

Natural Forces Renewable Energy 2 Ltd.

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PROPOSED CLOONANNY WIND FARM
CO. LONGFORD

VOLUME III
APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT



DECEMBER 2024

Document Control Sheet

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APPENDIX 1.1

GLOSSARY OF TERMS AND ACRONYMS

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Cloonanny Wind Farm

Glossary of Terms & Acronyms

Alternatives: Description of alternative locations, alternative designs and alternative processes.

Anemometer: Measures the wind speed and transmits wind speed data to the controller.

AA: Appropriate Assessment: An assessment of the potential adverse effects of a plan or project (in combination with other plans or projects) on Special Areas of Conservation and Special Protection Areas.

Blades: The aerodynamic surface that catches the wind. Blades lift and rotate when wind is blown over them, causing the rotor to spin. Most commercial turbines have three blades, most commonly made of glass reinforced plastic or wood epoxy, but can be made of aluminium or steel.

Blade Pitch: The pitch motor turns (or pitches) blades out of the wind to control the rotor speed, and to keep the rotor from turning in winds that are too high or too low to produce electricity.

Blade Pitch Actuator: This adjusts the pitch angle of a rotor blade.

Brake: The brake stops the rotor mechanically, electrically, or hydraulically, in cases of emergency.

Capacity Factor: The average power output of a wind development divided by its maximum power capability, its rated capacity. Capacity factor depends on the quality of the wind at the turbine. Higher capacity factors imply more energy generation. On land, capacity factors range from 0.25 (reasonable) to over 0.40 (excellent).

Cut-in Wind Speed: The wind speed at which a turbine produces a net power output. This is usually at hub height wind speeds of 4-5 metres per second.

DCCAE: Department of Communications, Climate Action and the Environment.

Decommissioning: The final closing down of a development or project when it has reached the end of its operational/useful life.

Development Applications Unit: Unit of the Department of Housing, Local Government and Heritage which coordinates the Department's response to development applications and plans that might have significant effects on either architectural heritage, archaeology and/or nature conservation, including the National Monuments Service, the National Parks and Wildlife Service and the Architectural Heritage Advisory Unit.

DHLGH: Department of Housing, Local Government and Heritage

DHCPLG: Department of Housing, Planning, Community and Local Government.

DHPLG: Department of Housing, Planning and Local Government.

EIA: Environmental Impact Assessment: The process of examining the anticipated environmental effects of proposed project - from consideration of environmental aspects at design stage, through consultation and preparation of an Environmental Impact Assessment Report (EIAR),

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evaluation of the EIAR by a competent authority, the subsequent decision as to whether the project should be permitted to proceed, encompassing public response to that decision.

EIAR: Environmental Impact Assessment Report: A report or statement of the effects, if any, which the proposed project, if carried out, would have on the environment.

EirGrid: Ireland's electricity transmission system operator, responsible for developing, managing and operating the electricity grid in Ireland.

EPA: Environmental Protection Agency.

ESB: Ireland's electricity distribution system operator

Gearbox: Gears connect the low-speed shaft to the high-speed shaft and increase the rotational speed of the shaft to the speed required by the generator. The gear box is heavy and power losses from friction are inherent in any gearing system.

Generator: A device that produces electricity from mechanical energy, such as from a rotating turbine shaft.

Grid Connection: Refers to the proposed route of connecting the wind farm to the national grid.

Hub height: Height of wind turbine tower from the ground to the centre-line of the turbine rotor.

Megawatt: Used as a measurement of electrical generating capacity. A megawatt (MW) is equal to 1,000 kilowatts (kW) or 1,000,000 watts (W).

Mitigation: Measures designed to avoid, reduce, remedy or compensate for adverse environmental effects that are identified.

Monitoring: Repetitive and continued observation, measurement and evaluation of environmental data to follow changes over a period of time, to assess the efficiency of control measures.

Nacelle: The nacelle sits atop the tower and contains the key mechanical components of the wind turbine including the gearbox, shafts, generator, controller, and brake. A yaw mechanism is employed to turn the nacelle so that the rotor blades face the prevailing wind.

Pitch: The angle between the edge of the blade and the plane of the blade's rotation. Blades are turned, or pitched, out of the wind to control the rotor speed.

Pitch controlled: These are turbine controls included to rotate the angle of the blades depending on the wind speed in order to regulate output and rotational forces.

Rated Wind Speed: The wind speed at which the turbine is producing power at its rated capacity. The rated wind speed generally corresponds to the point at which the turbine can perform most efficiently. Because of the variability of the wind, the amount of energy a wind turbine actually produces is lower than its rated capacity over a period of time.

Renewable Energy: Energy derived from renewable resources such as sunlight, wind, rain, tides and geothermal heat, which are naturally replenished. Fossil fuels, such as coal and oil, are considered non-renewable resources because they are consumed much faster than nature can create them. Fossil fuels, when burned to produce energy, cause harmful greenhouse gas emissions, such as carbon dioxide.

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Rotor: Blades and hub together form the rotor.

Rotor Hub: The centre of a turbine rotor, which holds the blades in place and attaches to the shaft.

RMP: Record of Monuments and Places, the county maps showing the archaeological sites and accompanying manuals.

RPS: Record of Protected Structures, a record of protected structures in the functional area of the Planning Authority that contains an identifying number and address for each protected structure and one or more maps which identify the location of each protected structure.

Shaft: The rotating part in the centre of a wind turbine or motor that transfers power.

Shadow Flicker: Term used to describe the short-lived effect of shadows cast by rotating blades of wind turbines when the sun passes behind them, which occurs under certain combinations of geographical positions and time of day.

Substation: Connects the local electricity network to the electrical system of the wind energy project through a series of automatic safety switches.

Temporary Construction Compound: The compound to be developed and used by the appointed contractor(s) for the purposes of constructing the development which will be reinstated following completion of construction.

Tower: The base structure that supports and elevates a wind turbine rotor and nacelle. Made from tubular steel, concrete, or steel lattice, the tower supports the structure of the turbine.

Transformer/Voltage Regulator: This is a device for changing the voltage of the alternating current. Electricity is typically generated at less than 1000 volts by the wind turbine and the transformer “steps up” this voltage to match that of the national grid. This may be housed either inside or alongside the tower.

Turbine Hardstand: The hardstand areas next to each turbine location used by cranes for erection of turbine hub, nacelles and rotor blades.

Turbine Foundation: The concrete base located under ground level and used to support the turbine hub.

Wind Farm Internal Cabling: Refers to the electrical cables connecting the turbines to the Onsite substation.

Wind Turbine: A machine that captures the force of the wind. Also called a Wind Energy Converter when used to produce electricity.

Wind Vane: Measures wind direction and communicates with the yaw drive to orient the turbine properly with respect to the wind.

Yaw: To rotate around a vertical axis, such a turbine tower.

Yaw drive: Orients upwind turbines to keep the turbine rotor facing into the wind as the wind direction changes. Downwind turbines don't require a yaw drive because the wind manually blows the rotor away from it.

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Yaw motor: The yaw drive is powered by the yaw motor.

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APPENDIX 1.2

CUMULATIVE ASSESSMENT - PROJECTS AND PLANS

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Cumulative Assessment

Cloonanny Windfarm

1. Introduction

This Briefing Note sets out the projects and plans that the project team should consider when carrying out the cumulative assessment sections of individual EIAR chapters and the in-combination section of the Appropriate Assessment Reports for the proposed Cloonanny Wind Farm which, briefly, comprises 2 no wind turbines with an overall tip height of 199.9m, hub height of 112.4m, rotor diameter of 175m, met mast with a height of 32m, and associated sub-station, foundations, and site works.

Cumulative effects are those that accrue over time and space from several development activities – the impact of the Proposed Development should therefore be considered in conjunction with the potential impacts from other projects or activities, which are both reasonably foreseeable in terms of delivery and are located within a realistic geographical scope where environmental impacts could act together with the Proposed Development to create a more significant overall effect.

The cumulative impact assessment should not consider other developments that are already constructed and operating, with the exception of other windfarms in the area, as such existing developments will be accounted for in the baseline conditions established for the individual specialist topics. The requirement of the EIA Directive and Guidelines to consider existing projects is therefore dealt with in the baseline.

Accordingly, the cumulative assessment should consider only proposed developments, being the “permitted or planned projects”.

A fundamental requirement of assessing cumulative/in-combination effects is to identify those projects, plans or activities with which the proposed development may interact and create a cumulative impact. These interactions can arise during the construction, operation and decommissioning phases.

The project team should consult the following resources.

- The ‘Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment’ (Government of Ireland, 2018) provides high-level guidance on assessing cumulative effects.
- The EPA’s ‘Guidelines on the information to be contained in Environmental Impact Assessment Reports’ (EPA, 2022) provides a checklist for assessing cumulative effects, it should be considered whether the EIAR has: ‘described cumulative effects? considered cumulative effects due to cumulation of effects with those of other projects that are existing or are approved but not yet built or operational?’
- The Office of the Planning Regulator (OPRs) Practice Note PN01 “Appropriate Assessment Screening for Development Management” provides the following advice with respect to in-combination assessment,

"In-combination effects must examine plans or projects that are:

- *Projects completed,*
- *Projects approved but not started or uncompleted,*
- *Projects proposed, i.e. for which an application for approval or consent has been made, including refusals subject to appeal and not yet determined,*
- *Proposals in adopted plans and*
- *Proposals in finalised draft plans formally published or submitted for consultation or adoption.*

Plans and projects that are not yet proposed do not generally have to be taken into account in the assessment of in-combination effects, even if they are part of an overarching masterplan. The exception is where the project is considered to be functionally interdependent with the development before the competent authority. An example of this is a grid connection for a proposed wind farm.

The consideration of in-combination effects is not restricted to similar types of plans or projects covering the same sector of activity (e.g. a series of housing projects). All types of plans or projects that could, in-combination with the project under consideration, have a significant effect, should be taken into account."

2. Zone of Influence

The Zone of Influence (Zol) for each environmental discipline must be defined by the appointed specialist. The basis for selecting the Zol must be set out in each chapter of the EIAR and in the AA Screening Report.

Projects and plans that are in closest proximity to the Proposed Development Site are generally considered to have the greatest potential to contribute to cumulative effects.

3. Subject Site

A search of committed developments (i.e., ones that have received full or outline planning permission) proximate to the Proposed Development Site was undertaken using

- the An Bord Pleanála Online Planning search tool,
- the web map portal providing spatial information relevant to the planning process in Ireland (myplan.ie) and
- the Longford County Council Online Planning Register.

It revealed no previous planning applications were made on the subject site.

4. Local area

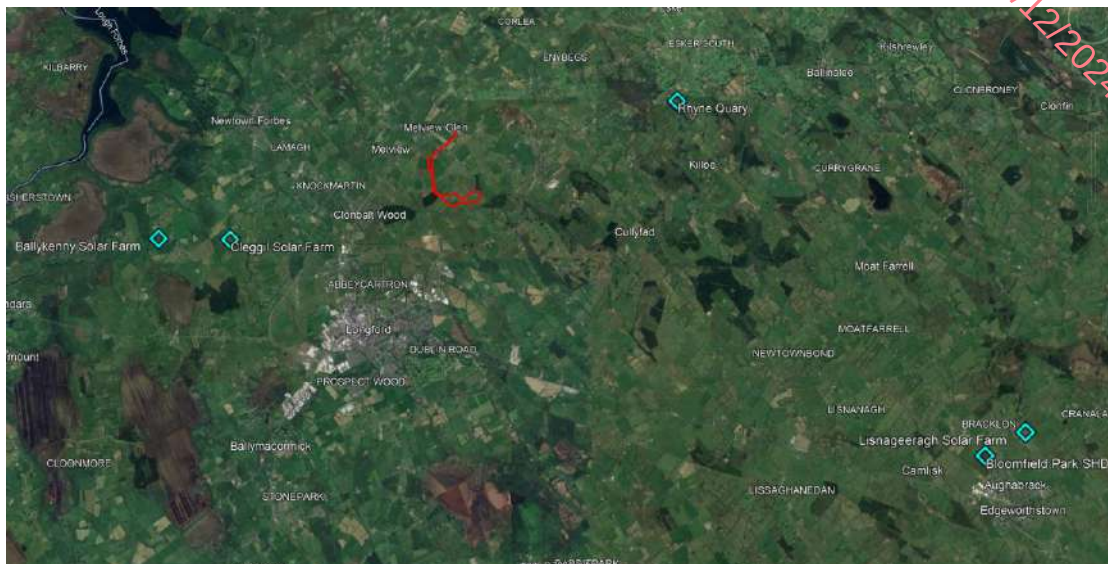
A desktop planning history search for permitted developments in the last five years and within 1.5 km of the Proposed Development was undertaken. Planning applications older than five years have not been assessed as they have been deemed to either have expired or have been constructed (due to the standard five-year life of planning consents).

Within the local area of 1.5km of the proposed development only minor developments listed below were identified.

LCC Reg Ref	Brief Description	Decision
2413	Extension of Duration of LCC19/40 - retention of changes to roof pitch, window design, changes to window and door openings, omission of chimney on existing dwelling and all associated services and retention of domestic garage and planning permission to convert attached garage to ensuite bedroom and alternation to the front elevation of the dwelling	Grant
22177	Retention of the installation of an onsite sewerage treatment system with polishing filter to service an existing dwelling house and the erection of boundary fences and all ancillary works	Grant
21331	Permission for bungalow and associated works.	Grant
21117	Permission for demolition of extension to existing bungalow and construction of a storey and a half extension and associated works.	Grant
19240	Permission for construction of domestic store and garage and all ancillary site works	Grant

Please refer to the planning file on Longford County Councils online planning portal for full details in relation to this application.

5. Surrounding area



5.1 Quarry at Rhine, Killoe, Co Longford

LCC Reg Ref 2017

Located c. 4.5km north west of the proposed development

10-year permission for the continuance of

- (i) extraction of aggregates on an area of 1.431 hectares;
- (ii) processing/loading of aggregates on an area of 0.233 hectares;
- (iii) manufacture of ready-mix concrete in existing plant (176m²);
- (iv) importation and storage of sand for use in concrete manufacturing (0.008 hectares);
- (v) use of existing weighbridge and wheel wash (154m²) and
- (vi) existing site entrance and access areas (0.956 hectares), all within 2.661 hectares of the site development authorised under PI08/529 and all ancillary works.

On 17.06.2020 Longford County Council granted permission for the proposed development subject to 16 conditions. The decision was not appealed.

[ePlan - Online Planning Details](#)

➔ The application was not accompanied by an EIAR or NIS.

An **EIA Screening** report concludes: Following this EIAR Screening Assessment using the Screening Checklist as outlined in the Guidance on EIA Screening (Directive 2011/92/EU as amended by 2014/52/EU) (European Commission, 2017), it is concluded that the proposed development is not likely to result in significant effects on the environment and as such, the proposed project will not be required to proceed to the EIA process.

Screening for AA concludes: The existing quarry site at Killoe, County Longford and the current proposals for the site will not have any significant effects upon any Natura 2000 site because of the site's location and significant separation distance from any European Sites. [...] The project can therefore be screened out of any further stages of Appropriate Assessment and a Stage 2 NIS is not required for this development.

Please refer to the planning file on Longford County Councils online planning portal for full details in relation to this application.

LCC Reg Ref 2023006 In 2023, Blessington Stone & Concrete Plant Hire also applied for permission in the immediate vicinity of the application above.

The planning permission is for a 25-year period for the development of a total area of 18.6 hectares and comprises of the following:

- (i) Extraction of rock by blasting means down to a level of 20mOD from an area of approximately 14.2 Hectares.
- (ii) Erection of a concrete batching plant, processing plant, block yard, storage sheds, workshop, office buildings, weighbridge, wheelwash, settlement lagoon and all other associated ancillary facilities at the proposed manufacturing area of approximately 2.1 Hectares.
- (iii) Landscaping consisting of planted Berms surround (1.6 Hectares).
- (iv) Entrance and access road from the public road to the manufacturing area (0.7 Hectares).
- (v) Landscaping and restoration of the site on completion of extractions.

This application was accompanied by an EIAR. The Planning Authority was not satisfied that sufficient information was submitted with the EIAR and Application to carry out a full assessment of environmental impacts in respect of the proposed development. The application was therefore deemed invalid.

5.2 Solar Farm at Ballykenny, Co Longford

LCC Reg Ref 19222, ABP Reg Ref 305969

Located c. 6km west of the proposed development

Permission for a solar farm at a 19ha site with an export capacity of c. 9MW.

LCC granted permission subject to 14 conditions on 24.10.2019. The decision was subsequently appealed to ABP by a 3rd Party. On 08.05.2020 An Bord Pleanála granted permission for the proposed development subject to 4 (revised) conditions.

[ePlan - Online Planning Details; 305969 | An Bord Pleanála \(pleanala.ie\)](#)

- ➔ The application was not accompanied by an EIAR, however, a NIS was prepared with respect of the proposed development.

Appropriate Assessment Screening: "The Board noted the Natura Impact Statement submitted with the application. The Board accepted and adopted the Inspector's screening

assessment and conclusions in respect of the identification of the European sites which could potentially be affected by the proposed development, and the identification and assessment of the potential likely significant effects of the proposed development, either individually or in combination with other plans or projects, on these European sites in view of the sites' conservation objectives. The Board was satisfied that the only European sites that could potentially be affected by the proposed development, individually or in combination with other plans or projects, are the Lough Forbes Complex Special Area of Conservation (site code 001818), and the Ballykenney-Fisherstown Bog Special Protection Area (site code 004101), in view of the sites' conservation objectives."

Natura Impact Statement: "The Board was satisfied that, subject to compliance with the mitigation measures as set out in the submitted Natura Impact Statement, as modified by the Inspector in her report, the proposed development, individually or in combination with other plans or projects, would not adversely affect the integrity of the two European sites, in the light of their conservation objectives and qualifying interests."

Environmental Impact Assessment Screening: ABP concluded that "The proposed development is not of any type included in Schedule 5 of the Planning and Development Regulations 2001 (as amended), i.e. development for which mandatory EIA is required nor is it integral to any project that is of a type included in Schedule 5. Having regard to the nature and scale of the development, there is no real likelihood of significant effects on the environment arising from the development. The need for environmental impact assessment can, therefore, be excluded at preliminary examination and a screening determination is not required."

5.3 Solar Farm at Cleggil Co Longford

LCC Reg Ref 17/47, ABP Reg Ref 248470

Located c. 4.5km west of the proposed development

10- year permission for a solar farm on a 19 ha site with an export capacity of 11.1MW.

LCC refused permission subject to 3 reasons on 12.04.2017. The decision was subsequently appealed to ABP by the applicant. On 22.03.2018 An Bord Pleanála granted permission for the proposed development subject to 13 conditions.

[ePlan - Online Planning Details; 248470 | An Bord Pleanála \(pleanala.ie\)](#)

➔ The application was not accompanied by an EIAR or NIS.

Appropriate Assessment Screening: ABP considered that "it is reasonable to conclude that based on the information on file, which I consider adequate to issue a screening determination, that the proposed development, individually or in combination with other plans or projects, would not be likely to have a significant effect on any designated European site in view of those sites' conservations objectives and that a Stage 2 Appropriate Assessment (and submission of an NIS) is not therefore required."

Environmental Impact Assessment Screening: ABP concluded "Solar farms are not listed as a class of development under Part 1 or 2 of Schedule 5 of the Planning and Development Regulations 2001-2017, as amended, whereby a mandatory EIA and the submission of an

EIS is required. [...] I also consider that the subject development is a not 'sub-threshold development' for the purpose of EIA and an EIS is not required for the development."

5.4 Solar Farm at Lisnageeragh, Edgeworthstown, Ballinalee Road Co. Longford

LCC Reg Ref 16/81, ABP Reg Ref 246850

Located c. 11.5km south east of the proposed development

10-year permission for a solar farm on a site of c.14.5 ha with an export capacity of approximately 4.2MVA and all associated works.

LCC granted permission subject to 16 conditions on 09.06.2016. The decision was subsequently appealed to ABP by a 3rd Party. On 07.11.2016 An Bord Pleanála granted permission for the proposed development subject to 16 (revised) conditions. Compliance submissions were made to Longford County Council in 2023.

[ePlan - Online Planning Details; 246850 | An Bord Pleanála \(pleanala.ie\)](#)

→ The application was not accompanied by an EIAR or NIS.

Appropriate Assessment Screening: The Board agreed with the Inspector, and is satisfied that, having regard to the separation distance between the subject site and the nearest European sites and to the lack of potential for connectivity with those sites, the proposed development, including the grid connection, either individually or in combination with other plans or project would not be likely to have significant effects on the European Sites having regard to the conservation objectives of these sites.

5.5 Bloomfield Park SHD at Bracklin Road, Edgeworthstown, Road Co Longford

ABP Reg Ref 313318

Located ca. 11km south east of the proposed development

The Strategic Housing Development comprises the demolition of an existing building and the construction of 100 no. residential units (50 no. houses, 50 no. apartments) and associated site works at a site located within Edgeworthstown's urban boundary, c.1km northwest of the town centre.

On 12.09.2023 An Bord Pleanála granted permission for the proposed development subject to 28 conditions. [313318 | An Bord Pleanála \(pleanala.ie\)](#)

→ The application was not accompanied by an EIAR or NIS.

Appropriate Assessment Screening: The Board completed an Appropriate Assessment screening exercise in relation to the potential effects of the proposed development on designated European Sites, taking into account the nature, scale and location of the proposed development, the Ecological Impact Assessment and Appropriate Assessment submitted with the application, the Inspector's Report, and the submissions on the application. In completing the screening exercise, the Board adopted the report of the

Inspector and concluded that, by itself or in combination with other developments in the vicinity, the proposed development would not be likely to have a significant effect on any European Site in view of the Conservation Objectives and qualifying interests of such sites, and that a Stage 2 Appropriate Assessment is not, therefore, required.

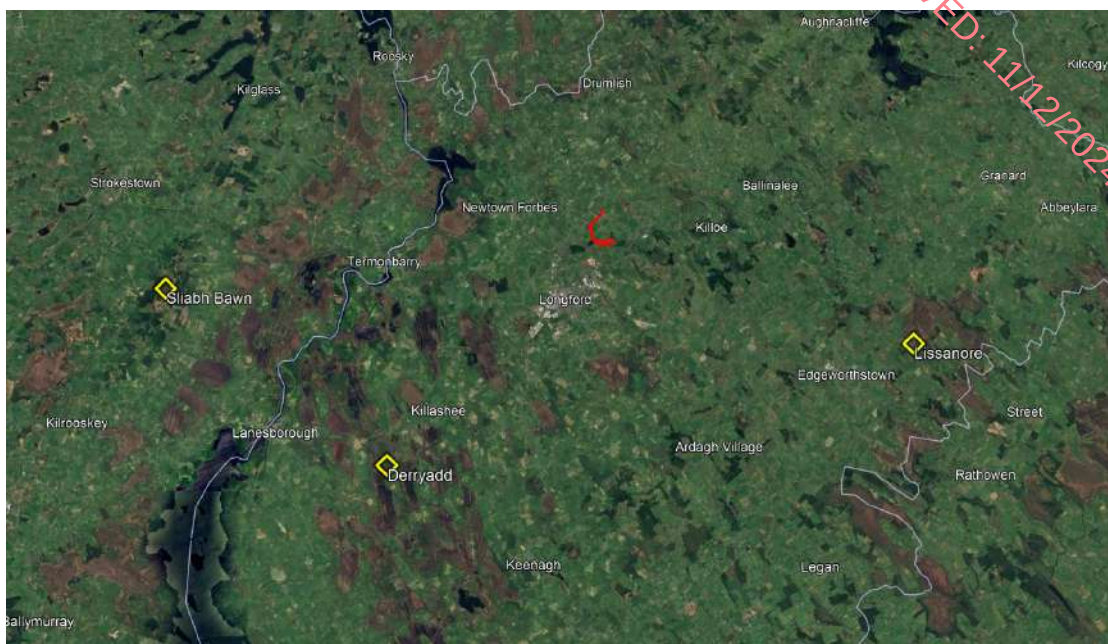
Environmental Impact Assessment Screening: The Board completed a preliminary examination in relation to the requirement for an Environmental Impact Assessment, taking into account the nature and scale of the proposed development, the location of the site on zoned and serviced lands within an existing built-up area, and outside of any sensitive and or designated location, the existing pattern of residential development in the vicinity, and the criteria set out in Schedule 7 of the Planning and Development Regulations 2001, as amended. In completing the preliminary examination, the Board adopted the report of the Inspector and concluded that there is no real likelihood of significant effects on the environment arising from the proposed development, and that the need for an environmental impact assessment and the submission of an Environmental Impact Assessment Report for the proposed development would not, therefore, be required.

