:42		09:45 (3)		08:02			07:03	06:52	05:52	05:18	05:30	06:14	07:04	07:54	07:49		09:38 (3)	08:35		09:31 (3)
	16:49	95	15:37 (1)		17:43			18:34	20:27	21:17	21:56	21:55	21:11	20:04	18:54	16:54	36	15:17 (1)	16:26	80	13:18 (5)
12	08:42		09:45 (3)		08:00			07:01	06:50	05:50	05:18	05:31	06:15	07:06	07:56	07:51		09:34 (3)	08:36		09:32 (3)
	16:50	94	15:38 (1)		17:45			18:35	20:29	21:19	21:57	21:54	21:09	20:01	18:52	16:52	45	15:18 (1)	16:26	81	13:19 (5)
13	08:41		09:46 (3)		07:58			06:58	06:47	05:48	05:18	05:32	06:17	07:07	07:57	07:52		09:32 (3)	08:37		09:32 (3)
	16:52	93	15:39 (1)		17:46			18:37	20:30	21:21	21:58	21:53	21:07	19:59	18:50	16:51	51	15:19 (1)	16:26	82	13:20 (5)
14	08:40		09:46 (3)		07:56			06:56	06:45	05:47	05:17	05:33	06:19	07:09	07:59	07:54		09:31 (3)	08:38		09:33 (3)
	16:53	92	15:39 (1)		17:48			18:39	20:32	21:22	21:58	21:53	21:05	19:57	18:48	16:49	54	15:19 (1)	16:26	81	13:20 (5)
15	08:39		09:47 (3)		07:54			06:54	06:43	05:45	05:17	05:35	06:20	07:11	08:01	07:56		09:30 (3)	08:38		09:33 (3)
	16:55	89	15:40 (1)		17:50			18:41	20:34	21:24	21:59	21:52	21:03	19:54	18:46	16:48	58	15:20 (1)	16:26	82	13:21 (5)
16	08:38		09:47 (3)		07:52			06:52	06:41	05:44	05:17	05:36	06:22	07:12	08:02	07:58		09:29 (3)	08:39		09:34 (3)
	16:56	86	15:41 (1)		17:52			18:42	20:36	21:25	21:59	21:51	21:01	19:52	18:43	16:46	60	15:20 (1)	16:26	82	13:22 (5)
17	08:38		09:48 (3)		07:50			06:49	06:39	05:42	05:17	05:37	06:23	07:14	08:04	07:59		09:28 (3)	08:40		09:35 (3)
	16:58	81	15:42 (1)		17:54			18:44	20:37	21:27	22:00	21:50	20:59	19:50	18:41	16:45	63	15:20 (1)	16:26	81	13:22 (5)
18	08:37		09:48 (3)		07:48			06:47	06:36	05:41	05:17	05:38	06:25	07:16	08:06	08:01		09:27 (3)	08:41		09:36 (3)
	17:00	73	15:43 (1)		17:56			18:46	20:39	21:28	22:00	21:48	20:57	19:47	18:39	16:44	65	15:20 (1)	16:27	81	13:23 (5)
19	08:36		09:49 (3)		07:46			06:45	06:34	05:39	05:17	05:40	06:27	07:17	08:08	08:03		09:27 (3)	08:42		09:35 (3)
	17:01	69	15:44 (1)		17:58			18:48	20:41	21:30	22:00	21:47	20:55	19:45	18:37	16:42	65	15:20 (1)	16:27	82	13:23 (5)
20	08:35		09:50 (3)		07:44			06:42	06:32	05:38	05:17	05:41	06:28	07:19	08:09	08:04		09:26 (3)	08:42		09:36 (3)
	17:03	68	15:45 (1)		17:59			18:49	20:42	21:31	22:01	21:46	20:53	19:43	18:35	16:41	67	15:20 (1)	16:27	82	13:24 (5)
21	08:34		09:51 (3)		07:42			06:40	06:30	05:37	05:17	05:42	06:30	07:20	08:11	08:06		09:26 (3)	08:43		09:36 (3)
	17:05	67	15:45 (1)		18:01			18:51	20:44	21:33	22:01	21:45	20:51	19:40	18:33	16:40	67	15:20 (1)	16:28	82	13:24 (5)
22	08:32		09:51 (3)		07:40			06:38	06:28	05:35	05:18	05:44	06:32	07:22	08:13	08:08		09:26 (3)	08:43		09:37 (3)
	17:06	67	15:45 (1)		18:03			18:53	20:46	21:34	22:01	21:44	20:49	19:38	18:31	16:39	68	15:21 (1)	16:28	82	13:25 (5)
23	08:31		09:53 (3)		07:38			06:35	06:26	05:34	05:18	05:45	06:33	07:24	08:15	08:09		09:26 (3)	08:44		09:37 (3)
	17:08	65	15:46 (1)		18:05			18:55	20:47	21:35	22:01	21:42	20:46	19:36	18:29	16:38	69	15:21 (1)	16:29	82	13:25 (5)
24	08:30		09:53 (3)		07:36			06:33	06:24	05:33	05:18	05:46	06:35	07:25	08:16	08:11		09:26 (3)	08:44		09:38 (3)
	17:10	65	15:46 (1)		18:07			18:56	20:49	21:37	22:01	21:41	20:44	19:33	18:26	16:37	71	15:20 (1)	16:29	82	13:26 (5)
25	08:29		09:54 (3)		07:34			06:31	06:22	05:32	05:18	05:48	06:36	07:27	07:18	08:13		09:26 (3)	08:45		09:39 (3)
	17:12	63	15:46 (1)		18:09			18:58	20:51	21:38	22:02	21:39	20:42	19:31	17:24	16:36	81	15:20 (1)	16:30	82	13:26 (5)
26	08:27		09:56 (3)		07:32			06:28	06:20	05:30	05:19	05:49	06:38	07:29	07:20	08:14		09:26 (3)	08:45		09:39 (3)
	17:13	60	15:47 (1)		18:10			19:00	20:53	21:39	22:02	21:38	20:40	19:29	17:22	16:35	86	15:20 (1)	16:31	81	13:26 (5)
27	08:26		09:57 (3)		07:30			06:26	06:18	05:29	05:19	05:51	06:40	07:30	07:22	08:16		09:27 (3)	08:45		09:39 (3)
	17:15	58	15:47 (1)		18:12			19:01	20:54	21:41	22:01	21:37	20:38	19:26	17:20	16:34	89	15:20 (1)	16:31	82	13:27 (5)
28	08:25		09:59 (3)		07:27			06:24	06:16	05:28	05:20	05:52	06:41	07:32	07:24	08:17		09:26 (3)	08:45		09:39 (3)
	17:17	54	15:47 (1)		18:14			19:03	20:56	21:42	22:01	21:35	20:36	19:24	17:19	16:33	93	15:20 (1)	16:32	82	13:27 (5)
29	08:23		10:01 (3)					07:21	06:14	05:27	05:20	05:54	06:43	07:34	07:25	08:19		09:27 (3)	08:46		09:40 (3)
	17:19	50	15:47 (1)					20:05	20:58	21:43	22:01	21:34	20:33	19:22	17:17	16:32	94	15:20 (1)	16:33	81	13:27 (5)
30	08:22		10:03 (3)					07:19	06:12	05:26	05:21	05:55	06:45	07:35	07:27	08:20		09:26 (3)	08:46		09:40 (3)
	17:20	44	15:46 (1)					20:07	20:59	21:44	22:01	21:32	20:31	19:19	17:15	16:31	94	15:19 (1)	16:34	81	13:27 (5)
31	08:20		10:08 (3)					07:17		05:25		05:57	06:46		07:29				08:46		09:41 (3)
	17:22	33	15:46 (1)					20:08		21:46		21:30	20:29		17:13				16:35	80	13:28 (5)
Potential sun hours	259		278		367	416	485	499	502	454	381	331	266		244						
Total, worst case		2357		126										1507		2618					
Sun reduction		0.16		0.21										0.18		0.13					
Oper. time red.		1.00		1.00										1.00		1.00					
Wind dir. red.		0.63		0.59										0.62		0.63					
Total reduction		0.10		0.12										0.12		0.09					
Total, real		231		15										174		224					

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** D - H4

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January			February			March			April		May	June
1	08:46		14:15 (2)	08:19		14:31 (2)	07:25		16:37 (3)	07:15		06:10	05:24
	16:36	42	14:57 (2)	17:24	31	15:02 (2)	18:16	36	17:13 (3)	20:10		21:01	21:47
2	08:46		14:15 (2)	08:17		14:33 (2)	07:23		16:36 (3)	07:12		06:08	05:24
	16:37	43	14:58 (2)	17:26	27	15:00 (2)	18:18	38	17:14 (3)	20:12		21:03	21:48
3	08:45		14:16 (2)	08:16		14:36 (2)	07:21		16:35 (3)	07:10		06:06	05:23
	16:38	43	14:59 (2)	17:28	24	15:00 (2)	18:19	39	17:14 (3)	20:13		21:04	21:49
4	08:45		14:15 (2)	08:14		14:38 (2)	07:19		16:34 (3)	07:08		06:04	05:22
	16:40	44	14:59 (2)	17:30	19	14:57 (2)	18:21	41	17:15 (3)	20:15		21:06	21:50
5	08:45		14:16 (2)	08:12		14:42 (2)	07:16		16:34 (3)	07:05		06:02	05:21
	16:41	44	15:00 (2)	17:32	12	14:54 (2)	18:23	41	17:15 (3)	20:17		21:08	21:51
6	08:45		14:16 (2)	08:11			07:14		16:32 (3)	07:03		06:00	05:21
	16:42	44	15:00 (2)	17:33			18:25	43	17:15 (3)	20:18		21:09	21:52
7	08:44		14:17 (2)	08:09			07:12		16:32 (3)	07:01		05:59	05:20
	16:43	44	15:01 (2)	17:35			18:27	43	17:15 (3)	20:20		21:11	21:53
8	08:44		14:17 (2)	08:07			07:10		16:32 (3)	06:59		05:57	05:20
	16:45	44	15:01 (2)	17:37			18:28	43	17:15 (3)	20:22		21:12	21:54
9	08:43		14:17 (2)	08:05			07:07		16:32 (3)	06:56		05:55	05:19
	16:46	44	15:01 (2)	17:39			18:30	43	17:15 (3)	20:24		21:14	21:55
10	08:43		14:18 (2)	08:04			07:05		16:32 (3)	06:54		05:53	05:19
	16:47	44	15:02 (2)	17:41			18:32	42	17:14 (3)	20:25		21:16	21:55
11	08:42		14:18 (2)	08:02			07:03		16:32 (3)	06:52		05:52	05:18
	16:49	45	15:03 (2)	17:43			18:34	42	17:14 (3)	20:27		21:17	21:56
12	08:42		14:18 (2)	08:00			07:01		16:33 (3)	06:50		05:50	05:18
	16:50	45	15:03 (2)	17:45			18:35	41	17:14 (3)	20:29		21:19	21:57
13	08:41		14:18 (2)	07:58			06:58		16:32 (3)	06:47		05:48	05:18
	16:52	45	15:03 (2)	17:46			18:37	40	17:12 (3)	20:30		21:20	21:57
14	08:40		14:18 (2)	07:56			06:56		16:33 (3)	06:45		05:47	05:17
	16:53	46	15:04 (2)	17:48			18:39	39	17:12 (3)	20:32		21:22	21:58
15	08:39		14:18 (2)	07:54			06:54		16:34 (3)	06:43		05:45	05:17
	16:55	46	15:04 (2)	17:50			18:41	37	17:11 (3)	20:34		21:24	21:59
16	08:38		14:19 (2)	07:52			06:51		16:34 (3)	06:41		05:44	05:17
	16:56	46	15:05 (2)	17:52			18:42	35	17:09 (3)	20:35		21:25	21:59
17	08:38		14:19 (2)	07:50			06:49		16:36 (3)	06:39		05:42	05:17
	16:58	46	15:05 (2)	17:54			18:44	32	17:08 (3)	20:37		21:27	22:00
18	08:37		14:20 (2)	07:48			06:47		16:37 (3)	06:36		05:41	05:17
	17:00	45	15:05 (2)	17:56			18:46	29	17:06 (3)	20:39		21:28	22:00
19	08:36		14:20 (2)	07:46			06:45		16:39 (3)	06:34		05:39	05:17
	17:01	46	15:06 (2)	17:58			18:48	25	17:04 (3)	20:41		21:30	22:00
20	08:35		14:21 (2)	07:44			06:42		16:41 (3)	06:32		05:38	05:17
	17:03	45	15:06 (2)	17:59			18:49	20	17:01 (3)	20:42		21:31	22:01
21	08:33		14:21 (2)	07:42			06:40		16:45 (3)	06:30		05:36	05:17
	17:05	45	15:06 (2)	18:01			18:51	13	16:58 (3)	20:44		21:32	22:01
22	08:32		14:22 (2)	07:40			06:38			06:28		05:35	05:17
	17:06	44	15:06 (2)	18:03			18:53			20:46		21:34	22:01
23	08:31		14:23 (2)	07:38		16:50 (3)	06:35			06:26		05:34	05:18
	17:08	43	15:06 (2)	18:05	12	17:02 (3)	18:54			20:47		21:35	22:01
24	08:30		14:23 (2)	07:36		16:46 (3)	06:33			06:24		05:33	05:18
	17:10	43	15:06 (2)	18:07	19	17:05 (3)	18:56			20:49		21:37	22:01
25	08:29		14:24 (2)	07:34		16:44 (3)	06:31			06:22		05:31	05:18
	17:11	42	15:06 (2)	18:09	24	17:08 (3)	18:58			20:51		21:38	22:01
26	08:27		14:25 (2)	07:32		16:41 (3)	06:28			06:20		05:30	05:19
	17:13	41	15:06 (2)	18:10	28	17:09 (3)	19:00			20:52		21:39	22:01
27	08:26		14:25 (2)	07:30		16:39 (3)	06:26			06:18		05:29	05:19
	17:15	40	15:05 (2)	18:12	32	17:11 (3)	19:01			20:54		21:41	22:01
28	08:25		14:26 (2)	07:27		16:38 (3)	06:24			06:16		05:28	05:20
	17:17	38	15:04 (2)	18:14	34	17:12 (3)	19:03			20:56		21:42	22:01
29	08:23		14:27 (2)				07:21			06:14		05:27	05:20
	17:19	38	15:05 (2)				20:05			20:58		21:43	22:01
30	08:22		14:28 (2)				07:19			06:12		05:26	05:21
	17:20	36	15:04 (2)				20:06			20:59		21:44	22:01
31	08:20		14:30 (2)				07:17					05:25	
	17:22	33	15:03 (2)				20:08					21:46	
Potential sun hours	259			278			367			416		485	499
Total, worst case		1334			262			762					
Sun reduction		0.16			0.21			0.24					
Oper. time red.		1.00			1.00			1.00					
Wind dir. red.		0.60			0.62			0.64					
Total reduction		0.09			0.13			0.15					
Total, real		125			33			118					

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** D - H4

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	July	August	September	October	November	December
1	05:21	05:58	06:48	07:37	17:12 (3)	07:31	08:22	14:00 (2)
	22:01	21:29	20:27	19:17 40	17:52 (3)	17:11	16:30 45	14:45 (2)
2	05:22	06:00	06:49	07:39	17:11 (3)	07:33	08:23	14:00 (2)
	22:00	21:27	20:24	19:15 42	17:53 (3)	17:09	16:30 45	14:45 (2)
3	05:23	06:01	06:51	07:40	17:10 (3)	07:34	08:25	14:01 (2)
	22:00	21:25	20:22	19:12 42	17:52 (3)	17:07	16:29 44	14:45 (2)
4	05:24	06:03	06:53	07:42	17:09 (3)	07:36	08:26	14:01 (2)
	22:00	21:24	20:20	19:10 43	17:52 (3)	17:05	16:29 44	14:45 (2)
5	05:24	06:04	06:54	07:44	17:09 (3)	07:38	08:27	14:02 (2)
	21:59	21:22	20:17	19:08 43	17:52 (3)	17:04	16:28 44	14:46 (2)
6	05:25	06:06	06:56	07:45	17:08 (3)	07:40 14:11 (2)	08:29	14:02 (2)
	21:59	21:20	20:15	19:06 43	17:51 (3)	17:02 13 14:24 (2)	16:28 44	14:46 (2)
7	05:26	06:07	06:58	07:47	17:08 (3)	07:42 14:08 (2)	08:30	14:02 (2)
	21:58	21:18	20:13	19:03 43	17:51 (3)	17:00 19 14:27 (2)	16:27 44	14:46 (2)
8	05:27	06:09	06:59	07:49	17:09 (3)	07:43 14:05 (2)	08:31	14:04 (2)
	21:57	21:16	20:11	19:01 41	17:50 (3)	16:58 25 14:30 (2)	16:27 43	14:47 (2)
9	05:28	06:11	07:01	07:50	17:09 (3)	07:45 14:03 (2)	08:32	14:04 (2)
	21:57	21:15	20:08	18:59 41	17:50 (3)	16:57 28 14:31 (2)	16:27 43	14:47 (2)
10	05:29	06:12	07:02	07:52	17:08 (3)	07:47 14:02 (2)	08:33	14:04 (2)
	21:56	21:13	20:06	18:57 40	17:48 (3)	16:55 31 14:33 (2)	16:26 43	14:47 (2)
11	05:30	06:14	07:04	07:54	17:09 (3)	07:49 14:01 (2)	08:34	14:05 (2)
	21:55	21:11	20:04	18:54 39	17:48 (3)	16:54 33 14:34 (2)	16:26 42	14:47 (2)
12	05:31	06:15	07:06	07:55	17:10 (3)	07:50 14:00 (2)	08:35	14:05 (2)
	21:54	21:09	20:01	18:52 37	17:47 (3)	16:52 35 14:35 (2)	16:26 42	14:47 (2)
13	05:32	06:17	07:07	07:57	17:11 (3)	07:52 13:59 (2)	08:36	14:06 (2)
	21:53	21:07	19:59	18:50 35	17:46 (3)	16:51 38 14:37 (2)	16:26 41	14:47 (2)
14	05:33	06:19	07:09	07:59	17:12 (3)	07:54 13:59 (2)	08:37	14:06 (2)
	21:52	21:05	19:57	18:48 33	17:45 (3)	16:49 38 14:37 (2)	16:26 42	14:48 (2)
15	05:35	06:20	07:11	08:01	17:12 (3)	07:56 13:58 (2)	08:38	14:07 (2)
	21:51	21:03	19:54	18:45 30	17:42 (3)	16:48 40 14:38 (2)	16:26 41	14:48 (2)
16	05:36	06:22	07:12	08:02	17:14 (3)	07:57 13:58 (2)	08:39	14:08 (2)
	21:50	21:01	19:52	18:43 27	17:41 (3)	16:46 41 14:39 (2)	16:26 41	14:49 (2)
17	05:37	06:23	07:14	08:04	17:16 (3)	07:59 13:57 (2)	08:40	14:09 (2)
	21:49	20:59	19:50	18:41 22	17:38 (3)	16:45 42 14:39 (2)	16:26 40	14:49 (2)
18	05:38	06:25	07:15	08:06	17:18 (3)	08:01 13:57 (2)	08:41	14:09 (2)
	21:48	20:57	19:47	18:39 18	17:36 (3)	16:44 43 14:40 (2)	16:27 41	14:50 (2)
19	05:39	06:27	07:17	08:08	17:23 (3)	08:03 13:57 (2)	08:41	14:09 (2)
	21:47	20:55	19:45	18:37 8	17:31 (3)	16:42 43 14:40 (2)	16:27 41	14:50 (2)
20	05:41	06:28	07:19	08:09	08:04	13:57 (2)	08:42	14:10 (2)
	21:46	20:53	19:43	18:35	16:41 44	14:41 (2)	16:27 41	14:51 (2)
21	05:42	06:30	07:20	08:11	08:06	13:57 (2)	08:43	14:10 (2)
	21:45	20:51	19:40	18:33	16:40 45	14:42 (2)	16:28 40	14:50 (2)
22	05:43	06:32	07:22 17:31 (3)	08:13	08:08	13:57 (2)	08:43	14:11 (2)
	21:43	20:48	19:38 10 17:41 (3)	18:31	16:39 45	14:42 (2)	16:28 40	14:51 (2)
23	05:45	06:33	07:24 17:27 (3)	08:15	08:09	13:57 (2)	08:44	14:11 (2)
	21:42	20:46	19:36 18 17:45 (3)	18:28	16:38 46	14:43 (2)	16:29 41	14:52 (2)
24	05:46	06:35	07:25 17:23 (3)	08:16	08:11	13:57 (2)	08:44	14:12 (2)
	21:41	20:44	19:33 24 17:47 (3)	18:26	16:37 45	14:42 (2)	16:29 41	14:53 (2)
25	05:48	06:36	07:27 17:21 (3)	07:18	08:13	13:57 (2)	08:45	14:12 (2)
	21:39	20:42	19:31 27 17:48 (3)	17:24	16:36 46	14:43 (2)	16:30 41	14:53 (2)
26	05:49	06:38	07:29 17:19 (3)	07:20	08:14	13:58 (2)	08:45	14:12 (2)
	21:38	20:40	19:29 31 17:50 (3)	17:22	16:35 46	14:44 (2)	16:31 41	14:53 (2)
27	05:51	06:40	07:30 17:17 (3)	07:22	08:16	13:58 (2)	08:45	14:13 (2)
	21:37	20:38	19:26 33 17:50 (3)	17:20	16:34 45	14:43 (2)	16:31 41	14:54 (2)
28	05:52	06:41	07:32 17:15 (3)	07:24	08:17	13:58 (2)	08:45	14:13 (2)
	21:35	20:35	19:24 36 17:51 (3)	17:18	16:33 46	14:44 (2)	16:32 41	14:54 (2)
29	05:53	06:43	07:34 17:14 (3)	07:25	08:19	13:59 (2)	08:46	14:13 (2)
	21:33	20:33	19:22 38 17:52 (3)	17:17	16:32 45	14:44 (2)	16:33 42	14:55 (2)
30	05:55	06:45	07:35 17:12 (3)	07:27	08:20	13:59 (2)	08:46	14:14 (2)
	21:32	20:31	19:19 40 17:52 (3)	17:15	16:31 45	14:44 (2)	16:34 41	14:55 (2)
31	05:56	06:46		07:29			08:46	14:14 (2)
	21:30	20:29		17:13			16:35 42	14:56 (2)
Potential sun hours	502	454	381	331	266	244		
Total, worst case			257	667	967	1302		
Sun reduction			0.28	0.24	0.18	0.13		
Oper. time red.			1.00	1.00	1.00	1.00		
Wind dir. red.			0.64	0.64	0.60	0.60		
Total reduction			0.18	0.15	0.11	0.08		
Total, real			46	100	107	105		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** E - H5

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April			May			June			July			August			September	October	November	December
1	08:46	08:19	07:25	07:15			06:10		20:08 (4)	05:24			05:21			05:58		20:23 (4)	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10			21:01	22	20:30 (4)	21:47			22:01			21:29	20	20:52 (1)	20:27	19:17	17:11	16:31
2	08:45	08:17	07:23	07:12			06:08		20:08 (4)	05:24			05:22			06:00		20:21 (4)	06:49	07:39	07:32	08:23
	16:37	17:26	18:18	20:12			21:02	22	20:30 (4)	21:48			22:00			21:27	16	20:37 (4)	20:24	19:15	17:09	16:30
3	08:45	08:15	07:21	07:10			06:06		20:08 (4)	05:23			05:23			06:01		20:21 (4)	06:51	07:40	07:34	08:25
	16:38	17:28	18:19	20:13			21:04	23	20:31 (4)	21:49			22:00			21:25	17	20:38 (4)	20:22	19:12	17:07	16:29
4	08:45	08:14	07:19	07:08			06:04		20:08 (4)	05:22			05:24			06:03		20:19 (4)	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15			21:06	23	20:31 (4)	21:50			21:59			21:24	19	20:38 (4)	20:20	19:10	17:05	16:29
5	08:45	08:12	07:16	07:05			06:02		20:08 (4)	05:21			05:24			06:04		20:19 (4)	06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17			21:07	22	20:30 (4)	21:51			21:59			21:22	21	20:40 (4)	20:17	19:08	17:04	16:28
6	08:45	08:11	07:14	07:03			06:00		20:08 (4)	05:21			05:25			06:06		20:18 (4)	06:56	07:45	07:40	08:29
	16:42	17:33	18:25	20:18			21:09	22	20:30 (4)	21:52			21:58			21:20	21	20:39 (4)	20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01			05:59		20:09 (4)	05:20			05:26			06:07		20:18 (4)	06:58	07:47	07:41	08:30
	16:43	17:35	18:27	20:20			21:11	21	20:30 (4)	21:53			21:58			21:18	22	20:40 (4)	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59			05:57		20:09 (4)	05:20			05:27			06:09		20:17 (4)	06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22			21:12	20	20:29 (4)	21:54			21:57			21:16	23	20:40 (4)	20:11	19:01	16:59	16:27
9	08:43	08:05	07:07	06:56			05:55		20:09 (4)	05:19			05:28			06:11		20:18 (4)	07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:24			21:14	19	20:28 (4)	21:54			21:57			21:15	22	20:40 (4)	20:08	18:59	16:57	16:27
10	08:43	08:03	07:05	06:54			05:53		20:11 (4)	05:19			05:29			06:12		20:17 (4)	07:02	07:52	07:47	08:33
	16:47	17:41	18:32	20:25			21:16	16	20:27 (4)	21:55			21:56			21:13	23	20:40 (4)	20:06	18:57	16:55	16:26
11	08:42	08:02	07:03	06:52			05:52		20:11 (4)	05:18			05:30			06:14		20:17 (4)	07:04	07:54	07:49	08:34
	16:49	17:43	18:34	20:27			21:17	15	20:26 (4)	21:56			21:55			21:11	23	20:40 (4)	20:04	18:54	16:54	16:26
12	08:41	08:00	07:01	06:50			05:50		20:13 (4)	05:18			05:31			06:15		20:17 (4)	07:06	07:55	07:50	08:35
	16:50	17:45	18:35	20:29			21:19	20	20:42 (1)	21:57			21:54			21:09	22	20:39 (4)	20:01	18:52	16:52	16:26
13	08:41	07:58	06:58	06:47			05:48		20:15 (4)	05:18			05:32			06:17		20:18 (4)	07:07	07:57	07:52	08:36
	16:52	17:46	18:37	20:30			21:20	18	20:43 (1)	21:57			21:53			21:07	21	20:39 (4)	19:59	18:50	16:51	16:26
14	08:40	07:56	06:56	06:45			05:47		20:32 (1)	05:17			05:33		20:45 (1)	06:19		20:18 (4)	07:09	07:59	07:54	08:37
	16:53	17:48	18:39	20:32			21:22	13	20:45 (1)	21:58			21:52	6	20:51 (1)	21:05	18	20:36 (4)	19:57	18:48	16:49	16:26
15	08:39	07:54	06:54	06:43			05:45		20:30 (1)	05:17			05:35		20:44 (1)	06:20		20:19 (4)	07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34			21:24	15	20:45 (1)	21:59			21:51	8	20:52 (1)	21:03	16	20:35 (4)	19:54	18:45	16:48	16:26
16	08:38	07:52	06:51	06:41			05:44		20:30 (1)	05:17			05:36		20:43 (1)	06:22		20:20 (4)	07:12	08:02	07:57	08:39
	16:56	17:52	18:42	20:35			21:25	16	20:46 (1)	21:59			21:50	10	20:53 (1)	21:01	13	20:33 (4)	19:52	18:43	16:46	16:26
17	08:37	07:50	06:49	06:39			05:42		20:30 (1)	05:17			05:37		20:42 (1)	06:23		20:22 (4)	07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37			21:27	16	20:46 (1)	22:00			21:49	12	20:54 (1)	20:59	9	20:31 (4)	19:50	18:41	16:45	16:27
18	08:36	07:48	06:47	06:36			05:41		20:29 (1)	05:17			05:38		20:41 (1)	06:25		20:24 (4)	07:15	08:06	08:01	08:41
	17:00	17:56	18:46	20:39			21:28	17	20:46 (1)	22:00			21:48	13	20:54 (1)	20:57	5	20:29 (4)	19:47	18:39	16:44	16:27
19	08:35	07:46	06:45	06:34			05:39		20:30 (1)	05:17			05:40		20:41 (1)	06:27			07:17	08:08	08:03	08:41
	17:01	17:58	18:48	20:41			21:30	16	20:46 (1)	22:00			21:47	14	20:55 (1)	20:55			19:45	18:37	16:42	16:27
20	08:34	07:44	06:42	06:32			05:38		20:30 (1)	05:17			05:41		20:41 (1)	06:28			07:19	08:09	08:04	08:42
	17:03	17:59	18:49	20:42			21:31	17	20:47 (1)	22:01			21:46	15	20:56 (1)	20:53			19:43	18:35	16:41	16:27
21	08:33	07:42	06:40	06:30			05:37		20:30 (1)	05:17			05:42		20:40 (1)	06:30			07:20	08:11	08:06	08:43
	17:05	18:01	18:51	20:44			21:32	17	20:47 (1)	22:01			21:45	16	20:56 (1)	20:51			19:40	18:33	16:40	16:28
22	08:32	07:40	06:38	06:28			05:35		20:30 (1)	05:18			05:44		20:40 (1)	06:32			07:22	08:13	08:08	08:43
	17:06	18:03	18:53	20:46			21:34	16	20:46 (1)	22:01			21:43	16	20:56 (1)	20:48			19:38	18:31	16:39	16:28
23	08:31	07:38	06:35	06:26			05:34		20:30 (1)	05:18			05:45		20:40 (1)	06:33			07:24	08:15	08:09	08:44
	17:08	18:05	18:54	20:47			21:35	16	20:46 (1)	22:01			21:42	16	20:56 (1)	20:46			19:36	18:28	16:38	16:29
24	08:30	07:36	06:33	06:24			05:33		20:31 (1)	05:18			05:46		20:40 (1)	06:35			07:25	08:16	08:11	08:44
	17:10	18:07	18:56	20:49			21:37	14	20:45 (1)	22:01			21:41	17	20:57 (1)	20:44			19:33	18:26	16:37	16:29
25	08:29	07:34	06:31	06:22		20:18 (4)	05:32		20:31 (1)	05:18			05:48		20:40 (1)	06:36			07:27	07:18	08:13	08:44
	17:11	18:09	18:58	20:51	5	20:23 (4)	21:38	14	20:45 (1)	22:01			21:39	17	20:57 (1)	20:42			19:31	17:24	16:36	16:30
26	08:27	07:32	06:28	06:20		20:15 (4)	05:30		20:32 (1)	05:19			05:49		20:40 (1)	06:38			07:29	07:20	08:14	08:45
	17:13	18:10	19:00	20:52	10	20:25 (4)	21:39	13	20:45 (1)	22:01			21:38	16	20:56 (1)	20:40			19:29	17:22	16:35	16:31
27	08:26	07:30	06:26	06:18		20:13 (4)	05:29		20:33 (1)	05:19			05:51		20:41 (1)	06:40			07:30	07:22	08:16	08:45
	17:15	18:12	19:01	20:54	13	20:26 (4)	21:41	11	20:44 (1)	22:01			21:36	16	20:57 (1)	20:38			19:26	17:20	16:34	16:31
28	08:25	07:27	06:24	06:16		20:11 (4)	05:28		20:34 (1)	05:20			05:52		20:41 (1)	06:41			07:32	07:24	08:17	08:45
	17:17	18:14	19:03	20:56	17	20:28 (4)	21:42	9	20:43 (1)	22:01			21:35	15	20:56 (1)	20:35			19:24	17:18	16:33	16:32
29	08:23		07:21	06:14		20:10 (4)	05:27		20:35 (1)	05:20			05:54		20:42 (1)	06:43			07:34	07:25	08:19	08:45
	17:19		20:05	20:57	19	20:29 (4)	21:43	7	20:42 (1)	22:01			21:33	14	20:56 (1)	20:33			19:22	17:17	16:32	16:33
30	08:22		07:19	06:12		20:09 (4)	05:26		20:38 (1)	05:21			05:55		20:42 (1)	06:45			07:35	07:27	08:20	08:46
	17:20		20:06	20:59	21	20:30 (4)	21:44	3	20:41 (1)	22:01			21:32	13	20:55 (1)	20:31			19:19	17:15	16:31	16:34
31	08:20		07:17				05:25						05:57		20:24 (4)	06:46				07:29		08:46
	17:22		20:08				21:46						21:30	20	20:53 (1)	20:29				17:13		16:35
Potential sun hours	259	278	367	416			485			499			502			454			381	331	266	244
Total, worst case					85			493						254			331					
Sun reduction					0.35			0.37						0.27			0.30					
Oper. time red.					1.00			1.00						1.00			1.00					
Wind dir. red.					0.68			0.68						0.68			0.68					
Total reduction					0.24			0.25						0.18			0.20					
Total, real					20			124						46			67					

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** F - H6

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:14	18:07 (2) 06:10	19:21 (3) 05:24	05:21	05:58	06:48	18:18 (2) 07:37	07:31	08:22
	16:36	17:24	18:16	20:10 40	18:47 (2) 21:01 27	19:48 (3) 21:47	22:01	21:29	20:27 12	18:30 (2) 19:17	17:11	16:30
2	08:46	08:17	07:23	07:12	18:07 (2) 06:08	19:22 (3) 05:24	05:22	06:00	06:49	18:14 (2) 07:39	07:32	08:23
	16:37	17:26	18:18	20:12 39	18:46 (2) 21:02 25	19:47 (3) 21:48	22:00	21:27	20:24 18	18:32 (2) 19:15	17:09	16:30
3	08:45	08:15	07:21	07:10	18:08 (2) 06:06	19:23 (3) 05:23	05:23	06:01	06:51	18:11 (2) 07:40	07:34	08:25
	16:38	17:28	18:19	20:13 38	18:46 (2) 21:04 24	19:47 (3) 21:49	22:00	21:25	20:22 24	18:35 (2) 19:12	17:07	16:29
4	08:45	08:14	07:19	07:08	18:08 (2) 06:04	19:24 (3) 05:22	05:24	06:03	06:53	18:09 (2) 07:42	07:36	08:26
	16:40	17:30	18:21	20:15 36	18:44 (2) 21:06 22	19:46 (3) 21:50	21:59	21:24	20:20 26	18:35 (2) 19:10	17:05	16:29
5	08:45	08:12	07:16	07:05	18:09 (2) 06:02	19:25 (3) 05:21	05:24	06:04	19:40 (3) 06:54	18:07 (2) 07:44	07:38	08:27
	16:41	17:31	18:23	20:17 34	18:43 (2) 21:07 19	19:44 (3) 21:51	21:59	21:22 9	19:49 (3) 20:17 30	18:37 (2) 19:08	17:04	16:28
6	08:45	08:11	07:14	07:03	18:10 (2) 06:00	19:26 (3) 05:21	05:25	06:06	19:37 (3) 06:56	18:06 (2) 07:45	07:40	08:29
	16:42	17:33	18:25	20:18 32	18:42 (2) 21:09 17	19:43 (3) 21:52	21:58	21:20 14	19:51 (3) 20:15 32	18:38 (2) 19:06	17:02	16:28
7	08:44	08:09	07:12	07:01	18:11 (2) 05:58	19:29 (3) 05:20	05:26	06:07	19:35 (3) 06:58	18:04 (2) 07:47	07:41	08:30
	16:43	17:35	18:27	20:20 30	18:41 (2) 21:11 12	19:41 (3) 21:53	21:58	21:18 18	19:53 (3) 20:13 34	18:38 (2) 19:03	17:00	16:27
8	08:44	08:07	07:10	06:59	18:12 (2) 05:57	19:32 (3) 05:20	05:27	06:09	19:34 (3) 06:59	18:03 (2) 07:49	07:43	08:31
	16:45	17:37	18:28	20:22 26	18:38 (2) 21:12 5	19:37 (3) 21:54	21:57	21:16 20	19:54 (3) 20:11 36	18:39 (2) 19:01	16:58	16:27
9	08:43	08:05	07:07	06:56	18:13 (2) 05:55	05:19	05:28	06:11	19:32 (3) 07:01	18:01 (2) 07:50	07:45	08:32
	16:46	17:39	18:30	20:23 24	18:37 (2) 21:14	21:54	21:57	21:15 23	19:55 (3) 20:08 38	18:39 (2) 18:59	16:57	16:27
10	08:43	08:03	07:05	06:54	18:16 (2) 05:53	05:19	05:29	06:12	19:31 (3) 07:02	18:01 (2) 07:52	07:47	08:33
	16:47	17:41	18:32	20:25 18	18:34 (2) 21:16	21:55	21:56	21:13 25	19:56 (3) 20:06 38	18:39 (2) 18:56	16:55	16:26
11	08:42	08:02	07:03	06:52	18:20 (2) 05:52	05:18	05:30	06:14	19:30 (3) 07:04	17:59 (2) 07:54	07:49	08:34
	16:49	17:43	18:34	20:27 11	18:31 (2) 21:17	21:56	21:55	21:11 26	19:56 (3) 20:04 40	18:39 (2) 18:54	16:54	16:26
12	08:41	08:00	07:01	06:50	05:50	05:18	05:31	06:15	19:30 (3) 07:06	17:59 (2) 07:55	07:50	08:35
	16:50	17:45	18:35	20:29	21:19	21:57	21:54	21:09 27	19:57 (3) 20:01 40	18:39 (2) 18:52	16:52	16:26
13	08:41	07:58	06:58	06:47	05:48	05:18	05:32	06:17	19:29 (3) 07:07	17:59 (2) 07:57	07:52	08:36
	16:52	17:46	18:37	20:30	21:20	21:57	21:53	21:07 29	19:58 (3) 19:59 40	18:39 (2) 18:50	16:51	16:26
14	08:40	07:56	06:56	06:45	05:47	05:17	05:33	06:19	19:28 (3) 07:09	17:58 (2) 07:59	07:54	08:37
	16:53	17:48	18:39	20:32	21:22	21:58	21:52	21:05 30	19:58 (3) 19:57 40	18:38 (2) 18:48	16:49	16:26
15	08:39	07:54	06:54	06:43	05:45	05:17	05:35	06:20	19:28 (3) 07:11	17:58 (2) 08:01	07:56	08:38
	16:55	17:50	18:41	20:34	21:24	21:59	21:51	21:03 30	19:58 (3) 19:54 40	18:38 (2) 18:45	16:48	16:26
16	08:38	07:52	06:51	06:41	19:32 (3) 05:44	05:17	05:36	06:22	19:27 (3) 07:12	17:57 (2) 08:02	07:57	08:39
	16:56	17:52	18:42	20:35 11	19:43 (3) 21:25	21:59	21:50	21:01 30	19:57 (3) 19:52 40	18:37 (2) 18:43	16:46	16:26
17	08:37	07:50	06:49 17:26 (2)	06:39	19:29 (3) 05:42	05:17	05:37	06:23	19:28 (3) 07:14	17:57 (2) 08:04	07:59	08:40
	16:58	17:54	18:44 10 17:36 (2)	20:37 17	19:46 (3) 21:27	22:00	21:49	20:59 30	19:58 (3) 19:50 40	18:37 (2) 18:41	16:45	16:26
18	08:37	07:48	06:47 17:22 (2)	06:36	19:27 (3) 05:41	05:17	05:38	06:25	19:27 (3) 07:15	17:58 (2) 08:06	08:01	08:41
	17:00	17:56	18:46 18 17:40 (2)	20:39 21	19:48 (3) 21:28	22:00	21:48	20:57 30	19:57 (3) 19:47 38	18:36 (2) 18:39	16:44	16:27
19	08:36	07:46	06:45 17:18 (2)	06:34	19:26 (3) 05:39	05:17	05:39	06:27	19:27 (3) 07:17	17:57 (2) 08:08	08:03	08:41
	17:01	17:58	18:48 24 17:42 (2)	20:41 23	19:49 (3) 21:30	22:00	21:47	20:55 30	19:57 (3) 19:45 38	18:35 (2) 18:37	16:42	16:27
20	08:34	07:44	06:42 17:16 (2)	06:32	19:25 (3) 05:38	05:17	05:41	06:28	19:27 (3) 07:19	17:58 (2) 08:09	08:04	08:42
	17:03	17:59	18:49 28 17:44 (2)	20:42 25	19:50 (3) 21:31	22:01	21:46	20:53 29	19:56 (3) 19:43 36	18:34 (2) 18:35	16:41	16:27
21	08:33	07:42	06:40 17:15 (2)	06:30	19:23 (3) 05:36	05:17	05:42	06:30	19:28 (3) 07:20	17:58 (2) 08:11	08:06	08:43
	17:05	18:01	18:51 31 17:46 (2)	20:44 26	19:49 (3) 21:32	22:01	21:45	20:51 28	19:56 (3) 19:40 34	18:32 (2) 18:33	16:40	16:28
22	08:32	07:40	06:38 17:13 (2)	06:28	19:22 (3) 05:35	05:17	05:43	06:31	19:27 (3) 07:22	17:59 (2) 08:13	08:08	08:43
	17:06	18:03	18:53 33 17:46 (2)	20:46 28	19:50 (3) 21:34	22:01	21:43	20:48 27	19:54 (3) 19:38 32	18:31 (2) 18:31	16:39	16:28
23	08:31	07:38	06:35 17:12 (2)	06:26	19:21 (3) 05:34	05:18	05:45	06:33	19:28 (3) 07:24	18:01 (2) 08:15	08:09	08:44
	17:08	18:05	18:54 35 17:47 (2)	20:47 29	19:50 (3) 21:35	22:01	21:42	20:46 25	19:53 (3) 19:36 28	18:29 (2) 18:28	16:38	16:29
24	08:30	07:36	06:33 17:11 (2)	06:24	19:21 (3) 05:33	05:18	05:46	06:35	19:29 (3) 07:25	18:01 (2) 08:16	08:11	08:44
	17:10	18:07	18:56 37 17:48 (2)	20:49 29	19:50 (3) 21:37	22:01	21:41	20:44 22	19:51 (3) 19:33 25	18:26 (2) 18:26	16:37	16:29
25	08:29	07:34	06:31 17:09 (2)	06:22	19:20 (3) 05:31	05:18	05:48	06:36	19:30 (3) 07:27	18:04 (2) 07:18	08:13	08:45
	17:11	18:09	18:58 39 17:48 (2)	20:51 30	19:50 (3) 21:38	22:01	21:39	20:42 20	19:50 (3) 19:31 20	18:24 (2) 17:24	16:36	16:30
26	08:27	07:32	06:28 17:09 (2)	06:20	19:21 (3) 05:30	05:19	05:49	06:38	19:32 (3) 07:29	18:07 (2) 07:20	08:14	08:45
	17:13	18:10	19:00 39 17:48 (2)	20:52 30	19:51 (3) 21:39	22:01	21:38	20:40 17	19:49 (3) 19:29 14	18:21 (2) 17:22	16:35	16:31
27	08:26	07:29	06:26 17:09 (2)	06:18	19:21 (3) 05:29	05:19	05:51	06:40	19:34 (3) 07:30	07:22	08:16	08:45
	17:15	18:12	19:01 40 17:49 (2)	20:54 30	19:51 (3) 21:41	22:01	21:36	20:38 11	19:45 (3) 19:26	17:20	16:34	16:31
28	08:25	07:27	06:24 17:07 (2)	06:16	19:21 (3) 05:28	05:20	05:52	06:41	07:32	07:24	08:17	08:45
	17:17	18:14	19:03 41 17:48 (2)	20:56 29	19:50 (3) 21:42	22:01	21:35	20:35	19:24	17:18	16:33	16:32
29	08:23		07:21 18:07 (2)	06:14	19:21 (3) 05:27	05:20	05:53	06:43	07:34	07:25	08:19	08:45
	17:19		20:05 41 18:48 (2)	20:57 29	19:50 (3) 21:43	22:01	21:33	20:33	19:22	17:16	16:32	16:33
30	08:22		07:19 18:07 (2)	06:12	19:21 (3) 05:26	05:21	05:55	06:45	07:35	07:27	08:20	08:46
	17:20		20:06 41 18:48 (2)	20:59 28	19:49 (3) 21:44	22:01	21:32	20:31	19:19	17:15	16:31	16:34
31	08:20		07:17 18:07 (2)		05:25		05:56	06:46		07:29		08:46
	17:22		20:08 40 18:47 (2)		21:46		21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case			497	713	151			550	833			
Sun reduction			0.24	0.35	0.37			0.30	0.28			
Oper. time red.			1.00	1.00	1.00			1.00	1.00			
Wind dir. red.			0.65	0.66	0.68			0.68	0.65			
Total reduction			0.16	0.24	0.25			0.20	0.18			
Total, real			79	168	38			110	153			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** G - H7

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:15	06:10	05:24	05:22	05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01	21:47	22:01	21:29	20:27	19:17	17:11	16:31
2	08:46	08:17	07:23	07:12	06:08	05:24	05:22	06:00	06:50	07:39	07:33	08:23
	16:37	17:26	18:18	20:12	21:03	21:48	22:00	21:27	20:24	19:15	17:09	16:30
3	08:45	08:16	07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34	08:25
	16:38	17:28	18:19	20:13	21:04	21:49	22:00	21:25	20:22	19:12	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15	21:06	21:50	21:59	21:24	20:20	19:10	17:05	16:29
5	08:45	08:12	07:16	07:05	06:02	05:21	05:25	06:04	06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17	21:08	21:51	21:59	21:22	20:18	19:08	17:04	16:28
6	08:45	08:11	07:14	07:03	06:00	05:21	05:25	06:06	06:56	07:45	07:40	08:29
	16:42	17:33	18:25	20:18	21:09	21:52	21:58	21:20	20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01	05:59	05:20	05:26	06:07	06:58	07:47	07:42	08:30
	16:43	17:35	18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59	05:57	05:20	05:27	06:09	06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22	21:12	21:54	21:57	21:16	20:11	19:01	16:59	16:27
9	08:43	08:05	07:07	06:56	05:55	05:19	05:28	06:11	07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:24	21:14	21:55	21:57	21:15	20:08	18:59	16:57	16:27
10	08:43	08:04	07:05	06:54	05:53	05:19	05:29	06:12	07:03	07:52	07:47	08:33
	16:47	17:41	18:32	20:25	21:16	21:55	21:56	21:13	20:06	18:57	16:55	16:27
11	08:42	08:02	07:03	06:52	05:52	05:18	05:30	06:14	07:04	07:54	07:49	08:34
	16:49	17:43	18:34	20:27	21:17	21:56	21:55	21:11	20:04	18:54	16:54	16:26
12	08:42	08:00	07:01	06:50	05:50	05:18	05:31	06:15	07:06	07:55	07:50	08:35
	16:50	17:45	18:35	20:29	21:19	21:57	21:54	21:09	20:01	18:52	16:52	16:26
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	16:53	17:48	18:39	20:32	21:22	21:58	21:52	21:05	19:57	18:48	16:49	16:26
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	17:00	17:56	18:46	20:39	21:28	22:00	21:48	20:57	19:47	18:39	16:44	16:27
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	17:03	17:59	18:49	20:42	21:31	22:01	21:46	20:53	19:43	18:35	16:41	16:27
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25	08:29	07:34	06:31	06:22	05:32	05:18	05:48	06:36	07:27	07:18	08:13	08:45
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26	08:27	07:32	06:28	06:20	05:30	05:19	05:49	06:38	07:29	07:20	08:14	08:45
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27	08:26	07:30	06:26	06:18	05:29	05:19	05:51	06:40	07:30	07:22	08:16	08:45
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	17:17	18:14	19:03	20:56	21:42	22:01	21:35	20:35	19:24	17:19	16:33	16:32
29	08:23		07:21	06:14	05:27	05:20	05:54	06:43	07:34	07:25	08:19	08:45
	17:19		20:05	20:58	21:43	22:01	21:33	20:33	19:22	17:17	16:32	16:33
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	17:21		20:06	20:59	21:44	22:01	21:32	20:31	19:19	17:15	16:31	16:34
31	08:20		07:17		05:25		05:57	06:46		07:29		08:46
	17:22		20:08		21:46		21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** H - H8

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:15	06:10	05:25	05:22	05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01	21:47	22:01	21:29	20:27	19:17	17:11	16:31
2	08:46	08:17	07:23	07:12	06:08	05:24	05:22	06:00	06:50	07:39	07:33	08:23
	16:37	17:26	18:18	20:12	21:03	21:48	22:00	21:27	20:24	19:15	17:09	16:30
3	08:45	08:16	07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34	08:25
	16:39	17:28	18:20	20:13	21:04	21:49	22:00	21:25	20:22	19:13	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15	21:06	21:50	22:00	21:24	20:20	19:10	17:06	16:29
5	08:45	08:12	07:16	07:05	06:02	05:22	05:25	06:04	06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17	21:08	21:51	21:59	21:22	20:18	19:08	17:04	16:28
6	08:45	08:11	07:14	07:03	06:00	05:21	05:25	06:06	06:56	07:45	07:40	08:29
	16:42	17:34	18:25	20:18	21:09	21:52	21:59	21:20	20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01	05:59	05:20	05:26	06:08	06:58	07:47	07:42	08:30
	16:43	17:35	18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59	05:57	05:20	05:27	06:09	06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22	21:12	21:54	21:57	21:17	20:11	19:01	16:59	16:27
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12	08:42	08:00	07:01	06:50	05:50	05:18	05:31	06:15	07:06	07:56	07:51	08:36
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15	08:39	07:54	06:54	06:43	05:45	05:17	05:35	06:20	07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34	21:24	21:59	21:52	21:03	19:54	18:46	16:48	16:26
16	08:38	07:52	06:52	06:41	05:44	05:17	05:36	06:22	07:12	08:02	07:58	08:39
	16:56	17:52	18:42	20:36	21:25	21:59	21:50	21:01	19:52	18:43	16:46	16:26
17	08:38	07:50	06:49	06:39	05:42	05:17	05:37	06:24	07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37	21:27	22:00	21:49	20:59	19:50	18:41	16:45	16:27
18	08:37	07:48	06:47	06:37	05:41	05:17	05:38	06:25	07:16	08:06	08:01	08:41
	17:00	17:56	18:46	20:39	21:28	22:00	21:48	20:57	19:47	18:39	16:44	16:27
19	08:36	07:46	06:45	06:34	05:39	05:17	05:40	06:27	07:17	08:08	08:03	08:41
	17:01	17:58	18:48	20:41	21:30	22:00	21:47	20:55	19:45	18:37	16:42	16:27
20	08:35	07:44	06:42	06:32	05:38	05:17	05:41	06:28	07:19	08:09	08:04	08:42
	17:03	18:00	18:49	20:42	21:31	22:01	21:46	20:53	19:43	18:35	16:41	16:28
21	08:33	07:42	06:40	06:30	05:37	05:17	05:42	06:30	07:20	08:11	08:06	08:43
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22	08:32	07:40	06:38	06:28	05:35	05:18	05:44	06:32	07:22	08:13	08:08	08:43
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	17:17	18:14	19:03	20:56	21:42	22:01	21:35	20:36	19:24	17:19	16:33	16:32
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30	08:22		07:19	06:12	05:26	05:21	05:55	06:45	07:35	07:27	08:20	08:46
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31	08:20		07:17		05:25		05:57	06:46		07:29		08:46
	17:22		20:08		21:46		21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** I - H9

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:15	06:10	05:24	05:22	05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01	21:47	22:01	21:29	20:27	19:17	17:11	16:31
2	08:46	08:17	07:23	07:12	06:08	05:24	05:22	06:00	06:49	07:39	07:33	08:23
	16:37	17:26	18:18	20:12	21:03	21:48	22:00	21:27	20:24	19:15	17:09	16:30
3	08:45	08:16	07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34	08:25
	16:38	17:28	18:19	20:13	21:04	21:49	22:00	21:25	20:22	19:12	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15	21:06	21:50	21:59	21:24	20:20	19:10	17:05	16:29
5	08:45	08:12	07:16	07:05	06:02	05:21	05:24	06:04	06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17	21:08	21:51	21:59	21:22	20:17	19:08	17:04	16:28
6	08:45	08:11	07:14	07:03	06:00	05:21	05:25	06:06	06:56	07:45	07:40	08:29
	16:42	17:33	18:25	20:18	21:09	21:52	21:58	21:20	20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01	05:59	05:20	05:26	06:07	06:58	07:47	07:42	08:30
	16:43	17:35	18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59	05:57	05:20	05:27	06:09	06:59	07:49	07:43	08:31
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	16:46	17:39	18:30	20:24	21:14	21:54	21:57	21:15	20:08	18:59	16:57	16:27
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	16:49	17:43	18:34	20:27	21:17	21:56	21:55	21:11	20:04	18:54	16:54	16:26
12	08:41	08:00	07:01	06:50	05:50	05:18	05:31	06:15	07:06	07:55	07:50	08:35
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13	08:41	07:58	06:58	06:47	05:48	05:18	05:32	06:17	07:07	07:57	07:52	08:36
	16:52	17:46	18:37	20:30	21:20	21:57	21:53	21:07	19:59	18:50	16:51	16:26
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15	08:39	07:54	06:54	06:43	05:45	05:17	05:35	06:20	07:11	08:01	07:56	08:38
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16	08:38	07:52	06:52	06:41	05:44	05:17	05:36	06:22	07:12	08:02	07:57	08:39
	16:56	17:52	18:42	20:35	21:25	21:59	21:50	21:01	19:52	18:43	16:46	16:26
17	08:37	07:50	06:49	06:39	05:42	05:17	05:37	06:23	07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37	21:27	22:00	21:49	20:59	19:50	18:41	16:45	16:27
18	08:37	07:48	06:47	06:36	05:41	05:17	05:38	06:25	07:16	08:06	08:01	08:41
	17:00	17:56	18:46	20:39	21:28	22:00	21:48	20:57	19:47	18:39	16:44	16:27
19	08:36	07:46	06:45	06:34	05:39	05:17	05:40	06:27	07:17	08:08	08:03	08:41
	17:01	17:58	18:48	20:41	21:30	22:00	21:47	20:55	19:45	18:37	16:42	16:27
20	08:34	07:44	06:42	06:32	05:38	05:17	05:41	06:28	07:19	08:09	08:04	08:42
	17:03	17:59	18:49	20:42	21:31	22:01	21:46	20:53	19:43	18:35	16:41	16:27
21	08:33	07:42	06:40	06:30	05:37	05:17	05:42	06:30	07:20	08:11	08:06	08:43
	17:05	18:01	18:51	20:44	21:32	22:01	21:45	20:51	19:40	18:33	16:40	16:28
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31	08:20		07:17		05:25		05:57	06:46		07:29		08:46
	17:22		20:08		21:46		21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** J - H10

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:15	06:10	05:24	05:22	05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01	21:47	22:01	21:29	20:27	19:17	17:11	16:31
2	08:46	08:17	07:23	07:12	06:08	05:24	05:22	06:00	06:50	07:39	07:33	08:23
	16:37	17:26	18:18	20:12	21:03	21:48	22:00	21:27	20:24	19:15	17:09	16:30
3	08:45	08:16	07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34	08:25
	16:39	17:28	18:19	20:13	21:04	21:49	22:00	21:25	20:22	19:12	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15	21:06	21:50	21:59	21:24	20:20	19:10	17:05	16:29
5	08:45	08:12	07:16	07:05	06:02	05:21	05:25	06:04	06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17	21:08	21:51	21:59	21:22	20:18	19:08	17:04	16:28
6	08:45	08:11	07:14	07:03	06:00	05:21	05:25	06:06	06:56	07:45	07:40	08:29
	16:42	17:33	18:25	20:18	21:09	21:52	21:58	21:20	20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01	05:59	05:20	05:26	06:07	06:58	07:47	07:42	08:30
	16:43	17:35	18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00	16:27
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	17:01	17:58	18:48	20:41	21:30	22:00	21:47	20:55	19:45	18:37	16:42	16:27
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	17:08	18:05	18:54	20:47	21:35	22:01	21:42	20:46	19:36	18:29	16:38	16:29
24	08:30	07:36	06:33	06:24	05:33	05:18	05:46	06:35	07:25	08:16	08:11	08:44
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	17:17	18:14	19:03	20:56	21:42	22:01	21:35	20:35	19:24	17:19	16:33	16:32
29	08:23		07:21	06:14	05:27	05:20	05:54	06:43	07:34	07:25	08:19	08:45
	17:19		20:05	20:58	21:43	22:01	21:33	20:33	19:22	17:17	16:32	16:33
30	08:22		07:19	06:12	05:26	05:21	05:55	06:45	07:35	07:27	08:20	08:46
	17:21		20:06	20:59	21:44	22:01	21:32	20:31	19:19	17:15	16:31	16:34
31	08:20		07:17		05:25		05:57	06:46		07:29		08:46
	17:22		20:08		21:46		21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** K - H11

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:15	06:10	05:24	05:22	05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01	21:47	22:01	21:29	20:27	19:17	17:11	16:31
2	08:46	08:17	07:23	07:12	06:08	05:24	05:22	06:00	06:50	07:39	07:33	08:23
	16:37	17:26	18:18	20:12	21:03	21:48	22:00	21:27	20:24	19:15	17:09	16:30
3	08:45	08:16	07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34	08:25
	16:38	17:28	18:19	20:13	21:04	21:49	22:00	21:25	20:22	19:12	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15	21:06	21:50	21:59	21:24	20:20	19:10	17:05	16:29
5	08:45	08:12	07:16	07:05	06:02	05:21	05:25	06:04	06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17	21:08	21:51	21:59	21:22	20:18	19:08	17:04	16:28
6	08:45	08:11	07:14	07:03	06:00	05:21	05:25	06:06	06:56	07:45	07:40	08:29
	16:42	17:33	18:25	20:18	21:09	21:52	21:58	21:20	20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01	05:59	05:20	05:26	06:07	06:58	07:47	07:42	08:30
	16:43	17:35	18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59	05:57	05:20	05:27	06:09	06:59	07:49	07:43	08:31
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	16:49	17:43	18:34	20:27	21:17	21:56	21:55	21:11	20:04	18:54	16:54	16:26
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14	08:40	07:56	06:56	06:45	05:47	05:18	05:33	06:19	07:09	07:59	07:54	08:37
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16	08:38	07:52	06:52	06:41	05:44	05:17	05:36	06:22	07:12	08:02	07:57	08:39
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	17:00	17:56	18:46	20:39	21:28	22:00	21:48	20:57	19:47	18:39	16:44	16:27
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	17:01	17:58	18:48	20:41	21:30	22:00	21:47	20:55	19:45	18:37	16:42	16:27
20	08:34	07:44	06:42	06:32	05:38	05:17	05:41	06:28	07:19	08:09	08:04	08:42
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29	08:23		07:21	06:14	05:27	05:20	05:54	06:43	07:34	07:25	08:19	08:45
	17:19		20:05	20:57	21:43	22:01	21:33	20:33	19:22	17:17	16:32	16:33
30	08:22		07:19	06:12	05:26	05:21	05:55	06:45	07:35	07:27	08:20	08:46
	17:21		20:06	20:59	21:44	22:01	21:32	20:31	19:19	17:15	16:31	16:34
31	08:20		07:17		05:25		05:57	06:46		07:29		08:46
	17:22		20:08		21:46		21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** L - H12

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January			February			March			April	May	June
1	08:46			08:19		15:30 (2)	07:25		16:56 (3)	07:14	06:10	05:24
	16:36			17:24	29	15:59 (2)	18:16	28	17:24 (3)	20:10	21:01	21:47
2	08:46			08:17		15:30 (2)	07:23		16:56 (3)	07:12	06:08	05:24
	16:37			17:26	28	15:58 (2)	18:18	29	17:25 (3)	20:12	21:03	21:48
3	08:45			08:16		15:32 (2)	07:21		16:55 (3)	07:10	06:06	05:23
	16:38			17:28	26	15:58 (2)	18:19	29	17:24 (3)	20:13	21:04	21:49
4	08:45			08:14		15:33 (2)	07:19		16:55 (3)	07:08	06:04	05:22
	16:39			17:30	24	15:57 (2)	18:21	35	17:43 (5)	20:15	21:06	21:50
5	08:45			08:12		15:34 (2)	07:16		16:55 (3)	07:05	06:02	05:21
	16:41			17:31	22	15:56 (2)	18:23	41	17:46 (5)	20:17	21:08	21:51
6	08:45			08:11		15:35 (2)	07:14		16:55 (3)	07:03	06:00	05:21
	16:42			17:33	19	15:54 (2)	18:25	43	17:47 (5)	20:18	21:09	21:52
7	08:44		15:33 (2)	08:09		15:38 (2)	07:12		16:55 (3)	07:01	05:58	05:20
	16:43	7	15:40 (2)	17:35	14	15:52 (2)	18:27	46	17:50 (1)	20:20	21:11	21:53
8	08:44		15:31 (2)	08:07		15:41 (2)	07:10		16:56 (3)	06:59	05:57	05:20
	16:45	11	15:42 (2)	17:37	8	15:49 (2)	18:28	48	17:52 (1)	20:22	21:12	21:54
9	08:43		15:30 (2)	08:05			07:07		16:57 (3)	06:56	05:55	05:19
	16:46	14	15:44 (2)	17:39			18:30	47	17:53 (1)	20:24	21:14	21:55
10	08:43		15:30 (2)	08:04			07:05		16:58 (3)	06:54	05:53	05:19
	16:47	16	15:46 (2)	17:41			18:32	43	17:52 (1)	20:25	21:16	21:55
11	08:42		15:29 (2)	08:02			07:03		17:00 (3)	06:52	05:52	05:18
	16:49	18	15:47 (2)	17:43			18:34	40	17:52 (1)	20:27	21:17	21:56
12	08:42		15:28 (2)	08:00			07:01		17:03 (3)	06:50	05:50	05:18
	16:50	20	15:48 (2)	17:45			18:35	33	17:52 (1)	20:29	21:19	21:57
13	08:41		15:28 (2)	07:58			06:58		17:30 (5)	06:47	05:48	05:18
	16:52	21	15:49 (2)	17:46			18:37	20	17:50 (1)	20:30	21:20	21:57
14	08:40		15:27 (2)	07:56			06:56		17:31 (5)	06:45	05:47	05:17
	16:53	24	15:51 (2)	17:48			18:39	18	17:49 (1)	20:32	21:22	21:58
15	08:39		15:27 (2)	07:54			06:54		17:33 (5)	06:43	05:45	05:17
	16:55	25	15:52 (2)	17:50			18:41	14	17:47 (1)	20:34	21:24	21:59
16	08:38		15:27 (2)	07:52			06:51			06:41	05:44	05:17
	16:56	26	15:53 (2)	17:52			18:42			20:35	21:25	21:59
17	08:37		15:26 (2)	07:50			06:49			06:39	05:42	05:17
	16:58	28	15:54 (2)	17:54			18:44			20:37	21:27	22:00
18	08:37		15:26 (2)	07:48			06:47			06:36	05:41	05:17
	16:59	29	15:55 (2)	17:56			18:46			20:39	21:28	22:00
19	08:36		15:26 (2)	07:46			06:45			06:34	05:39	05:17
	17:01	30	15:56 (2)	17:58			18:48			20:41	21:30	22:00
20	08:34		15:27 (2)	07:44			06:42			06:32	05:38	05:17
	17:03	30	15:57 (2)	17:59			18:49			20:42	21:31	22:01
21	08:33		15:26 (2)	07:42			06:40			06:30	05:36	05:17
	17:04	30	15:56 (2)	18:01			18:51			20:44	21:32	22:01
22	08:32		15:26 (2)	07:40		17:08 (3)	06:38			06:28	05:35	05:17
	17:06	31	15:57 (2)	18:03	5	17:13 (3)	18:53			20:46	21:34	22:01
23	08:31		15:26 (2)	07:38		17:04 (3)	06:35			06:26	05:34	05:18
	17:08	32	15:58 (2)	18:05	14	17:18 (3)	18:54			20:47	21:35	22:01
24	08:30		15:26 (2)	07:36		17:02 (3)	06:33			06:24	05:33	05:18
	17:10	32	15:58 (2)	18:07	18	17:20 (3)	18:56			20:49	21:37	22:01
25	08:29		15:27 (2)	07:34		17:00 (3)	06:31			06:22	05:31	05:18
	17:11	32	15:59 (2)	18:09	22	17:22 (3)	18:58			20:51	21:38	22:01
26	08:27		15:26 (2)	07:32		16:58 (3)	06:28			06:20	05:30	05:19
	17:13	33	15:59 (2)	18:10	24	17:22 (3)	19:00			20:52	21:39	22:01
27	08:26		15:27 (2)	07:30		16:57 (3)	06:26			06:18	05:29	05:19
	17:15	32	15:59 (2)	18:12	26	17:23 (3)	19:01			20:54	21:41	22:01
28	08:25		15:27 (2)	07:27		16:57 (3)	06:24			06:16	05:28	05:20
	17:17	32	15:59 (2)	18:14	27	17:24 (3)	19:03			20:56	21:42	22:01
29	08:23		15:28 (2)				07:21			06:14	05:27	05:20
	17:19	32	16:00 (2)				20:05			20:57	21:43	22:01
30	08:22		15:28 (2)				07:19			06:12	05:26	05:21
	17:20	31	15:59 (2)				20:06			20:59	21:44	22:01
31	08:20		15:29 (2)				07:17				05:25	
	17:22	31	16:00 (2)				20:08				21:46	
Potential sun hours	259			278			367			416	485	499
Total, worst case		647			306			514				
Sun reduction		0.16			0.21			0.24				
Oper. time red.		1.00			1.00			1.00				
Wind dir. red.		0.59			0.61			0.64				
Total reduction		0.09			0.12			0.16				
Total, real		59			38			80				

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** L - H12

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	July	August	September	October	November	December
1	05:21	05:58	06:48	07:37	07:31	08:22
	22:01	21:29	20:27	19:17 29	17:44 (3) 18:31 (1)	17:11 16:30 18 15:11 (2) 15:29 (2)
2	05:22	06:00	06:49	07:39	07:33	08:23
	22:00	21:27	20:24	19:15 37	17:40 (3) 18:31 (1)	17:09 16:30 16 15:12 (2) 15:28 (2)
3	05:23	06:01	06:51	07:40	07:34	08:25
	22:00	21:25	20:22	19:12 42	17:37 (3) 18:30 (1)	15:10 (2) 17:07 9 15:19 (2) 16:29 14 15:14 (2) 15:28 (2)
4	05:24	06:03	06:53	07:42	07:36	08:26
	22:00	21:24	20:20	19:10 45	17:35 (3) 18:30 (1)	15:07 (2) 17:05 15 15:22 (2) 16:29 11 15:15 (2) 15:26 (2)
5	05:24	06:04	06:54	07:44	07:38	08:27
	21:59	21:22	20:17	19:08 46	17:34 (3) 18:29 (1)	15:05 (2) 17:04 19 15:24 (2) 16:28 7 15:18 (2) 15:25 (2)
6	05:25	06:06	06:56	07:45	07:40	15:03 (2) 08:29
	21:58	21:20	20:15	19:06 46	17:32 (3) 18:27 (1)	17:02 23 15:26 (2) 16:28
7	05:26	06:07	06:58	07:47	07:42	15:02 (2) 08:30
	21:58	21:18	20:13	19:03 45	17:31 (3) 18:24 (1)	17:00 25 15:27 (2) 16:27
8	05:27	06:09	06:59	07:49	07:43	15:01 (2) 08:31
	21:57	21:16	20:11	19:01 41	17:31 (3) 18:22 (5)	16:58 27 15:28 (2) 16:27
9	05:28	06:10	07:01	07:50	07:45	15:01 (2) 08:32
	21:57	21:15	20:08	18:59 38	17:30 (3) 18:20 (5)	16:57 28 15:29 (2) 16:27
10	05:29	06:12	07:02	07:52	07:47	15:00 (2) 08:33
	21:56	21:13	20:06	18:56 29	17:29 (3) 17:58 (3)	16:55 30 15:30 (2) 16:26
11	05:30	06:14	07:04	07:54	07:49	15:00 (2) 08:34
	21:55	21:11	20:04	18:54 29	17:29 (3) 17:58 (3)	16:54 30 15:30 (2) 16:26
12	05:31	06:15	07:06	07:55	07:50	15:00 (2) 08:35
	21:54	21:09	20:01	18:52 29	17:29 (3) 17:58 (3)	16:52 31 15:31 (2) 16:26
13	05:32	06:17	07:07	07:57	07:52	15:00 (2) 08:36
	21:53	21:07	19:59	18:50 27	17:30 (3) 17:57 (3)	16:51 31 15:31 (2) 16:26
14	05:33	06:19	07:09	07:59	07:54	15:00 (2) 08:37
	21:52	21:05	19:57	18:48 27	17:30 (3) 17:57 (3)	16:49 32 15:32 (2) 16:26
15	05:35	06:20	07:11	08:01	07:56	15:00 (2) 08:38
	21:51	21:03	19:54	18:45 25	17:30 (3) 17:55 (3)	16:48 32 15:32 (2) 16:26
16	05:36	06:22	07:12	08:02	07:57	15:00 (2) 08:39
	21:50	21:01	19:52	18:43 23	17:31 (3) 17:54 (3)	16:46 33 15:33 (2) 16:26
17	05:37	06:23	07:14	08:04	07:59	14:59 (2) 08:40
	21:49	20:59	19:50	18:41 20	17:32 (3) 17:52 (3)	16:45 33 15:32 (2) 16:26
18	05:38	06:25	07:15	08:06	08:01	15:00 (2) 08:41
	21:48	20:57	19:47	18:39 17	17:34 (3) 17:51 (3)	16:44 32 15:32 (2) 16:27
19	05:39	06:27	07:17	08:08	08:03	15:00 (2) 08:41
	21:47	20:55	19:45	18:37 12	17:36 (3) 17:48 (3)	16:42 32 15:32 (2) 16:27
20	05:41	06:28	07:19	08:09	08:04	15:01 (2) 08:42
	21:46	20:53	19:43	18:35	16:41 31	15:32 (2) 16:27
21	05:42	06:30	07:20	08:11	08:06	15:02 (2) 08:43
	21:45	20:51	19:40	18:33	16:40 30	15:32 (2) 16:28
22	05:43	06:31	07:22	08:13	08:08	15:03 (2) 08:43
	21:43	20:48	19:38	18:31	16:39 30	15:33 (2) 16:28
23	05:45	06:33	07:24	08:15	08:09	15:03 (2) 08:44
	21:42	20:46	19:36	18:28	16:38 30	15:33 (2) 16:29
24	05:46	06:35	07:25	08:16	08:11	15:03 (2) 08:44
	21:41	20:44	19:33	18:26	16:37 29	15:32 (2) 16:29
25	05:48	06:36	07:27	07:18	08:13	15:04 (2) 08:45
	21:39	20:42	19:31	17:24	16:35 28	15:32 (2) 16:30
26	05:49	06:38	07:29	07:20	08:14	15:06 (2) 08:45
	21:38	20:40	19:29	17:22	16:35 26	15:32 (2) 16:31
27	05:50	06:40	07:30	07:22	08:16	15:06 (2) 08:45
	21:36	20:38	19:26	17:20	16:34 25	15:31 (2) 16:31
28	05:52	06:41	07:32 18:15 (5)	07:24	08:17	15:07 (2) 08:45
	21:35	20:35	19:24 8 18:23 (5)	17:18	16:33 24	15:31 (2) 16:32
29	05:53	06:43	07:34 18:12 (5)	07:25	08:19	15:09 (2) 08:45
	21:33	20:33	19:22 17 18:29 (1)	17:16	16:32 22	15:31 (2) 16:33
30	05:55	06:45	07:35 18:10 (5)	07:27	08:20	15:09 (2) 08:46
	21:32	20:31	19:19 20 18:30 (1)	17:15	16:31 21	15:30 (2) 16:34
31	05:56	06:46		07:29		08:46
	21:30	20:29		17:13		16:35
Potential sun hours	502	454	381	331	266	244
Total, worst case			45	607	758	66
Sun reduction			0.28	0.24	0.18	0.13
Oper. time red.			1.00	1.00	1.00	1.00
Wind dir. red.			0.64	0.64	0.59	0.59
Total reduction			0.18	0.15	0.11	0.08
Total, real			8	92	81	5

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** M - H13

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:15	06:10	05:24	05:22	05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01	21:47	22:01	21:29	20:27	19:17	17:11	16:31
2	08:46	08:17	07:23	07:12	06:08	05:24	05:22	06:00	06:50	07:39	07:33	08:23
	16:37	17:26	18:18	20:12	21:03	21:48	22:00	21:27	20:24	19:15	17:09	16:30
3	08:45	08:16	07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34	08:25
	16:38	17:28	18:19	20:13	21:04	21:49	22:00	21:25	20:22	19:12	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15	21:06	21:50	21:59	21:24	20:20	19:10	17:05	16:29
5	08:45	08:12	07:16	07:05	06:02	05:21	05:25	06:04	06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17	21:08	21:51	21:59	21:22	20:18	19:08	17:04	16:28
6	08:45	08:11	07:14	07:03	06:00	05:21	05:25	06:06	06:56	07:45	07:40	08:29
	16:42	17:33	18:25	20:18	21:09	21:52	21:58	21:20	20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01	05:59	05:20	05:26	06:07	06:58	07:47	07:42	08:30
	16:43	17:35	18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59	05:57	05:20	05:27	06:09	06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22	21:12	21:54	21:57	21:16	20:11	19:01	16:59	16:27
9	08:43	08:05	07:07	06:56	05:55	05:19	05:28	06:11	07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:24	21:14	21:55	21:57	21:15	20:08	18:59	16:57	16:27
10	08:43	08:04	07:05	06:54	05:53	05:19	05:29	06:12	07:03	07:52	07:47	08:33
	16:47	17:41	18:32	20:25	21:16	21:55	21:56	21:13	20:06	18:57	16:55	16:27
11	08:42	08:02	07:03	06:52	05:52	05:18	05:30	06:14	07:04	07:54	07:49	08:34
	16:49	17:43	18:34	20:27	21:17	21:56	21:55	21:11	20:04	18:54	16:54	16:26
12	08:41	08:00	07:01	06:50	05:50	05:18	05:31	06:15	07:06	07:55	07:50	08:35
	16:50	17:45	18:35	20:29	21:19	21:57	21:54	21:09	20:01	18:52	16:52	16:26
13	08:41	07:58	06:58	06:47	05:48	05:18	05:32	06:17	07:07	07:57	07:52	08:36
	16:52	17:47	18:37	20:30	21:20	21:57	21:53	21:07	19:59	18:50	16:51	16:26
14	08:40	07:56	06:56	06:45	05:47	05:18	05:33	06:19	07:09	07:59	07:54	08:37
	16:53	17:48	18:39	20:32	21:22	21:58	21:52	21:05	19:57	18:48	16:49	16:26
15	08:39	07:54	06:54	06:43	05:45	05:17	05:35	06:20	07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34	21:24	21:59	21:51	21:03	19:54	18:46	16:48	16:26
16	08:38	07:52	06:52	06:41	05:44	05:17	05:36	06:22	07:12	08:02	07:57	08:39
	16:56	17:52	18:42	20:35	21:25	21:59	21:50	21:01	19:52	18:43	16:46	16:26
17	08:37	07:50	06:49	06:39	05:42	05:17	05:37	06:23	07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37	21:27	22:00	21:49	20:59	19:50	18:41	16:45	16:27
18	08:37	07:48	06:47	06:36	05:41	05:17	05:38	06:25	07:16	08:06	08:01	08:41
	17:00	17:56	18:46	20:39	21:28	22:00	21:48	20:57	19:47	18:39	16:44	16:27
19	08:36	07:46	06:45	06:34	05:39	05:17	05:40	06:27	07:17	08:08	08:03	08:41
	17:01	17:58	18:48	20:41	21:30	22:00	21:47	20:55	19:45	18:37	16:42	16:27
20	08:34	07:44	06:42	06:32	05:38	05:17	05:41	06:28	07:19	08:09	08:04	08:42
	17:03	17:59	18:49	20:42	21:31	22:01	21:46	20:53	19:43	18:35	16:41	16:27
21	08:33	07:42	06:40	06:30	05:37	05:17	05:42	06:30	07:20	08:11	08:06	08:43
	17:05	18:01	18:51	20:44	21:32	22:01	21:45	20:51	19:40	18:33	16:40	16:28
22	08:32	07:40	06:38	06:28	05:35	05:18	05:44	06:32	07:22	08:13	08:08	08:43
	17:06	18:03	18:53	20:46	21:34	22:01	21:43	20:49	19:38	18:31	16:39	16:28
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	17:10	18:07	18:56	20:49	21:37	22:01	21:41	20:44	19:33	18:27	16:37	16:29
25	08:29	07:34	06:31	06:22	05:32	05:18	05:48	06:36	07:27	07:18	08:13	08:45
	17:12	18:09	18:58	20:51	21:38	22:01	21:39	20:42	19:31	17:24	16:36	16:30
26	08:27	07:32	06:28	06:20	05:30	05:19	05:49	06:38	07:29	07:20	08:14	08:45
	17:13	18:10	19:00	20:52	21:39	22:01	21:38	20:40	19:29	17:22	16:35	16:31
27	08:26	07:30	06:26	06:18	05:29	05:19	05:51	06:40	07:30	07:22	08:16	08:45
	17:15	18:12	19:01	20:54	21:41	22:01	21:36	20:38	19:26	17:20	16:34	16:32
28	08:25	07:27	06:24	06:16	05:28	05:20	05:52	06:41	07:32	07:24	08:17	08:45
	17:17	18:14	19:03	20:56	21:42	22:01	21:35	20:35	19:24	17:19	16:33	16:32
29	08:23		07:21	06:14	05:27	05:20	05:54	06:43	07:34	07:25	08:19	08:45
	17:19		20:05	20:58	21:43	22:01	21:33	20:33	19:22	17:17	16:32	16:33
30	08:22		07:19	06:12	05:26	05:21	05:55	06:45	07:35	07:27	08:20	08:46
	17:21		20:06	20:59	21:44	22:01	21:32	20:31	19:19	17:15	16:31	16:34
31	08:20		07:17		05:25		05:57	06:46		07:29		08:46
	17:22		20:08		21:46		21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** N - H14

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:15	06:10	05:24	05:22	05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01	21:47	22:01	21:29	20:27	19:17	17:11	16:31
2	08:46	08:17	07:23	07:12	06:08	05:24	05:22	06:00	06:50	07:39	07:33	08:23
	16:37	17:26	18:18	20:12	21:03	21:48	22:00	21:27	20:24	19:15	17:09	16:30
3	08:45	08:16	07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34	08:25
	16:38	17:28	18:19	20:13	21:04	21:49	22:00	21:25	20:22	19:12	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15	21:06	21:50	21:59	21:24	20:20	19:10	17:05	16:29
5	08:45	08:12	07:16	07:05	06:02	05:21	05:25	06:04	06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17	21:08	21:51	21:59	21:22	20:18	19:08	17:04	16:28
6	08:45	08:11	07:14	07:03	06:00	05:21	05:25	06:06	06:56	07:45	07:40	08:29
	16:42	17:33	18:25	20:18	21:09	21:52	21:58	21:20	20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01	05:59	05:20	05:26	06:07	06:58	07:47	07:42	08:30
	16:43	17:35	18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59	05:57	05:20	05:27	06:09	06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22	21:12	21:54	21:57	21:16	20:11	19:01	16:59	16:27
9	08:43	08:05	07:07	06:56	05:55	05:19	05:28	06:11	07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:24	21:14	21:55	21:57	21:15	20:08	18:59	16:57	16:27
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	16:47	17:41	18:32	20:25	21:16	21:55	21:56	21:13	20:06	18:57	16:55	16:27
11	08:42	08:02	07:03	06:52	05:52	05:18	05:30	06:14	07:04	07:54	07:49	08:34
	16:49	17:43	18:34	20:27	21:17	21:56	21:55	21:11	20:04	18:54	16:54	16:26
12	08:41	08:00	07:01	06:50	05:50	05:18	05:31	06:15	07:06	07:55	07:50	08:35
	16:50	17:45	18:35	20:29	21:19	21:57	21:54	21:09	20:01	18:52	16:52	16:26
13	08:41	07:58	06:58	06:47	05:48	05:18	05:32	06:17	07:07	07:57	07:52	08:36
	16:52	17:47	18:37	20:30	21:20	21:57	21:53	21:07	19:59	18:50	16:51	16:26
14	08:40	07:56	06:56	06:45	05:47	05:18	05:33	06:19	07:09	07:59	07:54	08:37
	16:53	17:48	18:39	20:32	21:22	21:58	21:52	21:05	19:57	18:48	16:49	16:26
15	08:39	07:54	06:54	06:43	05:45	05:17	05:35	06:20	07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34	21:24	21:59	21:51	21:03	19:54	18:46	16:48	16:26
16	08:38	07:52	06:52	06:41	05:44	05:17	05:36	06:22	07:12	08:02	07:57	08:39
	16:56	17:52	18:42	20:35	21:25	21:59	21:50	21:01	19:52	18:43	16:46	16:26
17	08:37	07:50	06:49	06:39	05:42	05:17	05:37	06:23	07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37	21:27	22:00	21:49	20:59	19:50	18:41	16:45	16:27
18	08:37	07:48	06:47	06:36	05:41	05:17	05:38	06:25	07:16	08:06	08:01	08:41
	17:00	17:56	18:46	20:39	21:28	22:00	21:48	20:57	19:47	18:39	16:44	16:27
19	08:36	07:46	06:45	06:34	05:39	05:17	05:40	06:27	07:17	08:08	08:03	08:41
	17:01	17:58	18:48	20:41	21:30	22:00	21:47	20:55	19:45	18:37	16:42	16:27
20	08:34	07:44	06:42	06:32	05:38	05:17	05:41	06:28	07:19	08:09	08:04	08:42
	17:03	17:59	18:49	20:42	21:31	22:01	21:46	20:53	19:43	18:35	16:41	16:27
21	08:33	07:42	06:40	06:30	05:37	05:17	05:42	06:30	07:20	08:11	08:06	08:43
	17:05	18:01	18:51	20:44	21:32	22:01	21:45	20:51	19:40	18:33	16:40	16:28
22	08:32	07:40	06:38	06:28	05:35	05:18	05:44	06:32	07:22	08:13	08:08	08:43
	17:06	18:03	18:53	20:46	21:34	22:01	21:43	20:48	19:38	18:31	16:39	16:28
23	08:31	07:38	06:35	06:26	05:34	05:18	05:45	06:33	07:24	08:15	08:09	08:44
	17:08	18:05	18:54	20:47	21:35	22:01	21:42	20:46	19:36	18:29	16:38	16:29
24	08:30	07:36	06:33	06:24	05:33	05:18	05:46	06:35	07:25	08:16	08:11	08:44
	17:10	18:07	18:56	20:49	21:37	22:01	21:41	20:44	19:33	18:27	16:37	16:29
25	08:29	07:34	06:31	06:22	05:32	05:18	05:48	06:36	07:27	07:18	08:13	08:45
	17:12	18:09	18:58	20:51	21:38	22:01	21:39	20:42	19:31	17:24	16:36	16:30
26	08:27	07:32	06:28	06:20	05:30	05:19	05:49	06:38	07:29	07:20	08:14	08:45
	17:13	18:10	19:00	20:52	21:39	22:01	21:38	20:40	19:29	17:22	16:35	16:31
27	08:26	07:30	06:26	06:18	05:29	05:19	05:51	06:40	07:30	07:22	08:16	08:45
	17:15	18:12	19:01	20:54	21:41	22:01	21:36	20:38	19:26	17:20	16:34	16:32
28	08:25	07:27	06:24	06:16	05:28	05:20	05:52	06:41	07:32	07:24	08:17	08:45
	17:17	18:14	19:03	20:56	21:42	22:01	21:35	20:35	19:24	17:19	16:33	16:32
29	08:23		07:21	06:14	05:27	05:20	05:54	06:43	07:34	07:25	08:19	08:45
	17:19		20:05	20:57	21:43	22:01	21:33	20:33	19:22	17:17	16:32	16:33
30	08:22		07:19	06:12	05:26	05:21	05:55	06:45	07:35	07:27	08:20	08:46
	17:21		20:06	20:59	21:44	22:01	21:32	20:31	19:19	17:15	16:31	16:34
31	08:20		07:17		05:25		05:57	06:46		07:29		08:46
	17:22		20:08		21:46		21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** O - H15

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May		June		July		August	September	October	November	December
1	08:46	08:19	07:25	07:15	06:10		05:25		06:07 (2)	05:22		05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01		21:47	15	06:22 (2)	22:01		21:29	20:27	19:17	17:11	16:31
2	08:46	08:17	07:23	07:12	06:08		05:24		06:08 (2)	05:22	06:19 (2)	06:00	06:50	07:39	07:33	08:23
	16:37	17:26	18:18	20:12	21:03		21:48	14	06:22 (2)	22:00	3 06:22 (2)	21:27	20:24	19:15	17:09	16:30
3	08:45	08:16	07:21	07:10	06:06		05:23		06:08 (2)	05:23	06:19 (2)	06:01	06:51	07:40	07:34	08:25
	16:39	17:28	18:20	20:13	21:04		21:49	14	06:22 (2)	22:00	5 06:24 (2)	21:25	20:22	19:13	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04		05:22		06:08 (2)	05:24	06:17 (2)	06:03	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15	21:06		21:50	13	06:21 (2)	22:00	7 06:24 (2)	21:24	20:20	19:10	17:06	16:29
5	08:45	08:12	07:17	07:05	06:02		05:22		06:10 (2)	05:25	06:17 (2)	06:04	06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17	21:08		21:51	11	06:21 (2)	21:59	8 06:25 (2)	21:22	20:18	19:08	17:04	16:28
6	08:45	08:11	07:14	07:03	06:00		05:21		06:10 (2)	05:25	06:16 (2)	06:06	06:56	07:45	07:40	08:29
	16:42	17:34	18:25	20:19	21:09		21:52	10	06:20 (2)	21:59	10 06:26 (2)	21:20	20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01	05:59		05:20		06:11 (2)	05:26	06:16 (2)	06:08	06:58	07:47	07:42	08:30
	16:43	17:35	18:27	20:20	21:11		21:53	9	06:20 (2)	21:58	11 06:27 (2)	21:18	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59	05:57		05:20		06:11 (2)	05:27	06:16 (2)	06:09	06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22	21:13		21:54	8	06:19 (2)	21:57	12 06:28 (2)	21:17	20:11	19:01	16:59	16:27
9	08:43	08:05	07:08	06:56	05:55		05:19		06:13 (2)	05:28	06:16 (2)	06:11	07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:24	21:14		21:55	6	06:19 (2)	21:57	13 06:29 (2)	21:15	20:08	18:59	16:57	16:27
10	08:43	08:04	07:05	06:54	05:53		05:19		06:15 (2)	05:29	06:16 (2)	06:12	07:03	07:52	07:47	08:33
	16:47	17:41	18:32	20:25	21:16		21:55	3	06:18 (2)	21:56	13 06:29 (2)	21:13	20:06	18:57	16:55	16:27
11	08:42	08:02	07:03	06:52	05:52		05:18			05:30	06:15 (2)	06:14	07:04	07:54	07:49	08:35
	16:49	17:43	18:34	20:27	21:17		21:56			21:55	15 06:30 (2)	21:11	20:04	18:54	16:54	16:26
12	08:42	08:00	07:01	06:50	05:50		05:18			05:31	06:15 (2)	06:15	07:06	07:56	07:51	08:36
	16:50	17:45	18:36	20:29	21:19		21:57			21:54	15 06:30 (2)	21:09	20:01	18:52	16:52	16:26
13	08:41	07:58	06:58	06:47	05:48		05:18			05:32	06:15 (2)	06:17	07:07	07:57	07:52	08:37
	16:52	17:47	18:37	20:30	21:21		21:57			21:53	16 06:31 (2)	21:07	19:59	18:50	16:51	16:26
14	08:40	07:56	06:56	06:45	05:47		05:18			05:34	06:15 (2)	06:19	07:09	07:59	07:54	08:37
	16:53	17:48	18:39	20:32	21:22		21:58			21:53	16 06:31 (2)	21:05	19:57	18:48	16:49	16:26
15	08:39	07:54	06:54	06:43	05:45		05:17			05:35	06:15 (2)	06:20	07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34	21:24		21:59			21:52	16 06:31 (2)	21:03	19:54	18:46	16:48	16:26
16	08:38	07:52	06:52	06:41	05:44		05:17			05:36	06:15 (2)	06:22	07:12	08:02	07:58	08:39
	16:56	17:52	18:42	20:36	21:25		21:59			21:51	16 06:31 (2)	21:01	19:52	18:43	16:46	16:26
17	08:38	07:50	06:49	06:39	05:42	06:10 (2)	05:17			05:37	06:14 (2)	06:24	07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37	21:27	7 06:17 (2)	22:00			21:49	17 06:31 (2)	20:59	19:50	18:41	16:45	16:27
18	08:37	07:48	06:47	06:37	05:41	06:08 (2)	05:17			05:38	06:14 (2)	06:25	07:16	08:06	08:01	08:41
	17:00	17:56	18:46	20:39	21:28	11 06:19 (2)	22:00			21:48	17 06:31 (2)	20:57	19:47	18:39	16:44	16:27
19	08:36	07:46	06:45	06:34	05:39	06:07 (2)	05:17			05:40	06:15 (2)	06:27	07:17	08:08	08:03	08:42
	17:01	17:58	18:48	20:41	21:30	12 06:19 (2)	22:00			21:47	17 06:32 (2)	20:55	19:45	18:37	16:42	16:27
20	08:35	07:44	06:42	06:32	05:38	06:06 (2)	05:17			05:41	06:15 (2)	06:28	07:19	08:09	08:04	08:42
	17:03	18:00	18:49	20:42	21:31	14 06:20 (2)	22:01			21:46	17 06:32 (2)	20:53	19:43	18:35	16:41	16:28
21	08:33	07:42	06:40	06:30	05:37	06:06 (2)	05:17			05:42	06:15 (2)	06:30	07:20	08:11	08:06	08:43
	17:05	18:01	18:51	20:44	21:33	15 06:21 (2)	22:01			21:45	16 06:31 (2)	20:51	19:40	18:33	16:40	16:28
22	08:32	07:40	06:38	06:28	05:35	06:06 (2)	05:18			05:44	06:15 (2)	06:32	07:22	08:13	08:08	08:43
	17:06	18:03	18:53	20:46	21:34	16 06:22 (2)	22:01			21:44	16 06:31 (2)	20:49	19:38	18:31	16:39	16:28
23	08:31	07:38	06:35	06:26	05:34	06:05 (2)	05:18			05:45	06:17 (2)	06:33	07:24	08:15	08:09	08:44
	17:08	18:05	18:55	20:47	21:35	16 06:21 (2)	22:01			21:42	14 06:31 (2)	20:46	19:36	18:29	16:38	16:29
24	08:30	07:36	06:33	06:24	05:33	06:05 (2)	05:18			05:46	06:17 (2)	06:35	07:25	08:17	08:11	08:44
	17:10	18:07	18:56	20:49	21:37	17 06:22 (2)	22:01			21:41	13 06:30 (2)	20:44	19:33	18:27	16:37	16:30
25	08:29	07:34	06:31	06:22	05:32	06:05 (2)	05:19			05:48	06:18 (2)	06:37	07:27	07:18	08:13	08:45
	17:12	18:09	18:58	20:51	21:38	17 06:22 (2)	22:01			21:39	11 06:29 (2)	20:42	19:31	17:25	16:36	16:30
26	08:27	07:32	06:29	06:20	05:31	06:05 (2)	05:19			05:49	06:19 (2)	06:38	07:29	07:20	08:14	08:45
	17:13	18:11	19:00	20:53	21:39	17 06:22 (2)	22:01			21:38	10 06:29 (2)	20:40	19:29	17:23	16:35	16:31
27	08:26	07:30	06:26	06:18	05:29	06:05 (2)	05:19			05:51	06:21 (2)	06:40	07:30	07:22	08:16	08:45
	17:15	18:12	19:01	20:54	21:41	17 06:22 (2)	22:01			21:37	6 06:27 (2)	20:38	19:26	17:21	16:34	16:32
28	08:25	07:27	06:24	06:16	05:28	06:05 (2)	05:20			05:52		06:41	07:32	07:24	08:17	08:45
	17:17	18:14	19:03	20:56	21:42	17 06:22 (2)	22:01			21:35		20:36	19:24	17:19	16:33	16:32
29	08:23		07:22	06:14	05:27	06:06 (2)	05:20			05:54		06:43	07:34	07:25	08:19	08:46
	17:19		20:05	20:58	21:43	17 06:23 (2)	22:01			21:34		20:33	19:22	17:17	16:32	16:33
30	08:22		07:19	06:12	05:26	06:06 (2)	05:21			05:55		06:45	07:35	07:27	08:20	08:46
	17:21		20:07	20:59	21:44	16 06:22 (2)	22:01			21:32		20:31	19:19	17:15	16:31	16:34
31	08:20		07:17		05:25	06:07 (2)				05:57		06:46		07:29		08:46
	17:22		20:08		21:46	15 06:22 (2)				21:30		20:29		17:13		16:35
Potential sun hours	259	278	367	416	485		499			502		454	381	331	266	244
Total, worst case						224		103		330						
Sun reduction						0.37		0.30		0.27						
Oper. time red.						1.00		1.00		1.00						
Wind dir. red.						0.63		0.63		0.63						
Total reduction						0.23		0.19		0.17						
Total, real						53		20		56						

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** P - H16

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:15	06:10	05:24	05:22	05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01	21:47	22:01	21:29	20:27	19:17	17:11	16:31
2	08:45	08:17	07:23	07:12	06:08	05:24	05:22	06:00	06:50	07:39	07:33	08:23
	16:37	17:26	18:18	20:12	21:03	21:48	22:00	21:27	20:24	19:15	17:09	16:30
3	08:45	08:16	07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34	08:25
	16:38	17:28	18:19	20:13	21:04	21:49	22:00	21:25	20:22	19:12	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15	21:06	21:50	21:59	21:24	20:20	19:10	17:05	16:29
5	08:45	08:12	07:16	07:05	06:02	05:21	05:25	06:04	06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17	21:07	21:51	21:59	21:22	20:17	19:08	17:04	16:28
6	08:45	08:11	07:14	07:03	06:00	05:21	05:25	06:06	06:56	07:45	07:40	08:29
	16:42	17:33	18:25	20:18	21:09	21:52	21:58	21:20	20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01	05:59	05:20	05:26	06:07	06:58	07:47	07:42	08:30
	16:43	17:35	18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59	05:57	05:20	05:27	06:09	06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22	21:12	21:54	21:57	21:16	20:11	19:01	16:59	16:27
9	08:43	08:05	07:07	06:56	05:55	05:19	05:28	06:11	07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:24	21:14	21:54	21:57	21:15	20:08	18:59	16:57	16:27
10	08:43	08:04	07:05	06:54	05:53	05:19	05:29	06:12	07:03	07:52	07:47	08:33
	16:47	17:41	18:32	20:25	21:16	21:55	21:56	21:13	20:06	18:57	16:55	16:27
11	08:42	08:02	07:03	06:52	05:52	05:18	05:30	06:14	07:04	07:54	07:49	08:34
	16:49	17:43	18:34	20:27	21:17	21:56	21:55	21:11	20:04	18:54	16:54	16:26
12	08:41	08:00	07:01	06:50	05:50	05:18	05:31	06:15	07:06	07:55	07:50	08:35
	16:50	17:45	18:35	20:29	21:19	21:57	21:54	21:09	20:01	18:52	16:52	16:26
13	08:41	07:58	06:58	06:47	05:48	05:18	05:32	06:17	07:07	07:57	07:52	08:36
	16:52	17:46	18:37	20:30	21:20	21:57	21:53	21:07	19:59	18:50	16:51	16:26
14	08:40	07:56	06:56	06:45	05:47	05:18	05:33	06:19	07:09	07:59	07:54	08:37
	16:53	17:48	18:39	20:32	21:22	21:58	21:52	21:05	19:57	18:48	16:49	16:26
15	08:39	07:54	06:54	06:43	05:45	05:17	05:35	06:20	07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34	21:24	21:59	21:51	21:03	19:54	18:45	16:48	16:26
16	08:38	07:52	06:52	06:41	05:44	05:17	05:36	06:22	07:12	08:02	07:57	08:39
	16:56	17:52	18:42	20:35	21:25	21:59	21:50	21:01	19:52	18:43	16:46	16:26
17	08:37	07:50	06:49	06:39	05:42	05:17	05:37	06:23	07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37	21:27	22:00	21:49	20:59	19:50	18:41	16:45	16:27
18	08:37	07:48	06:47	06:36	05:41	05:17	05:38	06:25	07:15	08:06	08:01	08:41
	17:00	17:56	18:46	20:39	21:28	22:00	21:48	20:57	19:47	18:39	16:44	16:27
19	08:36	07:46	06:45	06:34	05:39	05:17	05:40	06:27	07:17	08:08	08:03	08:41
	17:01	17:58	18:48	20:41	21:30	22:00	21:47	20:55	19:45	18:37	16:42	16:27
20	08:34	07:44	06:42	06:32	05:38	05:17	05:41	06:28	07:19	08:09	08:04	08:42
	17:03	17:59	18:49	20:42	21:31	22:01	21:46	20:53	19:43	18:35	16:41	16:27
21	08:33	07:42	06:40	06:30	05:37	05:17	05:42	06:30	07:20	08:11	08:06	08:43
	17:05	18:01	18:51	20:44	21:32	22:01	21:45	20:51	19:40	18:33	16:40	16:28
22	08:32	07:40	06:38	06:28	05:35	05:18	05:44	06:32	07:22	08:13	08:08	08:43
	17:06	18:03	18:53	20:46	21:34	22:01	21:43	20:48	19:38	18:31	16:39	16:28
23	08:31	07:38	06:35	06:26	05:34	05:18	05:45	06:33	07:24	08:15	08:09	08:44
	17:08	18:05	18:54	20:47	21:35	22:01	21:42	20:46	19:36	18:29	16:38	16:29
24	08:30	07:36	06:33	06:24	05:33	05:18	05:46	06:35	07:25	08:16	08:11	08:44
	17:10	18:07	18:56	20:49	21:37	22:01	21:41	20:44	19:33	18:26	16:37	16:29
25	08:29	07:34	06:31	06:22	05:32	05:18	05:48	06:36	07:27	07:18	08:13	08:45
	17:12	18:09	18:58	20:51	21:38	22:01	21:39	20:42	19:31	17:24	16:36	16:30
26	08:27	07:32	06:28	06:20	05:30	05:19	05:49	06:38	07:29	07:20	08:14	08:45
	17:13	18:10	19:00	20:52	21:39	22:01	21:38	20:40	19:29	17:22	16:35	16:31
27	08:26	07:30	06:26	06:18	05:29	05:19	05:51	06:40	07:30	07:22	08:16	08:45
	17:15	18:12	19:01	20:54	21:41	22:01	21:36	20:38	19:26	17:20	16:34	16:32
28	08:25	07:27	06:24	06:16	05:28	05:20	05:52	06:41	07:32	07:24	08:17	08:45
	17:17	18:14	19:03	20:56	21:42	22:01	21:35	20:35	19:24	17:19	16:33	16:32
29	08:23		07:21	06:14	05:27	05:20	05:54	06:43	07:34	07:25	08:19	08:45
	17:19		20:05	20:57	21:43	22:01	21:33	20:33	19:22	17:17	16:32	16:33
30	08:22		07:19	06:12	05:26	05:21	05:55	06:45	07:35	07:27	08:20	08:46
	17:21		20:06	20:59	21:44	22:01	21:32	20:31	19:19	17:15	16:31	16:34
31	08:20		07:17		05:25		05:57	06:46		07:29		08:46
	17:22		20:08		21:46		21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case
Assumptions for shadow calculations

Shadow receptor: Q - H17

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:15	06:10	06:34 (2) 05:25	05:53 (3) 05:22	05:53 (3) 05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01 9	06:43 (2) 21:47 31	06:24 (4) 22:01 39	06:32 (4) 21:29	20:27	19:17	17:11	16:31
2	08:46	08:17	07:23	07:12	06:08	06:32 (2) 05:24	05:53 (3) 05:22	05:54 (3) 06:00	06:50	07:39	07:33	08:23
	16:37	17:26	18:18	20:12	21:03 11	06:43 (2) 21:48 32	06:25 (4) 22:00 38	06:32 (4) 21:27	20:24	19:15	17:09	16:30
3	08:45	08:16	07:21	07:10	06:06	06:31 (2) 05:23	05:52 (3) 05:23	05:54 (3) 06:01	06:42 (2) 06:51	07:40	07:34	08:25
	16:39	17:28	18:20	20:13	21:04 13	06:44 (2) 21:49 33	06:25 (4) 22:00 39	06:33 (4) 21:25 6	06:48 (2) 20:22	19:13	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04	06:29 (2) 05:22	05:51 (3) 05:24	05:54 (3) 06:03	06:40 (2) 06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15	21:06 14	06:43 (2) 21:50 34	06:25 (4) 22:00 38	06:32 (4) 21:24 10	06:50 (2) 20:20	19:10	17:06	16:29
5	08:45	08:12	07:17	07:06	06:02	06:28 (2) 05:22	05:51 (3) 05:25	05:55 (3) 06:04	06:39 (2) 06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17	21:08 15	06:43 (2) 21:51 35	06:26 (4) 21:59 37	06:32 (4) 21:22 12	06:51 (2) 20:18	19:08	17:04	16:28
6	08:45	08:11	07:14	07:03	06:00	06:29 (2) 05:21	05:50 (3) 05:25	05:56 (3) 06:06	06:38 (2) 06:56	07:45	07:40	08:29
	16:42	17:34	18:25	20:19	21:09 14	06:43 (2) 21:52 36	06:26 (4) 21:59 37	06:33 (4) 21:20 14	06:52 (2) 20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01	05:59	06:29 (2) 05:20	05:50 (3) 05:26	05:57 (3) 06:08	06:38 (2) 06:58	07:47	07:42	08:30
	16:43	17:35	18:27	20:20	21:11 13	06:42 (2) 21:53 37	06:27 (4) 21:58 36	06:33 (4) 21:18 15	06:53 (2) 20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59	05:57	06:29 (2) 05:20	05:49 (3) 05:27	05:58 (3) 06:09	06:37 (2) 06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22	21:13 12	06:41 (2) 21:54 38	06:27 (4) 21:57 35	06:33 (4) 21:17 15	06:52 (2) 20:11	19:01	16:59	16:27
9	08:43	08:05	07:08	06:56	05:55	06:31 (2) 05:19	05:49 (3) 05:28	05:59 (3) 06:11	06:39 (2) 07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:24	21:14 9	06:40 (2) 21:55 38	06:27 (4) 21:57 34	06:33 (4) 21:15 14	06:53 (2) 20:08	18:59	16:57	16:27
10	08:43	08:04	07:05	06:54	05:53	06:33 (2) 05:19	05:49 (3) 05:29	06:00 (3) 06:12	06:40 (2) 07:03	07:52	07:47	08:33
	16:47	17:41	18:32	20:25	21:16 4	06:37 (2) 21:55 39	06:28 (4) 21:56 33	06:33 (4) 21:13 12	06:52 (2) 20:06	18:57	16:55	16:27
11	08:42	08:02	07:03	06:52	05:52	05:18	05:49 (3) 05:30	06:01 (3) 06:14	06:42 (2) 07:04	07:54	07:49	08:35
	16:49	17:43	18:34	20:27	21:17	21:56 39	06:28 (4) 21:55 31	06:32 (4) 21:11 10	06:52 (2) 20:04	18:54	16:54	16:26
12	08:42	08:00	07:01	06:50	05:50	05:18	05:49 (3) 05:31	06:02 (3) 06:16	06:43 (2) 07:06	07:56	07:51	08:36
	16:50	17:45	18:36	20:29	21:19	21:57 39	06:28 (4) 21:54 30	06:32 (4) 21:09 8	06:51 (2) 20:01	18:52	16:52	16:26
13	08:41	07:58	06:59	06:47	05:49	05:18	05:50 (3) 05:32	06:03 (3) 06:17	06:45 (2) 07:07	07:57	07:52	08:37
	16:52	17:47	18:37	20:30	21:21	21:58 39	06:29 (4) 21:53 29	06:32 (4) 21:07 6	06:51 (2) 19:59	18:50	16:51	16:26
14	08:40	07:56	06:56	06:45	05:47	05:18	05:50 (3) 05:34	06:04 (3) 06:19	06:46 (2) 07:09	07:59	07:54	08:38
	16:53	17:48	18:39	20:32	21:22	21:58 39	06:29 (4) 21:53 27	06:31 (4) 21:05 3	06:49 (2) 19:57	18:48	16:49	16:26
15	08:39	07:54	06:54	06:43	05:45	05:17	05:51 (3) 05:35	06:05 (3) 06:20	07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34	21:24	21:59 38	06:29 (4) 21:52 25	06:30 (4) 21:03	19:54	18:46	16:48	16:26
16	08:38	07:52	06:52	06:41	05:44	05:17	05:51 (3) 05:36	06:06 (3) 06:22	07:12	08:02	07:58	08:39
	16:56	17:52	18:43	20:36	21:25	21:59 39	06:30 (4) 21:51 22	06:30 (4) 21:01	19:52	18:43	16:46	16:26
17	08:38	07:50	06:49	06:39	05:42	05:17	05:51 (3) 05:37	06:07 (3) 06:24	07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37	21:27	22:00 39	06:30 (4) 21:49 18	06:29 (4) 20:59	19:50	18:41	16:45	16:27
18	08:37	07:48	06:47	06:37	05:41	05:17	05:51 (3) 05:38	06:13 (4) 06:25	07:16	08:06	08:01	08:41
	17:00	17:56	18:46	20:39	21:28	22:00 39	06:30 (4) 21:48 14	06:27 (4) 20:57	19:47	18:39	16:44	16:27
19	08:36	07:46	06:45	06:34	05:39	05:17	05:51 (3) 05:40	06:16 (4) 06:27	07:17	08:08	08:03	08:42
	17:01	17:58	18:48	20:41	21:30	22:00 39	06:30 (4) 21:47 11	06:27 (4) 20:55	19:45	18:37	16:43	16:27
20	08:35	07:44	06:42	06:32	05:38	05:17	05:51 (3) 05:41	06:18 (4) 06:28	07:19	08:09	08:04	08:42
	17:03	18:00	18:49	20:42	21:31	22:01 39	06:30 (4) 21:46 6	06:24 (4) 20:53	19:43	18:35	16:41	16:28
21	08:34	07:42	06:40	06:30	05:37	05:17	05:51 (3) 05:42	06:30	07:21	08:11	08:06	08:43
	17:05	18:01	18:51	20:44	21:33	22:01 39	06:30 (4) 21:45	20:51	19:40	18:33	16:40	16:28
22	08:32	07:40	06:38	06:28	05:35	05:18	05:51 (3) 05:44	06:32	07:22	08:13	08:08	08:43
	17:06	18:03	18:53	20:46	21:34	22:01 39	06:30 (4) 21:44	20:49	19:38	18:31	16:39	16:28
23	08:31	07:38	06:35	06:26	05:34	05:18	05:52 (3) 05:45	06:33	07:24	08:15	08:09	08:44
	17:08	18:05	18:55	20:47	21:35	22:01 39	06:31 (4) 21:42	20:46	19:36	18:29	16:38	16:29
24	08:30	07:36	06:33	06:24	05:33 06:06 (4)	05:18	05:52 (3) 05:46	06:35	07:25	08:17	08:11	08:44
	17:10	18:07	18:56	20:49	21:37 9	06:15 (4) 22:01 39	06:31 (4) 21:41	20:44	19:33	18:27	16:37	16:30
25	08:29	07:34	06:31	06:22	05:32	06:04 (4) 05:19	05:52 (3) 05:48	06:37	07:27	07:18	08:13	08:45
	17:12	18:09	18:58	20:51	21:38 13	06:17 (4) 22:02 39	06:31 (4) 21:39	20:42	19:31	17:25	16:36	16:30
26	08:27	07:32	06:29	06:20	05:31	06:03 (4) 05:19	05:53 (3) 05:49	06:38	07:29	07:20	08:14	08:45
	17:13	18:11	19:00	20:53	21:39 16	06:19 (4) 22:02 39	06:32 (4) 21:38	20:40	19:29	17:23	16:35	16:31
27	08:26	07:30	06:26	06:18	05:29	05:57 (3) 05:19	05:53 (3) 05:51	06:40	07:30	07:22	08:16	08:45
	17:15	18:12	19:01	20:54	21:41 20	06:20 (4) 22:01 39	06:32 (4) 21:37	20:38	19:26	17:21	16:34	16:32
28	08:25	07:28	06:24	06:16	05:28	05:56 (3) 05:20	05:53 (3) 05:52	06:41	07:32	07:24	08:17	08:45
	17:17	18:14	19:03	20:56	21:42 24	06:21 (4) 22:01 39	06:32 (4) 21:35	20:36	19:24	17:19	16:33	16:32
29	08:23		07:22	06:14 06:38 (2)	05:27	05:56 (3) 05:20	05:53 (3) 05:54	06:43	07:34	07:25	08:19	08:46
	17:19		20:05	20:58 3 06:41 (2)	21:43 26	06:22 (4) 22:01 39	06:32 (4) 21:34	20:33	19:22	17:17	16:32	16:33
30	08:22		07:19	06:12 06:36 (2)	05:26	05:55 (3) 05:21	05:54 (3) 05:55	06:45	07:35	07:27	08:20	08:46
	17:21		20:07	20:59 6 06:42 (2)	21:44 28	06:23 (4) 22:01 38	06:32 (4) 21:32	20:31	19:19	17:15	16:31	16:34
31	08:20		07:17		05:25	05:54 (3)	05:57	06:46		07:29		08:46
	17:22		20:08		21:46 29	06:23 (4)	21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case				9	279	1131	579	125				
Sun reduction				0.35	0.37	0.30	0.27	0.30				
Oper. time red.				1.00	1.00	1.00	1.00	1.00				
Wind dir. red.				0.64	0.63	0.63	0.63	0.64				
Total reduction				0.23	0.23	0.19	0.17	0.19				
Total, real				2	65	213	97	24				

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case
Assumptions for shadow calculations

Shadow receptor: R - H18

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April		May		June		July		August		September	October	November	December
1	08:46	08:19	07:25	07:15		06:10		06:34 (2)	05:25	05:53 (3)	05:22	05:56 (3)	05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10		21:01	10	06:44 (2)	21:47	35 06:28 (4)	22:01	39 06:35 (4)	21:29	20:27	19:17	17:11	16:31
2	08:46	08:17	07:23	07:12		06:08		06:32 (2)	05:24	05:53 (3)	05:22	05:57 (3)	06:00	06:50	07:39	07:33	08:23
	16:37	17:26	18:18	20:12		21:03	12	06:44 (2)	21:48	36 06:29 (4)	22:00	38 06:35 (4)	21:27	20:24	19:15	17:09	16:30
3	08:45	08:16	07:21	07:10		06:06		06:31 (2)	05:23	05:52 (3)	05:23	05:57 (3)	06:01	06:51	07:40	07:34	08:25
	16:39	17:28	18:20	20:13		21:04	13	06:44 (2)	21:49	37 06:29 (4)	22:00	39 06:36 (4)	21:25	20:22	19:13	17:07	16:29
4	08:45	08:14	07:19	07:08		06:04		06:29 (2)	05:22	05:51 (3)	05:24	05:56 (3)	06:03	06:43 (2)	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15		21:06	15	06:44 (2)	21:50	38 06:29 (4)	22:00	39 06:35 (4)	21:24	6 06:49 (2)	20:20	19:10	17:06	16:29
5	08:45	08:12	07:17	07:06		06:02		06:29 (2)	05:22	05:51 (3)	05:25	05:57 (3)	06:04	06:42 (2)	06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17		21:08	14	06:43 (2)	21:51	39 06:30 (4)	21:59	39 06:36 (4)	21:22	9 06:51 (2)	20:18	19:08	17:04	16:28
6	08:45	08:11	07:14	07:03		06:00		06:31 (2)	05:21	05:51 (3)	05:25	05:57 (3)	06:06	06:40 (2)	06:56	07:45	07:40	08:29
	16:42	17:34	18:25	20:19		21:09	12	06:43 (2)	21:52	39 06:30 (4)	21:59	39 06:36 (4)	21:20	12 06:52 (2)	20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01		05:59		06:31 (2)	05:20	05:51 (3)	05:26	05:57 (3)	06:08	06:40 (2)	06:58	07:47	07:42	08:30
	16:43	17:35	18:27	20:20		21:11	11	06:42 (2)	21:53	39 06:30 (4)	21:58	39 06:36 (4)	21:18	13 06:53 (2)	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59		05:57		06:32 (2)	05:20	05:51 (3)	05:27	05:58 (3)	06:09	06:39 (2)	06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22		21:13	8	06:40 (2)	21:54	39 06:30 (4)	21:57	38 06:36 (4)	21:17	14 06:53 (2)	20:11	19:01	16:59	16:27
9	08:43	08:05	07:08	06:56		05:55		06:35 (2)	05:19	05:52 (3)	05:28	05:59 (3)	06:11	06:39 (2)	07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:24		21:14	3	06:38 (2)	21:55	39 06:31 (4)	21:57	38 06:37 (4)	21:15	15 06:54 (2)	20:08	18:59	16:57	16:27
10	08:43	08:04	07:05	06:54		05:53			05:19	05:52 (3)	05:29	06:00 (3)	06:12	06:40 (2)	07:03	07:52	07:47	08:33
	16:48	17:41	18:32	20:25		21:16			21:55	39 06:31 (4)	21:56	37 06:37 (4)	21:13	13 06:53 (2)	20:06	18:57	16:55	16:27
11	08:42	08:02	07:03	06:52		05:52			05:18	05:52 (3)	05:30	06:01 (3)	06:14	06:42 (2)	07:04	07:54	07:49	08:35
	16:49	17:43	18:34	20:27		21:17			21:56	39 06:31 (4)	21:55	36 06:37 (4)	21:11	11 06:53 (2)	20:04	18:54	16:54	16:26
12	08:42	08:00	07:01	06:50		05:50			05:18	05:52 (3)	05:31	06:02 (3)	06:16	06:43 (2)	07:06	07:56	07:51	08:36
	16:50	17:45	18:36	20:29		21:19			21:57	39 06:31 (4)	21:54	34 06:36 (4)	21:09	9 06:52 (2)	20:01	18:52	16:52	16:26
13	08:41	07:58	06:59	06:47		05:49			05:18	05:53 (3)	05:32	06:03 (3)	06:17	06:45 (2)	07:07	07:57	07:52	08:37
	16:52	17:47	18:37	20:30		21:21			21:58	39 06:32 (4)	21:53	33 06:36 (4)	21:07	7 06:52 (2)	19:59	18:50	16:51	16:26
14	08:40	07:56	06:56	06:45		05:47			05:18	05:53 (3)	05:34	06:04 (3)	06:19	06:46 (2)	07:09	07:59	07:54	08:38
	16:53	17:48	18:39	20:32		21:22			21:58	39 06:32 (4)	21:53	32 06:36 (4)	21:05	4 06:50 (2)	19:57	18:48	16:49	16:26
15	08:39	07:54	06:54	06:43		05:45			05:17	05:54 (3)	05:35	06:05 (3)	06:20	06:48 (2)	07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34		21:24			21:59	38 06:32 (4)	21:52	31 06:36 (4)	21:03	1 06:49 (2)	19:54	18:46	16:48	16:26
16	08:38	07:52	06:52	06:41		05:44			05:17	05:54 (3)	05:36	06:06 (3)	06:22		07:12	08:02	07:58	08:39
	16:57	17:52	18:43	20:36		21:25			21:59	39 06:33 (4)	21:51	29 06:35 (4)	21:01		19:52	18:43	16:46	16:26
17	08:38	07:50	06:49	06:39		05:42			05:17	05:54 (3)	05:37	06:07 (3)	06:24		07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37		21:27			22:00	39 06:33 (4)	21:49	28 06:35 (4)	20:59		19:50	18:41	16:45	16:27
18	08:37	07:48	06:47	06:37		05:41			05:17	05:54 (3)	05:38	06:08 (3)	06:25		07:16	08:06	08:01	08:41
	17:00	17:56	18:46	20:39		21:28			22:00	39 06:33 (4)	21:48	25 06:34 (4)	20:57		19:47	18:39	16:44	16:27
19	08:36	07:46	06:45	06:34		05:39			05:17	05:55 (3)	05:40	06:10 (3)	06:27		07:17	08:08	08:03	08:42
	17:01	17:58	18:48	20:41		21:30			22:00	38 06:33 (4)	21:47	20 06:34 (4)	20:55		19:45	18:37	16:43	16:27
20	08:35	07:44	06:42	06:32		05:38		06:13 (4)	05:17	05:55 (3)	05:41	06:16 (4)	06:28		07:19	08:09	08:04	08:42
	17:03	18:00	18:49	20:42		21:31	2	06:15 (4)	22:01	38 06:33 (4)	21:46	17 06:33 (4)	20:53		19:43	18:35	16:41	16:28
21	08:34	07:42	06:40	06:30		05:37		06:09 (4)	05:17	05:55 (3)	05:42	06:17 (4)	06:30		07:21	08:11	08:06	08:43
	17:05	18:01	18:51	20:44		21:33	10	06:19 (4)	22:01	38 06:33 (4)	21:45	15 06:32 (4)	20:51		19:40	18:33	16:40	16:28
22	08:32	07:40	06:38	06:28		05:35		06:08 (4)	05:18	05:55 (3)	05:44	06:18 (4)	06:32		07:22	08:13	08:08	08:43
	17:06	18:03	18:53	20:46		21:34	13	06:21 (4)	22:01	38 06:33 (4)	21:44	12 06:30 (4)	20:49		19:38	18:31	16:39	16:28
23	08:31	07:38	06:35	06:26		05:34		06:07 (4)	05:18	05:56 (3)	05:45	06:21 (4)	06:33		07:24	08:15	08:09	08:44
	17:08	18:05	18:55	20:47		21:35	16	06:23 (4)	22:01	38 06:34 (4)	21:42	7 06:28 (4)	20:46		19:36	18:29	16:38	16:29
24	08:30	07:36	06:33	06:24		05:33		06:05 (4)	05:18	05:56 (3)	05:46		06:35		07:25	08:17	08:11	08:44
	17:10	18:07	18:56	20:49		21:37	18	06:23 (4)	22:01	38 06:34 (4)	21:41		20:44		19:33	18:27	16:37	16:30
25	08:29	07:34	06:31	06:22		05:32		05:59 (3)	05:19	05:55 (3)	05:48		06:37		07:27	07:18	08:13	08:45
	17:12	18:09	18:58	20:51		21:38	22	06:24 (4)	22:02	39 06:34 (4)	21:39		20:42		19:31	17:25	16:36	16:30
26	08:27	07:32	06:29	06:20		05:31		05:58 (3)	05:19	05:56 (3)	05:49		06:38		07:29	07:20	08:14	08:45
	17:13	18:11	19:00	20:53		21:39	27	06:25 (4)	22:02	39 06:35 (4)	21:38		20:40		19:29	17:23	16:35	16:31
27	08:26	07:30	06:26	06:18		05:29		05:57 (3)	05:19	05:56 (3)	05:51		06:40		07:30	07:22	08:16	08:45
	17:15	18:12	19:01	20:54		21:41	28	06:25 (4)	22:01	38 06:34 (4)	21:37		20:38		19:26	17:21	16:34	16:32
28	08:25	07:28	06:24	06:16	06:40 (2)	05:28		05:56 (3)	05:20	05:56 (3)	05:52		06:41		07:32	07:24	08:17	08:45
	17:17	18:14	19:03	20:56	2 06:42 (2)	21:42	30	06:26 (4)	22:01	39 06:35 (4)	21:35		20:36		19:24	17:19	16:33	16:32
29	08:23		07:22	06:14	06:38 (2)	05:27		05:56 (3)	05:20	05:56 (3)	05:54		06:43		07:34	07:25	08:19	08:46
	17:19		20:05	20:58	5 06:43 (2)	21:43	31	06:27 (4)	22:01	39 06:35 (4)	21:34		20:33		19:22	17:17	16:32	16:33
30	08:22		07:19	06:12	06:36 (2)	05:26		05:55 (3)	05:21	05:57 (3)	05:55		06:45		07:35	07:27	08:20	08:46
	17:21		20:07	20:59	8 06:44 (2)	21:44	33	06:28 (4)	22:01	38 06:35 (4)	21:32		20:31		19:19	17:15	16:31	16:34
31	08:20		07:17			05:25		05:54 (3)			05:57		06:46			07:29		08:46
	17:22		20:08			21:46	34	06:28 (4)			21:30		20:29			17:13		16:35
Potential sun hours	259	278	367	416		485			499		502		454	381	331	266	244
Total, worst case					15		362		1151		704		114				
Sun reduction					0.35		0.37		0.30		0.27		0.30				
Oper. time red.					1.00		1.00		1.00		1.00		1.00				
Wind dir. red.					0.64		0.63		0.63		0.63		0.64				
Total reduction					0.23		0.23		0.19		0.17		0.19				
Total, real					3		85		217		118		22				

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** S - H19

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January		February		March	April	May	June	July	August	September	October	November		December		
1	08:46		14:55 (5)	08:19	16:03 (1)	07:25	07:15	06:10	05:24	05:21	05:58	06:48	07:37	07:31		08:22		14:46 (5)
	16:36	23	15:18 (5)	17:24	9 16:12 (1)	18:16	20:10	21:01	21:47	22:01	21:29	20:27	19:17	17:11		16:30	15	15:01 (5)
2	08:46		14:56 (5)	08:17	16:07 (1)	07:23	07:12	06:08	05:24	05:22	06:00	06:49	07:39	07:33		08:23		14:46 (5)
	16:37	23	15:19 (5)	17:26	2 16:09 (1)	18:18	20:12	21:03	21:48	22:00	21:27	20:24	19:15	17:09		16:30	16	15:02 (5)
3	08:45		14:57 (5)	08:16		07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34		08:25		14:45 (5)
	16:38	22	15:19 (5)	17:28		18:19	20:13	21:04	21:49	22:00	21:25	20:22	19:12	17:07		16:29	18	15:03 (5)
4	08:45		14:57 (5)	08:14		07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36		08:26		14:44 (5)
	16:40	22	15:19 (5)	17:30		18:21	20:15	21:06	21:50	22:00	21:24	20:20	19:10	17:05		16:29	19	15:03 (5)
5	08:45		14:58 (5)	08:12		07:16	07:05	06:02	05:21	05:24	06:04	06:54	07:44	07:38		08:27		14:45 (5)
	16:41	21	15:19 (5)	17:32		18:23	20:17	21:08	21:51	21:59	21:22	20:18	19:08	17:04		16:28	20	15:05 (5)
6	08:45		14:58 (5)	08:11		07:14	07:03	06:00	05:21	05:25	06:06	06:56	07:45	07:40		08:29		14:44 (5)
	16:42	21	15:19 (5)	17:33		18:25	20:18	21:09	21:52	21:59	21:20	20:15	19:06	17:02		16:28	21	15:05 (5)
7	08:44		15:00 (5)	08:09		07:12	07:01	05:59	05:20	05:26	06:07	06:58	07:47	07:42		08:30		14:45 (5)
	16:43	20	15:20 (5)	17:35		18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00		16:27	21	15:06 (5)
8	08:44		15:00 (5)	08:07		07:10	06:59	05:57	05:20	05:27	06:09	06:59	07:49	07:43		08:31		14:45 (5)
	16:45	19	15:19 (5)	17:37		18:28	20:22	21:13	21:54	21:57	21:17	20:11	19:01	16:58		16:27	22	15:07 (5)
9	08:43		15:01 (5)	08:05		07:07	06:56	05:55	05:19	05:28	06:11	07:01	07:50	07:45	15:37 (1)	08:32		14:45 (5)
	16:46	18	15:19 (5)	17:39		18:30	20:24	21:14	21:55	21:57	21:15	20:08	18:59	16:57	3 15:40 (1)	16:27	22	15:07 (5)
10	08:43		15:03 (5)	08:04		07:05	06:54	05:53	05:19	05:29	06:12	07:02	07:52	07:47	15:34 (1)	08:33		14:45 (5)
	16:47	16	15:19 (5)	17:41		18:32	20:25	21:16	21:55	21:56	21:13	20:06	18:57	16:55	9 15:43 (1)	16:26	23	15:08 (5)
11	08:42		15:03 (5)	08:02		07:03	06:52	05:52	05:18	05:30	06:14	07:04	07:54	07:49	15:32 (1)	08:35		14:45 (5)
	16:49	16	15:19 (5)	17:43		18:34	20:27	21:17	21:56	21:55	21:11	20:04	18:54	16:54	13 15:45 (1)	16:26	23	15:08 (5)
12	08:42		15:05 (5)	08:00		07:01	06:50	05:50	05:18	05:31	06:15	07:06	07:56	07:51	15:32 (1)	08:36		14:45 (5)
	16:50	13	15:18 (5)	17:45		18:35	20:29	21:19	21:57	21:54	21:09	20:01	18:52	16:52	14 15:46 (1)	16:26	24	15:09 (5)
13	08:41		15:06 (5)	07:58		06:58	06:47	05:48	05:18	05:32	06:17	07:07	07:57	07:52	15:31 (1)	08:37		14:46 (5)
	16:52	11	15:17 (5)	17:46		18:37	20:30	21:21	21:58	21:53	21:07	19:59	18:50	16:51	16 15:47 (1)	16:26	23	15:09 (5)
14	08:40		15:09 (5)	07:56		06:56	06:45	05:47	05:17	05:33	06:19	07:09	07:59	07:54	15:31 (1)	08:38		14:46 (5)
	16:53	6	15:15 (5)	17:48		18:39	20:32	21:22	21:58	21:53	21:05	19:57	18:48	16:49	17 15:48 (1)	16:26	24	15:10 (5)
15	08:39			07:54		06:54	06:43	05:45	05:17	05:35	06:20	07:11	08:01	07:56	15:31 (1)	08:38		14:47 (5)
	16:55			17:50		18:41	20:34	21:24	21:59	21:52	21:03	19:54	18:45	16:48	17 15:48 (1)	16:26	23	15:10 (5)
16	08:38		16:00 (1)	07:52		06:52	06:41	05:44	05:17	05:36	06:22	07:12	08:02	07:58	15:31 (1)	08:39		14:47 (5)
	16:56	6	16:06 (1)	17:52		18:42	20:36	21:25	21:59	21:51	21:01	19:52	18:43	16:46	18 15:49 (1)	16:26	24	15:11 (5)
17	08:38		15:59 (1)	07:50		06:49	06:39	05:42	05:17	05:37	06:23	07:14	08:04	07:59	15:31 (1)	08:40		14:48 (5)
	16:58	9	16:08 (1)	17:54		18:44	20:37	21:27	22:00	21:49	20:59	19:50	18:41	16:45	18 15:49 (1)	16:26	24	15:12 (5)
18	08:37		15:58 (1)	07:48		06:47	06:36	05:41	05:17	05:38	06:25	07:15	08:06	08:01	15:30 (1)	08:41		14:48 (5)
	17:00	12	16:10 (1)	17:56		18:46	20:39	21:28	22:00	21:48	20:57	19:47	18:39	16:44	18 15:48 (1)	16:27	24	15:12 (5)
19	08:36		15:58 (1)	07:46		06:45	06:34	05:39	05:17	05:39	06:27	07:17	08:08	08:03	15:31 (1)	08:42		14:48 (5)
	17:01	13	16:11 (1)	17:58		18:48	20:41	21:30	22:00	21:47	20:55	19:45	18:37	16:42	18 15:49 (1)	16:27	24	15:12 (5)
20	08:35		15:57 (1)	07:44		06:42	06:32	05:38	05:17	05:41	06:28	07:19	08:09	08:04	15:32 (1)	08:42		14:49 (5)
	17:03	16	16:13 (1)	17:59		18:49	20:42	21:31	22:01	21:46	20:53	19:43	18:35	16:41	17 15:49 (1)	16:27	24	15:13 (5)
21	08:33		15:56 (1)	07:42		06:40	06:30	05:36	05:17	05:42	06:30	07:20	08:11	08:06	15:32 (1)	08:43		14:49 (5)
	17:05	17	16:13 (1)	18:01		18:51	20:44	21:33	22:01	21:45	20:51	19:40	18:33	16:40	17 15:49 (1)	16:28	24	15:13 (5)
22	08:32		15:57 (1)	07:40		06:38	06:28	05:35	05:17	05:43	06:32	07:22	08:13	08:08	15:33 (1)	08:43		14:50 (5)
	17:06	17	16:14 (1)	18:03		18:53	20:46	21:34	22:01	21:44	20:49	19:38	18:31	16:39	16 15:49 (1)	16:28	24	15:14 (5)
23	08:31		15:57 (1)	07:38		06:35	06:26	05:34	05:18	05:45	06:33	07:24	08:15	08:09	15:35 (1)	08:44		14:50 (5)
	17:08	18	16:15 (1)	18:05		18:54	20:47	21:35	22:01	21:42	20:46	19:36	18:28	16:38	13 15:48 (1)	16:29	24	15:14 (5)
24	08:30		15:56 (1)	07:36		06:33	06:24	05:33	05:18	05:46	06:35	07:25	08:16	08:11	15:35 (1)	08:44		14:51 (5)
	17:10	18	16:14 (1)	18:07		18:56	20:49	21:37	22:01	21:41	20:44	19:33	18:26	16:37	12 15:47 (1)	16:29	24	15:15 (5)
25	08:29		15:57 (1)	07:34		06:31	06:22	05:31	05:18	05:48	06:36	07:27	07:18	08:13	15:37 (1)	08:45		14:51 (5)
	17:11	18	16:15 (1)	18:09		18:58	20:51	21:38	22:02	21:39	20:42	19:31	17:24	16:36	9 15:46 (1)	16:30	24	15:15 (5)
26	08:27		15:58 (1)	07:32		06:28	06:20	05:30	05:19	05:49	06:38	07:29	07:20	08:14	15:39 (1)	08:45		14:52 (5)
	17:13	18	16:16 (1)	18:10		19:00	20:52	21:39	22:02	21:38	20:40	19:29	17:22	16:35	6 15:45 (1)	16:31	24	15:16 (5)
27	08:26		15:58 (1)	07:30		06:26	06:18	05:29	05:19	05:51	06:40	07:30	07:22	08:16		08:45		14:52 (5)
	17:15	17	16:15 (1)	18:12		19:01	20:54	21:41	22:01	21:37	20:38	19:26	17:20	16:34		16:31	24	15:16 (5)
28	08:25		15:59 (1)	07:27		06:24	06:16	05:28	05:20	05:52	06:41	07:32	07:24	08:17	14:49 (5)	08:45		14:52 (5)
	17:17	17	16:16 (1)	18:14		19:03	20:56	21:42	22:01	21:35	20:36	19:24	17:18	16:33	6 14:55 (5)	16:32	24	15:16 (5)
29	08:23		15:59 (1)			07:21	06:14	05:27	05:20	05:53	06:43	07:34	07:25	08:19	14:48 (5)	08:46		14:53 (5)
	17:19	16	16:15 (1)			20:05	20:58	21:43	22:01	21:34	20:33	19:22	17:17	16:32	10 14:58 (5)	16:33	24	15:17 (5)
30	08:22		16:00 (1)			07:19	06:12	05:26	05:21	05:55	06:45	07:35	07:27	08:20	14:46 (5)	08:46		14:53 (5)
	17:20	14	16:14 (1)			20:06	20:59	21:44	22:01	21:32	20:31	19:19	17:15	16:31	13 14:59 (5)	16:34	24	15:17 (5)
31	08:20		16:02 (1)			07:17		05:25		05:56	06:46		07:29			08:46		14:54 (5)
	17:22	12	16:14 (1)			20:08		21:46		21:30	20:29		17:13			16:35	23	15:17 (5)
Potential sun hours	259		278		367	416	485	499	502	454	381	331	266		243		
Total, worst case	489		11											280		697		
Sun reduction	0.16		0.21											0.18		0.13		
Oper. time red.	1.00		1.00											1.00		1.00		
Wind dir. red.	0.59		0.58											0.59		0.60		
Total reduction	0.09		0.12											0.11		0.08		
Total, real	45		1											30		57		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** T - H20

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:15	06:10	05:24	05:22	05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01	21:47	22:01	21:29	20:27	19:17	17:11	16:31
2	08:46	08:17	07:23	07:12	06:08	05:24	05:22	06:00	06:50	07:39	07:33	08:23
	16:37	17:26	18:18	20:12	21:03	21:48	22:00	21:27	20:24	19:15	17:09	16:30
3	08:45	08:16	07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34	08:25
	16:39	17:28	18:19	20:13	21:04	21:49	22:00	21:25	20:22	19:12	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15	21:06	21:50	21:59	21:24	20:20	19:10	17:05	16:29
5	08:45	08:12	07:16	07:05	06:02	05:21	05:25	06:04	06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17	21:08	21:51	21:59	21:22	20:17	19:08	17:04	16:28
6	08:45	08:11	07:14	07:03	06:00	05:21	05:25	06:06	06:56	07:45	07:40	08:29
	16:42	17:33	18:25	20:18	21:09	21:52	21:58	21:20	20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01	05:59	05:20	05:26	06:07	06:58	07:47	07:42	08:30
	16:43	17:35	18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59	05:57	05:20	05:27	06:09	06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22	21:12	21:54	21:57	21:16	20:11	19:01	16:59	16:27
9	08:43	08:05	07:07	06:56	05:55	05:19	05:28	06:11	07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:24	21:14	21:54	21:57	21:15	20:08	18:59	16:57	16:27
10	08:43	08:04	07:05	06:54	05:53	05:19	05:29	06:12	07:03	07:52	07:47	08:33
	16:47	17:41	18:32	20:25	21:16	21:55	21:56	21:13	20:06	18:57	16:55	16:27
11	08:42	08:02	07:03	06:52	05:52	05:18	05:30	06:14	07:04	07:54	07:49	08:34
	16:49	17:43	18:34	20:27	21:17	21:56	21:55	21:11	20:04	18:54	16:54	16:26
12	08:41	08:00	07:01	06:50	05:50	05:18	05:31	06:15	07:06	07:55	07:50	08:35
	16:50	17:45	18:35	20:29	21:19	21:57	21:54	21:09	20:01	18:52	16:52	16:26
13	08:41	07:58	06:58	06:47	05:48	05:18	05:32	06:17	07:07	07:57	07:52	08:36
	16:52	17:47	18:37	20:30	21:20	21:57	21:53	21:07	19:59	18:50	16:51	16:26
14	08:40	07:56	06:56	06:45	05:47	05:18	05:33	06:19	07:09	07:59	07:54	08:37
	16:53	17:48	18:39	20:32	21:22	21:58	21:52	21:05	19:57	18:48	16:49	16:26
15	08:39	07:54	06:54	06:43	05:45	05:17	05:35	06:20	07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34	21:24	21:59	21:51	21:03	19:54	18:46	16:48	16:26
16	08:38	07:52	06:52	06:41	05:44	05:17	05:36	06:22	07:12	08:02	07:57	08:39
	16:56	17:52	18:42	20:35	21:25	21:59	21:50	21:01	19:52	18:43	16:46	16:26
17	08:37	07:50	06:49	06:39	05:42	05:17	05:37	06:23	07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37	21:27	22:00	21:49	20:59	19:50	18:41	16:45	16:27
18	08:37	07:48	06:47	06:36	05:41	05:17	05:38	06:25	07:16	08:06	08:01	08:41
	17:00	17:56	18:46	20:39	21:28	22:00	21:48	20:57	19:47	18:39	16:44	16:27
19	08:36	07:46	06:45	06:34	05:39	05:17	05:40	06:27	07:17	08:08	08:03	08:41
	17:01	17:58	18:48	20:41	21:30	22:00	21:47	20:55	19:45	18:37	16:42	16:27
20	08:34	07:44	06:42	06:32	05:38	05:17	05:41	06:28	07:19	08:09	08:04	08:42
	17:03	17:59	18:49	20:42	21:31	22:01	21:46	20:53	19:43	18:35	16:41	16:27
21	08:33	07:42	06:40	06:30	05:37	05:17	05:42	06:30	07:20	08:11	08:06	08:43
	17:05	18:01	18:51	20:44	21:32	22:01	21:45	20:51	19:40	18:33	16:40	16:28
22	08:32	07:40	06:38	06:28	05:35	05:18	05:44	06:32	07:22	08:13	08:08	08:43
	17:06	18:03	18:53	20:46	21:34	22:01	21:43	20:48	19:38	18:31	16:39	16:28
23	08:31	07:38	06:35	06:26	05:34	05:18	05:45	06:33	07:24	08:15	08:09	08:44
	17:08	18:05	18:54	20:47	21:35	22:01	21:42	20:46	19:36	18:29	16:38	16:29
24	08:30	07:36	06:33	06:24	05:33	05:18	05:46	06:35	07:25	08:16	08:11	08:44
	17:10	18:07	18:56	20:49	21:37	22:01	21:41	20:44	19:33	18:27	16:37	16:29
25	08:29	07:34	06:31	06:22	05:32	05:18	05:48	06:36	07:27	07:18	08:13	08:45
	17:12	18:09	18:58	20:51	21:38	22:01	21:39	20:42	19:31	17:24	16:36	16:30
26	08:27	07:32	06:28	06:20	05:30	05:19	05:49	06:38	07:29	07:20	08:14	08:45
	17:13	18:10	19:00	20:52	21:39	22:01	21:38	20:40	19:29	17:22	16:35	16:31
27	08:26	07:30	06:26	06:18	05:29	05:19	05:51	06:40	07:30	07:22	08:16	08:45
	17:15	18:12	19:01	20:54	21:41	22:01	21:36	20:38	19:26	17:20	16:34	16:32
28	08:25	07:27	06:24	06:16	05:28	05:20	05:52	06:41	07:32	07:24	08:17	08:45
	17:17	18:14	19:03	20:56	21:42	22:01	21:35	20:35	19:24	17:19	16:33	16:32
29	08:23		07:21	06:14	05:27	05:20	05:54	06:43	07:34	07:25	08:19	08:45
	17:19		20:05	20:57	21:43	22:01	21:33	20:33	19:22	17:17	16:32	16:33
30	08:22		07:19	06:12	05:26	05:21	05:55	06:45	07:35	07:27	08:20	08:46
	17:21		20:06	20:59	21:44	22:01	21:32	20:31	19:19	17:15	16:31	16:34
31	08:20		07:17		05:25		05:57	06:46		07:29		08:46
	17:22		20:08		21:46		21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** U - H21

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:14	06:10	05:24	05:21	05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01	21:47	22:01	21:29	20:26	19:17	17:11	16:30
2	08:45	08:17	07:23	07:12	06:08	05:24	05:22	06:00	06:49	07:38	07:32	08:23
	16:37	17:26	18:18	20:12	21:02	21:48	22:00	21:27	20:24	19:15	17:09	16:30
3	08:45	08:15	07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34	08:24
	16:38	17:28	18:19	20:13	21:04	21:49	22:00	21:25	20:22	19:12	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15	21:06	21:50	21:59	21:24	20:20	19:10	17:05	16:29
5	08:45	08:12	07:16	07:05	06:02	05:21	05:24	06:04	06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17	21:07	21:51	21:59	21:22	20:17	19:08	17:04	16:28
6	08:44	08:10	07:14	07:03	06:00	05:21	05:25	06:06	06:56	07:45	07:40	08:28
	16:42	17:33	18:25	20:18	21:09	21:52	21:58	21:20	20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01	05:59	05:20	05:26	06:07	06:58	07:47	07:41	08:30
	16:43	17:35	18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59	05:57	05:20	05:27	06:09	06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22	21:12	21:54	21:57	21:16	20:11	19:01	16:58	16:27
9	08:43	08:05	07:07	06:56	05:55	05:19	05:28	06:11	07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:23	21:14	21:54	21:57	21:15	20:08	18:59	16:57	16:27
10	08:43	08:03	07:05	06:54	05:53	05:19	05:29	06:12	07:02	07:52	07:47	08:33
	16:47	17:41	18:32	20:25	21:16	21:55	21:56	21:13	20:06	18:56	16:55	16:26
11	08:42	08:02	07:03	06:52	05:52	05:18	05:30	06:14	07:04	07:54	07:49	08:34
	16:49	17:43	18:34	20:27	21:17	21:56	21:55	21:11	20:04	18:54	16:54	16:26
12	08:41	08:00	07:01	06:50	05:50	05:18	05:31	06:15	07:06	07:55	07:50	08:35
	16:50	17:45	18:35	20:29	21:19	21:57	21:54	21:09	20:01	18:52	16:52	16:26
13	08:41	07:58	06:58	06:47	05:48	05:18	05:32	06:17	07:07	07:57	07:52	08:36
	16:52	17:46	18:37	20:30	21:20	21:57	21:53	21:07	19:59	18:50	16:51	16:26
14	08:40	07:56	06:56	06:45	05:47	05:17	05:33	06:19	07:09	07:59	07:54	08:37
	16:53	17:48	18:39	20:32	21:22	21:58	21:52	21:05	19:57	18:48	16:49	16:26
15	08:39	07:54	06:54	06:43	05:45	05:17	05:35	06:20	07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34	21:23	21:59	21:51	21:03	19:54	18:45	16:48	16:26
16	08:38	07:52	06:51	06:41	05:44	05:17	05:36	06:22	07:12	08:02	07:57	08:39
	16:56	17:52	18:42	20:35	21:25	21:59	21:50	21:01	19:52	18:43	16:46	16:26
17	08:37	07:50	06:49	06:39	05:42	05:17	05:37	06:23	07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37	21:27	21:59	21:49	20:59	19:50	18:41	16:45	16:26
18	08:36	07:48	06:47	06:36	05:41	05:17	05:38	06:25	07:15	08:06	08:01	08:41
	17:00	17:56	18:46	20:39	21:28	22:00	21:48	20:57	19:47	18:39	16:44	16:27
19	08:35	07:46	06:45	06:34	05:39	05:17	05:40	06:27	07:17	08:08	08:03	08:41
	17:01	17:58	18:48	20:40	21:29	22:00	21:47	20:55	19:45	18:37	16:42	16:27
20	08:34	07:44	06:42	06:32	05:38	05:17	05:41	06:28	07:19	08:09	08:04	08:42
	17:03	17:59	18:49	20:42	21:31	22:01	21:46	20:53	19:43	18:35	16:41	16:27
21	08:33	07:42	06:40	06:30	05:37	05:17	05:42	06:30	07:20	08:11	08:06	08:43
	17:05	18:01	18:51	20:44	21:32	22:01	21:45	20:51	19:40	18:33	16:40	16:28
22	08:32	07:40	06:38	06:28	05:35	05:17	05:43	06:32	07:22	08:13	08:08	08:43
	17:06	18:03	18:53	20:46	21:34	22:01	21:43	20:48	19:38	18:31	16:39	16:28
23	08:31	07:38	06:35	06:26	05:34	05:18	05:45	06:33	07:24	08:15	08:09	08:44
	17:08	18:05	18:54	20:47	21:35	22:01	21:42	20:46	19:36	18:28	16:38	16:29
24	08:30	07:36	06:33	06:24	05:33	05:18	05:46	06:35	07:25	08:16	08:11	08:44
	17:10	18:07	18:56	20:49	21:37	22:01	21:41	20:44	19:33	18:26	16:37	16:29
25	08:29	07:34	06:31	06:22	05:32	05:18	05:48	06:36	07:27	07:18	08:13	08:44
	17:11	18:09	18:58	20:51	21:38	22:01	21:39	20:42	19:31	17:24	16:36	16:30
26	08:27	07:32	06:28	06:20	05:30	05:19	05:49	06:38	07:29	07:20	08:14	08:45
	17:13	18:10	19:00	20:52	21:39	22:01	21:38	20:40	19:29	17:22	16:35	16:31
27	08:26	07:29	06:26	06:18	05:29	05:19	05:51	06:40	07:30	07:22	08:16	08:45
	17:15	18:12	19:01	20:54	21:41	22:01	21:36	20:38	19:26	17:20	16:34	16:31
28	08:25	07:27	06:24	06:16	05:28	05:20	05:52	06:41	07:32	07:23	08:17	08:45
	17:17	18:14	19:03	20:56	21:42	22:01	21:35	20:35	19:24	17:18	16:33	16:32
29	08:23		07:21	06:14	05:27	05:20	05:53	06:43	07:34	07:25	08:19	08:45
	17:19		20:05	20:57	21:43	22:01	21:33	20:33	19:22	17:17	16:32	16:33
30	08:22		07:19	06:12	05:26	05:21	05:55	06:45	07:35	07:27	08:20	08:45
	17:20		20:06	20:59	21:44	22:01	21:32	20:31	19:19	17:15	16:31	16:34
31	08:20		07:17		05:25		05:56	06:46		07:29		08:46
	17:22		20:08		21:45		21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** V - H22

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:14	06:10	05:24	05:21	05:58	06:48	07:37	18:09 (3)	07:31
	16:36	17:24	18:16	20:10	21:01	21:47	22:01	21:29	20:27	19:17	18:44 (5)	17:11
2	08:46	08:17	07:23	07:12	06:08	05:23	05:22	05:59	06:49	07:38	18:09 (3)	07:32
	16:37	17:26	18:18	20:12	21:02	21:48	22:00	21:27	20:24	19:15	18:42 (5)	17:09
3	08:45	08:15	16:40 (2) 07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	18:09 (3)	07:34
	16:38	17:28	1 16:41 (2) 18:19	20:13	21:04	21:49	22:00	21:25	20:22	19:12	18:39 (5)	17:07
4	08:45	08:14	16:35 (2) 07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	18:09 (3)	07:36
	16:39	17:30	11 16:46 (2) 18:21	20:15	21:06	21:50	21:59	21:24	20:20	19:10	18:31 (3)	17:05
5	08:45	08:12	16:33 (2) 07:16	17:43 (3) 07:05	06:02	05:21	05:24	06:04	06:54	07:44	18:10 (3)	07:38
	16:41	17:31	15 16:48 (2) 18:23	2 17:45 (3) 20:17	21:07	21:51	21:59	21:22	20:17	19:08	18:30 (3)	17:04
6	08:45	08:11	16:31 (2) 07:14	17:37 (3) 07:03	06:00	05:21	05:25	06:06	06:56	07:45	18:10 (3)	07:40
	16:42	17:33	18 16:49 (2) 18:25	12 17:49 (3) 20:18	21:09	21:52	21:58	21:20	20:15	19:05	18:27 (3)	17:02
7	08:44	08:09	16:30 (2) 07:12	17:35 (3) 07:01	05:58	05:20	05:26	06:07	06:58	07:47	18:12 (3)	07:41
	16:43	17:35	21 16:51 (2) 18:27	16 17:51 (3) 20:20	21:11	21:53	21:58	21:18	20:13	19:03	18:26 (3)	17:00
8	08:44	08:07	16:29 (2) 07:10	17:34 (3) 06:58	05:57	05:20	05:27	06:09	06:59	07:49	18:14 (3)	07:43
	16:44	17:37	23 16:52 (2) 18:28	18 17:52 (3) 20:22	21:12	21:54	21:57	21:16	20:11	19:01	9 18:23 (3)	16:58
9	08:43	08:05	16:29 (2) 07:07	17:33 (3) 06:56	05:55	05:19	05:28	06:10	07:01	07:50		07:45
	16:46	17:39	24 16:53 (2) 18:30	20 17:53 (3) 20:23	21:14	21:55	21:57	21:15	20:08	18:59		16:57
10	08:43	08:03	16:28 (2) 07:05	17:31 (3) 06:54	05:53	05:19	05:29	06:12	07:02	07:52		07:47
	16:47	17:41	26 16:54 (2) 18:32	22 17:53 (3) 20:25	21:16	21:55	21:56	21:13	20:06	18:56		16:55
11	08:42	08:02	16:28 (2) 07:03	17:31 (3) 06:52	05:52	05:18	05:30	06:14	07:04	07:54		07:49
	16:49	17:43	26 16:54 (2) 18:34	31 18:03 (5) 20:27	21:17	21:56	21:55	21:11	20:04	18:54		16:54
12	08:41	08:00	16:28 (2) 07:01	17:31 (3) 06:50	05:50	05:18	05:31	06:15	07:06	07:55		07:50
	16:50	17:45	26 16:54 (2) 18:35	33 18:04 (5) 20:29	21:19	21:57	21:54	21:09	20:01	18:52		16:52
13	08:41	07:58	16:28 (2) 06:58	17:30 (3) 06:47	05:48	05:18	05:32	06:17	07:07	07:57		07:52
	16:52	17:46	26 16:54 (2) 18:37	35 18:05 (5) 20:30	21:20	21:57	21:53	21:07	19:59	18:50		16:51
14	08:40	07:56	16:28 (2) 06:56	17:30 (3) 06:45	05:47	05:17	05:33	06:18	07:09	07:59		07:54
	16:53	17:48	26 16:54 (2) 18:39	35 18:05 (5) 20:32	21:22	21:58	21:52	21:05	19:57	18:48		16:49
15	08:39	07:54	16:28 (2) 06:54	17:30 (3) 06:43	05:45	05:17	05:34	06:20	07:11	08:01	17:55 (4)	07:56
	16:55	17:50	26 16:54 (2) 18:41	36 18:06 (5) 20:34	21:24	21:59	21:51	21:03	19:54	18:45	4 17:59 (4)	16:48
16	08:38	07:52	16:28 (2) 06:51	17:30 (3) 06:41	05:44	05:17	05:36	06:22	07:12	08:02	17:52 (4)	07:57
	16:56	17:52	26 16:54 (2) 18:42	35 18:05 (5) 20:35	21:25	21:59	21:50	21:01	19:52	18:43	10 18:02 (4)	16:46
17	08:37	07:50	16:29 (2) 06:49	17:31 (3) 06:38	05:42	05:17	05:37	06:23	07:14	08:04	17:51 (4)	07:59
	16:58	17:54	27 17:27 (4) 18:44	33 18:04 (5) 20:37	21:27	22:00	21:49	20:59	19:50	18:41	12 18:03 (4)	16:45
18	08:37	07:48	16:30 (2) 06:47	17:33 (3) 06:36	05:41	05:17	05:38	06:25	07:15	08:06	17:50 (4)	08:01
	16:59	17:56	31 17:29 (4) 18:46	28 18:03 (5) 20:39	21:28	22:00	21:48	20:57	19:47	18:39	14 18:04 (4)	16:44
19	08:36	07:46	16:30 (2) 06:45	17:35 (3) 06:34	05:39	05:17	05:39	06:27	07:17	08:08	17:49 (4)	08:03
	17:01	17:58	32 17:30 (4) 18:48	21 18:01 (5) 20:41	21:30	22:00	21:47	20:55	19:45	18:37	15 18:04 (4)	16:42
20	08:34	07:44	16:31 (2) 06:42	17:52 (5) 06:32	05:38	05:17	05:41	06:28	07:19	08:09	17:07 (2)	08:04
	17:03	17:59	32 17:32 (4) 18:49	7 17:59 (5) 20:42	21:31	22:01	21:46	20:53	19:43	18:35	25 18:04 (4)	16:41
21	08:33	07:42	16:33 (2) 06:40	06:30	05:36	05:17	05:42	06:30	07:20	08:11	17:03 (2)	08:06
	17:04	18:01	30 17:33 (4) 18:51	20:44	21:32	22:01	21:45	20:51	19:40	18:33	31 18:03 (4)	16:40
22	08:32	07:40	16:37 (2) 06:38	06:28	05:35	05:17	05:43	06:31	07:22	08:13	17:01 (2)	08:08
	17:06	18:03	23 17:33 (4) 18:53	20:46	21:34	22:01	21:43	20:48	19:38	18:30	32 18:02 (4)	16:39
23	08:31	07:38	17:18 (4) 06:35	06:26	05:34	05:18	05:45	06:33	07:24	18:38 (5) 08:15	17:00 (2)	08:09
	17:08	18:05	15 17:33 (4) 18:54	20:47	21:35	22:01	21:42	20:46	19:36	4 18:42 (5) 18:28	31 18:00 (4)	16:38
24	08:30	07:36	17:19 (4) 06:33	06:24	05:33	05:18	05:46	06:35	07:25	18:20 (3) 08:16	16:59 (2)	08:11
	17:10	18:07	13 17:32 (4) 18:56	20:49	21:37	22:01	21:41	20:44	19:33	17 18:44 (5) 18:26	29 17:57 (4)	16:36
25	08:29	07:34	17:20 (4) 06:31	06:22	05:31	05:18	05:48	06:36	07:27	18:17 (3) 07:18	15:58 (2)	08:13
	17:11	18:09	11 17:31 (4) 18:58	20:51	21:38	22:01	21:39	20:42	19:31	26 18:46 (5) 17:24	25 16:23 (2)	16:35
26	08:27	07:32	17:21 (4) 06:28	06:20	05:30	05:19	05:49	06:38	07:29	18:15 (3) 07:20	15:58 (2)	08:14
	17:13	18:10	8 17:29 (4) 19:00	20:52	21:39	22:01	21:38	20:40	19:29	32 18:47 (5) 17:22	26 16:24 (2)	16:35
27	08:26	07:29	06:26	06:18	05:29	05:19	05:50	06:40	07:30	18:12 (3) 07:22	15:57 (2)	08:16
	17:15	18:12	19:01	20:54	21:41	22:01	21:36	20:38	19:26	34 18:46 (5) 17:20	27 16:24 (2)	16:34
28	08:25	07:27	06:24	06:16	05:28	05:20	05:52	06:41	07:32	18:11 (3) 07:24	15:57 (2)	08:17
	17:17	18:14	19:03	20:56	21:42	22:01	21:35	20:35	19:24	35 18:46 (5) 17:18	27 16:24 (2)	16:33
29	08:23		07:21	06:14	05:27	05:20	05:53	06:43	07:33	18:11 (3) 07:25	15:57 (2)	08:19
	17:19		20:05	20:57	21:43	22:01	21:33	20:33	19:22	35 18:46 (5) 17:16	27 16:24 (2)	16:32
30	08:22		07:19	06:12	05:26	05:21	05:55	06:45	07:35	18:09 (3) 07:27	15:57 (2)	08:20
	17:20		20:06	20:59	21:44	22:01	21:32	20:31	19:19	36 18:45 (5) 17:15	27 16:24 (2)	16:31
31	08:20		07:17		05:25		05:56	06:46		07:29	15:58 (2)	
	17:22		20:08		21:46		21:30	20:29		17:13	26 16:24 (2)	
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case		517	384						219	566	135	
Sun reduction		0.21	0.24						0.28	0.24	0.18	
Oper. time red.		1.00	1.00						1.00	1.00	1.00	
Wind dir. red.		0.62	0.65						0.65	0.63	0.62	
Total reduction		0.13	0.16						0.18	0.15	0.11	
Total, real		66	60						40	85	15	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** W - H23

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:15	06:10	05:24	05:22	05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01	21:47	22:01	21:29	20:27	19:17	17:11	16:31
2	08:45	08:17	07:23	07:12	06:08	05:24	05:22	06:00	06:50	07:39	07:33	08:23
	16:37	17:26	18:18	20:12	21:03	21:48	22:00	21:27	20:24	19:15	17:09	16:30
3	08:45	08:16	07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34	08:25
	16:38	17:28	18:19	20:13	21:04	21:49	22:00	21:25	20:22	19:12	17:07	16:29
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	16:40	17:30	18:21	20:15	21:06	21:50	21:59	21:24	20:20	19:10	17:05	16:29
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	16:41	17:32	18:23	20:17	21:07	21:51	21:59	21:22	20:17	19:08	17:04	16:28
6	08:45	08:11	07:14	07:03	06:00	05:21	05:25	06:06	06:56	07:45	07:40	08:29
	16:42	17:33	18:25	20:18	21:09	21:52	21:58	21:20	20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01	05:59	05:20	05:26	06:07	06:58	07:47	07:42	08:30
	16:43	17:35	18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59	05:57	05:20	05:27	06:09	06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22	21:12	21:54	21:57	21:16	20:11	19:01	16:59	16:27
9	08:43	08:05	07:07	06:56	05:55	05:19	05:28	06:11	07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:24	21:14	21:54	21:57	21:15	20:08	18:59	16:57	16:27
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	16:47	17:41	18:32	20:25	21:16	21:55	21:56	21:13	20:06	18:57	16:55	16:27
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14	08:40	07:56	06:56	06:45	05:47	05:18	05:33	06:19	07:09	07:59	07:54	08:37
	16:53	17:48	18:39	20:32	21:22	21:58	21:52	21:05	19:57	18:48	16:49	16:26
15	08:39	07:54	06:54	06:43	05:45	05:17	05:35	06:20	07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34	21:24	21:59	21:51	21:03	19:54	18:46	16:48	16:26
16	08:38	07:52	06:52	06:41	05:44	05:17	05:36	06:22	07:12	08:02	07:57	08:39
	16:56	17:52	18:42	20:35	21:25	21:59	21:50	21:01	19:52	18:43	16:46	16:26
17	08:37	07:50	06:49	06:39	05:42	05:17	05:37	06:23	07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37	21:27	22:00	21:49	20:59	19:50	18:41	16:45	16:27
18	08:37	07:48	06:47	06:36	05:41	05:17	05:38	06:25	07:16	08:06	08:01	08:41
	17:00	17:56	18:46	20:39	21:28	22:00	21:48	20:57	19:47	18:39	16:44	16:27
19	08:36	07:46	06:45	06:34	05:39	05:17	05:40	06:27	07:17	08:08	08:03	08:41
	17:01	17:58	18:48	20:41	21:30	22:00	21:47	20:55	19:45	18:37	16:42	16:27
20	08:34	07:44	06:42	06:32	05:38	05:17	05:41	06:28	07:19	08:09	08:04	08:42
	17:03	17:59	18:49	20:42	21:31	22:01	21:46	20:53	19:43	18:35	16:41	16:27
21	08:33	07:42	06:40	06:30	05:37	05:17	05:42	06:30	07:20	08:11	08:06	08:43
	17:05	18:01	18:51	20:44	21:32	22:01	21:45	20:51	19:40	18:33	16:40	16:28
22	08:32	07:40	06:38	06:28	05:35	05:18	05:44	06:32	07:22	08:13	08:08	08:43
	17:06	18:03	18:53	20:46	21:34	22:01	21:43	20:48	19:38	18:31	16:39	16:28
23	08:31	07:38	06:35	06:26	05:34	05:18	05:45	06:33	07:24	08:15	08:09	08:44
	17:08	18:05	18:54	20:47	21:35	22:01	21:42	20:46	19:36	18:29	16:38	16:29
24	08:30	07:36	06:33	06:24	05:33	05:18	05:46	06:35	07:25	08:16	08:11	08:44
	17:10	18:07	18:56	20:49	21:37	22:01	21:41	20:44	19:33	18:26	16:37	16:29
25	08:29	07:34	06:31	06:22	05:32	05:18	05:48	06:36	07:27	07:18	08:13	08:44
	17:12	18:09	18:58	20:51	21:38	22:01	21:39	20:42	19:31	17:24	16:36	16:30
26	08:27	07:32	06:28	06:20	05:30	05:19	05:49	06:38	07:29	07:20	08:14	08:45
	17:13	18:10	19:00	20:52	21:39	22:01	21:38	20:40	19:29	17:22	16:35	16:31
27	08:26	07:30	06:26	06:18	05:29	05:19	05:51	06:40	07:30	07:22	08:16	08:45
	17:15	18:12	19:01	20:54	21:41	22:01	21:36	20:38	19:26	17:20	16:34	16:32
28	08:25	07:27	06:24	06:16	05:28	05:20	05:52	06:41	07:32	07:24	08:17	08:45
	17:17	18:14	19:03	20:56	21:42	22:01	21:35	20:35	19:24	17:19	16:33	16:32
29	08:23		07:21	06:14	05:27	05:20	05:54	06:43	07:34	07:25	08:19	08:45
	17:19		20:05	20:57	21:43	22:01	21:33	20:33	19:22	17:17	16:32	16:33
30	08:22		07:19	06:12	05:26	05:21	05:55	06:45	07:35	07:27	08:20	08:46
	17:21		20:06	20:59	21:44	22:01	21:32	20:31	19:19	17:15	16:31	16:34
31	08:20		07:17		05:25		05:57	06:46		07:29		08:46
	17:22		20:08		21:46		21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** X - H24

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:14	06:10	05:24	20:43 (4) 05:21	05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01	21:47	9 20:52 (4) 22:01	21:29	20:27	19:17	17:11	16:31
2	08:45	08:17	07:23	07:12	06:08	05:24	20:44 (4) 05:22	06:00	06:49	07:39	07:32	08:23
	16:37	17:26	18:18	20:12	21:02	21:48	7 20:51 (4) 22:00	21:27	20:24	19:15	17:09	16:30
3	08:45	08:15	07:21	07:10	06:06	05:23	20:46 (4) 05:23	06:01	06:51	07:40	07:34	08:24
	16:38	17:28	18:19	20:13	21:04	21:49	5 20:51 (4) 22:00	21:25	20:22	19:12	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15	21:06	21:50	21:59	21:24	20:20	19:10	17:05	16:29
5	08:45	08:12	07:16	07:05	06:02	05:21	05:24	06:04	06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17	21:07	21:51	21:59	21:22	20:17	19:08	17:04	16:28
6	08:44	08:10	07:14	07:03	06:00	05:21	05:25	06:06	06:56	07:45	07:40	08:28
	16:42	17:33	18:25	20:18	21:09	21:52	21:58	21:20	20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01	05:59	05:20	05:26	06:07	06:58	07:47	07:41	08:30
	16:43	17:35	18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59	05:57	05:20	05:27	06:09	06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22	21:12	21:54	21:57	21:16	20:11	19:01	16:59	16:27
9	08:43	08:05	07:07	06:56	05:55	05:19	05:28 20:54 (4)	06:11	07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:23	21:14	21:54	21:56 3 20:57 (4)	21:15	20:08	18:59	16:57	16:27
10	08:43	08:03	07:05	06:54	05:53	05:19	05:29 20:53 (4)	06:12	07:02	07:52	07:47	08:33
	16:47	17:41	18:32	20:25	21:16	21:55	21:56 6 20:59 (4)	21:13	20:06	18:56	16:55	16:26
11	08:42	08:02	07:03	06:52	05:52	05:18	05:30 20:51 (4)	06:14	07:04	07:54	07:49	08:34
	16:49	17:43	18:34	20:27	21:17	21:56	21:55 8 20:59 (4)	21:11	20:04	18:54	16:54	16:26
12	08:41	08:00	07:01	06:50	05:50	05:18	05:31 20:51 (4)	06:15	07:06	07:55	07:50	08:35
	16:50	17:45	18:35	20:29	21:19	21:57	21:54 10 21:01 (4)	21:09	20:01	18:52	16:52	16:26
13	08:41	07:58	06:58	06:47	05:48 20:45 (4)	05:18	05:32 20:50 (4)	06:17	07:07	07:57	07:52	08:36
	16:52	17:46	18:37	20:30	21:20 1 20:46 (4)	21:57	21:53 12 21:02 (4)	21:07	19:59	18:50	16:51	16:26
14	08:40	07:56	06:56	06:45	05:47 20:42 (4)	05:17	05:33 20:50 (4)	06:19	07:09	07:59	07:54	08:37
	16:53	17:48	18:39	20:32	21:22 8 20:50 (4)	21:58	21:52 13 21:03 (4)	21:05	19:57	18:48	16:49	16:26
15	08:39	07:54	06:54	06:43	05:45 20:40 (4)	05:17	05:35 20:49 (4)	06:20	07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34	21:23 11 20:51 (4)	21:58	21:51 14 21:03 (4)	21:03	19:54	18:45	16:48	16:26
16	08:38	07:52	06:51	06:41	05:44 20:40 (4)	05:17	05:36 20:49 (4)	06:22	07:12	08:02	07:57	08:39
	16:56	17:52	18:42	20:35	21:25 13 20:53 (4)	21:59	21:50 15 21:04 (4)	21:01	19:52	18:43	16:46	16:26
17	08:37	07:50	06:49	06:39	05:42 20:39 (4)	05:17	05:37 20:48 (4)	06:23	07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37	21:27 15 20:54 (4)	21:59	21:49 16 21:04 (4)	20:59	19:50	18:41	16:45	16:27
18	08:36	07:48	06:47	06:36	05:41 20:38 (4)	05:17	05:38 20:48 (4)	06:25	07:15	08:06	08:01	08:41
	17:00	17:56	18:46	20:39	21:28 16 20:54 (4)	22:00	21:48 16 21:04 (4)	20:57	19:47	18:39	16:44	16:27
19	08:35	07:46	06:45	06:34	05:39 20:38 (4)	05:17	05:40 20:48 (4)	06:27	07:17	08:08	08:03	08:41
	17:01	17:58	18:48	20:40	21:29 16 20:54 (4)	22:00	21:47 16 21:04 (4)	20:55	19:45	18:37	16:42	16:27
20	08:34	07:44	06:42	06:32	05:38 20:38 (4)	05:17	05:41 20:48 (4)	06:28	07:19	08:09	08:04	08:42
	17:03	17:59	18:49	20:42	21:31 17 20:55 (4)	22:01	21:46 17 21:05 (4)	20:53	19:43	18:35	16:41	16:27
21	08:33	07:42	06:40	06:30	05:37 20:38 (4)	05:17	05:42 20:48 (4)	06:30	07:20	08:11	08:06	08:43
	17:05	18:01	18:51	20:44	21:32 17 20:55 (4)	22:01	21:45 17 21:05 (4)	20:51	19:40	18:33	16:40	16:28
22	08:32	07:40	06:38	06:28	05:35 20:37 (4)	05:18	05:44 20:48 (4)	06:32	07:22	08:13	08:08	08:43
	17:06	18:03	18:53	20:46	21:34 18 20:55 (4)	22:01	21:43 17 21:05 (4)	20:48	19:38	18:31	16:39	16:28
23	08:31	07:38	06:35	06:26	05:34 20:38 (4)	05:18	05:45 20:48 (4)	06:33	07:24	08:15	08:09	08:44
	17:08	18:05	18:54	20:47	21:35 17 20:55 (4)	22:01	21:42 17 21:05 (4)	20:46	19:36	18:28	16:38	16:29
24	08:30	07:36	06:33	06:24	05:33 20:38 (4)	05:18	05:46 20:49 (4)	06:35	07:25	08:16	08:11	08:44
	17:10	18:07	18:56	20:49	21:37 17 20:55 (4)	22:01	21:41 16 21:05 (4)	20:44	19:33	18:26	16:37	16:29
25	08:29	07:34	06:31	06:22	05:32 20:38 (4)	05:18	05:48 20:49 (4)	06:36	07:27	07:18	08:13	08:44
	17:11	18:09	18:58	20:51	21:38 17 20:55 (4)	22:01	21:39 16 21:05 (4)	20:42	19:31	17:24	16:36	16:30
26	08:27	07:32	06:28	06:20	05:30 20:39 (4)	05:19	05:49 20:49 (4)	06:38	07:29	07:20	08:14	08:45
	17:13	18:10	19:00	20:52	21:39 16 20:55 (4)	22:01	21:38 15 21:04 (4)	20:40	19:29	17:22	16:35	16:31
27	08:26	07:29	06:26	06:18	05:29 20:39 (4)	05:19	05:51 20:50 (4)	06:40	07:30	07:22	08:16	08:45
	17:15	18:12	19:01	20:54	21:41 15 20:54 (4)	22:01	21:36 14 21:04 (4)	20:38	19:26	17:20	16:34	16:31
28	08:24	07:27	06:24	06:16	05:28 20:39 (4)	05:20	05:52 20:50 (4)	06:41	07:32	07:23	08:17	08:45
	17:17	18:14	19:03	20:56	21:42 15 20:54 (4)	22:01	21:35 13 21:03 (4)	20:35	19:24	17:18	16:33	16:32
29	08:23		07:21	06:14	05:27 20:40 (4)	05:20	05:54 20:52 (4)	06:43	07:34	07:25	08:19	08:45
	17:19		20:05	20:57	21:43 13 20:53 (4)	22:01	21:33 10 21:02 (4)	20:33	19:22	17:17	16:32	16:33
30	08:22		07:19	06:12	05:26 20:42 (4)	05:21	05:55 20:54 (4)	06:45	07:35	07:27	08:20	08:45
	17:20		20:06	20:59	21:44 12 20:54 (4)	22:01	21:32 6 21:00 (4)	20:31	19:19	17:15	16:31	16:34
31	08:20		07:17		05:25 20:42 (4)		05:57	06:46		07:29		08:46
	17:22		20:08		21:45 11 20:53 (4)		21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case					265	21	287					
Sun reduction					0.37	0.30	0.27					
Oper. time red.					1.00	1.00	1.00					
Wind dir. red.					0.69	0.69	0.69					
Total reduction					0.25	0.21	0.18					
Total, real					67	4	53					

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** Y - H25

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:15	06:10	05:25	05:22	05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01	21:47	22:01	21:29	20:27	19:17	17:11	16:31
2	08:45	08:17	07:23	07:12	06:08	05:24	05:22	06:00	06:50	07:39	07:33	08:23
	16:37	17:26	18:18	20:12	21:03	21:48	22:00	21:27	20:24	19:15	17:09	16:30
3	08:45	08:16	07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34	08:25
	16:39	17:28	18:19	20:13	21:04	21:49	22:00	21:25	20:22	19:12	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36	08:26
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	17:01	17:58	18:48	20:41	21:30	22:00	21:47	20:55	19:45	18:37	16:42	16:27
20	08:34	07:44	06:42	06:32	05:38	05:17	05:41	06:28	07:19	08:09	08:04	08:42
	17:03	17:59	18:49	20:42	21:31	22:01	21:46	20:53	19:43	18:35	16:41	16:27
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22	08:32	07:40	06:38	06:28	05:35	05:18	05:44	06:32	07:22	08:13	08:08	08:43
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23	08:31	07:38	06:35	06:26	05:34	05:18	05:45	06:33	07:24	08:15	08:09	08:44
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25	08:29	07:34	06:31	06:22	05:32	05:18	05:48	06:36	07:27	07:18	08:13	08:45
	17:12	18:09	18:58	20:51	21:38	22:01	21:39	20:42	19:31	17:24	16:36	16:30
26	08:27	07:32	06:28	06:20	05:30	05:19	05:49	06:38	07:29	07:20	08:14	08:45
	17:13	18:10	19:00	20:52	21:39	22:01	21:38	20:40	19:29	17:22	16:35	16:31
27	08:26	07:30	06:26	06:18	05:29	05:19	05:51	06:40	07:30	07:22	08:16	08:45
	17:15	18:12	19:01	20:54	21:41	22:01	21:36	20:38	19:26	17:20	16:34	16:32
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	17:17	18:14	19:03	20:56	21:42	22:01	21:35	20:35	19:24	17:19	16:33	16:32
29	08:23		07:21	06:14	05:27	05:20	05:54	06:43	07:34	07:25	08:19	08:45
	17:19		20:05	20:57	21:43	22:01	21:33	20:33	19:22	17:17	16:32	16:33
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	17:21		20:06	20:59	21:44	22:01	21:32	20:31	19:19	17:15	16:31	16:34
31	08:20		07:17		05:25		05:57	06:46		07:29		08:46
	17:22		20:08		21:46		21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** Z - H26

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:15	06:10	05:24	05:22	05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01	21:47	22:01	21:29	20:27	19:17	17:11	16:31
2	08:45	08:17	07:23	07:12	06:08	05:24	05:22	06:00	06:49	07:39	07:32	08:23
	16:37	17:26	18:18	20:12	21:02	21:48	22:00	21:27	20:24	19:15	17:09	16:30
3	08:45	08:15	07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34	08:25
	16:38	17:28	18:19	20:13	21:04	21:49	22:00	21:25	20:22	19:12	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15	21:06	21:50	21:59	21:24	20:20	19:10	17:05	16:29
5	08:45	08:12	07:16	07:05	06:02	05:21	05:25	06:04	06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17	21:07	21:51	21:59	21:22	20:17	19:08	17:04	16:28
6	08:45	08:11	07:14	07:03	06:00	05:21	05:25	06:06	06:56	07:45	07:40	08:29
	16:42	17:33	18:25	20:18	21:09	21:52	21:58	21:20	20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01	05:59	05:20	05:26	06:07	06:58	07:47	07:41	08:30
	16:43	17:35	18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59	05:57	05:20	05:27	06:09	06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22	21:12	21:54	21:57	21:16	20:11	19:01	16:59	16:27
9	08:43	08:05	07:07	06:56	05:55	05:19	05:28	06:11	07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:24	21:14	21:54	21:57	21:15	20:08	18:59	16:57	16:27
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	16:47	17:41	18:32	20:25	21:16	21:55	21:56	21:13	20:06	18:57	16:55	16:27
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15	08:39	07:54	06:54	06:43	05:45	05:17	05:35	06:20	07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34	21:23	21:59	21:51	21:03	19:54	18:45	16:48	16:26
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	16:56	17:52	18:42	20:35	21:25	21:59	21:50	21:01	19:52	18:43	16:46	16:26
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	16:58	17:54	18:44	20:37	21:27	22:00	21:49	20:59	19:50	18:41	16:45	16:27
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	17:00	17:56	18:46	20:39	21:28	22:00	21:48	20:57	19:47	18:39	16:44	16:27
19	08:35	07:46	06:45	06:34	05:39	05:17	05:40	06:27	07:17	08:08	08:03	08:41
	17:01	17:58	18:48	20:41	21:30	22:00	21:47	20:55	19:45	18:37	16:42	16:27
20	08:34	07:44	06:42	06:32	05:38	05:17	05:41	06:28	07:19	08:09	08:04	08:42
	17:03	17:59	18:49	20:42	21:31	22:01	21:46	20:53	19:43	18:35	16:41	16:27
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	17:05	18:01	18:51	20:44	21:32	22:01	21:45	20:51	19:40	18:33	16:40	16:28
22	08:32	07:40	06:38	06:28	05:35	05:18	05:44	06:32	07:22	08:13	08:08	08:43
	17:06	18:03	18:53	20:46	21:34	22:01	21:43	20:48	19:38	18:31	16:39	16:28
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	17:08	18:05	18:54	20:47	21:35	22:01	21:42	20:46	19:36	18:29	16:38	16:29
24	08:30	07:36	06:33	06:24	05:33	05:18	05:46	06:35	07:25	08:16	08:11	08:44
	17:10	18:07	18:56	20:49	21:37	22:01	21:41	20:44	19:33	18:26	16:37	16:29
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	17:19		20:05	20:57	21:43	22:01	21:33	20:33	19:22	17:17	16:32	16:33
30	08:22		07:19	06:12	05:26	05:21	05:55	06:45	07:35	07:27	08:20	08:46
	17:21		20:06	20:59	21:44	22:01	21:32	20:31	19:19	17:15	16:31	16:34
31	08:20		07:17		05:25		05:57	06:46		07:29		08:46
	17:22		20:08		21:45		21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** AA - H27