6. Other Windfarms

The closest operating windfarm to the subject site is Sliabh Bawn Wind Farm in County Roscommon, ca 20km west of the subject site.

Additionally, an application for a single wind turbine in Lissanore, Co Longford, ca. 14 km southeast of the subject was granted permission by An Bord Pleanála in June 2024.

Furthermore, an application for the Derryadd Windfarm (c. 12km southeast of the site) has been granted by ABP in 2020. The decision has subsequently been quashed by Order of the High Court in 2022. However, it is understood that the applicant is currently in the progress to prepare a new application at this site.



6.1 Sliabh Bawn Wind Farm at Strokestown, Co Roscommon

ABP PL 20.239743 and RCC Ref 10/507

[An Bord Pleanála \(pleanala.ie\)](http://pleanala.ie); [ePlan - Online Planning Details](#); [Home - Sliabh Bawn Windfarm](#)

- The Sliabh Bawn Wind Farm comprises 20 no. 3.2MW turbines.
- The project has a maximum export capacity of 58 MW.
- A substation was constructed at the northeastern end of the site and the wind farm connects into the existing 110kV power line which crossed the site.
- Development commenced in 2015 in accordance with the planning permission that was granted for the project by An Bord Pleanála in March 2012.
- On 17th August 2018 the county council planning office confirmed that the development is operating in compliance with the conditions set in the original Grant of Permission.
- The site is of north/south orientation, approximately three kilometres in width and seven kilometres in length. The total site area is approximately 833 hectares and ranges in elevation from 70 metres to 262 metres OD (Malin Head).

6.2 Lissanore, Co Longford

LCC Reg Ref 2360010, ABP Reg Ref 317459

Permission for the construction of one Enercon E138 Wind Energy Converter on an 81m tower with an electrical rating of 4.2MW and an overall tip height of 149.38m.

LCC granted permission subject to 16 conditions on 08.06.2023. The decision was subsequently appealed to ABP by 3 no. 3rd Parties. Permission was granted by ABP in June 2024

[ePlan - Online Planning Details; 317459 | An Bord Pleanála \(pleanala.ie\)](#)

➔ The application was not accompanied by an EIAR or NIS.

Appropriate Assessment Screening: LCC's Planners Report states: "Having assessed the submitted Appropriate Assessment Screening report the Planning Authority is satisfied that the proposed development individually or in combination with other plans or projects, will not have a significant effect on any European sites."

Environmental Impact Assessment Screening: LCC's Planners Report states: "Schedule 5 of the Planning & Development Regulations 2001 (as amended); Part 2 Para 3 (j) relates to the applicable thresholds for the proposed development. The development of a single wind turbine with an output of c.4.2 megawatts (not exceeding 5 megawatts) does not exceed either of the above thresholds and the proposed development does not fall into the mandatory requirement under the EIA Directive for the preparation of and Environmental Impact Assessment Report."

The EIA Screening carried out by the applicant states that "having regard to the limited nature and scale of the proposed development, the absence of any significant environmental sensitivity in the vicinity of the proposed development and the absence of connectivity to any sensitive environment. There is no real likelihood of significant effects on the environment. As the purpose of thresholds within the EIA Directive is to distinguish between those projects which are likely to have significant environmental effect and those that are not, it can therefore be concluded that, as the proposed development does not exceed the relevant EIA threshold, it is unlikely to have any likely significant effects on the environment."

6.3 Derryadd Windfarm

A 10-year planning permission for the construction of a wind farm comprising 24 no. wind turbines, 1 no. 110kV substation and all related works.

Permission granted by ABP in 2020. The decision has subsequently been quashed by Order of the High Court in 2022. However, it is understood that the applicant is currently in the progress to prepare a new application at this site.

ABP Planning references:

- 31.01.2019 - SID Application [303592 | An Bord Pleanála \(pleanala.ie\)](#)
- 26.10.2022 - Determination that proposed development is Strategic Infrastructure [314965 | An Bord Pleanála \(pleanala.ie\)](#)
- 01.02.2024 - Request to enter into pre-application consultation [318974 | An Bord Pleanála \(pleanala.ie\)](#)

➔ The 2019 application was accompanied by an EIAR and NIS. It can be expected that this will also be the case for the new application.

The final preferred layout for the new application was published in June 2023 and comprises 22 turbines.

[Derryadd-Wind-Farm-Final-Layout-Infrastructure-Map.pdf \(derryaddwindfarm.ie\)](#)

Further information can be found here: [Bord na Móna Wind Farm | Derryadd Wind Farm](#)

7. Plans

7.1 Longford County Development Plan 2021-2027

The subject site is located within the functional area of Longford County Council and is governed by the Longford County Development Plan 2021-2027 (LCDP), which was adopted by the members of Longford County Council (LCC) on the 19th of October 2021. The Plan came into full effect on the 30th of November 2021.

7.2 Longford Local Area Plan 2023-2029

Longford County Council is preparing a new 6-year Local Area Plan (LAP) for Longford Town 2023-2029. The LAP is a statutory document prepared by the Planning Authority, in accordance with the requirements of the Planning and Development Act 2000 (as amended). The LAP will set out a land use strategy for the proper planning and sustainable development of the town to comply with the provisions of the Longford County Development Plan 2021—2027.

The Draft LAP was issued for consultation in September 2024 and Public Consultation closed on October 18th.

Based on the Draft LAP, the proposed development site is located outside the LAP boundary and the LAP makes no reference to the proposed development site or the development of renewable energy projects in the vicinity of Longford Town.

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APPENDIX 1.3

COMMUNITY REPORT

VOLUME III

APPENDICES TO

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DECEMBER 2024

Community Report

Cloonanny Wind Farm

Last Updated: 11/10/2024



Natural Forces
3rd Floor, Hampton House,
27 Mount Street Lower,
Dublin, D02 FC43

www.naturalforces.ie



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Introduction

This Community Report was prepared by Natural Forces Renewable Energy 2 Limited (Natural Forces).

The report outlines the approach taken by Natural Forces to inform and engage with the local communities during the development stage of the proposed development.

Natural Forces have adhered to the Guidelines for Community Engagement 2016¹, the Draft Revised Wind Energy Development Guidelines 2019² (the draft WEDG 2019), and the 2012 Best Practice Guidelines for the Irish Wind Energy Industry³, which sets the standards for community engagement for developers .

A Communication Plan has been included (Appendix A) and outlines the methods and mediums Natural Forces will implement to ensure the community are kept informed with regards the proposed development.

Proposed development Overview

The proposed development will be located in the townlands of Gorteenorna, Derryharrow, Corragarrow, Cloonanny Glebe, Co. Longford. The proposed development will involve the construction of two Enercon E175 EP5 E2 Wind Energy Converters, each with an electrical rating of 7 MW. These turbines will have a rotor diameter of 175 metres, a hub height of 112.4 metres, and a blade tip height of 199.6 metres.

Additionally, the development will include a 20 kV substation compound, comprising two prefabricated modular substation buildings, battery storage containers, and associated infrastructure.

A full proposed development description is provided in Chapter 02 Development Description of this EIAR.

Purpose

As per the 2012 Best Practice Guidelines for the Irish Wind Energy Industry, local engagement should begin before a planning application is submitted. The purpose of this Community Report is to summarise Natural Forces engagement efforts to date, including the materials presented, offering a comprehensive overview of stakeholder interactions.

¹ <https://www.gov.ie/en/consultation/8f3c71-public-consultation-on-the-revised-wind-energy-development-guideline/>

² <https://www.gov.ie/en/publication/9d0f66-draft-revised-wind-energy-development-guidelines-december-2019/>

³ <https://windenergyireland.com/images/files/9660bdfb5a4f1d276f41ae9ab54e991bb600b7.pdf>

Background

Natural Forces is a private, independent power producer that develops, constructs, owns, and operates wind, solar, and hydro proposed developments in Ireland, Canada, and France. The company has extensive experience developing renewable energy proposed development and working with communities, to inform and involve them in proposed development.

Natural Forces acknowledges that traditional information sharing methods are not always effective. Consequently, the organization has spent several years developing alternative engagement strategies to reach all stakeholders. The strategies, implemented by the proposed development team in the development of the proposed development, are detailed throughout this report.

Geographical area for Engagement

According to the draft WEDG 2019, the appropriate geographic scope for engagement is determined by the proposed development's scale. To effectively encompass the site and its surrounding areas, a buffer zone extending 1.75km around each turbine and equal to 10 times the turbines' rotor diameter has been established. This buffer zone forms the Zone of Influence (Zoi) and represents the geographical area for engagement.

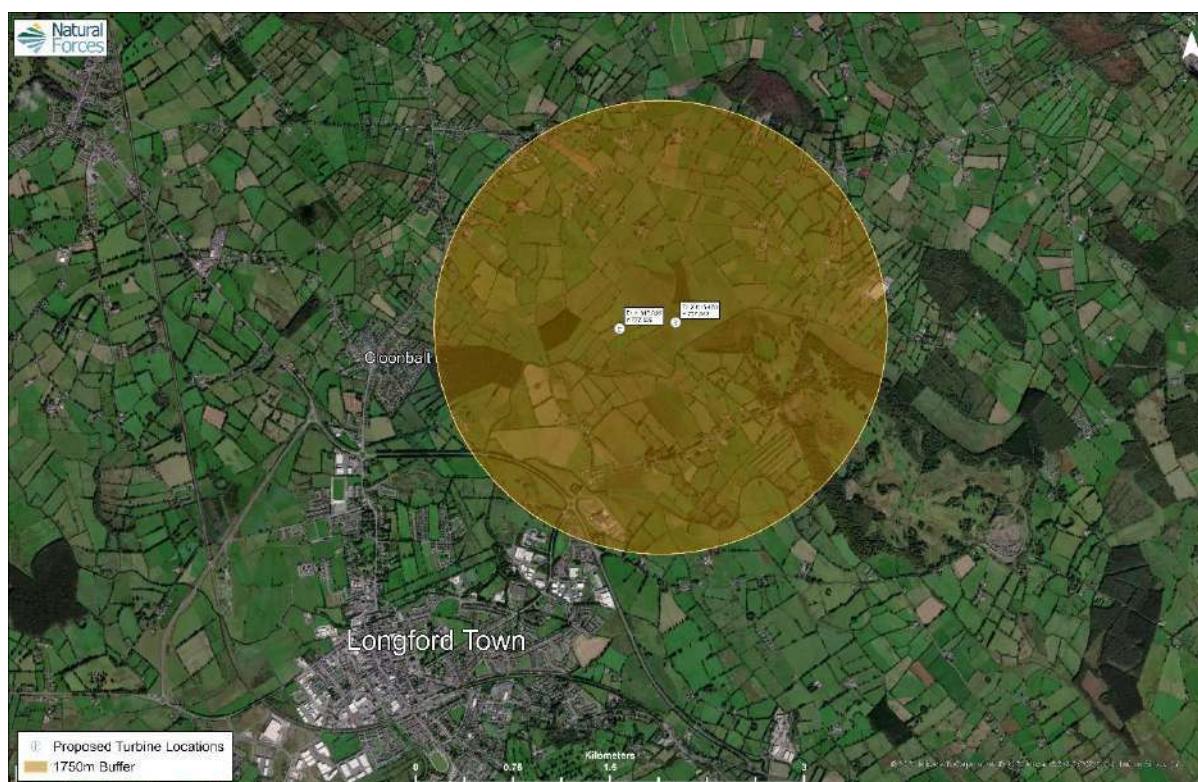


Figure 1 -Zone of Influence

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Engagement Process

Natural Forces recognises the importance of community engagement for the proposed development. Various communication strategies were employed, tailored to the specific needs of each stakeholder group. Based on the Communication Plan (Appendix A), the following individuals were identified as key stakeholders to the proposed development:

- Immediate neighbours
- Local residents
- Community register signatories

Immediate Neighbours

Immediate neighbours are defined as residents living along roads L5046 and L50461 (Figure 2).

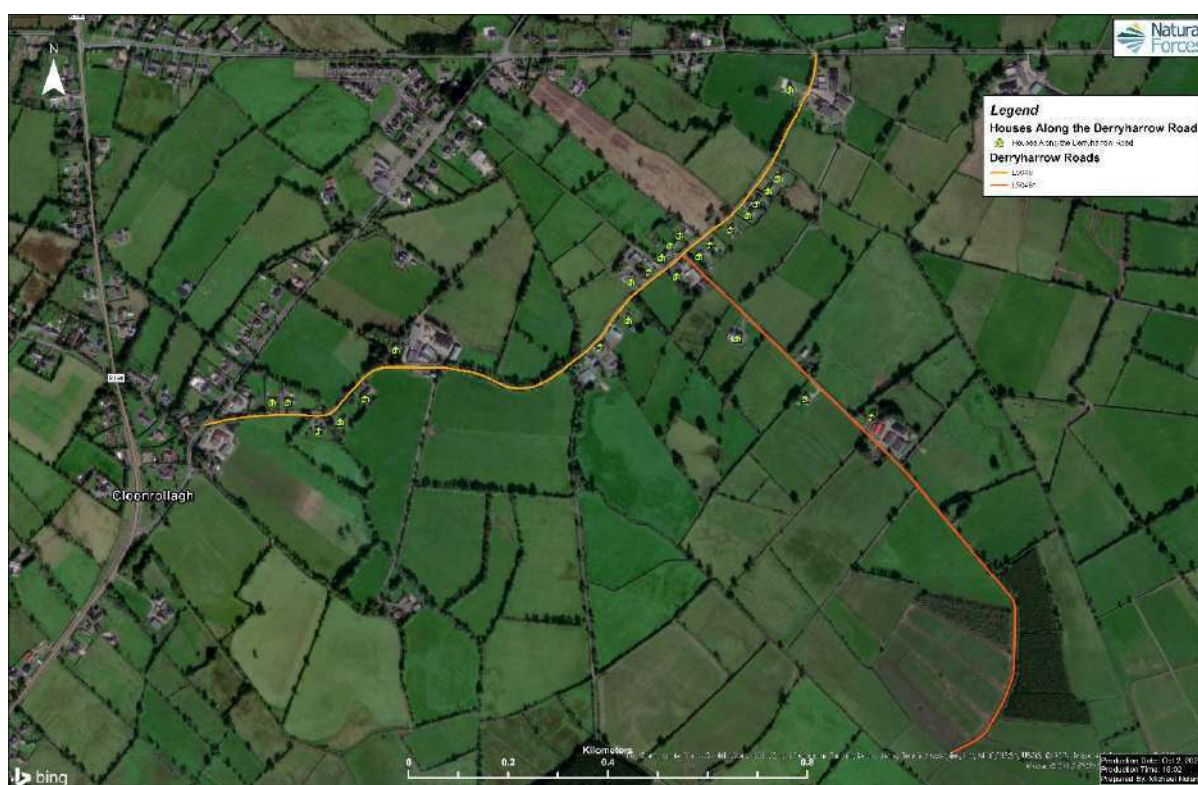


Figure 2 - Immediate neighbours

Natural Forces began working on the proposed development in Q4 2021 early 2022. First engagements were made with the immediate neighbours in April 2022,

This engagement involved members of the Natural Forces team calling door-to-door, distributing informational leaflets and speaking directly to residents about the proposed development and planned installation of a met mast scheduled for the following month (Appendix B).

During these visits, members of the Natural Forces team addressed residents' concerns and gathered valuable feedback. This direct engagement with the community was crucial in understanding their perspectives and helped inform the overall design of the proposed development. Based on the feedback received, the original layout was modified, and the number of turbines was reduced from four to two turbines to minimise the overall impact of the development on the local area.

Between Q4 2021 and September 2024 the Natural Forces team along with specialist consultants undertook extensive survey and assessment of the proposed development site and surrounding environs as a part of the EIAR process.

The team met Longford County Council through a pre- planning submission consultation in April 2024. The purpose of that meeting was to outline the progress made with the proposed development, the revised site layout and the findings of third party consultant assessments. The meeting with the county council served as a forum for the council to raises any concerns they had in relation to the proposed development and outline areas where they felt further assessment or attention was required. It was agreed that further community engagement was essential in advance of a planning submission for the proposed development.

On Friday 27th September 2024, Natural Forces undertook door to door visits with the immediate neighbours to provide further updates. During course of this engagement effort neighbours were provided with an information leaflet outlining the progress made in relation to the proposed development and invited to a further information session.

For those not at home during the door to door visits, an information pack was put through the letterbox for them. The pack contained details about the proposed development, contact information, and an invitation to attend an information session 09/10/2024 (Appendix C).

Residents within the Zone of Influence (Zoi)

In addition to the door to door visits which took place on Friday 27th September 2024, the same information package containing details about the proposed development, contact information, and an invitation to attend an information session on the 09/10/2024 (Appendix C) were distributed by post on the 01/10/2024 to all 184 residential dwellings within the Zone of Influence (Zoi) (nFigure 1 -Zone of Influence).

Proposed Development Information Session

The Natural Forces team held an information session on the proposed development. The session was held on 09/10/2024, at The Old Forge in Kiernan's Cross, between 14:30 & 20:00. This location was chosen due to its proximity to the proposed development and convenient parking.

In addition to the invitations sent to immediate neighbours and Residents within the Zone of Influence (Zoi), the event was advertised on the our website (Appendix D).

The session, designed as a walk-in event, and followed the 2016 Guidelines for Community Engagement. Approximately 50 residents attended the information session which presented details relating to the proposed development layout & design, the project's benefits and potential impacts, Maps, photomontages, and other visual materials were displayed. (Appendix E).

Attendees had the opportunity to ask questions directly to the Natural Forces team, planning consultants from McCutcheon Halley, and environmental and engineering specialists.

During the event, the most frequently asked questions were about noise, shadow flicker, traffic and transport, and community benefits. In response, the website's FAQ section (<https://www.naturalforces.ie/projects/cloonanny-wind-project/>) was updated to address these common concerns.

Community Register Signatories

At the information session, attendees had the chance to give feedback and join the Community Register Signatories by adding their names to the sign in sheet or by scanning a QR code that linked to a survey (Appendix F). This survey allowed participants to share their thoughts on the project and, by joining the registry, they ensured they would receive the latest project updates through their preferred communication method, whether by email or text message. 24 people were added to the registry during the information session.

Community Benefits

Natural Forces acknowledge that the Guidelines for Community Engagement 2016 stipulates that wind energy developers should identify the benefit to the communities concerned from the proposed development. These benefits which were expressed in the leaflets and the information session, are explained further in the sections below.

Community Benefit Fund

A mandatory Community Benefit Fund (CBF) is required for all projects that are successful in a RESS auction. This fund is currently set at €2/MWh generated for approximately 15 years. For a project involving two turbines, with an average wind speed of 6 m/s and utilising the Enercon E175 power curve, the anticipated CBF would be approximately €76,000 annually. This estimate is similar to what can be anticipated for the Cloonanny Windfarm.

This fund will specifically target and incentivise investments in the wider economic, environmental, social and cultural well-being of the local community. There is a potential to use the CBF to develop a walkway and cycleway around the windfarm, along with interpretive signage, outdoor exercise equipment, and a learning hub. This hub could be used by school and college groups for educational purposes and day trips. Other examples of projects that have been funded through CBFs include scholarships, community centres, energy upgrades in sports clubs and community centres, education programmes and disability access projects.

Local Infrastructure and Job Creation

The proposed development will involve significant investments in local infrastructure, such as roads and electrical systems. This investment will not only improve the overall quality of local infrastructure but also create employment opportunities in construction and related industries. Furthermore, the proposed development will contribute to contracting opportunities at various stages, including development, construction, operation, and decommissioning. These employment opportunities will have a positive impact on the local economy, providing a boost to businesses in the area and increasing revenue through project-related activities.

Environmental Advantages

Replacing fossil fuels with renewable energy sources such as wind helps reduce emissions of greenhouse gases and other pollutants. This reduction in air pollution can enhance the quality of life for residents, alleviating the prevalence of diseases such as stroke, heart disease, lung cancer, chronic respiratory illnesses, and acute respiratory conditions like asthma.

Next Steps

Engagement at All Stages

Community engagement will be sustained throughout all phases of the proposed development, from construction through the entire operational phase and into decommissioning. Similar approaches, based on the Communication Plan (Appendix A), will be employed at each stage.

The Appointment of a Community Liaison Officer

Once the proposed development receives planning permission, a Community Liaison Officer (CLO) will be appointed. The CLO will be responsible for providing full, clear, and comprehensive information about the development at key milestones, using methods outlined in the communication plan. All relevant stakeholders will have access to the CLO's contact details. The CLO will record, investigate, respond to, and address queries and complaints throughout all stages of the development.

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Conclusions

Natural Forces has actively engaged and maintained dialogue with the local community from an early stage, during the pre-application stage of this project. The process has been an extremely valuable exercise and has provided a detailed and enhanced understanding of the key issues and concerns of the local community, which have ultimately helped shape the final design of the proposed development.

Appendices

Appendix A – Communication Plan

Appendix B – Met Mast Information Leaflet

Appendix C – Project Information Leaflet/Information Session Invitation (Information Pack)

Appendix D – Advertisement on Webpage

Appendix E – Information Session Material (Posters & Photomontage Booklet)

Appendix F – Survey QR Code

RECEIVED: 11/12/2024

Appendix A – Communication Plan

RECEIVED: 11/12/2024

Communication Plan

Cloonanny Wind Farm

Last updated: 11/10/2024



Natural Forces
3rd Floor, Hampton House,
27 Mount Street Lower,
Dublin, D02 FC43

www.naturalforces.ie



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RECEIVED: 11/12/2024

Introduction

This Communication Plan was prepared by Natural Forces Renewables Ireland Limited 2 (Natural Forces).

The purpose of the plan is to outline the strategies and procedures for engaging with all stakeholders throughout the life of the Cloonanny Wind Farm (the proposed development).

The communication plan adheres to the Guidelines for Community Engagement 2016¹ and the Draft Revised Wind Energy Development Guidelines 2019², which sets the standards for community engagement for developers. This plan is a live document and will be updated and refined over time and made available via the Project's webpage.

Project Overview

The proposed development will be located in the townlands of Gorteenorna, Derryharrow, Corragarrow, Cloonanny Glebe, Co. Longford. The proposed development will involve the construction of two Enercon E175 EP5 E2 Wind Energy Converters, each with an electrical rating of 7 MW. These turbines will have a rotor diameter of 175 metres, a hub height of 112.4 metres, and a blade tip height of 199.6 metres.

Additionally, the development will include a 20 kV substation compound, comprising two prefabricated modular substation buildings, battery storage containers, and associated infrastructure.

A full proposed development description is provided in Chapter 02 Development Description of this EIAR.

Purpose

The purpose of this Communication Plan is to serve as a guide for effectively engaging with local residents and stakeholders.