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February		March		April	May	June	July	August	September		October		November	December
1	08:46	08:19		07:25		17:04 (2)	07:14	06:10	05:24	05:21	05:58	06:48		07:37		07:31	08:22
	16:36	17:24		18:16	22	17:26 (2)	20:10	21:01	21:47	22:01	21:29	20:26		19:17		17:11	16:30
2	08:45	08:17		07:23		17:03 (2)	07:12	06:08	05:23	05:22	05:59	06:49		07:38		07:32	08:23
	16:37	17:26		18:18	21	17:24 (2)	20:12	21:02	21:48	22:00	21:27	20:24		19:15		17:09	16:30
3	08:45	08:15		07:21		17:04 (2)	07:10	06:06	05:23	05:23	06:01	06:51		07:40		07:34	08:25
	16:38	17:28		18:19	19	17:23 (2)	20:13	21:04	21:49	22:00	21:25	20:22		19:12		17:07	16:29
4	08:45	08:14		07:19		17:06 (2)	07:08	06:04	05:22	05:24	06:03	06:53		07:42		07:36	08:26
	16:39	17:30		18:21	16	17:22 (2)	20:15	21:06	21:50	21:59	21:24	20:20		19:10		17:05	16:29
5	08:45	08:12		07:16		17:08 (2)	07:05	06:02	05:21	05:24	06:04	06:54		07:44		07:38	08:27
	16:41	17:31		18:23	12	17:20 (2)	20:17	21:07	21:51	21:59	21:22	20:17		19:08		17:04	16:28
6	08:45	08:11		07:14		17:11 (2)	07:03	06:00	05:21	05:25	06:06	06:56		07:45		07:40	08:29
	16:42	17:33		18:25	5	17:16 (2)	20:18	21:09	21:52	21:58	21:20	20:15		19:05		17:02	16:28
7	08:44	08:09		07:12			07:01	05:58	05:20	05:26	06:07	06:58		07:47		07:41	08:30
	16:43	17:35		18:26			20:20	21:11	21:53	21:58	21:18	20:13		19:03		17:00	16:27
8	08:44	08:07		07:10			06:58	05:57	05:19	05:27	06:09	06:59		07:49	17:44 (2)	07:43	08:31
	16:44	17:37		18:28			20:22	21:12	21:54	21:57	21:16	20:11		19:01	10 17:54 (2)	16:58	16:27
9	08:43	08:05		07:07			06:56	05:55	05:19	05:28	06:10	07:01		07:50	17:42 (2)	07:45	08:32
	16:46	17:39		18:30			20:23	21:14	21:54	21:57	21:15	20:08		18:59	14 17:56 (2)	16:57	16:27
10	08:43	08:03		07:05			06:54	05:53	05:19	05:29	06:12	07:02		07:52	17:39 (2)	07:47	08:33
	16:47	17:41		18:32			20:25	21:16	21:55	21:56	21:13	20:06		18:56	18 17:57 (2)	16:55	16:26
11	08:42	08:02		07:03			06:52	05:52	05:18	05:30	06:14	07:04		07:54	17:38 (2)	07:49	08:34
	16:49	17:43		18:34			20:27	21:17	21:56	21:55	21:11	20:04		18:54	20 17:58 (2)	16:54	16:26
12	08:41	08:00		07:01			06:49	05:50	05:18	05:31	06:15	07:06		07:55	17:37 (2)	07:50	08:35
	16:50	17:45		18:35			20:29	21:19	21:57	21:54	21:09	20:01		18:52	22 17:59 (2)	16:52	16:26
13	08:41	07:58		06:58			06:47	05:48	05:18	05:32	06:17	07:07		07:57	17:37 (2)	07:52	08:36
	16:52	17:46		18:37			20:30	21:20	21:57	21:53	21:07	19:59		18:50	22 17:59 (2)	16:51	16:26
14	08:40	07:56		06:56			06:45	05:47	05:17	05:33	06:18	07:09		07:59	17:36 (2)	07:54	08:37
	16:53	17:48		18:39			20:32	21:22	21:58	21:52	21:05	19:57		18:48	23 17:59 (2)	16:49	16:26
15	08:39	07:54		06:54		17:59 (3)	06:43	05:45	05:17	05:34	06:20	07:11		08:01	17:35 (2)	07:56	08:38
	16:55	17:50		18:41	9	18:08 (3)	20:34	21:24	21:59	21:51	21:03	19:54		18:45	23 17:58 (2)	16:48	16:26
16	08:38	07:52		06:51		17:56 (3)	06:41	05:44	05:17	05:36	06:22	07:12		08:02	17:35 (2)	07:57	08:39
	16:56	17:52		18:42	13	18:09 (3)	20:35	21:25	21:59	21:50	21:01	19:52		18:43	23 17:58 (2)	16:46	16:26
17	08:37	07:50		06:49		17:54 (3)	06:38	05:42	05:17	05:37	06:23	07:14	18:44 (3)	08:04		17:35 (2)	07:59	08:40
	16:58	17:54		18:44	21	18:15 (5)	20:37	21:27	22:00	21:49	20:59	19:50	9 18:53 (3)	18:41	23	17:58 (2)	16:45	16:26
18	08:36	07:48		06:47		17:53 (3)	06:36	05:41	05:17	05:38	06:25	07:15	18:42 (3)	08:06		17:36 (2)	08:01	08:41
	16:59	17:56		18:46	24	18:17 (5)	20:39	21:28	22:00	21:48	20:57	19:47	18 19:00 (5)	18:39	21	17:57 (2)	16:44	16:27
19	08:35	07:46	17:13 (2)	06:45		17:52 (3)	06:34	05:39	05:17	05:39	06:27	07:17	18:39 (3)	08:08		17:37 (2)	08:03	08:41
	17:01	17:57	4 17:17 (2)	18:48	25	18:17 (5)	20:41	21:30	22:00	21:47	20:55	19:45	22 19:01 (5)	18:37	20	17:57 (2)	16:42	16:27
20	08:34	07:44	17:09 (2)	06:42		17:52 (3)	06:32	05:38	05:17	05:41	06:28	07:19	18:38 (3)	08:09		17:38 (2)	08:04	08:42
	17:03	17:59	12 17:21 (2)	18:49	25	18:17 (5)	20:42	21:31	22:01	21:46	20:53	19:43	24 19:02 (5)	18:35	17	17:55 (2)	16:41	16:27
21	08:33	07:42	17:07 (2)	06:40		17:52 (3)	06:30	05:36	05:17	05:42	06:30	07:20	18:37 (3)	08:11		17:38 (2)	08:06	08:43
	17:04	18:01	16 17:23 (2)	18:51	26	18:18 (5)	20:44	21:32	22:01	21:45	20:51	19:40	25 19:02 (5)	18:33	15	17:53 (2)	16:40	16:28
22	08:32	07:40	17:06 (2)	06:38		17:51 (3)	06:28	05:35	05:17	05:43	06:31	07:22	18:36 (3)	08:13		17:40 (2)	08:08	08:43
	17:06	18:03	19 17:25 (2)	18:53	25	18:16 (5)	20:46	21:34	22:01	21:43	20:48	19:38	26 19:02 (5)	18:30	11	17:51 (2)	16:39	16:28
23	08:31	07:38	17:05 (2)	06:35		17:52 (3)	06:26	05:34	05:18	05:45	06:33	07:24	18:36 (3)	08:15			08:09	08:44
	17:08	18:05	21 17:26 (2)	18:54	24	18:16 (5)	20:47	21:35	22:01	21:42	20:46	19:36	26 19:02 (5)	18:28			16:38	16:29
24	08:30	07:36	17:04 (2)	06:33		17:52 (3)	06:24	05:33	05:18	05:46	06:35	07:25	18:35 (3)	08:16			08:11	08:44
	17:10	18:07	22 17:26 (2)	18:56	23	18:15 (5)	20:49	21:37	22:01	21:41	20:44	19:33	26 19:01 (5)	18:26			16:36	16:29
25	08:29	07:34	17:04 (2)	06:31		17:53 (3)	06:22	05:31	05:18	05:48	06:36	07:27	18:36 (3)	07:18			08:13	08:45
	17:11	18:08	23 17:27 (2)	18:58	19	18:12 (5)	20:51	21:38	22:01	21:39	20:42	19:31	24 19:00 (5)	17:24			16:35	16:30
26	08:27	07:32	17:03 (2)	06:28		17:55 (3)	06:20	05:30	05:19	05:49	06:38	07:29	18:37 (3)	07:20			08:14	08:45
	17:13	18:10	23 17:26 (2)	19:00	10	18:05 (3)	20:52	21:39	22:01	21:38	20:40	19:29	21 18:58 (5)	17:22			16:35	16:31
27	08:26	07:29	17:03 (2)	06:26			06:17	05:29	05:19	05:50	06:40	07:30	18:37 (3)	07:22			08:16	08:45
	17:15	18:12	23 17:26 (2)	19:01			20:54	21:41	22:01	21:36	20:38	19:26	15 18:52 (3)	17:20			16:34	16:31
28	08:25	07:27	17:03 (2)	06:24			06:15	05:28	05:20	05:52	06:41	07:32	18:38 (3)	07:23			08:17	08:45
	17:17	18:14	23 17:26 (2)	19:03			20:56	21:42	22:01	21:35	20:35	19:24	12 18:50 (3)	17:18			16:33	16:32
29	08:23			07:21			06:14	05:27	05:20	05:53	06:43	07:33	18:42 (3)	07:25			08:19	08:45
	17:19			20:05			20:57	21:43	22:01	21:33	20:33	19:22	5 18:47 (3)	17:16			16:32	16:33
30	08:22			07:19			06:12	05:26	05:21	05:55	06:44	07:35		07:27			08:20	08:46
	17:20			20:06			20:59	21:44	22:01	21:32	20:31	19:19		17:15			16:31	16:34
31	08:20			07:17				05:25		05:56	06:46			07:29				08:46
	17:22			20:08				21:46		21:30	20:29			17:13				16:35
Potential sun hours	259	278		367		416	485	499	502	454	381		331		266	244
Total, worst case			186		339							253		282		
Sun reduction			0.21		0.24							0.28		0.24		
Oper. time red.			1.00		1.00							1.00		1.00		
Wind dir. red.			0.64		0.66							0.66		0.64		
Total reduction			0.13		0.16							0.19		0.15		
Total, real			24		54							48		43		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** AB - H28

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:15	06:10	05:25	05:22	05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01	21:47	22:01	21:29	20:27	19:17	17:11	16:31
2	08:45	08:17	07:23	07:12	06:08	05:24	05:22	06:00	06:50	07:39	07:33	08:23
	16:37	17:26	18:18	20:12	21:03	21:48	22:00	21:27	20:24	19:15	17:09	16:30
3	08:45	08:16	07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34	08:25
	16:39	17:28	18:19	20:13	21:04	21:49	22:00	21:25	20:22	19:12	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15	21:06	21:50	21:59	21:24	20:20	19:10	17:05	16:29
5	08:45	08:12	07:16	07:05	06:02	05:21	05:25	06:04	06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17	21:07	21:51	21:59	21:22	20:17	19:08	17:04	16:28
6	08:45	08:11	07:14	07:03	06:00	05:21	05:25	06:06	06:56	07:45	07:40	08:29
	16:42	17:33	18:25	20:18	21:09	21:52	21:58	21:20	20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01	05:59	05:20	05:26	06:07	06:58	07:47	07:42	08:30
	16:43	17:35	18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59	05:57	05:20	05:27	06:09	06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22	21:12	21:54	21:57	21:16	20:11	19:01	16:59	16:27
9	08:43	08:05	07:07	06:56	05:55	05:19	05:28	06:11	07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:24	21:14	21:54	21:57	21:15	20:08	18:59	16:57	16:27
10	08:43	08:04	07:05	06:54	05:53	05:19	05:29	06:12	07:03	07:52	07:47	08:33
	16:47	17:41	18:32	20:25	21:16	21:55	21:56	21:13	20:06	18:57	16:55	16:27
11	08:42	08:02	07:03	06:52	05:52	05:18	05:30	06:14	07:04	07:54	07:49	08:34
	16:49	17:43	18:34	20:27	21:17	21:56	21:55	21:11	20:04	18:54	16:54	16:26
12	08:41	08:00	07:01	06:50	05:50	05:18	05:31	06:15	07:06	07:55	07:50	08:35
	16:50	17:45	18:35	20:29	21:19	21:57	21:54	21:09	20:01	18:52	16:52	16:26
13	08:41	07:58	06:58	06:47	05:48	05:18	05:32	06:17	07:07	07:57	07:52	08:36
	16:52	17:47	18:37	20:30	21:20	21:57	21:53	21:07	19:59	18:50	16:51	16:26
14	08:40	07:56	06:56	06:45	05:47	05:18	05:34	06:19	07:09	07:59	07:54	08:37
	16:53	17:48	18:39	20:32	21:22	21:58	21:52	21:05	19:57	18:48	16:49	16:26
15	08:39	07:54	06:54	06:43	05:45	05:17	05:35	06:20	07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34	21:24	21:59	21:51	21:03	19:54	18:46	16:48	16:26
16	08:38	07:52	06:52	06:41	05:44	05:17	05:36	06:22	07:12	08:02	07:57	08:39
	16:56	17:52	18:42	20:35	21:25	21:59	21:50	21:01	19:52	18:43	16:46	16:26
17	08:37	07:50	06:49	06:39	05:42	05:17	05:37	06:23	07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37	21:27	22:00	21:49	20:59	19:50	18:41	16:45	16:27
18	08:37	07:48	06:47	06:36	05:41	05:17	05:38	06:25	07:16	08:06	08:01	08:41
	17:00	17:56	18:46	20:39	21:28	22:00	21:48	20:57	19:47	18:39	16:44	16:27
19	08:36	07:46	06:45	06:34	05:39	05:17	05:40	06:27	07:17	08:08	08:03	08:41
	17:01	17:58	18:48	20:41	21:30	22:00	21:47	20:55	19:45	18:37	16:42	16:27
20	08:34	07:44	06:42	06:32	05:38	05:17	05:41	06:28	07:19	08:09	08:04	08:42
	17:03	17:59	18:49	20:42	21:31	22:01	21:46	20:53	19:43	18:35	16:41	16:27
21	08:33	07:42	06:40	06:30	05:37	05:17	05:42	06:30	07:20	08:11	08:06	08:43
	17:05	18:01	18:51	20:44	21:32	22:01	21:45	20:51	19:40	18:33	16:40	16:28
22	08:32	07:40	06:38	06:28	05:35	05:18	05:44	06:32	07:22	08:13	08:08	08:43
	17:06	18:03	18:53	20:46	21:34	22:01	21:43	20:48	19:38	18:31	16:39	16:28
23	08:31	07:38	06:35	06:26	05:34	05:18	05:45	06:33	07:24	08:15	08:09	08:44
	17:08	18:05	18:54	20:47	21:35	22:01	21:42	20:46	19:36	18:29	16:38	16:29
24	08:30	07:36	06:33	06:24	05:33	05:18	05:46	06:35	07:25	08:16	08:11	08:44
	17:10	18:07	18:56	20:49	21:37	22:01	21:41	20:44	19:33	18:27	16:37	16:29
25	08:29	07:34	06:31	06:22	05:32	05:18	05:48	06:36	07:27	07:18	08:13	08:44
	17:12	18:09	18:58	20:51	21:38	22:01	21:39	20:42	19:31	17:24	16:36	16:30
26	08:27	07:32	06:28	06:20	05:30	05:19	05:49	06:38	07:29	07:20	08:14	08:45
	17:13	18:10	19:00	20:52	21:39	22:01	21:38	20:40	19:29	17:22	16:35	16:31
27	08:26	07:30	06:26	06:18	05:29	05:19	05:51	06:40	07:30	07:22	08:16	08:45
	17:15	18:12	19:01	20:54	21:41	22:01	21:36	20:38	19:26	17:20	16:34	16:32
28	08:25	07:27	06:24	06:16	05:28	05:20	05:52	06:41	07:32	07:24	08:17	08:45
	17:17	18:14	19:03	20:56	21:42	22:01	21:35	20:35	19:24	17:19	16:33	16:32
29	08:23		07:21	06:14	05:27	05:20	05:54	06:43	07:34	07:25	08:19	08:45
	17:19		20:05	20:57	21:43	22:01	21:33	20:33	19:22	17:17	16:32	16:33
30	08:22		07:19	06:12	05:26	05:21	05:55	06:45	07:35	07:27	08:20	08:46
	17:21		20:06	20:59	21:44	22:01	21:32	20:31	19:19	17:15	16:31	16:34
31	08:20		07:17		05:25		05:57	06:46		07:29		08:46
	17:22		20:08		21:46		21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** AC - H29

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March		April		May	June	July	August	September		October		November	December
1	08:46	08:19	07:25		07:14		19:07 (3)	06:10	05:24	05:21	05:58	06:48		07:37	18:05 (2)	07:31	08:22
	16:36	17:24	18:16		20:10	14	19:21 (3)	21:01	21:47	22:01	21:29	20:26		19:17	19 18:24 (2)	17:11	16:30
2	08:45	08:17	07:23		07:12		19:09 (3)	06:08	05:23	05:22	05:59	06:49		07:38	18:04 (2)	07:32	08:23
	16:37	17:26	18:18		20:12	10	19:19 (3)	21:02	21:48	22:00	21:27	20:24		19:15	20 18:24 (2)	17:09	16:30
3	08:45	08:15	07:21		07:10		19:12 (3)	06:06	05:23	05:23	06:01	06:51		07:40	18:03 (2)	07:34	08:25
	16:38	17:28	18:19	8	17:41 (2)	3	19:15 (3)	21:04	21:49	22:00	21:25	20:22		19:12	21 18:24 (2)	17:07	16:29
4	08:45	08:14	07:19		17:30 (2)		07:08	06:04	05:22	05:24	06:03	06:53		07:42	18:02 (2)	07:36	08:26
	16:39	17:30	18:21	14	17:44 (2)		20:15	21:06	21:50	21:59	21:24	20:20		19:10	22 18:24 (2)	17:05	16:29
5	08:45	08:12	07:16		17:29 (2)		07:05	06:02	05:21	05:24	06:04	06:54		07:44	18:02 (2)	07:38	08:27
	16:41	17:31	18:23	16	17:45 (2)		20:17	21:07	21:51	21:59	21:22	20:17		19:08	22 18:24 (2)	17:04	16:28
6	08:45	08:10	07:14		17:27 (2)		07:03	06:00	05:21	05:25	06:06	06:56		07:45	18:02 (2)	07:40	08:29
	16:42	17:33	18:25	18	17:45 (2)		20:18	21:09	21:52	21:58	21:20	20:15		19:05	20 18:22 (2)	17:02	16:28
7	08:44	08:09	07:12		17:26 (2)		07:01	05:58	05:20	05:26	06:07	06:58		07:47	18:02 (2)	07:41	08:30
	16:43	17:35	18:26	20	17:46 (2)		20:20	21:11	21:53	21:58	21:18	20:13		19:03	20 18:22 (2)	17:00	16:27
8	08:44	08:07	07:10		17:26 (2)		06:58	05:57	05:19	05:27	06:09	06:59		07:49	18:03 (2)	07:43	08:31
	16:44	17:37	18:28	21	17:47 (2)		20:22	21:12	21:54	21:57	21:16	20:11		19:01	18 18:21 (2)	16:58	16:27
9	08:43	08:05	07:07		17:25 (2)		06:56	05:55	05:19	05:28	06:10	07:01		07:50	18:04 (2)	07:45	08:32
	16:46	17:39	18:30	22	17:47 (2)		20:23	21:14	21:54	21:57	21:15	20:08		18:59	16 18:20 (2)	16:57	16:27
10	08:43	08:03	07:05		17:25 (2)		06:54	05:53	05:19	05:29	06:12	07:02	19:02 (3)	07:52	18:05 (2)	07:47	08:33
	16:47	17:41	18:32	21	17:46 (2)		20:25	21:16	21:55	21:56	21:13	20:06	10 19:12 (3)	18:56	12 18:17 (2)	16:55	16:26
11	08:42	08:02	07:03		17:25 (2)		06:52	05:52	05:18	05:30	06:14	07:04	18:59 (3)	07:54	18:09 (2)	07:49	08:34
	16:49	17:43	18:34	21	17:46 (2)		20:27	21:17	21:56	21:55	21:11	20:04	14 19:13 (3)	18:54	4 18:13 (2)	16:54	16:26
12	08:41	08:00	07:01		17:26 (2)		06:49	05:50	05:18	05:31	06:15	07:06	18:58 (3)	07:55		07:50	08:35
	16:50	17:44	18:35	19	17:45 (2)		20:29	21:19	21:57	21:54	21:09	20:01	16 19:14 (3)	18:52		16:52	16:26
13	08:41	07:58	06:58		17:25 (2)		06:47	05:48	05:18	05:32	06:17	07:07	18:57 (3)	07:57		07:52	08:36
	16:52	17:46	18:37	19	17:44 (2)		20:30	21:20	21:57	21:53	21:07	19:59	18 19:15 (3)	18:50		16:51	16:26
14	08:40	07:56	06:56		17:27 (2)		06:45	05:47	05:17	05:33	06:18	07:09	18:56 (3)	07:59		07:54	08:37
	16:53	17:48	18:39	15	17:42 (2)		20:32	21:22	21:58	21:52	21:05	19:57	18 19:14 (3)	18:48		16:49	16:26
15	08:39	07:54	06:54		17:29 (2)		06:43	05:45	05:17	05:34	06:20	07:11	18:56 (3)	08:01		07:56	08:38
	16:55	17:50	18:41	12	17:41 (2)		20:34	21:23	21:59	21:51	21:03	19:54	18 19:14 (3)	18:45		16:48	16:26
16	08:38	07:52	06:51		17:31 (2)		06:41	05:44	05:17	05:36	06:22	07:12	18:55 (3)	08:02		07:57	08:39
	16:56	17:52	18:42	5	17:36 (2)		20:35	21:25	21:59	21:50	21:01	19:52	18 19:13 (3)	18:43		16:46	16:26
17	08:37	07:50	06:49				06:38	05:42	05:17	05:37	06:23	07:14	18:56 (3)	08:04		07:59	08:40
	16:58	17:54	18:44				20:37	21:27	22:00	21:49	20:59	19:50	17 19:13 (3)	18:41		16:45	16:26
18	08:36	07:48	06:47				06:36	05:41	05:17	05:38	06:25	07:15	18:56 (3)	08:06		08:01	08:41
	16:59	17:56	18:46				20:39	21:28	22:00	21:48	20:57	19:47	16 19:12 (3)	18:39		16:44	16:27
19	08:35	07:46	06:45				06:34	05:39	05:17	05:39	06:27	07:17	18:57 (3)	08:08		08:03	08:41
	17:01	17:57	18:47				20:40	21:30	22:00	21:47	20:55	19:45	13 19:10 (3)	18:37		16:42	16:27
20	08:34	07:44	06:42				06:32	05:38	05:17	05:41	06:28	07:19	18:58 (3)	08:09		08:04	08:42
	17:03	17:59	18:49				20:42	21:31	22:01	21:46	20:53	19:43	10 19:08 (3)	18:35		16:41	16:27
21	08:33	07:42	06:40				06:30	05:36	05:17	05:42	06:30	07:20		08:11		08:06	08:43
	17:04	18:01	18:51				20:44	21:32	22:01	21:45	20:51	19:40		18:33		16:40	16:28
22	08:32	07:40	06:38				06:28	05:35	05:17	05:43	06:31	07:22		08:13		08:08	08:43
	17:06	18:03	18:53				20:46	21:34	22:01	21:43	20:48	19:38		18:30		16:39	16:28
23	08:31	07:38	06:35		18:12 (3)		06:26	05:34	05:18	05:45	06:33	07:24		08:15		08:09	08:44
	17:08	18:05	18:54	9	18:21 (3)		20:47	21:35	22:01	21:42	20:46	19:36		18:28		16:38	16:29
24	08:30	07:36	06:33		18:10 (3)		06:24	05:33	05:18	05:46	06:35	07:25		08:16		08:11	08:44
	17:10	18:07	18:56	13	18:23 (3)		20:49	21:37	22:01	21:41	20:44	19:33		18:26		16:36	16:29
25	08:29	07:34	06:31		18:08 (3)		06:22	05:31	05:18	05:48	06:36	07:27		07:18		08:13	08:44
	17:11	18:08	18:58	16	18:24 (3)		20:51	21:38	22:01	21:39	20:42	19:31		17:24		16:35	16:30
26	08:27	07:32	06:28		18:07 (3)		06:20	05:30	05:19	05:49	06:38	07:29		07:20		08:14	08:45
	17:13	18:10	19:00	17	18:24 (3)		20:52	21:39	22:01	21:38	20:40	19:29		17:22		16:34	16:31
27	08:26	07:29	06:26		18:07 (3)		06:17	05:29	05:19	05:50	06:40	07:30		07:22		08:16	08:45
	17:15	18:12	19:01	18	18:25 (3)		20:54	21:41	22:01	21:36	20:38	19:26		17:20		16:34	16:31
28	08:25	07:27	06:24		18:06 (3)		06:15	05:28	05:20	05:52	06:41	07:32	18:10 (2)	07:23		08:17	08:45
	17:17	18:14	19:03	18	18:24 (3)		20:56	21:42	22:01	21:35	20:35	19:24	11 18:21 (2)	17:18		16:33	16:32
29	08:23		07:21		19:06 (3)		06:14	05:27	05:20	05:53	06:43	07:33	18:08 (2)	07:25		08:19	08:45
	17:19		20:05	18	19:24 (3)		20:57	21:43	22:01	21:33	20:33	19:22	15 18:23 (2)	17:16		16:32	16:33
30	08:22		07:19		19:06 (3)		06:12	05:26	05:21	05:55	06:44	07:35	18:06 (2)	07:27		08:20	08:46
	17:20		20:06	18	19:24 (3)		20:59	21:44	22:01	21:32	20:31	19:19	17 18:23 (2)	17:15		16:31	16:34
31	08:20		07:17		19:06 (3)			05:25		05:56	06:46			07:29			08:46
	17:22		20:08	16	19:22 (3)			21:45		21:30	20:29			17:13			16:35
Potential sun hours	259	278	367		416		485	499	502	454	381		331		266	244
Total, worst case				374		27						211		194		
Sun reduction				0.24		0.35						0.28		0.24		
Oper. time red.				1.00		1.00						1.00		1.00		
Wind dir. red.				0.65		0.67						0.67		0.64		
Total reduction				0.16		0.24						0.19		0.15		
Total, real				60		6						40		30		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** AD - H30

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:15	06:10	05:24	05:22	05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01	21:47	22:01	21:29	20:27	19:17	17:11	16:31
2	08:45	08:17	07:23	07:12	06:08	05:24	05:22	06:00	06:49	07:39	07:32	08:23
	16:37	17:26	18:18	20:12	21:02	21:48	22:00	21:27	20:24	19:15	17:09	16:30
3	08:45	08:15	07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34	08:24
	16:38	17:28	18:19	20:13	21:04	21:49	22:00	21:25	20:22	19:12	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15	21:06	21:50	21:59	21:24	20:20	19:10	17:05	16:29
5	08:45	08:12	07:16	07:05	06:02	05:21	05:24	06:04	06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17	21:07	21:51	21:59	21:22	20:17	19:08	17:04	16:28
6	08:44	08:10	07:14	07:03	06:00	05:21	05:25	06:06	06:56	07:45	07:40	08:28
	16:42	17:33	18:25	20:18	21:09	21:52	21:58	21:20	20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01	05:59	05:20	05:26	06:07	06:58	07:47	07:41	08:30
	16:43	17:35	18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59	05:57	05:20	05:27	06:09	06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22	21:12	21:54	21:57	21:16	20:11	19:01	16:59	16:27
9	08:43	08:05	07:07	06:56	05:55	05:19	05:28	06:11	07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:23	21:14	21:54	21:56	21:15	20:08	18:59	16:57	16:27
10	08:43	08:03	07:05	06:54	05:53	05:19	05:29	06:12	07:02	07:52	07:47	08:33
	16:47	17:41	18:32	20:25	21:16	21:55	21:56	21:13	20:06	18:57	16:55	16:26
11	08:42	08:02	07:03	06:52	05:52	05:18	05:30	06:14	07:04	07:54	07:49	08:34
	16:49	17:43	18:34	20:27	21:17	21:56	21:55	21:11	20:04	18:54	16:54	16:26
12	08:41	08:00	07:01	06:50	05:50	05:18	05:31	06:15	07:06	07:55	07:50	08:35
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13	08:41	07:58	06:58	06:47	05:48	05:18	05:32	06:17	07:07	07:57	07:52	08:36
	16:52	17:46	18:37	20:30	21:20	21:57	21:53	21:07	19:59	18:50	16:51	16:26
14	08:40	07:56	06:56	06:45	05:47	05:17	05:33	06:19	07:09	07:59	07:54	08:37
	16:53	17:48	18:39	20:32	21:22	21:58	21:52	21:05	19:57	18:48	16:49	16:26
15	08:39	07:54	06:54	06:43	05:45	05:17	05:35	06:20	07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34	21:23	21:58	21:51	21:03	19:54	18:45	16:48	16:26
16	08:38	07:52	06:51	06:41	05:44	05:17	05:36	06:22	07:12	08:02	07:57	08:39
	16:56	17:52	18:42	20:35	21:25	21:59	21:50	21:01	19:52	18:43	16:46	16:26
17	08:37	07:50	06:49	06:39	05:42	05:17	05:37	06:23	07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37	21:27	21:59	21:49	20:59	19:50	18:41	16:45	16:27
18	08:36	07:48	06:47	06:36	05:41	05:17	05:38	06:25	07:15	08:06	08:01	08:41
	17:00	17:56	18:46	20:39	21:28	22:00	21:48	20:57	19:47	18:39	16:44	16:27
19	08:35	07:46	06:45	06:34	05:39	05:17	05:40	06:27	07:17	08:08	08:03	08:41
	17:01	17:58	18:48	20:41	21:29	22:00	21:47	20:55	19:45	18:37	16:42	16:27
20	08:34	07:44	06:42	06:32	05:38	05:17	05:41	06:28	07:19	08:09	08:04	08:42
	17:03	17:59	18:49	20:42	21:31	22:01	21:46	20:53	19:43	18:35	16:41	16:27
21	08:33	07:42	06:40	06:30	05:37	05:17	05:42	06:30	07:20	08:11	08:06	08:43
	17:05	18:01	18:51	20:44	21:32	22:01	21:45	20:51	19:40	18:33	16:40	16:28
22	08:32	07:40	06:38	06:28	05:35	05:18	05:44	06:32	07:22	08:13	08:08	08:43
	17:06	18:03	18:53	20:46	21:34	22:01	21:43	20:48	19:38	18:31	16:39	16:28
23	08:31	07:38	06:35	06:26	05:34	05:18	05:45	06:33	07:24	08:15	08:09	08:44
	17:08	18:05	18:54	20:47	21:35	22:01	21:42	20:46	19:36	18:28	16:38	16:29
24	08:30	07:36	06:33	06:24	05:33	05:18	05:46	06:35	07:25	08:16	08:11	08:44
	17:10	18:07	18:56	20:49	21:37	22:01	21:41	20:44	19:33	18:26	16:37	16:29
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26	08:27	07:32	06:28	06:20	05:30	05:19	05:49	06:38	07:29	07:20	08:14	08:45
	17:13	18:10	19:00	20:52	21:39	22:01	21:38	20:40	19:29	17:22	16:35	16:31
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28	08:24	07:27	06:24	06:16	05:28	05:20	05:52	06:41	07:32	07:23	08:17	08:45
	17:17	18:14	19:03	20:56	21:42	22:01	21:35	20:35	19:24	17:18	16:33	16:32
29	08:23		07:21	06:14	05:27	05:20	05:54	06:43	07:34	07:25	08:19	08:45
	17:19		20:05	20:57	21:43	22:01	21:33	20:33	19:22	17:17	16:32	16:33
30	08:22		07:19	06:12	05:26	05:21	05:55	06:45	07:35	07:27	08:20	08:45
	17:20		20:06	20:59	21:44	22:01	21:32	20:31	19:19	17:15	16:31	16:34
31	08:20		07:17		05:25		05:57	06:46		07:29		08:46
	17:22		20:08		21:45		21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** AE - H31

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:15	06:10	05:24	05:22	05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01	21:47	22:01	21:29	20:27	19:17	17:11	16:31
2	08:45	08:17	07:23	07:12	06:08	05:24	05:22	06:00	06:49	07:39	07:32	08:23
	16:37	17:26	18:18	20:12	21:02	21:48	22:00	21:27	20:24	19:15	17:09	16:30
3	08:45	08:15	07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34	08:24
	16:38	17:28	18:19	20:13	21:04	21:49	22:00	21:25	20:22	19:12	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15	21:06	21:50	21:59	21:24	20:20	19:10	17:05	16:29
5	08:45	08:12	07:16	07:05	06:02	05:21	05:24	06:04	06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17	21:07	21:51	21:59	21:22	20:17	19:08	17:04	16:28
6	08:44	08:11	07:14	07:03	06:00	05:21	05:25	06:06	06:56	07:45	07:40	08:28
	16:42	17:33	18:25	20:18	21:09	21:52	21:58	21:20	20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01	05:59	05:20	05:26	06:07	06:58	07:47	07:41	08:30
	16:43	17:35	18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59	05:57	05:20	05:27	06:09	06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22	21:12	21:54	21:57	21:16	20:11	19:01	16:59	16:27
9	08:43	08:05	07:07	06:56	05:55	05:19	05:28	06:11	07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:23	21:14	21:54	21:56	21:15	20:08	18:59	16:57	16:27
10	08:43	08:03	07:05	06:54	05:53	05:19	05:29	06:12	07:02	07:52	07:47	08:33
	16:47	17:41	18:32	20:25	21:16	21:55	21:56	21:13	20:06	18:57	16:55	16:26
11	08:42	08:02	07:03	06:52	05:52	05:18	05:30	06:14	07:04	07:54	07:49	08:34
	16:49	17:43	18:34	20:27	21:17	21:56	21:55	21:11	20:04	18:54	16:54	16:26
12	08:41	08:00	07:01	06:50	05:50	05:18	05:31	06:15	07:06	07:55	07:50	08:35
	16:50	17:45	18:35	20:29	21:19	21:57	21:54	21:09	20:01	18:52	16:52	16:26
13	08:41	07:58	06:58	06:47	05:48	05:18	05:32	06:17	07:07	07:57	07:52	08:36
	16:52	17:46	18:37	20:30	21:20	21:57	21:53	21:07	19:59	18:50	16:51	16:26
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	16:53	17:48	18:39	20:32	21:22	21:58	21:52	21:05	19:57	18:48	16:49	16:26
15	08:39	07:54	06:54	06:43	05:45	05:17	05:35	06:20	07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34	21:23	21:59	21:51	21:03	19:54	18:45	16:48	16:26
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	16:56	17:52	18:42	20:35	21:25	21:59	21:50	21:01	19:52	18:43	16:46	16:26
17	08:37	07:50	06:49	06:39	05:42	05:17	05:37	06:23	07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37	21:27	21:59	21:49	20:59	19:50	18:41	16:45	16:27
18	08:36	07:48	06:47	06:36	05:41	05:17	05:38	06:25	07:15	08:06	08:01	08:41
	17:00	17:56	18:46	20:39	21:28	22:00	21:48	20:57	19:47	18:39	16:44	16:27
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	17:01	17:58	18:48	20:41	21:29	22:00	21:47	20:55	19:45	18:37	16:42	16:27
20	08:34	07:44	06:42	06:32	05:38	05:17	05:41	06:28	07:19	08:09	08:04	08:42
	17:03	17:59	18:49	20:42	21:31	22:01	21:46	20:53	19:43	18:35	16:41	16:27
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22	08:32	07:40	06:38	06:28	05:35	05:18	05:44	06:32	07:22	08:13	08:08	08:43
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	17:10	18:07	18:56	20:49	21:37	22:01	21:41	20:44	19:33	18:26	16:37	16:29
25	08:29	07:34	06:31	06:22	05:32	05:18	05:48	06:36	07:27	07:18	08:13	08:44
	17:12	18:09	18:58	20:51	21:38	22:01	21:39	20:42	19:31	17:24	16:36	16:30
26	08:27	07:32	06:28	06:20	05:30	05:19	05:49	06:38	07:29	07:20	08:14	08:45
	17:13	18:10	19:00	20:52	21:39	22:01	21:38	20:40	19:29	17:22	16:35	16:31
27	08:26	07:29	06:26	06:18	05:29	05:19	05:51	06:40	07:30	07:22	08:16	08:45
	17:15	18:12	19:01	20:54	21:41	22:01	21:36	20:38	19:26	17:20	16:34	16:31
28	08:25	07:27	06:24	06:16	05:28	05:20	05:52	06:41	07:32	07:23	08:17	08:45
	17:17	18:14	19:03	20:56	21:42	22:01	21:35	20:35	19:24	17:18	16:33	16:32
29	08:23		07:21	06:14	05:27	05:20	05:54	06:43	07:34	07:25	08:19	08:45
	17:19		20:05	20:57	21:43	22:01	21:33	20:33	19:22	17:17	16:32	16:33
30	08:22		07:19	06:12	05:26	05:21	05:55	06:45	07:35	07:27	08:20	08:45
	17:21		20:06	20:59	21:44	22:01	21:32	20:31	19:19	17:15	16:31	16:34
31	08:20		07:17		05:25		05:57	06:46		07:29		08:46
	17:22		20:08		21:45		21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** AF - H32

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:15	06:10	05:25	05:22	05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01	21:47	22:01	21:29	20:27	19:17	17:11	16:31
2	08:46	08:17	07:23	07:12	06:08	05:24	05:22	06:00	06:50	07:39	07:33	08:23
	16:38	17:26	18:18	20:12	21:03	21:48	22:00	21:27	20:24	19:15	17:09	16:30
3	08:45	08:16	07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34	08:25
	16:39	17:28	18:20	20:13	21:04	21:49	22:00	21:25	20:22	19:13	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15	21:06	21:50	22:00	21:24	20:20	19:10	17:06	16:29
5	08:45	08:12	07:17	07:06	06:02	05:22	05:25	06:04	06:54	07:44	07:38	08:27
	16:41	17:32	18:23	20:17	21:08	21:51	21:59	21:22	20:18	19:08	17:04	16:28
6	08:45	08:11	07:14	07:03	06:01	05:21	05:25	06:06	06:56	07:45	07:40	08:29
	16:42	17:34	18:25	20:19	21:09	21:52	21:59	21:20	20:15	19:06	17:02	16:28
7	08:44	08:09	07:12	07:01	05:59	05:20	05:26	06:08	06:58	07:47	07:42	08:30
	16:43	17:35	18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:59	05:57	05:20	05:27	06:09	06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22	21:13	21:54	21:57	21:17	20:11	19:01	16:59	16:27
9	08:43	08:05	07:08	06:56	05:55	05:19	05:28	06:11	07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:24	21:14	21:55	21:57	21:15	20:08	18:59	16:57	16:27
10	08:43	08:04	07:05	06:54	05:53	05:19	05:29	06:12	07:03	07:52	07:47	08:33
	16:48	17:41	18:32	20:25	21:16	21:55	21:56	21:13	20:06	18:57	16:55	16:27
11	08:42	08:02	07:03	06:52	05:52	05:18	05:30	06:14	07:04	07:54	07:49	08:34
	16:49	17:43	18:34	20:27	21:17	21:56	21:55	21:11	20:04	18:54	16:54	16:26
12	08:42	08:00	07:01	06:50	05:50	05:18	05:31	06:16	07:06	07:56	07:51	08:36
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13	08:41	07:58	06:59	06:47	05:49	05:18	05:32	06:17	07:07	07:57	07:52	08:37
	16:52	17:47	18:37	20:30	21:21	21:57	21:53	21:07	19:59	18:50	16:51	16:26
14	08:40	07:56	06:56	06:45	05:47	05:18	05:34	06:19	07:09	07:59	07:54	08:37
	16:53	17:48	18:39	20:32	21:22	21:58	21:53	21:05	19:57	18:48	16:49	16:26
15	08:39	07:54	06:54	06:43	05:45	05:17	05:35	06:20	07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34	21:24	21:59	21:52	21:03	19:54	18:46	16:48	16:26
16	08:38	07:52	06:52	06:41	05:44	05:17	05:36	06:22	07:12	08:02	07:58	08:39
	16:57	17:52	18:43	20:36	21:25	21:59	21:51	21:01	19:52	18:43	16:46	16:27
17	08:38	07:50	06:49	06:39	05:42	05:17	05:37	06:24	07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37	21:27	22:00	21:49	20:59	19:50	18:41	16:45	16:27
18	08:37	07:48	06:47	06:37	05:41	05:17	05:38	06:25	07:16	08:06	08:01	08:41
	17:00	17:56	18:46	20:39	21:28	22:00	21:48	20:57	19:47	18:39	16:44	16:27
19	08:36	07:46	06:45	06:34	05:39	05:17	05:40	06:27	07:17	08:08	08:03	08:42
	17:01	17:58	18:48	20:41	21:30	22:00	21:47	20:55	19:45	18:37	16:43	16:27
20	08:35	07:44	06:42	06:32	05:38	05:17	05:41	06:28	07:19	08:09	08:04	08:42
	17:03	18:00	18:49	20:42	21:31	22:01	21:46	20:53	19:43	18:35	16:41	16:28
21	08:33	07:42	06:40	06:30	05:37	05:18	05:42	06:30	07:21	08:11	08:06	08:43
	17:05	18:01	18:51	20:44	21:33	22:01	21:45	20:51	19:40	18:33	16:40	16:28
22	08:32	07:40	06:38	06:28	05:35	05:18	05:44	06:32	07:22	08:13	08:08	08:43
	17:06	18:03	18:53	20:46	21:34	22:01	21:44	20:49	19:38	18:31	16:39	16:28
23	08:31	07:38	06:35	06:26	05:34	05:18	05:45	06:33	07:24	08:15	08:09	08:44
	17:08	18:05	18:55	20:47	21:35	22:01	21:42	20:46	19:36	18:29	16:38	16:29
24	08:30	07:36	06:33	06:24	05:33	05:18	05:46	06:35	07:25	08:17	08:11	08:44
	17:10	18:07	18:56	20:49	21:37	22:01	21:41	20:44	19:33	18:27	16:37	16:30
25	08:29	07:34	06:31	06:22	05:32	05:19	05:48	06:37	07:27	07:18	08:13	08:45
	17:12	18:09	18:58	20:51	21:38	22:01	21:39	20:42	19:31	17:25	16:36	16:30
26	08:27	07:32	06:29	06:20	05:31	05:19	05:49	06:38	07:29	07:20	08:14	08:45
	17:13	18:11	19:00	20:53	21:39	22:01	21:38	20:40	19:29	17:23	16:35	16:31
27	08:26	07:30	06:26	06:18	05:29	05:19	05:51	06:40	07:30	07:22	08:16	08:45
	17:15	18:12	19:01	20:54	21:41	22:01	21:37	20:38	19:26	17:21	16:34	16:32
28	08:25	07:27	06:24	06:16	05:28	05:20	05:52	06:41	07:32	07:24	08:17	08:45
	17:17	18:14	19:03	20:56	21:42	22:01	21:35	20:36	19:24	17:19	16:33	16:32
29	08:23		07:22	06:14	05:27	05:20	05:54	06:43	07:34	07:25	08:19	08:46
	17:19		20:05	20:58	21:43	22:01	21:34	20:33	19:22	17:17	16:32	16:33
30	08:22		07:19	06:12	05:26	05:21	05:55	06:45	07:35	07:27	08:20	08:46
	17:21		20:07	20:59	21:44	22:01	21:32	20:31	19:19	17:15	16:31	16:34
31	08:20		07:17		05:25		05:57	06:46		07:29		08:46
	17:22		20:08		21:46		21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** AG - H33

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March		April		May	June	July	August	September		October		November	December
1	08:46	08:19	07:25		07:14		19:10 (3)	06:10	05:24	05:21	05:58	06:48		07:37		18:12 (2)	07:31	08:22
	16:36	17:24	18:16		20:10	16	19:26 (3)	21:01	21:47	22:01	21:29	20:26		19:17	20	18:32 (2)	17:11	16:30
2	08:45	08:17	07:23		07:12		19:11 (3)	06:08	05:23	05:22	05:59	06:49		07:38		18:12 (2)	07:32	08:23
	16:37	17:26	18:18		20:11	14	19:25 (3)	21:02	21:48	22:00	21:27	20:24		19:15	20	18:32 (2)	17:09	16:30
3	08:45	08:15	07:21		07:10		19:13 (3)	06:06	05:23	05:23	06:01	06:51		07:40		18:11 (2)	07:34	08:25
	16:38	17:28	18:19		20:13	10	19:23 (3)	21:04	21:49	22:00	21:25	20:22		19:12	20	18:31 (2)	17:07	16:29
4	08:45	08:14	07:19		07:08		19:14 (3)	06:04	05:22	05:24	06:03	06:53		07:42		18:12 (2)	07:36	08:26
	16:39	17:30	18:21		20:15	6	19:20 (3)	21:06	21:50	21:59	21:24	20:20		19:10	18	18:30 (2)	17:05	16:29
5	08:45	08:12	07:16		07:05			06:02	05:21	05:24	06:04	06:54		07:43		18:13 (2)	07:38	08:27
	16:41	17:31	18:23		20:17			21:07	21:51	21:59	21:22	20:17		19:08	16	18:29 (2)	17:04	16:28
6	08:45	08:10	07:14	17:41 (2)	07:03			06:00	05:21	05:25	06:06	06:56		07:45		18:13 (2)	07:40	08:28
	16:42	17:33	18:25	5 17:46 (2)	20:18			21:09	21:52	21:58	21:20	20:15		19:05	14	18:27 (2)	17:02	16:28
7	08:44	08:09	07:12	17:38 (2)	07:01			05:58	05:20	05:26	06:07	06:58		07:47		18:15 (2)	07:41	08:30
	16:43	17:35	18:26	12 17:50 (2)	20:20			21:11	21:53	21:58	21:18	20:13		19:03	9	18:24 (2)	17:00	16:27
8	08:44	08:07	07:10	17:36 (2)	06:58			05:57	05:19	05:27	06:09	06:59	19:10 (3)	07:49			07:43	08:31
	16:44	17:37	18:28	15 17:51 (2)	20:22			21:12	21:54	21:57	21:16	20:11	4 19:14 (3)	19:01			16:58	16:27
9	08:43	08:05	07:07	17:35 (2)	06:56			05:55	05:19	05:28	06:10	07:01	19:06 (3)	07:50			07:45	08:32
	16:46	17:39	18:30	18 17:53 (2)	20:23			21:14	21:54	21:57	21:15	20:08	10 19:16 (3)	18:59			16:57	16:27
10	08:43	08:03	07:05	17:34 (2)	06:54			05:53	05:19	05:29	06:12	07:02	19:04 (3)	07:52			07:47	08:33
	16:47	17:41	18:32	18 17:52 (2)	20:25			21:16	21:55	21:56	21:13	20:06	14 19:18 (3)	18:56			16:55	16:26
11	08:42	08:02	07:03	17:33 (2)	06:52			05:52	05:18	05:30	06:14	07:04	19:03 (3)	07:54			07:49	08:34
	16:49	17:43	18:34	20 17:53 (2)	20:27			21:17	21:56	21:55	21:11	20:04	15 19:18 (3)	18:54			16:54	16:26
12	08:41	08:00	07:01	17:33 (2)	06:49			05:50	05:18	05:31	06:15	07:06	19:02 (3)	07:55			07:50	08:35
	16:50	17:44	18:35	20 17:53 (2)	20:29			21:19	21:57	21:54	21:09	20:01	17 19:19 (3)	18:52			16:52	16:26
13	08:41	07:58	06:58	17:32 (2)	06:47			05:48	05:18	05:32	06:17	07:07	19:02 (3)	07:57			07:52	08:36
	16:52	17:46	18:37	20 17:52 (2)	20:30			21:20	21:57	21:53	21:07	19:59	17 19:19 (3)	18:50			16:51	16:26
14	08:40	07:56	06:56	17:33 (2)	06:45			05:47	05:17	05:33	06:18	07:09	19:01 (3)	07:59			07:54	08:37
	16:53	17:48	18:39	19 17:52 (2)	20:32			21:22	21:58	21:52	21:05	19:57	17 19:18 (3)	18:48			16:49	16:26
15	08:39	07:54	06:54	17:33 (2)	06:43			05:45	05:17	05:34	06:20	07:11	19:01 (3)	08:01			07:56	08:38
	16:55	17:50	18:41	18 17:51 (2)	20:34			21:23	21:59	21:51	21:03	19:54	17 19:18 (3)	18:45			16:48	16:26
16	08:38	07:52	06:51	17:33 (2)	06:41			05:44	05:17	05:36	06:22	07:12	19:01 (3)	08:02			07:57	08:39
	16:56	17:52	18:42	17 17:50 (2)	20:35			21:25	21:59	21:50	21:01	19:52	15 19:16 (3)	18:43			16:46	16:26
17	08:37	07:50	06:49	17:35 (2)	06:38			05:42	05:17	05:37	06:23	07:14	19:02 (3)	08:04			07:59	08:40
	16:58	17:54	18:44	13 17:48 (2)	20:37			21:27	22:00	21:49	20:59	19:50	13 19:15 (3)	18:41			16:45	16:26
18	08:36	07:48	06:47	17:37 (2)	06:36			05:41	05:17	05:38	06:25	07:15	19:03 (3)	08:06			08:01	08:41
	16:59	17:56	18:46	9 17:46 (2)	20:39			21:28	22:00	21:48	20:57	19:47	11 19:14 (3)	18:39			16:44	16:27
19	08:35	07:46	06:45		06:34			05:39	05:17	05:39	06:27	07:17	19:06 (3)	08:08			08:03	08:41
	17:01	17:57	18:47		20:40			21:30	22:00	21:47	20:55	19:45	3 19:09 (3)	18:37			16:42	16:27
20	08:34	07:44	06:42		06:32			05:38	05:17	05:41	06:28	07:19		08:09			08:04	08:42
	17:03	17:59	18:49		20:42			21:31	22:01	21:46	20:53	19:43		18:35			16:41	16:27
21	08:33	07:42	06:40		06:30			05:36	05:17	05:42	06:30	07:20		08:11			08:06	08:43
	17:04	18:01	18:51		20:44			21:32	22:01	21:45	20:51	19:40		18:33			16:40	16:28
22	08:32	07:40	06:38		06:28			05:35	05:17	05:43	06:31	07:22		08:13			08:08	08:43
	17:06	18:03	18:53		20:46			21:34	22:01	21:43	20:48	19:38		18:30			16:39	16:28
23	08:31	07:38	06:35		06:26			05:34	05:18	05:45	06:33	07:24		08:15			08:09	08:44
	17:08	18:05	18:54		20:47			21:35	22:01	21:42	20:46	19:36		18:28			16:38	16:29
24	08:30	07:36	06:33		06:24			05:33	05:18	05:46	06:35	07:25		08:16			08:11	08:44
	17:10	18:07	18:56		20:49			21:37	22:01	21:41	20:44	19:33		18:26			16:36	16:29
25	08:29	07:34	06:31	18:15 (3)	06:22			05:31	05:18	05:48	06:36	07:27	18:21 (2)	07:18			08:13	08:44
	17:11	18:08	18:58	10 18:25 (3)	20:51			21:38	22:01	21:39	20:42	19:31	6 18:27 (2)	17:24			16:35	16:30
26	08:27	07:32	06:28	18:14 (3)	06:20			05:30	05:19	05:49	06:38	07:29	18:18 (2)	07:20			08:14	08:45
	17:13	18:10	19:00	13 18:27 (3)	20:52			21:39	22:01	21:38	20:40	19:29	12 18:30 (2)	17:22			16:34	16:31
27	08:26	07:29	06:26	18:12 (3)	06:17			05:29	05:19	05:50	06:40	07:30	18:15 (2)	07:22			08:16	08:45
	17:15	18:12	19:01	16 18:28 (3)	20:54			21:41	22:01	21:36	20:38	19:26	16 18:31 (2)	17:20			16:34	16:31
28	08:25	07:27	06:24	18:11 (3)	06:15			05:28	05:20	05:52	06:41	07:32	18:14 (2)	07:23			08:17	08:45
	17:17	18:14	19:03	16 18:27 (3)	20:56			21:42	22:01	21:35	20:35	19:24	18 18:32 (2)	17:18			16:33	16:32
29	08:23		07:21	19:10 (3)	06:13			05:27	05:20	05:53	06:43	07:33	18:14 (2)	07:25			08:19	08:45
	17:19		20:05	18 19:28 (3)	20:57			21:43	22:01	21:33	20:33	19:22	19 18:33 (2)	17:16			16:32	16:33
30	08:22		07:19	19:10 (3)	06:12			05:26	05:21	05:55	06:44	07:35	18:12 (2)	07:27			08:20	08:46
	17:20		20:06	18 19:28 (3)	20:59			21:44	22:01	21:32	20:31	19:19	20 18:32 (2)	17:15			16:31	16:34
31	08:20		07:17	19:10 (3)				05:25		05:56	06:46			07:29				08:46
	17:22		20:08	16 19:26 (3)				21:45		21:30	20:29			17:13				16:35
Potential sun hours	259	278	367		416			485	499	502	454	381		331			266	244
Total, worst case				311		46							244		117			
Sun reduction				0.24		0.35							0.28		0.24			
Oper. time red.				1.00		1.00							1.00		1.00			
Wind dir. red.				0.65		0.67							0.66		0.64			
Total reduction				0.16		0.24							0.19		0.15			
Total, real				50		11							46		18			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** AH - H34

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January			February	March	April	May	June	July	August	September	October	November	December		
1	08:46		09:50 (3)	08:19	07:25	07:15	06:10	05:24	05:21	05:58	06:48	07:37	07:31	08:22		
	16:36	15	10:05 (3)	17:24	18:16	20:10	21:01	21:47	22:01	21:29	20:27	19:17	17:11	16:31		
2	08:46		09:51 (3)	08:17	07:23	07:12	06:08	05:24	05:22	06:00	06:50	07:39	07:33	08:23		
	16:37	15	10:06 (3)	17:26	18:18	20:12	21:03	21:48	22:00	21:27	20:24	19:15	17:09	16:30		
3	08:46		09:52 (3)	08:16	07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34	08:25		09:43 (3)
	16:38	14	10:06 (3)	17:28	18:19	20:13	21:04	21:49	22:00	21:25	20:22	19:13	17:07	16:29	4	09:47 (3)
4	08:45		09:52 (3)	08:14	07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36	08:26		09:42 (3)
	16:40	14	10:06 (3)	17:30	18:21	20:15	21:06	21:50	22:00	21:24	20:20	19:10	17:05	16:29	7	09:49 (3)
5	08:45		09:53 (3)	08:12	07:17	07:05	06:02	05:21	05:24	06:04	06:54	07:44	07:38	08:27		09:41 (3)
	16:41	13	10:06 (3)	17:32	18:23	20:17	21:08	21:51	21:59	21:22	20:18	19:08	17:04	16:28	10	09:51 (3)
6	08:45		09:54 (3)	08:11	07:14	07:03	06:00	05:21	05:25	06:06	06:56	07:45	07:40	08:29		09:40 (3)
	16:42	11	10:05 (3)	17:33	18:25	20:19	21:09	21:52	21:59	21:20	20:15	19:06	17:02	16:28	11	09:51 (3)
7	08:44		09:55 (3)	08:09	07:12	07:01	05:59	05:20	05:26	06:07	06:58	07:47	07:42	08:30		09:40 (3)
	16:43	11	10:06 (3)	17:35	18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00	16:27	13	09:53 (3)
8	08:44		09:57 (3)	08:07	07:10	06:59	05:57	05:20	05:27	06:09	06:59	07:49	07:43	08:31		09:40 (3)
	16:45	7	10:04 (3)	17:37	18:28	20:22	21:13	21:54	21:57	21:17	20:11	19:01	16:59	16:27	14	09:54 (3)
9	08:43		09:59 (3)	08:05	07:08	06:56	05:55	05:19	05:28	06:11	07:01	07:50	07:45	08:32		09:40 (3)
	16:46	5	10:04 (3)	17:39	18:30	20:24	21:14	21:55	21:57	21:15	20:08	18:59	16:57	16:27	14	09:54 (3)
10	08:43			08:04	07:05	06:54	05:53	05:19	05:29	06:12	07:03	07:52	07:47	08:34		09:40 (3)
	16:47			17:41	18:32	20:25	21:16	21:56	21:56	21:13	20:06	18:57	16:55	16:26	15	09:55 (3)
11	08:42			08:02	07:03	06:52	05:52	05:18	05:30	06:14	07:04	07:54	07:49	08:35		09:40 (3)
	16:49			17:43	18:34	20:27	21:17	21:56	21:55	21:11	20:04	18:54	16:54	16:26	15	09:55 (3)
12	08:42			08:00	07:01	06:50	05:50	05:18	05:31	06:15	07:06	07:56	07:51	08:36		09:41 (3)
	16:50			17:45	18:35	20:29	21:19	21:57	21:54	21:09	20:01	18:52	16:52	16:26	16	09:57 (3)
13	08:41			07:58	06:58	06:47	05:48	05:18	05:32	06:17	07:07	07:57	07:52	08:37		09:41 (3)
	16:52			17:47	18:37	20:30	21:21	21:58	21:54	21:07	19:59	18:50	16:51	16:26	17	09:58 (3)
14	08:40			07:56	06:56	06:45	05:47	05:17	05:33	06:19	07:09	07:59	07:54	08:38		09:41 (3)
	16:53			17:48	18:39	20:32	21:22	21:58	21:53	21:05	19:57	18:48	16:49	16:26	16	09:57 (3)
15	08:39			07:54	06:54	06:43	05:45	05:17	05:35	06:20	07:11	08:01	07:56	08:39		09:41 (3)
	16:55			17:50	18:41	20:34	21:24	21:59	21:52	21:03	19:54	18:46	16:48	16:26	17	09:58 (3)
16	08:39			07:52	06:52	06:41	05:44	05:17	05:36	06:22	07:12	08:02	07:58	08:39		09:42 (3)
	16:56			17:52	18:42	20:36	21:25	21:59	21:51	21:01	19:52	18:43	16:46	16:26	17	09:59 (3)
17	08:38			07:50	06:49	06:39	05:42	05:17	05:37	06:23	07:14	08:04	07:59	08:40		09:42 (3)
	16:58			17:54	18:44	20:37	21:27	22:00	21:50	20:59	19:50	18:41	16:45	16:26	17	09:59 (3)
18	08:37			07:48	06:47	06:36	05:41	05:17	05:38	06:25	07:16	08:06	08:01	08:41		09:43 (3)
	17:00			17:56	18:46	20:39	21:28	22:00	21:48	20:57	19:47	18:39	16:44	16:27	17	10:00 (3)
19	08:36			07:46	06:45	06:34	05:39	05:17	05:40	06:27	07:17	08:08	08:03	08:42		09:43 (3)
	17:01			17:58	18:48	20:41	21:30	22:01	21:47	20:55	19:45	18:37	16:42	16:27	17	10:00 (3)
20	08:35			07:44	06:42	06:32	05:38	05:17	05:41	06:28	07:19	08:09	08:05	08:42		09:43 (3)
	17:03			17:59	18:49	20:42	21:31	22:01	21:46	20:53	19:43	18:35	16:41	16:27	18	10:01 (3)
21	08:34			07:42	06:40	06:30	05:37	05:17	05:42	06:30	07:20	08:11	08:06	08:43		09:44 (3)
	17:05			18:01	18:51	20:44	21:33	22:01	21:45	20:51	19:40	18:33	16:40	16:28	18	10:02 (3)
22	08:32			07:40	06:38	06:28	05:35	05:17	05:44	06:32	07:22	08:13	08:08	08:43		09:44 (3)
	17:06			18:03	18:53	20:46	21:34	22:01	21:44	20:49	19:38	18:31	16:39	16:28	18	10:02 (3)
23	08:31			07:38	06:35	06:26	05:34	05:18	05:45	06:33	07:24	08:15	08:10	08:44		09:44 (3)
	17:08			18:05	18:55	20:47	21:35	22:01	21:42	20:46	19:36	18:29	16:38	16:29	18	10:02 (3)
24	08:30			07:36	06:33	06:24	05:33	05:18	05:46	06:35	07:25	08:17	08:11	08:44		09:45 (3)
	17:10			18:07	18:56	20:49	21:37	22:02	21:41	20:44	19:33	18:27	16:37	16:29	18	10:03 (3)
25	08:29			07:34	06:31	06:22	05:32	05:18	05:48	06:36	07:27	07:18	08:13	08:45		09:46 (3)
	17:12			18:09	18:58	20:51	21:38	22:02	21:40	20:42	19:31	17:24	16:36	16:30	17	10:03 (3)
26	08:27			07:32	06:28	06:20	05:30	05:19	05:49	06:38	07:29	07:20	08:14	08:45		09:46 (3)
	17:13			18:10	19:00	20:53	21:40	22:02	21:38	20:40	19:29	17:22	16:35	16:31	17	10:03 (3)
27	08:26			07:30	06:26	06:18	05:29	05:19	05:51	06:40	07:30	07:22	08:16	08:45		09:46 (3)
	17:15			18:12	19:01	20:54	21:41	22:02	21:37	20:38	19:26	17:20	16:34	16:31	18	10:04 (3)
28	08:25			07:28	06:24	06:16	05:28	05:20	05:52	06:41	07:32	07:24	08:17	08:46		09:48 (3)
	17:17			18:14	19:03	20:56	21:42	22:01	21:35	20:36	19:24	17:19	16:33	16:32	17	10:05 (3)
29	08:23				07:22	06:14	05:27	05:20	05:54	06:43	07:34	07:25	08:19	08:46		09:48 (3)
	17:19				20:05	20:58	21:43	22:01	21:34	20:33	19:22	17:17	16:32	16:33	17	10:05 (3)
30	08:22				07:19	06:12	05:26	05:21	05:55	06:45	07:35	07:27	08:20	08:46		09:49 (3)
	17:21				20:07	20:59	21:45	22:01	21:32	20:31	19:19	17:15	16:31	16:34	17	10:06 (3)
31	08:20				07:17		05:25		05:57	06:46		07:29		08:46		09:49 (3)
	17:22				20:08		21:46		21:30	20:29		17:13		16:35	16	10:05 (3)
Potential sun hours	259			278	367	416	485	499	502	454	381	331	266	243		
Total, worst case		105													446	
Sun reduction		0.16													0.13	
Oper. time red.		1.00													1.00	
Wind dir. red.		0.66													0.66	
Total reduction		0.10													0.09	
Total, real		11													40	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** AI - H35

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April		May		June	July		August		September	October	November	December
1	08:46	08:19	07:25	07:14		06:10	20:08 (2)	05:24	05:21		05:58	20:15 (2)	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10		21:01 13	20:21 (2)	21:47	22:01		21:29 18	20:33 (2)	20:26	19:17	17:11	16:30
2	08:45	08:17	07:23	07:12		06:08	20:06 (2)	05:24	05:22		05:59	20:14 (2)	06:49	07:38	07:32	08:23
	16:37	17:26	18:18	20:11		21:02 16	20:22 (2)	21:48	22:00		21:27 19	20:33 (2)	20:24	19:15	17:09	16:30
3	08:45	08:15	07:21	07:10		06:06	20:05 (2)	05:23	05:23		06:01	20:14 (2)	06:51	07:40	07:34	08:24
	16:38	17:28	18:19	20:13		21:04 17	20:22 (2)	21:49	22:00		21:25 20	20:34 (2)	20:22	19:12	17:07	16:29
4	08:45	08:14	07:19	07:08		06:04	20:05 (2)	05:22	05:24		06:03	20:14 (2)	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15		21:06 19	20:24 (2)	21:50	21:59		21:24 20	20:34 (2)	20:20	19:10	17:05	16:29
5	08:45	08:12	07:16	07:05		06:02	20:04 (2)	05:21	05:24		06:04	20:14 (2)	06:54	07:43	07:38	08:27
	16:41	17:31	18:23	20:17		21:07 20	20:24 (2)	21:51	21:59		21:22 20	20:34 (2)	20:17	19:08	17:04	16:28
6	08:44	08:10	07:14	07:03		06:00	20:03 (2)	05:21	05:25		06:06	20:13 (2)	06:56	07:45	07:40	08:28
	16:42	17:33	18:25	20:18		21:09 21	20:24 (2)	21:52	21:58		21:20 21	20:34 (2)	20:15	19:05	17:02	16:28
7	08:44	08:09	07:12	07:01		05:58	20:04 (2)	05:20	05:26		06:07	20:13 (2)	06:58	07:47	07:41	08:30
	16:43	17:35	18:26	20:20		21:11 20	20:24 (2)	21:53	21:58		21:18 20	20:33 (2)	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:58		05:57	20:04 (2)	05:20	05:27		06:09	20:14 (2)	06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22		21:12 20	20:24 (2)	21:54	21:57		21:16 19	20:33 (2)	20:11	19:01	16:58	16:27
9	08:43	08:05	07:07	06:56		05:55	20:03 (2)	05:19	05:28		06:10	20:14 (2)	07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:23		21:14 20	20:23 (2)	21:54	21:56		21:14 18	20:32 (2)	20:08	18:59	16:57	16:27
10	08:43	08:03	07:05	06:54		05:53	20:04 (2)	05:19	05:29		06:12	20:15 (2)	07:02	07:52	07:47	08:33
	16:47	17:41	18:32	20:25		21:16 20	20:24 (2)	21:55	21:56		21:13 17	20:32 (2)	20:06	18:56	16:55	16:26
11	08:42	08:02	07:03	06:52		05:52	20:04 (2)	05:18	05:30		06:14	20:15 (2)	07:04	07:54	07:49	08:34
	16:49	17:43	18:34	20:27		21:17 19	20:23 (2)	21:56	21:55		21:11 15	20:30 (2)	20:04	18:54	16:54	16:26
12	08:41	08:00	07:01	06:49		05:50	20:05 (2)	05:18	05:31		06:15	20:17 (2)	07:06	07:55	07:50	08:35
	16:50	17:45	18:35	20:29		21:19 18	20:23 (2)	21:57	21:54		21:09 12	20:29 (2)	20:01	18:52	16:52	16:26
13	08:41	07:58	06:58	06:47		05:48	20:05 (2)	05:18	05:32		06:17	20:18 (2)	07:07	07:57	07:52	08:36
	16:52	17:46	18:37	20:30		21:20 16	20:21 (2)	21:57	21:53		21:07 8	20:26 (2)	19:59	18:50	16:51	16:26
14	08:40	07:56	06:56	06:45		05:47	20:07 (2)	05:17	05:33		06:18		07:09	07:59	07:54	08:37
	16:53	17:48	18:39	20:32		21:22 14	20:21 (2)	21:58	21:52		21:05		19:57	18:48	16:49	16:26
15	08:39	07:54	06:54	06:43		05:45	20:07 (2)	05:17	05:35		06:20		07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34		21:23 12	20:19 (2)	21:58	21:51		21:03		19:54	18:45	16:48	16:26
16	08:38	07:52	06:51	06:41		05:44	20:09 (2)	05:17	05:36		06:22		07:12	08:02	07:57	08:39
	16:56	17:52	18:42	20:35		21:25 9	20:18 (2)	21:59	21:50		21:01		19:52	18:43	16:46	16:26
17	08:37	07:50	06:49	06:38		05:42		05:17	05:37		06:23		07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37		21:26		21:59	21:49		20:59		19:50	18:41	16:45	16:26
18	08:36	07:48	06:47	06:36		05:41		05:17	05:38		06:25		07:15	08:06	08:01	08:41
	16:59	17:56	18:46	20:39		21:28		22:00	21:48		20:57		19:47	18:39	16:44	16:27
19	08:35	07:46	06:45	06:34		05:39		05:17	05:39		06:27		07:17	08:07	08:03	08:41
	17:01	17:57	18:47	20:40		21:29		22:00	21:47		20:55		19:45	18:37	16:42	16:27
20	08:34	07:44	06:42	06:32		05:38		05:17	05:41		06:28		07:19	08:09	08:04	08:42
	17:03	17:59	18:49	20:42		21:31		22:01	21:46		20:53		19:43	18:35	16:41	16:27
21	08:33	07:42	06:40	06:30		05:36		05:17	05:42		06:30		07:20	08:11	08:06	08:43
	17:04	18:01	18:51	20:44		21:32		22:01	21:45		20:51		19:40	18:33	16:40	16:28
22	08:32	07:40	06:38	06:28		05:35		05:17	05:43		06:31		07:22	08:13	08:08	08:43
	17:06	18:03	18:53	20:46		21:34		22:01	21:43		20:48		19:38	18:30	16:39	16:28
23	08:31	07:38	06:35	06:26		05:34		05:18	05:45		06:33		07:24	08:15	08:09	08:44
	17:08	18:05	18:54	20:47		21:35		22:01	21:42		20:46		19:36	18:28	16:38	16:29
24	08:30	07:36	06:33	06:24		05:33		05:18	05:46		06:35		07:25	08:16	08:11	08:44
	17:10	18:07	18:56	20:49		21:37		22:01	21:41		20:44		19:33	18:26	16:37	16:29
25	08:28	07:34	06:31	06:22		05:31		05:18	05:48		06:36		07:27	07:18	08:12	08:44
	17:11	18:08	18:58	20:51		21:38		22:01	21:39		20:42		19:31	17:24	16:35	16:30
26	08:27	07:32	06:28	06:20		05:30		05:19	05:49		06:38		07:28	07:20	08:14	08:45
	17:13	18:10	19:00	20:52		21:39		22:01	21:38		20:40		19:29	17:22	16:35	16:31
27	08:26	07:29	06:26	06:18		05:29		05:19	05:50	20:22 (2)	06:40		07:30	07:22	08:16	08:45
	17:15	18:12	19:01	20:54		21:41		22:01	21:36 5	20:27 (2)	20:38		19:26	17:20	16:34	16:31
28	08:24	07:27	06:24	06:16		05:28		05:20	05:52	20:19 (2)	06:41		07:32	07:23	08:17	08:45
	17:17	18:14	19:03	20:56		21:42		22:01	21:35 10	20:29 (2)	20:35		19:24	17:18	16:33	16:32
29	08:23		07:21	06:14		05:27		05:20	05:53	20:17 (2)	06:43		07:33	07:25	08:19	08:45
	17:19		20:05	20:57		21:43		22:01	21:33 13	20:30 (2)	20:33		19:22	17:16	16:32	16:33
30	08:22		07:19	06:12	20:10 (2)	05:26		05:21	05:55	20:17 (2)	06:44		07:35	07:27	08:20	08:45
	17:20		20:06	20:59 9	20:19 (2)	21:44		22:01	21:32 15	20:32 (2)	20:31		19:19	17:15	16:31	16:34
31	08:20		07:17			05:25			05:56	20:15 (2)	06:46			07:29		08:46
	17:22		20:08			21:45			21:30 17	20:32 (2)	20:29			17:13		16:35
Potential sun hours	259	278	367	416		485		499	502		454		381	331	266	244
Total, worst case				9		274			60		227					
Sun reduction				0.35		0.37			0.27		0.30					
Oper. time red.				1.00		1.00			1.00		1.00					
Wind dir. red.				0.68		0.68			0.68		0.68					
Total reduction				0.24		0.25			0.18		0.20					
Total, real				2		68			11		46					

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** AJ - H36

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:25	07:14	06:10	20:02 (2)	05:24	05:21	05:58	20:15 (2)	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01 17	20:19 (2)	21:47	22:00	21:29 11	20:26 (2)	20:26	19:17	17:11	16:30
2	08:45	08:17	07:23	07:12	06:08	20:01 (2)	05:24	05:22	05:59	20:13 (2)	06:49	07:38	07:32	08:23
	16:37	17:26	18:18	20:11	21:02 19	20:20 (2)	21:48	22:00	21:27 14	20:27 (2)	20:24	19:15	17:09	16:30
3	08:45	08:15	07:21	07:10	06:06	20:00 (2)	05:23	05:23	06:01	20:13 (2)	06:51	07:40	07:34	08:24
	16:38	17:28	18:19	20:13	21:04 20	20:20 (2)	21:49	22:00	21:25 16	20:29 (2)	20:22	19:12	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04	20:01 (2)	05:22	05:24	06:03	20:11 (2)	06:53	07:42	07:36	08:26
	16:39	17:30	18:21	20:15	21:06 20	20:21 (2)	21:50	21:59	21:24 18	20:29 (2)	20:20	19:10	17:05	16:29
5	08:45	08:12	07:16	07:05	06:02	20:00 (2)	05:21	05:24	06:04	20:11 (2)	06:54	07:43	07:38	08:27
	16:41	17:31	18:23	20:17	21:07 20	20:20 (2)	21:51	21:59	21:22 19	20:30 (2)	20:17	19:08	17:04	16:28
6	08:44	08:10	07:14	07:03	06:00	20:00 (2)	05:21	05:25	06:06	20:10 (2)	06:56	07:45	07:40	08:28
	16:42	17:33	18:25	20:18	21:09 20	20:20 (2)	21:52	21:58	21:20 20	20:30 (2)	20:15	19:05	17:02	16:28
7	08:44	08:09	07:12	07:01	05:58	20:01 (2)	05:20	05:26	06:07	20:10 (2)	06:58	07:47	07:41	08:30
	16:43	17:35	18:26	20:20	21:11 19	20:20 (2)	21:53	21:58	21:18 19	20:29 (2)	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:58	05:57	20:01 (2)	05:20	05:27	06:09	20:10 (2)	06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22	21:12 18	20:19 (2)	21:54	21:57	21:16 20	20:30 (2)	20:10	19:01	16:58	16:27
9	08:43	08:05	07:07	06:56	05:55	20:01 (2)	05:19	05:28	06:10	20:09 (2)	07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:23	21:14 17	20:18 (2)	21:54	21:56	21:14 20	20:29 (2)	20:08	18:59	16:57	16:27
10	08:43	08:03	07:05	06:54	05:53	20:03 (2)	05:19	05:29	06:12	20:10 (2)	07:02	07:52	07:47	08:33
	16:47	17:41	18:32	20:25	21:16 15	20:18 (2)	21:55	21:56	21:13 19	20:29 (2)	20:06	18:56	16:55	16:26
11	08:42	08:02	07:03	06:52	05:52	20:03 (2)	05:18	05:30	06:14	20:10 (2)	07:04	07:54	07:49	08:34
	16:49	17:43	18:34	20:27	21:17 13	20:16 (2)	21:56	21:55	21:11 18	20:28 (2)	20:04	18:54	16:54	16:26
12	08:41	08:00	07:01	06:49	05:50	20:05 (2)	05:18	05:31	06:15	20:11 (2)	07:06	07:55	07:50	08:35
	16:50	17:45	18:35	20:29	21:19 10	20:15 (2)	21:57	21:54	21:09 17	20:28 (2)	20:01	18:52	16:52	16:26
13	08:41	07:58	06:58	06:47	05:48	20:07 (2)	05:18	05:32	06:17	20:11 (2)	07:07	07:57	07:52	08:36
	16:52	17:46	18:37	20:30	21:20 6	20:13 (2)	21:57	21:53	21:07 15	20:26 (2)	19:59	18:50	16:51	16:26
14	08:40	07:56	06:56	06:45	05:47		05:17	05:33	06:18	20:12 (2)	07:09	07:59	07:54	08:37
	16:53	17:48	18:39	20:32	21:22		21:58	21:52	21:05 13	20:25 (2)	19:57	18:48	16:49	16:26
15	08:39	07:54	06:54	06:43	05:45		05:17	05:35	06:20	20:14 (2)	07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34	21:23		21:58	21:51	21:03 10	20:24 (2)	19:54	18:45	16:48	16:26
16	08:38	07:52	06:51	06:41	05:44		05:17	05:36	06:22	20:18 (2)	07:12	08:02	07:57	08:39
	16:56	17:52	18:42	20:35	21:25		21:59	21:50	21:01 1	20:19 (2)	19:52	18:43	16:46	16:26
17	08:37	07:50	06:49	06:38	05:42		05:17	05:37	06:23		07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37	21:26		21:59	21:49	20:59		19:50	18:41	16:45	16:26
18	08:36	07:48	06:47	06:36	05:41		05:17	05:38	06:25		07:15	08:06	08:01	08:41
	16:59	17:56	18:46	20:39	21:28		22:00	21:48	20:57		19:47	18:39	16:44	16:27
19	08:35	07:46	06:44	06:34	05:39		05:17	05:39	06:27		07:17	08:07	08:03	08:41
	17:01	17:57	18:47	20:40	21:29		22:00	21:47	20:55		19:45	18:37	16:42	16:27
20	08:34	07:44	06:42	06:32	05:38		05:17	05:41	06:28		07:19	08:09	08:04	08:42
	17:03	17:59	18:49	20:42	21:31		22:01	21:46	20:53		19:43	18:35	16:41	16:27
21	08:33	07:42	06:40	06:30	05:36		05:17	05:42	06:30		07:20	08:11	08:06	08:43
	17:04	18:01	18:51	20:44	21:32		22:01	21:45	20:51		19:40	18:33	16:40	16:28
22	08:32	07:40	06:38	06:28	05:35		05:17	05:43	06:31		07:22	08:13	08:08	08:43
	17:06	18:03	18:53	20:46	21:34		22:01	21:43	20:48		19:38	18:30	16:39	16:28
23	08:31	07:38	06:35	06:26	05:34		05:18	05:45	06:33		07:24	08:15	08:09	08:44
	17:08	18:05	18:54	20:47	21:35		22:01	21:42	20:46		19:36	18:28	16:38	16:29
24	08:30	07:36	06:33	06:24	05:33		05:18	05:46	06:35		07:25	08:16	08:11	08:44
	17:10	18:07	18:56	20:49	21:37		22:01	21:41	20:44		19:33	18:26	16:37	16:29
25	08:28	07:34	06:31	06:22	05:31		05:18	05:48	06:36		07:27	07:18	08:12	08:44
	17:11	18:08	18:58	20:51	21:38		22:01	21:39	20:42		19:31	17:24	16:35	16:30
26	08:27	07:32	06:28	06:20	05:30		05:19	05:49	06:38		07:28	07:20	08:14	08:45
	17:13	18:10	19:00	20:52	21:39		22:01	21:38	20:40		19:29	17:22	16:35	16:31
27	08:26	07:29	06:26	06:18	20:09 (2) 05:29		05:19	05:50	06:40		07:30	07:22	08:16	08:45
	17:15	18:12	19:01	20:54 5	20:14 (2) 21:41		22:01	21:36	20:38		19:26	17:20	16:34	16:31
28	08:24	07:27	06:24	06:16	20:06 (2) 05:28		05:20	05:52	06:41		07:32	07:23	08:17	08:45
	17:17	18:14	19:03	20:56 11	20:17 (2) 21:42		22:01	21:35	20:35		19:24	17:18	16:33	16:32
29	08:23		07:21	06:14	20:04 (2) 05:27		05:20	05:53	06:43		07:33	07:25	08:19	08:45
	17:19		20:05	20:57 14	20:18 (2) 21:43		22:01	21:33	20:33		19:22	17:16	16:32	16:33
30	08:22		07:19	06:12	20:03 (2) 05:26		05:21	05:55	06:44		07:35	07:27	08:20	08:45
	17:20		20:06	20:59 16	20:19 (2) 21:44		22:01	21:32	20:31		19:19	17:15	16:31	16:34
31	08:20		07:17		05:25			05:56 20:16 (2)	06:46			07:29		08:46
	17:22		20:08		21:45			21:30 8 20:24 (2)	20:29			17:13		16:35
Potential sun hours	259	278	367	416	485		499	502	454		381	331	266	244
Total, worst case				46	214			8	250					
Sun reduction				0.35	0.37			0.27	0.30					
Oper. time red.				1.00	1.00			1.00	1.00					
Wind dir. red.				0.67	0.67			0.67	0.67					
Total reduction				0.24	0.25			0.18	0.20					
Total, real				11	53			1	50					

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** AK - H37

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May		June	July		August		September	October	November	December
1	08:46	08:19	07:25	07:14	06:10		05:24	05:21		05:58		20:19 (2)	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01		21:47	22:00		21:29	20	20:39 (2)	20:26	19:17	17:11	16:30
2	08:45	08:17	07:23	07:12	06:08		20:17 (2) 05:24	05:22		05:59		20:18 (2)	06:49	07:38	07:32	08:23
	16:37	17:26	18:18	20:11	21:02	3	20:20 (2) 21:48	22:00		21:27	20	20:38 (2)	20:24	19:15	17:09	16:30
3	08:45	08:15	07:21	07:10	06:06		20:13 (2) 05:23	05:23		06:01		20:19 (2)	06:51	07:40	07:34	08:24
	16:38	17:28	18:19	20:13	21:04	10	20:23 (2) 21:49	22:00		21:25	20	20:39 (2)	20:22	19:12	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04		20:12 (2) 05:22	05:24		06:03		20:18 (2)	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15	21:06	13	20:25 (2) 21:50	21:59		21:24	20	20:38 (2)	20:20	19:10	17:05	16:29
5	08:45	08:12	07:16	07:05	06:02		20:11 (2) 05:21	05:24		06:04		20:19 (2)	06:54	07:43	07:38	08:27
	16:41	17:31	18:23	20:17	21:07	15	20:26 (2) 21:51	21:59		21:22	19	20:38 (2)	20:17	19:08	17:04	16:28
6	08:44	08:10	07:14	07:03	06:00		20:10 (2) 05:21	05:25		06:06		20:19 (2)	06:56	07:45	07:40	08:28
	16:42	17:33	18:25	20:18	21:09	17	20:27 (2) 21:52	21:58		21:20	18	20:37 (2)	20:15	19:05	17:02	16:28
7	08:44	08:09	07:12	07:01	05:58		20:10 (2) 05:20	05:26		06:07		20:19 (2)	06:58	07:47	07:41	08:30
	16:43	17:35	18:26	20:20	21:11	18	20:28 (2) 21:53	21:58		21:18	17	20:36 (2)	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:58	05:57		20:09 (2) 05:20	05:27		06:09		20:21 (2)	06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22	21:12	19	20:28 (2) 21:54	21:57		21:16	14	20:35 (2)	20:11	19:01	16:58	16:27
9	08:43	08:05	07:07	06:56	05:55		20:08 (2) 05:19	05:28		06:10		20:21 (2)	07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:23	21:14	20	20:28 (2) 21:54	21:56		21:14	12	20:33 (2)	20:08	18:59	16:57	16:27
10	08:43	08:03	07:05	06:54	05:53		20:08 (2) 05:19	05:29		06:12		20:23 (2)	07:02	07:52	07:47	08:33
	16:47	17:41	18:32	20:25	21:16	20	20:28 (2) 21:55	21:56		21:13	9	20:32 (2)	20:06	18:56	16:55	16:26
11	08:42	08:02	07:03	06:52	05:52		20:08 (2) 05:18	05:30		06:14			07:04	07:54	07:49	08:34
	16:49	17:43	18:34	20:27	21:17	20	20:28 (2) 21:56	21:55		21:11			20:04	18:54	16:54	16:26
12	08:41	08:00	07:01	06:49	05:50		20:09 (2) 05:18	05:31		06:15			07:06	07:55	07:50	08:35
	16:50	17:45	18:35	20:29	21:19	19	20:28 (2) 21:57	21:54		21:09			20:01	18:52	16:52	16:26
13	08:41	07:58	06:58	06:47	05:48		20:08 (2) 05:18	05:32		06:17			07:07	07:57	07:52	08:36
	16:52	17:46	18:37	20:30	21:20	19	20:27 (2) 21:57	21:53		21:07			19:59	18:50	16:51	16:26
14	08:40	07:56	06:56	06:45	05:47		20:09 (2) 05:17	05:33		06:18			07:09	07:59	07:54	08:37
	16:53	17:48	18:39	20:32	21:22	18	20:27 (2) 21:58	21:52		21:05			19:57	18:48	16:49	16:26
15	08:39	07:54	06:54	06:43	05:45		20:09 (2) 05:17	05:35		06:20			07:11	08:01	07:56	08:38
	16:55	17:50	18:41	20:34	21:23	17	20:26 (2) 21:58	21:51		21:03			19:54	18:45	16:48	16:26
16	08:38	07:52	06:51	06:41	05:44		20:10 (2) 05:17	05:36		06:22			07:12	08:02	07:57	08:39
	16:56	17:52	18:42	20:35	21:25	16	20:26 (2) 21:59	21:50		21:01			19:52	18:43	16:46	16:26
17	08:37	07:50	06:49	06:38	05:42		20:11 (2) 05:17	05:37		06:23			07:14	08:04	07:59	08:40
	16:58	17:54	18:44	20:37	21:26	15	20:26 (2) 21:59	21:49		20:59			19:50	18:41	16:45	16:26
18	08:36	07:48	06:47	06:36	05:41		20:12 (2) 05:17	05:38		06:25			07:15	08:06	08:01	08:41
	16:59	17:56	18:46	20:39	21:28	12	20:24 (2) 22:00	21:48		20:57			19:47	18:39	16:44	16:27
19	08:35	07:46	06:45	06:34	05:39		20:13 (2) 05:17	05:39		06:27			07:17	08:07	08:03	08:41
	17:01	17:57	18:47	20:40	21:29	10	20:23 (2) 22:00	21:47		20:55			19:45	18:37	16:42	16:27
20	08:34	07:44	06:42	06:32	05:38		20:16 (2) 05:17	05:41		06:28			07:19	08:09	08:04	08:42
	17:03	17:59	18:49	20:42	21:31	5	20:21 (2) 22:01	21:46		20:53			19:43	18:35	16:41	16:27
21	08:33	07:42	06:40	06:30	05:36		05:17	05:42		06:30			07:20	08:11	08:06	08:43
	17:04	18:01	18:51	20:44	21:32		22:01	21:45		20:51			19:40	18:33	16:40	16:28
22	08:32	07:40	06:38	06:28	05:35		05:17	05:43		06:31			07:22	08:13	08:08	08:43
	17:06	18:03	18:53	20:46	21:34		22:01	21:43		20:48			19:38	18:30	16:39	16:28
23	08:31	07:38	06:35	06:26	05:34		05:18	05:45		06:33			07:24	08:15	08:09	08:44
	17:08	18:05	18:54	20:47	21:35		22:01	21:42		20:46			19:36	18:28	16:38	16:29
24	08:30	07:36	06:33	06:24	05:33		05:18	05:46	20:25 (2)	06:35			07:25	08:16	08:11	08:44
	17:10	18:07	18:56	20:49	21:37		22:01	21:41	8 20:33 (2)	20:44			19:33	18:26	16:37	16:29
25	08:28	07:34	06:31	06:22	05:31		05:18	05:48	20:23 (2)	06:36			07:27	07:18	08:12	08:44
	17:11	18:08	18:58	20:51	21:38		22:01	21:39	11 20:34 (2)	20:42			19:31	17:24	16:35	16:30
26	08:27	07:32	06:28	06:20	05:30		05:19	05:49	20:22 (2)	06:38			07:28	07:20	08:14	08:45
	17:13	18:10	19:00	20:52	21:39		22:01	21:38	13 20:35 (2)	20:40			19:29	17:22	16:35	16:31
27	08:26	07:29	06:26	06:18	05:29		05:19	05:50	20:21 (2)	06:40			07:30	07:22	08:16	08:45
	17:15	18:12	19:01	20:54	21:41		22:01	21:36	16 20:37 (2)	20:38			19:26	17:20	16:34	16:31
28	08:24	07:27	06:24	06:16	05:28		05:20	05:52	20:20 (2)	06:41			07:32	07:23	08:17	08:45
	17:17	18:14	19:03	20:56	21:42		22:01	21:35	17 20:37 (2)	20:35			19:24	17:18	16:33	16:32
29	08:23		07:21	06:14	05:27		05:20	05:53	20:19 (2)	06:43			07:33	07:25	08:19	08:45
	17:19		20:05	20:57	21:43		22:01	21:33	18 20:37 (2)	20:33			19:22	17:16	16:32	16:33
30	08:22		07:19	06:12	05:26		05:21	05:55	20:19 (2)	06:44			07:35	07:27	08:20	08:45
	17:20		20:06	20:59	21:44		22:01	21:32	19 20:38 (2)	20:31			19:19	17:15	16:31	16:34
31	08:20		07:17		05:25			05:56	20:19 (2)	06:46				07:29		08:45
	17:22		20:08		21:45			21:30	19 20:38 (2)	20:29				17:13		16:35
Potential sun hours	259	278	367	416	485		499	502		454		381	331	266	244
Total, worst case						286			121		169				
Sun reduction						0.37			0.27		0.30				
Oper. time red.						1.00			1.00		1.00				
Wind dir. red.						0.68			0.68		0.68				
Total reduction						0.25			0.18		0.20				
Total, real						72			22		34				