¹ <https://www.gov.ie/en/consultation/8f3c71-public-consultation-on-the-revised-wind-energy-development-guideline/>

² <https://www.gov.ie/en/publication/9d0f66-draft-revised-wind-energy-development-guidelines-december-2019/>

Background

Natural Forces is a private, independent power producer that develops, constructs, owns, and operates wind, solar, and hydro proposed developments in Ireland, Canada, and France. The company has extensive experience developing renewable energy proposed development and working with communities, to inform and involve them in proposed development.

Natural Forces acknowledges that traditional information sharing methods are not always effective. Consequently, the organization has spent several years developing alternative engagement strategies to reach all stakeholders. The strategies, implemented by the proposed development team in the development of the proposed development, are detailed throughout this plan.

Local Residents & Stakeholders

As outlined in the draft WEDG 2019, the geographic scope for stakeholder engagement is based on the scale of the project. To adequately cover the site and its surrounding areas, a buffer zone has been established, extending 1.75 km from the proposed development, equivalent to 10 times the turbines' rotor diameter.

Zone of Influence

This buffer zone defines the Zone of Influence (Zoi), representing the geographical area within which stakeholder engagement will take place.

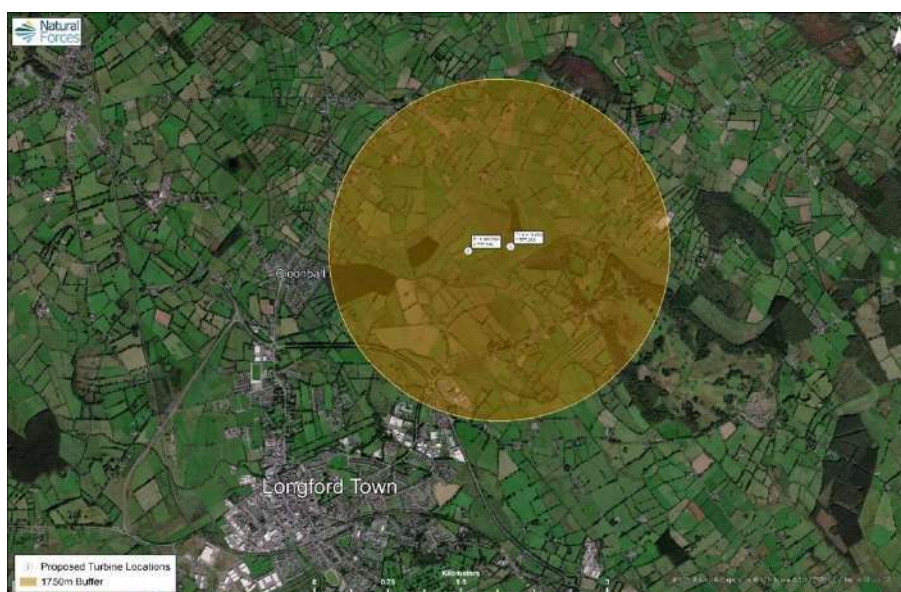


Figure 1 –Zone of Influence

Methods of Communication

As the proposed development progresses, the Natural Forces team will adopt a combination of communication methods to ensure residents and stakeholders are kept informed and engaged.

The following methods will be implemented:

- **Door-to-Door Visits:** Direct communication with residents in the immediate area.
- **Newsletters/Leaflets:** Distributed to nearby residents to provide updates on the project timeline, key milestones, and opportunities for engagement.
- **Emails/Texts:** will be sent to individuals who sign the community register, to ensuring they receive regular updates.
- **Project Website:** The dedicated project website ([Natural Forces Cloonanny Wind Project](#)) will be continuously updated with key information, planning documentation, and relevant links.
- **Dedicated Email Address:** A specific email (info@naturalforces.ie) will be available to facilitate direct communication, enabling real-time discussions and quick resolutions of any concerns.
- **Public Information Meetings:** Held in venues near the proposed development, such as The Old Forge, Kiernan's Cross, allowing residents to participate and discuss the project.
- **Consultation with Neighbours:** Regular communication will occur with immediate neighbours, particularly residents along roads L5046 and L50461
- **Signage:** Information boards will display key project details, such as construction schedules and Natural Forces contact information.
- **Community Liaison Officer (CLO):** A CLO will be appointed to act as a central contact point, with their contact details shared via leaflets and the company website.

Construction-Phase Specific Communication Methods:

1. **Construction Bulletins:** Regular updates on construction progress, timelines, and potential disruptions will be communicated through door to door visits, newsletters, emails, or flyers.
2. **Construction Notification Letters:** Regular letters will be sent to residents, informing them of specific activities that may affect them, such as increased traffic or abnormal load deliveries.
3. **Information Meetings:** If necessitated information meetings will be organised provide updates on construction progress and address any concerns or schedule changes.
4. **Interactive Maps:** Digital or printed maps will be provided to show construction progress and highlight areas affected by ongoing activities.

Conclusion

This plan outlines Natural Forces communication strategy across all stages of the proposed development. By adhering to the Guidelines for Community Engagement 2016 and the Draft Revised Wind Energy Development Guidelines 2019, and utilising various communication methods, the transparent and effective communication with all stakeholders is achieved.

Appendix B – Met Mast Consultation Cloonanny

RECEIVED: 11/12/2024



Who we are

Natural Forces is a Private Independent Power Producer (IPP) headquartered in Halifax, NS, Canada, with teams in New Brunswick, New York, and Ireland

Natural Forces has wind, solar, energy storage and hydro projects in development throughout Canada, Ireland, and New York state.

We develop projects in partnerships with First-Nations communities, universities, and corporations.

Natural Forces develop, finance, construct, operate and own projects.

Natural Forces are looking to develop several wind energy projects across Ireland.

Natural Forces are currently progressing a number of community owned single turbine projects through-out Ireland in line with the Department of the Environment, Climate and Communications renewable energy support scheme (RESS).

Proposed Project

Natural Forces have identified the lands within Cloonanny Glebe, County Longford as potentially suitable for the development of a wind energy project. Natural Forces are at the early stages of our development cycle with this project, which involves carrying out various assessments such as environmental surveying, technical assessments, wind resource monitoring etc.



To better understand the wind resource in the area of Cloonanny Glebe, Natural Forces plan on erecting a wind monitoring mast (Met Mast) in May 2022.

This mast will simply record the wind speed and direction at the site at different elevations using a cup anemometer and wind vane.

The data collected during the monitoring period will enable us to understand whether the conditions at the site are suitable for the development of a wind energy project.

Contact us

As the project progresses, Natural Forces will host a number of public consultation meetings in the local area.

If you would like to get in contact with anyone from our team, please contact us using the following details.

Name: Jonathan Wagner Coffey

Position: Development Manager

Email: jcoffey@naturalforces.ie

Phone: +353 87 63 52172

Website: naturalforces.ie

Address: 25 Sea Park Road, Clontarf, Dublin 3

Appendix C – Information Pack

RECEIVED: 11/12/2024

27 Mount Street Lower,
Dublin 2,
Ireland,
D02 FC43

Date: 27/09/2024

Invitation for an Information Session about the Proposed Cloonanny Wind Farm

To whom it may concern,

We are pleased to invite you to a drop in information session to discuss the proposed Cloonanny Wind Farm. As a local resident, we want to ensure you are informed about the project and provide an opportunity for you to ask any questions you may have.

Event Details:

- **Date:** Wednesday 9th October 2024
- **Time:** 14:30 – 20:00
- **Location:** The Old Forge, Kiernan's Cross, Carriglass, Co. Longford (N39 A7N6)

Your feedback is important to us, and we look forward to sharing information about the benefits and details of the project. If you are unable to attend, please refer to the information leaflet enclosed with this invitation, which includes contact details for any questions you might have.

We hope to see you there.

Best regards,

Jonathan Wagner Coffey | Managing Director

Phone: +353 87 635 2172

Email: info@naturalforces.ie

NATURAL FORCES

Natural Forces, an independent power producer, intends to submit a planning application to Longford County Council in late 2024 for a wind farm in Cloonanny Glebe, Co. Longford. Founded in 2001 in Halifax, Nova Scotia, Natural Forces partners with Indigenous communities, universities, and municipalities to develop, construct, own, and operate renewable energy projects. Currently the company manages approximately 300MW of wind, solar, and hydropower projects across Canada, Ireland, and France.

PROJECT DETAILS

The project will involve constructing two Enercon E175 EP5 E3 Wind Energy Converters, each with a rotor diameter of 175m, a hub height of 112.4m, a blade tip height of 200m, and an electrical rating of 7 MW. Additionally, the project will include the construction of a 20kV substation compound comprised of two pre-fabricated modular substation buildings and containerised battery storage modules placed on concrete plinths and associated works, such as underground cabling to connect to the national grid.

LOCATION

The 21.66-hectare site is made up of several private land parcels and is located in an agricultural area, 3.3km northeast of Longford Town. Nearby settlements include Clonbalt Wood and Newtown Forbes. The N4 National Road and the River Camlin lie to the south of the site, while the R194 Regional Road runs to the west.

SITE LAYOUT



WHY THIS SITE

The site is considered suitable for wind development in as per Longford's County Development Plan 2021-2027. It is not designated as a NATURA 2000 site, Special Area of Conservation (SAC), Special Protection Area (SPA), or Natural Heritage Area (NHA). The site also benefits from high annual average wind speeds and allows for a substantial 800m setback between turbines and residential properties, aligning with the Draft Wind Energy Guidelines 2019.

ENVIRONMENTAL IMPACT ASSESSMENT

An Environmental Impact Assessment Report (EIAR) will be submitted as part of the planning application. The EIAR assesses a wide range of topics, including human health, biodiversity, birds, bats, archaeology, shadow flicker, noise and vibration, water and hydrology, wind resource, landscape and visual aspects, geology, and traffic and transport.

BENEFITS

Financial

During peak construction, approximately 50 jobs will be created, benefiting local businesses that can provide services like materials, labour, and accommodation.

Once operational, the project will pay commercial rates to Longford County Council, supporting local services including road upkeep, fire services, street lighting, footpath maintenance etc.

If the project is successful in a RESS auction, a Community Benefit Fund will be established. The fund is set at €2 per MWh generated over approximately 15 years. This means that if the project generates 40,000 MWh annually, the fund will amount to €80,000 per year. This fund aims to support local initiatives in energy efficiency, education, sustainability, and safety.

Environmental

The project is expected to generate emission-free electricity, sufficient to power almost 9,000 homes annually, representing over 45% of county Longford's residences.

Switching from fossil fuels to renewable energy sources reduces greenhouse gas emissions. This shift can significantly improve residents' quality of life by reducing the incidence of diseases such as stroke, heart disease, lung cancer, and respiratory illnesses.

CONTACT DETAILS

Natural Forces

- Email: info@naturalforces.ie
- Telephone: 087-635-2172
- Website: <https://www.naturalforces.ie/projects/cloonanny-wind-project/>

Independent Advisory Bodies

- Longford County Council: www.longfordcoco.ie
- Sustainable Energy Authority: www.seai.ie
- Environmental Protection Agency: www.epa.ie
- Geological Survey of Ireland: www.gsi.ie
- National Parks and Wildlife Service: www.npws.ie
- Inland Fisheries Ireland: www.fisheriesireland.ie



CLOONANNY WIND FARM

Information Leaflet

Appendix D – Webpage Screenshot

RECEIVED: 11/12/2024

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- Cloonanny Wind Project
- About The Project
- Project Updates
- Project Milestone Timeline
- Who is proposing this project?
- Why here?
- Community Engagement
- Information Session
- What is the process?
- Environmental Impact Assessment
- Frequently Asked Questions

around the country. Factors other than the strength and consistency of the wind must be taken into account when considering a site, such as proximity to the electricity grid, road access, ecology, archaeology, and cultural significance, proximity to residential dwellings, and health concerns.

The location of the Cloonanny Wind Project was selected after a thorough review of all of these factors.

Community Engagement

Natural Forces is committed to engaging with the public, stakeholders, and stakeholder groups throughout the lifetime of the project. We are both keen to ensure the community understands the project details and is aware of project activities, and to accept input and feedback from community members. Below is information about the major public and stakeholder engagement activities that have taken place to date, including summaries of the information that has been shared at our open houses.

Information Session

An information session for this project will place on **Wednesday 9th October 2024** at The Old Forge, Kiernan's Cross, Carriglass, Co. Longford (N39 A7N6). The event will follow a drop-in format, running from 14:30 PM to 20:00 PM.

What is the process?

1

Development

- Assess the wind resource
- Survey for environmentally sensitive features
- Optimize turbine location to capture the wind efficiently and minimize impact on sensitive features
- Begin consultation with regulators and the public

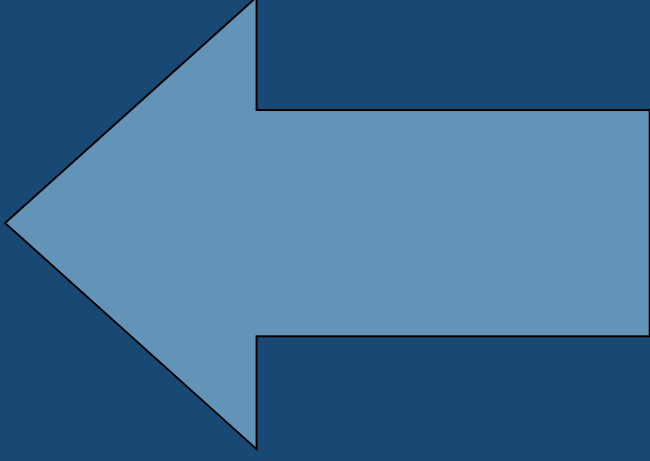
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Appendix E – Consultation Posters

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Information Session Ahead



Cloonanny Windfarm

Wednesday 9th October 2024
2:30–8:00pm

RECEIVED: 11/12/2024

Project Details



Cloonanny Windfarm

Natural Forces

Natural Forces, an independent power producer, intends to submit a planning application to Longford County Council in late 2024 for a wind farm in Cloonanny Glebe, Co. Longford. Founded in 2001 in Halifax, Nova Scotia, Natural Forces partners with Indigenous communities, universities, and municipalities to develop, construct, own, and operate renewable energy projects. Currently the company manages approximately 300MW of wind, solar, and hydropower projects across Canada, Ireland, and France.

Project Description

The project will involve constructing two Enercon E175 EP5 E3 Wind Energy Converters, each with a rotor diameter of 175m, a hub height of 112.4m, a blade tip height of 200m, and an electrical rating of 7 MW. Additionally, the project will include the construction of a 20kV substation compound comprised of two pre-fabricated modular substation buildings and containerised battery storage modules and associated works, such as underground cabling to connect to the national grid.

Location



The site is made up of several private land parcels and is located in an agricultural area, 3.3km northeast of Longford Town. Nearby settlements include Clonbalt Wood and Newtown Forbes. The N4 National Road and the River Camlin lie to the south of the site, while the R194 Regional Road runs to the west.

Why wind energy?

Utilising clean, renewable energy such as wind is a crucial step in addressing climate change

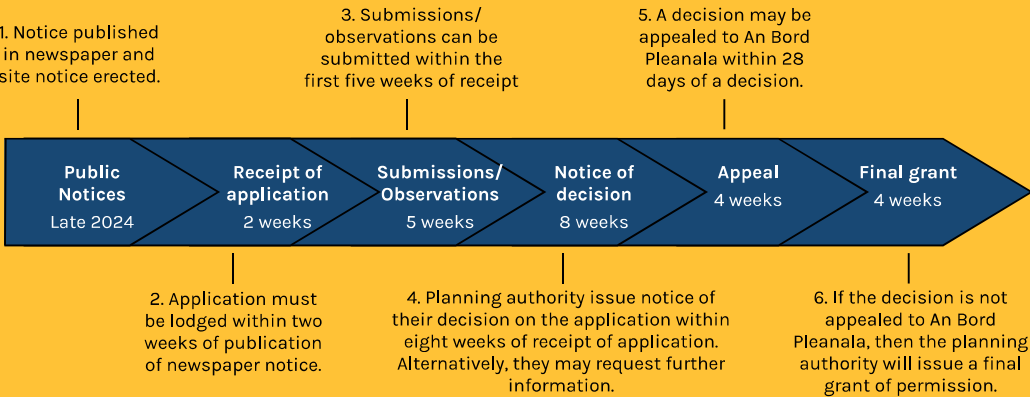
⁽¹⁾. If the rate of global warming continues to increase and the climate continues to change there could be severe adverse effects on Ireland⁽²⁾ including:

- The spread of invasive species threatening Ireland's native wildlife
- Decreases in productivity for some agricultural crops
- Exposure to sea level rise, storm surges and coastal erosion
- Increases in both floods and droughts, with impacts for water resources and water quality
- Risk to built environments and heritage sites from extreme weather events
- Failures in critical infrastructure needed for public services and other sectors
- Negative impacts on health and wellbeing, with critical health infrastructure like hospitals and care homes facing increased risks from heat and flood extremes
- Unmanaged increases in tourism due to warmer summers creating damaging and unsustainable pressures on sensitive heritage sites and environments.



1. <https://www.seai.ie/home-energy/take-climate-action/start-saving-energy/>
2. <https://www.epa.ie/environment-and-you/climate-change/what-impact-will-climate-change-have-for-ireland/#:~:text=By%20the%20middle%20of%20this,expected%20to%20occur%20more%20frequently.>

Timescale for most planning permission cases



Contact Information

- Natural Forces**
- Email: info@naturalforces.ie
 - Telephone: 087-635-2172
 - Website: <https://www.naturalforces.ie/projects/cloonanny-wind-project/>

- Independent Advisory Bodies**
- Longford County Council: www.longfordcoco.ie
 - Sustainable Energy Authority: www.seai.ie
 - Environmental Protection Agency: www.epa.ie
 - Geological Survey of Ireland: www.gsi.ie/en-ie/Pages/default.aspx
 - National Parks and Wildlife Service: www.npws.ie
 - Inland Fisheries Ireland: www.fisheriesireland.ie

Community Benefit Funds



Cloonanny Windfarm

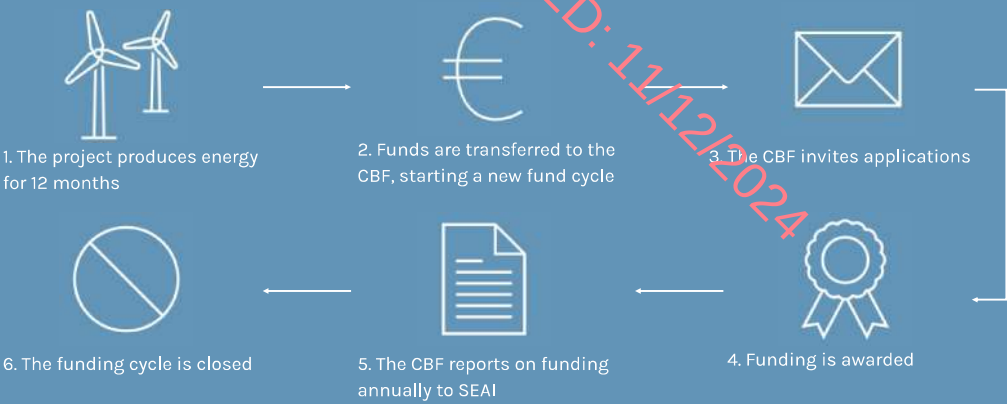
About the Community Benefit Fund

A key feature of projects that are developed under the Renewable Electricity Support Scheme (RESS) is the requirement for a mandatory Community Benefit Fund (CBF) to be established and dispersed within the local community on an annual basis for the duration of the RESS contract, approximately 15 years.

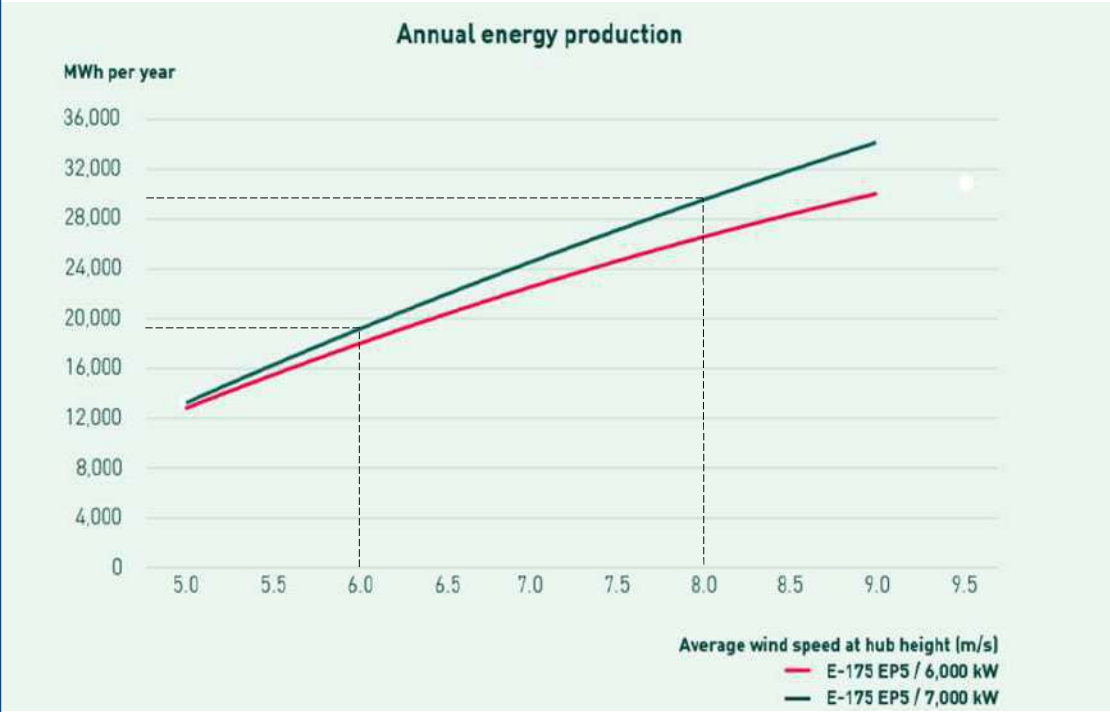
The contribution is to be set at €2 per Megawatt hour of generation produced by the RESS project. After 12 months of operation, the fund is calculated from total electricity generated from the project and is then advertised for community groups to apply.

This means there are real and quantifiable funds being made available annually for the benefit of the local community. The CBF will be aligned to incentivise investment in local renewable energy, energy efficiency measures and climate action initiatives⁽¹⁾.

The Funding Cycle⁽²⁾



How the Community Benefit Fund is Calculated and Allocated



Enercon’s Power Curve for E175 EP5 / 7000kW⁽³⁾

Under the current terms and conditions, the calculation for a CBF is total electricity generated (MWh) x €2. To illustrate how this calculation works in practice, consider two hypothetical windfarm sites with different wind speeds. The Enercon Power curve, which outlines the expected power output relative to wind speed, is displayed on the left for reference.

Example	Average Wind Speed (m/s)	Generation	€/MWh	No. Turbines	Expected CBF per annum
Site A (moderate wind speeds)	6.0	19,000	2	2	19000 x 2 x 2 = €76,000
Site B (high wind speeds)	8.0	30,000	2	2	30,000 x 2 x 2 = €120,000

Example of how a CBF of €120,000 (Site B) is distributed after allocating €1,000 to each household within a 1-kilometer radius of the project⁽⁴⁾.

Description	% of Fund	Annual Amount
Initiatives and projects that support Sustainable Development Goals within the local area	Minimum 40%	€48,000
Administration	Maximum 10%	€12,000
Local clubs, societies and near neighbours	Remainder (50%)	€60,000

What can a Community Benefit Fund Support?