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** AL - H38

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February		March		April	May	June	July	August	September	October		November		December
1	08:46	08:19		07:25		17:32 (3)	07:14	06:10	05:24	05:21	05:58	06:48	07:37		07:31	16:12 (2)	08:22
	16:36	17:24		18:16	14	17:46 (3)	20:10	21:01	21:47	22:01	21:29	20:26	19:17		17:11	20 16:32 (2)	16:30
2	08:45	08:17		07:23		17:30 (3)	07:12	06:08	05:23	05:22	05:59	06:49	07:38		07:32	16:13 (2)	08:23
	16:37	17:26		18:18	16	17:46 (3)	20:12	21:02	21:48	22:00	21:27	20:24	19:15		17:09	18 16:31 (2)	16:30
3	08:45	08:15		07:21		17:30 (3)	07:10	06:06	05:23	05:23	06:01	06:51	07:40		07:34	16:14 (2)	08:25
	16:38	17:28		18:19	17	17:47 (3)	20:13	21:04	21:49	22:00	21:25	20:22	19:12		17:07	17 16:31 (2)	16:29
4	08:45	08:14	16:50 (2)	07:19		17:30 (3)	07:08	06:04	05:22	05:23	06:03	06:53	07:42	18:12 (3)	07:36	16:14 (2)	08:26
	16:39	17:30	5 16:55 (2)	18:21	17	17:47 (3)	20:15	21:06	21:50	21:59	21:24	20:20	19:10	6 18:18 (3)	17:05	16 16:30 (2)	16:29
5	08:45	08:12	16:47 (2)	07:16		17:30 (3)	07:05	06:02	05:21	05:24	06:04	06:54	07:44	18:09 (3)	07:38	16:16 (2)	08:27
	16:41	17:31	11 16:58 (2)	18:23	17	17:47 (3)	20:17	21:07	21:51	21:59	21:22	20:17	19:08	11 18:20 (3)	17:04	13 16:29 (2)	16:28
6	08:45	08:11	16:46 (2)	07:14		17:29 (3)	07:03	06:00	05:21	05:25	06:06	06:56	07:45	18:07 (3)	07:40	16:17 (2)	08:29
	16:42	17:33	13 16:59 (2)	18:25	17	17:46 (3)	20:18	21:09	21:52	21:58	21:20	20:15	19:05	14 18:21 (3)	17:02	10 16:27 (2)	16:28
7	08:44	08:09	16:45 (2)	07:12		17:30 (3)	07:01	05:58	05:20	05:26	06:07	06:58	07:47	18:06 (3)	07:41	16:21 (2)	08:30
	16:43	17:35	15 17:00 (2)	18:26	15	17:45 (3)	20:20	21:11	21:53	21:58	21:18	20:13	19:03	15 18:21 (3)	17:00	3 16:24 (2)	16:27
8	08:44	08:07	16:44 (2)	07:10		17:31 (3)	06:58	05:57	05:19	05:27	06:09	06:59	07:49	18:05 (3)	07:43		08:31
	16:44	17:37	17 17:01 (2)	18:28	13	17:44 (3)	20:22	21:12	21:54	21:57	21:16	20:11	19:01	17 18:22 (3)	16:58		16:27
9	08:43	08:05	16:44 (2)	07:07		17:33 (3)	06:56	05:55	05:19	05:28	06:10	07:01	07:50	18:05 (3)	07:45		08:32
	16:46	17:39	19 17:03 (2)	18:30	9	17:42 (3)	20:23	21:14	21:54	21:57	21:15	20:08	18:59	17 18:22 (3)	16:57		16:27
10	08:43	08:03	16:44 (2)	07:05			06:54	05:53	05:19	05:29	06:12	07:02	07:52	18:04 (3)	07:47		08:33
	16:47	17:41	19 17:03 (2)	18:32			20:25	21:16	21:55	21:56	21:13	20:06	18:56	17 18:21 (3)	16:55		16:26
11	08:42	08:02	16:44 (2)	07:03			06:52	05:52	05:18	05:30	06:14	07:04	07:54	18:04 (3)	07:49		08:34
	16:49	17:43	19 17:03 (2)	18:34			20:27	21:17	21:56	21:55	21:11	20:04	18:54	17 18:21 (3)	16:54		16:26
12	08:41	08:00	16:44 (2)	07:01			06:49	05:50	05:18	05:31	06:15	07:06	07:55	18:05 (3)	07:50		08:35
	16:50	17:44	19 17:03 (2)	18:35			20:29	21:19	21:57	21:54	21:09	20:01	18:52	15 18:20 (3)	16:52		16:26
13	08:41	07:58	16:44 (2)	06:58			06:47	05:48	05:18	05:32	06:17	07:07	07:57	18:06 (3)	07:52		08:36
	16:52	17:46	19 17:03 (2)	18:37			20:30	21:20	21:57	21:53	21:07	19:59	18:50	13 18:19 (3)	16:51		16:26
14	08:40	07:56	16:44 (2)	06:56			06:45	05:47	05:17	05:33	06:18	07:09	07:59	18:07 (3)	07:54		08:37
	16:53	17:48	18 17:02 (2)	18:39			20:32	21:22	21:58	21:52	21:05	19:57	18:48	10 18:17 (3)	16:49		16:26
15	08:39	07:54	16:45 (2)	06:54			06:43	05:45	05:17	05:34	06:20	07:11	08:01	18:10 (3)	07:56		08:38
	16:55	17:50	16 17:01 (2)	18:41			20:34	21:24	21:59	21:51	21:03	19:54	18:45	3 18:13 (3)	16:48		16:26
16	08:38	07:52	16:46 (2)	06:51			06:41	05:44	05:17	05:36	06:22	07:12	08:02		07:57		08:39
	16:56	17:52	14 17:00 (2)	18:42			20:35	21:25	21:59	21:50	21:01	19:52	18:43		16:46		16:26
17	08:37	07:50	16:48 (2)	06:49			06:38	05:42	05:17	05:37	06:23	07:14	08:04		07:59		08:40
	16:58	17:54	11 16:59 (2)	18:44			20:37	21:27	22:00	21:49	20:59	19:50	18:41		16:45		16:26
18	08:36	07:48	16:52 (2)	06:47			06:36	05:41	05:17	05:38	06:25	07:15	08:06		08:01		08:41
	16:59	17:56	3 16:55 (2)	18:46			20:39	21:28	22:00	21:48	20:57	19:47	18:39		16:44		16:27
19	08:35	07:46		06:45			06:34	05:39	05:17	05:39	06:27	07:17	08:08		08:03		08:41
	17:01	17:57		18:47			20:41	21:30	22:00	21:47	20:55	19:45	18:37		16:42		16:27
20	08:34	07:44		06:42			06:32	05:38	05:17	05:41	06:28	07:19	08:09		08:04		08:42
	17:03	17:59		18:49			20:42	21:31	22:01	21:46	20:53	19:43	18:35		16:41		16:27
21	08:33	07:42		06:40			06:30	05:36	05:17	05:42	06:30	07:20	08:11		08:06		08:43
	17:04	18:01		18:51			20:44	21:32	22:01	21:45	20:51	19:40	18:33		16:40		16:28
22	08:32	07:40		06:38			06:28	05:35	05:17	05:43	06:31	07:22	08:13		08:08		08:43
	17:06	18:03		18:53			20:46	21:34	22:01	21:43	20:48	19:38	18:30		16:39		16:28
23	08:31	07:38		06:35			06:26	05:34	05:18	05:45	06:33	07:24	08:15		08:09		08:44
	17:08	18:05		18:54			20:47	21:35	22:01	21:42	20:46	19:36	18:28		16:38		16:29
24	08:30	07:36		06:33			06:24	05:33	05:18	05:46	06:35	07:25	08:16	17:20 (2)	08:11		08:44
	17:10	18:07		18:56			20:49	21:37	22:01	21:41	20:44	19:33	18:26	6 17:26 (2)	16:36		16:29
25	08:29	07:34		06:31			06:22	05:31	05:18	05:48	06:36	07:27	07:18	16:17 (2)	08:13		08:45
	17:11	18:08		18:58			20:51	21:38	22:01	21:39	20:42	19:31	17:24	12 16:29 (2)	16:35		16:30
26	08:27	07:32		06:28			06:19	05:30	05:19	05:49	06:38	07:29	07:20	16:16 (2)	08:14		08:45
	17:13	18:10		19:00			20:52	21:39	22:01	21:38	20:40	19:29	17:22	14 16:30 (2)	16:34		16:31
27	08:26	07:29	17:36 (3)	06:26			06:17	05:29	05:19	05:50	06:40	07:30	07:22	16:15 (2)	08:16		08:45
	17:15	18:12	6 17:42 (3)	19:01			20:54	21:41	22:01	21:36	20:38	19:26	17:20	16 16:31 (2)	16:34		16:31
28	08:25	07:27	17:33 (3)	06:24			06:15	05:28	05:20	05:52	06:41	07:32	07:23	16:14 (2)	08:17		08:45
	17:17	18:14	12 17:45 (3)	19:03			20:56	21:42	22:01	21:35	20:35	19:24	17:18	18 16:32 (2)	16:33		16:32
29	08:23			07:21			06:13	05:27	05:20	05:53	06:43	07:33	07:25	16:13 (2)	08:19		08:45
	17:19			20:05			20:57	21:43	22:01	21:33	20:33	19:22	17:16	19 16:32 (2)	16:32		16:33
30	08:22			07:19			06:12	05:26	05:21	05:55	06:44	07:35	07:27	16:13 (2)	08:20		08:46
	17:20			20:06			20:59	21:44	22:01	21:32	20:31	19:19	17:15	20 16:33 (2)	16:31		16:34
31	08:20			07:17				05:25		05:56	06:46		07:29	16:12 (2)			08:46
	17:22			20:08				21:46		21:30	20:29		17:13	20 16:32 (2)			16:35
Potential sun hours	259	278		367		416	485	499	502	454	381	331		266			244
Total, worst case			236		135								280		97		
Sun reduction			0.21		0.24								0.24		0.18		
Oper. time red.			1.00		1.00								1.00		1.00		
Wind dir. red.			0.63		0.64								0.63		0.63		
Total reduction			0.13		0.16								0.15		0.12		
Total, real			30		21								42		11		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar

Calculation: Alternative Scenario 3 Real Case **Shadow receptor:** AM - H39

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:45	08:19	07:25	07:14	06:10	05:24	05:21	05:58	06:48	07:37	07:31	08:22
	16:36	17:24	18:16	20:10	21:01	21:47	22:00	21:29	20:26	19:17	17:11	16:30
2	08:45	08:17	07:23	07:12	06:08	05:24	05:22	06:00	06:49	07:38	07:32	08:23
	16:37	17:26	18:18	20:11	21:02	21:48	22:00	21:27	20:24	19:15	17:09	16:30
3	08:45	08:15	07:21	07:10	06:06	05:23	05:23	06:01	06:51	07:40	07:34	08:24
	16:38	17:28	18:19	20:13	21:04	21:49	22:00	21:25	20:22	19:12	17:07	16:29
4	08:45	08:14	07:19	07:08	06:04	05:22	05:24	06:03	06:53	07:42	07:36	08:26
	16:40	17:30	18:21	20:15	21:06	21:50	21:59	21:23	20:20	19:10	17:05	16:29
5	08:45	08:12	07:16	07:05	06:02	05:21	05:24	06:04	06:54	07:43	07:38	08:27
	16:41	17:31	18:23	20:17	21:07	21:51	21:59	21:22	20:17	19:08	17:04	16:28
6	08:44	08:10	07:14	07:03	06:00	05:21	05:25	06:06	06:56	07:45	07:40	08:28
	16:42	17:33	18:25	20:18	21:09	21:52	21:58	21:20	20:15	19:05	17:02	16:28
7	08:44	08:09	07:12	07:01	05:59	05:20	05:26	06:07	06:58	07:47	07:41	08:30
	16:43	17:35	18:27	20:20	21:11	21:53	21:58	21:18	20:13	19:03	17:00	16:27
8	08:44	08:07	07:10	06:58	05:57	05:20	05:27	06:09	06:59	07:49	07:43	08:31
	16:45	17:37	18:28	20:22	21:12	21:54	21:57	21:16	20:11	19:01	16:58	16:27
9	08:43	08:05	07:07	06:56	05:55	05:19	05:28	06:11	07:01	07:50	07:45	08:32
	16:46	17:39	18:30	20:23	21:14	21:54	21:56	21:14	20:08	18:59	16:57	16:27
10	08:43	08:03	07:05	06:54	05:53	05:19	05:29	06:12	07:02	07:52	07:47	08:33
	16:47	17:41	18:32	20:25	21:16	21:55	21:56	21:13	20:06	18:56	16:55	16:26
11	08:42	08:02	07:03	06:52	05:52	05:18	05:30	06:14	07:04	07:54	07:49	08:34
	16:49	17:43	18:34	20:27	21:17	21:56	21:55	21:11	20:04	18:54	16:54	16:26
12	08:41	08:00	07:01	06:50	05:50	05:18	05:31	06:15	07:06	07:55	07:50	08:35
	16:50	17:45	18:35	20:29	21:19	21:57	21:54	21:09	20:01	18:52	16:52	16:26
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	16:58	17:54	18:44	20:37	21:26	21:59	21:49	20:59	19:50	18:41	16:45	16:26
18	08:36	07:48	06:47	06:36	05:41	05:17	05:38	06:25	07:15	08:06	08:01	08:41
	17:00	17:56	18:46	20:39	21:28	22:00	21:48	20:57	19:47	18:39	16:44	16:27
19	08:35	07:46	06:45	06:34	05:39	05:17	05:40	06:27	07:17	08:07	08:03	08:41
	17:01	17:58	18:47	20:40	21:29	22:00	21:47	20:55	19:45	18:37	16:42	16:27
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	17:11	18:09	18:58	20:51	21:38	22:01	21:39	20:42	19:31	17:24	16:36	16:30
26	08:27	07:32	06:28	06:20	05:30	05:19	05:49	06:38	07:29	07:20	08:14	08:45
	17:13	18:10	19:00	20:52	21:39	22:01	21:38	20:40	19:29	17:22	16:35	16:31
27	08:26	07:29	06:26	06:18	05:29	05:19	05:51	06:40	07:30	07:22	08:16	08:45
	17:15	18:12	19:01	20:54	21:41	22:01	21:36	20:38	19:26	17:20	16:34	16:31
28	08:24	07:27	06:24	06:16	05:28	05:20	05:52	06:41	07:32	07:23	08:17	08:45
	17:17	18:14	19:03	20:56	21:42	22:01	21:35	20:35	19:24	17:18	16:33	16:32
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31	08:20		07:17		05:25		05:56	06:46		07:29		08:45
	17:22		20:08		21:45		21:30	20:29		17:13		16:35
Potential sun hours	259	278	367	416	485	499	502	454	381	331	266	244
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

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Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
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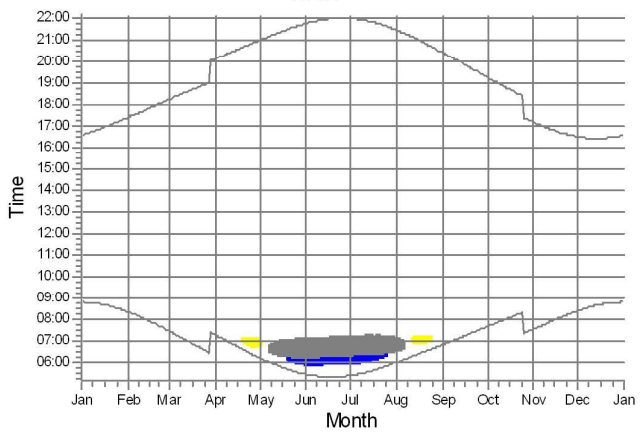
10/03/2023 13:04/3.6.361

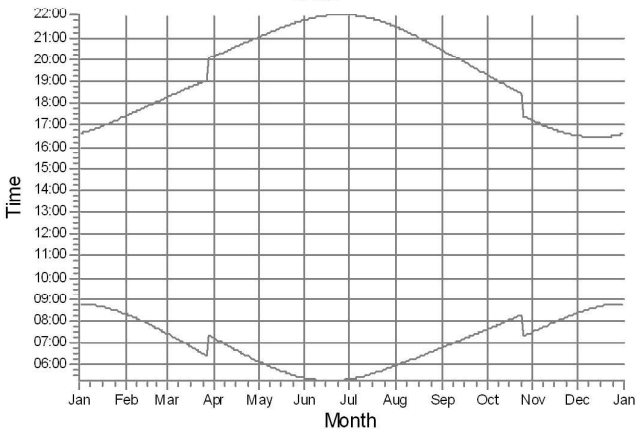
SHADOW - Calendar, graphical

Calculation: Alternative Scenario 3 Real Case

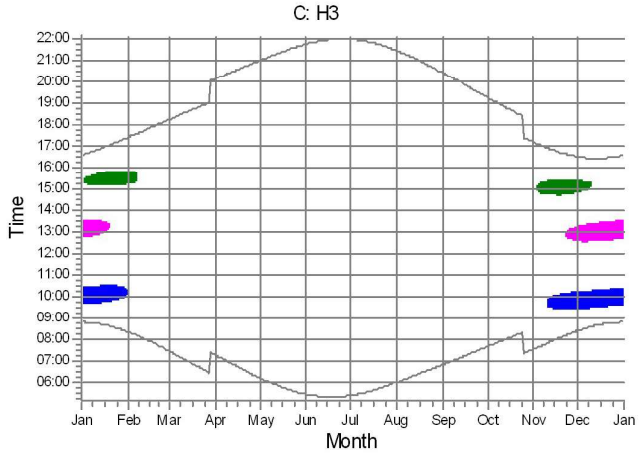
A: H1



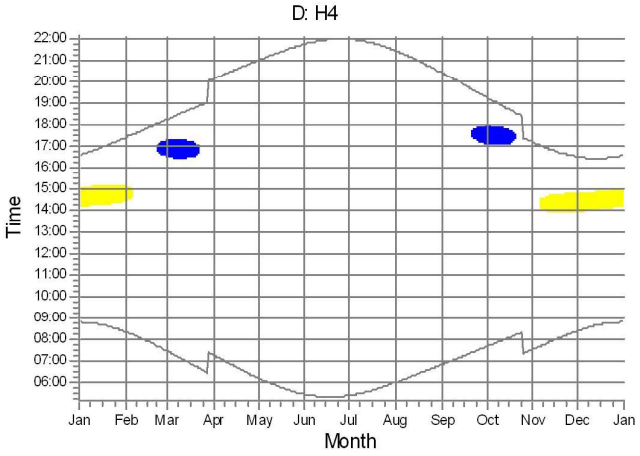
B: H2



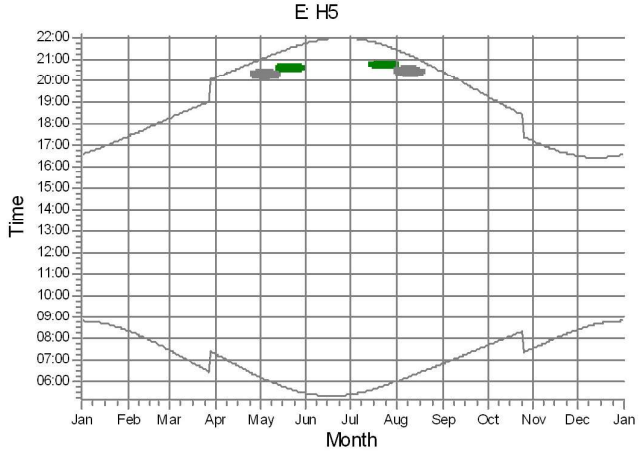
C: H3



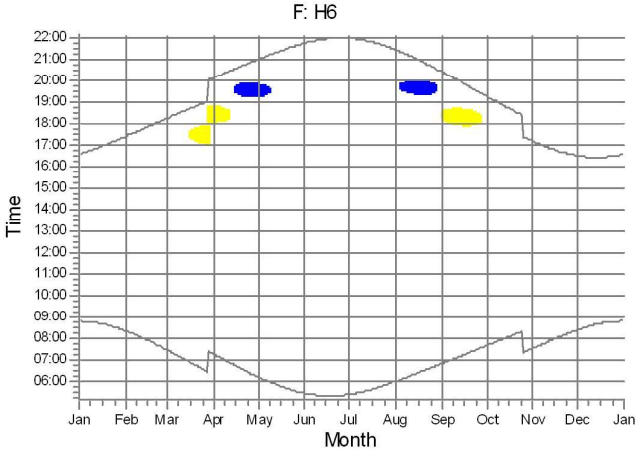
D: H4



E: H5



F: H6



WTGs

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
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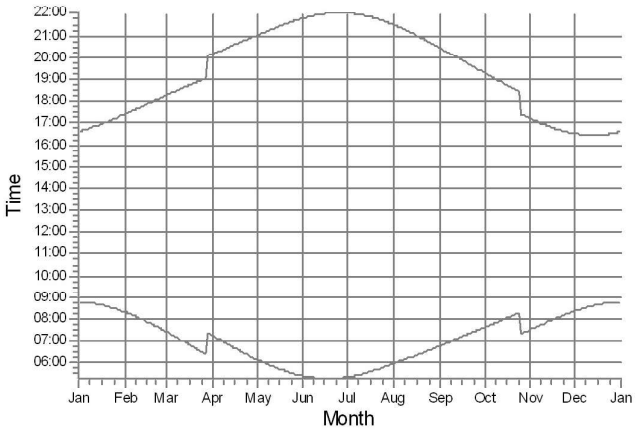
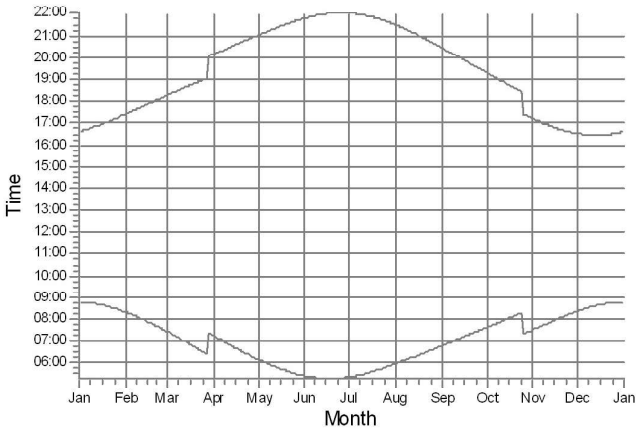
SHADOW - Calendar, graphical

Calculation: Alternative Scenario 3 Real Case

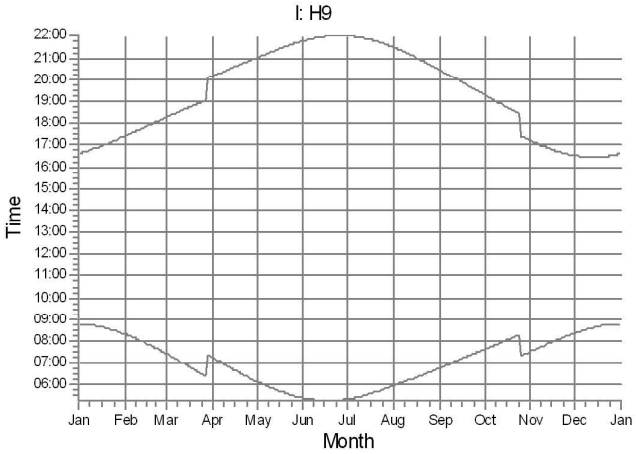
G: H7



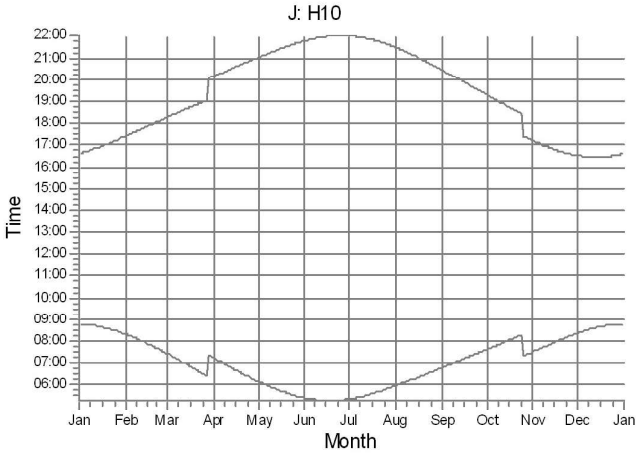
H: H8



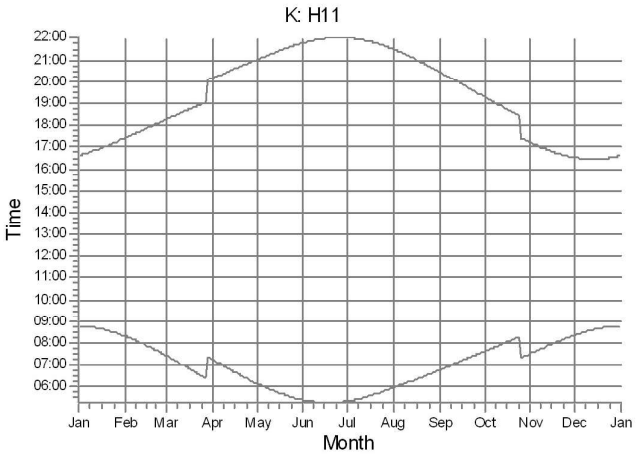
I: H9



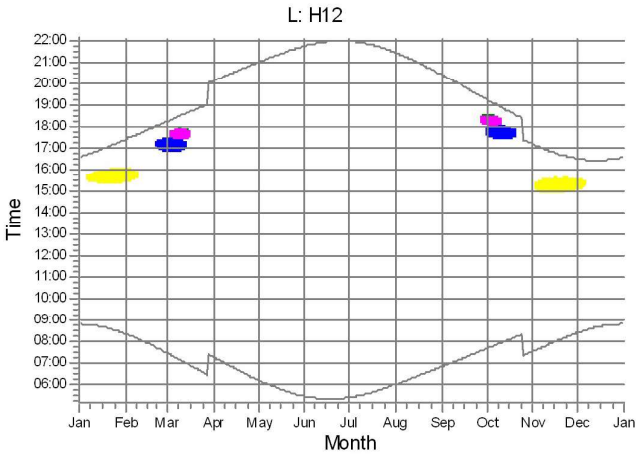
J: H10



K: H11



L: H12



WTGs

1: T1 2: T5 3: T4 5: T3

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
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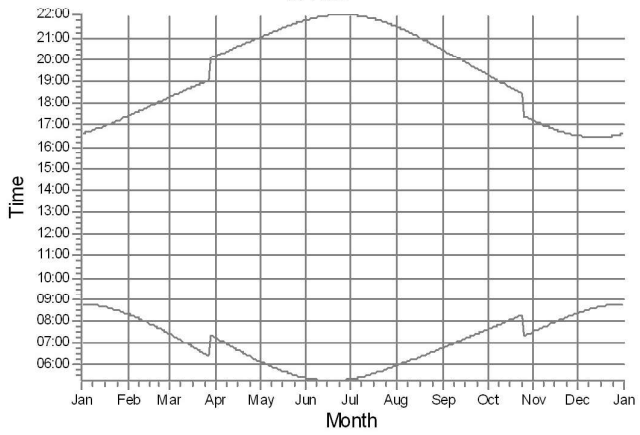
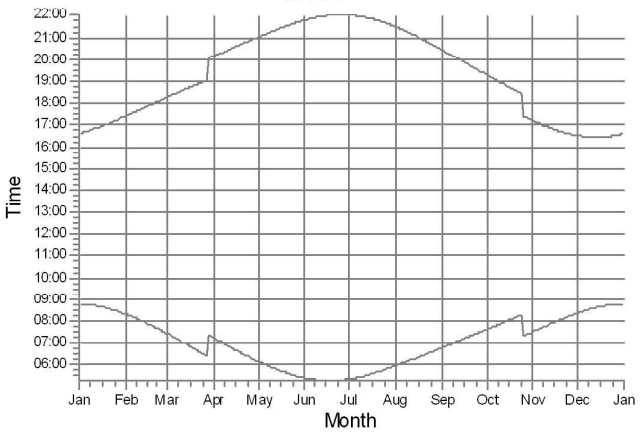
SHADOW - Calendar, graphical

Calculation: Alternative Scenario 3 Real Case

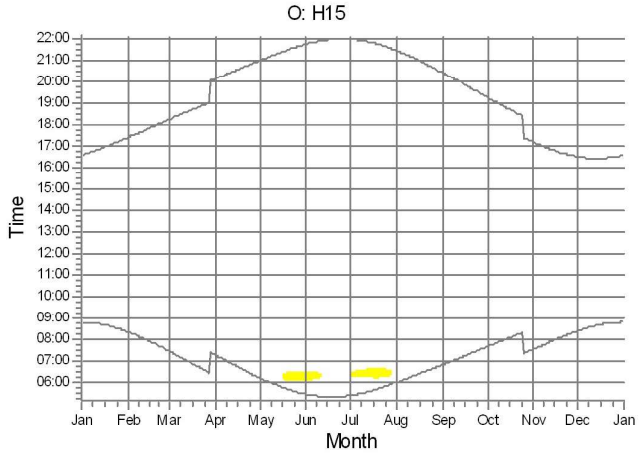
M: H13



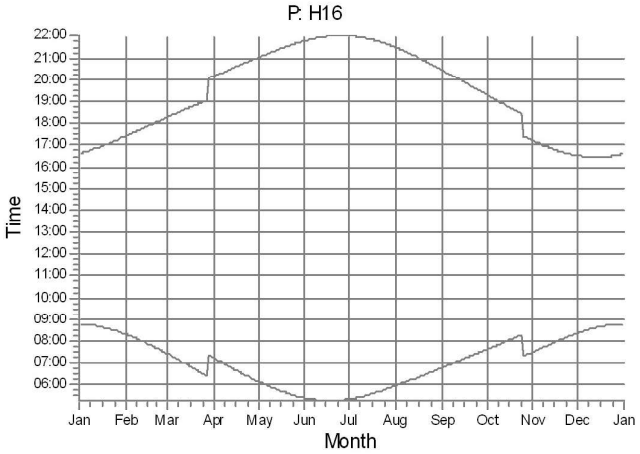
N: H14



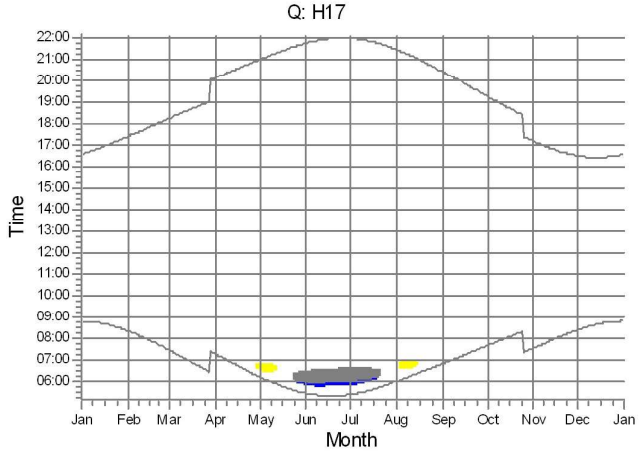
O: H15



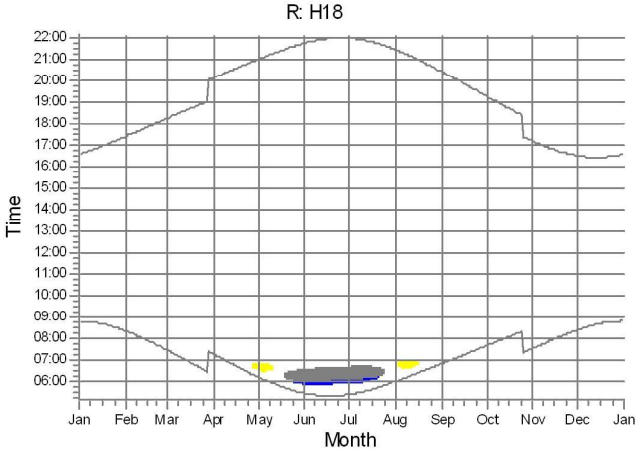
P: H16



Q: H17



R: H18



WTGs

2: T5 3: T4 4: T2

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
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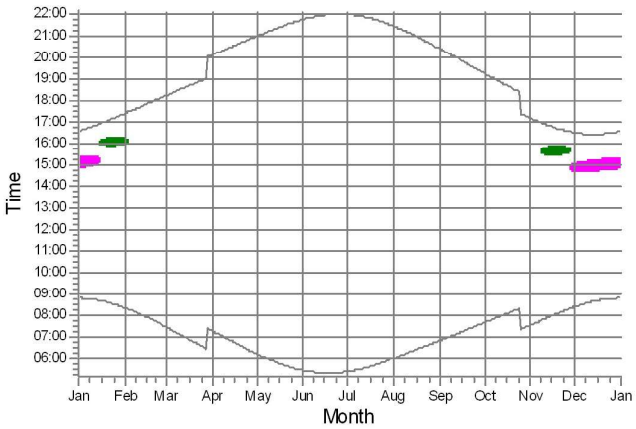
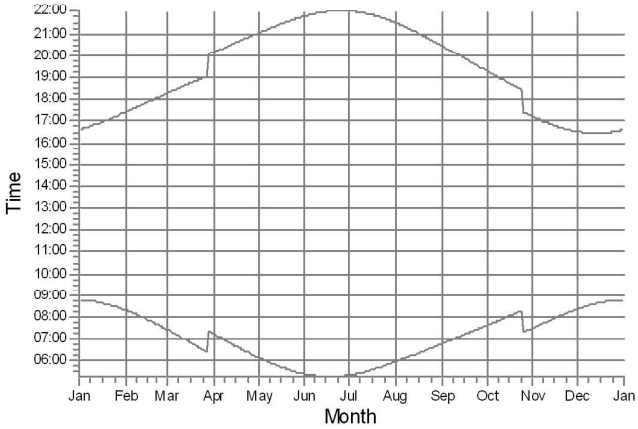
SHADOW - Calendar, graphical

Calculation: Alternative Scenario 3 Real Case

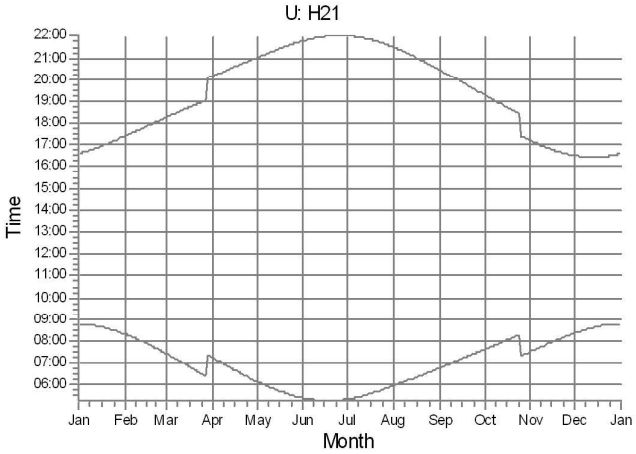
S: H19



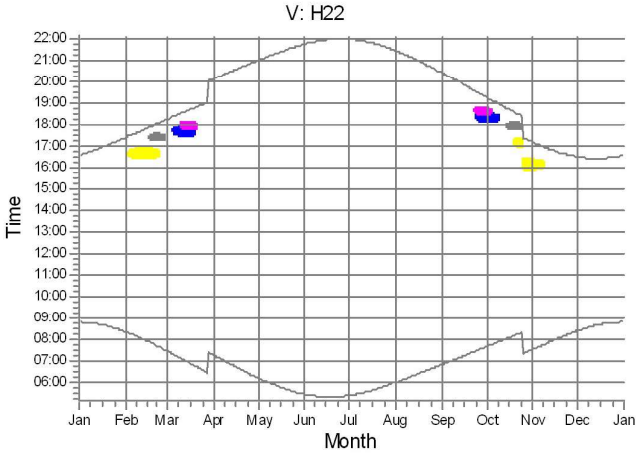
T: H20



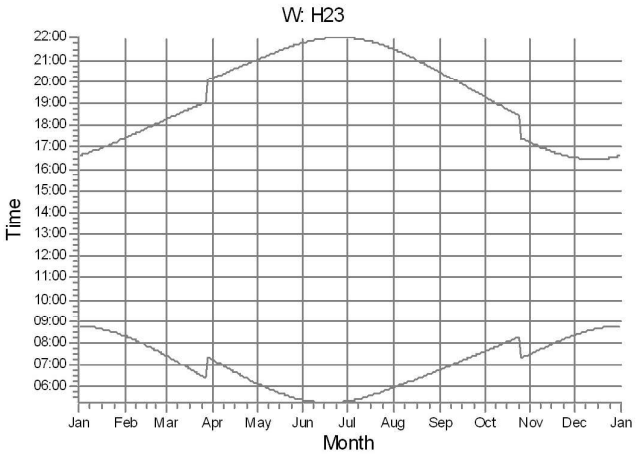
U: H21



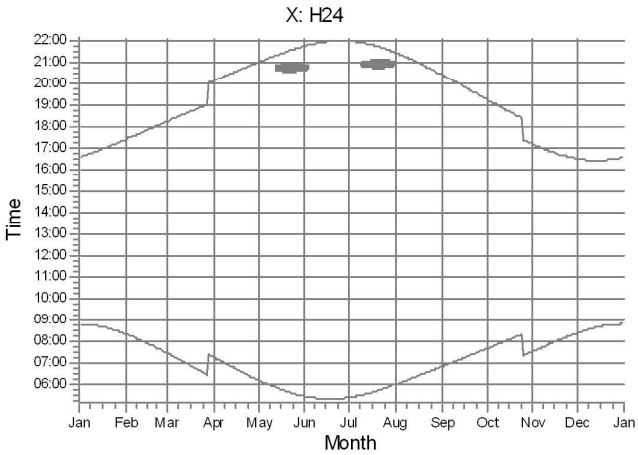
V: H22



W: H23



X: H24



WTGs

1: T1 2: T5 3: T4 4: T2 5: T3

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
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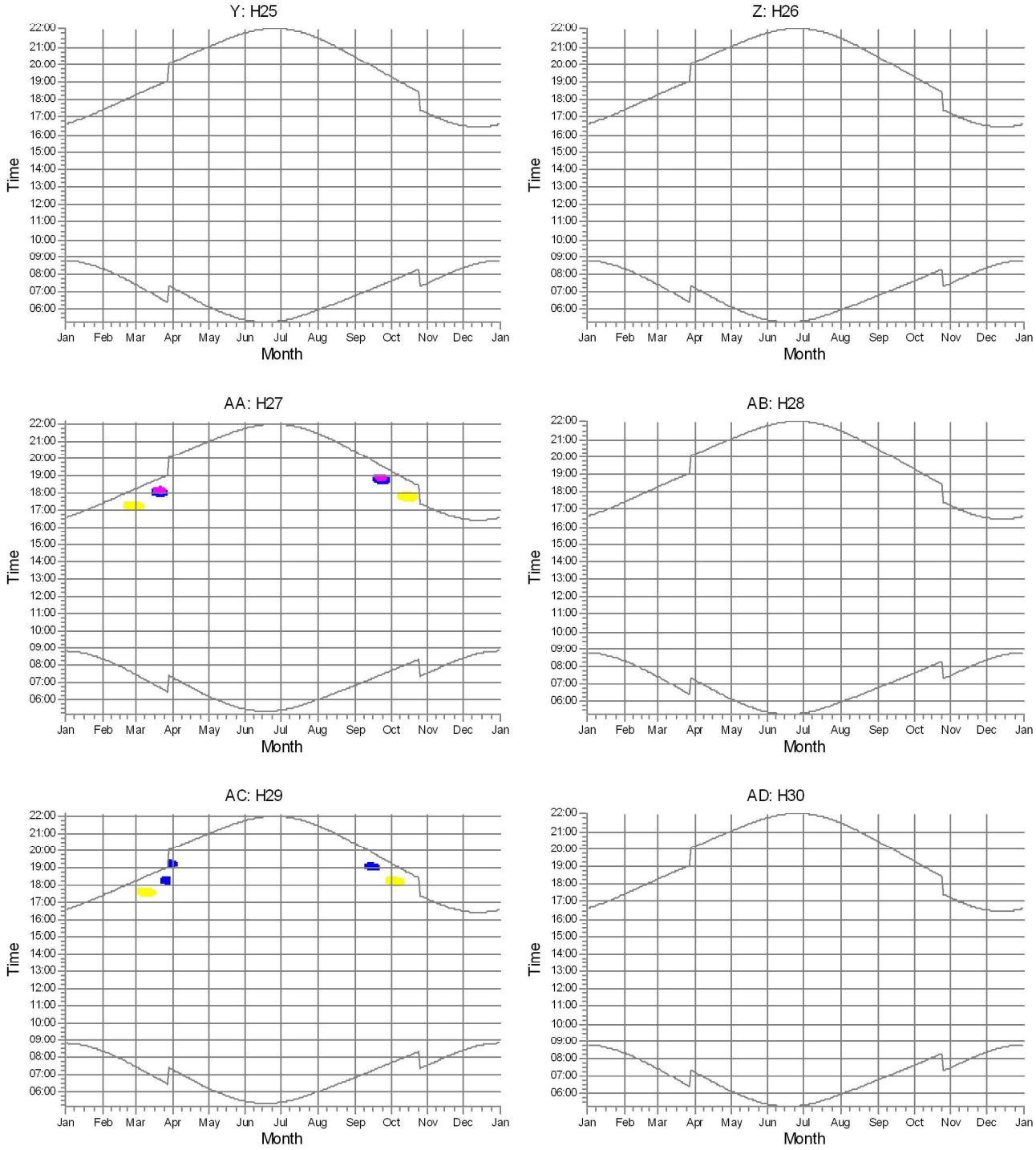
SHADOW - Calendar, graphical

Calculation: Alternative Scenario 3 Real Case



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Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
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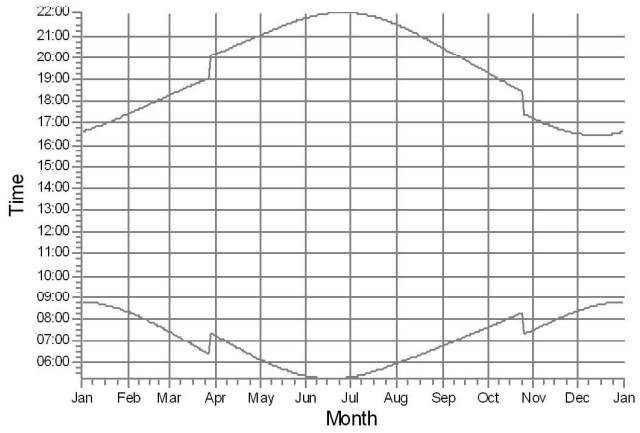
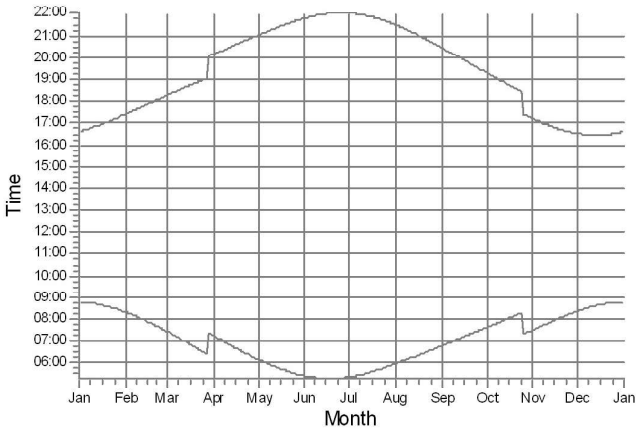
SHADOW - Calendar, graphical

Calculation: Alternative Scenario 3 Real Case

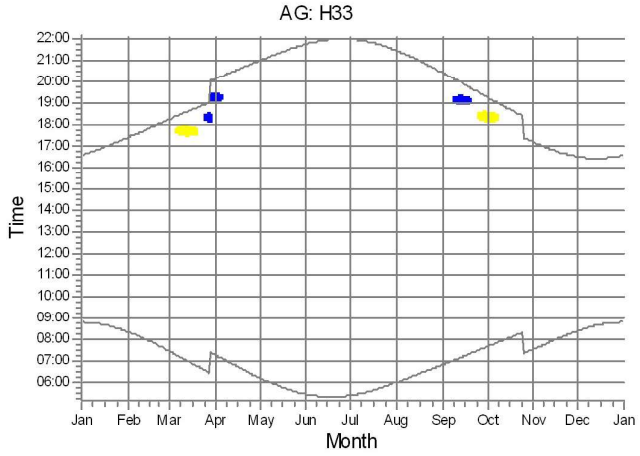
AE: H31



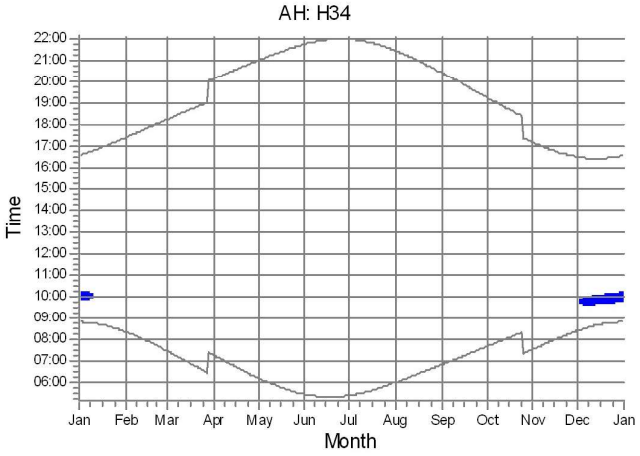
AF: H32



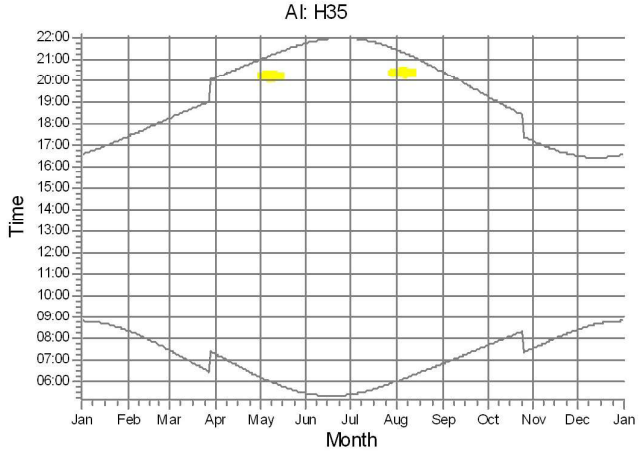
AG: H33



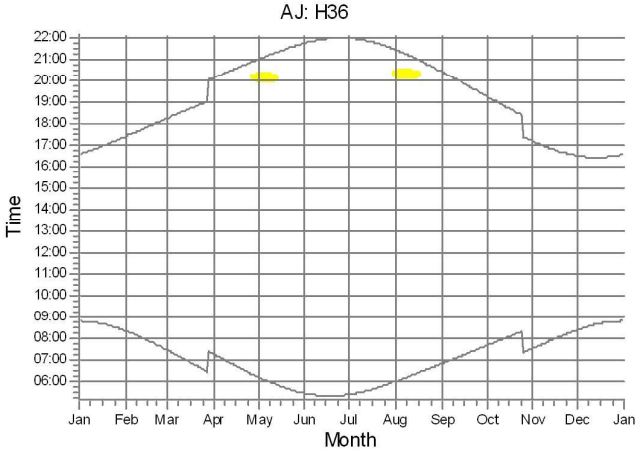
AH: H34



AI: H35



AJ: H36



WTGs

2: T5 3: T4

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
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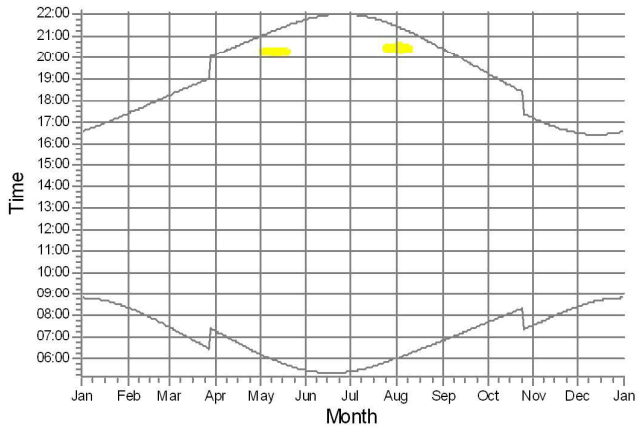
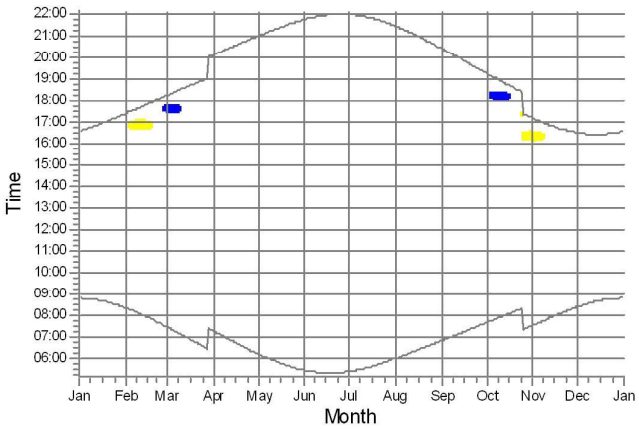
SHADOW - Calendar, graphical

Calculation: Alternative Scenario 3 Real Case

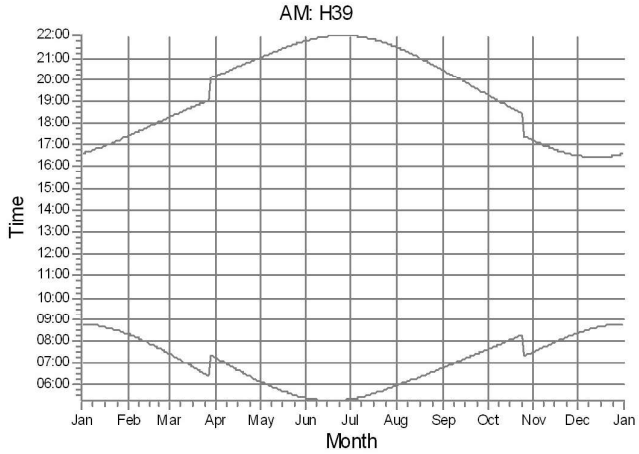
AK: H37



AL: H38



AM: H39



WTGs

2: T5 3: T4

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar per WTG

Calculation: Alternative Scenario 3 Real Case **WTG:** 1 - T1

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January		February		March		April	May		June	
1	08:46		08:19	16:03-16:12/9	07:25		07:15	06:10		05:24	
	16:36		17:24	15:18-15:45/27	18:16		20:10	21:01		21:47	
2	08:46		08:17	16:07-16:09/2	07:23		07:12	06:08		05:24	
	16:37		17:26	15:19-15:45/26	18:18		20:12	21:03		21:48	
3	08:45	15:21-15:24/3	08:16	15:21-15:44/23	07:21		07:10	06:06		05:23	
	16:39		17:28		18:20		20:13	21:04		21:49	
4	08:45	15:18-15:27/9	08:14	15:22-15:43/21	07:19		07:08	06:04		05:22	
	16:40		17:30		18:21		20:15	21:06		21:50	
5	08:45	15:18-15:29/11	08:12	15:24-15:41/17	07:17		07:05	06:02		05:21	
	16:41		17:32		18:23		20:17	21:08		21:51	
6	08:45	15:16-15:30/14	08:11	15:27-15:39/12	07:14		07:03	06:00		05:21	
	16:42		17:33		18:25		20:19	21:09		21:52	
7	08:44	15:16-15:32/16	08:09		07:12	17:42-17:50/8	07:01	05:59		05:20	
	16:43		17:35		18:27		20:20	21:11		21:53	
8	08:44	15:15-15:33/18	08:07		07:10	17:40-17:52/12	06:59	05:57		05:20	
	16:45		17:37		18:28		20:22	21:13		21:54	
9	08:43	15:16-15:35/19	08:05		07:08	17:39-17:53/14	06:56	05:55		05:19	
	16:46		17:39		18:30		20:24	21:14		21:55	
10	08:43	15:15-15:36/21	08:04		07:05	17:38-17:52/14	06:54	05:53		05:19	
	16:47		17:41		18:32		20:25	21:16		21:55	
11	08:42	15:14-15:37/23	08:02		07:03	17:38-17:52/14	06:52	05:52		05:18	
	16:49		17:43		18:34		20:27	21:17		21:56	
12	08:42	15:14-15:38/24	08:00		07:01	17:38-17:52/14	06:50	05:50	20:34-20:42/8	05:18	
	16:50		17:45		18:35		20:29	21:19		21:57	
13	08:41	15:14-15:39/25	07:58		06:58	17:38-17:50/12	06:47	05:48	20:32-20:43/11	05:18	
	16:52		17:47		18:37		20:30	21:21		21:58	
14	08:40	15:13-15:39/26	07:56		06:56	17:39-17:49/10	06:45	05:47	20:32-20:45/13	05:18	
	16:53		17:48		18:39		20:32	21:22		21:58	
15	08:39	15:13-15:40/27	07:54		06:54	17:42-17:47/5	06:43	05:45	20:30-20:45/15	05:17	
	16:55		17:50		18:41		20:34	21:24		21:59	
16	08:39	16:00-16:06/6	07:52		06:52		06:41	05:44	20:30-20:46/16	05:17	
	16:56	15:13-15:41/28	17:52		18:42		20:36	21:25		21:59	
17	08:38	15:59-16:08/9	07:50		06:49		06:39	05:42	20:30-20:46/16	05:17	
	16:58	15:13-15:42/29	17:54		18:44		20:37	21:27		22:00	
18	08:37	15:58-16:10/12	07:48		06:47		06:36	05:41	20:29-20:46/17	05:17	
	17:00	15:13-15:43/30	17:56		18:46		20:39	21:28		22:00	
19	08:36	15:58-16:11/13	07:46		06:45		06:34	05:39	20:30-20:46/16	05:17	
	17:01	15:13-15:44/31	17:58		18:48		20:41	21:30		22:00	
20	08:35	15:57-16:13/16	07:44		06:42		06:32	05:38	20:30-20:47/17	05:17	
	17:03	15:14-15:45/31	18:00		18:49		20:42	21:31		22:01	
21	08:34	15:56-16:13/17	07:42		06:40		06:30	05:37	20:30-20:47/17	05:17	
	17:05	15:14-15:45/31	18:01		18:51		20:44	21:33		22:01	
22	08:32	15:57-16:14/17	07:40		06:38		06:28	05:35	20:30-20:46/16	05:18	
	17:06	15:13-15:45/32	18:03		18:53		20:46	21:34		22:01	
23	08:31	15:57-16:15/18	07:38		06:35		06:26	05:34	20:30-20:46/16	05:18	
	17:08	15:14-15:46/32	18:05		18:55		20:47	21:35		22:01	
24	08:30	15:56-16:14/18	07:36		06:33		06:24	05:33	20:31-20:45/14	05:18	
	17:10	15:13-15:46/33	18:07		18:56		20:49	21:37		22:01	
25	08:29	15:57-16:15/18	07:34		06:31		06:22	05:32	20:31-20:45/14	05:18	
	17:12	15:14-15:46/32	18:09		18:58		20:51	21:38		22:02	
26	08:27	15:58-16:16/18	07:32		06:28		06:20	05:30	20:32-20:45/13	05:19	
	17:13	15:15-15:47/32	18:10		19:00		20:53	21:39		22:02	
27	08:26	15:58-16:15/17	07:30		06:26		06:18	05:29	20:33-20:44/11	05:19	
	17:15	15:15-15:47/32	18:12		19:01		20:54	21:41		22:01	
28	08:25	15:59-16:16/17	07:27		06:24		06:16	05:28	20:34-20:43/9	05:20	
	17:17	15:16-15:47/31	18:14		19:03		20:56	21:42		22:01	
29	08:23	15:59-16:15/16			07:22		06:14	05:27	20:35-20:42/7	05:20	
	17:19	15:16-15:47/31			20:05		20:58	21:43		22:01	
30	08:22	16:00-16:14/14			07:19		06:12	05:26	20:38-20:41/3	05:21	
	17:21	15:16-15:46/30			20:07		20:59	21:44		22:01	
31	08:20	16:02-16:14/12			07:17			05:25			
	17:22	15:18-15:46/28			20:08			21:46			
Potential sun hours	259		278		367		416	485		499	
Sum of minutes with flicker	967		137		103		0	249		0	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar per WTG

Calculation: Alternative Scenario 3 Real Case **WTG:** 1 - T1

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	July	August	September	October	November	December
1	05:22 22:01	05:58 20:45-20:52/7 21:29	06:48 20:27	07:37 18:17-18:31/14 19:17	07:31 17:11	08:22 14:56-15:19/23 16:31
2	05:22 22:00	06:00 21:27	06:50 20:24	07:39 18:17-18:31/14 19:15	07:33 17:09	08:23 14:58-15:19/21 16:30
3	05:23 22:00	06:01 21:25	06:51 20:22	07:40 18:16-18:30/14 19:13	07:34 17:07	08:25 14:59-15:18/19 16:29
4	05:24 22:00	06:03 21:24	06:53 20:20	07:42 18:16-18:30/14 19:10	07:36 15:00-15:04/4 17:05	08:26 14:59-15:17/18 16:29
5	05:25 21:59	06:04 21:22	06:54 20:18	07:44 18:17-18:29/12 19:08	07:38 14:56-15:09/13 17:04	08:27 15:01-15:17/16 16:28
6	05:25 21:59	06:06 21:20	06:56 20:15	07:45 18:17-18:27/10 19:06	07:40 14:53-15:11/18 17:02	08:29 15:02-15:16/14 16:28
7	05:26 21:58	06:07 21:18	06:58 20:13	07:47 18:19-18:24/5 19:03	07:42 14:52-15:13/21 17:00	08:30 15:05-15:16/11 16:27
8	05:27 21:57	06:09 21:17	06:59 20:11	07:49 19:01	07:43 14:51-15:14/23 16:59	08:31 15:06-15:15/9 16:27
9	05:28 21:57	06:11 21:15	07:01 20:08	07:50 18:59	07:45 15:37-15:40/3 16:57 14:50-15:15/25	08:32 15:09-15:13/4 16:27
10	05:29 21:56	06:12 21:13	07:03 20:06	07:52 18:57	07:47 15:34-15:43/9 16:55 14:49-15:16/27	08:33 16:27
11	05:30 21:55	06:14 21:11	07:04 20:04	07:54 18:54	07:49 15:32-15:45/13 16:54 14:48-15:17/29	08:35 16:26
12	05:31 21:54	06:15 21:09	07:06 20:01	07:56 18:52	07:51 15:32-15:46/14 16:52 14:48-15:18/30	08:36 16:26
13	05:32 21:53	06:17 21:07	07:07 19:59	07:57 18:50	07:52 15:31-15:47/16 16:51 14:48-15:19/31	08:37 16:26
14	05:33 20:45-20:51/6 21:53	06:19 21:05	07:09 19:57	07:59 18:48	07:54 15:31-15:48/17 16:49 14:48-15:19/31	08:38 16:26
15	05:35 20:44-20:52/8 21:52	06:20 21:03	07:11 19:54	08:01 18:46	07:56 15:31-15:48/17 16:48 14:48-15:20/32	08:38 16:26
16	05:36 20:43-20:53/10 21:51	06:22 21:01	07:12 19:52	08:02 18:43	07:58 15:31-15:49/18 16:46 14:48-15:20/32	08:39 16:26
17	05:37 20:42-20:54/12 21:50	06:24 20:59	07:14 19:50	08:04 18:41	07:59 15:31-15:49/18 16:45 14:48-15:20/32	08:40 16:27
18	05:38 20:41-20:54/13 21:48	06:25 20:57	07:16 19:47	08:06 18:39	08:01 15:30-15:48/18 16:44 14:47-15:20/33	08:41 16:27
19	05:40 20:41-20:55/14 21:47	06:27 20:55	07:17 19:45	08:08 18:37	08:03 15:31-15:49/18 16:42 14:48-15:20/32	08:42 16:27
20	05:41 20:41-20:56/15 21:46	06:28 20:53	07:19 19:43	08:09 18:35	08:04 15:32-15:49/17 16:41 14:48-15:20/32	08:42 16:27
21	05:42 20:40-20:56/16 21:45	06:30 20:51	07:20 19:40	08:11 18:33	08:06 15:32-15:49/17 16:40 14:49-15:20/31	08:43 16:28
22	05:44 20:40-20:56/16 21:44	06:32 20:49	07:22 19:38	08:13 18:31	08:08 15:33-15:49/16 16:39 14:50-15:21/31	08:43 16:28
23	05:45 20:40-20:56/16 21:42	06:33 20:46	07:24 19:36	08:15 18:29	08:09 15:35-15:48/13 16:38 14:50-15:21/31	08:44 16:29
24	05:46 20:40-20:57/17 21:41	06:35 20:44	07:25 19:33	08:17 18:27	08:11 15:35-15:47/12 16:37 14:50-15:20/30	08:44 16:29
25	05:48 20:40-20:57/17 21:39	06:37 20:42	07:27 19:31	07:18 17:25	08:13 15:37-15:46/9 16:36 14:51-15:20/29	08:45 16:30
26	05:49 20:40-20:56/16 21:38	06:38 20:40	07:29 19:29	07:20 17:23	08:14 15:39-15:45/6 16:35 14:52-15:20/28	08:45 16:31
27	05:51 20:41-20:57/16 21:37	06:40 20:38	07:30 19:26	07:22 17:21	08:16 14:53-15:20/27 16:34	08:45 16:32
28	05:52 20:41-20:56/15 21:35	06:41 20:36	07:32 19:24	07:24 17:19	08:17 14:53-15:20/27 16:33	08:45 16:32
29	05:54 20:42-20:56/14 21:34	06:43 20:33	07:34 18:21-18:29/8 19:22	07:25 17:17	08:19 14:55-15:20/25 16:32	08:46 16:33
30	05:55 20:42-20:55/13 21:32	06:45 20:31	07:35 18:18-18:30/12 19:19	07:27 17:15	08:20 14:55-15:19/24 16:31	08:46 16:34
31	05:57 20:43-20:53/10 21:30	06:46 20:29		07:29 17:13		08:46 16:35
Potential sun hours	502	454	381	331	266	244
Sum of minutes with flicker	244	7	20	83	979	135

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar per WTG

Calculation: Alternative Scenario 3 Real Case **WTG:** 2 - T5

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February	March	April	May	June
1	08:46 14:15-14:57/42	08:19 15:30-15:59/29	07:25 17:04-17:26/22	07:15 18:07-18:47/40	06:10 20:02-20:21/19 06:49-06:54/5	05:24 06:07-06:22/15
	16:36	17:24 14:31-15:02/31	18:16	20:10	21:01 06:34-06:44/10	21:47
2	08:46 14:15-14:58/43	08:17 15:30-15:58/28	07:23 17:03-17:24/21	07:12 18:07-18:46/39	06:08 20:01-20:22/21	05:24 06:08-06:22/14
	16:37	17:26 14:33-15:00/27	18:18	20:12	21:03 06:32-06:44/12	21:48
3	08:45 14:16-14:59/43	08:16 16:40-16:41/1 14:36-15:00/24	07:21 17:33-17:41/8	07:10 18:08-18:46/38	06:06 20:00-20:23/23	05:23 06:08-06:22/14
	16:38	17:28 15:32-15:58/26	18:19 17:04-17:23/19	20:13	21:04 06:31-06:44/13	21:49
4	08:45 14:15-14:59/44	08:14 16:50-16:55/5 15:33-15:57/24	07:19 17:30-17:44/14	07:08 18:08-18:44/36	06:04 20:01-20:25/24	05:22 06:08-06:21/13
	16:40	17:30 16:35-16:46/11 14:38-14:57/19	18:21 17:06-17:22/16	20:15	21:06 06:29-06:44/15	21:50
5	08:45 14:16-15:00/44	08:12 16:33-16:58/25 14:42-14:54/12	07:16 17:29-17:45/16	07:05 18:09-18:43/34	06:02 20:00-20:26/26	05:21 06:10-06:21/11
	16:41	17:32 15:34-15:56/22	18:23 17:08-17:20/12	20:17	21:08 06:28-06:43/15	21:51
6	08:45 14:16-15:00/44	08:11 16:31-16:59/28	07:14 17:27-17:46/19	07:03 18:10-18:42/32	06:00 20:00-20:27/27	05:21 06:10-06:20/10
	16:42	17:33 15:35-15:54/19	18:25 17:11-17:16/5	20:18	21:09 06:29-06:43/14	21:52
7	08:44 15:33-15:40/7	08:09 16:30-17:00/30	07:12 17:26-17:50/24	07:01 18:11-18:41/30	05:59 20:01-20:28/27	05:20 06:11-06:20/9
	16:43 14:17-15:01/44	17:35 15:38-15:52/14	18:27	20:20	21:11 06:29-06:42/13	21:53
8	08:44 15:31-15:42/11	08:07 16:29-17:01/32	07:10 17:26-17:51/25	06:59 18:12-18:38/26	05:57 20:01-20:28/27	05:20 06:11-06:19/8
	16:45 14:17-15:01/44	17:37 15:41-15:49/8	18:28	20:22	21:12 06:29-06:41/12	21:54
9	08:43 15:30-15:44/14	08:05 16:29-17:03/34	07:07 17:25-17:53/28	06:56 18:13-18:37/24	05:55 20:01-20:28/27	05:19 06:13-06:19/6
	16:46 14:17-15:01/44	17:39	18:30	20:24	21:14 06:31-06:40/9	21:55
10	08:43 15:30-15:46/16	08:04 16:28-17:03/35	07:05 17:25-17:52/27	06:54 18:16-18:34/18	05:53 20:03-20:28/25	05:19 06:15-06:18/3
	16:47 14:18-15:02/44	17:41	18:32	20:25	21:16 06:33-06:37/4	21:55
11	08:42 15:29-15:47/18	08:02 16:28-17:03/35	07:03 17:25-17:53/28	06:52 18:20-18:31/11	05:52 20:03-20:28/25	05:18
	16:49 14:18-15:03/45	17:43	18:34	20:27	21:17	21:56
12	08:42 15:28-15:48/20	08:00 16:28-17:03/35	07:01 17:26-17:53/27	06:50	05:50 20:05-20:28/23	05:18
	16:50 14:18-15:03/45	17:45	18:35	20:29	21:19	21:57
13	08:41 15:28-15:49/21	07:58 16:28-17:03/35	06:58 17:25-17:52/27	06:47	05:48 20:05-20:27/22	05:18
	16:52 14:18-15:03/45	17:46	18:37	20:30	21:20	21:57
14	08:40 15:27-15:51/24	07:56 16:28-17:02/34	06:56 17:27-17:52/25	06:45	05:47 20:07-20:27/20	05:17
	16:53 14:18-15:04/46	17:48	18:39	20:32	21:22	21:58
15	08:39 15:27-15:52/25	07:54 16:28-17:01/33	06:54 17:29-17:51/22	06:43	05:45 20:07-20:26/19	05:17
	16:55 14:18-15:04/46	17:50	18:41	20:34	21:24	21:59
16	08:38 15:27-15:53/26	07:52 16:28-17:00/32	06:52 17:31-17:50/19	06:41	05:44 20:09-20:26/17	05:17
	16:56 14:19-15:05/46	17:52	18:42	20:35	21:25	21:59
17	08:37 15:26-15:54/28	07:50 16:29-16:59/30	06:49 17:26-17:48/22	06:39	05:42 20:11-20:26/15	05:17
	16:58 14:19-15:05/46	17:54	18:44	20:37	21:27 06:10-06:17/7	22:00
18	08:37 15:26-15:55/29	07:48 16:30-16:55/25	06:47 17:22-17:46/24	06:36	05:41 20:12-20:24/12	05:17
	17:00 14:20-15:05/45	17:56	18:46	20:39	21:28 06:08-06:19/11	22:00
19	08:36 15:26-15:56/30	07:46 17:13-17:17/4	06:45 17:18-17:42/24	06:34 06:58-07:01/3	05:39 20:13-20:23/10	05:17
	17:01 14:20-15:06/46	17:58 16:30-16:51/21	18:48	20:41	21:30 06:07-06:19/12	22:00
20	08:35 15:27-15:57/30	07:44 17:09-17:21/12	06:42 17:16-17:44/28	06:32 06:56-07:02/6	05:38 20:16-20:21/5	05:17
	17:03 14:21-15:06/45	17:59 16:31-16:49/18	18:49	20:42	21:31 06:06-06:20/14	22:01
21	08:33 15:26-15:56/30	07:42 17:07-17:23/16	06:40 17:15-17:46/31	06:30 06:54-07:03/9	05:37 06:06-06:21/15	05:17
	17:05 14:21-15:06/45	18:01 16:33-16:48/15	18:51	20:44	21:32	22:01
22	08:32 15:26-15:57/31	07:40 17:06-17:25/19	06:38 17:13-17:46/33	06:28 06:52-07:03/11	05:35 06:06-06:22/16	05:18
	17:06 14:22-15:06/44	18:03 16:37-16:45/8	18:53	20:46	21:34	22:01
23	08:31 15:26-15:58/32	07:38 17:05-17:26/21	06:35 17:12-17:47/35	06:26 06:50-07:04/14	05:34 06:05-06:21/16	05:18
	17:08 14:23-15:06/43	18:05	18:54	20:47	21:35	22:01
24	08:30 15:26-15:58/32	07:36 17:04-17:26/22	06:33 17:11-17:48/37	06:24 06:48-07:03/15	05:33 06:05-06:22/17	05:18
	17:10 14:23-15:06/43	18:07	18:56	20:49	21:37	22:01
25	08:29 15:27-15:59/32	07:34 17:04-17:27/23	06:31 17:09-17:48/39	06:22 06:46-07:03/17	05:32 06:05-06:22/17	05:18
	17:11 14:24-15:06/42	18:09	18:58	20:51	21:38	22:01
26	08:27 15:26-15:59/33	07:32 17:03-17:26/23	06:28 17:09-17:48/39	06:20 06:44-07:02/18	05:30 06:05-06:22/17	05:19
	17:13 14:25-15:06/41	18:10	19:00	20:52	21:39	22:01
27	08:26 15:27-15:59/32	07:30 17:03-17:26/23	06:26 17:09-17:49/40	06:18 20:09-20:14/5	05:29 06:05-06:22/17	05:19
	17:15 14:25-15:05/40	18:12	19:01	20:54 06:44-07:02/18	21:41	22:01
28	08:25 15:27-15:59/32	07:27 17:03-17:26/23	06:24 17:07-17:48/41	06:16 20:06-20:17/11 06:45-07:01/16	05:28 06:05-06:22/17	05:20
	17:17 14:26-15:04/38	18:14	19:03	20:56 06:40-06:42/2	21:42	22:01
29	08:23 15:28-16:00/32		07:21 18:07-18:48/41	06:14 20:04-20:18/14 06:46-06:59/13	05:27 06:06-06:23/17	05:20
	17:19 14:27-15:05/38		20:05	20:58 06:38-06:43/5	21:43	22:01
30	08:22 15:28-15:59/31		07:19 18:07-18:48/41	06:12 20:03-20:19/16 06:47-06:57/10	05:26 06:06-06:22/16	05:21
	17:20 14:28-15:04/36		20:06	20:59 06:36-06:44/8	21:44	22:01
31	08:20 15:29-16:00/31		07:17 18:07-18:47/40		05:25 06:07-06:22/15	
	17:22 14:30-15:03/33		20:08		21:46	
Potential sun hours	259	278	367	416	485	499
Sum of minutes with flicker	1981	991	919	539	760	103

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar per WTG

Calculation: Alternative Scenario 3 Real Case **WTG:** 2 - T5

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	July	August	September	October	November	December
1	05:21 22:01	05:58 20:15-20:39/24 21:29	06:48 18:18-18:30/12 20:27	07:37 18:05-18:32/27 19:17	07:31 15:57-16:32/35 17:11	08:22 15:11-15:29/18 16:31 14:00-14:45/45
2	05:22 06:19-06:22/3 22:00	06:00 20:13-20:38/25 21:27	06:49 18:14-18:32/18 20:24	07:39 18:04-18:32/28 19:15	07:33 15:58-16:31/33 17:09	08:23 15:12-15:28/16 16:30 14:00-14:45/45
3	05:23 06:19-06:24/5 22:00	06:01 20:13-20:39/26 21:25 06:42-06:48/6	06:51 18:11-18:35/24 20:22	07:40 18:03-18:31/28 19:12	07:34 15:59-16:31/32 17:07 15:10-15:19/9	08:25 15:14-15:28/14 16:29 14:01-14:45/44
4	05:24 06:17-06:24/7 22:00	06:03 20:11-20:38/27 21:24 06:40-06:50/10	06:53 18:09-18:35/26 20:20	07:42 18:02-18:30/28 19:10	07:36 16:00-16:30/30 17:05 15:07-15:22/15	08:26 15:15-15:26/11 16:29 14:01-14:45/44
5	05:24 06:17-06:25/8 21:59	06:04 20:11-20:38/27 21:22 06:39-06:51/12	06:54 18:07-18:37/30 20:17	07:44 18:02-18:29/27 19:08	07:38 16:01-16:29/28 17:04 15:05-15:24/19	08:27 15:18-15:25/7 16:28 14:02-14:46/44
6	05:25 06:16-06:26/10 21:58	06:06 20:10-20:37/27 21:20 06:38-06:52/14	06:56 18:06-18:38/32 20:15	07:45 18:02-18:27/25 19:06	07:40 16:02-16:27/25 14:11-14:24/13 17:02 15:03-15:26/23	08:29 14:02-14:46/44 16:28
7	05:26 06:16-06:27/11 21:58	06:07 20:10-20:36/26 21:18 06:38-06:53/15	06:58 18:04-18:38/34 20:13	07:47 18:02-18:24/22 19:03	07:42 16:21-16:24/3 15:02-15:27/25 17:00 16:05-16:15/10 14:08-14:27/19	08:30 14:02-14:46/44 16:27
8	05:27 06:16-06:28/12 21:57	06:09 20:10-20:35/25 21:16 06:37-06:53/16	06:59 18:03-18:39/36 20:11	07:49 18:03-18:21/18 19:01 17:44-17:54/10	07:43 15:01-15:28/27 16:59 14:05-14:30/25	08:31 14:04-14:47/43 16:27
9	05:28 06:16-06:29/13 21:57	06:11 20:09-20:33/24 21:15 06:39-06:54/15	07:01 18:01-18:39/38 20:08	07:50 18:04-18:20/16 18:59 17:42-17:56/14	07:45 15:01-15:29/28 16:57 14:03-14:31/28	08:32 14:04-14:47/43 16:27
10	05:29 06:16-06:29/13 21:56	06:12 20:10-20:32/22 21:13 06:40-06:53/13	07:02 18:01-18:39/38 20:06	07:52 18:05-18:17/12 18:57 17:39-17:57/18	07:47 15:00-15:30/30 16:55 14:02-14:33/31	08:33 14:04-14:47/43 16:26
11	05:30 06:15-06:30/15 21:55	06:14 20:10-20:30/20 21:11 06:42-06:53/11	07:04 17:59-18:39/40 20:04	07:54 18:09-18:13/4 18:54 17:38-17:58/20	07:49 15:00-15:30/30 16:54 14:01-14:34/33	08:34 14:05-14:47/42 16:26
12	05:31 06:15-06:30/15 21:54	06:15 20:11-20:29/18 06:57-07:04/7 21:09 06:43-06:52/9	07:06 17:59-18:39/40 20:01	07:55 17:37-17:59/22 18:52	07:50 15:00-15:31/31 16:52 14:00-14:35/35	08:35 14:05-14:47/42 16:26
13	05:32 06:15-06:31/16 21:53	06:17 20:11-20:26/15 06:55-07:06/11 21:07 06:45-06:52/7	07:07 17:59-18:39/40 19:59	07:57 17:37-17:59/22 18:50	07:52 15:00-15:31/31 16:51 13:59-14:37/38	08:36 14:06-14:47/41 16:26
14	05:33 06:15-06:31/16 21:52	06:19 20:12-20:25/13 06:53-07:07/14 21:05 06:46-06:50/4	07:09 17:58-18:38/40 19:57	07:59 17:36-17:59/23 18:48	07:54 15:00-15:32/32 16:49 13:59-14:37/38	08:37 14:06-14:48/42 16:26
15	05:35 06:15-06:31/16 21:51	06:20 20:14-20:24/10 06:52-07:08/16 21:03 06:48-06:49/1	07:11 17:58-18:38/40 19:54	08:01 17:35-17:58/23 18:45	07:56 15:00-15:32/32 16:48 13:58-14:38/40	08:38 14:07-14:48/41 16:26
16	05:36 06:15-06:31/16 21:50	06:22 20:18-20:19/1 21:01 06:51-07:08/17	07:12 17:57-18:37/40 19:52	08:02 17:35-17:58/23 18:43	07:57 15:00-15:33/33 16:46 13:58-14:39/41	08:39 14:08-14:49/41 16:26
17	05:37 06:14-06:31/17 21:49	06:23 06:51-07:09/18 20:59	07:14 17:57-18:37/40 19:50	08:04 17:35-17:58/23 18:41	07:59 14:59-15:32/33 16:45 13:57-14:39/42	08:40 14:09-14:49/40 16:26
18	05:38 06:14-06:31/17 21:48	06:25 06:52-07:09/17 20:57	07:15 17:58-18:36/38 19:47	08:06 17:36-17:57/21 18:39	08:01 15:00-15:32/32 16:44 13:57-14:40/43	08:41 14:09-14:50/41 16:27
19	05:40 06:15-06:32/17 21:47	06:27 06:54-07:09/15 20:55	07:17 17:57-18:35/38 19:45	08:08 17:37-17:57/20 18:37	08:03 15:00-15:32/32 16:42 13:57-14:40/43	08:41 14:09-14:50/41 16:27
20	05:41 06:15-06:32/17 21:46	06:28 06:55-07:08/13 20:53	07:19 17:58-18:34/36 19:43	08:09 17:38-17:55/17 18:35 17:07-17:17/10	08:04 15:01-15:32/31 16:41 13:57-14:41/44	08:42 14:10-14:51/41 16:27
21	05:42 06:15-06:31/16 21:45	06:30 06:57-07:08/11 20:51	07:20 17:58-18:32/34 19:40	08:11 17:38-17:53/15 18:33 17:03-17:19/16	08:06 15:02-15:32/30 16:40 13:57-14:42/45	08:43 14:10-14:50/40 16:28
22	05:44 06:15-06:31/16 21:43	06:32 06:58-07:07/9 20:49	07:22 17:59-18:31/32 19:38	08:13 17:40-17:51/11 18:31 17:01-17:20/19	08:08 15:03-15:33/30 16:39 13:57-14:42/45	08:43 14:11-14:51/40 16:28
23	05:45 06:17-06:31/14 21:42	06:33 07:00-07:06/6 20:46	07:24 18:01-18:29/28 19:36	08:15 17:00-17:21/21 18:29	08:09 15:03-15:33/30 16:38 13:57-14:43/46	08:44 14:11-14:52/41 16:29
24	05:46 20:25-20:33/8 21:41 06:17-06:30/13	06:35 07:02-07:05/3 20:44	07:25 18:01-18:26/25 19:33	08:16 16:59-17:26/27 18:26	08:11 15:03-15:32/29 16:37 13:57-14:42/45	08:44 14:12-14:53/41 16:29
25	05:48 20:23-20:34/11 21:39 06:18-06:29/11	06:36 20:42	07:27 18:04-18:27/23 19:31	07:18 15:58-16:29/31 17:24	08:13 15:04-15:32/28 16:36 13:57-14:43/46	08:45 14:12-14:53/41 16:30
26	05:49 20:22-20:35/13 21:38 06:19-06:29/10	06:38 20:40	07:29 18:07-18:30/23 19:29	07:20 15:58-16:30/32 17:22	08:14 15:06-15:32/26 16:35 13:58-14:44/46	08:45 14:12-14:53/41 16:31
27	05:51 20:21-20:37/16 21:37 06:21-06:27/6	06:40 20:38	07:30 18:15-18:31/16 19:26	07:22 15:57-16:31/34 17:20	08:16 15:06-15:31/25 16:34 13:58-14:43/45	08:45 14:13-14:54/41 16:31
28	05:52 20:19-20:37/18 21:35	06:41 20:35	07:32 18:10-18:32/22 19:24	07:24 15:57-16:32/35 17:18	08:17 15:07-15:31/24 16:33 13:58-14:44/46	08:45 14:13-14:54/41 16:32
29	05:54 20:17-20:37/20 21:33	06:43 20:33	07:34 18:08-18:33/25 19:22	07:25 15:57-16:32/35 17:17	08:19 15:09-15:31/22 16:32 13:59-14:44/45	08:45 14:13-14:55/42 16:33
30	05:55 20:17-20:38/21 21:32	06:45 20:31	07:35 18:06-18:32/26 19:19	07:27 15:57-16:33/36 17:15	08:20 15:09-15:30/21 16:31 13:59-14:44/45	08:46 14:14-14:55/41 16:34
31	05:57 20:15-20:38/23 21:30	06:46 20:29		07:29 15:58-16:32/34 17:13		08:46 14:14-14:56/42 16:35
Potential sun hours	502	454	381	331	266	244
Sum of minutes with flicker	460	620	934	847	1921	1368

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar per WTG

Calculation: Alternative Scenario 3 Real Case **WTG:** 3 - T4

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January		February		March		April		May		June	
1	08:46	09:41-10:20/39	08:19		07:25	17:32-17:46/14	07:15	19:07-19:26/19	06:10	19:21-19:48/27	05:24	05:53-06:14/21
	16:36		17:24		18:16	16:37-17:24/47	20:10		21:01		21:47	
2	08:46	09:42-10:21/39	08:17		07:23	17:30-17:46/16	07:12	19:09-19:25/16	06:08	19:22-19:47/25	05:24	05:52-06:14/22
	16:37		17:26		18:18	16:36-17:25/49	20:12		21:03		21:48	
3	08:45	09:43-10:22/39	08:16		07:21	17:30-17:47/17	07:10	19:12-19:23/11	06:06	19:23-19:47/24	05:23	05:52-06:15/23
	16:38		17:28		18:19	16:35-17:24/49	20:13		21:04		21:49	
4	08:45	09:42-10:22/40	08:14		07:19	17:30-17:47/17	07:08	19:14-19:20/6	06:04	19:24-19:46/22	05:22	05:51-06:15/24
	16:40		17:30		18:21	16:34-17:24/50	20:15		21:06		21:50	
5	08:45	09:43-10:23/40	08:12		07:16	17:30-17:47/17	07:05		06:02	19:25-19:44/19	05:21	05:51-06:15/24
	16:41		17:32		18:23	16:34-17:24/50	20:17		21:08		21:51	
6	08:45	09:43-10:23/40	08:11		07:14	17:29-17:49/20	07:03		06:00	19:26-19:43/17	05:21	05:50-06:15/25
	16:42		17:33		18:25	16:32-17:23/51	20:18		21:09		21:52	
7	08:44	09:44-10:24/40	08:09		07:12	17:30-17:51/21	07:01		05:59	19:29-19:41/12	05:20	05:50-06:15/25
	16:43		17:35		18:27	16:32-17:22/50	20:20		21:11		21:53	
8	08:44	09:44-10:24/40	08:07		07:10	17:31-17:52/21	06:59		05:57	19:32-19:37/5	05:20	05:49-06:15/26
	16:45		17:37		18:28	16:32-17:22/50	20:22		21:12		21:54	
9	08:43	09:45-10:25/40	08:05		07:07	17:33-17:53/20	06:56		05:55		05:19	05:49-06:15/26
	16:46		17:39		18:30	16:32-17:21/49	20:24		21:14		21:55	
10	08:43	09:45-10:25/40	08:04		07:05	17:31-17:53/22	06:54		05:53		05:19	05:49-06:16/27
	16:47		17:41		18:32	16:32-17:18/46	20:25		21:16		21:55	
11	08:42	09:45-10:25/40	08:02		07:03	17:31-17:53/22	06:52		05:52		05:18	05:49-06:15/26
	16:49		17:43		18:34	16:32-17:17/45	20:27		21:17		21:56	
12	08:42	09:45-10:25/40	08:00		07:01	17:31-17:54/23	06:50		05:50		05:18	05:49-06:15/26
	16:50		17:45		18:35	16:33-17:14/41	20:29		21:19		21:57	
13	08:41	09:46-10:25/39	07:58		06:58	17:30-17:53/23	06:47		05:48		05:18	05:50-06:16/26
	16:52		17:46		18:37	16:32-17:12/40	20:30		21:20		21:57	
14	08:40	09:46-10:26/40	07:56		06:56	17:30-17:53/23	06:45		05:47		05:17	05:50-06:16/26
	16:53		17:48		18:39	16:33-17:12/39	20:32		21:22		21:58	
15	08:39	09:47-10:26/39	07:54		06:54	17:59-18:08/9 16:34-17:11/37	06:43		05:45		05:17	05:51-06:16/25
	16:55		17:50		18:41	17:30-17:52/22	20:34		21:24		21:59	
16	08:38	09:47-10:26/39	07:52		06:52	17:56-18:09/13 16:34-17:09/35	06:41	19:32-19:43/11	05:44		05:17	05:51-06:16/25
	16:56		17:52		18:42	17:30-17:50/20	20:35		21:25		21:59	
17	08:38	09:48-10:26/38	07:50		06:49	17:54-18:11/17 16:36-17:08/32	06:39	19:29-19:46/17	05:42		05:17	05:51-06:17/26
	16:58		17:54		18:44	17:31-17:49/18	20:37		21:27		22:00	
18	08:37	09:48-10:26/38	07:48		06:47	17:53-18:12/19 16:37-17:06/29	06:36	19:27-19:48/21	05:41		05:17	05:51-06:17/26
	17:00		17:56		18:46	17:33-17:48/15	20:39		21:28		22:00	
19	08:36	09:49-10:27/38	07:46		06:45	17:52-18:11/19 16:39-17:04/25	06:34	19:26-19:49/23	05:39		05:17	05:51-06:17/26
	17:01		17:58		18:48	17:35-17:45/10	20:41		21:30		22:00	
20	08:35	09:50-10:27/37	07:44		06:42	17:52-18:12/20	06:32	19:25-19:50/25	05:38	06:05-06:08/3	05:17	05:51-06:17/26
	17:03		17:59		18:49	16:41-17:01/20	20:42		21:31		22:01	
21	08:33	09:51-10:27/36	07:42		06:40	17:52-18:12/20	06:30	19:23-19:49/26	05:37	06:04-06:10/6	05:17	05:51-06:17/26
	17:05		18:01		18:51	16:45-16:58/13	20:44		21:33		22:01	
22	08:32	09:51-10:26/35	07:40	17:08-17:13/5	06:38	17:51-18:10/19	06:28	19:22-19:50/28	05:35	06:03-06:11/8	05:18	05:51-06:17/26
	17:06		18:03		18:53		20:46		21:34		22:01	
23	08:31	09:53-10:26/33	07:38	17:04-17:18/14	06:35	18:12-18:21/9	06:26	19:21-19:50/29	05:34	06:01-06:11/10	05:18	05:52-06:18/26
	17:08		18:05	16:50-17:02/12	18:54	17:52-18:10/18	20:47		21:35		22:01	
24	08:30	09:53-10:25/32	07:36	16:46-17:20/34	06:33	18:10-18:23/13	06:24	19:21-19:50/29	05:33	06:00-06:11/11	05:18	05:52-06:18/26
	17:10		18:07		18:56	17:52-18:09/17	20:49		21:37		22:01	
25	08:29	09:54-10:25/31	07:34	16:44-17:22/38	06:31	18:08-18:25/17	06:22	19:20-19:50/30	05:32	05:59-06:12/13	05:18	05:52-06:18/26
	17:12		18:09		18:58	17:53-18:07/14	20:51		21:38		22:01	
26	08:27	09:56-10:24/28	07:32	16:41-17:22/41	06:28	18:07-18:27/20	06:20	19:21-19:51/30	05:30	05:58-06:12/14	05:19	05:53-06:18/25
	17:13		18:10		19:00	17:55-18:05/10	20:52		21:39		22:01	
27	08:26	09:57-10:23/26	07:30	17:36-17:42/6	06:26	18:07-18:28/21	06:18	19:21-19:51/30	05:29	05:57-06:13/16	05:19	05:53-06:18/25
	17:15		18:12	16:39-17:23/44	19:01		20:54		21:41		22:01	
28	08:25	09:59-10:22/23	07:27	17:33-17:45/12	06:24	18:06-18:27/21	06:16	19:21-19:50/29	05:28	05:56-06:13/17	05:20	05:53-06:19/26
	17:17		18:14	16:38-17:24/46	19:03		20:56		21:42		22:01	
29	08:23	10:01-10:20/19			07:21	19:06-19:28/22	06:14	19:21-19:50/29	05:27	05:56-06:14/18	05:20	05:53-06:19/26
	17:19				20:05		20:58		21:43		22:01	
30	08:22	10:03-10:17/14			07:19	19:06-19:28/22	06:12	19:21-19:49/28	05:26	05:55-06:14/19	05:21	05:54-06:20/26
	17:20				20:06		20:59		21:44		22:01	
31	08:20	10:08-10:13/5			07:17	19:06-19:26/20			05:25	05:54-06:14/20		
	17:22				20:08				21:46			
Potential sun hours	259		278		367		416		485		499	
Sum of minutes with flicker	1067		252		1568		437		306		759	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar per WTG

Calculation: Alternative Scenario 3 Real Case **WTG:** 3 - T4

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	July	August	September	October	November	December
1	05:21 05:53-06:19/26 22:01	05:58 21:29	06:48 20:27	07:37 18:09-18:33/24 19:17 17:12-17:52/40	07:31 17:11	08:22 09:27-10:07/40 16:31
2	05:22 05:54-06:20/26 22:00	06:00 21:27	06:49 20:24	07:39 18:09-18:32/23 19:15 17:11-17:54/43	07:33 17:09	08:23 09:28-10:08/40 16:30
3	05:23 05:54-06:21/27 22:00	06:01 21:25	06:51 20:22	07:40 18:09-18:31/22 19:12 17:10-17:56/46	07:34 17:07	08:25 09:28-10:08/40 16:29
4	05:24 05:54-06:20/26 22:00	06:03 21:24	06:53 20:20	07:42 18:09-18:31/22 19:10 17:09-17:57/48	07:36 17:05	08:26 09:28-10:08/40 16:29
5	05:24 05:55-06:21/26 21:59	06:04 19:40-19:49/9 21:22	06:54 20:18	07:44 18:09-18:30/21 19:08 17:09-17:58/49	07:38 17:04	08:27 09:29-10:09/40 16:28
6	05:25 05:56-06:21/25 21:59	06:06 19:37-19:51/14 21:20	06:56 20:15	07:45 18:07-18:27/20 19:06 17:08-17:58/50	07:40 17:02	08:29 09:29-10:09/40 16:28
7	05:26 05:57-06:22/25 21:58	06:07 19:35-19:53/18 21:18	06:58 20:13	07:47 18:06-18:26/20 19:03 17:08-17:59/51	07:42 17:00	08:30 09:30-10:10/40 16:27
8	05:27 05:58-06:22/24 21:57	06:09 19:34-19:54/20 21:16	06:59 19:10-19:14/4 20:11	07:49 18:05-18:23/18 19:01 17:09-17:59/50	07:43 16:59	08:31 09:30-10:10/40 16:27
9	05:28 05:59-06:22/23 21:57	06:11 19:32-19:55/23 21:15	07:01 19:06-19:16/10 20:08	07:50 18:05-18:22/17 18:59 17:09-17:59/50	07:45 16:57	08:32 09:31-10:10/39 16:27
10	05:29 06:00-06:22/22 21:56	06:12 19:31-19:56/25 21:13	07:02 19:02-19:18/16 20:06	07:52 18:04-18:21/17 18:57 17:08-17:58/50	07:47 16:55	08:33 09:31-10:10/39 16:26
11	05:30 06:01-06:23/22 21:55	06:14 19:30-19:56/26 21:11	07:04 18:59-19:18/19 20:04	07:54 18:04-18:21/17 18:54 17:09-17:58/49	07:49 09:38-09:45/7 16:54	08:34 09:31-10:10/39 16:26
12	05:31 06:02-06:23/21 21:54	06:15 19:30-19:57/27 21:09	07:06 18:58-19:19/21 20:01	07:55 18:05-18:20/15 18:52 17:10-17:58/48	07:50 09:34-09:49/15 16:52	08:36 09:32-10:11/39 16:26
13	05:32 06:03-06:23/20 21:53	06:17 19:29-19:58/29 21:07	07:07 18:57-19:19/22 19:59	07:57 18:06-18:19/13 18:50 17:11-17:57/46	07:52 09:32-09:52/20 16:51	08:37 09:32-10:11/39 16:26
14	05:33 06:04-06:23/19 21:52	06:19 19:28-19:58/30 21:05	07:09 18:56-19:18/22 19:57	07:59 18:07-18:17/10 18:48 17:12-17:57/45	07:54 09:31-09:54/23 16:49	08:37 09:33-10:11/38 16:26
15	05:35 06:05-06:23/18 21:52	06:20 19:28-19:58/30 21:03	07:11 18:56-19:18/22 19:54	08:01 18:10-18:13/3 18:45 17:12-17:55/43	07:56 09:30-09:56/26 16:48	08:38 09:33-10:12/39 16:26
16	05:36 06:06-06:22/16 21:50	06:22 19:27-19:57/30 21:01	07:12 18:55-19:16/21 19:52	08:02 17:14-17:54/40 18:43	07:58 09:29-09:57/28 16:46	08:39 09:34-10:12/38 16:26
17	05:37 06:07-06:22/15 21:49	06:23 19:28-19:58/30 20:59	07:14 18:56-19:15/19 19:50 18:44-18:53/9	08:04 17:16-17:52/36 18:41	07:59 09:28-09:59/31 16:45	08:40 09:35-10:13/38 16:27
18	05:38 06:08-06:22/14 21:48	06:25 19:27-19:57/30 20:57	07:16 18:56-19:14/18 19:47 18:42-18:55/13	08:06 17:18-17:51/33 18:39	08:01 09:27-09:59/32 16:44	08:41 09:36-10:14/38 16:27
19	05:40 06:10-06:22/12 21:47	06:27 19:27-19:57/30 20:55	07:17 18:57-19:10/13 19:45 18:39-18:55/16	08:08 17:36-17:48/12 18:37 17:23-17:31/8	08:03 09:27-10:00/33 16:42	08:41 09:35-10:13/38 16:27
20	05:41 06:11-06:21/10 21:46	06:28 19:27-19:56/29 20:53	07:19 18:58-19:08/10 19:43 18:38-18:56/18	08:09 18:35	08:04 09:26-10:01/35 16:41	08:42 09:36-10:14/38 16:27
21	05:42 06:12-06:21/9 21:45	06:30 19:28-19:56/28 20:51	07:20 18:37-18:56/19 19:40	08:11 18:33	08:06 09:26-10:02/36 16:40	08:43 09:36-10:14/38 16:28
22	05:44 06:13-06:20/7 21:43	06:32 19:27-19:54/27 20:49	07:22 18:36-18:56/20 19:38 17:31-17:41/10	08:13 18:31	08:08 09:26-10:03/37 16:39	08:43 09:37-10:15/38 16:28
23	05:45 06:15-06:19/4 21:42	06:33 19:28-19:53/25 20:46	07:24 18:36-18:56/20 19:36 17:27-17:45/18	08:15 18:29	08:09 09:26-10:04/38 16:38	08:44 09:37-10:15/38 16:29
24	05:46 06:16-06:18/2 21:41	06:35 19:29-19:51/22 20:44	07:25 18:35-18:55/20 17:23-17:47/24 19:33 18:20-18:27/7	08:16 18:26	08:11 09:26-10:03/37 16:37	08:44 09:38-10:16/38 16:29
25	05:48 21:39	06:36 19:30-19:50/20 20:42	07:27 18:36-18:55/19 17:21-17:48/27 19:31 18:17-18:30/13	07:18 17:24	08:13 09:26-10:04/38 16:36	08:45 09:39-10:17/38 16:30
26	05:49 21:38	06:38 19:32-19:49/17 20:40	07:29 18:37-18:54/17 17:19-17:50/31 19:29 18:15-18:32/17	07:20 17:22	08:14 09:26-10:05/39 16:35	08:45 09:39-10:17/38 16:31
27	05:51 21:37	06:40 19:34-19:45/11 20:38	07:30 18:37-18:52/15 17:17-17:50/33 19:26 18:12-18:32/20	07:22 17:20	08:16 09:27-10:06/39 16:34	08:45 09:39-10:17/38 16:31
28	05:52 21:35	06:41 20:36	07:32 18:38-18:50/12 17:15-17:51/36 19:24 18:11-18:33/22	07:24 17:18	08:17 09:26-10:06/40 16:33	08:45 09:39-10:18/39 16:32
29	05:54 21:34	06:43 20:33	07:34 18:42-18:47/5 17:14-17:52/38 19:22 18:11-18:33/22	07:25 17:17	08:19 09:27-10:07/40 16:32	08:46 09:40-10:18/38 16:33
30	05:55 21:32	06:45 20:31	07:35 18:09-18:32/23 19:19 17:12-17:52/40	07:27 17:15	08:20 09:26-10:06/40 16:31	08:46 09:40-10:19/39 16:34
31	05:57 21:30	06:46 20:29		07:29 17:13		08:46 09:41-10:19/38 16:35
Potential sun hours	502	454	381	331	266	244
Sum of minutes with flicker	439	550	801	1099	634	1202

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar per WTG

Calculation: Alternative Scenario 3 Real Case **WTG:** 4 - T2

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January	February		March	April		May		June	
1	08:46	08:19		07:25	07:15		06:10	20:08-20:30/22	05:24	20:43-20:52/9
	16:36	17:24		18:16	20:10		21:01		21:47	06:00-07:02/62
2	08:46	08:17		07:23	07:12		06:08	20:08-20:30/22	05:24	20:44-20:51/7
	16:37	17:26		18:18	20:12		21:03		21:48	06:00-07:02/62
3	08:45	08:16		07:21	07:10		06:06	20:08-20:31/23	05:23	20:46-20:51/5
	16:38	17:28		18:19	20:13		21:04		21:49	05:59-07:03/64
4	08:45	08:14		07:19	07:08		06:04	20:08-20:31/23	05:22	05:59-07:03/64
	16:40	17:30		18:21	20:15		21:06		21:50	
5	08:45	08:12		07:16	07:05		06:02	20:08-20:30/22	05:21	05:59-07:03/64
	16:41	17:32		18:23	20:17		21:08		21:51	
6	08:45	08:11		07:14	07:03		06:00	20:08-20:30/22	05:21	05:59-07:03/64
	16:42	17:33		18:25	20:18		21:09		21:52	
7	08:44	08:09		07:12	07:01		05:59	20:09-20:30/21	05:20	05:59-07:04/65
	16:43	17:35		18:27	20:20		21:11	06:34-06:41/7	21:53	
8	08:44	08:07		07:10	06:59		05:57	20:09-20:29/20	05:20	05:59-07:03/64
	16:45	17:37		18:28	20:22		21:13	06:29-06:45/16	21:54	
9	08:43	08:05		07:08	06:56		05:55	20:09-20:28/19	05:19	05:59-07:04/65
	16:46	17:39		18:30	20:24		21:14	06:27-06:48/21	21:55	
10	08:43	08:04		07:05	06:54		05:53	20:11-20:27/16	05:19	06:00-07:04/64
	16:47	17:41		18:32	20:25		21:16	06:24-06:50/26	21:55	
11	08:42	08:02		07:03	06:52		05:52	20:11-20:26/15	05:18	05:59-07:04/65
	16:49	17:43		18:34	20:27		21:17	06:22-06:51/29	21:56	
12	08:42	08:00		07:01	06:50		05:50	20:13-20:25/12	05:18	05:59-07:04/65
	16:50	17:45		18:35	20:29		21:19	06:21-06:53/32	21:57	
13	08:41	07:58		06:58	06:47		05:48	20:45-20:46/1 06:19-06:53/34	05:18	06:00-07:04/64
	16:52	17:47		18:37	20:30		21:21	20:15-20:22/7	21:57	
14	08:40	07:56		06:56	06:45		05:47	20:42-20:50/8	05:18	06:00-07:05/65
	16:53	17:48		18:39	20:32		21:22	06:19-06:55/36	21:58	
15	08:39	07:54		06:54	06:43		05:45	20:40-20:51/11	05:17	06:00-07:05/65
	16:55	17:50		18:41	20:34		21:24	06:18-06:56/38	21:59	
16	08:38	07:52		06:52	06:41		05:44	20:40-20:53/13	05:17	06:00-07:05/65
	16:56	17:52		18:42	20:36		21:25	06:17-06:56/39	21:59	
17	08:38	07:50	17:24-17:27/3	06:49	06:39		05:42	20:39-20:54/15	05:17	06:01-07:05/64
	16:58	17:54		18:44	20:37		21:27	06:17-06:57/40	22:00	
18	08:37	07:48	17:21-17:29/8	06:47	06:36		05:41	20:38-20:54/16	05:17	06:01-07:06/65
	17:00	17:56		18:46	20:39		21:28	06:15-06:57/42	22:00	
19	08:36	07:46	17:19-17:30/11	06:45	06:34		05:39	20:38-20:54/16	05:17	06:01-07:06/65
	17:01	17:58		18:48	20:41		21:30	06:15-06:58/43	22:00	
20	08:35	07:44	17:18-17:32/14	06:42	06:32		05:38	20:38-20:55/17	05:17	06:01-07:06/65
	17:03	17:59		18:49	20:42		21:31	06:13-06:59/46	22:01	
21	08:33	07:42	17:18-17:33/15	06:40	06:30		05:37	20:38-20:55/17	05:17	06:01-07:06/65
	17:05	18:01		18:51	20:44		21:33	06:09-06:59/50	22:01	
22	08:32	07:40	17:18-17:33/15	06:38	06:28		05:35	20:37-20:55/18	05:18	06:01-07:06/65
	17:06	18:03		18:53	20:46		21:34	06:08-07:00/52	22:01	
23	08:31	07:38	17:18-17:33/15	06:35	06:26		05:34	20:38-20:55/17	05:18	06:02-07:07/65
	17:08	18:05		18:55	20:47		21:35	06:07-07:00/53	22:01	
24	08:30	07:36	17:19-17:32/13	06:33	06:24		05:33	20:38-20:55/17	05:18	06:02-07:07/65
	17:10	18:07		18:56	20:49		21:37	06:05-07:00/55	22:01	
25	08:29	07:34	17:20-17:31/11	06:31	06:22	20:18-20:23/5	05:32	20:38-20:55/17	05:18	06:02-07:07/65
	17:12	18:09		18:58	20:51		21:38	06:04-07:00/56	22:01	
26	08:27	07:32	17:21-17:29/8	06:28	06:20	20:15-20:25/10	05:30	20:39-20:55/16	05:19	06:03-07:07/64
	17:13	18:10		19:00	20:53		21:39	06:03-07:01/58	22:01	
27	08:26	07:30		06:26	06:18	20:13-20:26/13	05:29	20:39-20:54/15	05:19	06:02-07:07/65
	17:15	18:12		19:01	20:54		21:41	06:02-07:01/59	22:01	
28	08:25	07:27		06:24	06:16	20:11-20:28/17	05:28	20:39-20:54/15	05:20	06:03-07:08/65
	17:17	18:14		19:03	20:56		21:42	06:01-07:01/60	22:01	
29	08:23			07:22	06:14	20:10-20:29/19	05:27	20:40-20:53/13	05:20	06:03-07:08/65
	17:19			20:05	20:58		21:43	06:01-07:02/61	22:01	
30	08:22			07:19	06:12	20:09-20:30/21	05:26	20:42-20:54/12	05:21	06:04-07:08/64
	17:21			20:07	20:59		21:44	06:01-07:02/61	22:01	
31	08:20			07:17			05:25	20:42-20:53/11		
	17:22			20:08			21:46	06:00-07:02/62		
Potential sun hours	259	278		367	416		485		499	
Sum of minutes with flicker	0	113		0	85		1585		1955	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar per WTG

Calculation: Alternative Scenario 3 Real Case **WTG:** 4 - T2

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	July		August		September	October		November	December
1	05:22	06:03-07:08/65	05:58	20:23-20:36/13	06:48	07:37		07:31	08:22
	22:01		21:29	06:32-07:02/30	20:27	19:17		17:11	16:31
2	05:22	06:04-07:08/64	06:00	20:21-20:37/16	06:50	07:39		07:33	08:23
	22:00		21:27	06:33-07:01/28	20:24	19:15		17:09	16:30
3	05:23	06:04-07:09/65	06:01	20:21-20:38/17	06:51	07:40		07:34	08:25
	22:00		21:25	06:35-06:59/24	20:22	19:12		17:07	16:29
4	05:24	06:04-07:08/64	06:03	20:19-20:38/19	06:53	07:42		07:36	08:26
	22:00		21:24	06:37-06:57/20	20:20	19:10		17:05	16:29
5	05:25	06:05-07:09/64	06:04	20:19-20:40/21	06:54	07:44		07:38	08:27
	21:59		21:22	06:40-06:54/14	20:18	19:08		17:04	16:28
6	05:25	06:05-07:09/64	06:06	20:18-20:39/21	06:56	07:45		07:40	08:29
	21:59		21:20		20:15	19:06		17:02	16:28
7	05:26	06:06-07:10/64	06:07	20:18-20:40/22	06:58	07:47		07:42	08:30
	21:58		21:18		20:13	19:03		17:00	16:27
8	05:27	06:06-07:10/64	06:09	20:17-20:40/23	06:59	07:49		07:43	08:31
	21:57		21:17		20:11	19:01		16:59	16:27
9	05:28	20:54-20:57/3	06:11	20:18-20:40/22	07:01	07:50		07:45	08:32
	21:57	06:07-07:10/63	21:15		20:08	18:59		16:57	16:27
10	05:29	20:53-20:59/6	06:12	20:17-20:40/23	07:03	07:52		07:47	08:33
	21:56	06:07-07:10/63	21:13		20:06	18:57		16:55	16:27
11	05:30	20:51-20:59/8	06:14	20:17-20:40/23	07:04	07:54		07:49	08:34
	21:55	06:08-07:11/63	21:11		20:04	18:54		16:54	16:26
12	05:31	20:51-21:01/10	06:15	20:17-20:39/22	07:06	07:56		07:51	08:36
	21:54	06:08-07:11/63	21:09		20:01	18:52		16:52	16:26
13	05:32	20:50-21:02/12	06:17	20:18-20:39/21	07:07	07:57		07:52	08:37
	21:53	06:09-07:11/62	21:07		19:59	18:50		16:51	16:26
14	05:33	20:50-21:03/13	06:19	20:18-20:36/18	07:09	07:59		07:54	08:37
	21:53	06:10-07:11/61	21:05		19:57	18:48		16:49	16:26
15	05:35	20:49-21:03/14	06:20	20:19-20:35/16	07:11	08:01	17:55-17:59/4	07:56	08:38
	21:52	06:10-07:11/61	21:03		19:54	18:46		16:48	16:26
16	05:36	20:49-21:04/15	06:22	20:20-20:33/13	07:12	08:02	17:52-18:02/10	07:58	08:39
	21:51	06:11-07:10/59	21:01		19:52	18:43		16:46	16:26
17	05:37	20:48-21:04/16	06:23	20:22-20:31/9	07:14	08:04	17:51-18:03/12	07:59	08:40
	21:49	06:12-07:10/58	20:59		19:50	18:41		16:45	16:27
18	05:38	20:48-21:04/16	06:25	20:24-20:29/5	07:16	08:06	17:50-18:04/14	08:01	08:41
	21:48	06:13-07:10/57	20:57		19:47	18:39		16:44	16:27
19	05:40	20:48-21:04/16	06:27		07:17	08:08	17:49-18:04/15	08:03	08:42
	21:47	06:15-07:11/56	20:55		19:45	18:37		16:42	16:27
20	05:41	20:48-21:05/17	06:28		07:19	08:09	17:49-18:04/15	08:04	08:42
	21:46	06:16-07:10/54	20:53		19:43	18:35		16:41	16:27
21	05:42	20:48-21:05/17	06:30		07:20	08:11	17:48-18:03/15	08:06	08:43
	21:45	06:17-07:10/53	20:51		19:40	18:33		16:40	16:28
22	05:44	20:48-21:05/17	06:32		07:22	08:13	17:49-18:02/13	08:08	08:43
	21:44	06:18-07:09/51	20:49		19:38	18:31		16:39	16:28
23	05:45	20:48-21:05/17	06:33		07:24	08:15	17:50-18:00/10	08:09	08:44
	21:42	06:21-07:10/49	20:46		19:36	18:29		16:38	16:29
24	05:46	20:49-21:05/16	06:35		07:25	08:16	17:51-17:57/6	08:11	08:44
	21:41	06:25-07:09/44	20:44		19:33	18:27		16:37	16:29
25	05:48	20:49-21:05/16	06:37		07:27	07:18		08:13	08:45
	21:39	06:26-07:08/42	20:42		19:31	17:25		16:36	16:30
26	05:49	20:49-21:04/15	06:38		07:29	07:20		08:14	08:45
	21:38	06:27-07:08/41	20:40		19:29	17:23		16:35	16:31
27	05:51	20:50-21:04/14	06:40		07:30	07:22		08:16	08:45
	21:37	06:27-07:07/40	20:38		19:26	17:21		16:34	16:32
28	05:52	20:50-21:03/13	06:41		07:32	07:24		08:17	08:45
	21:35	06:28-07:06/38	20:36		19:24	17:19		16:33	16:32
29	05:54	20:52-21:02/10	06:43		07:34	07:25		08:19	08:46
	21:34	06:29-07:06/37	20:33		19:22	17:17		16:32	16:33
30	05:55	20:54-21:00/6	06:45		07:35	07:27		08:20	08:46
	21:32	06:30-07:05/35	20:31		19:19	17:15		16:31	16:34
31	05:57	20:24-20:34/10	06:46			07:29			08:46
	21:30	06:30-07:03/33	20:29			17:13			16:35
Potential sun hours	502		454		381	331		266	244
Sum of minutes with flicker		1994		440	0		114	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar per WTG

Calculation: Alternative Scenario 3 Real Case **WTG:** 5 - T3

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	January		February	March		April	May	June
1	08:46	14:55-15:18/23	08:19	07:25		07:15	06:10	05:24
	16:36	12:47-13:28/41	17:24	18:16		20:10	21:01	21:47
2	08:46	14:56-15:19/23	08:17	07:23		07:12	06:08	05:24
	16:37	12:48-13:29/41	17:26	18:18		20:12	21:03	21:48
3	08:45	14:57-15:19/22	08:16	07:21		07:10	06:06	05:23
	16:38	12:49-13:29/40	17:28	18:19		20:13	21:04	21:49
4	08:45	14:57-15:19/22	08:14	07:19	17:37-17:43/6	07:08	06:04	05:22
	16:40	12:49-13:29/40	17:30	18:21		20:15	21:06	21:50
5	08:45	14:58-15:19/21	08:12	07:16	17:34-17:46/12	07:05	06:02	05:21
	16:41	12:50-13:29/39	17:32	18:23		20:17	21:08	21:51
6	08:45	14:58-15:19/21	08:11	07:14	17:32-17:47/15	07:03	06:00	05:21
	16:42	12:50-13:29/39	17:33	18:25		20:18	21:09	21:52
7	08:44	15:00-15:20/20	08:09	07:12	17:31-17:48/17	07:01	05:59	05:20
	16:43	12:52-13:29/37	17:35	18:27		20:20	21:11	21:53
8	08:44	15:00-15:19/19	08:07	07:10	17:30-17:49/19	06:59	05:57	05:20
	16:45	12:52-13:29/37	17:37	18:28		20:22	21:13	21:54
9	08:43	15:01-15:19/18	08:05	07:08	17:30-17:49/19	06:56	05:55	05:19
	16:46	12:54-13:29/35	17:39	18:30		20:24	21:14	21:55
10	08:43	15:03-15:19/16	08:04	07:05	17:29-17:48/19	06:54	05:53	05:19
	16:47	12:55-13:29/34	17:41	18:32		20:25	21:16	21:55
11	08:42	15:03-15:19/16	08:02	07:03	17:54-18:03/9	06:52	05:52	05:18
	16:49	12:56-13:28/32	17:43	18:34	17:29-17:48/19	20:27	21:17	21:56
12	08:42	15:05-15:18/13	08:00	07:01	17:52-18:04/12	06:50	05:50	05:18
	16:50	12:57-13:27/30	17:45	18:35	17:30-17:48/18	20:29	21:19	21:57
13	08:41	15:06-15:17/11	07:58	06:58	17:50-18:05/15	06:47	05:48	05:18
	16:52	12:58-13:27/29	17:47	18:37	17:30-17:46/16	20:30	21:21	21:58
14	08:40	15:09-15:15/6	07:56	06:56	17:49-18:05/16	06:45	05:47	05:17
	16:53	13:00-13:26/26	17:48	18:39	17:31-17:45/14	20:32	21:22	21:58
15	08:39	13:02-13:25/23	07:54	06:54	17:49-18:06/17	06:43	05:45	05:17
	16:55		17:50	18:41	17:33-17:43/10	20:34	21:24	21:59
16	08:38	13:04-13:23/19	07:52	06:52	17:48-18:05/17	06:41	05:44	05:17
	16:56		17:52	18:42		20:36	21:25	21:59
17	08:38	13:07-13:21/14	07:50	06:49	18:07-18:15/8	06:39	05:42	05:17
	16:58		17:54	18:44	17:49-18:04/15	20:37	21:27	22:00
18	08:37	13:12-13:17/5	07:48	06:47	18:06-18:17/11	06:36	05:41	05:17
	17:00		17:56	18:46	17:50-18:03/13	20:39	21:28	22:00
19	08:36		07:46	06:45	18:04-18:17/13	06:34	05:39	05:17
	17:01		17:58	18:48	17:50-18:01/11	20:41	21:30	22:00
20	08:35		07:44	06:42	18:03-18:17/14	06:32	05:38	05:17
	17:03		17:59	18:49	17:52-17:59/7	20:42	21:31	22:01
21	08:33		07:42	06:40	18:03-18:18/15	06:30	05:37	05:17
	17:05		18:01	18:51		20:44	21:33	22:01
22	08:32		07:40	06:38	18:02-18:16/14	06:28	05:35	05:18
	17:06		18:03	18:53		20:46	21:34	22:01
23	08:31		07:38	06:35	18:03-18:16/13	06:26	05:34	05:18
	17:08		18:05	18:55		20:47	21:35	22:01
24	08:30		07:36	06:33	18:04-18:15/11	06:24	05:33	05:18
	17:10		18:07	18:56		20:49	21:37	22:01
25	08:29		07:34	06:31	18:05-18:12/7	06:22	05:32	05:18
	17:12		18:09	18:58		20:51	21:38	22:02
26	08:27		07:32	06:28		06:20	05:30	05:19
	17:13		18:10	19:00		20:53	21:39	22:02
27	08:26		07:30	06:26		06:18	05:29	05:19
	17:15		18:12	19:01		20:54	21:41	22:01
28	08:25		07:27	06:24		06:16	05:28	05:20
	17:17		18:14	19:03		20:56	21:42	22:01
29	08:23			07:22		06:14	05:27	05:20
	17:19			20:05		20:58	21:43	22:01
30	08:22			07:19		06:12	05:26	05:21
	17:21			20:07		20:59	21:44	22:01
31	08:20			07:17			05:25	
	17:22			20:08			21:46	
Potential sun hours	259		278	367		416	485	499
Sum of minutes with flicker		812		0	422	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Licensed user:
Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
Calculated:
10/03/2023 13:04/3.6.361

SHADOW - Calendar per WTG

Calculation: Alternative Scenario 3 Real Case **WTG:** 5 - T3

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [VALENTIA OBS.]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.30	2.04	2.89	4.92	5.79	4.99	4.32	4.35	3.60	2.54	1.64	1.06

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
357	232	194	296	505	722	799	1,057	875	1,557	847	1,319	8,760

	July	August	September	October	November	December
1	05:22	05:58	06:48	07:37 18:30-18:44/14	07:31	08:22 14:46-15:01/15
	22:01	21:29	20:27	19:17 18:09-18:26/17	17:11	16:31 12:38-13:10/32
2	05:22	06:00	06:50	07:39 18:32-18:42/10	07:33	08:23 14:46-15:02/16
	22:00	21:27	20:24	19:15 18:08-18:27/19	17:09	16:30 12:38-13:12/34
3	05:23	06:01	06:51	07:40 18:33-18:39/6	07:34	08:25 14:45-15:03/18
	22:00	21:25	20:22	19:12 18:07-18:26/19	17:07	16:29 12:37-13:12/35
4	05:24	06:03	06:53	07:42 18:07-18:26/19	07:36	08:26 14:44-15:03/19
	22:00	21:24	20:20	19:10	17:05	16:29 12:36-13:13/37
5	05:24	06:04	06:54	07:44 18:07-18:26/19	07:38	08:27 14:45-15:05/20
	21:59	21:22	20:18	19:08	17:04	16:28 12:37-13:14/37
6	05:25	06:06	06:56	07:45 18:07-18:24/17	07:40	08:29 14:44-15:05/21
	21:59	21:20	20:15	19:06	17:02	16:28 12:36-13:15/39
7	05:26	06:07	06:58	07:47 18:07-18:23/16	07:42	08:30 14:45-15:06/21
	21:58	21:18	20:13	19:03	17:00	16:27 12:37-13:16/39
8	05:27	06:09	06:59	07:49 18:09-18:22/13	07:43	08:31 14:45-15:07/22
	21:57	21:17	20:11	19:01	16:59	16:27 12:37-13:17/40
9	05:28	06:11	07:01	07:50 18:11-18:20/9	07:45	08:32 14:45-15:07/22
	21:57	21:15	20:08	18:59	16:57	16:27 12:37-13:17/40
10	05:29	06:12	07:03	07:52	07:47	08:33 14:45-15:08/23
	21:56	21:13	20:06	18:57	16:55	16:27 12:37-13:18/41
11	05:30	06:14	07:04	07:54	07:49	08:35 14:45-15:08/23
	21:55	21:11	20:04	18:54	16:54	16:26 12:37-13:18/41
12	05:31	06:15	07:06	07:56	07:51	08:36 14:45-15:09/24
	21:54	21:09	20:01	18:52	16:52	16:26 12:37-13:19/42
13	05:32	06:17	07:07	07:57	07:52	08:37 14:46-15:09/23
	21:53	21:07	19:59	18:50	16:51	16:26 12:37-13:20/43
14	05:33	06:19	07:09	07:59	07:54	08:38 14:46-15:10/24
	21:53	21:05	19:57	18:48	16:49	16:26 12:37-13:20/43
15	05:35	06:20	07:11	08:01	07:56	08:38 14:47-15:10/23
	21:52	21:03	19:54	18:46	16:48	16:26 12:38-13:21/43
16	05:36	06:22	07:12	08:02	07:58	08:39 14:47-15:11/24
	21:51	21:01	19:52	18:43	16:46	16:26 12:38-13:22/44
17	05:37	06:23	07:14	08:04	07:59	08:40 14:48-15:12/24
	21:49	20:59	19:50	18:41	16:45	16:27 12:39-13:22/43
18	05:38	06:25	07:16 18:54-19:00/6	08:06	08:01	08:41 14:48-15:12/24
	21:48	20:57	19:47	18:39	16:44	16:27 12:40-13:23/43
19	05:40	06:27	07:17 18:51-19:01/10	08:08	08:03	08:42 14:48-15:12/24
	21:47	20:55	19:45	18:37	16:42	16:27 12:39-13:23/44
20	05:41	06:28	07:19 18:49-19:02/13	08:09	08:04	08:42 14:49-15:13/24
	21:46	20:53	19:43	18:35	16:41	16:27 12:40-13:24/44
21	05:42	06:30	07:20 18:48-19:02/14	08:11	08:06	08:43 14:49-15:13/24
	21:45	20:51	19:40	18:33	16:40	16:28 12:40-13:24/44
22	05:44	06:32	07:22 18:47-19:02/15	08:13	08:08	08:43 14:50-15:14/24
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31	05:57	06:46		07:29		08:46 14:54-15:17/23
	21:30	20:29		17:13		16:35 12:46-13:28/42
Potential sun hours	502	454	381	331	266	244
Sum of minutes with flicker	0	0	248	178	174	1978

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

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Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
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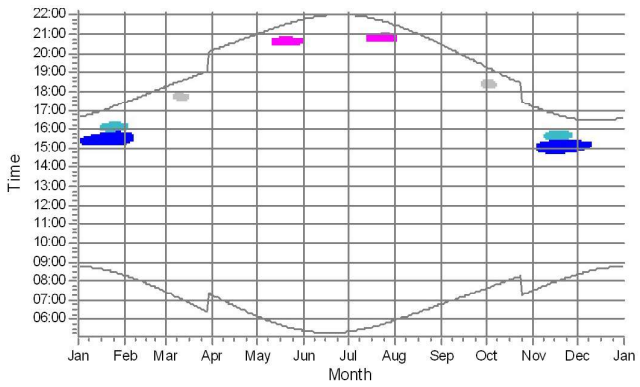
10/03/2023 13:04/3.6.361

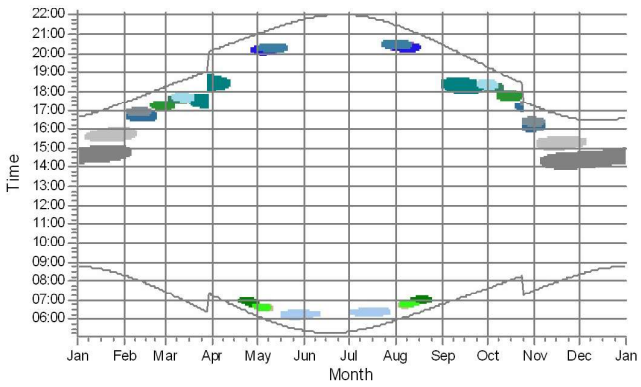
SHADOW - Calendar per WTG, graphical

Calculation: Alternative Scenario 3 Real Case

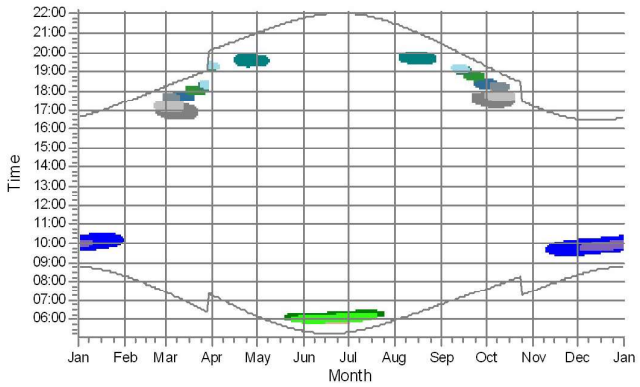
1: T1



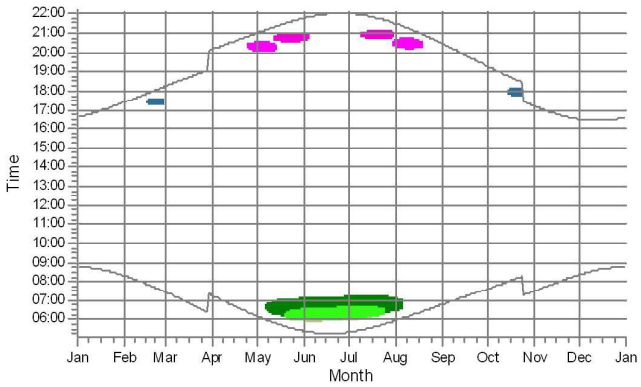
2: T5



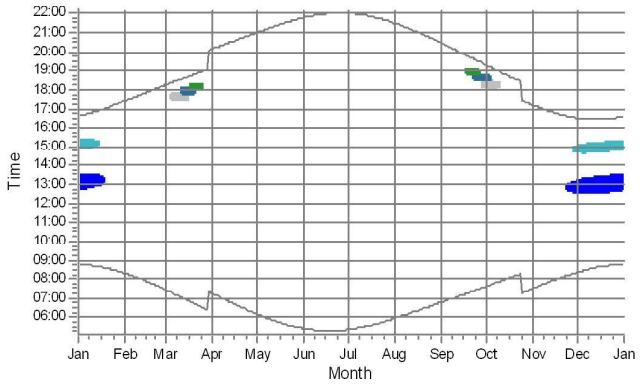
3: T4



4: T2



5: T3



Shadow receptors

A: H1	F: H6	R: H18	AA: H27	AI: H35
C: H3	L: H12	S: H19	AC: H29	AJ: H36
D: H4	O: H15	V: H22	AG: H33	AK: H37
E: H5	Q: H17	X: H24	AH: H34	AL: H38

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Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
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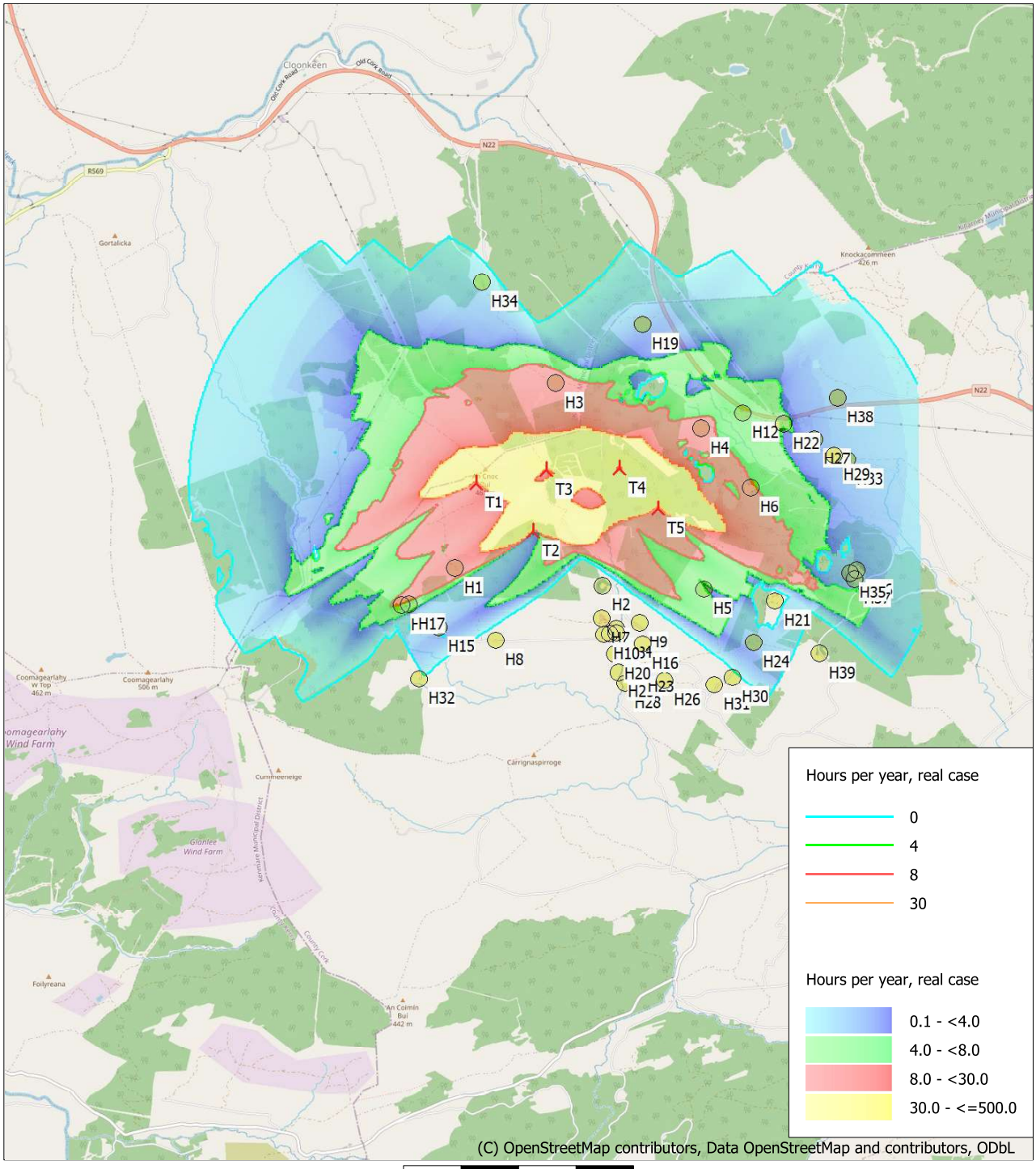
10/03/2023 13:04/3.6.361

SHADOW - Map

Calculation: Alternative Scenario 3 Real Case



0 500 1000 1500 2000 m

Map: EMD OpenStreetMap , Print scale 1:50,000, Map center Irish ITM-IRENET95 (IE), geocentric, GRS80 East: 512,720 North: 578,100

New WTG Shadow receptor

Flicker map level: Elevation Grid Data Object: Inchamore_EMDGrid_3.wpg (3)

Time step: 2 minutes, Day step: 3 days, Map resolution: 10 m, Visibility resolution: 5 m, Eye height: 1.5 m

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Jennings O'Donovan
Finisklin Business Park
IE-F91 RHH9 Sligo
+353719161416
abyrne / abyrne@jodireland.com
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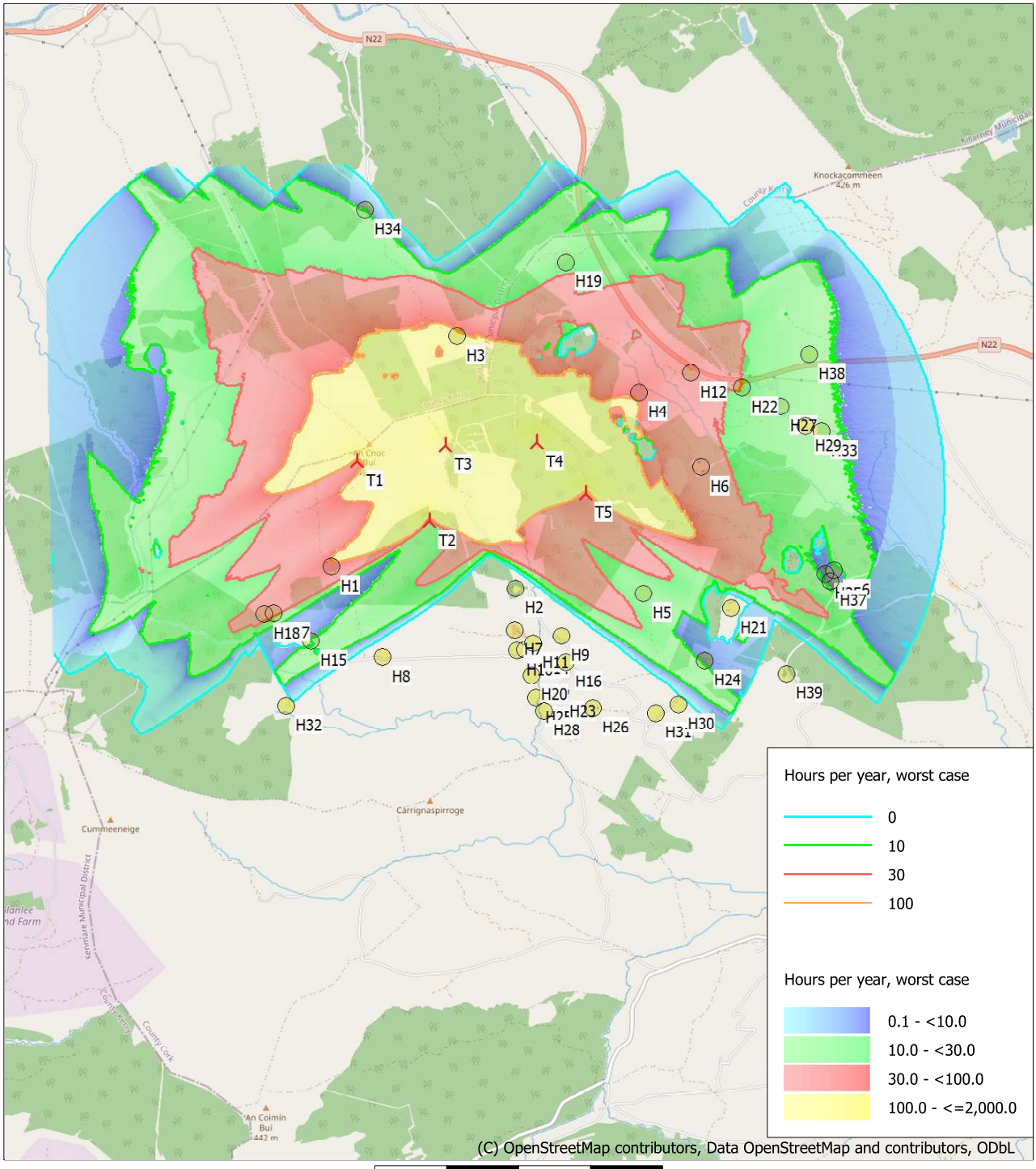
SHADOW - Map

Calculation: Alternative Scenario 3 Worst Case



0 500 1000 1500 2000 m

Map: EMD OpenStreetMap , Print scale 1:40,000, Map center Irish ITM-IRENET95 (IE), geocentric, GRS80 East: 513,470 North: 578,100

New WTG Shadow receptor

Flicker map level: Elevation Grid Data Object: Inchamore_EMDGrid_3.wpg (3)

Time step: 2 minutes, Day step: 3 days, Map resolution: 10 m, Visibility resolution: 5 m, Eye height: 1.5 m

APPENDIX 5.1

Plant species list for habitats encountered within the Inchamore Wind Farm site.

Latin name	English name	Main habitat
Agrostis canina	Velvet bent grass	Dry-humid acid grassland
Agrostis capillaris	Common bent grass	Dry-humid acid grassland
Agrostis stolonifera	Creeping bent	Wet grassland
Anagallis tenella	Bog pimpernel	Poor flush
Anthoxanthum odoratum	Sweet vernal grass	Dry-humid acid grassland
Asplenium trichomanes	Maidenhair spleenwort	Rock outcrops
Aulacomium palustris	A moss	Poor flush
Bellis perennis	Daisy	Wet grassland
Betula pubescens	Downy birch	Conifer plantation margins
Blechnum spicant	Hard fen	Rock outcrops
Calluna vulgaris	Ling	Dry heath
Campylopus atrovirens	A moss	Blanket bog
Campylopus introflexus	A moss	Cutover bog
Carex echinata	Star sedge	Poor flush
Carex ovalis	Oval sedge	Wet grassland
Carex panicea	Carnation sedge	Blanket bog
Carx binervis	Green ribbed sedge	Dry humid acid grassland
Cirsium palustre	Marsh thistle	Wet grassland
Cladonia portentosa	A lichen	Blanket bog
Cladonia uncialis	A lichen	Blanket bog
Cynosurus cristatus	Crested Dogs tail	Wet grassland
Deschampsia flexuosa	Wavy hair grass	Dry heath
Dicranum scoparium	A moss	Dry heath
Drosera rotundifolia	Round-leaved sundew	Blanket bog
Dryopteris affinis	Scaly male fern	Rock outcrops
Dryopteris dilatata	Broad buckler fern	Rock outcrops
Erica cinerea	Bell heather	Dry heath
Erica tetralix	Cross-leaved heath	Wet heath
Eriophorum angustifolium	Common bog cotton	Blanket bog
Eriophorum vaginatum	Hare's tail bog cotton	Blanket bog
Eurhynchium praelongum	A moss	Conifer plantation
Festuca ovina	Sheep's fescue	Dry-humid acid grassland
Filipendula ulmaria	Meadowsweet	Wet grassland
Galium palustre	Marsh bedstraw	Wet grassland
Galium saxatile	Heath bedstraw	Dry-humid acid grassland
Hedera helix	Ivy	Rock outcrops
Holcus lanatus	Yorkshire fog	Wet grassland
Hylocomium splendens	A moss	Dry-humid acid grassland
Hymenophyllum tunbrigense	Tunbridge filmy fern	Rock outcrops
Hypericum puchrum	Heath St. Johns wort	Dry heath
Hypnum jutlandicum	A moss	Blanket bog
Juncus articulatus	Jointed rush	Cutover bog
Juncus conglomeratus	Compact rush	Wet grassland
Juncus effusus	Soft rush	Wet grassland
Juncus squarrosus	Heath rush	Cutover bog
Luzula multiflora	Heath woodrush	Dry heath
Luzula sylvatica	Great wood rush	Rock outcrops
Molinia caerulea	Purple moor-grass	Wet heath
Myrica gale	Bog myrtle	Blanket bog
Nardus stricta	Mat grass	Dry-humid acid grassland
Narthecium ossifragum	Bog asphodel	Blanket bog
Odontoschisma sphagni	A liverwort	Blanket bog
Picea sitchensis	Sitka spruce	Conifer plantation
Pinus contorta	Lodgepole pine	Conifer plantation
Pinguicula grandiflora	Large flowered butterwort	Wet heath
Plantago lanceolata	Ribwort plantain	Dry humid acid grassland

Latin name	English name	Main habitat
Pleurozia purpurea	A liverwort	Blanket bog
Pleurozium schreberi	A moss	Dry heath
Polygala serpyllifolia	Heath milkwort	Blanket bog
Polypodium vulgare	Common polypody	Rock outcrops
Polytrichum commune	A moss	Blanket bog
Potentilla erecta	Tormentil	Wet heath
Prunella vulgaris	Self heal	Wet grassland grassland
Pseudoscleropodium purum	A moss	Dry-humid acid grassland
Racomitrium lanuginosum	A moss	Blanket bog and wet heath
Ranunculus acris	Meadow buttercup	Wet grassland
Ranunculus flammula	Lesser spearwort	Wet grassland
Ranunculus repens	Creeping buttercup	Wet grassland
Rhynchospora alba	White beaked sedge	Blanket bog
Rhytidiadelphus loreus	A moss	Dry-humid acid grassland
Rhytidiadelphus squarrosus	A moss	Dry-humid acid grassland
Rubus fruticosus	Bramble	Conifer plantation
Rumex acetosa	Sorrel	Wet grassland
Rumex acetosella	Sheeps sorrel	Dry heath
Salix aurita	Eared willow	Stream banks
Saxifraga spathularis	St. Patricks cabbage	Rock outcrops
Schoenus nigricans	Black bog rush	Blanket bog
Sphagnum capillifolium	A moss	Blanket bog
Sphagnum cuspidatum	A moss	Blanket bog
Sphagnum fallax	A moss	Wet grassland
Sphagnum palustre	A moss	Conifer plantation
Sphagnum papillosum	A moss	Blanket bog
Sphagnum subnitens	A moss	Wet heath
Sphagnum tenellum	A moss	Blanket bog
Succisa pratensis	Devils bit scabious	Dry heath
Thuidium tamariscinum	A moss	Conifer plantation
Trichophorum germanicum	Deer grass	Wet heath and blanket bog
Trifolium repens	White clover	Wet grassland
Ulex europaeus	Common gorse	Conifer plantation margins
Ulex gallii	Western gorse	Dry heath
Vaccinium myrtillus	Bilberry	Dry heath
Viola riviniana	Common dog violet	Dry humid acid grassland

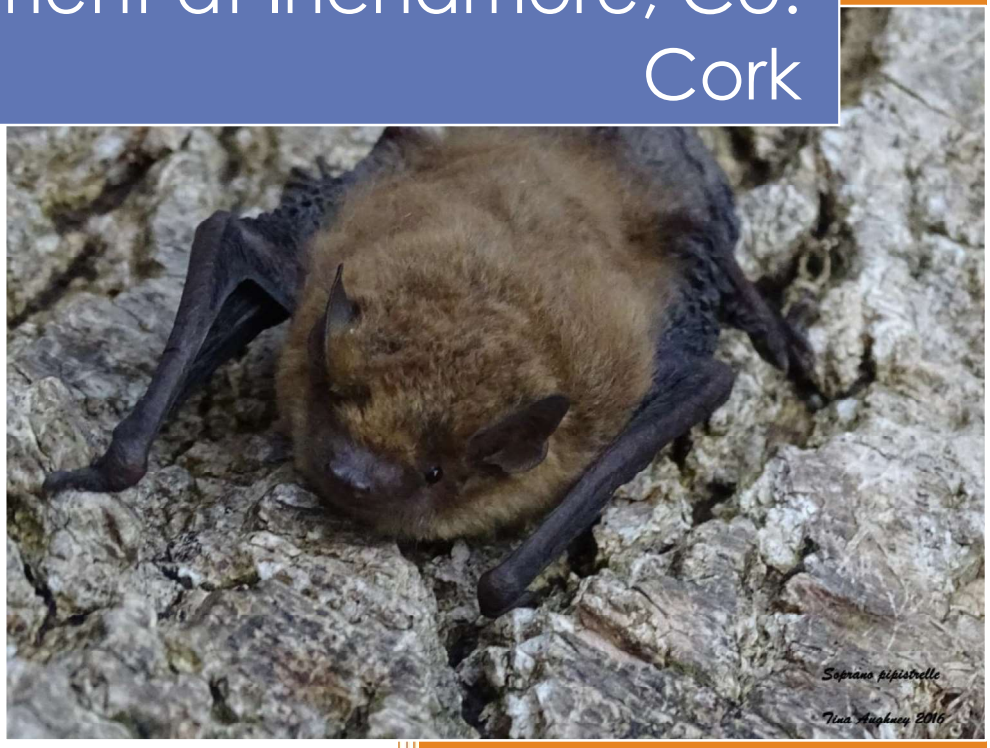
APPENDIX 5.2

Plant species list for habitats encountered along forest tracks within the grid connection route.

Agrostis stolonifera	Creeping bent
Bellis perennis	Daisy
Breutelia chrysocoma	A moss
Calliergonella cuspidata	A moss
Calluna vulgaris	Ling heather
Carex viridula subsp oedocarpa	Common yellow sedge
Catapodium rigidium	Fern grass
Cerastium fontanum	Common mouse-ear
Cirsium palustre	Marsh thistle
Cirsium vulgare	Spear thistle
Cynosurus cristatus	Crested dog's-tail
Epilobium brunnescens	New Zealand willowherb
Filago minima	Small cudweed
Holcus lanatus	Yorkshire fog
Hylocomium splendens	A moss
Hypochoeris radicata	Cat's ear
Juncus articulatus	Jointed rush
Juncus bufonius	Toad rush
Juncus effusus	Soft rush
Linum catharticum	Fairy flax
Lotus corniculatus	Bird's foot trefoil
Matricaria discoidea	Pineappleweed
Molinia caerulea	Purple moor-grass
Odontites vernus	Red bartsia
Plantago lanceolata	Ribwort plantain
Plantago major	Greater plantain
Poa annua	Annual meadow-grass
Prunella vulgaris	Self heal
Ranunculus repens	Creeping buttercup
Rhytidiadelphus loreus	A moss
Rumex acetosella	Sheeps sorrel
Sagina procumbens	Procumbent pearlwort
Senecio jacobea	Ragwort
Trifolium repens	White clover
Tussilago farfara	Colts foot
Veronica officinalis	Heath speedwell
Veronica serpyllifolia	Thyme-leaved speedwell

2023

Bat Assessment: proposed wind farm development at Inchamore, Co. Cork



Dr Tina Aughney
Bat Eco Services

Client: Inchamore Wind DAC

Project Name & Location: Inchamore, Co. Cork.

Report Revision History

Date of Issue	Draft Number	Issued To (process of issuing)
31st January 2023	Draft 1	Issued by email
18th March 2023	Draft 2	Issued by email
30th March 2023	Draft 3	Issued by email
2nd May 2023	Draft 4	Issued by email

Purpose

This document has been prepared as a Report for Inchamore Wind DAC. Only the most up to-date report should be consulted. All previous drafts/reports are deemed redundant in relation to the named site.

Bat Eco Service accepts no responsibility or liability for any use that is made of this document other than by the client for the purposes for which it was originally commissioned and prepared.

Carbon Footprint Policy

It is the policy of Bat Eco Services to provide documentation digitally in order to reduce carbon footprint. Printing of reports etc. is avoided, where possible.

Bat Record Submission Policy

It is the policy of Bat Eco Services to submit all bat records to Bat Conservation Ireland database one year post-surveying. This is to ensure that a high level bat database is available for future desktop reviews. This action will be automatically undertaken unless otherwise requested, where there is genuine justification.

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1. Summary

Project Name & Location: Inchamore, Co. Cork.

Proposed work: Wind farm development.

This report provides the bat survey results completed for the proposed development. An array of bat surveys were completed and the following tables lists the bat species recorded and the bat survey duties completes.

Bat Survey Results - Summary

Bat Species	Roosts	Foraging	Commuting
Common pipistrelle *Pipistrellus pipistrellus*		√	√
Soprano pipistrelle *Pipistrellus pygmaeus*		√	√
Nathusius' pipistrelle *Pipistrellus nathusii*			
Leisler's bat *Nyctalus leisleri*		√	√
Brown long-eared bat *Plecotus auritus*	√	√	√
Daubenton's bat *Myotis daubentonii*		√	√
Natterer's bat *Myotis nattereri*	√	√	√
Whiskered bat *Myotis mystacinus*		√	√
Lesser horseshoe bat *Rhinolophus hipposideros*	√	√	√

Bat Survey Duties Completed (Indicated by red shading)

Tree PBR Survey	◯	Daytime Building Inspection	◯
Static Detector Survey	◯	Daytime Bridge Inspection	○
Dusk Bat Survey	◯	Dawn Bat Survey	○
Walking Transect	◯	Driving Transect	◯
Trapping / Mist Netting	○	IR Camcorder filming	○
Endoscope Inspection	◯	Other	○

Please see main body of report for greater details on the methodologies deployed.

In summary, the proposed development area has a Low to Medium Landscape Favourability for Irish bat species.

During the night-time bat surveys completed the following bat species were recorded during dusk surveys and the transects: soprano pipistrelle, common pipistrelle, Leisler's bat, Natterer's bat, Daubenton's bat, *Myotis* species and brown long-eared bat. The level of bat activity recorded was considered to be Low.

Four static surveillance periods were completed in 2022 (one in each of the Spring and Summer periods and two in the Autumn period). The following bat species were recorded during the static surveillance: soprano pipistrelle, common pipistrelle, Leisler's bat, Natterer's bat, whiskered bat, Daubenton's bat, *Myotis* species, lesser horseshoe bat and brown long-eared bat. The data collected from the static surveillance was used to determine the potential impact of proposed turbine locations on local bat populations.

In summary, the total number of common pipistrelles bat passes recorded during all four static surveillance periods was 10,980 while soprano pipistrelles (720 bat passes) and Leisler's bats (650 bat passes) were the second and third most frequently recorded bat species, respectively. Overall, common pipistrelles accounted for 85% of the recordings from static units.

Using the EcoBat Tool and additional analysis, proposed turbine locations where a high value of bat activity for specific bat species were determined with specific reference to common pipistrelle activity. Over the course of the 2022 surveillance, the proposed turbine locations for T1, T4 and T5 were deemed to have a Low level of common pipistrelle bat activity. T3 was deemed to have a Medium level of common pipistrelle bat activity while T2 was deemed to have a High level of common pipistrelle bat activity.

Four buildings were inspected in relation to potential bat roosts. One set of buildings is located within the proposed development area and this was recorded as a bat roost (Night Roost) for three bat species: lesser horseshoe bat, Natterer's bat and brown long-eared bat (Building 2). However, all three bat species recorded roosting are considered to be Low Risk bat species in relation to wind farms and there is no proposed turbine or infrastructure adjacent to the buildings. None of the other buildings inspected were deemed to be suitable.

A daytime tree inspection survey was undertaken of trees located adjacent to the buildings within the proposed development site. None of the trees were deemed to have a Potential Bat Roost (PBR) value.

The mitigation measures recommended in this report require strict implementation to reduce the long-term impact of the proposed wind farm on local bat populations. The implementation of mitigation measures will reduce the impact on local bat populations.

Monitoring (including acoustic surveillance and carcass surveys) is essential to determine that mitigation measures recommended are reducing the potential impacts on local bat populations. The operation of the wind farm should be flexible to implement changes, if recommended, by the monitoring results.

Citation: Bat Eco Services (2023) Bat assessment of proposed wind farm development at Inchamore, Co. Cork. Unpublished report prepared for Inchamore Wind DAC.

2. Introduction

Bat Eco Services was commissioned by Inchamore Wind DAC to undertake a bat survey of Inchamore, Co. Cork. Bat surveys were completed in 2022 and 2023 and this comprised of static surveillance, daytime inspections, dusk surveys and walking/driving transects. Due to lack of availability for the Spring Surveillance Period by Bat Eco Services, the Spring Surveillance static units (6 units) were deployed by EirEcology while all other static units for the three remaining surveillance periods were deployed by Bat Eco Services. As a consequence, night-time surveys were completed by Bat Eco Services for the Summer and Autumn survey periods. Collation and analysis of audio files for all surveys was undertaken by Bat Eco Services.

2.1 Site Location & Description

The proposed wind farm is to be located within Inchamore along the Cork-Kerry border, an estimated 18 km south-east of the town of Killarney and 5 km west of the town of Ballyvourney.

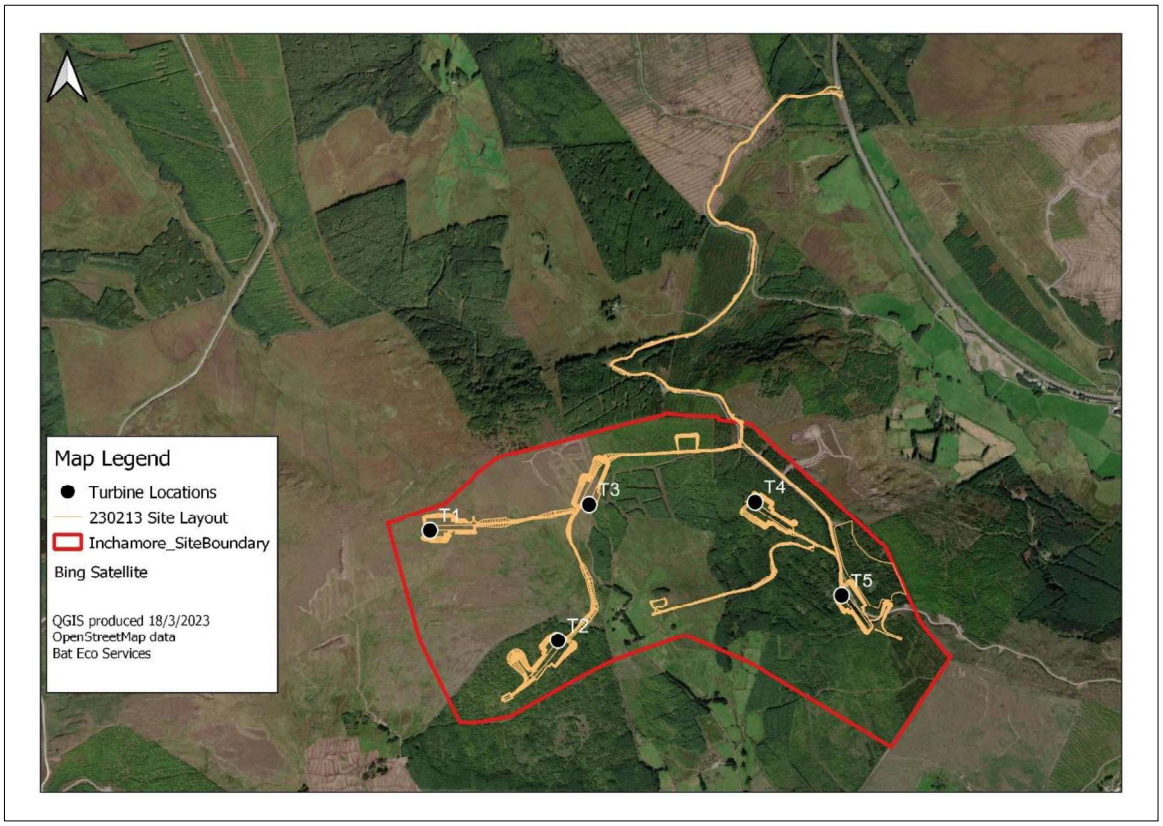

Figure 1: Proposed development area.

The main habitat within the survey area is conifer plantation along with some areas of wet heath (HH3), upland blanket bog (PB2) and cutover bog (PB4).

2.2 Details of the Proposed Development

Permission is being sought by the Developer for the construction of 5 No. Wind Turbines, an on-site substation and all ancillary works, a grid connection to Ballyvouskill 220kV substation, and works along the turbine delivery route.

The Development will consist of the following main components:

- Construction of five wind turbines with an overall ground to blade tip height ranging from 177 m to 185 m inclusive. The wind turbines will have a rotor diameter ranging from 149 m to 155 m inclusive and a hub height ranging from 102.5 m to 110.5 m inclusive.
- Construction of permanent turbine hardstands and turbine foundations.
- Construction of a temporary construction compound with associated temporary site offices, parking areas and security fencing.
- Installation of a (35-year life cycle) meteorological mast with a height of 110 m and a 4 m lightning pole on top.
- Development of an on-site borrow pit.
- Construction of new permanent internal site access roads and upgrade of existing internal site access to include passing bays and all associated drainage infrastructure.
- Development of an internal site drainage network and sediment control systems.
- Construction of a permanent 38 kV electrical substation including a control building with welfare facilities, all associated electrical plant and equipment, security fencing and gates, all associated underground cabling, wastewater holding tank, and all ancillary structures and works.
- All associated underground electrical and communications cabling connecting the wind turbines to the wind farm substation.
- Ancillary forestry felling to facilitate construction of the Development.
- All associated site development works including berms, landscaping, and soil excavation.
- Upgrade works on the Turbine Delivery Route to include the following:
    - Works at an entrance to an existing forest road off the N22 to include localised widening of the road and creation of a splayed entrance, removal of existing vegetation for visibility splays and removal of street furniture to facilitate the delivery of abnormal loads and turbine component deliveries.
    - The construction of a temporary access road off the N22 in the townland of Cummeenavrick to facilitate 180 degrees turning manoeuvre by construction vehicles.

A 10-year planning permission and 35-year operational life from the date of commissioning of the entire wind farm is being sought. This reflects the lifespan of modern-day turbines.

A permanent planning permission is being sought for the substation and all associated electrical plant, equipment cabling security fencing and gates, wastewater holding tank, and all ancillary structures and works as these will become an asset of the national grid under the management of ESB & EirGrid and will remain in place upon decommissioning of the wind farm.

The Inchamore Wind Farm 38kV substation will be connected to the existing Ballyvouskill 220kV substation via underground cabling (UGC). The UGC route is approximately 19.8 km in length and traverse in an east to south easterly direction from the existing Ballyvouskill 220kV substation to the Inchamore Wind Farm substation location utilising public local road networks, existing access tracks (1 km) and private forestry access tracks (18.3 km).

The underground cable route initially begins within the townland of Caherdowney, Co. Cork where from Ballyvouskil 220kV substation compound, the UGC departs the substation on the north-western boundary, converging onto a permanent access track to be constructed as part of this development within agricultural lands and traverses on an upward trajectory for approximately 950 m prior to entering into forested plantations propertied by Coillte.

The UGC will consist of 3 No. 110 mm diameter HDPE power cable ducts and 1 No. 110 mm diameter HDPE communications duct to be installed in an excavated trench, typically 600 mm wide by 1,220 mm deep, with variations on this design to adapt to bridge crossings, service crossings and watercourse crossings, etc. It has been determined that no more than 100 m section of trench will be excavated at a time and it is anticipated to take (1 no.) day to complete each 100 m excavation, installation of ducting and reinstatement of material. In its entirety, the UGC will have a total of 18 No. Cable Joint Bays (CJBs) and 115 No. identified culvert crossings. 3 No. identified bridge crossings which have insufficient clearance within each structure and will require a Horizontal Directional Drill method to cross. An additional HDD crossing will be required to cross the N22.

2.3 Purpose of this Report

The purpose of this bat survey report is to document the bat species and their utilisation of the proposed development area and to determine the potential impact of the proposed development on local bat populations.

2.4 Relevant Legislation & Bat Species Status in Ireland

The principal statutory provisions for the protection of animal species are under the Wildlife Act 1976 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011, as amended. The Habitats Directive (Council Directive 92/43/EEC) are the legislative instruments which are transposed into Irish law, *inter alia,* by the European Communities (Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) ('the 2011' Regulations), as amended.

All Irish bat species are protected under the Wildlife Act (1976) and Wildlife Amendment Acts (2000 and 2010). Also, the EC Directive on The Conservation of Natural habitats and of Wild Fauna and Flora (Habitats Directive 1992), seeks to protect rare species, including bats, and their habitats and requires that appropriate monitoring of populations be undertaken. All Irish bats are listed in Annex IV of the Habitats Directive and the lesser horseshoe bat *Rhinolophus hipposideros* is further listed under Annex II. Across Europe, they are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention

1979, enacted 1983) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both these conventions.

There are eleven recorded bat species in Ireland, nine of which are considered resident on the island. Eight resident bat species and one of the vagrant bat species are vesper bats and all vespertilionid bats have a tragus (cartilaginous structure inside the pinna of the ear). Vesper bats are distributed throughout the island. Nathusius' pipistrelle *Pipistrellus nathusii* is a recent addition while the Brandt's bat has only been recorded once to-date (Only record confirmed by DNA testing, all other records has not been genetically confirmed). The ninth resident species is the lesser horseshoe bat *Rhinolophus hipposideros*, which belongs to the Rhinolophidea and has a complex nose leaf structure on the face, distinguishing it from the vesper bats.

Please see Appendices for more details.

3. Methods

3.1 Scope

The following is the scope of works:

- Document the level of bat usage and number of bat species within the proposed development site (i.e. the red line boundary as illustrated by Figure 1).
- Document the distribution of local bat species in a wider area surrounding the proposed development site as determined by safe accessible tracks and local roads for night-time surveying.
- Determine the level of bat activity of recorded bat species in vicinity of the proposed turbine locations through static surveillance over a minimum of three surveillance periods as per NaturScot (2021) guidelines.
- Complete bat surveys, where possible, according to Collins (2016) bat survey guidelines.
- Provide an assessment of the potential impact of the proposed development on local bat populations using the EcoBat Tool and according to NaturScot (2021) guidelines.
- Provide bat mitigation measures, where required, according to NaturScot (2021) and Marnell *et al.* (2022) guidelines.

3.2 Desk Study

3.2.1 Bat Conservation Ireland Database

Bat Conservation Ireland acts as the central depository for bat records for the Republic of Ireland. Its' bat database is comprised of >60,000 bat records. A 1km and 10km radius search was requested for the Irish Grid Reference W1403878722 in February 2023.

3.2.2 Bat Conservation Landscape Favourability

Bat Conservation Ireland produced a landscape conservation guide for Irish bat species using their database of species records collated during the 2000 - 2009 survey seasons. An analysis of the habitat and landscape associations of all bat species deemed resident in Ireland was undertaken and reported in Lundy *et al*., 2011. The geographical area suitable for individual species was used to identify the core favourable areas of each species. This was produced as a GIS layer for local authorities and planners in order to provide a guide to the consideration of bat conservation. The island is divided into 5km squares and the landscape favourability of each 5km square for each species of bat was modelled. A caveat is attached to the model and it is that the model is based on records held on the BCIreland database, while core areas have been identified, areas outside the core area should not be discounted as unimportant as bats are a landscape species and can travel many kilometres between roosts and foraging areas nightly and seasonally. This model was used as part of the desktop study for this report.

3.2.3 Previous Survey Data

A full season bat survey was previously completed in 2019 and 2020 by Fehily Timoney. This report was in reference to Inchamore and a second proposed development site at Gortyrahilly, Co. Cork.

3.3 Bat Field Surveys

3.3.1 Daytime Inspections

3.3.1.1 Building & Structure Inspection

A small number of buildings were assessed for potential bat usage. Evidence of bat usage is in the form of actual bats (visible or audible), bat droppings, urine staining, grease marks (oily secretions from glands present on stonework) and claw marks. In addition, the presence of bat fly pupae (bat parasite) also indicated that bat usage of a crevice, for example, has occurred in the past. Inspections are undertaken visually with the aid of a strong torch beam (LED Lenser P14.2) and endoscope (General DC5660A Wet / Dry Scope). These structures were also assessed to determine their suitability as a bat roost and described using the parameters Negligible, Low, Medium or High suitability according to Collins (2016). Please see Appendix 2 for more information (Table B). Daytime inspections was completed on numerous dates in 2022 (Please see results section for more details).

3.3.1.2 Tree Potential Bat Roost (PBRs) Inspection

Deciduous trees located adjacent to buildings within the survey area were inspected (21/12/2022) to determine if they provide a roosting space for bats using the Bat Tree Habitat Key (BTHK, 2018) and the classification system adapted from Collins (2016). The Potential Roost Features (PRFs) listed in BTHK (2018) were used to determine the PBR value of trees. Evidence of bat usage is in the form of actual bats (visible or audible), bat droppings, urine staining, grease marks (oily secretions from glands present) and claw marks. In addition, the presence of bat fly pupae (bat parasite) also indicated that bat usage of a crevice, for example, has occurred in the past. A Phase 1 inspection was undertaken visually with the aid of a strong torch beam (LED Lenser P14.2) during the daytime searching for PRFs, if visible. Please see Appendix 8.2 for more information (Table C).

3.3.2 Bat Detector Surveys

3.3.2.1 Dusk Bat Surveys – Walking and Driving Transects

Dusk Surveys were completed from 10 minutes before sunset to at least 110 minutes post sunset. These dusk surveys were primarily completed by walking transects within the proposed development area along tracks and conifer plantation edges. There was limited areas within the proposed development area that were safe to walk during the hours of darkness.

- Dusk Survey on 21/7/2022 from 21:30 hrs to 23:20 hrs;
- Dusk Survey on 28/8/2022 from 21:20 hrs to 23:10 hrs.

Walking transects involved the surveyor(s) walking in survey area along tracks and safe accessible points, noting the time, location and bat species encountered. Mapping of bat encounters was undertaken using QGIS and an excel file produced for mapping purposes (ITM Irish grid reference co-ordinates). Validation of bat records was completed by the principal bat surveyor prior to mapping.

Driving transects were undertaken for large survey areas and were completed along large tracks and local road network in the greater area around the proposed development site. Bat Logger

M2 Spectrum Bat Detector was used for this survey type and was located outside on the passenger side of the vehicle. The vehicle was driven at 24 km/hr following Bat Conservation Ireland's car-based bat monitoring methodology (Aughney *et al.,* 2018). The time, location (grid reference) and bat species encountered were recorded. These recordings were mapped using QGIS and an excel file produced for mapping purposes (ITM Irish grid reference co-ordinates). Validation of bat records was completed by the principal bat surveyor prior to mapping.

Walking and Driving transects were undertaken to gather information on local bat populations within and adjacent to the proposed development area. Walking and Driving transects were undertaken on the following dates:

- Driving transect on 21/7/2022 from 22:00hrs to 00:00 hrs;
- Walking transect on 21/7/2022 from 23:20 hrs to 01:30 hrs;
- Walking transect on 29/8/2022 from 21:20 hrs to 02:00 hrs;
- Walking transect on 19/9/2022 from 20:30 hrs to 01:00 hrs.

All bat encounters were noted during surveys.

The following equipment was used:

- Surveyor 1 (Principal surveyor): Anabat Walkabout Full Spectrum Bat Detector and Petersson D200 Heterodyne Bat Detector.
- Surveyor 2: Bat Logger M2 Full Spectrum Bat Detector and Petersson D200 Heterodyne Bat Detector.

3.3.2.2 Passive Static Bat Detector Survey

A Passive Static Bat Surveys was the principal survey to document the bat usage of the proposed development site. This involved leaving a static bat detector unit (with ultrasonic microphone) in a specific location (erected on a 2m pole) and set to record from 30 minutes before sunset to 30 minutes after sunrise (i.e. a bat detector is left in the field, there is no observer present and bats which pass near enough to the monitoring unit are recorded and their calls are stored for analysis post surveying). The bat detector was effectively used as a bat activity data logger.

All audio recordings collected were analysed using Wildlife Acoustics Kaleidoscope Pro. The Auto-Id function was used for all sound files and manual verification was used to check 20% of positively identified audio files ensure the auto-id function was accurate. This is particularly important for less common bat species and cryptic bat species such as *Myotis* species. In addition, "Noise" and "Unidentified" sound files were also manually checked. Each sequence of bat pulses was noted as a bat pass to indicate level of bat activity for each species recorded. This data was prepared for EcoBat Tool analysis. In addition, all audio files auto-identified as Nathusius' pipistrelle were manually checked as low Common pipistrelle bat calls can be frequently misidentified. Only *Pipistrellus* species calls with a peak frequency of less than 40kHz were accepted as Nathusius' pipistrelle.

Audio files were a maximum of 15 seconds long and each audio file was taken as a bat pass (registration) for each bat species recorded within the audio file. Each bat pass does not equate

to the number of individuals of bats flying in vicinity of the recording device but is representative of bat activity levels.

Static Surveillance was undertaken in 2022. The location of static units was determined by the proposed location of turbines. The following static unit models were deployed during this static bat detector surveys. Additional statics were deployed to survey habitats in September in order to gather additional information as recommended by NaturScot, 2021 (i.e. paired habitat surveys).

Table 1: Static Bat Detectors deployed during Static Bat Detector Surveys.

Static Unit Code	Bat Detector Type	Recording Function	Microphone
SM4 Units 1-8	Wildlife Acoustics SongMeter 4 Bat FS	Passive Full Spectrum	SMM-U2, 4m cable
SM Mini Bat Units 1-12	Wildlife Acoustics SongMeter Mini Bat	Passive Full Spectrum	SMM-U2

Note: ultrasonic microphone were annually checked to ensure that their sensitivity was accurate for static surveillance.

3.3.3 Summary Statistics, Mapping & Analysis

Summary statistics of data collated from static surveillance, walking and driven transects and dusk and dawn surveys were completed. All data collected was collated into excel files for each bat species in order to produce distribution maps.

In addition, the nightly number of bat passes recorded per species on the statics units were analysed using the website based tool EcoBat (http://www.ecobat.org.uk/).

3.3.3.1 EcoBat Tool

This EcoBat tool was designed by the University of Exeter, UK and is hosted by the Mammal Society, UK. The following is taken from the "About " section of the website:

Using bat passes to assess the relative importance of a site for policymakers therefore requires practitioners to account for how these multiple factors may have influenced the number of bat passes recorded at a site. Although professional opinion is valuable, it can often be based on intuition, is context dependent and can vary considerably between practitioners (Hulme, 2014).

It is therefore likely that an assessment of the ecological value of a site (and the impacts of any proposed action) will vary between practitioners based upon their own level of experience and knowledge of the region and/or species.

EcoBat compares surveys submitted by the user with a national reference dataset and objectively quantifies bat activity levels. It offers a web-based interface for depositing data rapidly and securely, automatically generating a numerical indicator of the relative importance of a night's worth of activity, by contrasting with a comparable reference range. The output can

be used by ecologists to accurately quantify what bat activity means for use during ecological impact assessments.

EcoBat uses percentiles to provide a numerical representation of activity levels relative to the surrounding landscape for each night of surveying. Percentiles can then be assigned to activity categories (low, moderate, high) to provide a quantifiable measure of bat activity. Percentiles provide a numerical indicator of the relative importance of a nights' worth of bat activity by comparing it with a national database. For example, activity data in the 80th percentile would indicate that the recorded data were in the top 20% of activity for the reference range".

Table 2: Percentile score and categorised level of bat activity.

Percentile	Bat Activity
81 to 100	High
61 to 80	Moderate to High
41 to 60	Moderate
21 to 40	Low to Moderate
0 to 20	Low

3.3.3.2 Bat Habitats & Bat Activity Analysis

All static recording locations sampled are also classed according to their favourability as a bat habitat within 200m radius of the static location. Four classifications are used:

- Open – for example, open peat bog. Typically, there is little tall vegetation in this category which is generally required for bat species to forage and commute along (exception to this is Leisler's bats). This category would be considered to have a low potential for the majority of bat species.
- Edge – for example, hedgerows, treelines and woodland edge. Bat species such as *Pipistrellus* species have a preference to fly along linear habitat features. This category would be considered to have a high potential for the majority of bat species.
- Closed – for example woodland. Bat species such a brown long-eared bats have a preference to foraging within woodland habitats. This category would be considered to have a high potential for the majority of bat species.
- Water – while an open habitat, due to the insect resource associated with water, these habitat types are often favoured by foraging bats, especially Daubenton's bat.

Roche *et al.* (2014) and Lundy *et al.* (2011) reported on the habitats consider favourable for each Irish bat species. Using the habitat maps (QGIS map layers) produced by Tobin examined to aid analysis for this report. Habitats deemed by the author, under guidance of Roche *et al.* (2014) and Lundy *et al.* (2011), as "Bat Habitat" are as follows:

- Mixed broad leaved woodland
- Water bodies
- Linear habitat
- Bog Woodland
- Mosaic

- Scrub
- Conifer plantation

As a consequence, the "Habitat" shapefile provided by Jennings O'Donovan & Partners Ltd Consulting Engineers was used to represent "Bat Habitats" for analysis.
Additional QGIS layers were created to aid analysis for this report. Each bat encounter was mapped and bat encounters within 1km of the proposed turbine locations was extracted to represent the bat encounters of the principal proposed development area. As bats echolocation calls can be detected some distance from where the actual bat is flying, a 50m fly zone was created around each bat encounter to represent the general area that individual bat recorded could be located at that point in time. This was named the ***"Buffered Bat Encounters"*** and represents the potential distance that bat echolocation calls can be detected by an ultrasonic microphone (i.e. bat detector zone). While this value varies greatly depending on the "loudness" of the echolocation call, the 50m value is representative of louder bats such as *Pipistrellus* bat species, Ireland's most common bat species.

To further facilitate analysis, all turbine locations were buffered to 200m (this 200m figure is taken from EUROBAT guidelines and represents the recommended distance from woodland habitats to locate wind turbines. It is an arbitrary figure used to determine what bat encounters were recorded within 200m radius around proposed wind turbine locations). This layer was named "Buffered Turbine Locations" and represents the potential area/zone directly around the turbine locations that may impact on local bat populations.