The CBF can support not-for-profit community enterprises where the focus is aligned with UN Sustainable Development goals, further details can be found in the Good Practice Principles⁽³⁾ published by The Department of Environment, Climate and Communications. Additionally, a near-neighbour payment will be paid to those living within 1km of the site through this fund. Examples of projects and initiatives that have been funded through CBFs include scholarships, community centres, energy upgrades in sports clubs and community centres, education programmes and disability access projects⁽²⁾.

Case Studies

Hazelwood Tennis Club⁽⁵⁾

Hazelwood Tennis Club in Hazelwood, Newtwopothouse in Mallow, Co. Cork has been able to upgrade its club and accommodate new members thanks to the Castlepook CBF. Upgrades carried out included, replacing existing light bulbs with LED bulbs, adding a new seating area with recycled materials, and resurfacing 'Court 2'. The total cost of the project came to €22,500, with €16,500 covered by the Castlepook CBF.



An Súcán⁽⁶⁾

The establishment of An Súcán, the Museum of the Irish Language and Gaelic Revival in Ballygeary, Co. Cork, has been supported by grants totalling €28,000 from nearby CBFs. These funds were contributed by ESB's Grousemount Windfarm and SSE Renewables' Coomacheo & Curragh Windfarm in Cork and Kerry since 2020. Upon its opening, the museum aims to serve as a valuable educational resource and cultural tourism destination in Ballygeary village. It is projected to attract up to 8,000 visitors annually and will also host community events, thereby creating local employment opportunities.



1. <https://www.seai.ie/community-energy/community-benefit-funds/>
2. <https://www.seai.ie/CBFs-for-Communities.pdf>
3. <https://www.enercon.de/en/turbines/e-175-ep5>
4. <https://www.gov.ie/en/publication/5f12f-community-projects-and-benefit-funds-ress/>
5. <https://www.youtube.com/watch?v=NotZ28d0fxY&t=25s>
6. https://www.seai.ie/case-studies/an-sugan_cbf/

Surveys

As part of the planning application, independent consultants conducted environmental surveys. These surveys cover built services and ecology, and include the following:

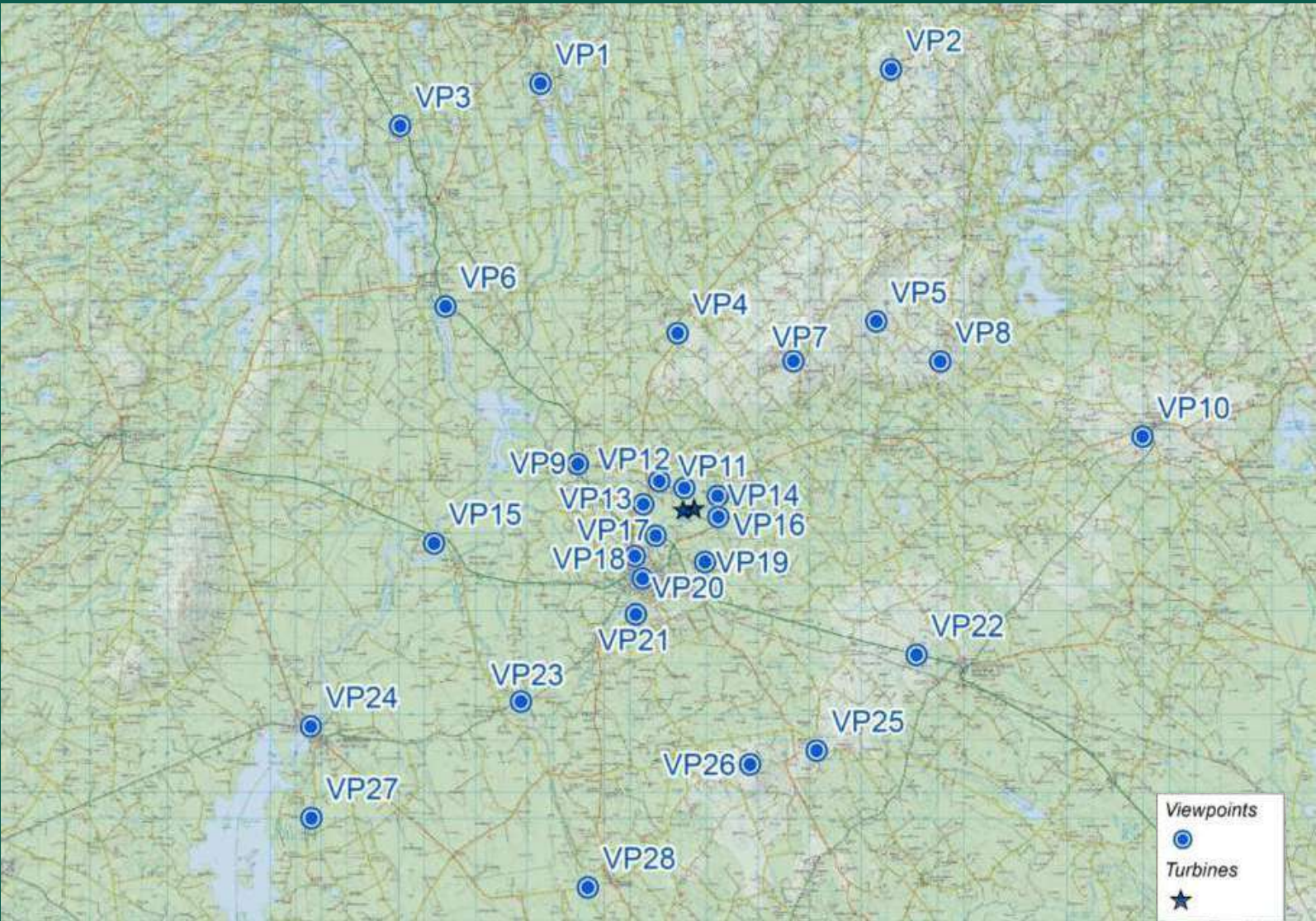
Magnitude of Impact			
No Impact	Low	Medium	High

Built Services		
Survey	Description	Impact
Shadow Flicker	Assesses sunlight strobing effects from the sun shining through the rotating blades of a turbine on nearby properties.	A shadow shutdown system will turn off the turbines if shadow flicker is detected.
Noise	Analyses the sound levels generated by the turbines on the surrounding community and potential for noise disturbance.	Third-party experts AWN Consulting concluded that noise from construction, operation, and decommissioning activities will not be significant.
Aviation	Investigates how the turbine structures may interfere with aircraft flight paths, radar systems, and safety.	Third-party experts AiBridges concluded that the project is unlikely to affect nearby aviation systems.
Telecommunication	Evaluates potential disruptions the location of turbines might cause to radio, television, mobile, and other communication networks.	The turbine locations do not interfere with telecommunication lines.
Landscape Visual Impact	Assesses how the presence of turbines alters the visual character and aesthetic value of the surrounding environment.	Third-party experts Macroworks concluded that the project will have no significant impact on the landscape or visual amenity.

Ecology		
Survey	Description	Impact
Biodiversity	Conducts a study of flora and fauna to assess the current biological conditions at the site and the potential impacts of the development on nearby ecosystems.	Mitigation and reinstatement efforts will result in only a temporary loss of biodiversity in the area.
Hydrology	Examines how water flows within the landscape, analysing baseline and adjacent hydrological conditions, and includes a flood risk assessment.	Turbine 2 is in an area with a 1% chance of an extreme flooding event occurring within 100 years, which could pose challenges during construction.
Ornithology and Bats	Studies bird and bat populations in the area, evaluating their activity to understand the potential impacts of the development on wildlife and includes a collision risk model.	Third-party experts ID Environment Consultants concludes that with mitigation and a bat management plan, there is no risk to bird or bat species.
Soils and Geology	Analyses soil and geological hazards that may arise from the construction of turbines, access tracks, and other infrastructure throughout the project's lifespan.	Third-party experts Whiteford Geoservices determined that the turbines are rated as low on their hazard scale.
Archaeology	Assesses potential archaeological sites and artifacts in the area to ensure that the development does not adversely impact historical and cultural resources.	Test trenching on the site found no features.

Photomontages

Viewpoint locations selected for the photomontages:



- VP1: Rinn Lough (17.4 km)
- VP2: R198 at Legga (18.6 km)
- VP3: N4 at Fearnaght (18.6 km)
- VP4: R198 at Drumlish (10.3 km)
- VP5: L1035 at Drumderg (11.3 km)
- VP6: R371 at Osprey Park (12.1 km)
- VP7: L1031 at Corn Hill (6.3 km)
- VP8: L1051 at Gelsagh (11.1 km)
- VP9: N4 at Newtown Forbes (4.5 km)
- VP10: Granard Motte and Bailey (17.7 km)
- VP11: L50461 at Derryharrow (1.1 km)
- VP12: L1018 at Melview (1.4km)
- VP13: R198 at Melview (1.4 km)
- VP14: Lane at Kiltybegs (1.1 km)
- VP15: Termonbarry Lock (9.8 km)
- VP16: R194 at Carrickglass Demesne (1.0 km)
- VP17: N4 at Camlin River, Longford (1.4 km)
- VP18: R198 at Abbeycarton, Longford (2.6 km)
- VP19: L1071 at Corraabaun, Longford (2.1 km)
- VP20: St Mel's Cathedral, Longford (3.1 km)
- VP21: L1127 at Aghafad, Longford (4.4 km)
- VP22: N4 at Edgeworthstown (10.3 km)
- VP23: N63 at Royal Canal (9.7 km)
- VP24: Harbour Lane, Ballyleague (16.7 km)
- VP25: St Patrick's Church, Ardagh (10.5 km)
- VP26: L5209 at Lisduff (10.1 km)
- VP27: L1167 at Carrowroe (18.7 km)
- VP28: L1136 at Mosstown Harbour (15.0 km)

Environmental Background

Cloonanny Windfarm



Photomontages cont.

Baseline:



VP11:



VP13:



VP14:



VP17:



VP26:

Montage:





macroworks

LVIA PHOTOMONTAGES

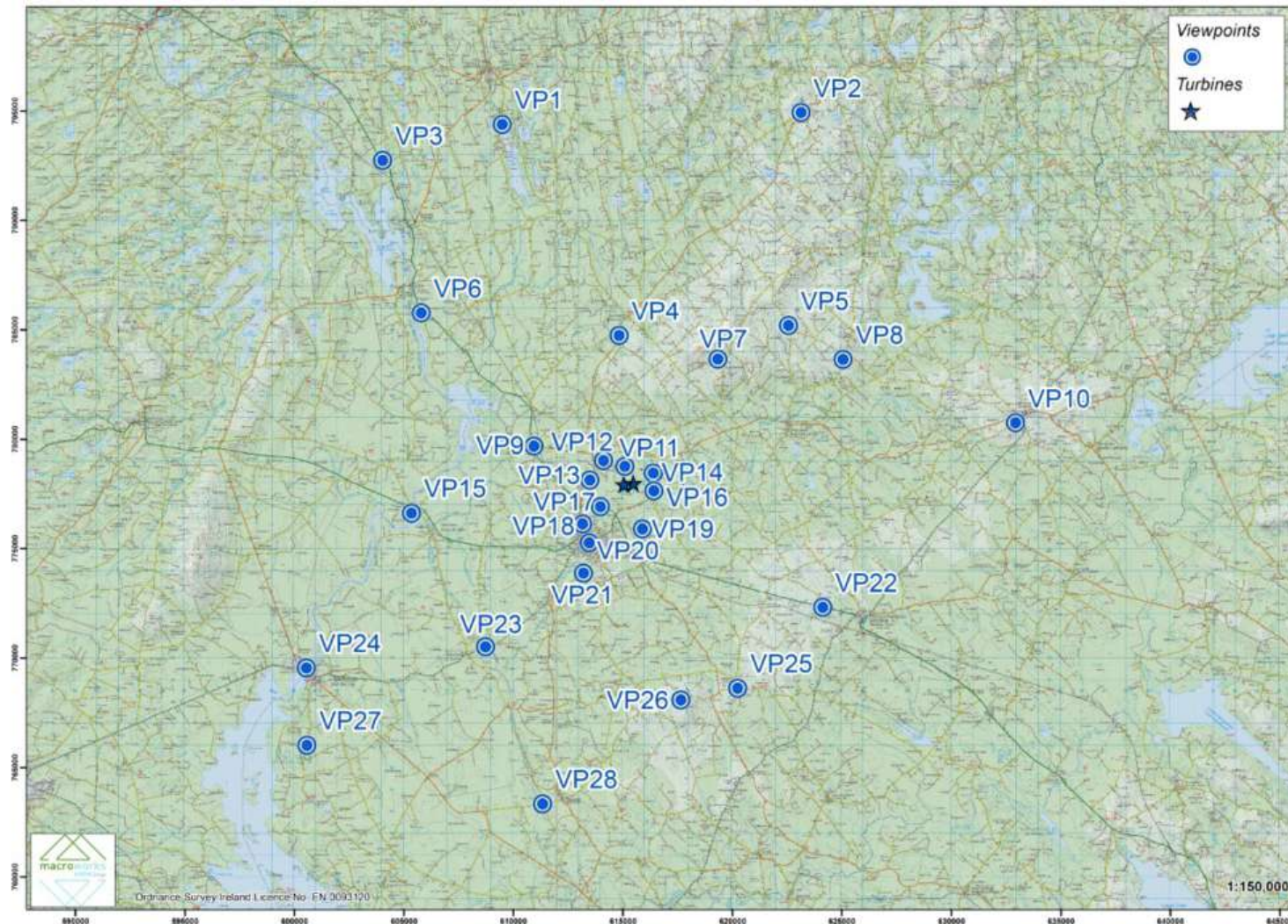
Cloonanny Wind Farm

This book contains imagery for the viewpoints chosen for the LVIA study

September 2024



Viewpoint (VP) Locations Selected



- RECEIVED 12/12/2014
- VP1: Rinn Lough
 - VP2: R198 at Legga
 - VP3: N4 at Fearnaght
 - VP4: R198 at Drumlish
 - VP5: L1035 at Drumderg
 - VP6: R371 at Osprey Park
 - VP7: L1031 at Corn Hill
 - VP8: L1051 at Gelsagh
 - VP9: N4 at Newtown Forbes
 - VP10: Granard Motte and Bailey
 - VP11: L50461 at Derryharrow
 - VP12: L1018 at Melview
 - VP13: R198 at Melview
 - VP14: Lane at Kiltybegs
 - VP15: Termonbarry Lock
 - VP16: R194 at Carrickglass Demesne
 - VP17: N4 at Camlin River, Longford
 - VP18: R198 at Abbeycarton, Longford
 - VP19: L1071 at Corraabaun, Longford
 - VP20: St Mel's Cathedral, Longford
 - VP21: L1127 at Aghafad, Longford
 - VP22: N4 at Edgeworthstown
 - VP23: N63 at Royal Canal
 - VP24: Harbour Lane, Ballyleague
 - VP25: St Patrick's Church, Ardagh Village
 - VP26: L5209 at Lisduff
 - VP27: L1167 at Carrowroe
 - VP28: L1136 at Mosstown Harbour

VP1:

Before



After



VP2:



Not visible from this VP



VP3:



VP4:



Not visible from this VP



VP5:

Before



After



VP6:



Not visible from this VP



VP7:



VP8:



VP9:

Before



After



VP10:



VP11:



VP12:



VP13:

Before



After



VP14:



VP15:



Not visible from this VP



VP16:



VP17:

Before



After



VP18:



Not visible from this VP



VP19:



VP20:



VP21:

Before



After



VP22:



Not visible from this VP



VP23:



VP24:



Not visible from this VP

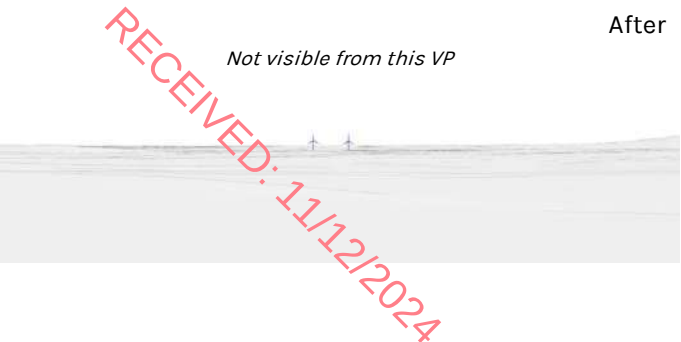


VP25:

Before



After



VP26:



VP27:



VP28:



Appendix F – Survey QR Code

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We would love to hear your feedback. Scan the QR code with your phone to complete an optional survey.



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APPENDIX 2.1
TURBINE SPECIFICATIONS

VOLUME III
APPENDICES TO
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Technical description

ENERCON E-175 EP5 wind energy converter

RECEIVED: 11/12/2024

Publisher

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Applicable documents

The titles of the documents listed are the titles of the original language versions, with translations of these titles in brackets where applicable. The titles of superordinate standards and guidelines are indicated in the original language or as an English translation. Document IDs always refer to the original language versions. If the document ID does not contain a revision, the most recent revision of the document applies. This list contains documents concerning optional components if necessary.

Document ID	Document
D02766054	Technische Daten E-175 EP5 (Technical specifications – E-175 EP5)

Table of contents

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List of abbreviations

CFRP	Carbon fibre reinforced plastic
FACTS	Flexible Alternating Current Transmission System
FT	FACTS Transmission (electrical configuration with FACTS properties)
FTQ	FACTS Transmission with Q+ option (electrical configuration with extended reactive power range)
FTQS	FACTS Transmission with Q+ option and STATCOM option (electrical configuration with extended reactive power range and STATCOM option)
FTS	FACTS Transmission with STATCOM option (electrical configuration with STATCOM option)
GFRP	Glass-fibre reinforced plastic
SCADA	Supervisory Control and Data Acquisition
STATCOM	Static compensator

RECEIVED: 11/12/2023

1 Product overview



RECEIVED: 11/12/2024

Fig. 1: Product overview

The wind energy converter generates electrical energy from the wind. Wind flowing towards the wind energy converter causes the rotor to rotate clockwise. This rotational movement is converted into electrical energy. The wind energy converter operates automatically.

The wind energy converter essentially consists of the tower, the rotating nacelle with adjustable rotor blades and electrical components for generating and conditioning the electrical energy.

Gearless

The wind energy converter drive system comprises very few rotating components. The hub and the rotor of the generator are directly interconnected without a gear to form one solid unit. This reduces mechanical load and increases the technical service life. It reduces maintenance and service costs and also keeps operating costs to a minimum. Since there are no gears or other fast-rotating parts, the energy loss between generator and rotor as well as sound emissions are reduced.

Active pitch control

The active pitch control limits rotor speed and the amount of power extracted from the wind. The maximum output of the wind energy converter can then be limited to nominal power, even at short notice. Pitching the rotor blades into the feathered position stops the

rotor without any load on the drive train caused by the application of a mechanical brake. The energy supply for emergency pitching of the rotor blades is located in the pitch control cabinets.

Indirect grid connection

The electrical power produced by the generator is fed via a full-scale converter into the grid. The full-scale converter decouples the generator completely from the grid and the electrical properties of the generator are irrelevant to the behaviour of the wind energy converter on the grid. The grid feed system with full-scale converter ensures maximum energy yield with excellent power quality.

The generator can be operated at an optimum operating point, e.g. speed, power, voltage, at any wind speed, by decoupling it from the grid.

2 Components of the ENERCON wind energy converter

2.1 Rotor blades

The rotor blades are made of GFRP, CFRP, balsa wood and foam and are a major factor in the wind energy converter yield and sound emissions. The shape and profile of the rotor blades were designed with the following criteria in mind:

- High power coefficient
- Long service life
- Low sound emissions
- Low mechanical loads
- Efficient use of material

The rotor blades of the wind energy converter were specially designed to operate with variable pitch control and at variable speeds. A polyurethane-based surface coating protects the rotor blades from environmental influences such as UV radiation and erosion. This coating is visco-hard and highly resistant to abrasion.

Microprocessor-controlled pitch units adjust each of the 3 rotor blades independently of each other. 2 blade angle measurements constantly monitor the set angle of each blade, and the 3 blade angles are adjusted individually. This enables quick and precise setting of the blade angles according to the prevailing wind conditions.

2.2 Nacelle

The hub rotates around the fixed axle pin on 2 rotor bearings. Among other components, the rotor blades and the generator rotor are attached to the hub. The slip ring unit is located at the tip of the axle pin. It transmits electrical energy and data between the stationary and rotating parts of the nacelle via sliding contacts.

The stator support is the load-bearing element of the fixed generator stator. The stator support is firmly connected to the main carrier. The stator supports the electrical windings in which the electric current is induced.

The main carrier is the central load-bearing element of the nacelle. All parts of the rotor and generator are attached to it either directly or indirectly. The main carrier rotates on the tower head by means of the yaw bearing. The entire nacelle can be rotated by the yaw drives so that the rotor is always optimally aligned with the wind.

The machine house casing comprises multiple sections and is fastened to the nacelle floor by means of steel profiles.

2.2.1 Generator

A permanently excited synchronous generator of internal rotor design is used in the wind energy converter. The wind energy converter operates at variable speeds in order to optimally exploit the wind energy potential at all wind speeds. The annular generator therefore produces alternating current with fluctuating voltage, frequency and amplitude.

The windings in the stator of the generator form several independent three-phase systems. These systems are actively rectified in the nacelle. The inverters then reconvert them into three-phase current whose voltage, frequency and phase position conform to the grid. The transformer in the nacelle converts the voltage generated to the level of the grid into which the current is fed. The transformer is connected to the receiving grid via the medium-voltage switchgear.

Consequently, the generator is not directly connected to the receiving grid of the utility and is decoupled from the grid by the full-scale converter.

2.3 Tower

The tower of the wind energy converter is a tubular steel tower, hybrid steel tower or hybrid tower.

The tubular steel tower is a sheet steel tube consisting of a small number of large steel sections. Depending on the tower version, the lowermost steel section may be in one piece or subdivided into several longitudinal elements. The longitudinal elements are first joined at the installation site to form a single steel section. Flanges with drill holes for assembly are welded onto the ends of the steel sections. The steel sections are stacked on top of one another and bolted together at the installation site. They are linked to the foundation by means of a foundation basket.

The hybrid steel tower is a sheet steel tube consisting of a small number of large steel sections. The lower steel sections are subdivided into a number of edged section plates. The upper steel sections are in one piece. The edged section plates are first bolted together to form steel sections at the installation site. The individual steel sections are stacked on top of each other and bolted together at the installation site. This is done for the longitudinally-divided steel sections by connection plates and for the one-piece steel sections by flange joints. They are linked to the foundation by means of a foundation basket.

The lower part of the hybrid tower is made of concrete segments and the upper part of steel sections. The concrete segments are assembled from precast elements that are stacked on top of each other at the installation site. The upper steel sections are placed onto the concrete segments and bolted in place. The concrete segments are prestressed vertically by means of prestressing steel tendons. The prestressing tendons run either vertically through ducts in the concrete segments or externally along the interior tower wall. They are anchored to the tower foundation.

All towers receive the final paint top coat or weather and corrosion protection at the factory. This means that ideally no further work is required on the tower surface after installation.

3 Grid management system

The permanent magnet synchronous generator is coupled to the grid via the grid feed system. This system essentially consists of a modular rectifier and inverter system with a common DC link each.

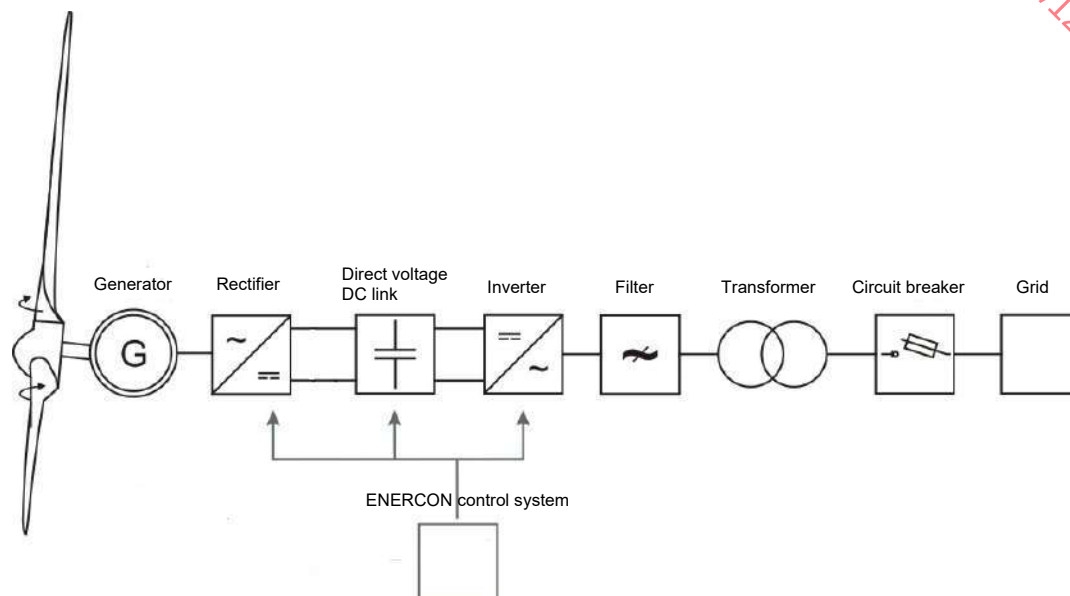


Fig. 2: Simplified electric diagram of a wind energy converter

The grid feed system and pitch control are managed by the control system to achieve maximum energy yield and excellent power quality.

Optimum power transmission is achieved by decoupling the generator from the grid. Any sudden changes in wind speed are translated into controlled changes in the power fed into the grid. In a similar way, any disruptions from the grid have virtually no effect on the mechanics of the wind energy converter. The electric power fed in by the wind energy converter can be precisely regulated from 0 kW up to the nominal power.

In general, grid operators specify the characteristics required for a certain wind energy converter or wind farm to be connected to a receiving grid. To meet different requirements, ENERCON wind energy converters are therefore available in a range of configurations.

The inverter system in the nacelle is designed according to the particular configuration of the wind energy converter. A transformer in the nacelle converts the low voltage to the desired medium voltage.

Reactive power

If necessary, a wind energy converter equipped with the standard FACTS open-loop control system can supply reactive power in order to contribute to the reactive power balance and to maintaining voltage levels in the grid. The maximum reactive power range varies, depending on the configuration of the wind energy converter.

FT configuration

By default, the wind energy converter comes equipped with FACTS technology that meets the stringent requirements of specific grid codes. It is able to ride through grid faults of a few seconds (undervoltage, overvoltage, automatic reclosing, etc.) and thus to remain connected to the grid during a fault.

If the voltage measured at the reference point exceeds a defined limit value, the wind energy converter changes from normal operation to a special fault operating mode.

Once the fault has been cleared, the wind energy converter returns to normal operation and feeds the available power into the grid. If the voltage does not return to the operating range admissible for normal operation within an adjustable time frame, the wind energy converter is disconnected from the grid.

While the system is riding through a grid fault, various fault modes using different grid feed strategies are available, including feeding in additional reactive current during the grid fault. The control strategies include different options for setting fault types.

Selection of a suitable control strategy depends on specific grid code and project requirements that must be confirmed by the particular grid operator.

FTS configuration

FT configuration with STATCOM option

Same as FT configuration; however, the STATCOM option additionally enables the wind energy converter to output and absorb reactive power regardless of whether it is generating and feeding active power into the grid. It is thus able to actively support the power grid at any time, similar to a power plant. Whether or not this configuration can be used needs to be determined on a project-by-project basis.

FTQ configuration

FT configuration with Q+ option

The FTQ configuration has all of the features of the FT configuration. In addition, it offers an extended reactive power range.

FTQS configuration

FT configuration with Q+ and STATCOM options

The FTQS configuration has all of the features of the FTQ and FTS configurations.

Frequency protection

ENERCON wind energy converters can be used in grids with a nominal frequency of 50 Hz or 60 Hz.

The range of operation of the wind energy converters is defined by a lower and upper frequency limit value. Overfrequency and underfrequency events at the reference point of the wind energy converter trigger frequency protection and cause the wind energy converter to shut down after the maximum delay time of 60 seconds has elapsed.

Power-frequency control

If temporary overfrequency occurs as a result of a grid fault, the wind energy converter can reduce its power feed dynamically to contribute to restoring the balance between the generating and transmission networks.

As a pre-emptive measure, the active power feed can be limited during normal operation. During an underfrequency event, the power reserved by this limitation is made available to stabilise the frequency. The characteristics of this control system can be adapted to various specifications in a flexible manner.

4 Safety system

The wind energy converter comes with a large number of safety features whose purpose is to permanently keep the wind energy converter inside a safe operating range. In addition to components that ensure safe stopping of the wind energy converter, these include a complex sensor system. This system records all relevant operating states of the wind energy converter on an ongoing basis and makes the corresponding information available through the ENERCON SCADA remote monitoring system.

The control system of the wind energy converter detects a fault with the sensors and attempts to continue operating the wind energy converter with reduced power. If this does not control the defect causing the fault, the wind energy converter is brought into the safe state by the safety control system.

4.1 Safety equipment

Emergency stop button

In the wind energy converter, there are emergency stop buttons on the control console in the tower base, on the nacelle control cabinet and, if necessary, in the tower entrance area as well as at other locations. Actuating an emergency stop button activates emergency pitching of the rotor blades. This brakes the rotor aerodynamically. An emergency stop renders the wind energy converter only partially dead.

Power is still supplied to the following:

- Beacon system components
- Lighting
- Sockets

4.2 Sensor system

Checking the sensors

Proper functioning of all sensors is either regularly checked by the wind energy converter control system itself during normal wind energy converter operation or, where this is not possible, in the course of wind energy converter maintenance work.

A large number of sensors continuously monitors the current status of the wind energy converter as well as all the relevant surrounding parameters. The sensor system provides the relevant information via a remote monitoring system. The wind energy converter control system analyses the signals and regulates the wind energy converter to optimally exploit the available wind energy at any given time and to ensure operating safety at the same time.

Redundant sensors

Redundant sensors are installed for some operating states to allow plausibility checks by comparing the reported values. Defective sensors are reliably detected and can be repaired or replaced through activation of a back-up sensor. The wind energy converter is thus usually able to continue safe operation without the need for immediate service work.

Speed monitoring

The wind energy converter control system regulates the rotor speed by adjusting the blade angle in such a way that the nominal speed is not significantly exceeded, even if the wind is very strong. If the nominal speed is exceeded by a defined value, however, the wind energy converter control system stops the wind energy converter. The wind energy converter can be restarted via the remote monitoring system.

If a fault occurs, the wind energy converter is stopped by an emergency pitching motion.

Air gap monitoring

The air gap between the rotor and stator of the generator must not be less than a specified width. The air gap is monitored by dedicated sensors. If the air gap falls below a specified value, the wind energy converter is stopped. The wind energy converter can be restarted as soon as the cause has been eliminated.

Temperature monitoring system

Some components of the wind energy converter are cooled. Temperature sensors also continuously measure components that need to be protected from high temperatures.

In the event of high temperatures, the wind energy converter's power is reduced or the wind energy converter is stopped, if necessary.

Some measuring points are equipped with additional overtemperature switches. The overtemperature switches similarly cause the wind energy converter to be stopped once a certain temperature has been exceeded. When it has cooled down, the wind energy converter can be put back into operation once the reason for the overtemperature has been investigated.

Cable twisting monitoring

The tower cables have plenty of space in the upper tower area enabling the nacelle to be turned left and right without damaging and/or overheating the tower cables. Depending on the degree of twisting and level of the wind speed, the wind energy converter open-loop control system decides when the tower cables require untwisting.

5 Open-loop control system

The wind energy converter open-loop control system is based on a programmable logic controller that uses sensors to query all wind energy converter components and collect data such as wind direction and wind speed. Using this information, it adjusts the operating mode of the wind energy converter accordingly. The wind energy converter display in the tower base and in the nacelle shows the current status of the wind energy converter and any faults that may have occurred.

5.1 Yaw system

The yaw bearing with a gear rim is located on the tower head. The yaw bearing allows the nacelle to rotate, thus allowing yaw control of the nacelle.

When the difference between the wind direction and the rotor axis direction exceeds the maximum permissible value, the yaw drives are switched on and align the nacelle with the wind direction. The yaw motor open-loop control system ensures smooth starting and stopping. The open-loop control system monitors the yaw control. If it detects any irregularities, yaw control is deactivated and the wind energy converter is stopped.

5.2 Pitch control

Functional principle

The pitch unit changes the position of the rotor blades and thus the angle of attack at which the air strikes the blade profile. Changes to the blade angle change the lift at the rotor blade and therefore also the force with which the rotor turns.

In automatic mode (normal operation), the blade angle is adjusted to ensure optimal exploitation of the wind's energy while avoiding overload of the wind energy converter. Any boundary conditions, such as noise optimisation, are also observed. In addition, the pitch unit is used to decelerate the rotor aerodynamically.

If the wind energy converter achieves its nominal power and the wind speed continues to increase, the pitch unit turns the rotor blades just far enough out of the wind to keep the rotor speed and the amount of energy extracted from the wind, i.e. the energy to be converted by the generator, within or just slightly above the nominal values.

Blade angle

Special rotor blade positions (blade angle):

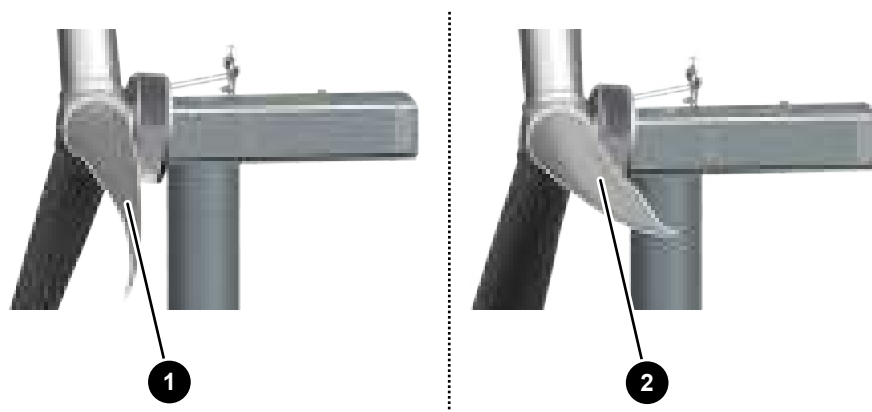


Fig. 3: Special rotor blade positions

Rotor blade position	Explanation
1	Position in partial load operation. The rotor blades generate maximum lift. The rotor turns.
2	Feathered position. The rotor blades do not generate lift. The rotor is braked aerodynamically and comes to a standstill or rotates only minimally.

5.3 Start of the wind energy converter

5.3.1 Start lead-up

As long as the main status is `> 0`, the wind energy converter remains stopped. As soon as the main status changes to `0`, the wind energy converter is ready and the start-up process is initiated. If certain boundary conditions for start-up, e.g. charging of the emergency stop capacitors, have not been fulfilled yet, status `0:3 Start lead-up` is displayed.

During start lead-up, a wind measurement and alignment phase of 150 seconds begins for the wind energy converter.

5.3.2 Wind measurement and nacelle alignment

After completing start lead-up, status `0:2 Turbine operational` is displayed.

If the open-loop control system is in automatic mode, the mean wind speed is above approx. 1.8 m/s and the wind direction deviation is sufficient for yawing, the wind energy converter starts alignment with the prevailing wind direction. The wind energy converter goes into idle mode approx. 60 seconds after completing start lead-up. The rotor blades are pitched slowly into the wind while a check is performed on the emergency stop capacitors.

If the wind energy converter is equipped with rotor blade load control sensors, the rotor blades stop at an angle of 70° and adjust the rotor blade load control sensors, which may take several minutes. During this time, the status `0:5 Calibration of load control` is displayed.

If the mean wind speed during the wind measurement and alignment phase of approx. 150 seconds is above the current cut-in wind speed, the start-up process is initiated (status 0:1). Otherwise, the wind energy converter remains in idle mode (status 2:1 Lack of wind: Wind speed too low).

Power consumption

As the wind energy converter is not generating any active power at that moment, the electrical energy required for the wind energy converter's own power consumption is taken from the grid.

5.3.3 Power feed

As soon as a sufficient DC link voltage is available, the feed-in process is initiated. After the speed has increased due to sufficient wind and with a power setpoint > 0 kW, the line contactors (low-voltage side) are closed and the wind energy converter starts feeding power into the grid.

The power increase gradient (dP/dt) after a grid fault or a regular start-up can be defined in the open-loop control system within a certain range.

5.4 Operating modes

After completion of the start-up process, the wind energy converter switches to automatic mode (normal operation). While in automatic mode, the wind energy converter constantly monitors wind conditions, optimises rotor speed and generator power, aligns the nacelle position with the wind direction and records all sensor states.

In order to optimise power generation under diverse wind conditions when in automatic mode, the wind energy converter changes between 3 operating modes, depending on the wind speed. In certain circumstances, the wind energy converter stops if provided for by its configuration. In addition, the utility into whose grid the generated energy is being fed can be given the option to directly influence the behaviour of the wind energy converter by remote control, e.g. for temporary reduction of the grid feed.

The wind energy converter switches between the following operating modes:

- Full load operation
- Partial load operation
- Idle mode

5.4.1 Full load operation

Wind speed $\geq$ nominal wind speed

At wind speeds at and above the nominal wind speed, the wind energy converter uses pitch control to maintain the rotor speed at its setpoint, thereby limiting the power to the nominal value.

5.4.2 Partial load operation

Cut-in wind speed $\leq$ wind speed $<$ nominal wind speed

During partial load operation (i.e. the wind speed is between cut-in wind speed and nominal wind speed), the maximum possible power is extracted from the wind. The rotor speed and the power output are determined by the current wind speed. Pitch control already starts as the wind energy converter approaches full load operation in order to ensure a smooth transition.

5.4.3 Idle mode

Wind speed $<$ cut-in wind speed

At wind speeds below the cut-in wind speed, no current can be fed into the grid. The wind energy converter runs in idle mode, i.e. the rotor blades are turned almost completely out of the wind (blade angle $\geq$ approx. 60°), and the rotor turns slowly or stops completely if there is no wind at all.

Slow movement (idling) puts less load on the rotor bearings than longer periods of complete standstill; in addition, the wind energy converter can resume power generation and grid feed more quickly as soon as the wind picks up.

5.5 Safe stopping of the wind energy converter

The wind energy converter can be stopped by manual intervention or automatically by the control system.

The causes are divided into groups by risk.

Stopping the wind energy converter by means of pitch control

In the event of a malfunction that is not safety-relevant, the wind energy converter open-loop control system pitches the rotor blades out of the wind, causing the rotor blades not to generate any lift and bringing the wind energy converter to a safe stop.

Emergency pitching

The emergency stop capacitors store the energy required for emergency pitching and are kept charged and undergo continuous testing during wind energy converter operation. For emergency pitching, each pitch motor is supplied with energy by the associated emergency stop capacitors. The rotor blades move in a controlled manner into a position in which no lift is generated; this is called the feathered position.

Since the 3 pitch units are interconnected but also operate independently of each other, if one component fails, the remaining pitch units can still function and stop the rotor.

Emergency braking

If an emergency stop button is pressed, or if the rotor lock is actuated while the rotor is turning, the control system initiates an emergency braking procedure.

Here, the emergency pitching of the rotor blades brakes the rotor from nominal speed virtually to standstill within a maximum of 60 seconds.

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6 Remote monitoring

By default, all ENERCON wind energy converters are equipped with the ENERCON SCADA system that connects them to Technical Service Dispatch. Technical Service Dispatch can retrieve each wind energy converter's operating data at any time and instantly respond to any irregularities or malfunctions.

All status messages are also sent via the ENERCON SCADA system to Technical Service Dispatch, where they are permanently stored. Practical experience gained from long-term operation can then be incorporated into the further development of ENERCON wind energy converters.

Connection of the individual wind energy converters is through the ENERCON SCADA Server that is usually located in the substation or the transmission substation of a wind farm. An ENERCON SCADA Server is installed in every wind farm.

At the operator/owner's request, monitoring of the wind energy converters can be performed by a third party.

7 Maintenance

To ensure long-term safe and optimum operation of the wind energy converter, maintenance is required at regular intervals.

The wind energy converters are regularly serviced, once a year, depending on requirements.

During maintenance, all safety-relevant components and functions are checked, e.g. the pitch unit, yaw control, safety systems, lightning protection system, anchorage points and safety ladder. The bolt connections on load-bearing joints (main components) are checked. All other components are visually inspected to check for any irregularities or damage. Lubrication systems are refilled.

Maintenance intervals and scope may vary, depending on regional guidelines and standards.

Technical description

ENERCON E-175 EP5 E2 / 7000 kW wind energy converter
Early Customer Information Package

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Applicable documents

The titles of the documents listed are the titles of the original language versions, with translations of these titles in brackets where applicable. The titles of superordinate standards and guidelines are indicated in the original language or as an English translation. Document IDs always refer to the original language versions. If the document ID does not contain a revision, the most recent revision of the document applies. This list contains documents concerning optional components if necessary.

Document ID	Document
D02885203	Übersichtszeichnung E-175 EP5 E2-HST-132-FB-C-01 (Layout drawing E-175 EP5 E2-HST-132-FB-C-01)
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D03011491	Übersichtszeichnung E-175 EP5 E2-HST-112-FB-C-01 (Layout drawing E-175 EP5 E2-HST-112-FB-C-01)
D03011510	Übersichtszeichnung E-175 EP5 E2-HT-175-ES-C-01 (Layout drawing E-175 EP5 E2-HT-175-ES-C-01)

List of abbreviations

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CFRP	Carbon fibre reinforced plastic
DIBt	Deutsches Institut für Bautechnik (German institute for civil engineering)
FACTS	Flexible Alternating Current Transmission System
FTQS	FACTS Transmission with Q+ option and STATCOM option (electrical configuration with extended reactive power range and STATCOM option)
GFRP	Glass-fibre reinforced plastic
HST	Hybrid steel tower
HT	Hybrid tower
IEC	International Electrotechnical Commission
SCADA	Supervisory Control and Data Acquisition
STATCOM	Static compensator

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1 Preliminary remarks

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This document is neither a statement of work nor a technical data sheet. The purpose of this document is solely to provide the user with assistance in assessing the fundamental suitability of the wind energy converter described for the site and its approximate yield. The information contained in this document is based on the technical information available as of the date of issue of this document.

2 Product overview

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Fig. 1: E-175 EP5 E2/7000 kW wind energy converter

The new E-175 EP5 E2 wind energy converter with a nominal power of 7000 kW is a top-of-the-line model that is more powerful and has a higher yield.

With the E-175 EP5 E2, the current EP5 platform for low-wind sites has been further optimised on the basis of the E-nacelle with integrated electrical engineering.

The E-175 EP5 E2 is designed for wind class S or II (IEC) and a service life of 25 years. The wind energy converter is offered by ENERCON worldwide in all its markets. The requirements of DIBt wind zone S or DIBt wind zone 2 are met for ENERCON's core market, Germany.

Different tower versions with hub heights of up to 175 m are available for the E-175 EP5 E2. Depending on the size of the project, it is also possible to develop site-specific towers.

3 Technical specifications

General data	
Manufacturer	ENERCON GmbH Dreerkamp 5 26605 Aurich Germany
Type designation	E-175 EP5 E2
Nominal power	7000 kW
Rotor diameter	175 m
Horizontal distance between tower centre and lowest blade position	26.44 m
Horizontal distance between tower centre and highest blade position	8.23 m
Swept area	23,840.5 m ²
Swept ground area (eccentricity area)	24,784.1 m ²
Cut-in wind speed	2.5 m/s
Nominal wind speed (simulated value, power-optimised operation)	12.5 m/s
Start of storm control (power reduction wind speed)	21 m/s
Cut-out wind speed	25 m/s (10-minute mean)
Design service life	25 years

Tower data	E-175 EP5 E2-HST-112-FB-C-01	E-175 EP5 E2-HST-132-FB-C-01	E-175 EP5 E2-HT-162-ES-C-01	E-175 EP5 E2-HT-175-ES-C-01
Hub height above ground level ¹	Max. 113 m	Max. 133 m	Max. 163 m	Max. 176 m
Total height above ground level ¹	Max. 200 m	Max. 220 m	Max. 250 m	Max. 263 m
Type	Hybrid steel tower	Hybrid steel tower	Hybrid tower	Hybrid tower
Foundation diameter of deep foundation/shallow foundation	Under development/24.7 m	Under development/under development	Under development/under development	Under development/under development

¹ The maximum value is specified to avoid any inconsistencies caused by rounding.

Design (tower-specific)					
	E-175 EP5 E 2-HST-112- FB-C-01	E-175 EP5 E2-HST-132- FB-C-01	E-175 EP5 E 2-HT-162-ES- C-01	E-175 EP5 E2-HT-175- ES-C-01	
Characteristic	Value	Value	Value	Value	Unit
Wind class (IEC 4th edition)	II	S	S	S	
Turbulence category (IEC 4th edition)	A	A	A	A	
Wind zone (DIBt 2012)	WZ S	WZ S	WZ 2	WZ S	
50-year extreme wind speed at hub height (10-minute mean) (IEC 4th edition)	42.50	42.50	42.50	42.50	m/s
Corresponds to a load equivalent of approx. (3-second gust)	59.50	59.50	59.50	59.50	m/s
50-year extreme wind speed at hub height (10-minute mean) (DIBt 2012)	42.50	42.50	42.50	42.50	m/s
Annual average wind speed at hub height (IEC 4th edition) ²	8.50	7.20	7.80	7.20	m/s
Annual average wind speed at hub height (DIBt 2012)	8.50	7.20	7.80	7.20	m/s
c value of extreme turbulence model	2	2	2	2	
Form parameter of Weibull function k	2	2	2	2	
Wind shear	0.10 to 0.20	0.20	0.20	0.20 to 0.40	

Design (cross-tower)	
Flow inclination	8°
Relative air humidity	≤ 95 %
Maximum solar irradiance	1000 W/m ²
Standard air density	1.225 kg/m ³
Normal temperature range	-10 °C to +40 °C

² An increase in the annual average wind speed at hub height is being tested for various towers.

Design (cross-tower)	
Extreme temperature range	-20 °C to +50 °C

Generator rotor with pitch unit	
Type	Upwind rotor with active pitch unit
Rotational direction	Clockwise (viewed from upwind)
Number of rotor blades	3
Rotor blade length	85.98 m
Rotor blade material	GFRP sandwich structure with CFRP spar booms
Conical angle	-5°
Incline of rotor axis to horizontal	6°
Pitch unit	One independent electrical pitch unit per rotor blade with dedicated emergency power supply

Drive train with generator	
Wind energy converter concept	Gearless, variable speed, full-scale converter
Hub	Rigid
Bearing	2 tapered roller bearings
Generator	Direct-driven, permanent magnet synchronous generator

Brake system	
Aerodynamic brake	Aerodynamic via 3 independent pitch units with emergency power supply
Rotor holding brake	E-brake
Rotor lock	Latching in 30° steps

Yaw control	
Yaw system	Electromechanical yaw system
Yaw brake	Electromechanical

Wind energy converter control system	
Type	Programmable logic controller (PI-CS)
Grid feed	Full-scale converter with integrated microprocessor control system
Remote monitoring system	ENERCON SCADA Edge system
Uninterruptible power supply (UPS)	Integrated

4 Power values and sound power levels

Site characteristics

The power and c_t curves as well as the corresponding sound power levels have been calculated for the conditions stated in the following table with undamaged rotor blade leading edges and clean rotor blades.