3.3.4 Internal Wind Farm Access Tracks

To facilitate the construction of the proposed wind turbines, internal wind farm access tracks are required. This may result in the removal of habitats and the potential impact of this is investigated using the ***"Habitat"*** layer, ***"Buffered bat Encounters"*** layer and the ***"Buffered Turbine Locations"*** layer produced.

3.3.5 Core Sustenance Areas

Bat Conservation Trust (BCT) defines Core Sustenance Zones (CSZs) for different bat species and this is based on an extensive literature review (www.bats.org.uk). A CSZ refers to the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost. With reference to development, the CSZ could be used to indicate:

- The area surrounding a communal roost within which development work may impact the commuting and foraging habitat of bats using that roost.
- The area within which it may be necessary to ensure no net reduction in the quality and availability of foraging habitat for the colony.

3.4 Project Team

Licensed Bat Specialist: Dr Tina Aughney
NPWS licence C17/2023 (Licence to handle bats, expires 23rd January 2026);
NPWS licence 27/2023 (Licence to photograph/film bats, expires 31st December 2024);
NPWS licence DER/BAT 2022-36 (Survey licence, expires 24th March 2025).

Statement of Authority: Dr Aughney has worked as a Bat Specialist since 2000 and has undertaken extensive survey work for all Irish bat species including large scale development projects, road schemes, residential developments, wind farm developments and smaller projects in relation to building renovation or habitat enhancement. She is a monitoring co-ordinator and trainer for Bat Conservation Ireland. She is a co-author of the 2014 publication *Irish Bats in the 21st Century.* This book received the 2015 CIEEM award for Information Sharing. Dr Aughney is a contributing author for the Atlas of Mammals in Ireland 2010-2015.

All analysis and reporting is completed by Dr Tina Aughney. Data collected and surveying is completed with the assistance of a trained field assistant.

Mr. Shaun Boyle (Field Assistant) NPWS licence DER/BAT 2022-37 (Survey licence, expires 24th March 2025).

3.5 Limitations

The proposed development area is primarily upland heath and conifer plantation with limited safe access points for night-time bat surveys. As a consequence, a larger area within vicinity of the proposed development area was surveyed to supplement the local bat population knowledge by walking and driving transects. Additional static surveillance was undertaken in September 2022 to gather data on bat usage of “paired habitats”.

Two static units failed to recorded (one during Spring Static surveillance and one during Autumn Static surveillance). As a consequence, a static unit was deployed to compensate for this (different survey dates) while a full fourth static surveillance period was completed to compensate for the failed unit in the first autumn surveillance period.

Details of the one building, located within the proposed development area, was not received until the after the summer survey season. Therefore, a winter survey was completed using daytime inspections and an extended static surveillance period.

4. Results

4.1 Desk Review

4.1.1 Sites Designated for Nature Conservation

The southern boundary of the Special Area of Conservation designation Killarney National Park, Macgillycuddy's Reeks & Caragh River Catchment SAC (No. 000365) is located approximately 3.5km from the northern boundary of the proposed development area. One of the "Qualifying Interests" for this site designation is the Annex II bat species Lesser horseshoe bat. This species of bat was recorded during the bat surveys for the proposed development.

Kilgarvan Ice House SAC and pNHA (Site Code: 000364) is also designated for the presence of lesser horseshoe bats. This SAC is located c.12.3 km to the south-west of the proposed wind farm at Inchamore at its closest point.

Old Domestic Building, Curraglass Wood SAC and pNHA (Site Code: 002041), designated for the presence of lesser horseshoe bats, is located c.9.9 km to the north-west of the proposed wind farm at Inchamore.

4.1.2 Bat Conservation Ireland Database

A 1km and 10km radius search was requested for the Irish Grid Reference W1403878722 in February 2023. There were no records on the database for the 1km search while the records at a 10km search are presented on the map below. The nearest BCIreland database recorded is 2.5km from the boundary of the proposed development site.

Table 3a: BCIreland Bat Records for 10km radius search.

Bat Species	Records	Roost Records	Transect Records	Ad Hoc Records
Brown long-eared bat	8	5	0	3
Common pipistrelle	17	0	4	13
Daubenton's bat	6	0	0	6
Leisler's bat	10	0	1	9
Lesser horseshoe bat	7	5	0	2
Nathusius' pipistrelle	0	0	0	0
Natterer's bat	3	1	0	2
Soprano pipistrelle	13	0	1	12
Whiskered bat	4	0	0	4
Pipistrellus species	7	1	0	6

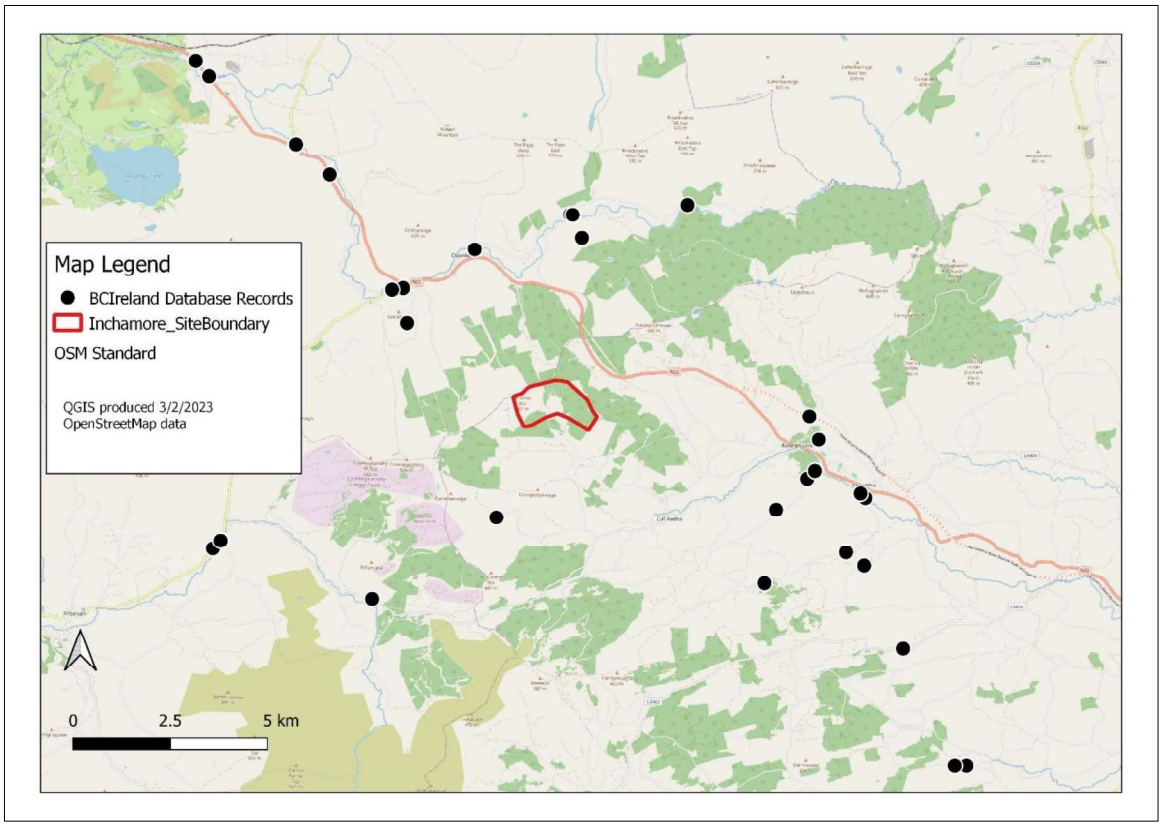

Figure 2a: Bat Conservation Ireland Database Records (10km radius).

4.1.3 Bat Conservation Landscape Favourability

Figure 2b depicts the BCIreland Bat Landscape Favourability Model (Lundy *et al.,* 2011) for all bat species (individual species values are presented in the table below). The county is divided into 5km squares and the darker the shading of the square, the higher favourability of the 5km square for bats. This GIS layer is hosted on the NBDC website www.biodiversityireland.ie.

The 5km square within which the proposed development is located has a Low to Medium favourability for bats. For the bat species recorded during this bat survey, the 5km square has a Low or Low to Medium favourability value for eight recorded bat species recorded during the surveys.

Figure 2b: Bat Landscape Favourability Model (All Bats) (Source: NBDC) – Blue Box = proposed development area.

Table 3b: Bat Conservation Ireland Bat Landscape Favourability Model – 5km Square value.

Bat species	5km Square
Common pipistrelle	26% Low to Medium)
Soprano pipistrelle	23% (Low to Medium)
Nathusius' pipistrelle	0% (Low)
Leisler's bat	17% (Low)
Brown long-eared bat	13% (Low)
Daubenton's bat	11% (Low)
Natterer's bat	17% (Low to Medium)
Whiskered bat	13% (Low to Medium)
Lesser horseshoe bat	5% (Low to Medium)

4.1.4 Previous Survey Data

A previous bat survey report include the proposed development area as part of their survey area:

Fehily Timoney (2020) Gortyrahilly and Inchamore Wind Farms Bat Survey 2019/2020 Report. Unpublished report prepared for SSE Renewables.

This bat survey completed the following bat survey elements:

- Spring Static Surveillance: 10 static units, 11 nights surveillance;
- Summer Static Surveillance: 10 static units, 10 nights surveillance;
- Autumn Static Surveillance: 10 static units, 26 nights surveillance;
- 1 extra static unit was deployed on 30/7/2019 for 24 nights;
- Daytime assessment of 4 buildings;
- Daytime assessment of trees;
- Dusk bat emergence surveys:
- Walking transects along pre-mapped routes.

This bat survey recorded all nine resident bat species during the surveys. The majority of the bat survey data was recorded by the static surveillance surveys. A total of 22,877 recordings over the 46 nights of surveys were recorded on the static units. The most commonly recorded species was common pipistrelle, followed by soprano pipistrelle and Nathusius' pipistrelle.

Table 3c: 2019 Static Surveillance Results (Calculations based on recordings over 46 nights).

Bat Species	No. of Recordings	Percentage	No. of Recordings/ Night
Brown long-eared bat	419	1.84%	9.11
Common pipistrelle	16,180	70.29%	616.09
Daubenton's bat	563	2.55%	22.33
Leisler's bat	872	3.84%	18.96
Lesser horseshoe bat	39	0.17%	0.85
Nathusius' pipistrelle	1,001	4.41%	21.76
Natterer's bat	174	0.89%	4.41
Soprano pipistrelle	3,219	14.17%	69.98
Whiskered bat	381	1.68%	8.28

4.2 Bat Species

The results of the different types of surveys are presented below and summarised at the end of the section. It is important that the whole section is read in order to gain a full impression of the potential bat value of the survey area.

4.2.1 Daytime Inspections

4.2.1.1 Building & Structure Inspection

Four sets of buildings were inspected, one set of buildings is located within the proposed development area, while the remaining three are located outside the proposed development area (Figure 2a). Daytime inspections were undertaken on 21/12/2022 and 6/1/2023 of the buildings and the results of these inspections are presented in the table below. In addition, static units were deployed in three of the buildings and left in-situ (recording from sunset to sunrise from 21/12/2022 to 6/1/2023).

Building 2, located within the proposed development area, was recorded as a bat roost for three species of bat: lesser horseshoe bat (bat droppings), Natterer's bat (bat droppings and audio files) and brown long-eared bat (audio files). The level of droppings and the number of audio files recorded (4 bat encounters, see Table 4b) indicates that this building is used as a night roost for these three species of bat.

Table 4a: Buildings / Structures inspection results.

Building Code	Description	Grid Reference (ITM)	Daytime Inspection	Static Unit Results
Building 1	2-storey dwelling and 5 single storey sheds. Natural stone walls, mixed roofs (slate and corrugated iron). No evidence of bat usage.	514755, 578855	No bat evidence recorded during daytime inspection Suitability: Low to Medium level	No bats recorded on static unit
Building 2	2-storey derelict house, slate roof, timber fascia, small lean-too shed with corrugated roof	513562, 578539	Small number of bat droppings on ground floor room (Lesser horseshoe bat) and in lean-to shed (Myotis spp.). Suitability: Medium to High level	Static Recordings - Main House: Natterer's bat and Brown long-eared bat. Lean-to: Natterer's bat.
Building 3	2-storey derelict dwelling (slate roof in poor condition) and	514338, 577982	No bat evidence recorded during daytime inspection	Unknown - permission refused to collect static unit

	numerous stonewall ruins.		Suitability: Low to Medium level	
Building 4	Single storey shed.	514703, 578897	No bat evidence recorded during daytime inspection Suitability: Low level	Not applicable

Plate 1: Building 2 (front view).

Plate 2: Building 2 along with lean-to structure (rear view).

Table 4b: Static unit results of winter surveillance of Building 2.

Date	Time	Bat Species	Survey Type	Bat Detector Model
21/12/2022	23:52:00	Natterer's bat	Statics in buildings	Mini Bat
27/12/2022	16:57:00	Brown long-eared bat	Statics in buildings	Mini Bat
28/12/2022	20:57:00	Natterer's bat	Statics in buildings	Mini Bat
29/12/2022	19:29:00	Natterer's bat	Statics in buildings	Mini Bat

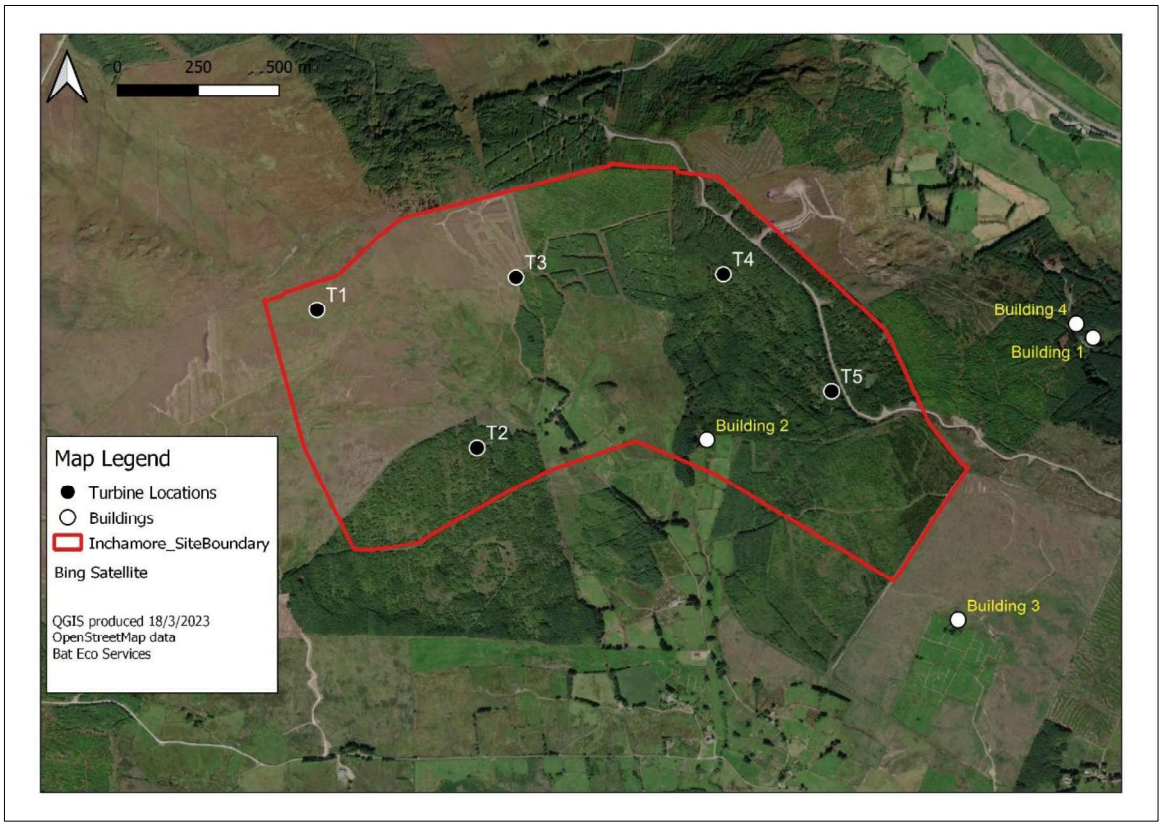

Figure 3a: Location of buildings surveyed.

4.2.2 Tree Potential Bat Roost (PBRs) Inspection

There is an area of mature trees surrounding Building 2 within the proposed development area (Figure 3a). All of the trees within this located were inspected on 21/12/2022 for features such as tree holes, spilt limbs etc. that can provided roosting features for bats. The majority of trees in this area are conifer trees and therefore do not have a Potential Bat Roost or PBR value for local bat populations.

Plate 3: Mature trees located around Building 2.

4.3 Bat Detector Surveys

4.3.1 Dusk Bat Surveys, Walking & Driving Transects

The bat encounters recorded for these surveys (completed on 21/7/2022, 28/8/2022, 29/8/2022 and 19/9/2022) are reported as part of overall summary maps for each of the bat species. The following bat species were recorded during dusk surveys and the transects: soprano pipistrelle, common pipistrelle, Leisler's bat, Natterer's bat, Daubenton's bat, *Myotis* species and brown long-eared bat. This information provides distribution results for the bat species recorded which are presented in Section 4.3.3. Full breakdown of the nightly data is provided in the appendices.

4.3.2 Passive Static Bat Detector Survey

The following tables summarises the results recorded on the static units deployed over four surveillance periods. The information collated by the static surveillance is analysed using the EcoBat Tool (Please see note on p. 42) and therefore will be discussed in greater detail under that section of the report. Figures are provided to show the location of each of the static units in relation to the proposed turbine locations. The principal location of static units was determined by the proposed location of turbines while additional units were deployed to sample specific habitats within the proposed development area. All static units were deployed for a minimum of 10 days and therefore meet the level of surveillance recommended by guidance documents.

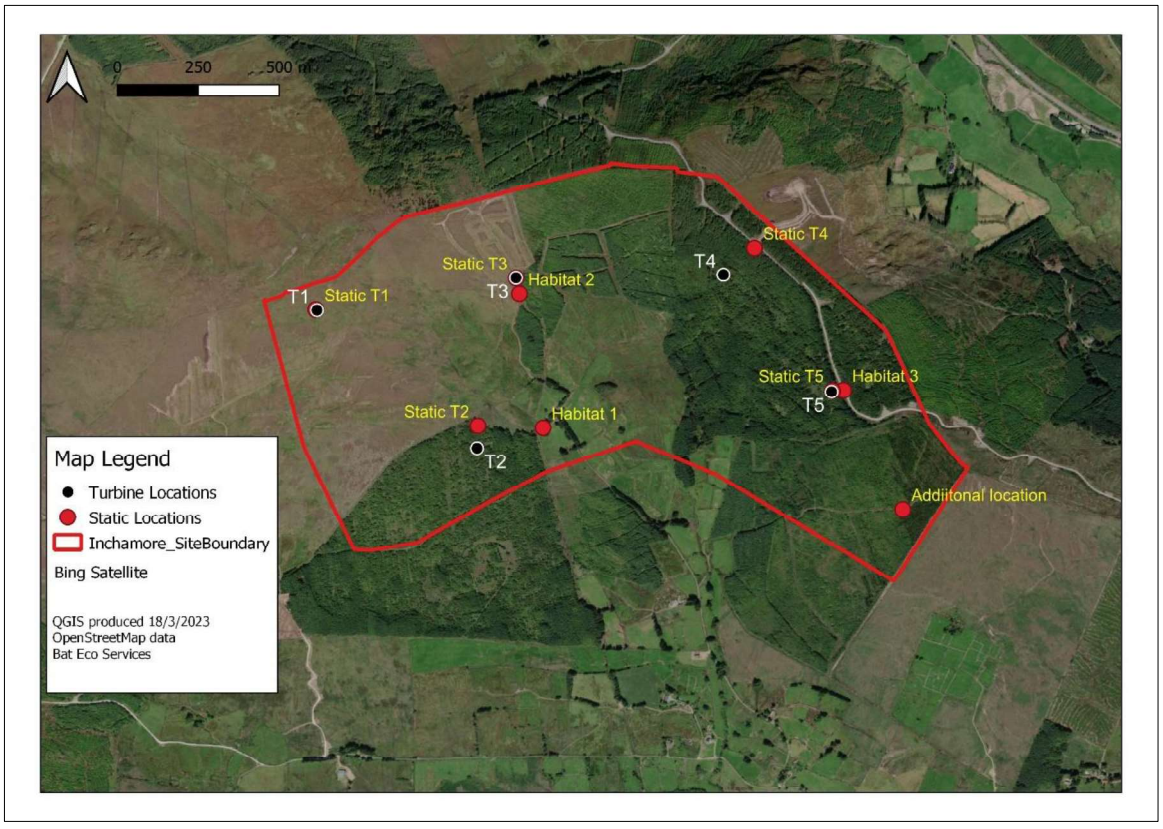

Figure 3b: Location of static units deployed during static surveillance relative to proposed turbine locations.

The following bat species were recorded during the static surveillance: soprano pipistrelle, common pipistrelle, Leisler's bat, Natterer's bat, whiskered bat, Daubenton's bat, *Myotis* species, lesser horseshoe bat and brown long-eared bat. These records were also used to prepared distribution maps for the individual bat species recorded.

Table 5a: Results of Static Bat Detectors deployed during Spring 2022.

Static Code	Grid Reference (ITM)	Closest Turbine No.	Survey Period	Bat Species
Spring 1 – Static T1	512354, 578942	T1	27/5/2022 to 9/6/2022 (13 nights)	Common pipistrelle
Spring 2 – Static T2	512855, 578583	T2	27/5/2022 to 9/6/2022 (13 nights)	Common pipistrelle Soprano pipistrelle Leisler's bat Brown long-eared bat Natterer's bat Daubenton's bat Whiskered bat Myotis species
Spring 3 – Static T3	512973, 579040	T3	27/5/2022 to 9/6/2022 (13 nights)	Common pipistrelle Soprano pipistrelle Leisler's bat Brown long-eared bat Natterer's bat Daubenton's bat Whiskered bat Myotis species
Spring 4 – Static T4	513709, 579132	T4	27/5/2022 to 9/6/2022 (13 nights)	Common pipistrelle Soprano pipistrelle Leisler's bat Natterer's bat Daubenton's bat Myotis species
Spring 5 – Static T5	513950, 578692	T5	27/5/2022 to 9/6/2022 (13 nights)	Common pipistrelle Soprano pipistrelle Leisler's bat Brown long-eared bat Daubenton's bat Whiskered bat
Spring 6 – Additional location	514167, 578324	Not applicable	Failed first attempt. Re-deployed on 6/6/2022 for 15 nights	Common pipistrelle Soprano pipistrelle Leisler's bat Brown long-eared bat Natterer's bat Daubenton's bat Whiskered bat Myotis species

Table 5b: Results of Static Bat Detectors deployed during Summer 2022.

Static Code	Grid Reference (ITM)	Closest Turbine No.	Survey Period	Bat Species
Summer 1 – Static T1	512354, 578942	T1	21/7/2022 to 1/8/2022 (11 nights)	Common pipistrelle Soprano pipistrelle Leisler's bat Brown long-eared bat
Summer 2 – Static T2	512855, 578583	T2	21/7/2022 to 1/8/2022 (11 nights)	Common pipistrelle Soprano pipistrelle Leisler's bat Brown long-eared bat Natterer's bat Whiskered bat
Summer 3 – Static T3	512973, 579040	T3	21/7/2022 to 1/8/2022 (11 nights)	Common pipistrelle Soprano pipistrelle Leisler's bat Brown long-eared bat Natterer's bat Daubenton's bat Whiskered bat Myotis species
Summer 4 – Static T4	513709, 579132	T4	21/7/2022 to 1/8/2022 (11 nights)	Common pipistrelle Soprano pipistrelle Leisler's bat
Summer 5 – Static T5	513950, 578692	T5	21/7/2022 to 1/8/2022 (11 nights)	Common pipistrelle Soprano pipistrelle Leisler's bat Brown long-eared bat Natterer's bat Daubenton's bat Whiskered bat Myotis species
Summer 6 – Additional location	514167, 578324	Not applicable	21/7/2022 to 1/8/2022 (11 nights)	Common pipistrelle Soprano pipistrelle Leisler's bat Brown long-eared bat Natterer's bat Whiskered bat

Table 5c: Results of Static Bat Detectors deployed during 1st Autumn 2022 period.

Static Code	Grid Reference (ITM)	Closest Turbine No.	Survey Period	Bat Species
Autumn 1 – Static T1	512354, 578942	T1	Failed to record	Failed to record
Autumn 2 – Static T2	512855, 578583	T2	24/8/2022 to 3/9/2022 (10 nights)	Common pipistrelle Soprano pipistrelle Leisler's bat Brown long-eared bat Natterer's bat Daubenton's bat Whiskered bat Myotis species
Autumn 3 – Static T3	512973, 579040	T3	24/8/2022 to 3/9/2022 (10 nights)	Common pipistrelle Soprano pipistrelle Leisler's bat Brown long-eared bat Natterer's bat Daubenton's bat Whiskered bat Myotis species Lesser horseshoe bat
Autumn 4 – Static T4	513709, 579132	T4	24/8/2022 to 3/9/2022 (10 nights)	Common pipistrelle Soprano pipistrelle Leisler's bat Brown long-eared bat Myotis species
Autumn 5 – Static T5	513950, 578692	T5	24/8/2022 to 3/9/2022 (10 nights)	Common pipistrelle Soprano pipistrelle Leisler's bat Brown long-eared bat Natterer's bat Daubenton's bat Whiskered bat Myotis species
Autumn 6 – Additional location	514167, 578324	Not applicable	24/8/2022 to 3/9/2022 (10 nights)	Common pipistrelle Soprano pipistrelle Leisler's bat Brown long-eared bat Natterer's bat Daubenton's bat Whiskered bat Myotis species

Table 5d: Results of Static Bat Detectors deployed during 2nd Autumn 2022 period.

Static Code	Grid Reference (ITM)	Closest Turbine No.	Survey Period	Bat Species
Autumn 7 – Static T1	512354, 578942	T1	19/9/2022 to 2/10/2022 (13 nights)	Common pipistrelle Brown long-eared bat Daubenton's bat
Autumn 8 – Static T2	512855, 578583	T2	19/9/2022 to 2/10/2022 (13 nights)	Common pipistrelle Soprano pipistrelle Brown long-eared bat Natterer's bat Daubenton's bat Whiskered bat
Autumn 9 – Static T3	512973, 579040	T3	19/9/2022 to 2/10/2022 (13 nights)	Common pipistrelle Soprano pipistrelle Leisler's bat Brown long-eared bat Natterer's bat Daubenton's bat Whiskered bat Myotis species
Autumn 10 – Static T5	513950, 578692	T5	19/9/2022 to 2/10/2022 (13 nights)	Common pipistrelle Soprano pipistrelle Leisler's bat Brown long-eared bat Natterer's bat Daubenton's bat Whiskered bat Myotis species
Autumn 11 – Habitat 1	513056, 578577	Paired habitat with T2	19/9/2022 to 2/10/2022 (13 nights)	Common pipistrelle Soprano pipistrelle Leisler's bat
Autumn 12 – Habitat 2	512983, 578991	Paired habitat with T3	19/9/2022 to 2/10/2022 (13 nights)	Common pipistrelle Soprano pipistrelle Leisler's bat Brown long-eared bat Natterer's bat Daubenton's bat Whiskered bat Myotis species Lesser horseshoe bat
Autumn 13 – Habitat 3	513984, 578693	Paired habitat with T5	19/9/2022 to 2/10/2022 (13 nights)	Common pipistrelle Soprano pipistrelle Leisler's bat Brown long-eared bat Natterer's bat Daubenton's bat Whiskered bat Myotis species

In summary, the total number of common pipistrelles bat passes recorded during all four static surveillance periods was 10,980 while soprano pipistrelles (720 bat passes) and Leisler's bats (650 bat passes) were the second and third most frequently recorded bat species, respectively. However, overall, common pipistrelles accounted for 85% of the recordings.

In relation to distribution across the static unit locations and during all surveillance periods, common pipistrelle was the most frequently recorded bat species (i.e. recorded on all static units deployed) . The highest level of common pipistrelle bat passes was recorded on the static located adjacent to "Additional Location" during the Spring Surveillance. All other bat species were recorded at a lower level of bat passes and less frequently across static surveillance locations. These totals included the three additional static units deployed in the second Autumn Surveillance.

In order to compare with Table 3 in Section 4.2.1, only data from the static units deployed at the proposed turbine locations are used for the following summary table. Apart from the common pipistrelles and Leisler's bats, the level of recordings detected was less in 2022 compared to 2019 for all other bat species noted. No Nathusius' pipistrelles were recorded in the 2022 static surveillance.

Table 5e: 2022 Static Surveillance Results at propose turbine locations only (250 nights / 6 static units = mean of 42 nights).

Bat Species	No. of Recordings	Percentage	No. of Recordings/ Night
Brown long-eared bat	86	0.81%	2.05
Common pipistrelle	9,061	84.94%	215.74
Daubenton's bat	75	0.7%	1.79
Leisler's bat	636	5.96%	15.14
Lesser horseshoe bat	1	0.01%	0.02
Natterer's bat	75	0.7%	1.79
Soprano pipistrelle	584	5.47%	13.9
Whiskered bat	47	0.44%	1.12
Myotis species	103	0.97	2.45

NOTE: The behaviour of bats during commuting and foraging greatly influences the level of bat passes recorded on static units. The number of bat passes do not equate to the number of bats flying past the static unit. Pipistrellus species tend to foraging as they commute and therefore are regularly observed flying up and down a treeline or hedgerow before moving on in the landscape. Leisler's bats fly high in the sky and therefore can be observed flying fast through the landscape, occasionally foraging over treetops as they commute. As a consequence, Pipistrellus species bat activity tends to result in a higher number of bat passes recorded on static units compared to Leisler's bats. In relation to other bat species recorded, as they tend to be less common in the landscape compared to common pipistrelles, soprano pipistrelles and Leisler's bats, their recorded presence is notable. .

Four static surveillance periods was undertaken in 2022. This was a total of 2,688 hours of surveillance. In order to provide an overall visual in relation to the total level of bat activity recorded at the static units the following graphs were prepared.

The bat species were divided into two groups:

- Common bat species: common pipistrelle, soprano pipistrelle and Leisler's bat;
- Less Common bat species: all remaining Irish bat species.

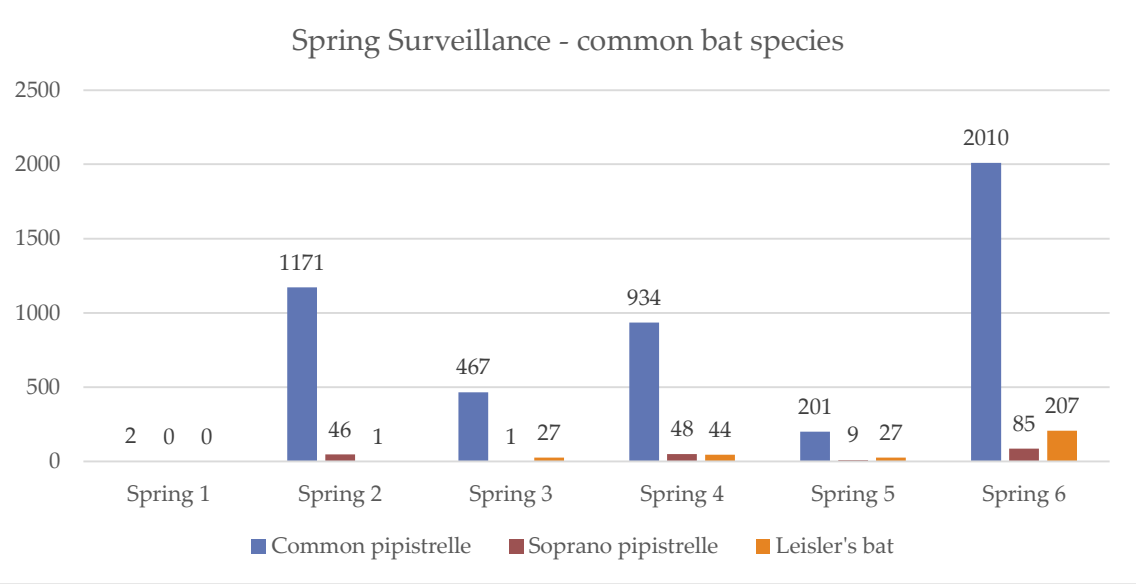

Figure 4a: Total number of bat passes for common bat species recorded during the Spring Static Surveillance.

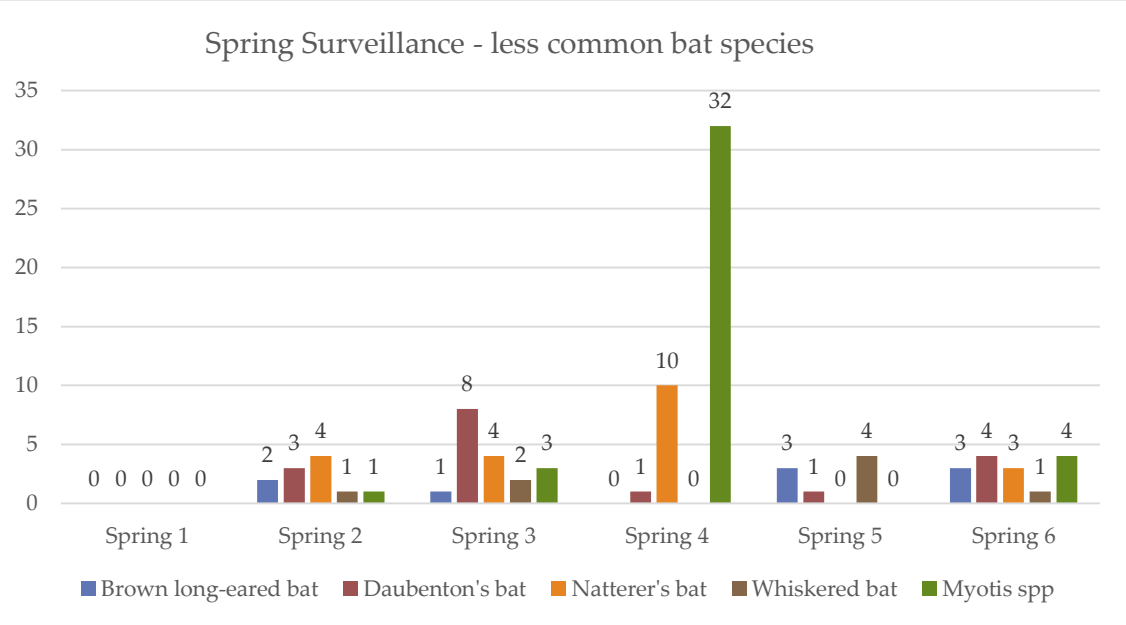

Figure 4b: Total number of bat passes for less common bat species recorded during the Spring Static Surveillance.

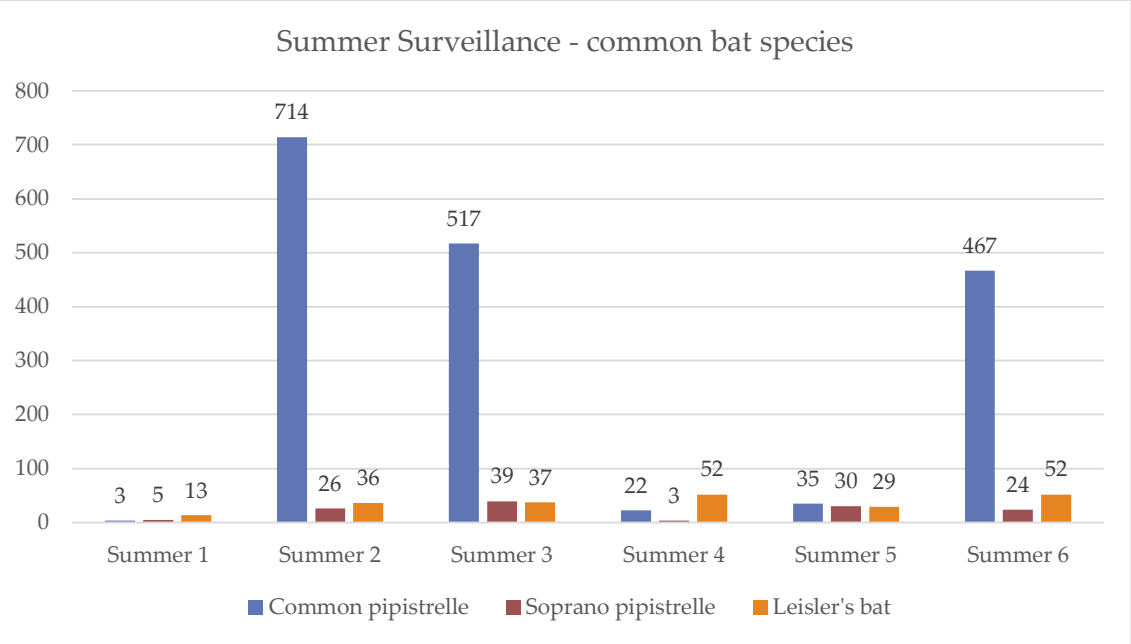

Figure 4c: Total number of bat passes for common bat species recorded during the Summer Static Surveillance.

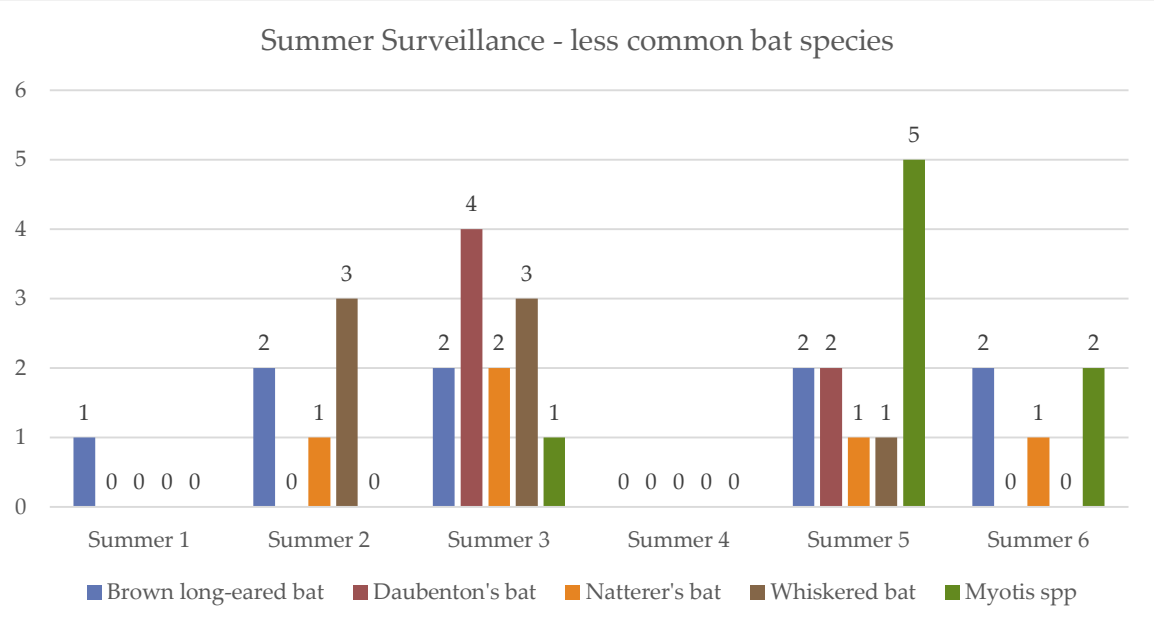

Figure 4d: Total number of bat passes for less common bat species recorded during the Summer Static Surveillance.

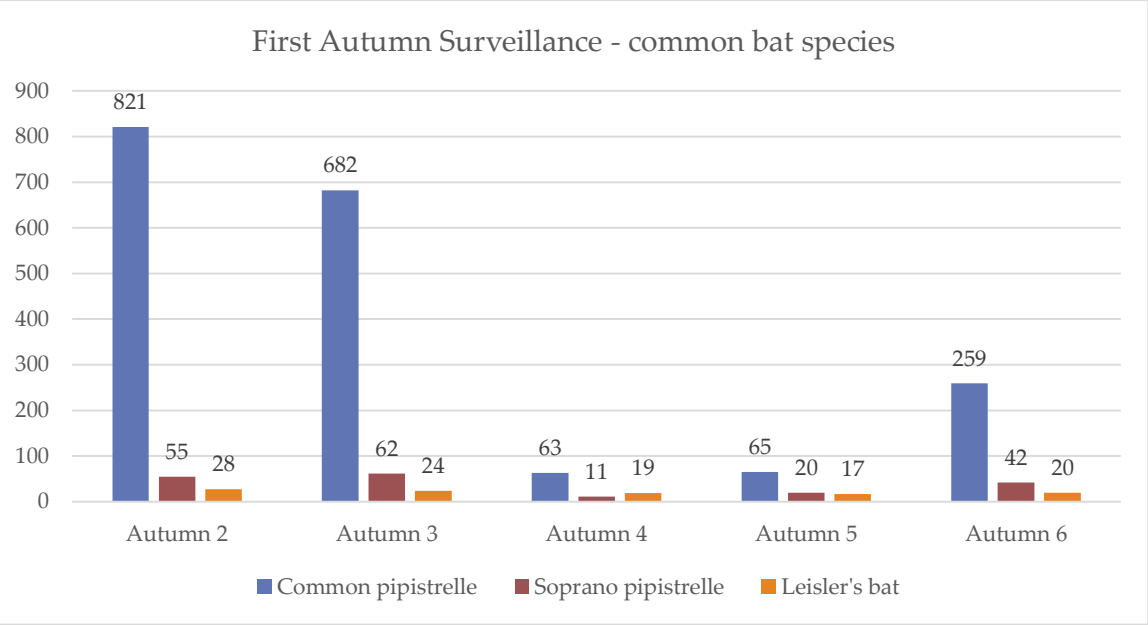

Figure 4e: Total number of bat passes for common bat species recorded during the first Autumn Static Surveillance (Please Note: Autumn 1 failed to record).

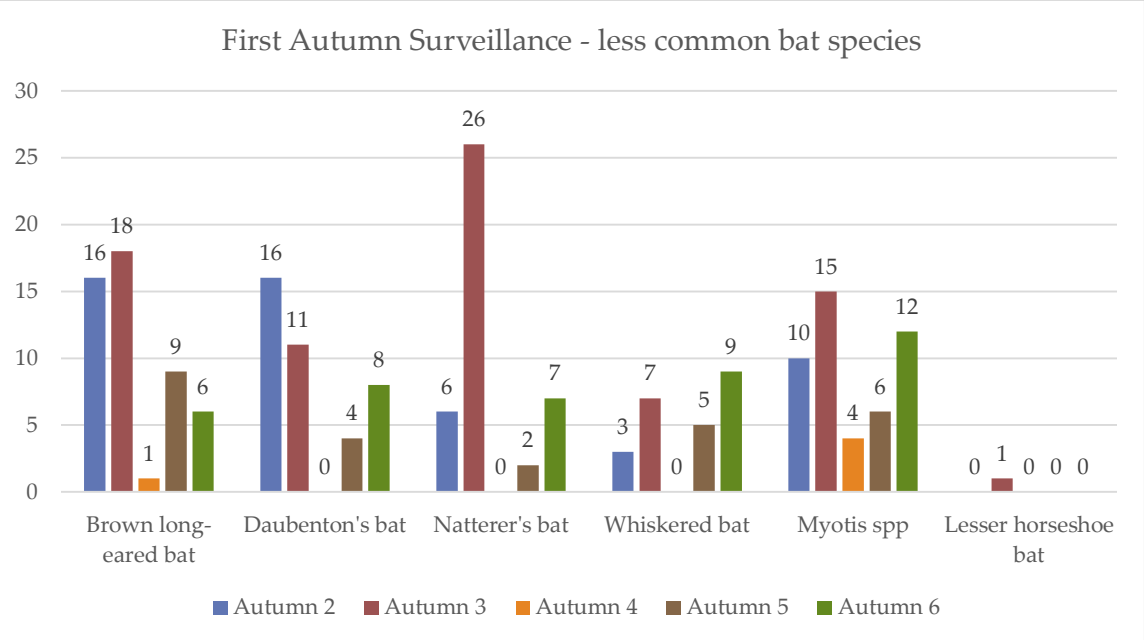

Figure 4f: Total number of bat passes for less common bat species recorded during the first Autumn Static Surveillance (Please Note: Autumn 1 failed to record).

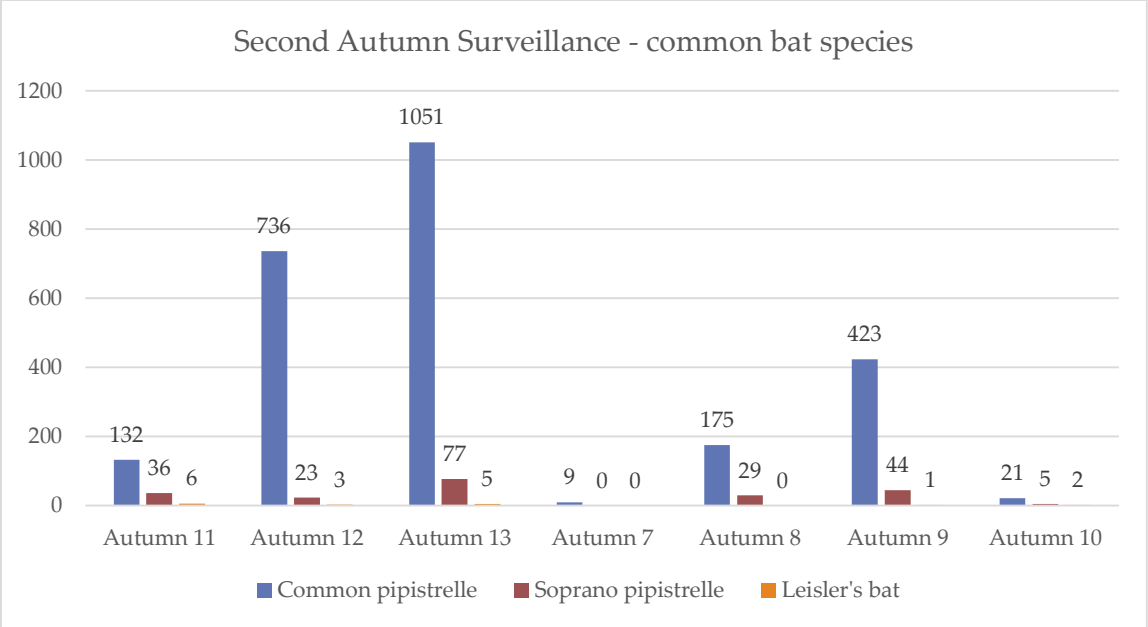

Figure 4g: Total number of bat passes for common bat species recorded during the second Autumn Static Surveillance.

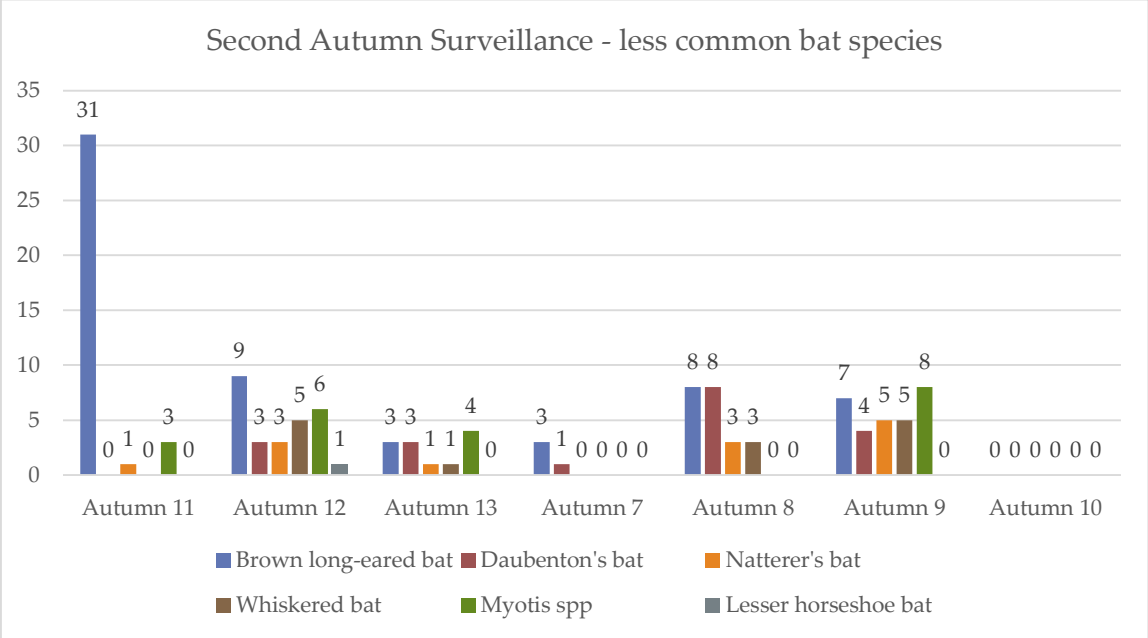

Figure 4h: Total number of bat passes for less common bat species recorded during the second Autumn Static Surveillance.

The principal summary points from the graphs above are as follows:

- Common pipistrelles were consistently recorded across the survey site in medium to high bat activity levels during all four static surveillance periods but particularly high levels were recorded during the spring surveillance.
- Common pipistrelle bat activity levels was highest at the location of additional static unit deployed during the first three surveillance periods (Spring 6, Summer 6 and Autumn 6). This was located in the south-east of the proposed development site and is not located in vicinity of a proposed turbine location.
- During the 2nd Autumn Surveillance, common pipistrelle bat activity levels was higher on the static located adjacent to one of the 'habitat' sites surveyed. This 'habitat' was the road access through the conifer plantations and therefore is indicative of commuting individuals along the open roads through a generally cluttered environment.
- Generally, Leisler's bat activity levels recorded was low and therefore are likely to indicate commuting individuals through the landscape. The highest level of bat activity for this species was recorded at the location of additional static unit deployed during the first three surveillance periods (Spring 6, Summer 6 and Autumn 6). This unit was located in the south-east of the proposed development site and is not located in vicinity of a proposed turbine location. This high level of Leisler's bat activity was recorded during the Spring surveillance.
- Soprano pipistrelle bat activity levels was consistently low during all static surveillance period at all proposed turbine locations.
- T1 was not an important location for the less common bat species and this is primarily a reflection of the habitats at this location (i.e. no tall tree vegetation). For all other turbine locations, the level of bat activity for the less common bat species was consistent during each of the surveillance periods in generally low levels of activity.
- Habitat 1 (mature deciduous treeline) was particularly important for brown long-eared bats during the 2nd Autumn Static Surveillance.

4.3.3 Bat Survey Results - Summary

The following figures illustrate the location of bat encounters recorded during all of the bat surveys completed. A total of eight bat species were recorded within the proposed development site. The only Irish resident bat species not recorded during these surveys was Nathusius' pipistrelle. While the Auto-Id function of the audio file analysis reported the presence of this bat species, manual inspection of such files confirmed such calls as low-echolocating common pipistrelles.

While a large array of night-time surveys were undertaken, an overall low level of bat activity was recorded during dusk and dawn surveys and walking/driving transects. For less common bat species, the bat encounters recorded were primarily on static units as these were left in the "field" for a minimum of 10 days and therefore provide a greater opportunity to record these bat species.

4.3.3.1 Soprano pipistrelle

A total of 75 geo-reference bat encounters were recorded for this species of bat during the array of bat surveys completed. As shown on Figure 5a, this bat species was recorded throughout the survey area and the majority of this species was recorded on a walking and driving transects covering a greater survey area and primarily to the south of the proposed development area.

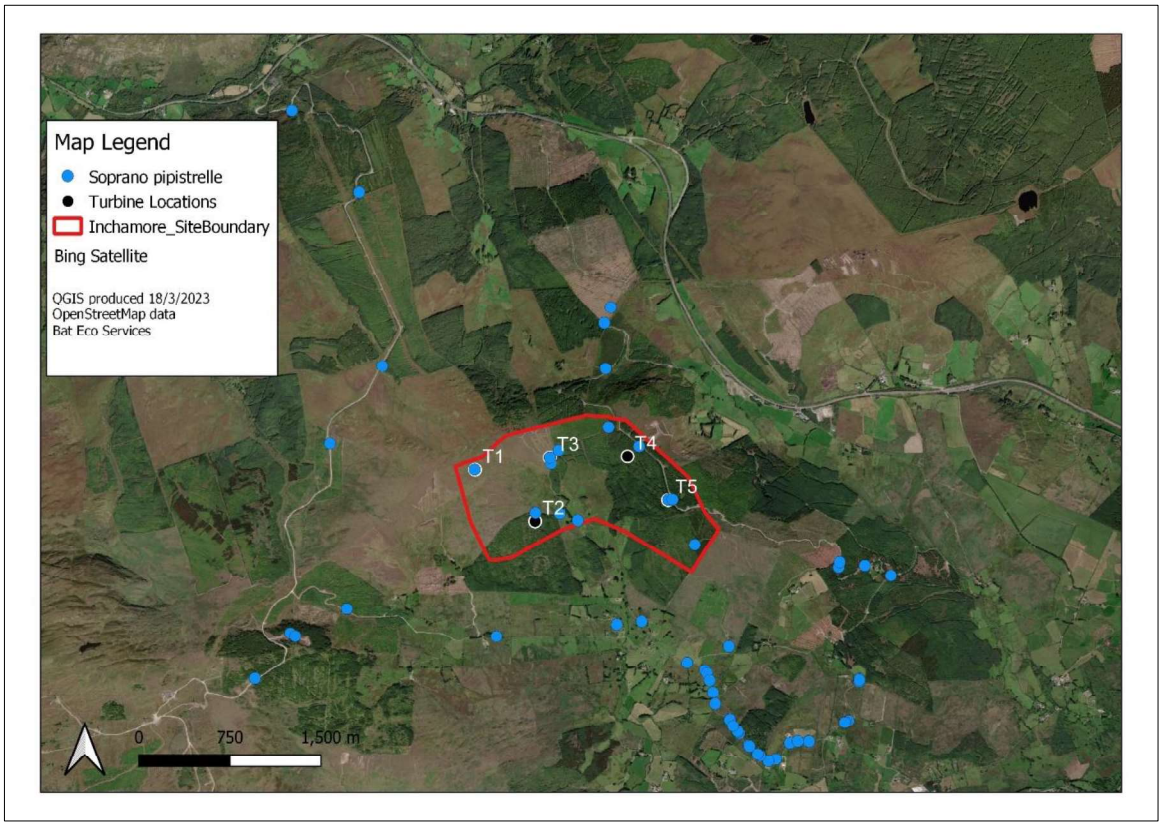

Figure 5a: Location of soprano pipistrelle bat encounters within the proposed development area and at a wider survey area

4.3.3.2 Common pipistrelle

A total of 56 geo-reference bat encounters were recorded for this species of bat during the array of bat surveys completed. As shown on Figure 5b, this bat species was recorded throughout the survey area but with the majority of the bat encounters to the south of the proposed development area.

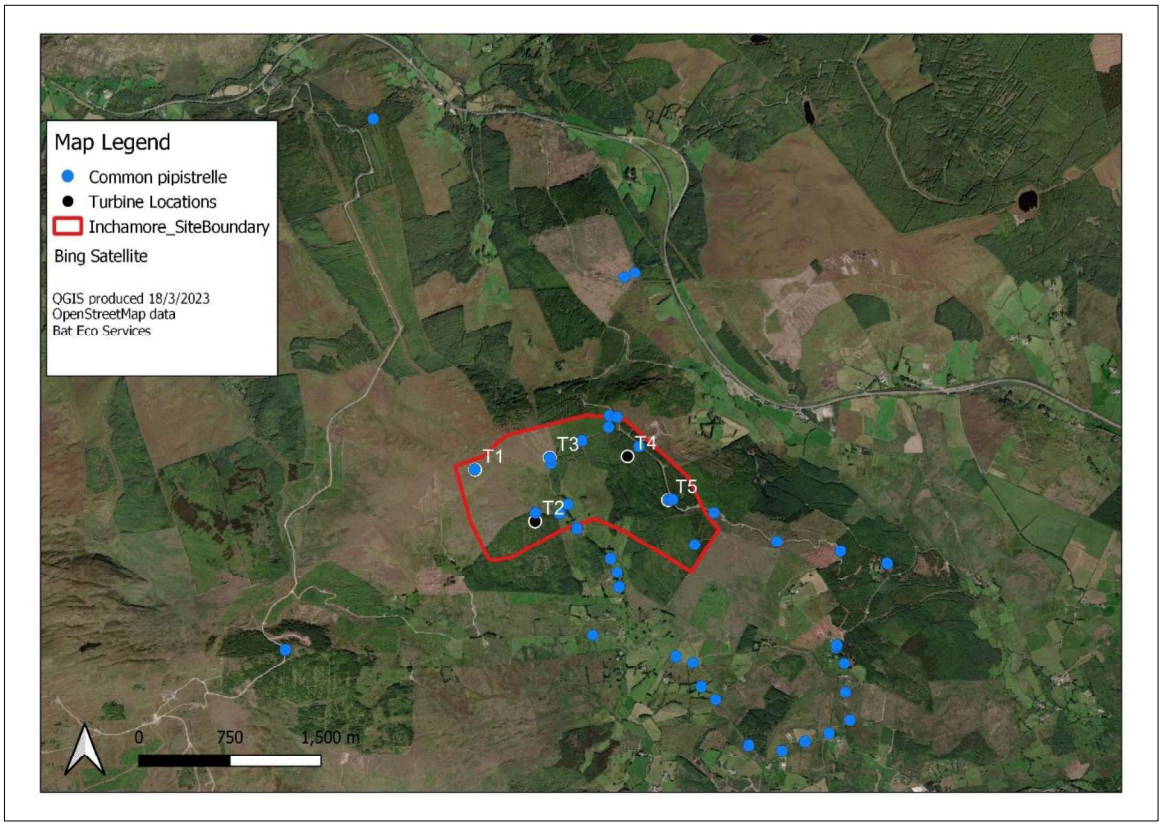

Figure 5b: Location of common pipistrelle bat encounters within the proposed development area and at a wider survey area.

4.3.3.3 Leisler's bat

A total of 33 geo-reference bat encounters were recorded for this species of bat during the array of bat surveys completed. As shown on Figure 5c, this bat species was recorded throughout the survey area primarily during the driving transects to the south of the proposed development area.

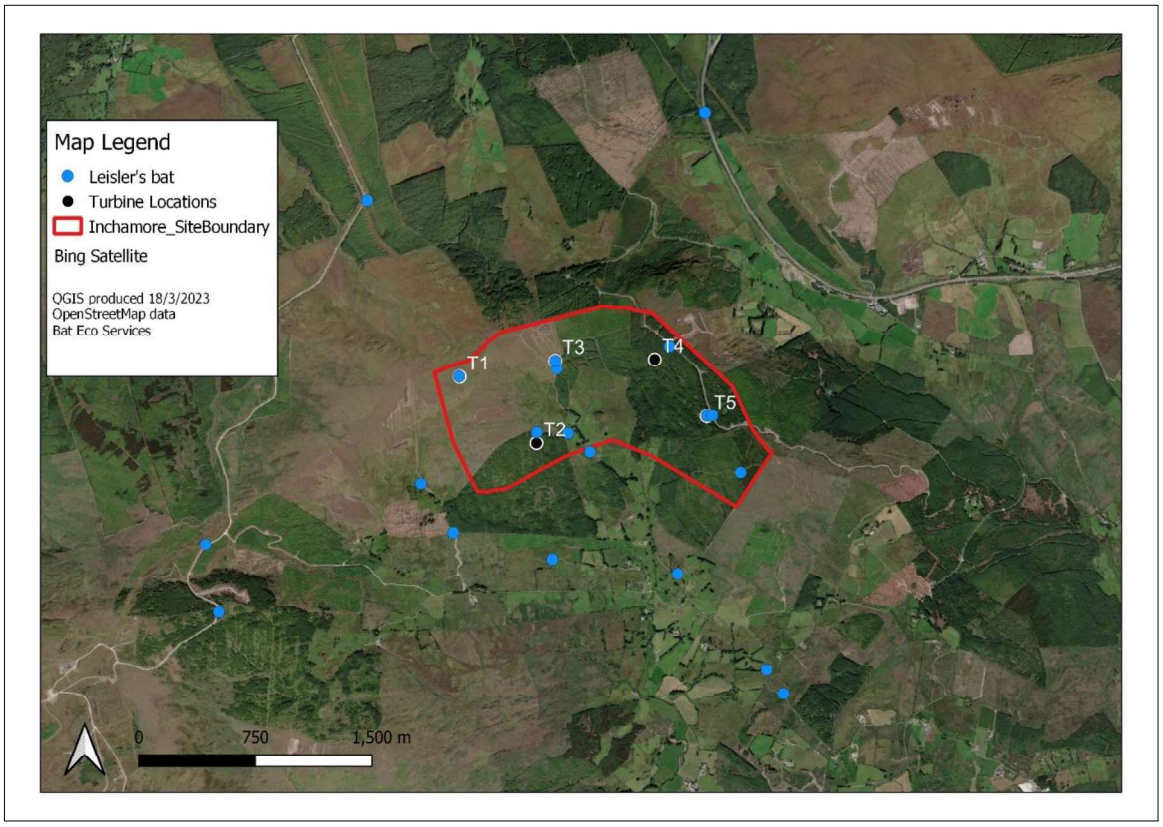

Figure 5c: Location of Leisler's bat encounters within the proposed development area and at a wider survey area.

4.3.3.4 Daubenton's bat

A total of 16 geo-reference bat encounters were recorded for this species of bat during the array of bat surveys completed. As shown on Figure 5d, this bat species was only recorded within the proposed development on the static units deployed. The level of encounter rate was low.

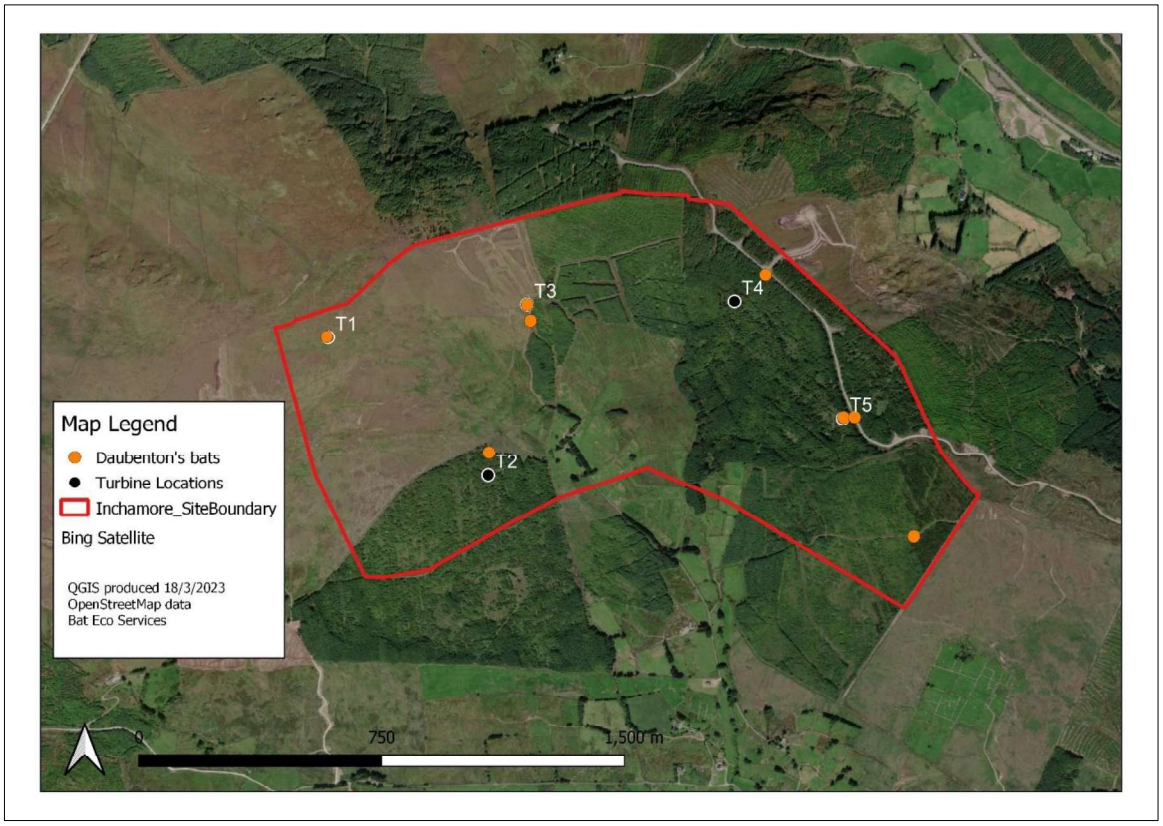

Figure 5d: Location of Daubenton's bat encounters within the proposed development area and at a wider survey area.

4.3.3.5 Lesser horseshoe bat

Three geo-reference bat encounters were recorded for this species of bat during the array of bat surveys completed. As shown on Figure 5e, this species was only recorded on two static units and in Building 2 (i.e. bat droppings). The level of encounter rate was low.

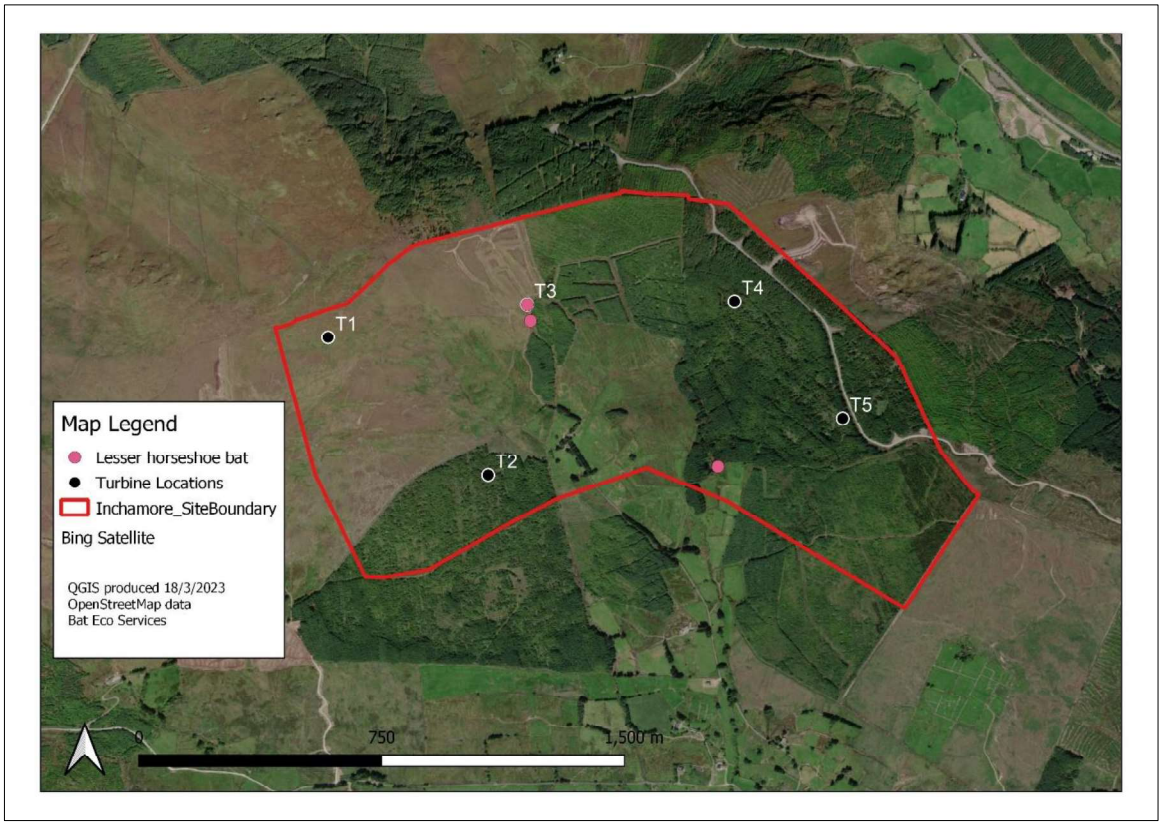

Figure 5e: Location of lesser horseshoe bat encounters within the proposed development area and at a wider survey area.

4.3.3.6 Natterer's bat

A total of 23 geo-reference bat encounters were recorded for this species of bat during the array of bat surveys completed. As shown on Figure 5f, this bat species was primarily recorded within the proposed development area on the static surveillance units. The level of encounter rate was low.

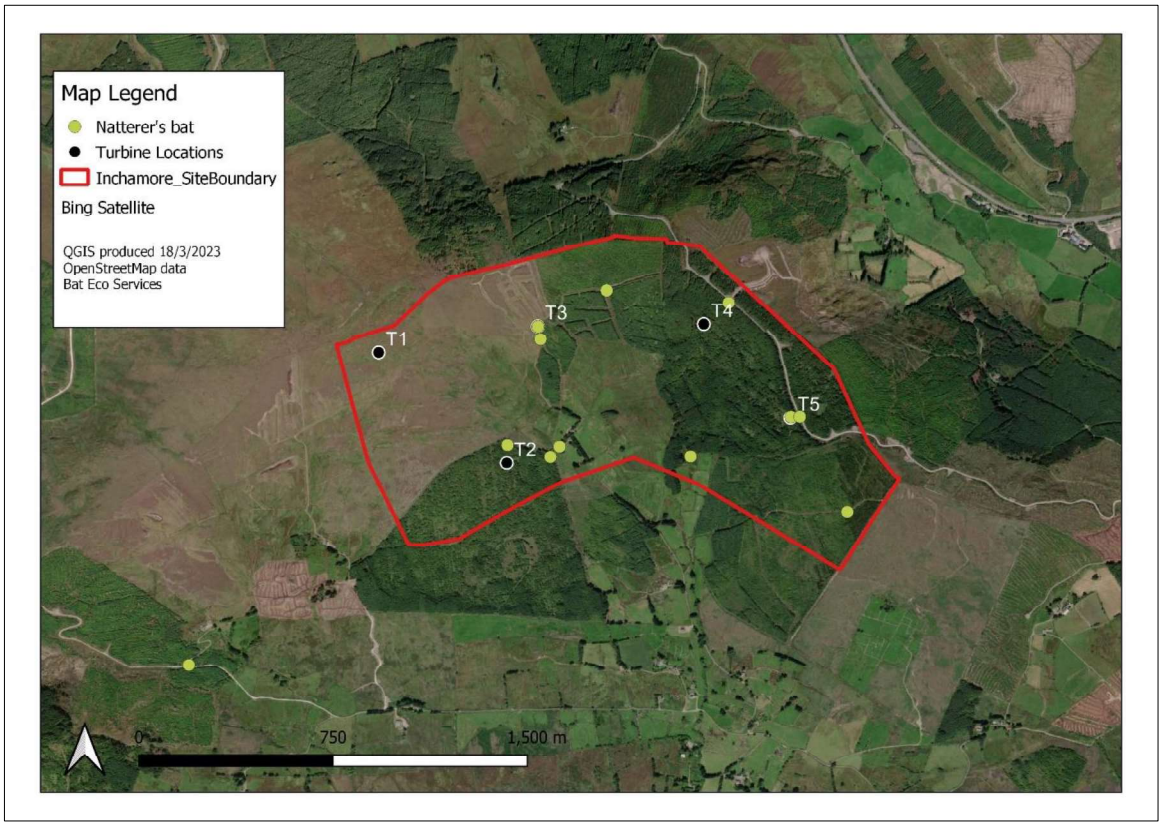

Figure 5f: Location of Natterer's bat encounters within the proposed development area and at a wider survey area.

4.3.3.7 Whiskered bat

A total of 15 geo-reference bat encounters were recorded for this species of bat during the array of bat surveys completed. As shown on Figure 5g, this bat species was only recorded within the proposed development area on the static surveillance units. The level of encounter rate was low.

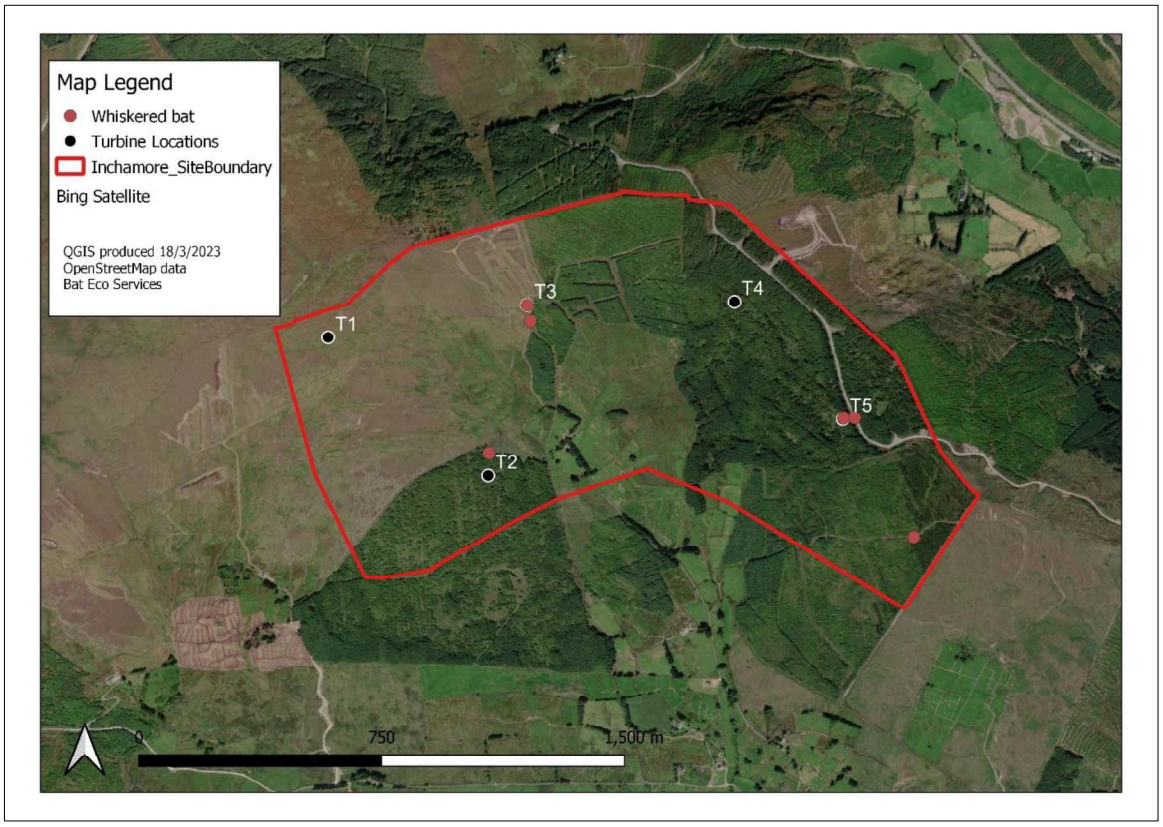

Figure 5g: Location of Whiskered bat encounters within the proposed development area and at a wider survey area.

4.3.3.8 Brown long-eared bat

A total of 26 geo-reference bat encounters were recorded for this species of bat during the array of bat surveys completed. As shown on Figure 5h, this bat species was recorded primarily within the proposed development area on the static unit locations. The level of encounter rate was low.

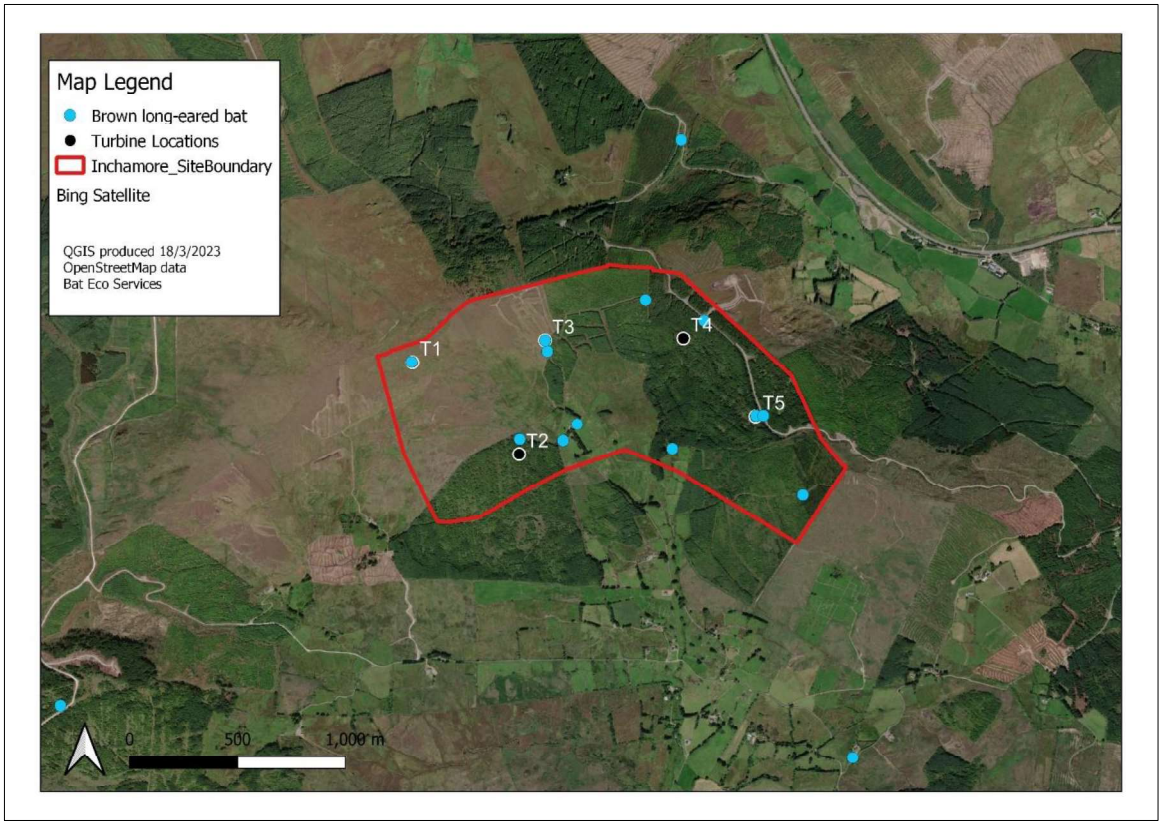

Figure 5h: Location of Brown long-eared bat encounters within proposed development area and at a wider survey area.

4.4 EcoBat Tool Results

Static surveillance results were entered into the "Per Night" forms and submitted for analysis using the EcoBat tool.

The reference range datasets were stratified to include:

- Only records from within 30 days of the survey date.
- Only records from within 100km^2 of the survey location.
- Records using any make of bat detector.

The EcoBat tool provides are series of summary tables to enable analysis of the bat activity level at each static location. These are presented below and categorisation of activity level is based on the following table (presented earlier in the report):

Table 6a: Percentile score and categorised level of bat activity.

Percentile	Bat Activity
81 to 100	High
61 to 80	Moderate to High
41 to 60	Moderate
21 to 40	Low to Moderate
0 to 20	Low

Additional figures are presented in the appendices which provide information on the spread of nightly activity according to the five percentile ranges in table above.

Note: The EcoBat tool has been offline since November 2022. Only four of the six static units for the summer surveillance data were analysed prior to this. The analysis carried out for the present assessment was carried out in line with the EcoBat tool using the professional judgment of the bat specialist. Please see Section 4.4.2 for more details.

4.4.1 Summer Surveillance 2022 – Preliminary EcoBat Tool Analysis

Bat surveys were conducted at Summer 5 (located at proposed location of T5), Summer 6 (Additional Static Unit Location named as Additional Location), Summer 1 (located at proposed location of T1), Summer 4 (located at proposed location of T4), for 11 nights between 2022-07-21 and 2022-07-31, using Wildlife Acoustics static bat detectors. The maximum of passes recorded in a single night was 111 passes, and 8 species were recorded.
The reference range dataset was stratified to include:

- Only records from within 30 days of the survey date.
- Only records from within 100km^2 of the survey location.
- Records using any make of bat detector.

Only one species had a High level of bat activity according to the Median Percential value (highlight in table below).

Table 6b: Summary table showing the number of nights recorded bat activity fell into each activity band for each bat species.

Location	Species/Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity	Median Percentile
Summer 1	*Nyctalus leisleri*	0	0	1	2	8	9
Summer 1	*Pipistrellus pipistrellus*	0	0	0	1	10	0
Summer 1	*Pipistrellus pygmaeus*	0	0	0	1	10	0
Summer 1	*Plecotus auritus*	0	0	0	0	11	0
Summer 4	*Nyctalus leisleri*	0	2	2	1	6	9
Summer 4	*Pipistrellus pipistrellus*	0	0	1	3	7	9
Summer 4	*Pipistrellus pygmaeus*	0	0	0	1	10	0
Summer 5	*Myotis*	0	0	1	1	9	0
Summer 5	*Myotis daubentonii*	0	0	0	0	11	0
Summer 5	*Myotis mystacinus*	0	0	0	0	11	0
Summer 5	*Myotis nattereri*	0	0	0	0	11	0
Summer 5	*Nyctalus leisleri*	0	0	3	1	7	9
Summer 5	*Pipistrellus pipistrellus*	0	1	1	3	6	9
Summer 5	*Pipistrellus pygmaeus*	0	1	1	2	7	0
Summer 5	*Plecotus auritus*	0	0	0	0	11	0
Summer 6	*Myotis*	0	0	0	1	10	0
Summer 6	*Myotis nattereri*	0	0	0	0	11	0
Summer 6	*Nyctalus leisleri*	0	1	4	2	4	32
Summer 6	*Pipistrellus pipistrellus*	6	0	0	0	5	84
Summer 6	*Pipistrellus pygmaeus*	0	0	2	4	5	24
Summer 6	*Plecotus auritus*	0	0	0	0	11	0

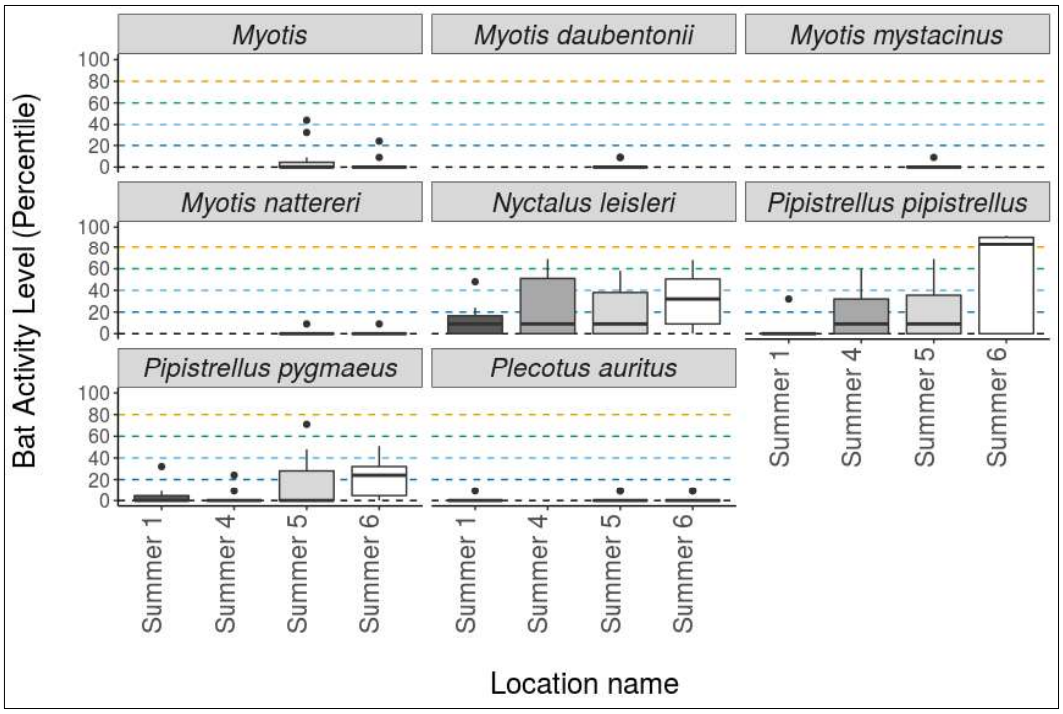

Figure 6. Differences in bat activity between static detector locations. The centre line indicates the median activity level whereas the box represents the interquartile range (the spread of the middle 50% of nights of activity)

Differences in activity between static detector locations split by species and location is presented in the figure below. The centre line indicates the median activity level whereas the box represents the interquartile range (therefore the spread of the middle 50% of nights of activity). The plots indicate that, in general, the level of bat activity varied greatly from static location and that there was not a consistent of species activity from night to night.

4.4.2 Static Surveillance 2022 – Analysis

The EcoBat Tool analysis presented in Section 4.4.1 demonstrated that levels of bat activity is reported as “High” when the number of nightly passes is greater than 40. Therefore, using this information, all of the static surveillance data collected in 2022 for each individual bat species recorded was examined to complete analysis in absence of the EcoBat Tool. Only the nightly bat activity level of common pipistrelles consistently exceeded this criteria and therefore, as this bat species is deemed as a “High Risk”, this species was used to determine the assessment of the proposed location of the turbines and their potential impact on local bat populations.

The number of nights when the number of nightly passes was greater than 40 for common pipistrelles was calculated (summary of data and raw data are presented in the appendices). Over the course of the 2022 surveillance, at the proposed turbine locations for T1, T4 and T5 were deemed to have a Low level of bat activity. T3 was deemed to have a Medium level of bat activity while T2 and “Additional Location” were deemed to have a High level of bat activity.

Table 6c: Summary table showing the number of nights recorded bat activity fell into High activity band for common pipistrelles only.

Turbine No.	No. of Nights >40 bat passes	No. of Nights of Surveillance	Percentage	Activity Level
T1	0 nights	37 nights	0%	Low
T2	23 nights	47 nights	49%	High
T3	18 nights	47 nights	38%	Medium
T4	1 night	34 nights	3%	Low
T5	2 nights	34 nights	6%	Low
Additional Location	21 nights	37 nights	57%	High

5. Discussion / Interpretation

5.1 Bat Species Recorded & Sensitivity

Eight species of bat and additional records for *Myotis* species group were recorded during the 2022 bat surveys. This represents eight of the nine bat species known to be resident in County Kerry/Cork. The ninth bat species, Nathusius' pipistrelle, was recorded in previous bat surveys completed in 2019/2020 but not during this current set of bat surveys.

The table below provides an ecological valuation of each the nine bat species and the collision risk factor in relation to wind farms. Three of the bat species recorded is considered to be High risk.

Table 7: Evaluation of the bat species recorded during the bat survey.

Using CIEM (2016) Guidelines for ecological value, "Bat Risk" in relation to Wind Turbines (NaturScot, 2021) and with reference to Wray et al., 2010 (Table 2 in NaturScot, 2021) in relation to level of potential vulnerability of populations extrapolated for Irish bat species, Irish status according to Marnell et al., 2019 and population numbers and core area from Roche et al., 2014.