Site characteristics (10-minute mean)	
Standard air density	1.225 kg/m ³
Relative air humidity	70 %
Temperature	10 °C
Wind shear exponent	0.0 to 0.3
Maximum difference in wind direction between upper and lower blade tip	10°
Maximum flow inclination	± 2°
Terrain	According to IEC 61400-12-1:2017
Snow/ice	No
Rain	No

Otherwise, the framework conditions according to IEC 61400-12-1:2017 apply.

4.1 OM-0-0 operating mode

The OM-0-0 operating mode represents the optimum mode of operation for standard design conditions in order to achieve the maximum yield within the framework of the design specifications and the sound setpoint.

4.1.1 Calculated power, c_p and c_t values in OM-0-0 operating mode

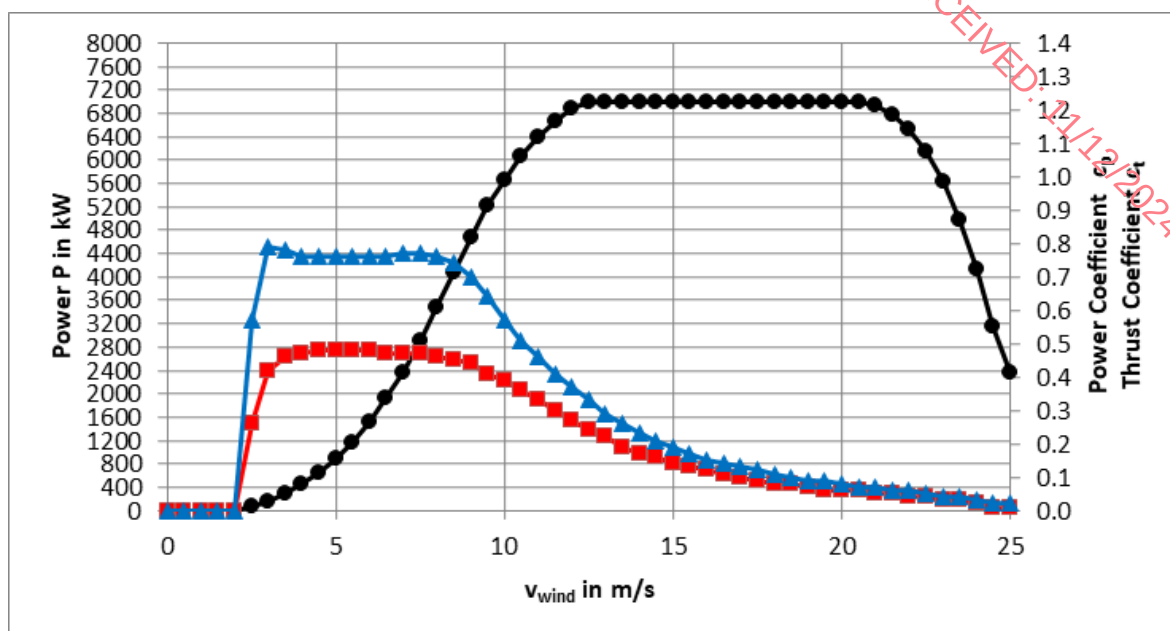
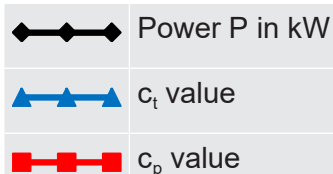


Fig. 2: Power, c_p and c_t curves for E-175 EP5 E2 / 7000 kW in OM-0-0 operating mode



Tab. 1: Calculated power, c_p and c_t values for E-175 EP5 E2 / 7000 kW in OM-0-0 operating mode

Wind speed v in m/s	Power P in kW	c_p value	c_t value
0.00	0	0.00	0.00
0.50	0	0.00	0.00
1.00	0	0.00	0.00
1.50	0	0.00	0.00
2.00	0	0.00	0.00
2.50	60	0.26	0.57
3.00	165	0.42	0.79
3.50	287	0.46	0.78
4.00	444	0.47	0.76
4.50	644	0.48	0.76
5.00	885	0.48	0.76
5.50	1174	0.48	0.76
6.00	1515	0.48	0.76
6.50	1913	0.47	0.76
7.00	2373	0.47	0.77

Wind speed v in m/s	Power P in kW	c_p value	c_t value
7.50	2897	0.47	0.77
8.00	3478	0.46	0.76
8.50	4090	0.45	0.74
9.00	4684	0.44	0.70
9.50	5214	0.41	0.64
10.00	5665	0.39	0.57
10.50	6053	0.36	0.51
11.00	6392	0.33	0.46
11.50	6677	0.30	0.41
12.00	6892	0.27	0.37
12.50	6997	0.24	0.33
13.00	7000	0.22	0.29
13.50	7000	0.19	0.26
14.00	7000	0.17	0.23
14.50	7000	0.16	0.21
15.00	7000	0.14	0.19
15.50	7000	0.13	0.17
16.00	7000	0.12	0.15
16.50	7000	0.11	0.14
17.00	7000	0.10	0.13
17.50	7000	0.09	0.12
18.00	7000	0.08	0.11
18.50	7000	0.08	0.10
19.00	7000	0.07	0.09
19.50	7000	0.06	0.09
20.00	7000	0.06	0.08
20.50	7000	0.06	0.07
21.00	6936	0.05	0.07
21.50	6780	0.05	0.06
22.00	6519	0.04	0.06
22.50	6142	0.04	0.05
23.00	5636	0.03	0.04
23.50	4977	0.03	0.04
24.00	4137	0.02	0.03
24.50	3138	0.01	0.02

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Wind speed v in m/s	Power P in kW	c_p value	c_t value
25.00	2371	0.01	0.02

4.1.2 Calculated sound power level in OM-0-0 operating mode

The highest sound power level to be expected in the nominal power range is 106.9 dB(A). After reaching the nominal power, the sound power level will not increase further.

Wind speed at hub height v_H in m/s	Sound power levels in dB(A)
5.0	97.6
5.5	98.6
6.0	99.8
6.5	101.1
7.0	102.4
7.5	103.8
8.0	105.2
8.5	106.5
9.0	106.9
9.5	106.9
10.0	106.9
10.5	106.9
11.0	106.9
11.5	106.9
12.0	106.9
12.5	106.9
13.0	106.9
13.5	106.9
14.0	106.9
14.5	106.9
15.0	106.9

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5 Grid performance

The values given in this chapter refer to the FTQS configuration.

General data	
Nominal frequency	50 Hz/60 Hz
Nominal active power	7000 kW
Rated reactive power	4410 kvar
Rated apparent power	8300 kVA
Nominal voltage	750 V
Nominal current	5389 A

Reactive power (export/import)	
Maximum reactive power (export)	4410 kvar
Minimum reactive power (import)	-4410 kvar

Operating voltages	
Max. continuous operating voltage	120 % U_n
Min. continuous Operating Voltage	85 % U_n
Temporary minimum voltage	80 % U_n

Frequency range	Nominal grid frequency 50 Hz	Nominal grid frequency 60 Hz
Maximum frequency	53 Hz	63 Hz
Nominal frequency	50 Hz	60 Hz
Minimum frequency	47 Hz	55.5 Hz

Fault Ride Through behaviour

The wind energy converter is equipped with a Fault Ride Through capability that enables it to remain in operation in the event of fault-related undervoltage (Undervoltage Ride Through) and overvoltage (Overvoltage Ride Through).

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6 Safety and protection

Additional information on the following chapters will be created and made available in separate documents during the further development process of the wind energy converter.

Lightning protection

In order to prevent damage from lightning strikes and to ensure safe operation, the wind energy converter is fitted with a lightning protection system.

The lightning protection system (lightning protection level/LPL) is classified from IV (low) to I (high). The wind energy converter is designed to meet the requirements of LPL I. In some cases, modifications to the earthing system may be necessary. This is dependent on the conductivity of the soil at the location which is investigated as part of the project-specific soil investigations.

Fire safety

Numerous technical and organizational fire protection measures are being taken for the wind energy converter that minimise the probability of a fire occurring, the spread of fire and smoke and damage to persons and property.

Ice detection

To reduce the dangers of ice throw, ice detection based on the ENERCON power curve method is employed as standard in the wind energy converter. If ice build-up is detected on a running wind energy converter, the wind energy converter stops at the end of the set detection time.

Remote monitoring system/SCADA

The wind energy converter is connected as standard to Technical Service Dispatch via the ENERCON SCADA Edge System. Technical Service Dispatch can retrieve the operating data of the wind energy converters at any time and instantly respond to any irregularities or faults.

At the operator/owner's request, monitoring of the wind energy converters can be performed by a third party.

Functional safety

The safety-related part of the wind energy converter control system is developed in accordance with DIN EN ISO 13849-1.

Protection against emissions

Various sound-reduced operating modes are available for the wind energy converter. The various sound-reduced operating modes differ in the level of sound reduction they offer and serve to satisfy the requirements applicable at the installation site with regard to permissible sound emissions.

The shadow shutdown function stops the wind energy converter in line with requirements to minimise or prevent immissions caused by periodic shadow flickering at relevant locations.

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Technical description

Trailing edge serration (TES)

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Publisher

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Description of trailing edge serration

Introduction

Different flow speeds prevail on the suction and pressure sides of the rotor blade. As a result, turbulence occurs at the trailing edge and the noise level rises when the wind energy converter is in operation.

To reduce this noise level, a serrated profile is mounted on the trailing edge. This profile is known as a trailing edge serration (or TES for short).

The figures in this document show a trailing edge serration on rotor blades with a curved blade tip by way of example. The shape of the blade tip has no influence on the arrangement or the function of the trailing edge serration.

Development of trailing edge noise

The principal cause of trailing edge noise is the formation of a turbulent boundary layer on the rotor blade surface in which eddies develop. Proportional to their size, these eddies interact with the trailing edge inducing a fluctuating pressure field, which emits aerodynamic broadband noise.

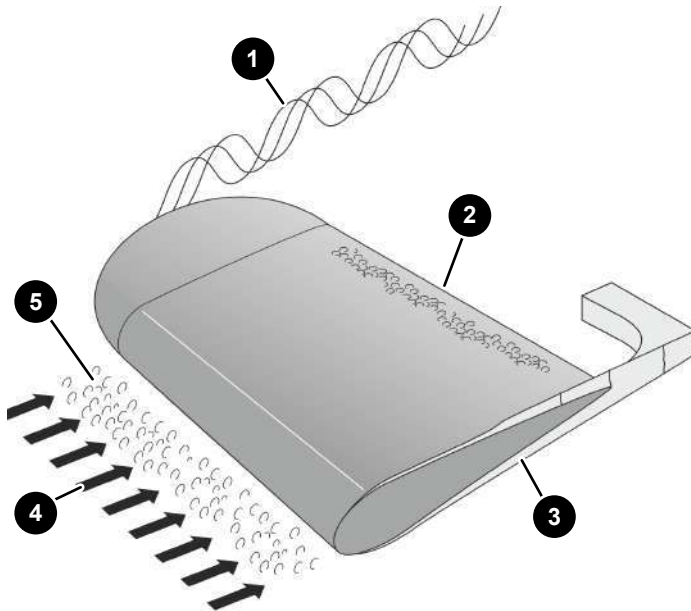
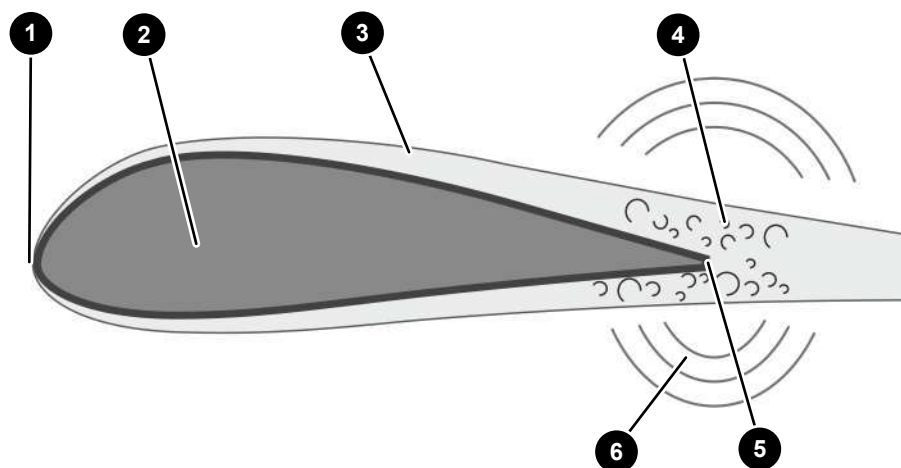


Fig. 1: Schematic illustration of air flow on the rotor blade

1	Blade tip turbulence	2	Eddies at the trailing edge
3	Boundary layer	4	Oncoming flow
5	Eddies in oncoming flow		



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Fig. 2: Mechanism of trailing edge noise

1	Leading edge	2	Cross section of rotor blade
3	Boundary layer	4	Eddy
5	Trailing edge	6	Trailing edge noise emission

Functional principle of the trailing edge serration

A serrated extension of the trailing edge mitigates noise emission by effectively breaking up the eddies on the tooth flanks into smaller eddies. The intensity of the pressure fluctuations is reduced, which mitigates noise emission. Since the intensity of the noise emission is largely dependent on the local flow speed, trailing edge serrations are only installed in the outer rotor blade area where the rotary speed is the highest.

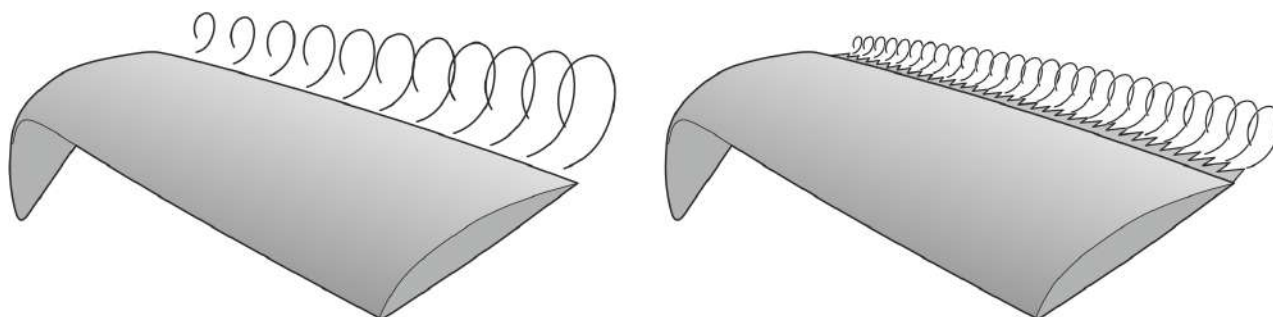


Fig. 3: Turbulence without trailing edge serration (left) and with trailing edge serration (right)

Since the flow conditions along the rotor blade vary, the size and spacing of the serrations has to be adapted to meet the local oncoming flow conditions. The patented continuous distribution of the different-sized serrations along the rotor blades of ENERCON wind energy converters results in optimally reduced noise emission.

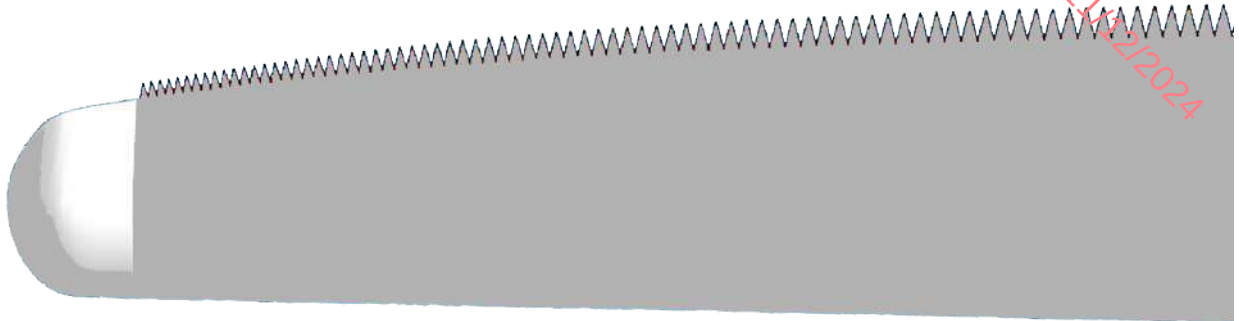


Fig. 4: Trailing edge serration

Effects on power, c_t and c_p characteristic curves

The trailing edge serration has no effect on the power curve or the c_t and c_p characteristic curves. The sole purpose of the trailing edge serration is to reduce noise.

Technical specification

Access Road and Construction Site Areas

ENERCON wind energy converter

E-175 EP5 112 m steel tower

Prototype

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Publisher

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Applicable documents

The titles of the documents listed are the titles of the original language versions, with translations of these titles in brackets where applicable. The titles of superordinate standards and guidelines are indicated in the original language or as an English translation. Document IDs always refer to the original language versions. If the document ID does not contain a revision, the most recent revision of the document applies. This list contains documents concerning optional components if necessary.

Higher-level standards and guidelines

Document ID	Document
DIN 18134	Soil - Testing procedures and testing equipment - Plate load test
DIN 4017	Subsoil – Calculation of design bearing capacity of soil beneath shallow foundations
DIN 4019:2015	Soil - Analysis of settlement

Associated documents

Document ID	Document
D02108591	Baustellenordnung (Construction site regulations)
D02768819	Anforderungen Zusatzbelastung Fundamentanschüttung und Fundamentaufflast für Servicetätigkeiten (Additional load requirements for foundation soil cover/load for service activities)

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List of abbreviations

Abbreviations

CM	Construction Manager
GPM	General Project Manager
LHV	Abnormal load
SPMT	Self-propelled modular transporter
WEC	Wind energy converter

Variables, units, formulas

D_{Pr}	Degree of compaction after Proctor compaction test
E_{V1}	Calculated deformation modulus of the first load cycle of a static plate load test
E_{V2}	Calculated deformation modulus of the second load cycle of a static plate load test

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1 Introduction

Meticulous planning and design of construction site infrastructure are the basis for cost-effective construction work. Transport routes and construction site areas in the wind farm must ensure safe and cost-effective construction site traffic. Trouble-free functionality must be ensured throughout the entire period of use.

Deviations from this specification may affect the installation and logistics concept. This will result in extra costs, longer construction times and possibly delays in the course of the project. If deviations from the standards described here occur, they must be coordinated with the ENERCON GPM. An alternative solution can be offered by ENERCON for standards from this specification that may not be capable of being implemented for topographical reasons. This must be commissioned through the ENERCON GPM. The customer shall bear the resulting additional costs.

This specification applies to the transport and installation, using a standard large crane, of a WEC with the tower designation:

- E-175 EP5-ST-112-FB-C-01

This specification describes the requirements for access roads and construction site areas for the wind farm infrastructure. In addition to this information, the following documents must also be included in the planning.

- Foundation data sheet for the applicable foundation version of the tower type
- Technical description of the tower type
- Data sheets on weights and dimensions of tower type, nacelle and rotor blades
- D02108591 'Baustellenordnung' (Construction site regulations)
- D02768819 'Anforderungen Zusatzbelastung Fundamentanschüttung und Fundamentauflast für Servicetätigkeiten' (Additional load requirements for foundation soil cover/load for service activities)

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2 WEC installation

The ENERCON WEC is assembled in several stages: Foundation construction, deep foundation where necessary, and installation and assembly of the tower and nacelle. Depending on the wind farm size, project-specific installation concepts are developed to ensure economically efficient execution and to permit completion of the WEC in the shortest possible time. As such, the work steps described in the following subchapters can be performed in parallel in the wind farm.

2.1 Delivery of the tower and WEC components

The manner of delivery depends on the installation concept for the intended construction site area. The tower and the WEC components are delivered in advance. They are stored in accordance with a pre-defined stowage plan. The necessary areas must be dimensioned and set up precisely in accordance with this specification.

2.2 Tower installation

Depending on the type of tower and installation concept, assembly can be performed in different ways. Depending on tower type, pre-assembly may be necessary that is performed in a separate work section directly on the planned construction site area. The pre-assembled sections are temporarily stored on the construction site or assembled directly after pre-assembly. Tower assembly is carried out with suitable crane equipment, depending on the installation concept and tower.

2.3 Nacelle installation

The nacelle components are delivered directly to the designated construction site areas (e.g. assembly area). Once pre-assembly is complete, the pre-assembled nacelle is lifted using the designated crane equipment and mounted on the tower.

3 Crane equipment

3.1 Cranes used

The relevant crane type is selected during the planning phase of the wind farm concept. The max. permissible soil bearing pressure under the crane tracks or outriggers is limited with load distribution plates and must be verified via geotechnical calculations. If crawler cranes are used, it may be possible, among other things, to move from site to site in an assembled state. Prior to this, the bearing capacity of the soil and the loading gauge must be tested on the crane routes.

3.2 Installing the crane with a lattice tower

A lattice tower crane is used to install the WECs. This crane technology places specific demands on the crane platform and requires sufficient space to assemble the lattice tower. The basic unit and the individual crane parts (e.g. lattice tower parts, ballast, fixtures) are delivered to the wind farm in the required quantities by truck. The number of truck transports required depends on the crane type and mast length. The lattice tower crane is assembled in the following individual stages:

- Delivery of the basic unit and auxiliary cranes
- Alignment of the basic unit on the crane platform
- Positioning of Superlift ballast
- Lattice tower assembly

To assemble the lattice tower, the existing access road to the crane platform is used. If the access road cannot be used, a temporary site road is needed. The technical framework conditions for assembling the crane and jib will be explained in this document.

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4 Transport and logistics

4.1 General information

The installation of a WEC requires a large number of abnormal loads. These abnormal load transports are needed to deliver the tower and WEC components and crane equipment, and for subsoil improvement measures and foundation construction. These abnormal load transports require approval in some cases and are subject to country-specific and official regulations. The resultant max. transport weights and axle loads must be taken into account.

4.2 Construction and logistics concept

Specific installation and logistics concepts are necessary for large wind farms and for WECs erected at sites with special requirements (e.g. industrial sites, dikes, hills). In order to enable optimal project execution, the local conditions must be incorporated directly into the concept. Depending on the WEC type and the installation and logistics concept, there may be additional areas required, e.g. a logistics area and/or rotor blade storage area. The additional logistical costs are borne by the customer. If necessary, contractually agreed deadlines must be adjusted by the contractor.

4.3 Use of SPMT

If an SPMT is used, there may be changes in the following areas, depending on the component and system platform:

- Width of road
- Loading gauge
- Curve radii and swept paths
- Lateral gradient on straight routes and in curves

These points must then be agreed with ENERCON and the transport service provider.

5 Access roads

Access roads in the wind farm are an integral part of the supply of material to the respective WEC sites. In addition, access roads ensure cranes can move around the wind farm. Access roads are used over the entire course of the project as the access for all transport types. In addition, the access roads are also needed for service and to dismantle the WECs. The access road and construction site area concept and the construction work shall be designed in accordance with this specification.

5.1 Routeing

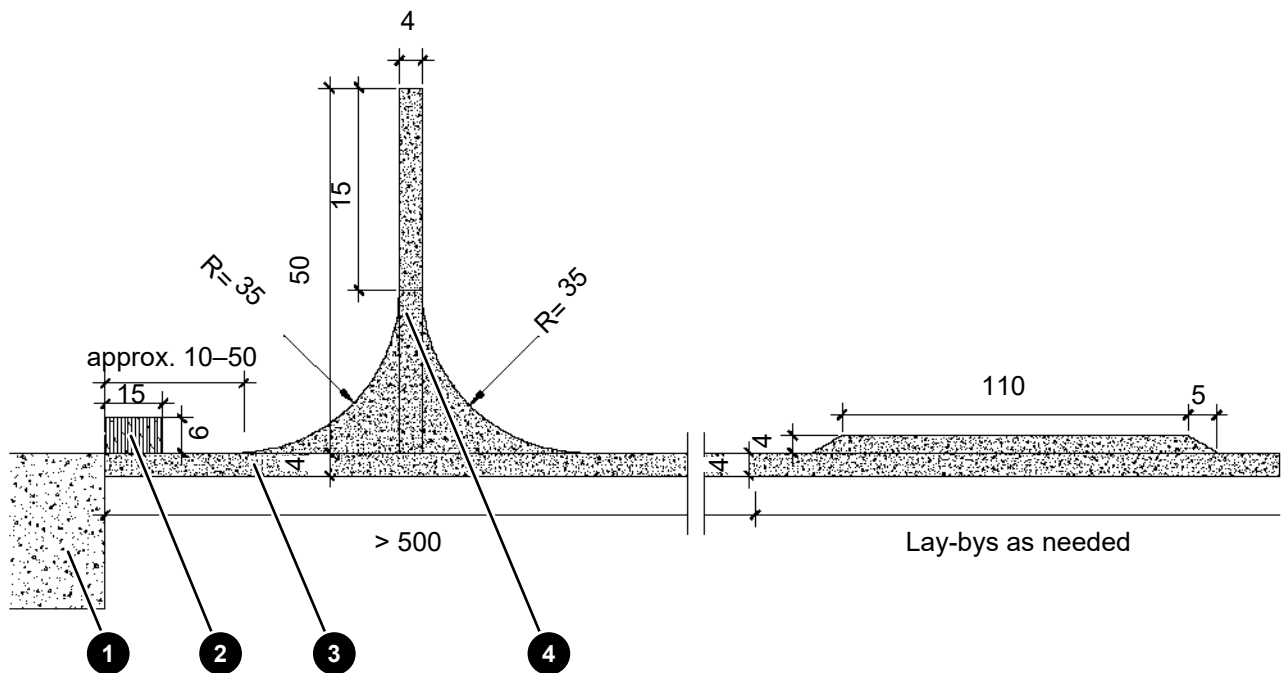


Fig. 1: Routing elements (all dimensions in metres)

1	Crane platform	2	Parking area
3	Access road	4	Turning area

The use of large and abnormal loads presents special challenges for the internal wind farm access roads, at intersections and curves, wind farm entrances and public roads.

Routing elements

In most cases, transport vehicles with a high total weight and excess width are used to transport components to the construction site. Due to the major transport requirements and the transport costs, the routing of the access roads in the wind farm must be kept short and straight. The routes must be selected so that transport vehicles carrying abnormal loads are not forced to travel in reverse. If WEC sites are located in a dead-end position that has an access road longer than 500 m, a turning area for empty transports must be provided. The turning area must have a minimum length of 50 m. Depending on the location, turning areas may also be needed at shorter intervals (less than 500 m). This is decided by the ENERCON GPM. On long

access roads, lay-bys and/or parking bays in sufficient number and length must be planned in consultation with the ENERCON GPM in order to guarantee flowing traffic and free rescue routes.

Wind farm entrance

If there are wind farm entrances from public roads, we recommend asphaltting the first 50 m of the entrance. This enables vehicles exiting the site to clean their wheels before accessing the public road. Depending on the number of access roads to the wind farm and the number of trucks driving into the wind park, other options may be explored, such as wheel washing facilities. This requirement shall be checked in consultation with the ENERCON GPM according to local conditions. Regulatory specifications must be observed.

Parking areas for long transports

In the wind farm or in the immediate vicinity, one or more areas must be identified on which at least 3 long transports can be parked on an interim basis. This ensures that waiting transport vehicles do not impede the other construction site traffic. Long transports include the transport of rotor blades or steel sections of towers. For instance, lay-bys are suitable areas.

Obstacles on the route

Any particular obstacles to be crossed on the route must be clearly indicated with the appropriate markings, so that they can be detected by traffic. If lines must be crossed (e.g. pipelines, gas lines), a prior investigation must be carried out to make sure that it is possible to drive over them. The results of the investigation shall be submitted to the ENERCON GPM for inspection. In addition, approval to drive over them must be obtained from the pipeline operator. Lines must be secured by construction of special superstructures. To avoid contact with the construction traffic passing beneath, overhead lines must be clearly indicated by means of height limitation markings (e.g. wooden frames).

5.1.1 Intersections and curves

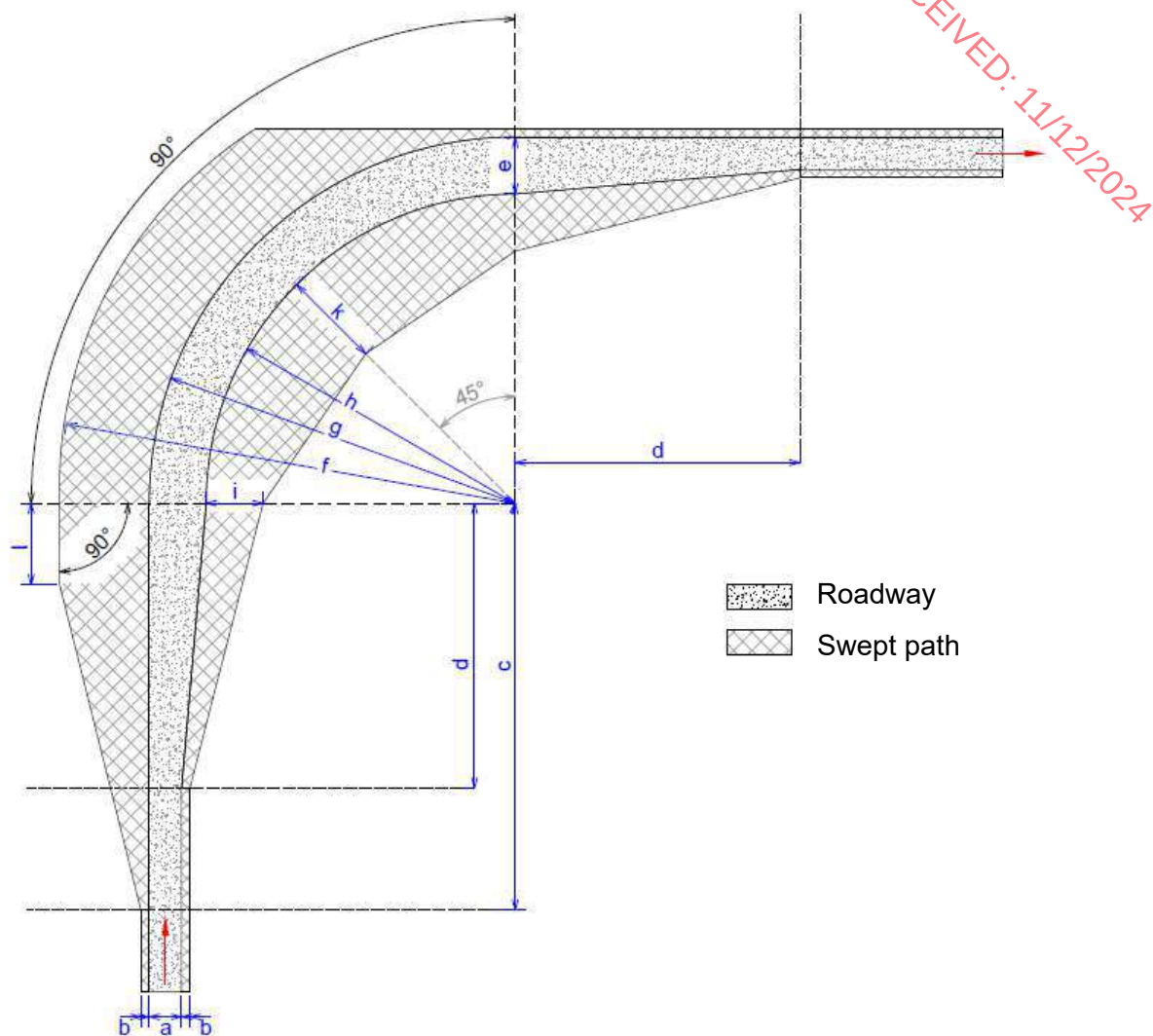


Fig. 2: 90 degree curve (construction diagram)

	90 de- gree curve	60 de- gree curve			90 de- gree curve	60 de- gree curve	
a	4 m		Drivable width of road in straight line	b	1.5 m		Lateral swept path includ- ing safe distance
c	60 m		Start of outer swept path at curve entry	d	40 m		Start of inner swept path at curve entry
e	7 m		Drivable width of road in curves	f	70 m	69 m	Outer radius of outer swept path
g	60 m	60 m	Outer radius of curve	h	53 m	53 m	Inside radius of curve
i	7 m	7 m	Dimension 1 of inner swept path	k	13 m	12 m	Dimension 2 of inner swept path
l	10 m	10 m	Dimension 3 of outer swept path				

The longest transport combination is decisive for curve dimensioning. The curves and swept paths are implemented structurally in accordance with the dimensions indicated in the drawing. If this radius cannot be maintained due to local conditions, it is imperative that the ENERCON GPM is consulted to find an alternative solution.

Swept paths

Transport combinations with flatbed and/or swing-out load must be able to pass through curves without problem. Obstacles in the swept paths must be removed for this purpose if these obstacles exceed a certain height.

- Obstacles in the inner swept path must not protrude by more than 0.15 m max. above the level of the roadway.
- Obstacles in the outer swept path must not protrude by more than 1.25 m max. above the level of the roadway.

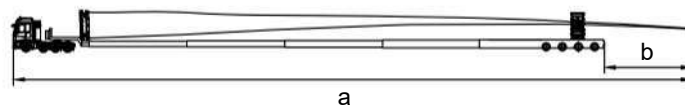


Fig. 3: Rotor blade transport overhang

a	100 m	b	10 m

5.1.2 Crests, sags and gradients

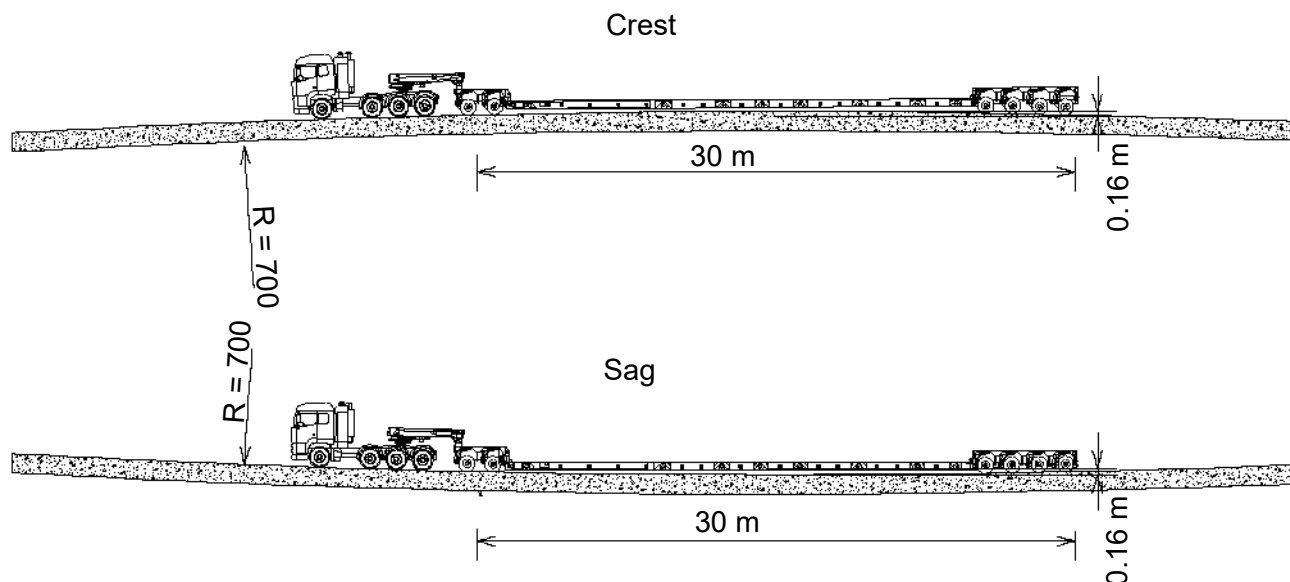


Fig. 4: Crest and sag ($R = 700$ m)

Vehicles with a maximum total length of 100 m are used to transport components to the construction site. For these transport vehicle combinations with excess length, the access roads must fulfil crest and sag radii of 700 m. This prevents the transports from hitting the ground, e.g. in the case of flatbed transport vehicle combinations.

In specific instances, the radius can be reduced to $R = 400$ m. However, this requires specific transport vehicles that can lift the flatbed to a minimum height of 45 cm. $R = 400$ m corresponds to a camber (crest) or depression (sag) of 0.26 m over a length of 30 m.

Uphill and downhill gradients

Abnormal loads are only able to travel on access roads with maximum uphill and downhill gradients of ≤ 12 %. With gradients of 7 % or more, a bonded surface course (e.g. asphalt, concrete) is installed. This ensures nonpositive traction for the transport vehicles. In individual instances, traction vehicles may be required (hilly or mountainous locations). This is clarified in advance in detail with the ENERCON GPM. The ENERCON GPM must evaluate the economic and scheduling effects to be borne by the customer.

For curves with gradient > 7 %, the width of the road must be adapted to the local conditions. The planning must take any such adjustments into account and the plans must be checked and approved by ENERCON.

When planning the access route around bends and intersections with inclines and declines, make sure that the torsion between the towing vehicle and trailer or trailer is ≤ 5 %.

Tab. 1: Requirements for the longitudinal profile of the access road

Parameter	Requirement
Gradient, loose surface course	≤ 7 %
Gradient, paved surface course	≤ 12 %
Ground clearance of transport vehicles	0.10 m
Radius of hilltop/bottom of valley	700 m

5.1.3 Loading gauge

For abnormal loads, there must be a specific loading gauge above the access roads. Complying with this loading gauge ensures unhindered access by all vehicles on the access roads. This area must be kept free from obstacles of any kind (e.g. structures, power supply cables, masts, trees, and branches) during construction.

The loading gauge may vary depending on the country, vehicle technology or delivery concept. If the specified loading gauge cannot be implemented, consult with the ENERCON GPM regarding an alternative solution.

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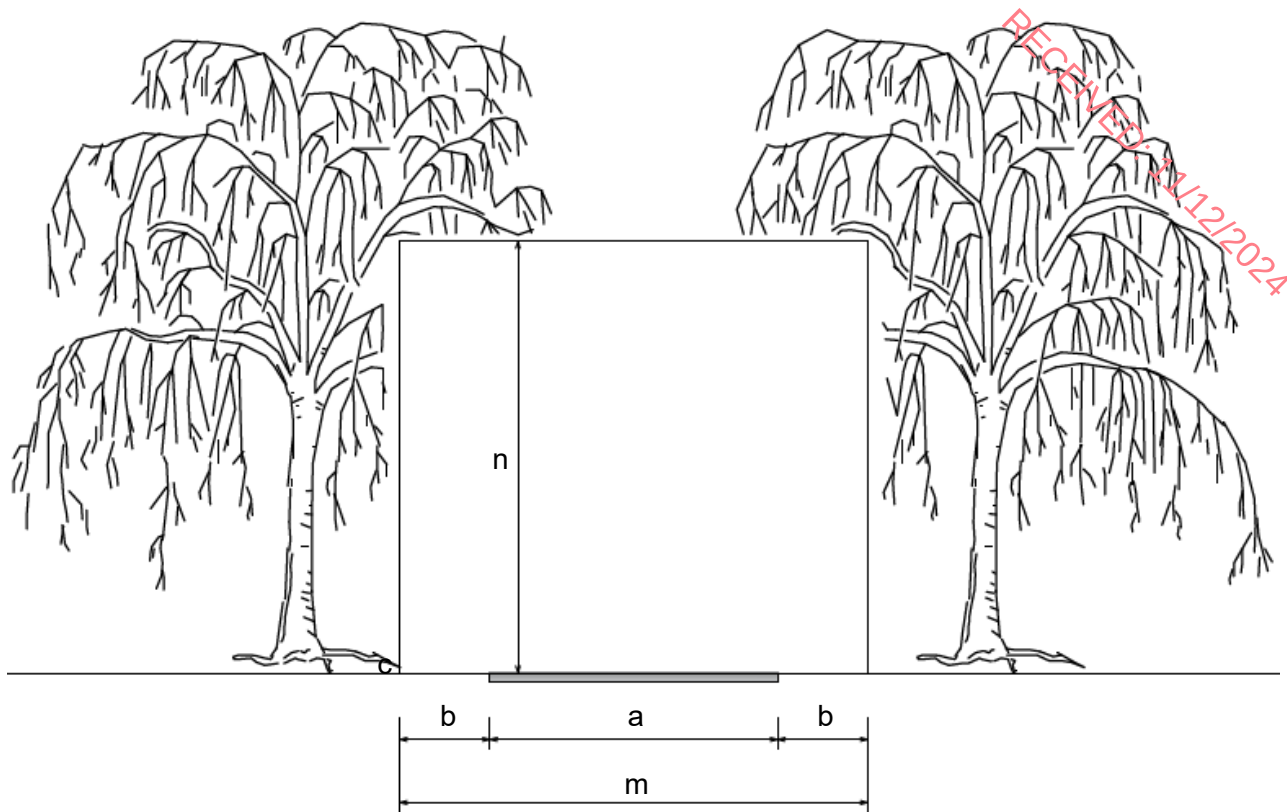


Fig. 5: Loading gauge

a	4 m	Drivable width of road in straight line	b	1.5 m	Lateral swept path including safe distance
m	7 m	Clearance width	n	4.8-6 m	Clearance height

5.2 Structure of access roads

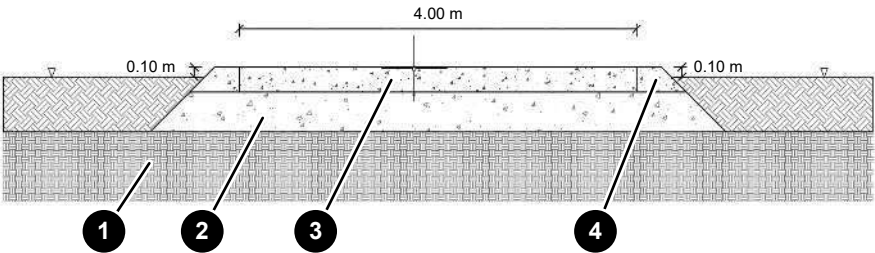


Fig. 6: Schematic structure of access roads

1	Load-bearing subsoil	2	Binder course
3	Surface course	4	Side area (shoulder)

The upper surface course is contoured with a cross slope or a straight crossfall. This ensures drainage to the sides. A drivable width of 4 m must be ensured. The construction of the side area (shoulder) is dependent on the subsoil and load transfer angle of the binder course.

The actual design is sized and determined by the traffic engineer in accordance with the local soil conditions and coordinated with the ENERCON GPM before implementation. A drivable width of 4 m must be ensured for the access road. More comprehensive expansion works may be required in order to ensure correct load transfer.

5.2.1 Lateral slopes: crown and camber

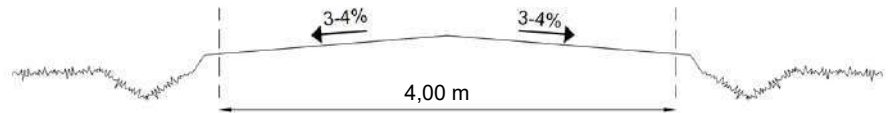


Fig. 7: Cross slope

In general, the access road must be created with a camber (cross slope) and an incline of 3–4 %. This cross slope on the road ensures that rainwater flows away from the road surface, minimising erosion, pothole formation and wheel ruts. If the road surface is paved (with concrete or asphalt), a cross slope of 2 % is sufficient to ensure adequate drainage.

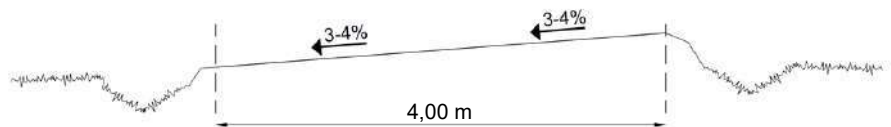


Fig. 8: Lateral slope

If the topography of the area makes it impossible to build the road with a cross slope, the lateral slope must be no more than 3–4 % over the whole width. In this case, the section regarding transitions to lateral slopes applies.

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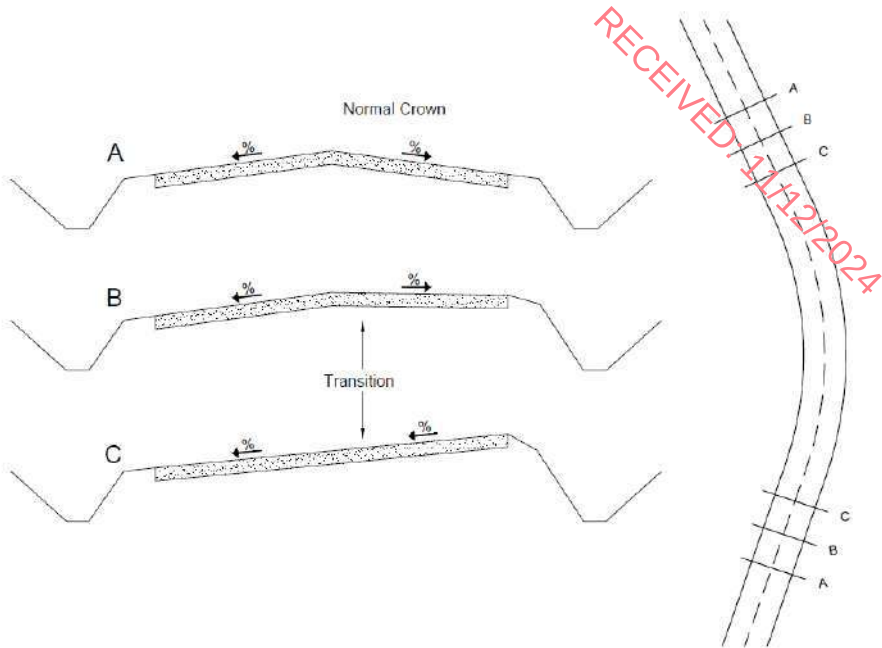


Fig. 9: Transition to lateral slope

When transitioning from a cross slope to a lateral slope, the normal crown profile must be taken out and converted to a camber profile. As a result, the surface can transition from the camber (highest point on the profile on the outer side of the curve) to the crest (highest point on the profile on the road axis). The lateral slope must be max. 2.5 % for double curves. The torsion between the towing vehicle and semitrailer/trailer must not exceed 5 %. If this cannot be realised, at least one vehicle length of the longest vehicle must be planned between the curves.

5.2.2 Road classifications

Within the wind farm, 3 different road types are used, depending on the starting situation for the road and the works required during construction: All 3 road types must fulfil the requirements with respect to the form, strength and bearing capacity as stated in this document.

Existing roads in good condition

Any existing roads within the wind farm with good surface and profile properties (sufficient bearing capacity, lateral incline and roughness) and a drivable width of at least min. 4 m. If these parameters are met, no additional works must be performed on these roads. The usual maintenance works on the road network after the start of the installation phase are mandatory.

Existing roads in need of expansion

Any existing roads within the wind farm that do not meet the requirements with respect to the road surface, the road profile, or the drivable width. Additional works to improve the road conditions are required for these roads. By using the existing road platform, the extent of the works to be performed is significantly reduced.