Yellow = low population vulnerability
Orange = medium population vulnerability
Red = high population vulnerability

Bat Species	Ecological Value / Geographical Scale of Importance	Irish Status	Bat Risk	Population Numbers / Core Area
Leisler's bat	International	Least Concern	High	Common
Natterer's bat	County	Least Concern	Low	Widespread
Whiskered bat	Regional	Least Concern	Low	Rare
Nathusius' pipistrelle	Regional	Least Concern	High	Rare
Daubenton's bat	County	Least Concern	Low	Common
Brown long-eared bat	County	Least Concern	Low	Widespread
Common pipistrelle	Local	Least Concern	High	Common
Soprano pipistrelle	Local	Least Concern	High	Common
Lesser horseshoe bat	National	Least Concern	Low	Rare

5.2 EcoBat Tool Evaluation

The static surveillance data collected 2022 was partially analysed using the EcoBat Tool but this partial analysis was used to form an analysis to continue the evaluation process. This identified locations where a high value of bat activity for specific bat species was recorded. Over the course of the 2022 surveillance, at the proposed turbine locations for T1, T4 and T5 were deemed to have a Low level of common pipistrelle bat activity. T3 was deemed to have a Medium level of common pipistrelle bat activity while T2 was deemed to have a High level of common pipistrelle bat activity.

Therefore, in summary, the following proposed turbine locations are considered to be important in relation to level of bat activity recorded during static surveillance and their potential impact on local bat populations:

- T2, T3.

5.3 QGIS Analysis

To facilitate the construction of the proposed wind turbine, internal wind farm access tracks are required. This may result in the removal of habitats and the potential impact of this is investigated using the ***"Habitats"*** layer, **"Buffered Bat Encounters"** layer and the **"Buffered Turbine Locations"** layer produced (See Section 3.3.3 for a greater explanation of this process).

- "Habitats" layer – using aerial photograph
- "Buffered Bat Encounters" = all bat encounters within 1km of turbine locations (to represent the primary proposed development area) was extracted from full bat dataset. This new dataset was named "Bat Encounters within boundary" and each of these bat encounters were buffered to 50m.
- "Buffered Turbine Locations" = all turbine locations were buffered to 200m to aid analysis.

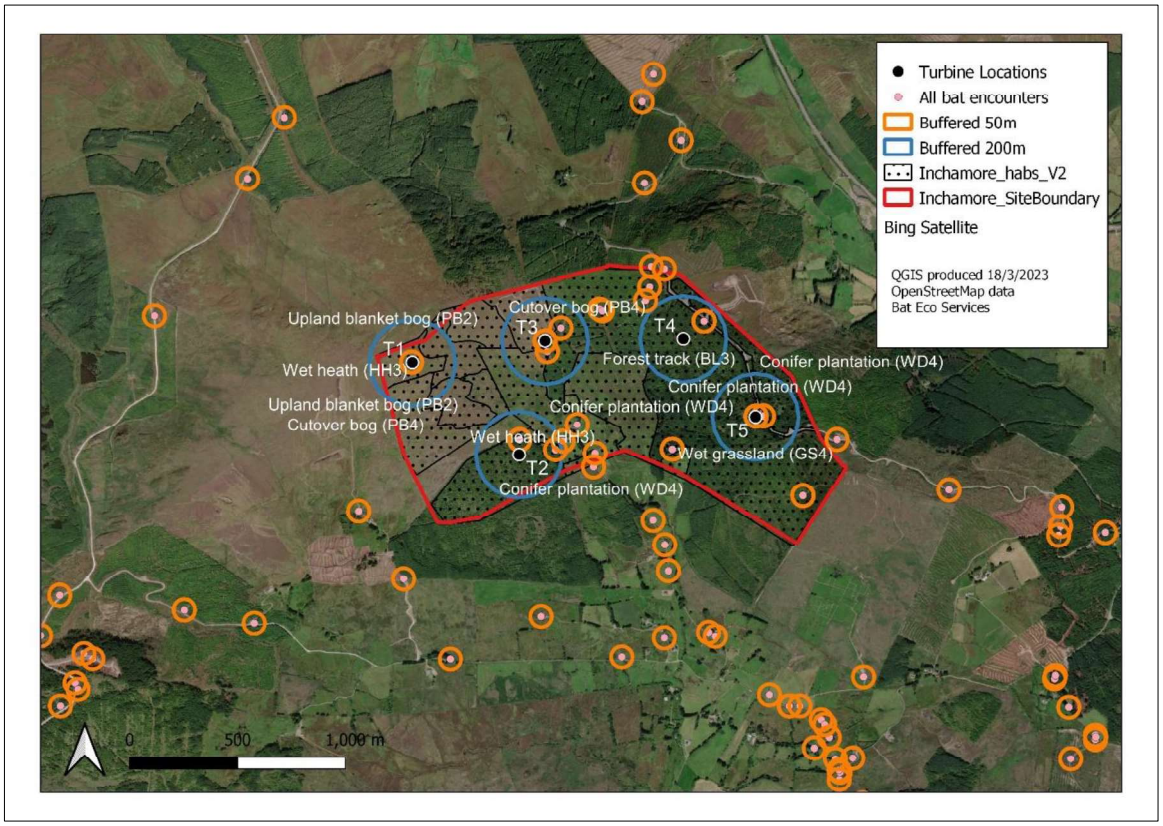

Figure 7a: QGIS analysis of bat encounters within 200m of turbine locations and habitats shapefile.

The predominant habitat type for each proposed turbine location is as follows:

T1: Wet heath
T2: Conifer plantation and cut-over bog
T3: Conifer plantation and cut-over bog
T4: Conifer plantation
T5: Conifer plantation
Additional location: Conifer plantation and forest tracks.

The supporting infrastructure for the proposed development travels south to the proposed development area. In vicinity of the tracks, the following bat species were recorded: common pipistrelle, soprano pipistrelle, Leisler's bats, brown long-eared bats, Natterer's bats, Daubenton's bats, whiskered bats and lesser horseshoe bats.

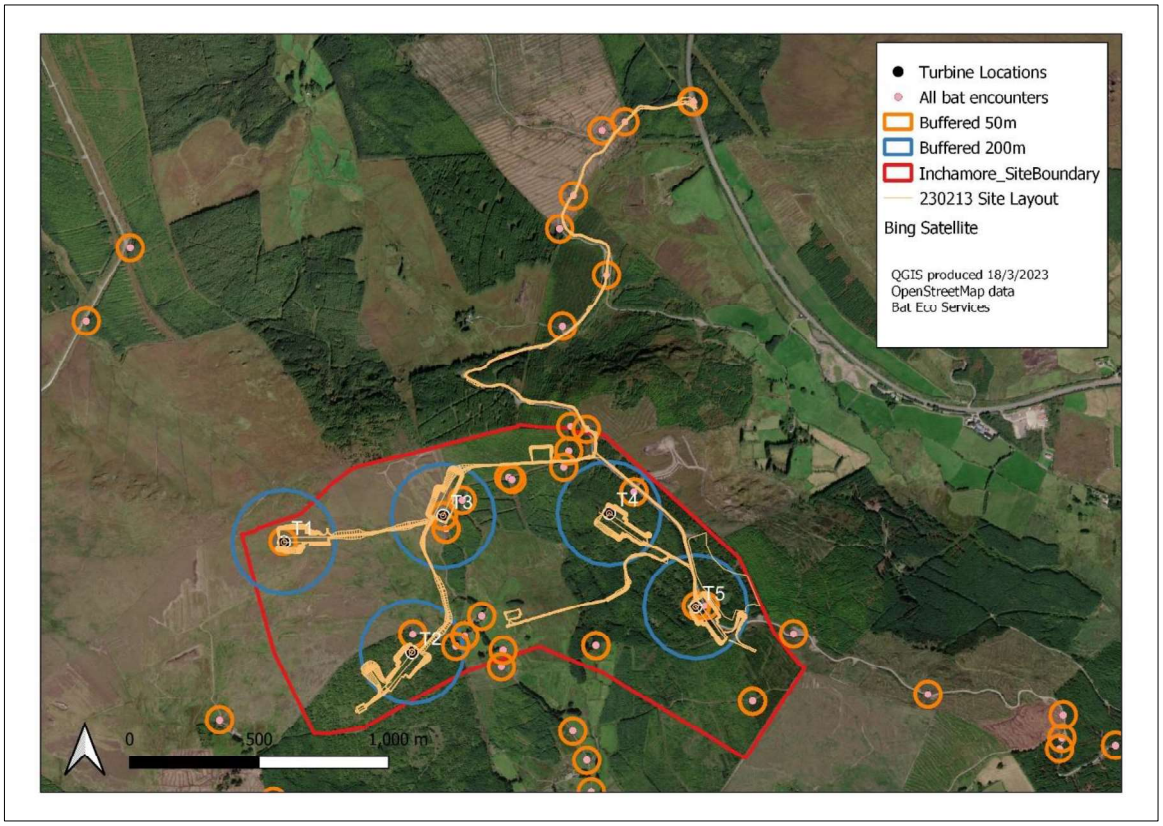

Figure 7b: QGIS analysis of bat encounters 50m buffers and proposed infrastructure.

5.4 Site Risk Assessment

The Site Risk Assessment is calculated according to NaturScot, 2021 (See Appendix 8.3 for details of how this is calculated).

The assessment value (i.e. Turbine Risk value) is compared to the ranges below:

- Low (green) 0-4
- Medium (amber) 5-12
- High (red) 15-25

While Leisler's bat can be considered as common in Ireland, its status as an "Internationally Important" population, ranks it higher than the two common *Pipistrellus* species. However, both the bat activity level of Leisler's bat and soprano pipistrelle was low during the 2022 surveillance while the majority of bat passes recorded was identified as common pipistrelle. Therefore, the Risk Assessment were completed for this bat species only (i.e. for common pipistrelle).

5.4.1 Common pipistrelle

With reference to the nightly bat activity at each of the static locations, T1, T4 and T5 were deemed to have a Low level of common pipistrelle bat activity. T3 was deemed to have a Medium level of common pipistrelle bat activity while T2 was deemed to have a High level of common pipistrelle bat activity. In order to complete the table below, the Bat Activity Category (using similar values as per EcoBat Tool) is valued as follows:

Low = 1 point
Medium = 3 points
High = 5 points

Table 8: Risk assessment for each proposed turbine location for local bat populations using Common pipistrelle bat activity levels.

Turbine No.	Site Risk Value	Bat Activity Category	Turbine Risk
			Site Risk x Bat Activity Category
1	3	1	3
2	3	5	15
3	3	3	9
4	3	1	3
5	3	1	3

In summary, for common pipistrelles, the propose turbine locations have the following Risk Factor:

Low: T1, T4, T5
Medium: T3
High: T2

5.5 Impact Assessment

The impact assessment takes into consideration the following:

- Eight bat species were recorded during the 2022 and 2023 bat surveys of the proposed development site.
- Three of these species are considered to be High Risk bat species in relation to wind turbines: Leisler's bat, common pipistrelle and soprano pipistrelle.
- The remaining five species are Low Risk: Natterer's bat, Daubenton's bat, whiskered bat, lesser horseshoe bat and brown long-eared bat.
- Partial EcoBat Tool Analysis results highlighted turbine locations with High Risk and Medium Risk for common pipistrelle, as this bat species were recorded at High levels of bat activity during static surveillance.
- Spread of bat encounter records within the proposed development site, particularly, in relation to infrastructure.
- Bat habitats present within 200m of turbine locations and along infrastructure routes.

5.5.1 Core Sustenance Areas

One set of buildings within the proposed development area was recorded as a bat roosts: lesser horseshoe bat, Natterer's bat and brown long-eared bat (Building 2). The CSZ for brown long-eared bat is 3km, for lesser horseshoe bat is 2km and for Natterer's bat is 4km. Therefore, the proposed development is located inside the CSZ for the known bat roosts recorded within Building 2. However, all three bat species recorded roosting are considered to be Low Risk bat species in relation to wind farms.

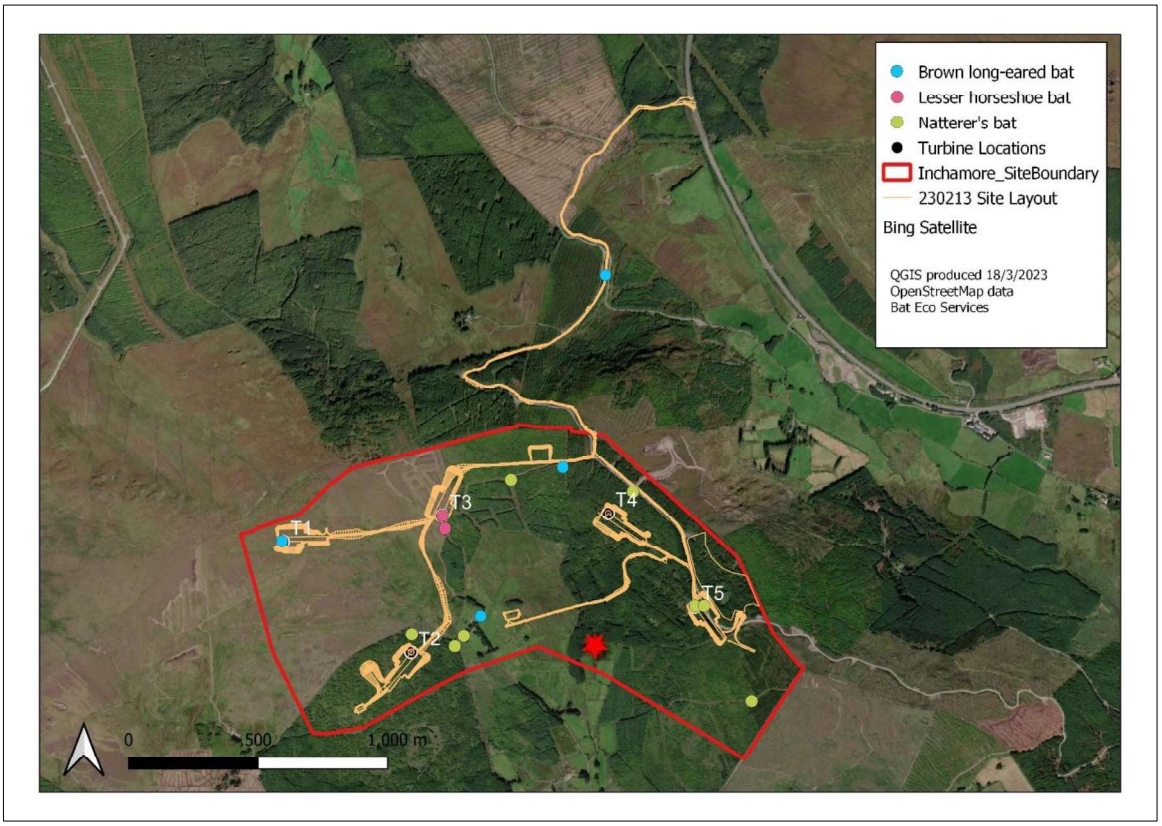

Figure 7c: QGIS analysis of Building 2 and specific bat species encounters with reference to proposed development. Red star represents the location of Building 2.

5.5.2 *Potential Impact on Local Bat Populations*

One set of buildings is located within the proposed development area and this was recorded as a bat roost for three bat species: lesser horseshoe bat, Natterer's bat and brown long-eared bat (Building 2). However, all three bat species recorded roosting are considered to be Low Risk bat species in relation to wind farms and there is no proposed turbine or infrastructure adjacent to the buildings.

The following table summarises the result of the impact assessment for each of the turbine locations. If no mitigation measures are implemented, there is one High Risk turbine (T2) and one Medium Risk turbine (T3).

Table 9: Summary table showing the number of nights recorded bat activity fell into High activity band for common pipistrelles only.

Turbine No.	Risk Assessment: Common pipistrelle	Other bat species recorded within 200m of turbine	If no mitigation is applied, what is the potential impact level?
T1	Low	SP, BLE, Leis, Daub	Low
T2	High	SP, BLE, Leis, Daub, Natt, Whis	High
T3	Medium	SP, BLE, Leis, Daub, LHB, Natt, Whis	Medium
T4	Low	SP, BLE, Leis, Daub, Natt	Low
T5	Low	SP, BLE, Leis, Daub, Natt, Whis	Low

The following table summarises the result of the impact assessment for each of the turbine locations. If no mitigation measures are implemented, there is one High Risk turbine (T2) and one Medium Risk turbine (T3).

5.5.3 *Cumulative Impacts of Existing Forestry Operations*

Forestry operations will continue within sections of the proposed development site during the construction phase and throughout the life span of the proposed development. Such operations include clear felling and new planting. The cumulative impact of these forestry operations in combination with the proposed development will not cause a significant increase to potential impacts of the proposed development identified above.

5.5.4 *Cumulative Impacts of Additional Wind Farm Applications*

There are 26 wind farms within 20 km^1 of the Inchamore proposed development (an area of 1,256 km^2 - Please consult Chapter 5 for more information). Of the 26, 18 no. are operational (175 turbines total), 6 no. are permitted (25 turbines), 1 no. is at pre-planning stage (17 turbines) and 1 no. is proposed (14 turbines).

Using the Core Sustenance Zone radius of 4km (this is the CSZ for Natterer's bat, the widest zone value for the eight bat species recorded during the surveys and for the three bat species recorded roosting in Building 2), a buffer of 4km was created from the proposed wind farm site boundary of the proposed development site.

The nearest operational wind farms to the Inchamore site is Coomagearlaghy, Kilgarvan Wind Farm (15 turbines), which is located 2.7 km to the south-west, and Inchee, Poulbatha & Foilgreana (6 turbines), which is located 3.3 km to the south-west. The permitted Gortnakilla, Clonkeen, Killarney Wind Farm is located 1.87 km to the west of the Inchamore site. Most of the remainder wind farms are clustered to the north-east, south and south-west of the Inchamore site and are outside the 4km radius. The Inchamore project will add a further 5 turbines to the total of 231 turbines which represents an additional 2.2%. It is considered that there is a potential for cumulative impacts of additional planning applications to local bat populations. This increases the importance of strict implementation of the bat mitigation measures presented in this report.

5.6 Mitigation Measures

In order to reduce the potential impact of the proposed development on local bat populations the following mitigation is recommended.

5.6.1 Construction Phase

Mitigation is best achieved through avoidance especially in relation to bat fauna. It is proposed that the following measures be put in place to avoid or lessen the degree of impacts on local bat populations.

5.6.1.1 Minimum Buffer Zone

To minimize risk to bat populations, a buffer zone is recommended around any forestry, treeline, hedgerow, woodland feature, into which no part of the turbine should intrude. Using the formula quoted below (NaturScot, 2021), the minimum distances of wind turbines for bat mitigation are calculated for each of the potential turbine models (information supplied by TOBIN).

formula: $Buffer\ distance = \sqrt{(50 + b1)^2 - (hh - fh)^2}$
where bl = blade length, hh = hub height, fh = feature height (all in meters)

The dimensions of the potential wind turbine models proposed to be used are provided in the table below. Feature height is 25m (typical conifer plantation height, the predominant habitat type present within the survey area). Dimensions of Blade length and Hub height were provided and the calculation is as follows:

$Buffer\ distance = \sqrt{(50 + 77.5)^2 - (102.5 - 25)^2}$
Buffer distance = 101.24m

Providing alternative foraging areas outside the wind farm zone has been shown to reduce the presence of bats within cleared zones around individual wind turbines (i.e. bats are attracted to

the more favourable foraging habitats). Therefore compensatory habitat is recommended and, where possible, such planting should include deciduous woodland.

5.6.1.2 Construction Phase Bat Mitigation Measures

Following the formula in the above section, ensure that the required minimum distance from tall vegetation is achieved.

Table 10: Bat Mitigation Measures recommended during the Construction Phase.

High Level Turbine Locations This applies to T2	**EcoBat Tool Medium Level Turbine Locations** This applies to T3 This also applies to remaining Internal Road Network	**EcoBat Tool Low Level Turbine Locations** This applies to T1, T4 & T5
Ensure that wind turbine is 101.2m away from plantation edge.	Ensure that wind turbine is 101.2m away from plantation edge.	Ensure that wind turbine is 101.2m away from plantation edge.
A zone of 100m around the wind turbines (from the tip of the blade) should be cleared of tall vegetation (shrubs, trees, scrub etc.) to reduce favourability of this zone for foraging and commuting bats. A low level of vegetation should be maintained for the entire operational phase. This should be monitored to ensure that scrub vegetation does not develop within the zone around the turbines.	A zone of 50m around the wind turbines (from the tip of the blade) should be cleared of tall vegetation (shrubs, trees, scrub etc.) to reduce favourability of this zone for foraging and commuting bats. A low level of vegetation should be maintained for the entire operational phase. This should be monitored to ensure that scrub vegetation does not develop within the zone around the turbines.	A zone of 50m around the wind turbines (from the tip of the blade) should be cleared of tall vegetation (shrubs, trees, scrub etc.) to reduce favourability of this zone for foraging and commuting bats. A low level of vegetation should be maintained for the entire operational phase. This should be monitored to ensure that scrub vegetation does not develop within the zone around the turbines.
Complete clearance work at least 6 months prior to installation of wind turbines. Studies have shown that bats are attracted to clear felled forestry areas due to increase insect loading. This has been shown to occur for a period of 3-6 months before the insect loading reduces to pre-cleared felled levels.	Complete clearance work at least 6 months prior to installation of wind turbines. Studies have shown that bats are attracted to clear felled forestry areas due to increase insect loading. This has been shown to occur for a period of 3-6 months before the insect loading reduces to pre-cleared felled levels.	Complete clearance work at least 6 months prior to installation of wind turbines. Studies have shown that bats are attracted to clear felled forestry areas due to increase insect loading. This has been shown to occur for a period of 3-6 months before the insect loading reduces to pre-cleared felled levels.
Building 2 and mature trees surrounding the building will not be removed during construction of the proposed development. This area will be protected from any construction works proposed to be undertaken in vicinity of this area. This area will also be protected during the operation of the proposed development.		

5.6.2 Operational Phase

5.6.2.1 Feathering of blades

The operation of the turbines should be in a manner that will restrict the rotation of turbine blades as much as possible below the manufacturer's cut-in speed (e.g. by feathering the blades during low wind levels - changes in blade feathering by altering the angle of the blade and therefore preventing the blades from rotating during low wind situations). This would prevent freewheeling or idling of the blades.

Therefore ensure that blades of turbines are prevented from freewheeling (idling/spinning). Feathering of the blades during low wind conditions are recommended for all turbines.

5.6.2.2 Turbine Cut-in Speeds

There are a number of bat mitigation measures available in relation to wind farms to reduce fatalities. One successful measure applied to wind farms in Europe is to increase the cut-in speeds of the individual turbines. This is important in order to protect High Risk species (Leisler's bat, soprano and common pipistrelle) foraging/commuting in vicinity of turbine locations.

Increasing the cut-in speed to 5.5 m/s from 30 minutes prior to sunset and to 30 minutes after sunrise to reduce bat collisions with turbines should be employed where required (i.e. at turbine locations where surveillance recorded high bat activity levels for High Risk and Medium Risk bat species and/or bat carcasses were recorded). The duration required depends on the level of bat mitigation required for individual turbine sites (i.e. full bat activity season or confined to spring & autumn months – this will be determine by first year surveillance). A risk assessment should be undertaken using the surveillance data and analysed using best practice e.g. assessment of static data should be completed using the online tool *EcoBat* (http://www.mammal.org.uk/science-research/ecostat/) as recommended by NaturScot, 2021 or other equivalent tool depending on most up to-date recommendations at the time of monitoring.

Where cut-in speeds are required, they should be operated according to specific weather conditions. In a previous bat survey (on different site location) undertaken by the author, static units were erected on an anemometer at 4m and 50m level. The number of bat passes recorded on the static units was analysed according to temperature and wind speed recorded at similar height levels. During this survey, it was determined that:

1. The vast majority of bat passes were recorded at the temperatures of 8°C and greater. Therefore, when the air temperature was less than 7°C there was no bat activity recorded below this temperature during the surveys completed.
2. In general, bat activity was highest at low wind speeds (<5.5m/s). It has been shown that curtailing the operations of wind turbines at low wind speeds can reduce bat mortality dramatically, especially during the late summer and early autumn months.
3. NaturScot (2021) recommend that curtailment is implemented for 10°C and above.

Reducing fatalities can be reduced by changing the speed trigger or cut-in speeds of the turbines (i.e. meaning that the turbine is not operational during low wind speeds) or by changing the

turbine blades angles which will mean that higher wind speeds are needed to start the wind turbine blades moving. Modern remotely operated wind turbines allow such cut-in speeds to be controlled centrally and automatically.

Due to the high levels of bat activity, cut-in speeds is required at T2. As a precautionary, cut-in speeds is also recommended at T3. This is due to the research by (Lintott *et al.* (2016) and Richardson *et al.* (2021) which reported that ecological impact assessments have failed to reduce the risk of wind farms on local bat populations and that the bat activity levels recorded during pre-construction bat surveys may not accurately reflect the bat activity levels during wind farm operation.

It is recommended that surveillance is undertaken at the High (T2) and Medium Risk turbines (T3) over a period of three years (first three years of operation, but an annual review is required to determine if the cut-in speeds should be implemented after 1 year of operation). If the Common pipistrelle activity remains moderate to high at the T3 Medium Risk turbine after the first year of surveillance then the cut-in speeds (coupled with carcass search results) should be put in place immediately. High and Medium Risk turbines surveillance will continue to review the situation at each individual turbine location for the remaining two years. This will allow refinement of the curtailment regime.

For all other turbines, operation without cut-in speeds coupled with 3 years of surveillance (according to NaturScot, 2021 guidelines) to determine if cut-in speeds are required at these turbine locations.

As recommended by SNH, 2019 if curtailment is put into operation, *"then the effectiveness of curtailment needs to be monitored in order to determine (a) whether it is working effectively (i.e. the level of bat mortality is considered to be incidental), and (b) whether the curtailment regime can be refined such that turbine down-time can be minimised whilst ensuring that it remains effective at preventing casualties".*

"Where the need for curtailment has been identified, a curtailment regime should be developed and presented as a part of the supporting Environmental Statement for the project. The proposed operating regime should specify, and be designed around the values for the key weather parameters and other factors that are known to influence collision risk which may include any or all of the following:

- *Wind speed in m/s (measured at nacelle height)*
- *Time after sunset*
- *Month of the year*
- *Temperature (ºC)*
- *Precipitation (mm/hr) "*

Post construction acoustic surveys provide additional information which, when used in conjunction with appropriate carcass search data, can support any proposed changes to pre-application predictions concerning the need for curtailment or adjustments to an agreed curtailment regime.

This surveillance and annual review should be carried out by an independent experienced bat ecologist and all reports should be issued to the Local Authority and NPWS for review.

Table 11: Bat Mitigation Measures recommended during the Operational Phase.

EcoBat Tool High Level Turbine Locations This applies to T2	**EcoBat Tool Medium Level Turbine Locations** This applies to T3 This also applies to remaining Internal Road Network	**EcoBat Tool Low Level Turbine Locations** This applies to T1, T4 & T5
Operate the wind turbines in a manner that reduces the movement of the blades below the cut-in speed (e.g. by feathering the blades).	Operate the wind turbines in a manner that reduces the movement of the blades below the cut-in speed (e.g. by feathering the blades).	Operate the wind turbines in a manner that reduces the movement of the blades below the cut-in speed (e.g. by feathering the blades).
Operate the wind turbine from 30 minutes prior sunset to 30 minutes after sunrise at a cut-in speed of 5.5 m/s during specified weather conditions and during the active bat season (April to October) when air temperatures are 10^{o}C or more at the nacelle height. Undertake monitoring the first three years of operation to determine bat activity levels post construction. Review the results of monitoring at individual High Risk turbines after Year 1. Operate wind farm with specific cut-in speeds from Day 1 of Year 2, if required, and review after surveillance/monitoring is completed.	Operate the wind turbine from 30 minutes prior sunset to 30 minutes after sunrise at a cut-in speed of 5.5 m/s during specified weather conditions and during the active bat season (April to October) when air temperatures are 10^{o}C or more at the nacelle height. Undertake monitoring the first three years of operation to determine bat activity levels post construction. Review the results of monitoring at individual High Risk turbines after Year 1. Operate wind farm with specific cut-in speeds from Day 1 of Year 2, if required, and review after surveillance/monitoring is completed.	
Undertake a carcass search for 3 years post operation of the wind farm to determine whether a higher cut-in speed of the blades is required. Review after Year 1 along with bat activity monitoring.	Undertake a carcass search for 3 years post operation of the wind farm to determine whether a higher cut-in speed of the blades is required. Review after Year 1 along with bat activity monitoring.	Undertake a carcass search for 3 years post operation of the wind farm.
Annual inspection of each buffer zone around each turbine will be undertaken and any regenerating trees or tall shrubs will be cut back.	Annual inspection of each buffer zone around each turbine will be annually inspected and any regenerating trees or tall shrubs will be cut back.	Annual inspection of each buffer zone around each turbine will be annually inspected and any regenerating trees or tall shrubs will be cut back.

Bat mitigation measures during the Operational Phase can be reviewed by implementing a strict surveillance programme for the first three years of operation of the wind farm in order to identify if there exists a substantial risk at a particular turbine location or during a particular time-period (3 yrs - as per recommendation of NaturScot, 2021 guidelines). This surveillance should then be repeated at Year 10 and Year 20 of the operation of the wind farm to ensure that sufficient mitigation is being implemented. This surveillance required is as follows:

a) Bat activity surveillance
   The level of bat activity should be monitoring for a minimum of 10 nights at each turbine location (ground level) during three of the eight month activity period (March/April to October/November). The surveillance periods should be divided into three survey periods to represent the three main periods where bat collisions have been documented: Spring (April/May); Summer (June/July) and Autumn (August/September).
b) Carcass search
   During the surveillance periods of specific wind turbines, carcass search is required for a minimum of 1 morning per turbine (i.e. 3/4 mornings in total over the 1 year surveillance i.e. one per surveillance period). For each turbine, the search area should be 100m radius after ideal bat foraging weather conditions (mild, calm and dry weather and greater than 10^{o}C). A scavenger trial is required to facilitate analysis (as per NaturScot, 2021 guidelines).
c) For exact protocols consult most up-date best practice guidelines from current research publications / guidelines (e.g. SNH, 2021).
d) Assessment of static data should be completed using the online tool *EcoBat Tool* (http://www.mammal.org.uk/science-research/ecostat/) as recommended by NaturScot, 2021 or other equivalent tool depending on most up to-date recommendations at the time of monitoring.

5.6.3 Bat Surveys – Age of Data

It is recommended that if three years lapse from between pre-construction surveys and the construction of the wind turbines, it may be necessary to repeat the pre-construction surveys (Rodrigues *et al.*, 2015). Surveys completed for this report concluded in early 2023. Therefore, a review should be undertaken no later than Spring 2025. Future survey work should be completed according to best practice guidelines available.

6. Conclusions

The survey area is deemed to have a Low to Medium landscape favourability for Irish bat species.

During bat surveys eight species of bat were recorded within the survey area and this is a high level of bat biodiversity. The level of bat activity recorded in 2022 was, in general, Low but some Moderate to High levels were recorded on specific static units during surveillance, particularly for common pipistrelle.

Five turbines are proposed as part of this wind farm development. Bat activity was recorded at all or in vicinity of the proposed turbine locations. Additional bat activity was recorded along much of the walking and driven transect routes while a lower level was recorded in open areas of bog. But this is also a reflection of restricted survey locations during the hours of darkness.

One set of buildings located within the proposed development site was recorded as a Night Roost for three species of bat: lesser horseshoe bat, Natterer's bat and brown long-eared bat. However, all three of these bat species are considered to be Low Risk in relation to potential impact from wind turbines.

The location of wind turbines is important in relation to their potential impact on local bat populations. To reduce impact on High Risk species such as common pipistrelle, it is important to ensure that turbines are not located adjacent to the linear habitat features and habitat considered important for foraging bats. The proposed development will impact on local bat populations and this is primarily due to the moderate to high levels of bat activity of common pipistrelle. This bat species are considered to be High Risk species in relation to wind farms. As a consequence bat mitigation measures are required.

The mitigation measures recommended in this report require strict implementation to reduce the long-term impact of the proposed wind farm on local bat populations. The proposed wind farm is likely to have an overall Moderate impact on local bat populations. The implementation of mitigation measures will potentially reduce this to a Low Impact on local bat populations.

Monitoring (including acoustic surveillance and carcass surveys) is essential to determine that mitigation measures recommended are reducing the potential impacts on local bat populations. The operation of the wind farm should be flexible to implement changes, if recommended, by the monitoring results.

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8. Appendices

Appendix I:
Static Surveillance Bat Survey Data

Table A: Summary of the total number of bat passes recorded for each bat species on each static unit during static surveillance.

P.pip = Common pipistrelle *Pipistrellus pipistrellus;* P.pyg = Soprano pipistrelle *P. pygmaeus*, N.leis – Leisler's bat *Nyctalus leisleri*, P.aur = Brown long-eared bat *Plecotus auritus*, M.daub = Daubenton's bat *Myotis daubentonii*, M.natt = Natterer's bat *M. nattereri*, M.mys = Whiskered bat *M. mystacinus*, Myotis = Myotis species, R.hip = Lesser horseshoe bat *Rhinolophus hipposideros*

Turbine	EcoBat Code	Date Deployed	No. Nights	P.pip	P.pyg	N.leis	P.aur	M.daub	M.natt	M.mys	Myotis	R.hip	Total
T1	Spring 1	27/05/2022	13	2	0	0	0	0	0	0	0	0	2
T2	Spring 2	27/05/2022	13	1171	46	1	2	3	4	1	1	0	1229
T3	Spring 3	27/05/2022	13	467	1	27	1	8	4	2	3	0	513
T4	Spring 4	27/05/2022	13	934	48	44	0	1	10	0	32	0	1069
T5	Spring 5	27/05/2022	13	201	9	27	3	1	0	4	0	0	245
Additional Location	Spring 6	06/07/2022	15	2010	85	207	3	4	3	1	4	0	2317

Turbine	EcoBat Code	Date Deployed	No. Nights	P.pip	P.pyg	N.leis	P.aur	M.daub	M.natt	M.mys	Myotis	R.hip	Total
T1	Summer 1	21/07/2022	11	3	5	13	1	0	0	0	0	0	22
T2	Summer 2	21/07/2022	11	714	26	36	2	0	1	3	0	0	782
T3	Summer 3	21/07/2022	11	517	39	37	2	4	2	3	1	0	605
T4	Summer 4	21/07/2022	11	22	3	52	0	0	0	0	0	0	77
T5	Summer 5	21/07/2022	11	35	30	29	2	2	1	1	5	0	105
Additional Location	Summer 6	21/07/2022	11	467	24	52	2	0	1	0	2	0	548

Turbine	EcoBat Code	Date Deployed	No. Nights	P.pip	P.pyg	N.leis	P.aur	M.daub	M.natt	M.mys	Myotis	R.hip	Total
T1	Autumn 1	24/08/2022	10	0	0	0	0	0	0	0	0	0	0
T2	Autumn 2	24/08/2022	10	821	55	28	16	16	6	3	10	0	955
T3	Autumn 3	24/08/2022	10	682	62	24	18	11	26	7	15	1	846
T4	Autumn 4	24/08/2022	10	63	11	19	1	0	0	0	4	0	98

T5	Autumn 5	24/08/2022	10	65	20	17	9	4	2	5	6	0	128
Additional Location	Autumn 6	24/08/2022	10	259	42	20	6	8	7	9	12	0	363
T1	Autumn 7	19/09/2022	13	9	0	0	3	1	0	0	0	0	13
T2	Autumn 8	19/09/2022	13	175	29	0	8	8	3	3	0	0	226
T3	Autumn 9	19/09/2022	13	423	44	1	7	4	5	5	8	0	497
T5	Autumn 10	19/09/2022	13	21	5	2	0	0	0	0	0	0	28
Habitat 1	Autumn 11	19/09/2022	13	132	36	6	31	0	1	0	3	0	209
Habitat 2	Autumn 12	19/09/2022	13	736	23	3	9	3	3	5	6	1	789
Habitat 3	Autumn 13	19/09/2022	13	1051	77	5	3	3	1	1	4	0	1145

Table B: Nightly data for each bat species recorded on each static unit during Spring Surveillance 2022

Location name	Location of bat detector (geographic coordinates)	Spatial Reference System	Date of bat survey	Species	Passes per night
Spring 3	51.95662686.-9.26621797	Latitude and Longitude	27/05/2022	Myotis	0
Spring 3	51.95662686.-9.26621798	Latitude and Longitude	28/05/2022	Myotis	0
Spring 3	51.95662686.-9.26621799	Latitude and Longitude	29/05/2022	Myotis	0
Spring 3	51.95662686.-9.26621800	Latitude and Longitude	30/05/2022	Myotis	0
Spring 3	51.95662686.-9.26621801	Latitude and Longitude	31/05/2022	Myotis	0
Spring 3	51.95662686.-9.26621802	Latitude and Longitude	01/06/2022	Myotis	0
Spring 3	51.95662686.-9.26621803	Latitude and Longitude	02/06/2022	Myotis	0
Spring 3	51.95662686.-9.26621804	Latitude and Longitude	03/06/2022	Myotis	0
Spring 3	51.95662686.-9.26621805	Latitude and Longitude	04/06/2022	Myotis	3
Spring 3	51.95662686.-9.26621806	Latitude and Longitude	05/06/2022	Myotis	0
Spring 3	51.95662686.-9.26621807	Latitude and Longitude	06/06/2022	Myotis	0
Spring 3	51.95662686.-9.26621808	Latitude and Longitude	07/06/2022	Myotis	0
Spring 3	51.95662686.-9.26621809	Latitude and Longitude	08/06/2022	Myotis	0
Spring 4	51.95680764,-9.256896514	Latitude and Longitude	27/05/2022	Myotis	0
Spring 4	51.95680764,-9.256896515	Latitude and Longitude	28/05/2022	Myotis	4
Spring 4	51.95680764,-9.256896516	Latitude and Longitude	29/05/2022	Myotis	17
Spring 4	51.95680764,-9.256896517	Latitude and Longitude	30/05/2022	Myotis	0
Spring 4	51.95680764,-9.256896518	Latitude and Longitude	31/05/2022	Myotis	0
Spring 4	51.95680764,-9.256896519	Latitude and Longitude	01/06/2022	Myotis	11
Spring 4	51.95680764,-9.256896520	Latitude and Longitude	02/06/2022	Myotis	0
Spring 4	51.95680764,-9.256896521	Latitude and Longitude	03/06/2022	Myotis	0
Spring 4	51.95680764,-9.256896522	Latitude and Longitude	04/06/2022	Myotis	0

Spring 4	51.95680764,-9.256896523	Latitude and Longitude	05/06/2022	Myotis	0
Spring 4	51.95680764,-9.256896524	Latitude and Longitude	06/06/2022	Myotis	0
Spring 4	51.95680764,-9.256896525	Latitude and Longitude	07/06/2022	Myotis	0
Spring 4	51.95680764,-9.256896526	Latitude and Longitude	08/06/2022	Myotis	0
Spring 6	51.95017242,-9.248534998	Latitude and Longitude	06/07/2022	Myotis	0
Spring 6	51.95017242,-9.248534999	Latitude and Longitude	07/07/2022	Myotis	0
Spring 6	51.95017242,-9.248535000	Latitude and Longitude	08/07/2022	Myotis	0
Spring 6	51.95017242,-9.248535001	Latitude and Longitude	09/07/2022	Myotis	0
Spring 6	51.95017242,-9.248535002	Latitude and Longitude	10/07/2022	Myotis	0
Spring 6	51.95017242,-9.248535003	Latitude and Longitude	11/07/2022	Myotis	0
Spring 6	51.95017242,-9.248535004	Latitude and Longitude	12/07/2022	Myotis	0
Spring 6	51.95017242,-9.248535005	Latitude and Longitude	13/07/2022	Myotis	0
Spring 6	51.95017242,-9.248535006	Latitude and Longitude	14/07/2022	Myotis	0
Spring 6	51.95017242,-9.248535007	Latitude and Longitude	15/07/2022	Myotis	2
Spring 6	51.95017242,-9.248535008	Latitude and Longitude	16/07/2022	Myotis	0
Spring 6	51.95017242,-9.248535009	Latitude and Longitude	17/07/2022	Myotis	0
Spring 6	51.95017242,-9.248535010	Latitude and Longitude	18/07/2022	Myotis	0
Spring 6	51.95017242,-9.248535011	Latitude and Longitude	19/07/2022	Myotis	1
Spring 6	51.95017242,-9.248535012	Latitude and Longitude	20/07/2022	Myotis	1
Spring 3	51.95662686.-9.26621758	Latitude and Longitude	27/05/2022	Myotis daubentonii	0
Spring 3	51.95662686.-9.26621759	Latitude and Longitude	28/05/2022	Myotis daubentonii	2
Spring 3	51.95662686.-9.26621760	Latitude and Longitude	29/05/2022	Myotis daubentonii	1
Spring 3	51.95662686.-9.26621761	Latitude and Longitude	30/05/2022	Myotis daubentonii	2
Spring 3	51.95662686.-9.26621762	Latitude and Longitude	31/05/2022	Myotis daubentonii	0
Spring 3	51.95662686.-9.26621763	Latitude and Longitude	01/06/2022	Myotis daubentonii	1
Spring 3	51.95662686.-9.26621764	Latitude and Longitude	02/06/2022	Myotis daubentonii	1
Spring 3	51.95662686.-9.26621765	Latitude and Longitude	03/06/2022	Myotis daubentonii	1
Spring 3	51.95662686.-9.26621766	Latitude and Longitude	04/06/2022	Myotis daubentonii	0
Spring 3	51.95662686.-9.26621767	Latitude and Longitude	05/06/2022	Myotis daubentonii	0
Spring 3	51.95662686.-9.26621768	Latitude and Longitude	06/06/2022	Myotis daubentonii	0
Spring 3	51.95662686.-9.26621769	Latitude and Longitude	07/06/2022	Myotis daubentonii	0
Spring 3	51.95662686.-9.26621770	Latitude and Longitude	08/06/2022	Myotis daubentonii	0
Spring 4	51.95680764,-9.256896488	Latitude and Longitude	27/05/2022	Myotis daubentonii	0
Spring 4	51.95680764,-9.256896489	Latitude and Longitude	28/05/2022	Myotis daubentonii	0
Spring 4	51.95680764,-9.256896490	Latitude and Longitude	29/05/2022	Myotis daubentonii	0
Spring 4	51.95680764,-9.256896491	Latitude and Longitude	30/05/2022	Myotis daubentonii	0
Spring 4	51.95680764,-9.256896492	Latitude and Longitude	31/05/2022	Myotis daubentonii	0
Spring 4	51.95680764,-9.256896493	Latitude and Longitude	01/06/2022	Myotis daubentonii	0

Spring 4	51.95680764,-9.256896494	Latitude and Longitude	02/06/2022	Myotis daubentonii	0
Spring 4	51.95680764,-9.256896495	Latitude and Longitude	03/06/2022	Myotis daubentonii	0
Spring 4	51.95680764,-9.256896496	Latitude and Longitude	04/06/2022	Myotis daubentonii	0
Spring 4	51.95680764,-9.256896497	Latitude and Longitude	05/06/2022	Myotis daubentonii	0
Spring 4	51.95680764,-9.256896498	Latitude and Longitude	06/06/2022	Myotis daubentonii	1
Spring 4	51.95680764,-9.256896499	Latitude and Longitude	07/06/2022	Myotis daubentonii	0
Spring 4	51.95680764,-9.256896500	Latitude and Longitude	08/06/2022	Myotis daubentonii	0
Spring 5	51.95361514,-9.251947816	Latitude and Longitude	27/05/2022	Myotis daubentonii	0
Spring 5	51.95361514,-9.251947817	Latitude and Longitude	28/05/2022	Myotis daubentonii	0
Spring 5	51.95361514,-9.251947818	Latitude and Longitude	29/05/2022	Myotis daubentonii	0
Spring 5	51.95361514,-9.251947819	Latitude and Longitude	30/05/2022	Myotis daubentonii	0
Spring 5	51.95361514,-9.251947820	Latitude and Longitude	31/05/2022	Myotis daubentonii	0
Spring 5	51.95361514,-9.251947821	Latitude and Longitude	01/06/2022	Myotis daubentonii	0
Spring 5	51.95361514,-9.251947822	Latitude and Longitude	02/06/2022	Myotis daubentonii	0
Spring 5	51.95361514,-9.251947823	Latitude and Longitude	03/06/2022	Myotis daubentonii	0
Spring 5	51.95361514,-9.251947824	Latitude and Longitude	04/06/2022	Myotis daubentonii	0
Spring 5	51.95361514,-9.251947825	Latitude and Longitude	05/06/2022	Myotis daubentonii	1
Spring 5	51.95361514,-9.251947826	Latitude and Longitude	06/06/2022	Myotis daubentonii	0
Spring 5	51.95361514,-9.251947827	Latitude and Longitude	07/06/2022	Myotis daubentonii	0
Spring 5	51.95361514,-9.251947828	Latitude and Longitude	08/06/2022	Myotis daubentonii	0
Spring 6	51.95017242,-9.248534953	Latitude and Longitude	06/07/2022	Myotis daubentonii	0
Spring 6	51.95017242,-9.248534954	Latitude and Longitude	07/07/2022	Myotis daubentonii	0
Spring 6	51.95017242,-9.248534955	Latitude and Longitude	08/07/2022	Myotis daubentonii	0
Spring 6	51.95017242,-9.248534956	Latitude and Longitude	09/07/2022	Myotis daubentonii	0
Spring 6	51.95017242,-9.248534957	Latitude and Longitude	10/07/2022	Myotis daubentonii	1
Spring 6	51.95017242,-9.248534958	Latitude and Longitude	11/07/2022	Myotis daubentonii	0
Spring 6	51.95017242,-9.248534959	Latitude and Longitude	12/07/2022	Myotis daubentonii	0
Spring 6	51.95017242,-9.248534960	Latitude and Longitude	13/07/2022	Myotis daubentonii	0
Spring 6	51.95017242,-9.248534961	Latitude and Longitude	14/07/2022	Myotis daubentonii	0
Spring 6	51.95017242,-9.248534962	Latitude and Longitude	15/07/2022	Myotis daubentonii	1
Spring 6	51.95017242,-9.248534963	Latitude and Longitude	16/07/2022	Myotis daubentonii	1
Spring 6	51.95017242,-9.248534964	Latitude and Longitude	17/07/2022	Myotis daubentonii	0
Spring 6	51.95017242,-9.248534965	Latitude and Longitude	18/07/2022	Myotis daubentonii	1
Spring 6	51.95017242,-9.248534966	Latitude and Longitude	19/07/2022	Myotis daubentonii	0
Spring 6	51.95017242,-9.248534967	Latitude and Longitude	20/07/2022	Myotis daubentonii	0
Spring 3	51.95662686.-9.26621771	Latitude and Longitude	27/05/2022	Myotis mystacinus	0
Spring 3	51.95662686.-9.26621772	Latitude and Longitude	28/05/2022	Myotis mystacinus	0
Spring 3	51.95662686.-9.26621773	Latitude and Longitude	29/05/2022	Myotis mystacinus	1

Spring 3	51.95662686.-9.26621774	Latitude and Longitude	30/05/2022	Myotis mystacinus	0
Spring 3	51.95662686.-9.26621775	Latitude and Longitude	31/05/2022	Myotis mystacinus	0
Spring 3	51.95662686.-9.26621776	Latitude and Longitude	01/06/2022	Myotis mystacinus	0
Spring 3	51.95662686.-9.26621777	Latitude and Longitude	02/06/2022	Myotis mystacinus	1
Spring 3	51.95662686.-9.26621778	Latitude and Longitude	03/06/2022	Myotis mystacinus	0
Spring 3	51.95662686.-9.26621779	Latitude and Longitude	04/06/2022	Myotis mystacinus	0
Spring 3	51.95662686.-9.26621780	Latitude and Longitude	05/06/2022	Myotis mystacinus	0
Spring 3	51.95662686.-9.26621781	Latitude and Longitude	06/06/2022	Myotis mystacinus	0
Spring 3	51.95662686.-9.26621782	Latitude and Longitude	07/06/2022	Myotis mystacinus	0
Spring 3	51.95662686.-9.26621783	Latitude and Longitude	08/06/2022	Myotis mystacinus	0
Spring 5	51.95361514,-9.251947829	Latitude and Longitude	27/05/2022	Myotis mystacinus	0
Spring 5	51.95361514,-9.251947830	Latitude and Longitude	28/05/2022	Myotis mystacinus	1
Spring 5	51.95361514,-9.251947831	Latitude and Longitude	29/05/2022	Myotis mystacinus	0
Spring 5	51.95361514,-9.251947832	Latitude and Longitude	30/05/2022	Myotis mystacinus	0
Spring 5	51.95361514,-9.251947833	Latitude and Longitude	31/05/2022	Myotis mystacinus	0
Spring 5	51.95361514,-9.251947834	Latitude and Longitude	01/06/2022	Myotis mystacinus	0
Spring 5	51.95361514,-9.251947835	Latitude and Longitude	02/06/2022	Myotis mystacinus	0
Spring 5	51.95361514,-9.251947836	Latitude and Longitude	03/06/2022	Myotis mystacinus	0
Spring 5	51.95361514,-9.251947837	Latitude and Longitude	04/06/2022	Myotis mystacinus	1
Spring 5	51.95361514,-9.251947838	Latitude and Longitude	05/06/2022	Myotis mystacinus	0
Spring 5	51.95361514,-9.251947839	Latitude and Longitude	06/06/2022	Myotis mystacinus	0
Spring 5	51.95361514,-9.251947840	Latitude and Longitude	07/06/2022	Myotis mystacinus	1
Spring 5	51.95361514,-9.251947841	Latitude and Longitude	08/06/2022	Myotis mystacinus	1
Spring 6	51.95017242,-9.248534968	Latitude and Longitude	06/07/2022	Myotis mystacinus	0
Spring 6	51.95017242,-9.248534969	Latitude and Longitude	07/07/2022	Myotis mystacinus	0
Spring 6	51.95017242,-9.248534970	Latitude and Longitude	08/07/2022	Myotis mystacinus	0
Spring 6	51.95017242,-9.248534971	Latitude and Longitude	09/07/2022	Myotis mystacinus	0
Spring 6	51.95017242,-9.248534972	Latitude and Longitude	10/07/2022	Myotis mystacinus	0
Spring 6	51.95017242,-9.248534973	Latitude and Longitude	11/07/2022	Myotis mystacinus	0
Spring 6	51.95017242,-9.248534974	Latitude and Longitude	12/07/2022	Myotis mystacinus	0
Spring 6	51.95017242,-9.248534975	Latitude and Longitude	13/07/2022	Myotis mystacinus	0
Spring 6	51.95017242,-9.248534976	Latitude and Longitude	14/07/2022	Myotis mystacinus	0
Spring 6	51.95017242,-9.248534977	Latitude and Longitude	15/07/2022	Myotis mystacinus	0
Spring 6	51.95017242,-9.248534978	Latitude and Longitude	16/07/2022	Myotis mystacinus	1
Spring 6	51.95017242,-9.248534979	Latitude and Longitude	17/07/2022	Myotis mystacinus	0
Spring 6	51.95017242,-9.248534980	Latitude and Longitude	18/07/2022	Myotis mystacinus	0
Spring 6	51.95017242,-9.248534981	Latitude and Longitude	19/07/2022	Myotis mystacinus	0
Spring 6	51.95017242,-9.248534982	Latitude and Longitude	20/07/2022	Myotis mystacinus	0

Spring 3	51.95662686.-9.26621784	Latitude and Longitude	27/05/2022	Myotis nattereri	0
Spring 3	51.95662686.-9.26621785	Latitude and Longitude	28/05/2022	Myotis nattereri	0
Spring 3	51.95662686.-9.26621786	Latitude and Longitude	29/05/2022	Myotis nattereri	0
Spring 3	51.95662686.-9.26621787	Latitude and Longitude	30/05/2022	Myotis nattereri	1
Spring 3	51.95662686.-9.26621788	Latitude and Longitude	31/05/2022	Myotis nattereri	0
Spring 3	51.95662686.-9.26621789	Latitude and Longitude	01/06/2022	Myotis nattereri	0
Spring 3	51.95662686.-9.26621790	Latitude and Longitude	02/06/2022	Myotis nattereri	0
Spring 3	51.95662686.-9.26621791	Latitude and Longitude	03/06/2022	Myotis nattereri	0
Spring 3	51.95662686.-9.26621792	Latitude and Longitude	04/06/2022	Myotis nattereri	1
Spring 3	51.95662686.-9.26621793	Latitude and Longitude	05/06/2022	Myotis nattereri	0
Spring 3	51.95662686.-9.26621794	Latitude and Longitude	06/06/2022	Myotis nattereri	0
Spring 3	51.95662686.-9.26621795	Latitude and Longitude	07/06/2022	Myotis nattereri	1
Spring 3	51.95662686.-9.26621796	Latitude and Longitude	08/06/2022	Myotis nattereri	1
Spring 4	51.95680764,-9.256896501	Latitude and Longitude	27/05/2022	Myotis nattereri	0
Spring 4	51.95680764,-9.256896502	Latitude and Longitude	28/05/2022	Myotis nattereri	0
Spring 4	51.95680764,-9.256896503	Latitude and Longitude	29/05/2022	Myotis nattereri	4
Spring 4	51.95680764,-9.256896504	Latitude and Longitude	30/05/2022	Myotis nattereri	1
Spring 4	51.95680764,-9.256896505	Latitude and Longitude	31/05/2022	Myotis nattereri	0
Spring 4	51.95680764,-9.256896506	Latitude and Longitude	01/06/2022	Myotis nattereri	5
Spring 4	51.95680764,-9.256896507	Latitude and Longitude	02/06/2022	Myotis nattereri	0
Spring 4	51.95680764,-9.256896508	Latitude and Longitude	03/06/2022	Myotis nattereri	0
Spring 4	51.95680764,-9.256896509	Latitude and Longitude	04/06/2022	Myotis nattereri	0
Spring 4	51.95680764,-9.256896510	Latitude and Longitude	05/06/2022	Myotis nattereri	0
Spring 4	51.95680764,-9.256896511	Latitude and Longitude	06/06/2022	Myotis nattereri	0
Spring 4	51.95680764,-9.256896512	Latitude and Longitude	07/06/2022	Myotis nattereri	0
Spring 4	51.95680764,-9.256896513	Latitude and Longitude	08/06/2022	Myotis nattereri	0
Spring 6	51.95017242,-9.248534983	Latitude and Longitude	06/07/2022	Myotis nattereri	0
Spring 6	51.95017242,-9.248534984	Latitude and Longitude	07/07/2022	Myotis nattereri	0
Spring 6	51.95017242,-9.248534985	Latitude and Longitude	08/07/2022	Myotis nattereri	0
Spring 6	51.95017242,-9.248534986	Latitude and Longitude	09/07/2022	Myotis nattereri	0
Spring 6	51.95017242,-9.248534987	Latitude and Longitude	10/07/2022	Myotis nattereri	1
Spring 6	51.95017242,-9.248534988	Latitude and Longitude	11/07/2022	Myotis nattereri	0
Spring 6	51.95017242,-9.248534989	Latitude and Longitude	12/07/2022	Myotis nattereri	0
Spring 6	51.95017242,-9.248534990	Latitude and Longitude	13/07/2022	Myotis nattereri	1
Spring 6	51.95017242,-9.248534991	Latitude and Longitude	14/07/2022	Myotis nattereri	0
Spring 6	51.95017242,-9.248534992	Latitude and Longitude	15/07/2022	Myotis nattereri	0
Spring 6	51.95017242,-9.248534993	Latitude and Longitude	16/07/2022	Myotis nattereri	0
Spring 6	51.95017242,-9.248534994	Latitude and Longitude	17/07/2022	Myotis nattereri	1

Spring 6	51.95017242,-9.248534995	Latitude and Longitude	18/07/2022	Myotis nattereri	0
Spring 6	51.95017242,-9.248534996	Latitude and Longitude	19/07/2022	Myotis nattereri	0
Spring 6	51.95017242,-9.248534997	Latitude and Longitude	20/07/2022	Myotis nattereri	0
Spring 2	51.951872.-9.26782946	Latitude and Longitude	27/05/2022	Nyctalus leisleri	0
Spring 2	51.951872.-9.26782947	Latitude and Longitude	28/05/2022	Nyctalus leisleri	0
Spring 2	51.951872.-9.26782948	Latitude and Longitude	29/05/2022	Nyctalus leisleri	1
Spring 2	51.951872.-9.26782949	Latitude and Longitude	30/05/2022	Nyctalus leisleri	0
Spring 2	51.951872.-9.26782950	Latitude and Longitude	31/05/2022	Nyctalus leisleri	0
Spring 2	51.951872.-9.26782951	Latitude and Longitude	01/06/2022	Nyctalus leisleri	0
Spring 2	51.951872.-9.26782952	Latitude and Longitude	02/06/2022	Nyctalus leisleri	0
Spring 2	51.951872.-9.26782953	Latitude and Longitude	03/06/2022	Nyctalus leisleri	0
Spring 2	51.951872.-9.26782954	Latitude and Longitude	04/06/2022	Nyctalus leisleri	0
Spring 2	51.951872.-9.26782955	Latitude and Longitude	05/06/2022	Nyctalus leisleri	0
Spring 2	51.951872.-9.26782956	Latitude and Longitude	06/06/2022	Nyctalus leisleri	0
Spring 2	51.951872.-9.26782957	Latitude and Longitude	07/06/2022	Nyctalus leisleri	0
Spring 2	51.951872.-9.26782958	Latitude and Longitude	08/06/2022	Nyctalus leisleri	0
Spring 3	51.95662686.-9.26621706	Latitude and Longitude	27/05/2022	Nyctalus leisleri	0
Spring 3	51.95662686.-9.26621707	Latitude and Longitude	28/05/2022	Nyctalus leisleri	0
Spring 3	51.95662686.-9.26621708	Latitude and Longitude	29/05/2022	Nyctalus leisleri	0
Spring 3	51.95662686.-9.26621709	Latitude and Longitude	30/05/2022	Nyctalus leisleri	1
Spring 3	51.95662686.-9.26621710	Latitude and Longitude	31/05/2022	Nyctalus leisleri	0
Spring 3	51.95662686.-9.26621711	Latitude and Longitude	01/06/2022	Nyctalus leisleri	0
Spring 3	51.95662686.-9.26621712	Latitude and Longitude	02/06/2022	Nyctalus leisleri	1
Spring 3	51.95662686.-9.26621713	Latitude and Longitude	03/06/2022	Nyctalus leisleri	0
Spring 3	51.95662686.-9.26621714	Latitude and Longitude	04/06/2022	Nyctalus leisleri	1
Spring 3	51.95662686.-9.26621715	Latitude and Longitude	05/06/2022	Nyctalus leisleri	0
Spring 3	51.95662686.-9.26621716	Latitude and Longitude	06/06/2022	Nyctalus leisleri	0
Spring 3	51.95662686.-9.26621717	Latitude and Longitude	07/06/2022	Nyctalus leisleri	0
Spring 3	51.95662686.-9.26621718	Latitude and Longitude	08/06/2022	Nyctalus leisleri	24
Spring 4	51.95680764,-9.256896449	Latitude and Longitude	27/05/2022	Nyctalus leisleri	0
Spring 4	51.95680764,-9.256896450	Latitude and Longitude	28/05/2022	Nyctalus leisleri	3
Spring 4	51.95680764,-9.256896451	Latitude and Longitude	29/05/2022	Nyctalus leisleri	3
Spring 4	51.95680764,-9.256896452	Latitude and Longitude	30/05/2022	Nyctalus leisleri	0
Spring 4	51.95680764,-9.256896453	Latitude and Longitude	31/05/2022	Nyctalus leisleri	0
Spring 4	51.95680764,-9.256896454	Latitude and Longitude	01/06/2022	Nyctalus leisleri	0
Spring 4	51.95680764,-9.256896455	Latitude and Longitude	02/06/2022	Nyctalus leisleri	0
Spring 4	51.95680764,-9.256896456	Latitude and Longitude	03/06/2022	Nyctalus leisleri	0
Spring 4	51.95680764,-9.256896457	Latitude and Longitude	04/06/2022	Nyctalus leisleri	0

Spring 4	51.95680764,-9.256896458	Latitude and Longitude	05/06/2022	Nyctalus leisleri	0
Spring 4	51.95680764,-9.256896459	Latitude and Longitude	06/06/2022	Nyctalus leisleri	35
Spring 4	51.95680764,-9.256896460	Latitude and Longitude	07/06/2022	Nyctalus leisleri	1
Spring 4	51.95680764,-9.256896461	Latitude and Longitude	08/06/2022	Nyctalus leisleri	2
Spring 5	51.95361514,-9.251947764	Latitude and Longitude	27/05/2022	Nyctalus leisleri	0
Spring 5	51.95361514,-9.251947765	Latitude and Longitude	28/05/2022	Nyctalus leisleri	2
Spring 5	51.95361514,-9.251947766	Latitude and Longitude	29/05/2022	Nyctalus leisleri	4
Spring 5	51.95361514,-9.251947767	Latitude and Longitude	30/05/2022	Nyctalus leisleri	0
Spring 5	51.95361514,-9.251947768	Latitude and Longitude	31/05/2022	Nyctalus leisleri	0
Spring 5	51.95361514,-9.251947769	Latitude and Longitude	01/06/2022	Nyctalus leisleri	1
Spring 5	51.95361514,-9.251947770	Latitude and Longitude	02/06/2022	Nyctalus leisleri	4
Spring 5	51.95361514,-9.251947771	Latitude and Longitude	03/06/2022	Nyctalus leisleri	1
Spring 5	51.95361514,-9.251947772	Latitude and Longitude	04/06/2022	Nyctalus leisleri	2
Spring 5	51.95361514,-9.251947773	Latitude and Longitude	05/06/2022	Nyctalus leisleri	2
Spring 5	51.95361514,-9.251947774	Latitude and Longitude	06/06/2022	Nyctalus leisleri	2
Spring 5	51.95361514,-9.251947775	Latitude and Longitude	07/06/2022	Nyctalus leisleri	0
Spring 5	51.95361514,-9.251947776	Latitude and Longitude	08/06/2022	Nyctalus leisleri	8
Spring 6	51.95017242,-9.248534893	Latitude and Longitude	06/07/2022	Nyctalus leisleri	0
Spring 6	51.95017242,-9.248534894	Latitude and Longitude	07/07/2022	Nyctalus leisleri	0
Spring 6	51.95017242,-9.248534895	Latitude and Longitude	08/07/2022	Nyctalus leisleri	5
Spring 6	51.95017242,-9.248534896	Latitude and Longitude	09/07/2022	Nyctalus leisleri	45
Spring 6	51.95017242,-9.248534897	Latitude and Longitude	10/07/2022	Nyctalus leisleri	39
Spring 6	51.95017242,-9.248534898	Latitude and Longitude	11/07/2022	Nyctalus leisleri	5
Spring 6	51.95017242,-9.248534899	Latitude and Longitude	12/07/2022	Nyctalus leisleri	29
Spring 6	51.95017242,-9.248534900	Latitude and Longitude	13/07/2022	Nyctalus leisleri	0
Spring 6	51.95017242,-9.248534901	Latitude and Longitude	14/07/2022	Nyctalus leisleri	1
Spring 6	51.95017242,-9.248534902	Latitude and Longitude	15/07/2022	Nyctalus leisleri	22
Spring 6	51.95017242,-9.248534903	Latitude and Longitude	16/07/2022	Nyctalus leisleri	46
Spring 6	51.95017242,-9.248534904	Latitude and Longitude	17/07/2022	Nyctalus leisleri	4
Spring 6	51.95017242,-9.248534905	Latitude and Longitude	18/07/2022	Nyctalus leisleri	3
Spring 6	51.95017242,-9.248534906	Latitude and Longitude	19/07/2022	Nyctalus leisleri	8
Spring 6	51.95017242,-9.248534907	Latitude and Longitude	20/07/2022	Nyctalus leisleri	0
Spring 1	51.95563163,-9.27513818	Latitude and Longitude	27/05/2022	Pipistrellus pipistrellus	0
Spring 1	51.95563163,-9.27513818	Latitude and Longitude	28/05/2022	Pipistrellus pipistrellus	1
Spring 1	51.95563163,-9.27513818	Latitude and Longitude	29/05/2022	Pipistrellus pipistrellus	0
Spring 1	51.95563163,-9.27513818	Latitude and Longitude	30/05/2022	Pipistrellus pipistrellus	0
Spring 1	51.95563163,-9.27513818	Latitude and Longitude	31/05/2022	Pipistrellus pipistrellus	0
Spring 1	51.95563163,-9.27513818	Latitude and Longitude	01/06/2022	Pipistrellus pipistrellus	0

Spring 1	51.95563163,-9.27513818	Latitude and Longitude	02/06/2022	Pipistrellus pipistrellus	0
Spring 1	51.95563163,-9.27513818	Latitude and Longitude	03/06/2022	Pipistrellus pipistrellus	0
Spring 1	51.95563163,-9.27513818	Latitude and Longitude	04/06/2022	Pipistrellus pipistrellus	0
Spring 1	51.95563163,-9.27513818	Latitude and Longitude	05/06/2022	Pipistrellus pipistrellus	0
Spring 1	51.95563163,-9.27513818	Latitude and Longitude	06/06/2022	Pipistrellus pipistrellus	1
Spring 1	51.95563163,-9.27513818	Latitude and Longitude	07/06/2022	Pipistrellus pipistrellus	0
Spring 1	51.95563163,-9.27513818	Latitude and Longitude	08/06/2022	Pipistrellus pipistrellus	0
Spring 2	51.951872.-9.26782959	Latitude and Longitude	27/05/2022	Pipistrellus pipistrellus	7
Spring 2	51.951872.-9.26782960	Latitude and Longitude	28/05/2022	Pipistrellus pipistrellus	322
Spring 2	51.951872.-9.26782961	Latitude and Longitude	29/05/2022	Pipistrellus pipistrellus	190
Spring 2	51.951872.-9.26782962	Latitude and Longitude	30/05/2022	Pipistrellus pipistrellus	29
Spring 2	51.951872.-9.26782963	Latitude and Longitude	31/05/2022	Pipistrellus pipistrellus	20
Spring 2	51.951872.-9.26782964	Latitude and Longitude	01/06/2022	Pipistrellus pipistrellus	66
Spring 2	51.951872.-9.26782965	Latitude and Longitude	02/06/2022	Pipistrellus pipistrellus	74
Spring 2	51.951872.-9.26782966	Latitude and Longitude	03/06/2022	Pipistrellus pipistrellus	55
Spring 2	51.951872.-9.26782967	Latitude and Longitude	04/06/2022	Pipistrellus pipistrellus	7
Spring 2	51.951872.-9.26782968	Latitude and Longitude	05/06/2022	Pipistrellus pipistrellus	1
Spring 2	51.951872.-9.26782969	Latitude and Longitude	06/06/2022	Pipistrellus pipistrellus	74
Spring 2	51.951872.-9.26782970	Latitude and Longitude	07/06/2022	Pipistrellus pipistrellus	18
Spring 2	51.951872.-9.26782971	Latitude and Longitude	08/06/2022	Pipistrellus pipistrellus	308
Spring 3	51.95662686.-9.26621719	Latitude and Longitude	27/05/2022	Pipistrellus pipistrellus	4
Spring 3	51.95662686.-9.26621720	Latitude and Longitude	28/05/2022	Pipistrellus pipistrellus	68
Spring 3	51.95662686.-9.26621721	Latitude and Longitude	29/05/2022	Pipistrellus pipistrellus	54
Spring 3	51.95662686.-9.26621722	Latitude and Longitude	30/05/2022	Pipistrellus pipistrellus	7
Spring 3	51.95662686.-9.26621723	Latitude and Longitude	31/05/2022	Pipistrellus pipistrellus	0
Spring 3	51.95662686.-9.26621724	Latitude and Longitude	01/06/2022	Pipistrellus pipistrellus	2
Spring 3	51.95662686.-9.26621725	Latitude and Longitude	02/06/2022	Pipistrellus pipistrellus	58
Spring 3	51.95662686.-9.26621726	Latitude and Longitude	03/06/2022	Pipistrellus pipistrellus	19
Spring 3	51.95662686.-9.26621727	Latitude and Longitude	04/06/2022	Pipistrellus pipistrellus	3
Spring 3	51.95662686.-9.26621728	Latitude and Longitude	05/06/2022	Pipistrellus pipistrellus	0
Spring 3	51.95662686.-9.26621729	Latitude and Longitude	06/06/2022	Pipistrellus pipistrellus	149
Spring 3	51.95662686.-9.26621730	Latitude and Longitude	07/06/2022	Pipistrellus pipistrellus	25
Spring 3	51.95662686.-9.26621731	Latitude and Longitude	08/06/2022	Pipistrellus pipistrellus	78
Spring 4	51.95680764,-9.256896462	Latitude and Longitude	27/05/2022	Pipistrellus pipistrellus	2
Spring 4	51.95680764,-9.256896463	Latitude and Longitude	28/05/2022	Pipistrellus pipistrellus	34
Spring 4	51.95680764,-9.256896464	Latitude and Longitude	29/05/2022	Pipistrellus pipistrellus	31
Spring 4	51.95680764,-9.256896465	Latitude and Longitude	30/05/2022	Pipistrellus pipistrellus	6
Spring 4	51.95680764,-9.256896466	Latitude and Longitude	31/05/2022	Pipistrellus pipistrellus	1

Spring 4	51.95680764,-9.256896467	Latitude and Longitude	01/06/2022	Pipistrellus pipistrellus	0
Spring 4	51.95680764,-9.256896468	Latitude and Longitude	02/06/2022	Pipistrellus pipistrellus	0
Spring 4	51.95680764,-9.256896469	Latitude and Longitude	03/06/2022	Pipistrellus pipistrellus	2
Spring 4	51.95680764,-9.256896470	Latitude and Longitude	04/06/2022	Pipistrellus pipistrellus	5
Spring 4	51.95680764,-9.256896471	Latitude and Longitude	05/06/2022	Pipistrellus pipistrellus	0
Spring 4	51.95680764,-9.256896472	Latitude and Longitude	06/06/2022	Pipistrellus pipistrellus	0
Spring 4	51.95680764,-9.256896473	Latitude and Longitude	07/06/2022	Pipistrellus pipistrellus	0
Spring 4	51.95680764,-9.256896474	Latitude and Longitude	08/06/2022	Pipistrellus pipistrellus	853
Spring 5	51.95361514,-9.251947777	Latitude and Longitude	27/05/2022	Pipistrellus pipistrellus	4
Spring 5	51.95361514,-9.251947778	Latitude and Longitude	28/05/2022	Pipistrellus pipistrellus	90
Spring 5	51.95361514,-9.251947779	Latitude and Longitude	29/05/2022	Pipistrellus pipistrellus	65
Spring 5	51.95361514,-9.251947780	Latitude and Longitude	30/05/2022	Pipistrellus pipistrellus	14
Spring 5	51.95361514,-9.251947781	Latitude and Longitude	31/05/2022	Pipistrellus pipistrellus	0
Spring 5	51.95361514,-9.251947782	Latitude and Longitude	01/06/2022	Pipistrellus pipistrellus	0
Spring 5	51.95361514,-9.251947783	Latitude and Longitude	02/06/2022	Pipistrellus pipistrellus	5
Spring 5	51.95361514,-9.251947784	Latitude and Longitude	03/06/2022	Pipistrellus pipistrellus	7
Spring 5	51.95361514,-9.251947785	Latitude and Longitude	04/06/2022	Pipistrellus pipistrellus	3
Spring 5	51.95361514,-9.251947786	Latitude and Longitude	05/06/2022	Pipistrellus pipistrellus	1
Spring 5	51.95361514,-9.251947787	Latitude and Longitude	06/06/2022	Pipistrellus pipistrellus	1
Spring 5	51.95361514,-9.251947788	Latitude and Longitude	07/06/2022	Pipistrellus pipistrellus	2
Spring 5	51.95361514,-9.251947789	Latitude and Longitude	08/06/2022	Pipistrellus pipistrellus	9
Spring 6	51.95017242,-9.248534908	Latitude and Longitude	06/07/2022	Pipistrellus pipistrellus	6
Spring 6	51.95017242,-9.248534909	Latitude and Longitude	07/07/2022	Pipistrellus pipistrellus	114
Spring 6	51.95017242,-9.248534910	Latitude and Longitude	08/07/2022	Pipistrellus pipistrellus	67
Spring 6	51.95017242,-9.248534911	Latitude and Longitude	09/07/2022	Pipistrellus pipistrellus	116
Spring 6	51.95017242,-9.248534912	Latitude and Longitude	10/07/2022	Pipistrellus pipistrellus	306
Spring 6	51.95017242,-9.248534913	Latitude and Longitude	11/07/2022	Pipistrellus pipistrellus	198
Spring 6	51.95017242,-9.248534914	Latitude and Longitude	12/07/2022	Pipistrellus pipistrellus	287
Spring 6	51.95017242,-9.248534915	Latitude and Longitude	13/07/2022	Pipistrellus pipistrellus	89
Spring 6	51.95017242,-9.248534916	Latitude and Longitude	14/07/2022	Pipistrellus pipistrellus	190
Spring 6	51.95017242,-9.248534917	Latitude and Longitude	15/07/2022	Pipistrellus pipistrellus	143
Spring 6	51.95017242,-9.248534918	Latitude and Longitude	16/07/2022	Pipistrellus pipistrellus	266
Spring 6	51.95017242,-9.248534919	Latitude and Longitude	17/07/2022	Pipistrellus pipistrellus	104
Spring 6	51.95017242,-9.248534920	Latitude and Longitude	18/07/2022	Pipistrellus pipistrellus	38
Spring 6	51.95017242,-9.248534921	Latitude and Longitude	19/07/2022	Pipistrellus pipistrellus	70
Spring 6	51.95017242,-9.248534922	Latitude and Longitude	20/07/2022	Pipistrellus pipistrellus	16
Spring 2	51.951872.-9.26782972	Latitude and Longitude	27/05/2022	Pipistrellus pygmaeus	13
Spring 2	51.951872.-9.26782973	Latitude and Longitude	28/05/2022	Pipistrellus pygmaeus	25

Spring 2	51.951872.-9.26782974	Latitude and Longitude	29/05/2022	Pipistrellus pygmaeus	2
Spring 2	51.951872.-9.26782975	Latitude and Longitude	30/05/2022	Pipistrellus pygmaeus	0
Spring 2	51.951872.-9.26782976	Latitude and Longitude	31/05/2022	Pipistrellus pygmaeus	0
Spring 2	51.951872.-9.26782977	Latitude and Longitude	01/06/2022	Pipistrellus pygmaeus	0
Spring 2	51.951872.-9.26782978	Latitude and Longitude	02/06/2022	Pipistrellus pygmaeus	4
Spring 2	51.951872.-9.26782979	Latitude and Longitude	03/06/2022	Pipistrellus pygmaeus	0
Spring 2	51.951872.-9.26782980	Latitude and Longitude	04/06/2022	Pipistrellus pygmaeus	0
Spring 2	51.951872.-9.26782981	Latitude and Longitude	05/06/2022	Pipistrellus pygmaeus	0
Spring 2	51.951872.-9.26782982	Latitude and Longitude	06/06/2022	Pipistrellus pygmaeus	0
Spring 2	51.951872.-9.26782983	Latitude and Longitude	07/06/2022	Pipistrellus pygmaeus	0
Spring 2	51.951872.-9.26782984	Latitude and Longitude	08/06/2022	Pipistrellus pygmaeus	2
Spring 3	51.95662686.-9.26621732	Latitude and Longitude	27/05/2022	Pipistrellus pygmaeus	0
Spring 3	51.95662686.-9.26621733	Latitude and Longitude	28/05/2022	Pipistrellus pygmaeus	0
Spring 3	51.95662686.-9.26621734	Latitude and Longitude	29/05/2022	Pipistrellus pygmaeus	1
Spring 3	51.95662686.-9.26621735	Latitude and Longitude	30/05/2022	Pipistrellus pygmaeus	0
Spring 3	51.95662686.-9.26621736	Latitude and Longitude	31/05/2022	Pipistrellus pygmaeus	0
Spring 3	51.95662686.-9.26621737	Latitude and Longitude	01/06/2022	Pipistrellus pygmaeus	0
Spring 3	51.95662686.-9.26621738	Latitude and Longitude	02/06/2022	Pipistrellus pygmaeus	0
Spring 3	51.95662686.-9.26621739	Latitude and Longitude	03/06/2022	Pipistrellus pygmaeus	0
Spring 3	51.95662686.-9.26621740	Latitude and Longitude	04/06/2022	Pipistrellus pygmaeus	0
Spring 3	51.95662686.-9.26621741	Latitude and Longitude	05/06/2022	Pipistrellus pygmaeus	0
Spring 3	51.95662686.-9.26621742	Latitude and Longitude	06/06/2022	Pipistrellus pygmaeus	0
Spring 3	51.95662686.-9.26621743	Latitude and Longitude	07/06/2022	Pipistrellus pygmaeus	0
Spring 3	51.95662686.-9.26621744	Latitude and Longitude	08/06/2022	Pipistrellus pygmaeus	0
Spring 4	51.95680764,-9.256896475	Latitude and Longitude	27/05/2022	Pipistrellus pygmaeus	1
Spring 4	51.95680764,-9.256896476	Latitude and Longitude	28/05/2022	Pipistrellus pygmaeus	2
Spring 4	51.95680764,-9.256896477	Latitude and Longitude	29/05/2022	Pipistrellus pygmaeus	3
Spring 4	51.95680764,-9.256896478	Latitude and Longitude	30/05/2022	Pipistrellus pygmaeus	0
Spring 4	51.95680764,-9.256896479	Latitude and Longitude	31/05/2022	Pipistrellus pygmaeus	0
Spring 4	51.95680764,-9.256896480	Latitude and Longitude	01/06/2022	Pipistrellus pygmaeus	1
Spring 4	51.95680764,-9.256896481	Latitude and Longitude	02/06/2022	Pipistrellus pygmaeus	0
Spring 4	51.95680764,-9.256896482	Latitude and Longitude	03/06/2022	Pipistrellus pygmaeus	1
Spring 4	51.95680764,-9.256896483	Latitude and Longitude	04/06/2022	Pipistrellus pygmaeus	0
Spring 4	51.95680764,-9.256896484	Latitude and Longitude	05/06/2022	Pipistrellus pygmaeus	0
Spring 4	51.95680764,-9.256896485	Latitude and Longitude	06/06/2022	Pipistrellus pygmaeus	0
Spring 4	51.95680764,-9.256896486	Latitude and Longitude	07/06/2022	Pipistrellus pygmaeus	0
Spring 4	51.95680764,-9.256896487	Latitude and Longitude	08/06/2022	Pipistrellus pygmaeus	40
Spring 5	51.95361514,-9.251947790	Latitude and Longitude	27/05/2022	Pipistrellus pygmaeus	1

Spring 5	51.95361514,-9.251947791	Latitude and Longitude	28/05/2022	Pipistrellus pygmaeus	1
Spring 5	51.95361514,-9.251947792	Latitude and Longitude	29/05/2022	Pipistrellus pygmaeus	6
Spring 5	51.95361514,-9.251947793	Latitude and Longitude	30/05/2022	Pipistrellus pygmaeus	0
Spring 5	51.95361514,-9.251947794	Latitude and Longitude	31/05/2022	Pipistrellus pygmaeus	0
Spring 5	51.95361514,-9.251947795	Latitude and Longitude	01/06/2022	Pipistrellus pygmaeus	0
Spring 5	51.95361514,-9.251947796	Latitude and Longitude	02/06/2022	Pipistrellus pygmaeus	0
Spring 5	51.95361514,-9.251947797	Latitude and Longitude	03/06/2022	Pipistrellus pygmaeus	0
Spring 5	51.95361514,-9.251947798	Latitude and Longitude	04/06/2022	Pipistrellus pygmaeus	1
Spring 5	51.95361514,-9.251947799	Latitude and Longitude	05/06/2022	Pipistrellus pygmaeus	0
Spring 5	51.95361514,-9.251947800	Latitude and Longitude	06/06/2022	Pipistrellus pygmaeus	0
Spring 5	51.95361514,-9.251947801	Latitude and Longitude	07/06/2022	Pipistrellus pygmaeus	0
Spring 5	51.95361514,-9.251947802	Latitude and Longitude	08/06/2022	Pipistrellus pygmaeus	0
Spring 6	51.95017242,-9.248534923	Latitude and Longitude	06/07/2022	Pipistrellus pygmaeus	0
Spring 6	51.95017242,-9.248534924	Latitude and Longitude	07/07/2022	Pipistrellus pygmaeus	0
Spring 6	51.95017242,-9.248534925	Latitude and Longitude	08/07/2022	Pipistrellus pygmaeus	1
Spring 6	51.95017242,-9.248534926	Latitude and Longitude	09/07/2022	Pipistrellus pygmaeus	23
Spring 6	51.95017242,-9.248534927	Latitude and Longitude	10/07/2022	Pipistrellus pygmaeus	32
Spring 6	51.95017242,-9.248534928	Latitude and Longitude	11/07/2022	Pipistrellus pygmaeus	6
Spring 6	51.95017242,-9.248534929	Latitude and Longitude	12/07/2022	Pipistrellus pygmaeus	1
Spring 6	51.95017242,-9.248534930	Latitude and Longitude	13/07/2022	Pipistrellus pygmaeus	0
Spring 6	51.95017242,-9.248534931	Latitude and Longitude	14/07/2022	Pipistrellus pygmaeus	5
Spring 6	51.95017242,-9.248534932	Latitude and Longitude	15/07/2022	Pipistrellus pygmaeus	2
Spring 6	51.95017242,-9.248534933	Latitude and Longitude	16/07/2022	Pipistrellus pygmaeus	4
Spring 6	51.95017242,-9.248534934	Latitude and Longitude	17/07/2022	Pipistrellus pygmaeus	4
Spring 6	51.95017242,-9.248534935	Latitude and Longitude	18/07/2022	Pipistrellus pygmaeus	2
Spring 6	51.95017242,-9.248534936	Latitude and Longitude	19/07/2022	Pipistrellus pygmaeus	4
Spring 6	51.95017242,-9.248534937	Latitude and Longitude	20/07/2022	Pipistrellus pygmaeus	1
Spring 2	51.951872.-9.26782985	Latitude and Longitude	27/05/2022	Plecotus auritus	0
Spring 2	51.951872.-9.26782986	Latitude and Longitude	28/05/2022	Plecotus auritus	0
Spring 2	51.951872.-9.26782987	Latitude and Longitude	29/05/2022	Plecotus auritus	0
Spring 2	51.951872.-9.26782988	Latitude and Longitude	30/05/2022	Plecotus auritus	0
Spring 2	51.951872.-9.26782989	Latitude and Longitude	31/05/2022	Plecotus auritus	0
Spring 2	51.951872.-9.26782990	Latitude and Longitude	01/06/2022	Plecotus auritus	0
Spring 2	51.951872.-9.26782991	Latitude and Longitude	02/06/2022	Plecotus auritus	1
Spring 2	51.951872.-9.26782992	Latitude and Longitude	03/06/2022	Plecotus auritus	1
Spring 2	51.951872.-9.26782993	Latitude and Longitude	04/06/2022	Plecotus auritus	0
Spring 2	51.951872.-9.26782994	Latitude and Longitude	05/06/2022	Plecotus auritus	0
Spring 2	51.951872.-9.26782995	Latitude and Longitude	06/06/2022	Plecotus auritus	0

Spring 2	51.951872.-9.26782996	Latitude and Longitude	07/06/2022	Plecotus auritus	0
Spring 2	51.951872.-9.26782997	Latitude and Longitude	08/06/2022	Plecotus auritus	0
Spring 3	51.95662686.-9.26621745	Latitude and Longitude	27/05/2022	Plecotus auritus	0
Spring 3	51.95662686.-9.26621746	Latitude and Longitude	28/05/2022	Plecotus auritus	0
Spring 3	51.95662686.-9.26621747	Latitude and Longitude	29/05/2022	Plecotus auritus	0
Spring 3	51.95662686.-9.26621748	Latitude and Longitude	30/05/2022	Plecotus auritus	0
Spring 3	51.95662686.-9.26621749	Latitude and Longitude	31/05/2022	Plecotus auritus	1
Spring 3	51.95662686.-9.26621750	Latitude and Longitude	01/06/2022	Plecotus auritus	0
Spring 3	51.95662686.-9.26621751	Latitude and Longitude	02/06/2022	Plecotus auritus	0
Spring 3	51.95662686.-9.26621752	Latitude and Longitude	03/06/2022	Plecotus auritus	0
Spring 3	51.95662686.-9.26621753	Latitude and Longitude	04/06/2022	Plecotus auritus	0
Spring 3	51.95662686.-9.26621754	Latitude and Longitude	05/06/2022	Plecotus auritus	0
Spring 3	51.95662686.-9.26621755	Latitude and Longitude	06/06/2022	Plecotus auritus	0
Spring 3	51.95662686.-9.26621756	Latitude and Longitude	07/06/2022	Plecotus auritus	0
Spring 3	51.95662686.-9.26621757	Latitude and Longitude	08/06/2022	Plecotus auritus	0
Spring 5	51.95361514,-9.251947803	Latitude and Longitude	27/05/2022	Plecotus auritus	0
Spring 5	51.95361514,-9.251947804	Latitude and Longitude	28/05/2022	Plecotus auritus	0
Spring 5	51.95361514,-9.251947805	Latitude and Longitude	29/05/2022	Plecotus auritus	0
Spring 5	51.95361514,-9.251947806	Latitude and Longitude	30/05/2022	Plecotus auritus	0
Spring 5	51.95361514,-9.251947807	Latitude and Longitude	31/05/2022	Plecotus auritus	0
Spring 5	51.95361514,-9.251947808	Latitude and Longitude	01/06/2022	Plecotus auritus	0
Spring 5	51.95361514,-9.251947809	Latitude and Longitude	02/06/2022	Plecotus auritus	0
Spring 5	51.95361514,-9.251947810	Latitude and Longitude	03/06/2022	Plecotus auritus	0
Spring 5	51.95361514,-9.251947811	Latitude and Longitude	04/06/2022	Plecotus auritus	1
Spring 5	51.95361514,-9.251947812	Latitude and Longitude	05/06/2022	Plecotus auritus	0
Spring 5	51.95361514,-9.251947813	Latitude and Longitude	06/06/2022	Plecotus auritus	1
Spring 5	51.95361514,-9.251947814	Latitude and Longitude	07/06/2022	Plecotus auritus	1
Spring 5	51.95361514,-9.251947815	Latitude and Longitude	08/06/2022	Plecotus auritus	0
Spring 6	51.95017242,-9.248534938	Latitude and Longitude	06/07/2022	Plecotus auritus	0
Spring 6	51.95017242,-9.248534939	Latitude and Longitude	07/07/2022	Plecotus auritus	0
Spring 6	51.95017242,-9.248534940	Latitude and Longitude	08/07/2022	Plecotus auritus	0
Spring 6	51.95017242,-9.248534941	Latitude and Longitude	09/07/2022	Plecotus auritus	0
Spring 6	51.95017242,-9.248534942	Latitude and Longitude	10/07/2022	Plecotus auritus	0
Spring 6	51.95017242,-9.248534943	Latitude and Longitude	11/07/2022	Plecotus auritus	0
Spring 6	51.95017242,-9.248534944	Latitude and Longitude	12/07/2022	Plecotus auritus	0
Spring 6	51.95017242,-9.248534945	Latitude and Longitude	13/07/2022	Plecotus auritus	0
Spring 6	51.95017242,-9.248534946	Latitude and Longitude	14/07/2022	Plecotus auritus	0
Spring 6	51.95017242,-9.248534947	Latitude and Longitude	15/07/2022	Plecotus auritus	1

Spring 6	51.95017242,-9.248534948	Latitude and Longitude	16/07/2022	Plecotus auritus	1
Spring 6	51.95017242,-9.248534949	Latitude and Longitude	17/07/2022	Plecotus auritus	0
Spring 6	51.95017242,-9.248534950	Latitude and Longitude	18/07/2022	Plecotus auritus	0
Spring 6	51.95017242,-9.248534951	Latitude and Longitude	19/07/2022	Plecotus auritus	0
Spring 6	51.95017242,-9.248534952	Latitude and Longitude	20/07/2022	Plecotus auritus	1

Table C: Nightly data for each bat species recorded on each static unit during Summer Surveillance 2022

Location name	Location of bat detector (geographic coordinates)	Spatial Reference System	Date of bat survey	Species	Passes per night
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	21/07/2022	Myotis	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	22/07/2022	Myotis	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	23/07/2022	Myotis	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	24/07/2022	Myotis	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	25/07/2022	Myotis	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	26/07/2022	Myotis	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	28/07/2022	Myotis	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	29/07/2022	Myotis	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	30/07/2022	Myotis	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	31/07/2022	Myotis	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	21/07/2022	Myotis	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	22/07/2022	Myotis	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	23/07/2022	Myotis	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	24/07/2022	Myotis	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	25/07/2022	Myotis	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	28/07/2022	Myotis	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	29/07/2022	Myotis	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	31/07/2022	Myotis	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	21/07/2022	Myotis	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	22/07/2022	Myotis	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	23/07/2022	Myotis	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	24/07/2022	Myotis	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	25/07/2022	Myotis	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	26/07/2022	Myotis	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	27/07/2022	Myotis	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	30/07/2022	Myotis	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	31/07/2022	Myotis	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	27/07/2022	Myotis	1
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	26/07/2022	Myotis	1
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	30/07/2022	Myotis	1

Summer 6	51.95017242,-9.248535012	Latitude and Longitude	28/07/2022	Myotis	1
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	29/07/2022	Myotis	1
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	27/07/2022	Myotis	3
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	22/07/2022	Myotis daubentonii	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	23/07/2022	Myotis daubentonii	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	25/07/2022	Myotis daubentonii	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	27/07/2022	Myotis daubentonii	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	29/07/2022	Myotis daubentonii	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	30/07/2022	Myotis daubentonii	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	31/07/2022	Myotis daubentonii	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	21/07/2022	Myotis daubentonii	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	22/07/2022	Myotis daubentonii	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	23/07/2022	Myotis daubentonii	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	24/07/2022	Myotis daubentonii	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	25/07/2022	Myotis daubentonii	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	28/07/2022	Myotis daubentonii	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	29/07/2022	Myotis daubentonii	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	30/07/2022	Myotis daubentonii	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	31/07/2022	Myotis daubentonii	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	21/07/2022	Myotis daubentonii	1
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	24/07/2022	Myotis daubentonii	1
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	26/07/2022	Myotis daubentonii	1
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	28/07/2022	Myotis daubentonii	1
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	26/07/2022	Myotis daubentonii	1
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	27/07/2022	Myotis daubentonii	1
Summer 2	51.951872,-9.26782997	Latitude and Longitude	21/07/2022	Myotis mystacinus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	22/07/2022	Myotis mystacinus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	23/07/2022	Myotis mystacinus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	24/07/2022	Myotis mystacinus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	25/07/2022	Myotis mystacinus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	26/07/2022	Myotis mystacinus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	30/07/2022	Myotis mystacinus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	31/07/2022	Myotis mystacinus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	21/07/2022	Myotis mystacinus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	23/07/2022	Myotis mystacinus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	24/07/2022	Myotis mystacinus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	25/07/2022	Myotis mystacinus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	26/07/2022	Myotis mystacinus	0

Summer 3	51.95662686,-9.26621809	Latitude and Longitude	27/07/2022	Myotis mystacinus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	28/07/2022	Myotis mystacinus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	30/07/2022	Myotis mystacinus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	31/07/2022	Myotis mystacinus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	21/07/2022	Myotis mystacinus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	22/07/2022	Myotis mystacinus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	23/07/2022	Myotis mystacinus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	24/07/2022	Myotis mystacinus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	25/07/2022	Myotis mystacinus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	26/07/2022	Myotis mystacinus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	28/07/2022	Myotis mystacinus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	29/07/2022	Myotis mystacinus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	30/07/2022	Myotis mystacinus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	31/07/2022	Myotis mystacinus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	27/07/2022	Myotis mystacinus	1
Summer 2	51.951872,-9.26782997	Latitude and Longitude	28/07/2022	Myotis mystacinus	1
Summer 2	51.951872,-9.26782997	Latitude and Longitude	29/07/2022	Myotis mystacinus	1
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	22/07/2022	Myotis mystacinus	1
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	27/07/2022	Myotis mystacinus	1
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	29/07/2022	Myotis mystacinus	2
Summer 2	51.951872,-9.26782997	Latitude and Longitude	21/07/2022	Myotis nattereri	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	22/07/2022	Myotis nattereri	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	23/07/2022	Myotis nattereri	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	24/07/2022	Myotis nattereri	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	26/07/2022	Myotis nattereri	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	27/07/2022	Myotis nattereri	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	28/07/2022	Myotis nattereri	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	29/07/2022	Myotis nattereri	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	30/07/2022	Myotis nattereri	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	31/07/2022	Myotis nattereri	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	21/07/2022	Myotis nattereri	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	22/07/2022	Myotis nattereri	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	23/07/2022	Myotis nattereri	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	24/07/2022	Myotis nattereri	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	25/07/2022	Myotis nattereri	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	27/07/2022	Myotis nattereri	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	28/07/2022	Myotis nattereri	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	29/07/2022	Myotis nattereri	0

Summer 3	51.95662686,-9.26621809	Latitude and Longitude	31/07/2022	Myotis nattereri	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	21/07/2022	Myotis nattereri	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	22/07/2022	Myotis nattereri	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	23/07/2022	Myotis nattereri	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	24/07/2022	Myotis nattereri	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	25/07/2022	Myotis nattereri	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	27/07/2022	Myotis nattereri	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	28/07/2022	Myotis nattereri	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	29/07/2022	Myotis nattereri	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	30/07/2022	Myotis nattereri	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	31/07/2022	Myotis nattereri	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	21/07/2022	Myotis nattereri	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	22/07/2022	Myotis nattereri	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	23/07/2022	Myotis nattereri	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	24/07/2022	Myotis nattereri	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	25/07/2022	Myotis nattereri	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	26/07/2022	Myotis nattereri	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	27/07/2022	Myotis nattereri	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	28/07/2022	Myotis nattereri	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	30/07/2022	Myotis nattereri	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	31/07/2022	Myotis nattereri	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	25/07/2022	Myotis nattereri	1
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	26/07/2022	Myotis nattereri	1
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	30/07/2022	Myotis nattereri	1
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	26/07/2022	Myotis nattereri	1
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	29/07/2022	Myotis nattereri	1
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	23/07/2022	Nyctalus leisleri	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	24/07/2022	Nyctalus leisleri	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	25/07/2022	Nyctalus leisleri	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	28/07/2022	Nyctalus leisleri	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	30/07/2022	Nyctalus leisleri	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	21/07/2022	Nyctalus leisleri	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	23/07/2022	Nyctalus leisleri	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	24/07/2022	Nyctalus leisleri	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	25/07/2022	Nyctalus leisleri	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	30/07/2022	Nyctalus leisleri	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	21/07/2022	Nyctalus leisleri	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	23/07/2022	Nyctalus leisleri	0

Summer 3	51.95662686,-9.26621809	Latitude and Longitude	24/07/2022	Nyctalus leisleri	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	25/07/2022	Nyctalus leisleri	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	30/07/2022	Nyctalus leisleri	0
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	21/07/2022	Nyctalus leisleri	0
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	23/07/2022	Nyctalus leisleri	0
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	24/07/2022	Nyctalus leisleri	0
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	25/07/2022	Nyctalus leisleri	0
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	30/07/2022	Nyctalus leisleri	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	24/07/2022	Nyctalus leisleri	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	25/07/2022	Nyctalus leisleri	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	30/07/2022	Nyctalus leisleri	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	31/07/2022	Nyctalus leisleri	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	30/07/2022	Nyctalus leisleri	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	21/07/2022	Nyctalus leisleri	1
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	29/07/2022	Nyctalus leisleri	1
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	31/07/2022	Nyctalus leisleri	1
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	31/07/2022	Nyctalus leisleri	1
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	31/07/2022	Nyctalus leisleri	1
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	21/07/2022	Nyctalus leisleri	1
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	23/07/2022	Nyctalus leisleri	1
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	28/07/2022	Nyctalus leisleri	1
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	25/07/2022	Nyctalus leisleri	1
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	27/07/2022	Nyctalus leisleri	1
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	31/07/2022	Nyctalus leisleri	1
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	22/07/2022	Nyctalus leisleri	2
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	26/07/2022	Nyctalus leisleri	2
Summer 2	51.951872,-9.26782997	Latitude and Longitude	22/07/2022	Nyctalus leisleri	2
Summer 2	51.951872,-9.26782997	Latitude and Longitude	31/07/2022	Nyctalus leisleri	2
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	28/07/2022	Nyctalus leisleri	3
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	29/07/2022	Nyctalus leisleri	3
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	21/07/2022	Nyctalus leisleri	3
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	24/07/2022	Nyctalus leisleri	3
Summer 2	51.951872,-9.26782997	Latitude and Longitude	29/07/2022	Nyctalus leisleri	4
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	29/07/2022	Nyctalus leisleri	4
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	28/07/2022	Nyctalus leisleri	4
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	27/07/2022	Nyctalus leisleri	5
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	22/07/2022	Nyctalus leisleri	5
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	29/07/2022	Nyctalus leisleri	5

Summer 1	51.95563163,-9.27513818	Latitude and Longitude	27/07/2022	Nyctalus leisleri	6
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	28/07/2022	Nyctalus leisleri	6
Summer 2	51.951872,-9.26782997	Latitude and Longitude	28/07/2022	Nyctalus leisleri	7
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	27/07/2022	Nyctalus leisleri	7
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	29/07/2022	Nyctalus leisleri	7
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	26/07/2022	Nyctalus leisleri	8
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	23/07/2022	Nyctalus leisleri	8
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	26/07/2022	Nyctalus leisleri	8
Summer 2	51.951872,-9.26782997	Latitude and Longitude	26/07/2022	Nyctalus leisleri	10
Summer 2	51.951872,-9.26782997	Latitude and Longitude	27/07/2022	Nyctalus leisleri	10
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	26/07/2022	Nyctalus leisleri	10
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	27/07/2022	Nyctalus leisleri	10
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	22/07/2022	Nyctalus leisleri	14
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	26/07/2022	Nyctalus leisleri	16
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	22/07/2022	Nyctalus leisleri	16
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	22/07/2022	Nyctalus leisleri	17
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	21/07/2022	Pipistrellus pipistrellus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	22/07/2022	Pipistrellus pipistrellus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	23/07/2022	Pipistrellus pipistrellus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	24/07/2022	Pipistrellus pipistrellus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	25/07/2022	Pipistrellus pipistrellus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	27/07/2022	Pipistrellus pipistrellus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	28/07/2022	Pipistrellus pipistrellus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	29/07/2022	Pipistrellus pipistrellus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	30/07/2022	Pipistrellus pipistrellus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	31/07/2022	Pipistrellus pipistrellus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	25/07/2022	Pipistrellus pipistrellus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	30/07/2022	Pipistrellus pipistrellus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	23/07/2022	Pipistrellus pipistrellus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	25/07/2022	Pipistrellus pipistrellus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	30/07/2022	Pipistrellus pipistrellus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	31/07/2022	Pipistrellus pipistrellus	0
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	23/07/2022	Pipistrellus pipistrellus	0
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	24/07/2022	Pipistrellus pipistrellus	0
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	25/07/2022	Pipistrellus pipistrellus	0
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	30/07/2022	Pipistrellus pipistrellus	0
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	31/07/2022	Pipistrellus pipistrellus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	23/07/2022	Pipistrellus pipistrellus	0

Summer 5	51.95361514,-9.251947841	Latitude and Longitude	24/07/2022	Pipistrellus pipistrellus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	25/07/2022	Pipistrellus pipistrellus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	30/07/2022	Pipistrellus pipistrellus	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	24/07/2022	Pipistrellus pipistrellus	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	25/07/2022	Pipistrellus pipistrellus	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	30/07/2022	Pipistrellus pipistrellus	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	31/07/2022	Pipistrellus pipistrellus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	31/07/2022	Pipistrellus pipistrellus	1
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	21/07/2022	Pipistrellus pipistrellus	1
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	28/07/2022	Pipistrellus pipistrellus	1
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	21/07/2022	Pipistrellus pipistrellus	1
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	31/07/2022	Pipistrellus pipistrellus	1
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	23/07/2022	Pipistrellus pipistrellus	1
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	26/07/2022	Pipistrellus pipistrellus	3
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	22/07/2022	Pipistrellus pipistrellus	3
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	26/07/2022	Pipistrellus pipistrellus	3
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	29/07/2022	Pipistrellus pipistrellus	3
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	22/07/2022	Pipistrellus pipistrellus	3
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	29/07/2022	Pipistrellus pipistrellus	3
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	28/07/2022	Pipistrellus pipistrellus	4
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	26/07/2022	Pipistrellus pipistrellus	6
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	24/07/2022	Pipistrellus pipistrellus	8
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	27/07/2022	Pipistrellus pipistrellus	11
Summer 2	51.951872,-9.26782997	Latitude and Longitude	23/07/2022	Pipistrellus pipistrellus	13
Summer 2	51.951872,-9.26782997	Latitude and Longitude	24/07/2022	Pipistrellus pipistrellus	13
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	27/07/2022	Pipistrellus pipistrellus	17
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	22/07/2022	Pipistrellus pipistrellus	28
Summer 2	51.951872,-9.26782997	Latitude and Longitude	29/07/2022	Pipistrellus pipistrellus	32
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	29/07/2022	Pipistrellus pipistrellus	41
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	22/07/2022	Pipistrellus pipistrellus	43
Summer 2	51.951872,-9.26782997	Latitude and Longitude	28/07/2022	Pipistrellus pipistrellus	44
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	21/07/2022	Pipistrellus pipistrellus	45
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	21/07/2022	Pipistrellus pipistrellus	54
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	27/07/2022	Pipistrellus pipistrellus	54
Summer 2	51.951872,-9.26782997	Latitude and Longitude	21/07/2022	Pipistrellus pipistrellus	72
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	29/07/2022	Pipistrellus pipistrellus	77
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	27/07/2022	Pipistrellus pipistrellus	85
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	26/07/2022	Pipistrellus pipistrellus	106

Summer 2	51.951872,-9.26782997	Latitude and Longitude	26/07/2022	Pipistrellus pipistrellus	109
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	28/07/2022	Pipistrellus pipistrellus	111
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	26/07/2022	Pipistrellus pipistrellus	157
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	28/07/2022	Pipistrellus pipistrellus	175
Summer 2	51.951872,-9.26782997	Latitude and Longitude	27/07/2022	Pipistrellus pipistrellus	192
Summer 2	51.951872,-9.26782997	Latitude and Longitude	22/07/2022	Pipistrellus pipistrellus	238
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	22/07/2022	Pipistrellus pygmaeus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	23/07/2022	Pipistrellus pygmaeus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	24/07/2022	Pipistrellus pygmaeus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	25/07/2022	Pipistrellus pygmaeus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	26/07/2022	Pipistrellus pygmaeus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	27/07/2022	Pipistrellus pygmaeus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	29/07/2022	Pipistrellus pygmaeus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	30/07/2022	Pipistrellus pygmaeus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	23/07/2022	Pipistrellus pygmaeus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	24/07/2022	Pipistrellus pygmaeus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	25/07/2022	Pipistrellus pygmaeus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	28/07/2022	Pipistrellus pygmaeus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	21/07/2022	Pipistrellus pygmaeus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	23/07/2022	Pipistrellus pygmaeus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	24/07/2022	Pipistrellus pygmaeus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	25/07/2022	Pipistrellus pygmaeus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	30/07/2022	Pipistrellus pygmaeus	0
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	21/07/2022	Pipistrellus pygmaeus	0
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	22/07/2022	Pipistrellus pygmaeus	0
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	23/07/2022	Pipistrellus pygmaeus	0
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	24/07/2022	Pipistrellus pygmaeus	0
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	25/07/2022	Pipistrellus pygmaeus	0
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	26/07/2022	Pipistrellus pygmaeus	0
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	28/07/2022	Pipistrellus pygmaeus	0
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	29/07/2022	Pipistrellus pygmaeus	0
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	30/07/2022	Pipistrellus pygmaeus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	21/07/2022	Pipistrellus pygmaeus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	23/07/2022	Pipistrellus pygmaeus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	24/07/2022	Pipistrellus pygmaeus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	25/07/2022	Pipistrellus pygmaeus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	26/07/2022	Pipistrellus pygmaeus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	29/07/2022	Pipistrellus pygmaeus	0

Summer 5	51.95361514,-9.251947841	Latitude and Longitude	30/07/2022	Pipistrellus pygmaeus	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	21/07/2022	Pipistrellus pygmaeus	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	23/07/2022	Pipistrellus pygmaeus	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	25/07/2022	Pipistrellus pygmaeus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	21/07/2022	Pipistrellus pygmaeus	1
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	28/07/2022	Pipistrellus pygmaeus	1
Summer 2	51.951872,-9.26782997	Latitude and Longitude	21/07/2022	Pipistrellus pygmaeus	1
Summer 2	51.951872,-9.26782997	Latitude and Longitude	30/07/2022	Pipistrellus pygmaeus	1
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	27/07/2022	Pipistrellus pygmaeus	1
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	24/07/2022	Pipistrellus pygmaeus	1
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	30/07/2022	Pipistrellus pygmaeus	1
Summer 2	51.951872,-9.26782997	Latitude and Longitude	26/07/2022	Pipistrellus pygmaeus	2
Summer 4	51.95680764,-9.256896526	Latitude and Longitude	31/07/2022	Pipistrellus pygmaeus	2
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	28/07/2022	Pipistrellus pygmaeus	2
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	26/07/2022	Pipistrellus pygmaeus	2
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	27/07/2022	Pipistrellus pygmaeus	2
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	31/07/2022	Pipistrellus pygmaeus	3
Summer 2	51.951872,-9.26782997	Latitude and Longitude	31/07/2022	Pipistrellus pygmaeus	3
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	31/07/2022	Pipistrellus pygmaeus	3
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	31/07/2022	Pipistrellus pygmaeus	3
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	29/07/2022	Pipistrellus pygmaeus	3
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	31/07/2022	Pipistrellus pygmaeus	3
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	22/07/2022	Pipistrellus pygmaeus	4
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	26/07/2022	Pipistrellus pygmaeus	4
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	29/07/2022	Pipistrellus pygmaeus	4
Summer 2	51.951872,-9.26782997	Latitude and Longitude	27/07/2022	Pipistrellus pygmaeus	5
Summer 2	51.951872,-9.26782997	Latitude and Longitude	29/07/2022	Pipistrellus pygmaeus	5
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	22/07/2022	Pipistrellus pygmaeus	5
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	27/07/2022	Pipistrellus pygmaeus	6
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	28/07/2022	Pipistrellus pygmaeus	7
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	28/07/2022	Pipistrellus pygmaeus	7
Summer 2	51.951872,-9.26782997	Latitude and Longitude	22/07/2022	Pipistrellus pygmaeus	9
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	27/07/2022	Pipistrellus pygmaeus	17
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	22/07/2022	Pipistrellus pygmaeus	19
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	21/07/2022	Plecotus auritus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	23/07/2022	Plecotus auritus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	24/07/2022	Plecotus auritus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	25/07/2022	Plecotus auritus	0

Summer 1	51.95563163,-9.27513818	Latitude and Longitude	26/07/2022	Plecotus auritus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	27/07/2022	Plecotus auritus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	28/07/2022	Plecotus auritus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	29/07/2022	Plecotus auritus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	30/07/2022	Plecotus auritus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	31/07/2022	Plecotus auritus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	21/07/2022	Plecotus auritus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	22/07/2022	Plecotus auritus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	23/07/2022	Plecotus auritus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	24/07/2022	Plecotus auritus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	25/07/2022	Plecotus auritus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	28/07/2022	Plecotus auritus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	29/07/2022	Plecotus auritus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	30/07/2022	Plecotus auritus	0
Summer 2	51.951872,-9.26782997	Latitude and Longitude	31/07/2022	Plecotus auritus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	21/07/2022	Plecotus auritus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	22/07/2022	Plecotus auritus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	23/07/2022	Plecotus auritus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	24/07/2022	Plecotus auritus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	25/07/2022	Plecotus auritus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	27/07/2022	Plecotus auritus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	29/07/2022	Plecotus auritus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	30/07/2022	Plecotus auritus	0
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	31/07/2022	Plecotus auritus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	21/07/2022	Plecotus auritus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	22/07/2022	Plecotus auritus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	23/07/2022	Plecotus auritus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	24/07/2022	Plecotus auritus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	25/07/2022	Plecotus auritus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	28/07/2022	Plecotus auritus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	29/07/2022	Plecotus auritus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	30/07/2022	Plecotus auritus	0
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	31/07/2022	Plecotus auritus	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	21/07/2022	Plecotus auritus	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	22/07/2022	Plecotus auritus	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	23/07/2022	Plecotus auritus	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	24/07/2022	Plecotus auritus	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	25/07/2022	Plecotus auritus	0

Summer 6	51.95017242,-9.248535012	Latitude and Longitude	27/07/2022	Plecotus auritus	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	29/07/2022	Plecotus auritus	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	30/07/2022	Plecotus auritus	0
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	31/07/2022	Plecotus auritus	0
Summer 1	51.95563163,-9.27513818	Latitude and Longitude	22/07/2022	Plecotus auritus	1
Summer 2	51.951872,-9.26782997	Latitude and Longitude	26/07/2022	Plecotus auritus	1
Summer 2	51.951872,-9.26782997	Latitude and Longitude	27/07/2022	Plecotus auritus	1
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	26/07/2022	Plecotus auritus	1
Summer 3	51.95662686,-9.26621809	Latitude and Longitude	28/07/2022	Plecotus auritus	1
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	26/07/2022	Plecotus auritus	1
Summer 5	51.95361514,-9.251947841	Latitude and Longitude	27/07/2022	Plecotus auritus	1
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	26/07/2022	Plecotus auritus	1
Summer 6	51.95017242,-9.248535012	Latitude and Longitude	28/07/2022	Plecotus auritus	1

Table D: Nightly data for each bat species recorded on each static unit during Autumn Surveillance 2022

Location name	Location of bat detector (geographic coordinates)	Spatial Reference System	Date of bat survey	Species	Passes per night
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	24/08/2022	Myotis	1
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	25/08/2022	Myotis	1
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	26/08/2022	Myotis	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	27/08/2022	Myotis	2
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	28/08/2022	Myotis	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	29/08/2022	Myotis	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	30/08/2022	Myotis	3
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	31/08/2022	Myotis	1
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	01/09/2022	Myotis	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	02/09/2022	Myotis	2
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	24/08/2022	Myotis	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	25/08/2022	Myotis	1
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	26/08/2022	Myotis	2
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	27/08/2022	Myotis	1
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	28/08/2022	Myotis	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	29/08/2022	Myotis	2
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	30/08/2022	Myotis	5
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	31/08/2022	Myotis	2
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	01/09/2022	Myotis	2
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	02/09/2022	Myotis	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	24/08/2022	Myotis	1
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	25/08/2022	Myotis	0

Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	26/08/2022	Myotis	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	27/08/2022	Myotis	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	28/08/2022	Myotis	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	29/08/2022	Myotis	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	30/08/2022	Myotis	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	31/08/2022	Myotis	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	01/09/2022	Myotis	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	02/09/2022	Myotis	3
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	24/08/2022	Myotis	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	25/08/2022	Myotis	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	26/08/2022	Myotis	1
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	27/08/2022	Myotis	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	28/08/2022	Myotis	3
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	29/08/2022	Myotis	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	30/08/2022	Myotis	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	31/08/2022	Myotis	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	01/09/2022	Myotis	2
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	02/09/2022	Myotis	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	24/08/2022	Myotis	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	25/08/2022	Myotis	2
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	26/08/2022	Myotis	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	27/08/2022	Myotis	3
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	28/08/2022	Myotis	2
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	29/08/2022	Myotis	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	30/08/2022	Myotis	2
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	31/08/2022	Myotis	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	01/09/2022	Myotis	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	02/09/2022	Myotis	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	24/08/2022	Myotis daubentonii	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	25/08/2022	Myotis daubentonii	2
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	26/08/2022	Myotis daubentonii	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	27/08/2022	Myotis daubentonii	8
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	28/08/2022	Myotis daubentonii	2
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	29/08/2022	Myotis daubentonii	2
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	30/08/2022	Myotis daubentonii	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	31/08/2022	Myotis daubentonii	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	01/09/2022	Myotis daubentonii	1
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	02/09/2022	Myotis daubentonii	1

Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	24/08/2022	Myotis daubentonii	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	25/08/2022	Myotis daubentonii	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	26/08/2022	Myotis daubentonii	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	27/08/2022	Myotis daubentonii	1
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	28/08/2022	Myotis daubentonii	3
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	29/08/2022	Myotis daubentonii	3
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	30/08/2022	Myotis daubentonii	1
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	31/08/2022	Myotis daubentonii	3
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	01/09/2022	Myotis daubentonii	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	02/09/2022	Myotis daubentonii	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	24/08/2022	Myotis daubentonii	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	25/08/2022	Myotis daubentonii	2
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	26/08/2022	Myotis daubentonii	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	27/08/2022	Myotis daubentonii	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	28/08/2022	Myotis daubentonii	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	29/08/2022	Myotis daubentonii	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	30/08/2022	Myotis daubentonii	1
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	31/08/2022	Myotis daubentonii	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	01/09/2022	Myotis daubentonii	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	02/09/2022	Myotis daubentonii	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	24/08/2022	Myotis daubentonii	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	25/08/2022	Myotis daubentonii	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	26/08/2022	Myotis daubentonii	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	27/08/2022	Myotis daubentonii	3
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	28/08/2022	Myotis daubentonii	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	29/08/2022	Myotis daubentonii	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	30/08/2022	Myotis daubentonii	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	31/08/2022	Myotis daubentonii	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	01/09/2022	Myotis daubentonii	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	02/09/2022	Myotis daubentonii	1
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	24/08/2022	Myotis mystacinus	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	25/08/2022	Myotis mystacinus	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	26/08/2022	Myotis mystacinus	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	27/08/2022	Myotis mystacinus	1
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	28/08/2022	Myotis mystacinus	1
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	29/08/2022	Myotis mystacinus	1
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	30/08/2022	Myotis mystacinus	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	31/08/2022	Myotis mystacinus	0

Autumn 2	51.951872,-9.26782997	Latitude and Longitude	01/09/2022	Myotis mystacinus	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	02/09/2022	Myotis mystacinus	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	24/08/2022	Myotis mystacinus	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	25/08/2022	Myotis mystacinus	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	26/08/2022	Myotis mystacinus	1
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	27/08/2022	Myotis mystacinus	3
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	28/08/2022	Myotis mystacinus	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	29/08/2022	Myotis mystacinus	1
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	30/08/2022	Myotis mystacinus	1
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	31/08/2022	Myotis mystacinus	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	01/09/2022	Myotis mystacinus	1
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	02/09/2022	Myotis mystacinus	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	24/08/2022	Myotis mystacinus	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	25/08/2022	Myotis mystacinus	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	26/08/2022	Myotis mystacinus	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	27/08/2022	Myotis mystacinus	1
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	28/08/2022	Myotis mystacinus	2
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	29/08/2022	Myotis mystacinus	2
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	30/08/2022	Myotis mystacinus	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	31/08/2022	Myotis mystacinus	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	01/09/2022	Myotis mystacinus	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	02/09/2022	Myotis mystacinus	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	24/08/2022	Myotis mystacinus	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	25/08/2022	Myotis mystacinus	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	26/08/2022	Myotis mystacinus	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	27/08/2022	Myotis mystacinus	2
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	28/08/2022	Myotis mystacinus	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	29/08/2022	Myotis mystacinus	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	30/08/2022	Myotis mystacinus	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	31/08/2022	Myotis mystacinus	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	01/09/2022	Myotis mystacinus	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	02/09/2022	Myotis mystacinus	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	24/08/2022	Myotis nattereri	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	25/08/2022	Myotis nattereri	1
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	26/08/2022	Myotis nattereri	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	27/08/2022	Myotis nattereri	1
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	28/08/2022	Myotis nattereri	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	29/08/2022	Myotis nattereri	0

Autumn 2	51.951872,-9.26782997	Latitude and Longitude	30/08/2022	Myotis nattereri	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	31/08/2022	Myotis nattereri	1
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	01/09/2022	Myotis nattereri	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	02/09/2022	Myotis nattereri	3
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	24/08/2022	Myotis nattereri	3
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	25/08/2022	Myotis nattereri	1
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	26/08/2022	Myotis nattereri	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	27/08/2022	Myotis nattereri	5
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	28/08/2022	Myotis nattereri	1
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	29/08/2022	Myotis nattereri	3
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	30/08/2022	Myotis nattereri	3
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	31/08/2022	Myotis nattereri	5
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	01/09/2022	Myotis nattereri	2
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	02/09/2022	Myotis nattereri	2
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	24/08/2022	Myotis nattereri	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	25/08/2022	Myotis nattereri	1
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	26/08/2022	Myotis nattereri	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	27/08/2022	Myotis nattereri	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	28/08/2022	Myotis nattereri	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	29/08/2022	Myotis nattereri	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	30/08/2022	Myotis nattereri	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	31/08/2022	Myotis nattereri	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	01/09/2022	Myotis nattereri	1
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	02/09/2022	Myotis nattereri	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	24/08/2022	Myotis nattereri	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	25/08/2022	Myotis nattereri	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	26/08/2022	Myotis nattereri	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	27/08/2022	Myotis nattereri	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	28/08/2022	Myotis nattereri	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	29/08/2022	Myotis nattereri	2
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	30/08/2022	Myotis nattereri	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	31/08/2022	Myotis nattereri	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	01/09/2022	Myotis nattereri	2
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	02/09/2022	Myotis nattereri	2
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	24/08/2022	Nyctalus leisleri	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	25/08/2022	Nyctalus leisleri	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	26/08/2022	Nyctalus leisleri	3
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	27/08/2022	Nyctalus leisleri	7

Autumn 2	51.951872,-9.26782997	Latitude and Longitude	28/08/2022	Nyctalus leisleri	8
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	29/08/2022	Nyctalus leisleri	2
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	30/08/2022	Nyctalus leisleri	1
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	31/08/2022	Nyctalus leisleri	2
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	01/09/2022	Nyctalus leisleri	5
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	02/09/2022	Nyctalus leisleri	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	24/08/2022	Nyctalus leisleri	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	25/08/2022	Nyctalus leisleri	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	26/08/2022	Nyctalus leisleri	2
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	27/08/2022	Nyctalus leisleri	10
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	28/08/2022	Nyctalus leisleri	4
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	29/08/2022	Nyctalus leisleri	3
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	30/08/2022	Nyctalus leisleri	2
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	31/08/2022	Nyctalus leisleri	2
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	01/09/2022	Nyctalus leisleri	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	02/09/2022	Nyctalus leisleri	1
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	24/08/2022	Nyctalus leisleri	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	25/08/2022	Nyctalus leisleri	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	26/08/2022	Nyctalus leisleri	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	27/08/2022	Nyctalus leisleri	14
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	28/08/2022	Nyctalus leisleri	3
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	29/08/2022	Nyctalus leisleri	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	30/08/2022	Nyctalus leisleri	1
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	31/08/2022	Nyctalus leisleri	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	01/09/2022	Nyctalus leisleri	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	02/09/2022	Nyctalus leisleri	1
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	24/08/2022	Nyctalus leisleri	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	25/08/2022	Nyctalus leisleri	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	26/08/2022	Nyctalus leisleri	2
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	27/08/2022	Nyctalus leisleri	8
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	28/08/2022	Nyctalus leisleri	1
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	29/08/2022	Nyctalus leisleri	1
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	30/08/2022	Nyctalus leisleri	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	31/08/2022	Nyctalus leisleri	3
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	01/09/2022	Nyctalus leisleri	1
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	02/09/2022	Nyctalus leisleri	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	24/08/2022	Nyctalus leisleri	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	25/08/2022	Nyctalus leisleri	0

Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	26/08/2022	Nyctalus leisleri	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	27/08/2022	Nyctalus leisleri	7
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	28/08/2022	Nyctalus leisleri	8
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	29/08/2022	Nyctalus leisleri	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	30/08/2022	Nyctalus leisleri	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	31/08/2022	Nyctalus leisleri	3
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	01/09/2022	Nyctalus leisleri	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	02/09/2022	Nyctalus leisleri	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	24/08/2022	Pipistrellus pipistrellus	65
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	25/08/2022	Pipistrellus pipistrellus	60
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	26/08/2022	Pipistrellus pipistrellus	56
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	27/08/2022	Pipistrellus pipistrellus	198
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	28/08/2022	Pipistrellus pipistrellus	95
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	29/08/2022	Pipistrellus pipistrellus	53
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	30/08/2022	Pipistrellus pipistrellus	78
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	31/08/2022	Pipistrellus pipistrellus	121
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	01/09/2022	Pipistrellus pipistrellus	76
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	02/09/2022	Pipistrellus pipistrellus	19
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	24/08/2022	Pipistrellus pipistrellus	27
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	25/08/2022	Pipistrellus pipistrellus	19
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	26/08/2022	Pipistrellus pipistrellus	31
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	27/08/2022	Pipistrellus pipistrellus	166
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	28/08/2022	Pipistrellus pipistrellus	103
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	29/08/2022	Pipistrellus pipistrellus	38
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	30/08/2022	Pipistrellus pipistrellus	96
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	31/08/2022	Pipistrellus pipistrellus	102
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	01/09/2022	Pipistrellus pipistrellus	97
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	02/09/2022	Pipistrellus pipistrellus	3
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	24/08/2022	Pipistrellus pipistrellus	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	25/08/2022	Pipistrellus pipistrellus	12
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	26/08/2022	Pipistrellus pipistrellus	4
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	27/08/2022	Pipistrellus pipistrellus	21
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	28/08/2022	Pipistrellus pipistrellus	8
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	29/08/2022	Pipistrellus pipistrellus	2
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	30/08/2022	Pipistrellus pipistrellus	2
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	31/08/2022	Pipistrellus pipistrellus	5
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	01/09/2022	Pipistrellus pipistrellus	8
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	02/09/2022	Pipistrellus pipistrellus	1

Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	24/08/2022	Pipistrellus pipistrellus	1
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	25/08/2022	Pipistrellus pipistrellus	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	26/08/2022	Pipistrellus pipistrellus	1
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	27/08/2022	Pipistrellus pipistrellus	31
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	28/08/2022	Pipistrellus pipistrellus	17
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	29/08/2022	Pipistrellus pipistrellus	4
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	30/08/2022	Pipistrellus pipistrellus	2
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	31/08/2022	Pipistrellus pipistrellus	4
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	01/09/2022	Pipistrellus pipistrellus	5
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	02/09/2022	Pipistrellus pipistrellus	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	24/08/2022	Pipistrellus pipistrellus	2
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	25/08/2022	Pipistrellus pipistrellus	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	26/08/2022	Pipistrellus pipistrellus	51
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	27/08/2022	Pipistrellus pipistrellus	62
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	28/08/2022	Pipistrellus pipistrellus	40
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	29/08/2022	Pipistrellus pipistrellus	17
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	30/08/2022	Pipistrellus pipistrellus	49
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	31/08/2022	Pipistrellus pipistrellus	25
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	01/09/2022	Pipistrellus pipistrellus	11
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	02/09/2022	Pipistrellus pipistrellus	1
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	24/08/2022	Pipistrellus pygmaeus	7
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	25/08/2022	Pipistrellus pygmaeus	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	26/08/2022	Pipistrellus pygmaeus	2
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	27/08/2022	Pipistrellus pygmaeus	20
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	28/08/2022	Pipistrellus pygmaeus	12
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	29/08/2022	Pipistrellus pygmaeus	4
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	30/08/2022	Pipistrellus pygmaeus	5
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	31/08/2022	Pipistrellus pygmaeus	2
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	01/09/2022	Pipistrellus pygmaeus	3
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	02/09/2022	Pipistrellus pygmaeus	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	24/08/2022	Pipistrellus pygmaeus	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	25/08/2022	Pipistrellus pygmaeus	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	26/08/2022	Pipistrellus pygmaeus	5
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	27/08/2022	Pipistrellus pygmaeus	10
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	28/08/2022	Pipistrellus pygmaeus	16
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	29/08/2022	Pipistrellus pygmaeus	3
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	30/08/2022	Pipistrellus pygmaeus	10
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	31/08/2022	Pipistrellus pygmaeus	5

Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	01/09/2022	Pipistrellus pygmaeus	12
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	02/09/2022	Pipistrellus pygmaeus	1
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	24/08/2022	Pipistrellus pygmaeus	1
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	25/08/2022	Pipistrellus pygmaeus	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	26/08/2022	Pipistrellus pygmaeus	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	27/08/2022	Pipistrellus pygmaeus	3
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	28/08/2022	Pipistrellus pygmaeus	4
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	29/08/2022	Pipistrellus pygmaeus	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	30/08/2022	Pipistrellus pygmaeus	1
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	31/08/2022	Pipistrellus pygmaeus	2
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	01/09/2022	Pipistrellus pygmaeus	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	02/09/2022	Pipistrellus pygmaeus	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	24/08/2022	Pipistrellus pygmaeus	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	25/08/2022	Pipistrellus pygmaeus	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	26/08/2022	Pipistrellus pygmaeus	2
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	27/08/2022	Pipistrellus pygmaeus	7
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	28/08/2022	Pipistrellus pygmaeus	4
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	29/08/2022	Pipistrellus pygmaeus	3
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	30/08/2022	Pipistrellus pygmaeus	2
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	31/08/2022	Pipistrellus pygmaeus	2
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	01/09/2022	Pipistrellus pygmaeus	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	02/09/2022	Pipistrellus pygmaeus	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	24/08/2022	Pipistrellus pygmaeus	2
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	25/08/2022	Pipistrellus pygmaeus	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	26/08/2022	Pipistrellus pygmaeus	3
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	27/08/2022	Pipistrellus pygmaeus	7
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	28/08/2022	Pipistrellus pygmaeus	13
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	29/08/2022	Pipistrellus pygmaeus	4
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	30/08/2022	Pipistrellus pygmaeus	8
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	31/08/2022	Pipistrellus pygmaeus	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	01/09/2022	Pipistrellus pygmaeus	3
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	02/09/2022	Pipistrellus pygmaeus	1
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	24/08/2022	Plecotus auritus	3
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	25/08/2022	Plecotus auritus	1
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	26/08/2022	Plecotus auritus	1
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	27/08/2022	Plecotus auritus	5
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	28/08/2022	Plecotus auritus	0
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	29/08/2022	Plecotus auritus	2

Autumn 2	51.951872,-9.26782997	Latitude and Longitude	30/08/2022	Plecotus auritus	1
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	31/08/2022	Plecotus auritus	1
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	01/09/2022	Plecotus auritus	1
Autumn 2	51.951872,-9.26782997	Latitude and Longitude	02/09/2022	Plecotus auritus	1
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	24/08/2022	Plecotus auritus	1
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	25/08/2022	Plecotus auritus	1
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	26/08/2022	Plecotus auritus	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	27/08/2022	Plecotus auritus	2
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	28/08/2022	Plecotus auritus	2
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	29/08/2022	Plecotus auritus	4
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	30/08/2022	Plecotus auritus	3
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	31/08/2022	Plecotus auritus	1
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	01/09/2022	Plecotus auritus	1
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	02/09/2022	Plecotus auritus	3
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	24/08/2022	Plecotus auritus	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	25/08/2022	Plecotus auritus	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	26/08/2022	Plecotus auritus	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	27/08/2022	Plecotus auritus	1
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	28/08/2022	Plecotus auritus	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	29/08/2022	Plecotus auritus	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	30/08/2022	Plecotus auritus	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	31/08/2022	Plecotus auritus	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	01/09/2022	Plecotus auritus	0
Autumn 4	51.95680764,-9.256896526	Latitude and Longitude	02/09/2022	Plecotus auritus	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	24/08/2022	Plecotus auritus	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	25/08/2022	Plecotus auritus	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	26/08/2022	Plecotus auritus	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	27/08/2022	Plecotus auritus	2
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	28/08/2022	Plecotus auritus	2
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	29/08/2022	Plecotus auritus	2
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	30/08/2022	Plecotus auritus	2
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	31/08/2022	Plecotus auritus	0
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	01/09/2022	Plecotus auritus	1
Autumn 5	51.95361514,-9.251947841	Latitude and Longitude	02/09/2022	Plecotus auritus	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	24/08/2022	Plecotus auritus	1
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	25/08/2022	Plecotus auritus	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	26/08/2022	Plecotus auritus	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	27/08/2022	Plecotus auritus	3

Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	28/08/2022	Plecotus auritus	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	29/08/2022	Plecotus auritus	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	30/08/2022	Plecotus auritus	2
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	31/08/2022	Plecotus auritus	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	01/09/2022	Plecotus auritus	0
Autumn 6	51.95017242,-9.248535012	Latitude and Longitude	02/09/2022	Plecotus auritus	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	24/08/2022	Rhinolophus hipposideros	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	25/08/2022	Rhinolophus hipposideros	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	26/08/2022	Rhinolophus hipposideros	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	27/08/2022	Rhinolophus hipposideros	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	28/08/2022	Rhinolophus hipposideros	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	29/08/2022	Rhinolophus hipposideros	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	30/08/2022	Rhinolophus hipposideros	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	31/08/2022	Rhinolophus hipposideros	1
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	01/09/2022	Rhinolophus hipposideros	0
Autumn 3	51.95662686,-9.26621809	Latitude and Longitude	02/09/2022	Rhinolophus hipposideros	0

Table E: Summary of Common pipistrelle bat passes recorded on static units during static surveillance (used for analysis)

Spring 2022 Surveillance - highlights cells = >40 bat passes

Turbine	Static Code	27/05/2022	28/05/2022	29/05/2022	30/05/2022	31/05/2022	01/06/2022	02/06/2022	03/06/2022	04/06/2022	05/06/2022
T1	Spring 1	0	1	0	0	0	0	0	0	0	0
T2	Spring 2	7	322	190	29	20	66	74	55	7	1
T3	Spring 3	4	68	54	7	0	2	58	19	3	0
T4	Spring 4	2	34	31	6	1	0	0	2	5	0
T5	Spring 5	4	90	65	14	0	0	6	7	3	1

Turbine	Static Code	06/06/2022	07/06/2022	08/06/2022
T1	Spring 1	1	0	0
T2	Spring 2	74	18	308
T3	Spring 3	149	25	78
T4	Spring 4	0	0	853
T5	Spring 5	1	2	9

Turbine	Static Code	06/07/2022	07/07/2022	08/07/2022	09/07/2022	10/07/2022	11/07/2022	12/07/2022	13/07/2022	14/07/2022	15/07/2022

T6	Spring 6	6	114	67	116	306	198	287	89	190	143

Turbine	Static Code	16/07/2022	17/07/2022	18/07/2022	19/07/2022	20/07/2022
T6	Spring 6	266	104	38	70	16

Summer 2022 Surveillance - highlights cells = >40 bat passes

Turbine	Static Code	21/07/2022	22/07/2022	23/07/2022	24/07/2022	25/07/2022	26/07/2022	27/07/2022	28/07/2022	29/07/2022	30/07/2022	31/07/2022
T1	Summer 1	0	0	0	0	0	3	0	0	0	0	0
T2	Summer 2	72	238	13	13	0	109	192	44	32	0	1
T3	Summer 3	54	28	0	8	0	157	54	175	41	0	0
T4	Summer 4	1	3	0	0	0	3	11	1	3	0	0
T5	Summer 5	1	3	0	0	0	6	17	4	3	0	1
T6	Summer 6	45	43	1	0	0	106	85	111	77	0	0

Autumn 2022 1st Surveillance - highlights cells = >40 bat passes

Turbine	Static Code	24/08/2022	25/08/2022	26/08/2022	27/08/2022	28/08/2022	29/08/2022	30/08/2022	31/08/2022	01/09/2022	02/09/2022
T2	Autumn 2	65	60	56	198	95	53	78	121	76	19
T3	Autumn 3	27	19	31	166	103	38	96	102	97	3
T4	Autumn 4	0	12	4	21	8	2	2	5	8	1
T5	Autumn 5	1	0	1	31	17	4	2	4	5	0
T6	Autumn 6	2	1	51	62	40	17	49	25	11	1

Autumn 2022 2nd Surveillance - highlights cells = >40 bat passes

Turbine	Static Code	19/09/2022	20/09/2022	21/09/2022	22/09/2022	23/09/2022	24/09/2022	25/09/2022	26/09/2022	27/09/2022	28/09/2022
T1	2nd Autumn 7	7	0	0	0	0	0	0	0	0	0
T2	2nd Autumn 8	69	43	15	3	0	3	1	0	0	0
T3	2nd Autumn 9	230	18	0	126	2	14	2	0	0	3
T5	2nd Autumn 10	0	0	0	4	1	2	0	0	0	0

Turbine	Static Code	29/09/2022	30/09/2022	01/10/2022
T1	2nd Autumn 7	1	0	1

T2	2nd Autumn 8	40	1	0
T3	2nd Autumn 9	111	1	14
T5	2nd Autumn 10	14	0	1

Appendix II:
Relevant Legislation

Relevant Legislation & Bat Species Status in Ireland

Irish Statutory Provisions

A small number of animals and plants are protected under Irish legislation (Nelson, *et al.,* 2019). The principal statutory provisions for the protection of animal and plant species are under the Wildlife Act 1976 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011, as amended. The Flora (Protection) Order 2015 (S.I. no. 356 of 2015) lists the plant species protected by Section 21 of the Wildlife Acts. See www.npws.ie/ legislation for further information.

The codes used for national legislation are as follows:

- WA = Wildlife Act, 1976, Wildlife (Amendment) Act, 2000 and other relevant amendments
- FPO = Flora (Protection) Order, 2015 (S.I. No. 356 of 2015)

EU Legislation

The Birds Directive (Directive 2009/147/EC) and Habitats Directive (Council Directive 92/43/EEC) are the legislative instruments which are transposed into Irish law, *inter alia,* by the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) ('the 2011' Regulations), as amended.

The codes used for the Habitats Directive (Council Directive 92/43/EEC) are:

- Annex II Animal and plant species listed in Annex II
- Annex IV Animal and plant species listed in Annex IV
- Annex V Animal and plant species listed in Annex V

The main aim of the Habitats Directive is the conservation of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes to the Directive at a favourable conservation status. These annexes list habitats (Annex I) and species (Annexes II, IV and V) which are considered threatened in the EU territory. The listed habitats and species represent a considerable proportion of biodiversity in Ireland and the Directive itself is one of the most important pieces of legislation governing the conservation of biodiversity in Europe.

Under Article 11 of the Directive, each member state is obliged to undertake surveillance of the conservation status of the natural habitats and species in the Annexes and under Article 17, to report to the European Commission every six years on their status and on the implementation of the measures taken under the Directive. In April 2019, Ireland submitted the third assessment of conservation status for 59 habitats and 60 species. There are three volumes with the third listing details of the species assessed.

Article 12 of the Habitats Directive requires Member States to take measures for the establishment of a strict protection regime for animal species listed in Annex IV(a) of the Habitats Directive within the whole territory of Member States. Article 16 provides for derogation from these provisions under defined conditions. These provisions are implemented under Regulations 51 and 54 of the 2011 Regulations.

IUCN Red Lists

The International Union for the Conservation of Nature (IUCN) coordinates the Red Listing process at the global level, defining the categories so that they are standardised across all taxa. Red Lists are also produced at regional, national and subnational levels using the same IUCN categories (IUCN 2012, 2019). Since 2009, Red Lists have been produced for the island of Ireland by the National Parks and Wildlife Service (NPWS) and the Northern Ireland Environment Agency (NIEA) using these IUCN categories. To date, 13 Red Lists have been completed. The Red Lists are an assessment of the risk of extinction of each species and not just an assessment of their rarity. Threatened species are those species categorised as Critically Endangered, Endangered or Vulnerable (IUCN, 2019) – also commonly referred to as 'Red Listed'.

Irish Red List - Mammals

Red Lists in Ireland refer to the whole island, i.e. including Northern Ireland, and so follow the guidelines for regional assessments (IUCN, 2012, 2019). The abbreviations used are as follows:.

- RE Regionally Extinct
- CR Critically Endangered
- EN Endangered
- VU Vulnerable
- NT Near Threatened
- DD Data Deficient
- LC Least Concern
- NA Not Assessed
- NE Not Evaluated

There are 27 terrestrial mammals species in Ireland, which includes the nine resident bat species listed. The terrestrial mammal, according to Marnell *et al.,* 2019, list for Ireland consists of all terrestrial species native to Ireland or naturalised in Ireland before 1500. The IUCN Red List categories and criteria are used to assess that status of wildlife. This was recently completed for the terrestrial mammals of Ireland. Apart from the two following two mammal species (grey wolf *Canis lupus* (regionally extinct) and black rat *Rattus rattus* (Vulnerable)), the remaining 25 species were assessed as least concern in the most recent IUCN Red List publication by NPWS (Marnell *et al*., 2019).

Irish Bat Species

All Irish bat species are protected under the Wildlife Act (1976) and Wildlife Amendment Acts (2000 and 2010). Also, the EC Directive on The Conservation of Natural habitats and of Wild Fauna and Flora (Habitats Directive 1992), seeks to protect rare species, including bats, and their habitats and requires that appropriate monitoring of populations be undertaken. All Irish bats are listed in Annex IV of the Habitats Directive and the lesser horseshoe bat *Rhinolophus hipposideros* is further listed under Annex II. Across Europe, they are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention

1979, enacted 1983) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both these conventions.

Also, under existing legislation, the destruction, alteration or evacuation of a known bat roost is an offence. The most recent guidance document is "Guidance document on the strict protection of animal species of Community interest un the Habitats Directive (Brussels, 12.10.2021 C(2021) 7391 final".

Regulation 51(2) of the 2011 Regulations provides –

(*"(2) Notwithstanding any consent, statutory or otherwise, given to a person by a public authority or held by a person, except in accordance with a licence granted by the Minister under Regulation 54, a person who in respect of the species referred to in Part 1 of the First Schedule—*

(a) deliberately captures or kills any specimen of these species in the wild, (b) deliberately disturbs these species particularly during the period of breeding, rearing, hibernation and migration,

(c) deliberately takes or destroys eggs of those species from the wild,

(d) damages or destroys a breeding site or resting place of such an animal, or

(e) keeps, transports, sells, exchanges, offers for sale or offers for exchange any specimen of these species taken in the wild, other than those taken legally as referred to in Article 12(2) of the Habitats Directive,

shall be guilty of an offence."

The grant of planning permission does not permit the commission of any of the above acts or render the requirement for a derogation licence unnecessary in respect of any of those acts.

Any works interfering with bats and especially their roosts, may only be carried out under a derogation licence granted by National Parks and Wildlife Service (NPWS) pursuant to Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011 (which transposed the EU Habitats Directive into Irish law).

There are eleven recorded bat species in Ireland, nine of which are considered resident on the island. Eight resident bat species and one of the vagrant bat species are vesper bats and all vespertilionid bats have a tragus (cartilaginous structure inside the pinna of the ear). Vesper bats are distributed throughout the island. Nathusius' pipistrelle *Pipistrellus nathusii* is a recent addition while the Brandt's bat has only been recorded once to-date (Only record confirmed by DNA testing, all other records has not been genetically confirmed). The ninth resident species is the lesser horseshoe bat *Rhinolophus hipposideros*, which belongs to the Rhinolophidea and has a complex nose leaf structure on the face, distinguishing it from the vesper bats. This species' current distribution is confined to the western seaboard counties of Mayo, Galway, Clare, Limerick, Kerry and Cork. The eleventh bat species, the greater horseshoe bat, was only recorded for the first time in February 2013 in County Wexford and is therefore considered to be a vagrant species. A total of 41 SACs have been designated for

the Annex II species lesser horseshoe bat (1303), of which nine have also been selected for the Annex I habitat 'Caves not open to the public' (8310).

Irish bat species list is presented in Table A along with their current status.

Table A: Status of the Irish bat fauna (Marnell *et al.*, 2019).

Species: Common Name	Irish Status	European Status	Global Status
Resident Bat Species ^			
Daubenton's bat *Myotis daubentonii*	Least Concern	Least Concern	Least Concern
Whiskered bat *Myotis mystacinus*	Least Concern	Least Concern	Least Concern
Natterer's bat *Myotis nattereri*	Least Concern	Least Concern	Least Concern
Leisler's bat *Nyctalus leisleri*	Least Concern	Least Concern	Least Concern
Nathusius' pipistrelle *Pipistrellus nathusii*	Least Concern	Least Concern	Least Concern
Common pipistrelle *Pipistrellus pipistrellus*	Least Concern	Least Concern	Least Concern
Soprano pipistrelle *Pipistrellus pygmaeus*	Least Concern	Least Concern	Least Concern
Brown long-eared bat *Plecotus auritus*	Least Concern	Least Concern	Least Concern
Lesser horseshoe bat *Rhinolophus hipposideros*	Least Concern	Least Concern	Least Concern
Possible Vagrants ^			
Brandt's bat Myotis brandtii	Data deficient	Least Concern	Least Concern
Greater horseshoe bat *Rhinolophus ferrumequinum*	Data deficient	Near threatened	Near threatened

^ Roche *et al.*, 2014

Appendix III:
Bat Survey Data – Dusk Surveys, Walking & Driving Transects

Table A: Bat Survey Results & Weather Data

Survey Date	21/07/2022
Type of Survey	Dusk Survey, Walking Transects & Driving Transects
Weather Data	14oC, light wind, dry, patchy cloud cover
Bat Species	**Dusk Survey & Walking Transect**
Common pipistrelle	5 bat encounters
Soprano pipistrelle	6 bat encounters
Leisler's bat	3 bat encounters
Natterer's bat	2 bat encounters
Daubenton's bat	
Whiskered bat	
Myotis species	2 bat encounters
Brown long-eared bat	2 bat encounters
Nathusius' pipistrelle	
Lesser horseshoe bat	
Bat Species	**Driving Transect**
Common pipistrelle	19 bat encounters
Soprano pipistrelle	33 bat encounters
Leisler's bat	4 bat encounters
Natterer's bat	
Daubenton's bat	
Whiskered bat	
Brown long-eared bat	
Nathusius' pipistrelle	
Lesser horseshoe bat	
Survey Date	28/08/2022
Type of Survey	Dusk Survey
Weather Data	16oC, light wind, dry, full cloud cover
Bat Species	**Walking Transect**
Common pipistrelle	4 bat encounters
Soprano pipistrelle	1 bat encounter
Leisler's bat	1 bat encounter
Natterer's bat	1 bat encounter
Daubenton's bat	
Whiskered bat	
Myotis species	
Brown long-eared bat	1 bat encounter
Nathusius' pipistrelle	
Lesser horseshoe bat	
Survey Date	29/08/2022
Type of Survey	Walking Transect
Weather Data	15oC, breezy, dry, full cloud cover
Bat Species	**Walking Transect**
Common pipistrelle	2 bat encounters
Soprano pipistrelle	7 bat encounters
Leisler's bat	4 bat encounters
Natterer's bat	
Daubenton's bat	
Whiskered bat	
Myotis species	1 bat encounter
Brown long-eared bat	1 bat encounter
Nathusius' pipistrelle	
Lesser horseshoe bat	

Survey Date	19/09/2022
Type of Survey	Walking Transect
Weather Data	13oC, light wind, dry, full cloud cover
Bat Species	**Walking Transect**
Common pipistrelle	2 bat encounters
Soprano pipistrelle	6 bat encounters
Leisler's bat	
Natterer's bat	
Daubenton's bat	
Whiskered bat	
Myotis species	
Brown long-eared bat	1 bat encounter
Nathusius' pipistrelle	
Lesser horseshoe bat	

Appendix IV:
Additional Information

Tables from Collins (2016) and Marnell *et al.* (2022)

Table A: Building Bat Roost Classification System & Survey Effort (Adapted from Collins, 2016 and Marnell *et al.*, 2022).

Suitability Category	Description (examples of criteria)	Survey Effort (Timings)
Negligible	Building have no potential as a roost site Urban setting, heavily disturbed, building material unsuitable, building in poor condition etc.	No surveys required.
Low	Building has a low potential as a roost site. No evidence of bat usage (e.g. droppings)	One dusk or dawn survey.
Medium	Building with some suitable voids / crevices for roosting bats. Some evidence of bat usage Suitable foraging and commuting habitat present.	At least one survey in May to August, minimum of two surveys (one dusk and one dawn).
High	Building with many features deemed suitable for roosting bats. Evidence of bat usage. Largely undisturbed setting, rural, suitable foraging and commuting habitat, suitable roof void and building material.	At least two surveys in May to August, with a minimum of three surveys (at least one dusk survey and one dawn survey).

Table B: Tree Bat Roost Category Classification System (adapted from Collins, 2016).

Tree Category	Description
1 High	Trees with multiple, highly suitable features (Potential Roosting Features = PRFs) capable of supporting larger roosts
2 Moderate	Trees with definite bat potential but supporting features (PRFs) suitable for use by individual bats;
3 Low	Trees have no obvious potential although the tree is of a size and age that elevated surveys may result in cracks or crevices being found or the tree supports some features (PRFs) which may have limited potential to support bats;
4 Negligible	Trees have no potential.

Site Risk Assessment & Impact Assessment (NaturScot, 2021)

According to NaturScot, 2021 wind farms can affect bats in the following ways:

- Collision mortality, barotrauma and other injuries (although it is important to consider these in the context of other forms of anthropogenic mortality)
- Loss or damage to commuting and foraging habitat, (wind farms may form barriers to commuting or seasonal movements, and can result in severance of foraging habitat);
- Loss of, or damage to, roosts;
- Displacement of individuals or populations (due to wind farm construction or because bats avoid the wind farm area).

According to the NaturScot, 2021 to ensure that bats are protected by minimising the risk of collision, an assessment of impact at a site requires an appraisal of:

- The level of activity of all bat species recorded at the site assessed both spatially and temporally.
- The risk of turbine-related mortality for all bat species recorded at the site during bat activity surveys.
- The effect on the species' population status if predicted impacts are not mitigated.

In addition, it is recommended to consider the relevant factors in the assessment process:

- Is the bat species at the edge of its range
- Cumulative effects
- Presents of protected sites
- Proximity of maternity roosts
- Key foraging areas
- Key flight lines
- Possible migration routes.

Using Table 3 (See Appendices for details) in the SNH (2021) guidelines the following risk assessment for the individual turbines in relation to each bat species recorded was completed using the following values:

- Project Size = Medium (6 turbines);
- Habitat Risk = Low;
- Proposed tall wind turbines.

Therefore a value of 3 is applied to this proposed development site (Stage 1 Site Risk Assessment) and this is multiplied by the EcoBat value for the three most common bat species recorded which are also High Risk species (i.e. Leisler's bat, common pipistrelle and soprano pipistrelle) for two separate value categories. However as there is a large array of static surveillance units located across the proposed development area, a table was produced to determine which static unit results are used to assess each proposed turbine location (Please see Appendices for this table).

The overall value of the site is based on a summary of Tables ?? as presented in Appendices.

- Highest Ecobat activity category recorded;
- Most frequent activity category (i.e. median value).

Overall assessment value (i.e. Turbine Risk value) is then compared to the ranges below:

- Low (green) 0-4
- Medium (amber) 5-12
- High (red) 15-25

Bat Species Profile

Leisler's bat

Ireland's population is deemed of international importance and the paucity of knowledge of roosting sites, makes this species vulnerable. However, it is considered to be widespread across the island. The modelled Core Area for Leisler's bats is a relatively large area that covers much of the island of Ireland (52,820km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the Leisler's bat habitat preference has been difficult to define in Ireland. Habitat modelling for Ireland shows an association with riparian habitats and woodlands (Roche *et al.,* 2014). The landscape model emphasised that this is a species that cannot be defined by habitats preference at a local scale compared to other Irish bat species but that it is a landscape species and has a habitat preference at a scale of 20.5km. In addition, of all Irish bat species, Leisler's bats have the most specific roosting requirements. It tends to select roosting habitat with areas of woodland and freshwater.

Irish Status	Near Threatened
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	2003-2013 ↑
Estimated Irish Population Size	73,000 to 130,000 (2007-2013) Ireland is considered the world stronghold for this species
Estimate Core Area (Lundy *et al. 2011)*	52,820 km^2

Taken from Roche *et al.,* 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

The principal concerns for Leisler's bats are poorly known in Ireland but those that are relevant for this survey area are as follows:

- Selection of maternity sites is limited to specific habitats;
- Relative to the population estimates, the number of roost sites is poorly recorded;
- Tree felling, especially during autumn and winter months; and
- Increasing urbanisation.

Common pipistrelle

This species is generally considered to be the most common bat species in Ireland. The species is widespread and is found in all provinces. The modelled Core Area for common pipistrelles is a large area that covers much of the island of Ireland (56,485km^2) which covers primarily the east and south east of the area (Roche *et al.,* 2014). The Bat Conservation Ireland Irish Landscape Model indicated that the Common pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanization (<30%) (Roche *et al.,* 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	2003-2013 ↑
Estimated Irish Population Size	1.2 to 2.8 million (2007-2012)
Estimate Core Area (km^2) (Lundy *et al. 2011)*	56,485

Taken from Roche *et al.,* 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

Principal concerns for Common pipistrelles in Ireland that are relevant for this survey area are as follows:

- Lack of knowledge of roosting requirements
- This species has complex habitat requirements in the immediate vicinity of roosts. Therefore, careful site specific planning for this species is required in order to ensure all elements are maintained.
- Renovation or demolition of derelict buildings.
- Tree felling
- Increasing urbanisation (e.g. increase in lighting)

Soprano pipistrelle

This species is generally considered to be the second most common bat species in Ireland. The species is widespread and is found in all provinces, with particular concentration along the western seaboard. The modelled Core Area for soprano pipistrelle is a large area that covers much of the island of Ireland (62,020km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the soprano pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanisation (Roche *et al.,* 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	2003-2013 ↑
Estimated Irish Population Size	0.54 to 1.2 million (2007-2012)
Estimate Core Area (km²) (Lundy *et al. 2011)*	62,020

Taken from Roche *et al.,* 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

Principal concerns for Soprano pipistrelles in Ireland that are relevant for this survey area are as follows:

- Lack of knowledge of roosts;
- Renovation or demolition of structures;
- Tree felling; and
- Increasing urbanisation (e.g. increase in lighting).

Brown long-eared Bat

This species is generally considered to be widespread across the island. The modelled Core Area for Brown long-eared bats is a relatively large area that covers much of the island of Ireland (52,820km^2) with preference suitable areas in the southern half of the island. The Bat Conservation Ireland Irish Landscape Model indicated that the Brown long-eared bat habitat preference is for areas with broadleaf woodland and riparian habitats on a small scale of 0.5km emphasising the importance of local landscape features for this species (Roche *et al.,* 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	2008-2013 Stable
Biographical Range	km²
Estimate Core Area (Lundy *et al. 2011)*	49,929 km²

Taken from Roche *et al.,* 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

Principal concerns for brown long-eared bats are poorly known in Ireland, but those that are relevant for this survey area are as follows:

- Selection of maternity sites is limited to specific habitats;
- Lack of knowledge of winter roosts;
- Loss of woodland, scrub and hedgerows;
- Tree surgery and felling;
- Increasing urbanisation; and
- Light pollution.

Natterer's bat

There are three species included in the *Myotis* species family and their echolocation calls are very similar across these three species. The modelled Core Area for Natterer's bats is a relatively large area that covers much of the island of Ireland (52,864km^2). The Bat Conservation Ireland Irish Landscape Model indicated that the Natterer's bat selects areas with broadleaf woodland, riparian habitats and areas with larger scale provision of mixed forest (Roche *et al.,* 2014). Therefore, it is likely that this species is more widespread within the survey area.

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	Unknown
Estimated Irish Population Size	Unknown
Estimate Core Area (Lundy *et al. 2011)*	52,864

Taken from Roche *et al.,* 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

Principal concerns for Natterer's bats in Ireland that are relevant for this survey area are as follows:

- Lack of knowledge of roosting requirements;
- This species has complex habitat requirements in the immediate vicinity of roosts. Therefore careful site specific planning for this species is required in order to ensure all elements are maintained;
- Tree felling; and
- Increasing urbanisation (e.g. increase in lighting).

Daubenton's bat

The modelled Core Area for Daubenton's bats is a relatively large area that covers much of the island of Ireland (41,285km^2) reflecting the distribution of sizeable river catchments. The Irish Landscape Model indicated that the Daubenton's bat habitat preference is for areas with broadleaf woodland, riparian habitats and low density urbanisation (Roche *et al.,* 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	2008-2013 Stable
Estimated Irish Population Size	81,000 to 103,000 (2007-2012)
Estimate Core Area (km^2) (Lundy *et al. 2011)*	41,285

Taken from Roche *et al.,* 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

Principal concerns for Daubenton's bats are poorly known in Ireland but those that are relevant for this survey area are as follows:

- Potential roost loss due to bridge maintenance;

- Loss of woodland and forest clearance;
- Loss of woodland, scrub and hedgerows;
- Tree surgery and felling;
- Increasing urbanisation; and
- Light pollution.

Whiskered bat

The modelled Core Area for whiskered bats is a relatively small area (29,222 km2) compared to the other two resident *Myotis* bat species. The range is restricted to southern and eastern areas of Ireland. The Irish Landscape Model indicated that the whiskered bat habitat preference is for areas of woodland cover, small areas of pasture, urban and scrub habitat (Roche *et al.,* 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	Unknown
Estimated Irish Population Size	Unknown
Estimate Core Area (km²) (Lundy *et al. 2011)*	29,222

Taken from Roche *et al.,* 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

Principal concerns for whiskered bats are poorly known in Ireland but those that are relevant for this survey area are as follows:

- Lack of knowledge of roosting requirements, swarming sites
- Riparian habitat loss
- Loss of woodland and forest clearance
- Loss of woodland, scrub and hedgerows
- Tree surgery and felling
- Increasing urbanisation
- Light pollution

Nathusius' pipistrelle

The modelled Core Area for Nathusius' pipistrelle is a relatively restricted area (13,543km^2) and these areas are primarily associated with large water bodies such as Lough Neagh and the Lough Erne complex. The Bat Conservation Ireland Irish Landscape Model indicated that the Nathusius' pipistrelle habitat preference is large waterbodies (Roche *et al.,* 2014). But due to the paucity of information on this species, the knowledge of this species preference in Ireland is limited, any records recorded for this species is important.

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Irish Population Trend	2003-2013 (limited data, probably stable
Estimated Irish Population Size	10,000 to 18,000 (2007-2013)
Estimate Core Area (km²) (Lundy *et al. 2011)*	13,543

Taken from Roche *et al.,* 2014, Lysaght & Marnell, 2016 & Marnell *et al.*, 2019

The principal concerns for Nathusius' pipistrelle is the fact that roosting sites are poorly known in the Republic of Ireland:

- Lack of knowledge of winter sites and whether migration occurs;

- Renovation or demolition of derelict buildings and structures may cause undocumented roost losses; and
- Water pollution may be a threat to this species because it is particularly associated with lakes.

Please note that there is a greater number of bat species resident in the UK compared to Ireland and therefore some of the species listed below are not resident in Ireland.

Table 1. Core Sustenance Zone sizes calculated for UK bat species

Species	CSZ radius (km)
Greater horseshoe bat *Rhinolophus ferrumequinum*	3
Lesser horseshoe bat *Rhinolophus hipposideros*	2
Barbastelle *Barbastella barbastellus*	6
Brown long-eared bat *Plecotus auritus*	3
Grey long-eared bat *Plecotus austriacus*	3
Daubenton's bat *Myotis daubentonii*	2
Natterer's bat *Myotis nattereri*	4
Whiskered/Brandt's/Alcathoe bat *Myotis mystacinus/brandtii/ alcathoe*	1
Bechstein's bat *Myotis bechsteinii*	3**
Common pipistrelle *Pipistrellus pipistrellus*	2
Soprano pipistrelle *Pipistrellus pygmaeus*	3
Nathusius pipistrelle *Pipistrellus nathusii*	3
Noctule *Nyctalus noctula*	4
Leisler's bat *Nyctalus leisleri*	3
Serotine *Eptesicus serotinus*	4

** Note: There may be justification with Annex II and other rare species to increase the CSZ to reflect use of the landscape by all bats in a population. We suggest increasing the CSZ of Bechstein's bat to at least 3km, reflecting its very specific habitat requirements.

Extracted from Bat-Species-Core-Sustenance-Zones-and-Habitats-for-Biodiversity-Net-Gain.pdf (bats.org.uk)

INCHAMORE WINDFARM, KERRY SLUG SURVEYS

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Prepared for:

BioSphere Environmental Services

By:

Wetland Surveys Ireland Ltd.
Bell Height
Kenmare
Co Kerry
T: + 353 86 8510292
E: info@WetlandSurveysIreland.com
www.WetlandSurveysIreland.com

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1 INTRODUCTION

Wetland Surveys Ireland Ltd. were commissioned by BioSphere Environmental Services to undertake a survey for the presence of Kerry Slug (*Geomalacus maculosus*) within a proposed wind farm site at Inchamore, County Cork. The extent of the proposed site is ca 170.1 ha and occurs and straddles the County Cork and Kerry boundary approximately 6km to the west of Ballyvourney, Co. Cork. The survey was undertaken to inform the assessment of potential ecological impacts of the proposed wind farm and devise appropriate mitigation as may be required.

The occurrence of the wind farm within the known range of Kerry Slug (*Geomalacus maculosus*) together with the presence of suitable habitat throughout the site suggested the likely presence of the species.

1.1 KERRY SLUG

The Kerry slug (*Geomalacus maculosus*) is protected by the Wildlife (Amendment) Act 2000. It is listed under Annex II of the Habitats Directive and seven Special Areas of Conservation (SACs) have been designated for the species with a combined total area of approximately 95,337 hectares. The Kerry slug is also listed in Annex IV of the Habitats Directive and as such is strictly protected from injury, or disturbance / damage to their breeding or resting place wherever it occurs.

Historically, the Kerry Slug has been considered to be restricted to Devonian Old Red Sandstone areas of Kerry and West Cork where it occurs most commonly in either of three distinct habitats:

- deciduous woodlands in particular those with rocky outcrops or boulders;
- rock outcrops associated with heath or blanket bog; and
- lake shores

Within these habitats, the species tends to only be present if there is outcropping Devonian Old Red Sandstone, humid conditions and lichen, liverwort and / or mosses in which the species shelters and feeds (Platts and Speight 1988).

However, the species has also been recently discovered on both granite outcrops within blanket bog and from a Conifer plantation in County Galway (Kearney 2010). Further records of the species from Conifer Plantations suggest that this may also be a suitable habitat for the species (McDonnell *et al.* 2013). A possible explanation put forward to explain the recent discovery of the species in County Galway is an inadvertent introduction (during forestry operations) (McDonnell *et al.* 2013). However this has not yet been determined (Reich *et al.* 2012).

Like many slug species, Kerry Slug is a crepuscular animal and it takes refuge in crevices under rocks or bark (in woodlands) during daylight hours. The species are also known to be diurnal during and after periods of rain and in saturated conditions. Adult slugs vary in colour from black and white spots to brown with cream spots, brown individuals tend to occur in woodland habitats. The black form is found in open habitat such as bogs and heathland. Studies have shown that the species can be abundant on conifer trees and can recolonise boulder habitat when the wood is clearfelled.

The overall conservation status of the species has been reported as 'favourable and improving' and it is not currently considered threatened within its range (NPWS 2019).

A review of data held by the National Biodiversity Data Centre (September 2021) confirms that the species has previously been reported from the 10km square that the site intersects (W17). The proposed wind farm is not located within any site designated for nature conservation. The nearest site designate for the protection of Kerry Slug is the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (NPWS Site Code: 0365).

Based on the habitats recorded during the ecological assessment of the proposed wind farm, the following potentially suitable habitats have been identified:

- wet heath and rock outcrop habitat present throughout much of the site.

2 STUDY AREA

The study area is confined to an upland site proposed for wind energy development. From an initial review of habitats present in the area it was determined that there was a high probability of Kerry Slug occurrence. This conclusion was based on the geography of the site, habitat types present, and the known Kerry Slug distribution (NPWS 2019). A brief summary of the study area is presented in the following section.

2.1 INCHAMORE PROPOSED WIND FARM

The Inchamore site occurs approximately 6km west of Ballyvourney in west Cork. The site is accessed by a private road that occurs within the southern section of the site. The main habitats within the proposed development site include conifer forestry (WD4), wet heath (HH3), and acid grassland (GS3) which is grazed by cattle and sheep. Much of the conifer forestry within the site comprises mature stands of sitka spruce (*Picea sitchensis*) which mostly occur within the eastern, western, and southern sections of the site. Wet heath with frequent rock outcropping (ER1) occurs within the central and northern sections of the site. The wet heath and outcropping rock provide high value habitat to Kerry Slug. Mature conifer forestry may provide limited opportunities for Kerry Slug. The extent of the Inchamore site boundary is illustrated in

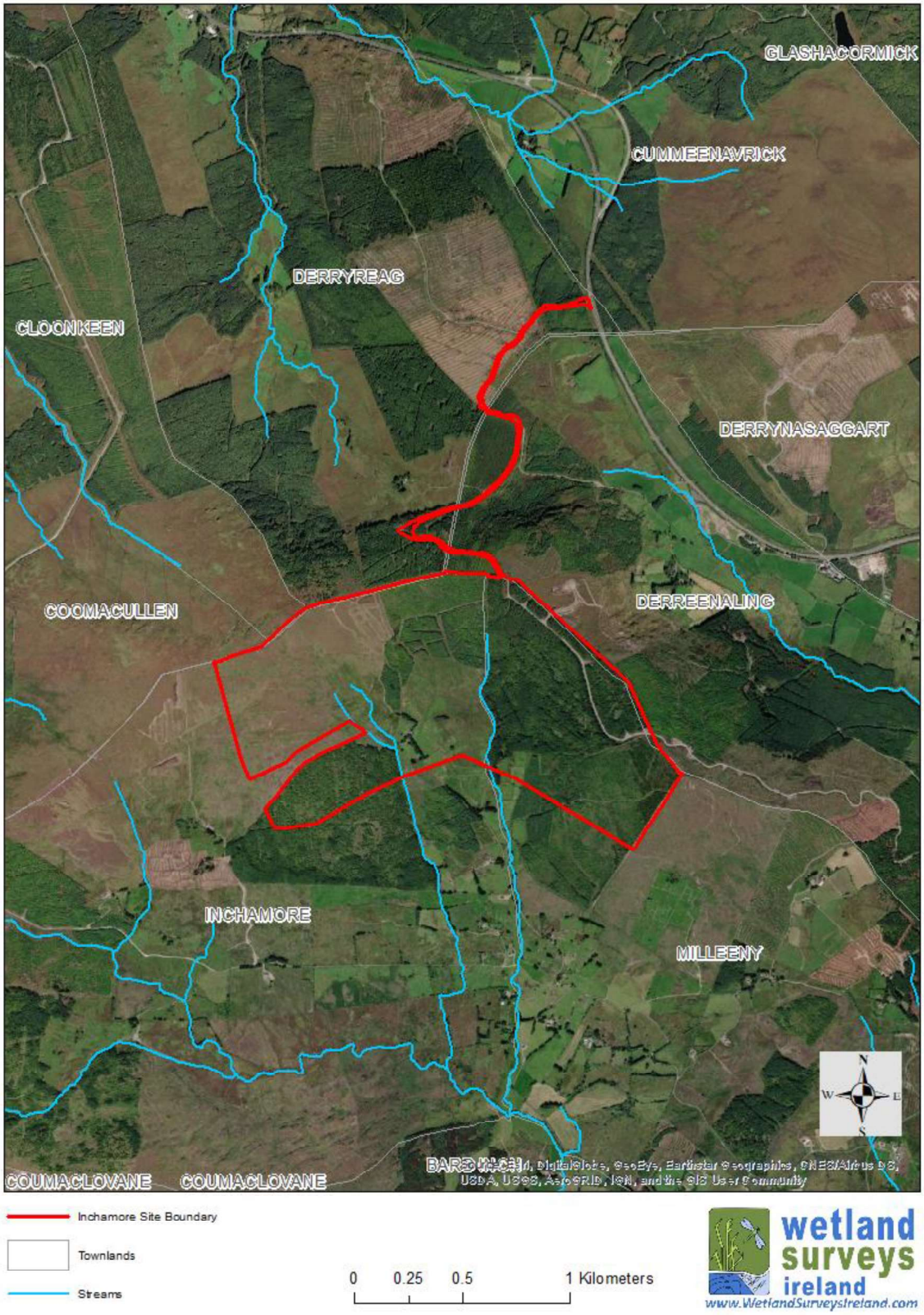

Figure 1: Inchamore site boundary overlain on aerial imagery.

3 METHODOLOGY

3.1 DESKTOP REVIEW

A desktop assessment including a review of previous records of Kerry Slug within and surrounding the study area was undertaken, the results of which are presented in Section 2.1 above.

3.2 FIELD SURVEYS

There are three main survey approaches that are used to survey for Kerry Slug. These include hand searching techniques (diurnal or nocturnal) and live refuge trapping (metric traps). The method used during the current survey is live refuge trapping as recommended for use by McDonnell *et al.* (2013). This method is favoured over other techniques because it enables quantitative sampling (McDonnell and Gormley 2011a,b). In addition, it removes the requirement of undertaking searches during wet weather (in the case of diurnal searches), and the health and safety risks associated with nocturnal searches in remote locations. The metric trap method involves the following:

- Metric traps. This is a refuge trap technique. The metric traps (0.25 m^2), manufactured by De Sangosse (Pont du Casse, France), are made up of absorbent material covered with a reflective upper surface and a black perforated plastic on the underside. They are wetted in advance of being laid out and are baited with Carrot. Traps are secured to rock outcrops (outcrop metric traps) or on surface vegetation (in the case of heath) using stones, tent pegs, or nails as appropriate. They can also be wrapped around tree trunks (banded metric traps) when undertaking surveys at wooded sites (not relevant to current survey). Traps are checked weekly for a period of up to six weeks. If required, traps are re-wetted during site visits using a watering can.

In addition to checking the metric traps, incidental observations of Kerry Slug were recorded during each site visit following hand searches amongst suitable habitat. A summary of the dates, methods, and weather conditions of each site visit undertaken are presented in Table 1.

Table 1: Survey effort at Inchamore.

Date	Site	Survey	Weather
23/07/2020	Inchamore	Hand searches and set traps	Light rain, wet conditions on site.
30/07/2020	Inchamore	Hand searches and check traps	Light persistent rain. Mild and calm.
13/08/2020	Inchamore	Hand searches and check traps	Light rain. Warm
20/08/2020	Inchamore	Hand searches and remove traps	Heavy showers, bouts of strong wind.

After an initial site walkover, the occurrence of suitable Kerry Slug habitat was identified and seven metric traps (Plate 1 below) were deployed amongst wet heath and outcropping rock. The traps were deployed on the 23rd of July 2020 and subsequently checked on three separate occasions with at least a weekly interval before being removed four weeks later. The location of each trap is summarised in Table 2 and illustrated in Figure 2 below.

Plate 1: Slug trap on rock outcrop.

Table 2: Trap locations and habitats at Inchamore.

Trap	Location (ITM)	Habitat
Trap 1	512468, 578335	Rock outcrop (ER1) in wet heath (HH3) adjacent to a stone wall.
Trap 2	5124181, 578354	Rock outcrop (ER1) in wet heath (HH3) adjacent to a stone wall.
Trap 3	512460, 578537	Rock outcrop (ER1) in wet heath (HH3)
Trap 4	512405, 578583	Rock outcrop (ER1) in wet heath (HH3)
Trap 5	512406, 578594	Halved on wet heath (HH3) and rock outcrop (ER1)
Trap 6	512331, 578672	Halved on wet heath (HH3) and rock outcrop (ER1)
Trap 7	512482, 578615	Rock outcrop (ER1) in wet heath (HH3)

Figure 2: Slug trap locations at Inchamore.

4 RESULTS

Kerry Slug were regularly recorded amongst suitable habitat during each visit. Kerry Slug numbers recorded within slug traps were relatively low with just 19 records in seven traps over the four week period. Individuals were also recorded along a traditional stone wall that occurs along the southern boundary of the heath and adjacent mature conifer forestry. Kerry Slug were frequently recorded within suitable habitat during targeted hand searches. Slugs were most commonly encountered from exposed rock during hand searches, with most hand search observations made during wet weather (see Plate 2). A summary of all records observed at the site is presented in Table 3. The individuals recorded were largely confined to rock outcrops within wet heath. The total number of slugs recorded at the site was 149 individuals, 130 of which were from hand searches.

Table 3: Results of metric trap surveys and targeted hand searches at Inchamore.

Date	Task	Trap 1	Trap 2	Trap 3	Trap 4	Trap 5	Trap 6	Trap 7	Hand Searches	Total
23/07/20	Set Traps	NA	NA	NA	NA	NA	NA	NA	32	32
30/07/20	Check Traps	5	4	2	0	0	0	3	80	94
13/08/20	Check Traps	1	2	2	0	0	0	0	14	19
20/08/20	Check & remove	0	0	0	0	0	0	0	4	4
Total		**6**	**6**	**4**	**0**	**0**	**0**	**3**	**130**	**149**

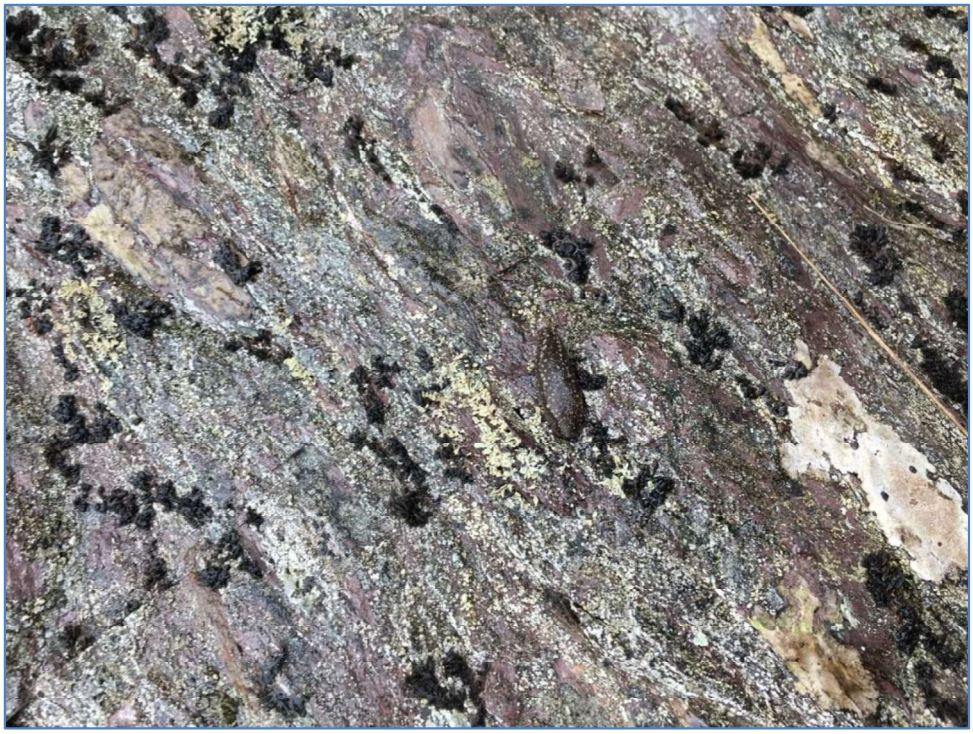

Plate 2: Kerry Slug recorded during targeted hand searches.

5 DISCUSSION AND RECOMMENDATIONS

Results from the current survey confirm the presence of Kerry Slug within the proposed wind farm site. These results also suggest a notable preference for exposed siliceous rock. This is in line with previous surveys undertaken amongst similar habitat complexes (McDonnell and Gormley 2011a). The species is thought to be widespread throughout suitable habitat within its known range (NPWS 2019).

The development of the wind farm could potentially impact on the local population of Kerry Slug due to loss and disturbance of suitable habitat. Based on the likely extent of habitat loss throughout the wind farm site, this impact is likely to be minor and localised as only a very small proportion of suitable Kerry Slug habitat within the site will be impacted. During construction, works could also result in the death of low numbers of Kerry Slug due to machinery movements in areas of suitable habitat.

The following measures are recommended to minimise the above potential impacts on the local Kerry Slug population:

- Areas of suitable habitat that occur outside of the footprint of the development should be avoided during the course of construction thereby minimising the loss and disturbance of Kerry Slug habitat.

- Immediately prior to undertaking works in areas of suitable habitat, the project ecologist will check for the presence of Kerry Slug. Should slugs be discovered then they will be transferred to suitable habitat in the surroundings. Similar on-going monitoring of suitable habitat within works areas should continue throughout the construction phase. Such monitoring should be undertaken during periods of wet weather when slugs are most active and feeding on the surface and therefore at greater risk of impacts by movement of machinery.
- Due to the unavoidable disturbance to Kerry Slug habitat, a derogation license will be sought from the NPWS prior to the commencement of construction. Works will be carried out in compliance with any conditions set by such the license.

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