New roads

New roads to be build on natural ground. For these roads, all construction works must be performed:

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- Clearing of vegetation
- Levelling
- Removal of topsoil
- Earthwork
- Alignment of strata
- etc.

5.2.3 Requirements

Soil investigation The structural design of the access road is dependent on the properties of the subsoil and the expected stress from traffic. The subsoil must be investigated adequately by subsoil exploration drill holes and probing. The number and depth of the probes must be defined by the geotechnical expert, depending on the subsoil structure. The expected abnormal loads must be estimated for each relevant road section. In these estimations, the abnormal loads for each WEC must be taken into account that result from the construction of the road and paved surfaces, and from the delivery of WEC components and WEC assembly. The number of WECs operated on the relevant road section must also be considered. The structural design of the access road is defined based on the results of the soil investigations and the expected traffic.

Suitability for use The access roads are designed with sufficient bearing capacity with consideration to the expected traffic loads, so that they will remain usable throughout the duration of their use. Suitability for use and bearing capacity must be ensured even in heavy rainfall. It must be ensured that the surface course remains permanently free of potholes. The max. wheel rut depth is limited to 7.5 cm. The design of the construction site areas must include plans for drainage on access roads. In the event of snow or ice, the operator/customer must ensure safe working and driving conditions through use of gritting and snow clearance services. The implementation plan as well as all specifications for testing, examinations, evaluations and verifications must be submitted to the ENERCON GPM for inspection unsolicited.

5.2.4 Subsoil and pavement

In order to ensure safe, effective and economical traffic conditions during the construction phase, the following geometric requirements with respect to road construction must be fulfilled.

Tab. 2: Minimum requirements for the access road

Parameter	Requirement
Drivable width of access road	4 m
Max. permitted depth of ruts	7.5 cm
Max. lateral incline of the access road on straight stretches and in curves	3-4 %

Parameter	Requirement
Height of the road surface above the natural ground	10 cm

5.2.4.1 Requirements relating to compaction and bearing capacity

In order to ensure safe, effective and economical transport during the construction phase, the following requirements relating to the bearing capacity of the road must be fulfilled.

Tab. 3: Minimum requirements for the access road

Parameter	Requirement
Max. axle load	12 t
Max. total weight of transport combination	210 t
Surface course, deformation modulus	$E_{V2} \geq 100 \text{ MN/m}^2$
Surface course, Proctor density	$D_{Pr} \geq 100 \%$
Binder course, deformation modulus (if required)	$E_{V2} \geq 80 \text{ MN/m}^2$
Binder course, Proctor density	$D_{Pr} \geq 100 \%$
Ratio E_{V2}/E_{V1}	≤ 2.3

The construction firm must inspect and document the specified deformation moduli for each stratum constructed. If the specified values are not achieved, improvement measures must be implemented. Generally, a static plate load test is recommended for each stratum constructed.

The required values for the second deformation modulus (E_{V2}) and the ratio E_{V2}/E_{V1} reflect the plate load tests performed in accordance with German standard DIN 18134. This document summarises various aspects of the inspection to be performed, such as the plate diameter, max. pressure, load levels, E_v calculation formula, etc. Plate load tests that are performed on the basis of differing standards are not directly comparable.

Depending on the results of the geotechnical expert report, a static plate load test must be performed every 200 to 500 m along the access road. Static plate load tests must also be performed at transitions between existing roads and site roads, at crossings, and at junctions.

For existing roads in good condition, it is recommended to inspect the bearing capacity of the road by way of plate load tests, whereby the same requirements apply as with other road types.

The following points shall be checked and the results recorded:

- Structure of access roads (material and installation thickness)
- Sufficient compaction of the construction material
- Bearing capacity of access roads

- Bearing capacity of bridges
- Bearing capacity of culverts and pipework
- Distances to ditches, pits and bodies of water
- Distances to cable routes and overhead lines
- Feasibility of crossing installed lines (e.g. pipelines)

It may be advisable (e.g. in the case of long traffic routes on poor sub-soil) to not dimension the access road based on the specified deformation modulus but instead based on the traffic load with consideration of the axle transitions.

A drivable width of 4 m must be ensured for the access road. Depending on the load transfer and subsoil properties, more extensive expansion works may be required.

5.2.4.2 Subsoil and ground

The load-bearing subsoil is the basis for supporting high levels of surface pressure that can occur as a result of unusual loads or the cranes used. Therefore, the topsoil and any soft strata must be excavated until the first load-bearing stratum of natural ground has been reached. If cohesive and organic soils are not load-bearing, these are exchanged or replaced with layers of a suitable compacted filling material (e.g. sand). Alternatively, other technical methods can also be used (e.g. injecting, geogrid).

The bearing capacity of the subsoil must be verified. The required load distribution angle of the planned access roads is taken into account when excavating the width of the road.

5.2.4.3 Binder course

The binder course for the access roads within the wind farm consists of loose materials, such as sand, gravel, moraine, or a mixture thereof.

The proportion of fine aggregate cannot exceed 6 % of the total amount.

The gravel material for the binder course generally consists of larger stones with a much smaller proportion of clay or fine materials than the gravel material for the surface course. This is necessary in order to achieve the required strength and good drainage properties in the binder courses. Equally, the binder course material requires low plasticity index values.

The live loads are transferred to the subsoil via this binder course. The binder course must withstand the climatic and mechanical loads. The material used must be approved for use in road construction. The grading curve of the materials used must comply with whichever national regulations are applicable. The suitability of the material must be evidenced before installation by presenting valid inspection certificates. The required bearing capacity is guaranteed by way of graded grain size distribution, which must be agreed upon in coordination with the geotechnical expert.

Brick fragments are not used as bulk material for the binder course. The material is pulverised by moisture and loses its strength.

The binder course must be properly compacted in layers.

5.2.4.4 Surface course

Material The proportion of fine aggregate cannot exceed 10 % of the total amount. The gravel material for the surface course generally contains a finer aggregate than the gravel for the binder course. Aggregate that is too coarse will make maintenance more difficult and result in a rough road surface. A higher proportion of fine aggregate and a higher plasticity index are also required in order to be able to create a binding property and a smooth road surface in the surface course. In order to account for the stress resulting from high live loads, the surface course must be correctly compacted in layers.

The grading curve of the materials used must comply with whichever national regulations are applicable. The suitability of materials must be evidenced before installation by presenting valid inspection certificates. The surface course is constructed to be as even as possible, with a minimum height offset of 10 cm above the adjacent land. The minimum layer thickness is 25 cm.

Surface course If the access road has a pitch of 7 % to a maximum of 12 %, the surface course has a hydraulic or bituminous bond. The surface course provides a friction fit that prevents the wheels of vehicles with abnormal loads from spinning.

6 Construction site areas and foundation

6.1 Work area at the WEC site

6.1.1 General information

Different jobs are performed on the construction area at the site of the WEC to be erected. These range from foundation construction, storage of components, pre-assembly and WEC assembly through to grid connection and commissioning. The construction area is divided into different areas that are used for assembly and storage of the WEC components. Different requirements apply to these areas. The construction site areas must therefore be sufficiently dimensioned and have sufficient bearing capacity to ensure safe and cost-effective progress of the project.

Differences in level

In order to ensure a smooth sequence of construction, the following differences in level must be observed:

- Between construction site areas and surrounding terrain: If the height difference between the construction site areas and the surrounding area is > 0.30 m, the side areas need to be sloped with a gradient of 45° . Depending on the height of the slope, there is a circumferential strip around the perimeter on which loads must not be placed. If necessary, the area must be increased in size in order to create the required useful area.
- Between access road, crane platform, storage area and assembly area: A height difference or offset is not permitted.
- Between crane platform and foundation top edge: The permissible height difference can be found in the foundation data sheet.

If height differences are necessary due to the topographical conditions, the point 'Slopes' must be taken into account and coordinated with the ENERCON GPM.

- If the construction area is built into an elevation or a hill, an edge strip of 4 m must be planned, which means that the base area is increased by this edge strip. In this case, sufficient drainage must be guaranteed. This regulation applies to the edge area as well as to elevations within the construction area.

Slopes

In the case of slopes, the safety zone that must not be loaded must be taken into account. The base area is thus increased by the safety zone. This regulation applies to the edge area as well as to slopes within the construction area. The safety zone must be determined by the geotechnical expert.

Storing spoil

Spoil generated during the construction phase that will not be re-used is to be stored exclusively in heaps outside of the work area. When creating heaps of earth, take into account the planned cable route and cable bushing from and to the WEC. The minimum distance from the heaps of earth to the work area is 4 m. So as not to impede delivery of the tower and WEC components, spoil must not be stored in

the swept path of the transport vehicles. The same applies along the crane jib assembly area. If not used, excess spoil is to be completely removed by the customer. For orientation, observe the fig. 12, p. 32.

Locations for winches

In order to guide the WEC components during lifting, they are held in position with ropes and winches. The position of the winches depends, among other factors, on the component to be lifted and the wind situation and is coordinated shortly beforehand with the ENERCON CM or installation team. The winches are positioned at a minimum distance of 1 hub height in metres from the tower base.

The winch location must be accessible with a telescopic handler. The owner of the plots of land in question must be notified of the activities, and in some cases, their permission may be required. Driving over the land with a telescopic handler can cause damage to it. This must be borne by the customer to a reasonable extent.

Depending on the local forest density, additional areas may have to be cleared. In the case of forest locations, the winch location must be agreed with ENERCON at an early stage.

6.1.2 Foundation

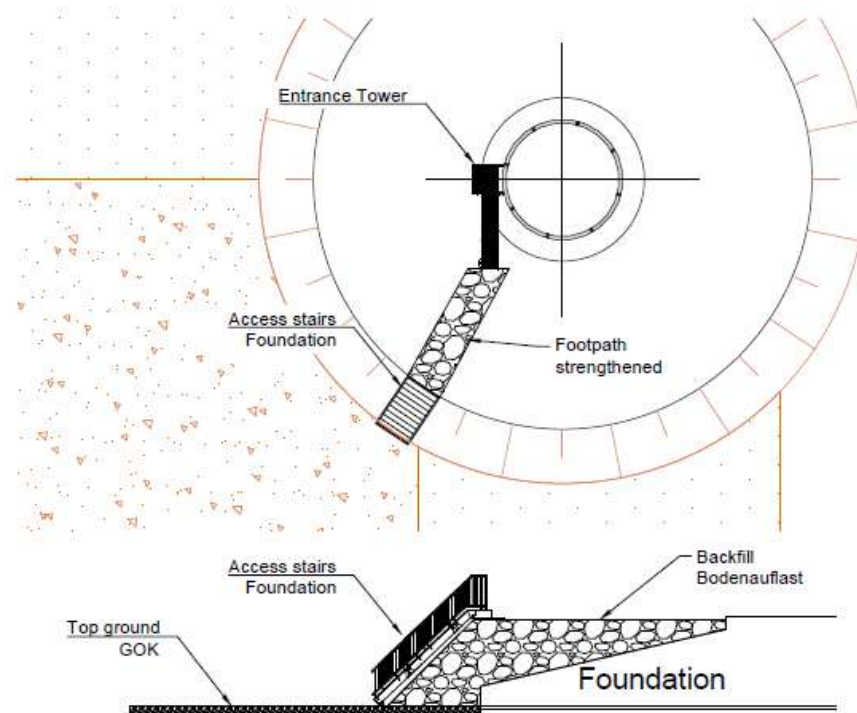


Fig. 10: Foundation at GL with soil load

For operation of the WEC, the foundation requires a soil cover that must be applied before the start of construction of the WEC. Here the outer diameter of the slope must not be greater than the foundation outside edge ± 3 m.

If there are differences between the specified height levels, such that the distance between the foundation top edge and ground level is greater or smaller than the prescribed standard, this must be agreed with ENERCON. The space required for the soil cover and adapted entrance stairs must be taken into account in the plans.

Once the soil cover is in place, entrance stairs must be installed for access. This stairway is included in the scope of delivery of the WEC and is installed by the assembly team. If the customer prefers to install their own stairs, this must be agreed with ENERCON in advance. Height differences other than those specified on the foundation formwork plan must be taken into account. The standard stairway is only adapted if there are height differences > 0.4 m. If the stairway is too short, gravel will be used at the bottom end to compensate for the height difference. If the stairway is too long, the bottom end will be dug in or shimmed above the soil cover.

For HSTs, a temporarily drivable strip 3 m wide must be planned around the soil cover. A telescopic work platform will be driven onto this strip during pre-assembly of the foundation section. The strip can be made from e.g. steel plates.

Other than the soil cover, additional loads on foundations are not covered by the scope of the type testing. Additional loads require approval from ENERCON.

- Prohibited additional loads during the installation phase:
 - Storing or driving any kind of vehicle or crane on the area
 - Any soil density properties for the materials or soil cover properties that deviate from the formwork plan
 - Unloading and storage of crane components and weights
 - Unloading or storage of brickwork, stone or concrete foundation curbs
 - Erecting transformer stations, etc.
- Permissible additional loads during the installation phase:
 - Laying down cables and small tools required for assembly
 - Access by installation and service personnel

Sequence of construction

1. Creating the entire substructure of the crane platform and assembly area. The surface course is applied up to a distance of +3 m from the outside edge of the foundation.
2. Creating the foundation.
3. Applying and sloping the foundation slope according to the specifications, whereby the slope outer diameter must not exceed +3 m from the outside edge of the foundation.
4. Installing a stairway with handrail at the slope, in the direction of the crane platform. Here, the safety and construction regulations that currently apply in the region must be complied with.
5. Using gravel to secure the foundation from the entrance stairs to the crane platform up to the access to the outer tower stairs in order to ensure safe and clean access routes.
6. Reworking and profiling the entire building area as per minimum requirements.

6.1.3 Building area

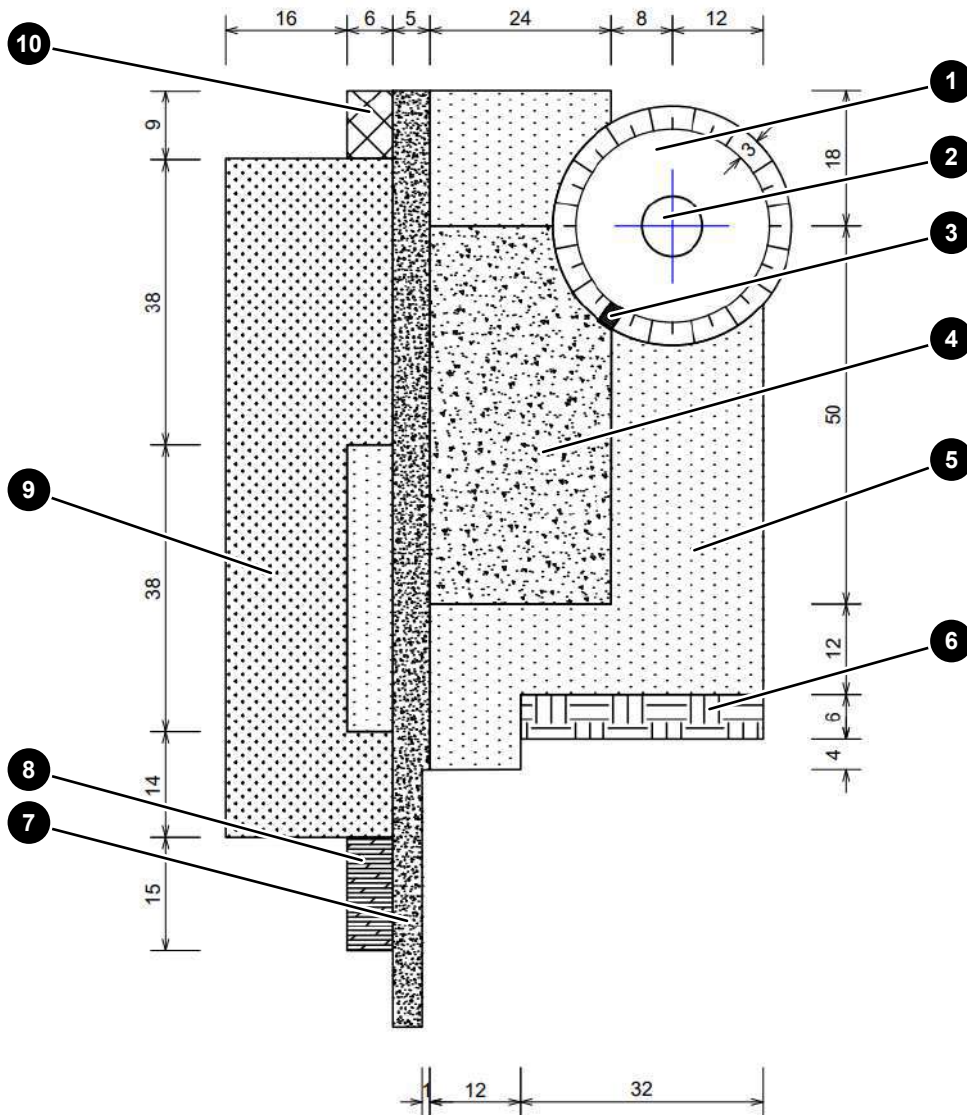


Fig. 11: Working area dimensions at the WEC site (all dimensions in metres)

1	Foundation	2	Tower
3	Stairs	4	Crane platform
5	Assembly area	6	Container area
7	Access road	8	Parking area
9	Storage area	10	Waste collection point

Soil investigation

The structural design of the crane platform and assembly area may differ, depending on the nature of the subsoil. The subsoil must be investigated adequately by subsoil exploration drill holes and probing. All strata relevant to settlement and soil failure must be recorded during this process. The number and depth of the explorations must be specified by the geotechnical expert in relation to the subsoil structure. The structural design of the crane platform and assembly area is then determined based on the results of the soil investigations.

Suitability for use The construction site areas are designed with sufficient bearing capacity with consideration to the expected loads, so that they will remain usable throughout the duration of their use. Suitability for use and bearing capacity must be ensured even in heavy rainfall. The max. wheel rut depth is limited to 7.5 cm. The design of the areas must include an option for drainage. In the event of snow or ice, the operator/customer must ensure safe working and driving conditions through use of gritting and snow clearance services. The implementation plan as well as all specifications for testing, examinations, evaluations and verifications must be submitted to the ENERCON GPM for inspection unsolicited.

6.1.3.1 Material

Certified crushed bulk materials, e.g. gravel or similar, that fulfil the requirements may be used as a material for the surface course. The minimum layer thickness is 25 cm. The following considerations apply to materials that will be used both on the crane platform and in the assembly area.

6.1.3.2 Subsoil and soil

The load-bearing subsoil is the basis for supporting high levels of surface pressure that can occur as a result of unusual loads or the cranes used. Therefore, the topsoil and any soft strata must be excavated until the first load-bearing stratum of natural ground has been reached. If cohesive and organic soils are not load-bearing, these are exchanged or replaced with layers of a suitable compacted filling material (e.g. sand). Alternatively, other technical methods can also be used (e.g. injecting, geogrid).

Binder course

The binder course for the crane platforms and hardstands can consist of loose materials, such as sand, gravel, moraine, or a mixture thereof. The proportion of fine aggregate cannot exceed 6 % of the total amount. The gravel material for the binder course generally consists of larger stones with a much smaller proportion of clay or fine materials than the gravel material for the surface course. This is necessary in order to achieve the required strength and good drainage properties in the binder courses. Equally, the binder course material requires lower plasticity index values.

The live loads are transferred to the subsoil via this binder course. The binder course must withstand the climatic and mechanical loads. The material used must be approved for use in road construction and building construction. The grading curve of the materials used must comply with whichever national regulations are applicable. The suitability of the material must be evidenced before installation by presenting valid inspection certificates. The required bearing capacity is ensured by way of graded grain size distribution, which must be agreed upon in coordination with the geotechnical expert.

Brick fragments are not to be used as bulk material for the binder course. This material is pulverised by moisture and loses its strength. It must be ensured that the compaction is correct.

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Surface course Certified crushed bulk material, e.g. gravel or crushed stone, is used as material for the surface course. An aggregate of 0/32-0/45 mm is used. The proportion of fine aggregate cannot exceed 10 % of the total amount. The gravel material for the surface course generally contains a finer aggregate than the gravel for the binder course. Aggregate that is too coarse will make maintenance more difficult and result in a rough road surface. A higher proportion of fine aggregate and a higher plasticity index are also required in order to be able to create a binding property and a smooth road surface in the surface course. The grading curve of the materials used must comply with whichever national regulations are applicable. The suitability of materials must be evidenced before installation by presenting valid inspection certificates. The minimum layer thickness is 25 cm. In order to account for the stress resulting from high live loads, the surface course must be well compacted in layers.

6.1.3.3 Crane platform

The crane is set up on the crane platform. This is where the main works are carried out. This area is subjected to the highest levels of stress as a result of live loads and distributed loads. An improperly designed or dimensioned crane platform may result in unforeseen movements or toppling of the crane.

Tab. 4: Crane platform minimum requirements

Parameter	Requirement
Surface evenness	$\leq 0.25 \%$
Minimum bearing capacity	220 kN/m ²
Surface course, deformation modulus	$E_{V2} \geq 120 \text{ MN/m}^2$
Surface course, Proctor density	$D_{Pr} \geq 103 \%$
Binder course, deformation modulus (if required)	$E_{V2} \geq 100 \text{ MN/m}^2$
Binder course, Proctor density	$D_{Pr} \geq 100 \%$
Ratio E_{V2}/E_{V1}	≤ 2.3

The bearing capacity of the crane platform must be verified by soil failure calculations or, on slopes, by slope failure calculations in accordance with DIN 4017. Settlement calculations are required in order to prevent the crane from standing at an incline that is greater than the maximum permitted by DIN 4019:2015. The crane loads are reduced to the specified permissible soil pressure by load distribution plates underneath the crawlers or outriggers.

The required geotechnical verifications of the load distribution shall be provided in each case for an area with the following dimensions:

- 2 m x 10 m
- 5 m x 10 m

The construction firm must check and document the specified deformation moduli for each stratum constructed. If the specified values are not achieved, improvement measures must be implemented. Gener-

ally, a static plate load test is recommended for each stratum constructed. The recommended values for the second deformation modulus (E_{V2}) and the ratio E_{V2}/E_{V1} reflect the plate load tests performed in accordance with German standard DIN 18134. This document summarises various aspects of the inspection to be performed, such as the plate diameter, max. pressure, load levels, E_V calculation formula, etc. Plate load tests that are performed on the basis of differing standards are not directly comparable.

The following points shall be checked and the results recorded:

- Structure of the construction site area (material and installation thickness)
- Sufficient compaction of the construction material
- Distances to ditches, pits and bodies of water
- Distances to cable routes and overhead lines

For the compaction test of the crane platform, a minimum of 3 plate load tests should be performed that provide a representative result of the condition of the surface. Plate load tests in the edge area must be avoided. If there are doubts with respect to the suitability for use of the crane plate, further tests must be performed if necessary.

6.1.3.4 Assembly area

The assembly area serves as a work area for pre-assembly and assembly purposes and for storing WEC and tower components. This area is required during construction and can be restored to its original state after work in the wind farm has been completed. In the case of component replacement or dismantling, a section of this area must be restored. The size and position of this section must be agreed upon in coordination with the ENERCON GPM.

Tab. 5: Minimum requirements for the assembly area

Parameter	Requirement
Surface evenness	$\leq 1 \%$
Minimum bearing capacity	135 kN/m ²
Surface course, deformation modulus	$E_{V2} \geq 120 \text{ MN/m}^2$
Surface course, Proctor density	$D_{Pr} \geq 103 \%$
Binder course, deformation modulus (if required)	$E_{V2} \geq 80 \text{ MN/m}^2$
Binder course, Proctor density	$D_{Pr} \geq 100 \%$
Ratio E_{V2}/E_{V1}	≤ 2.3

The bearing capacity of the assembly area must be verified by soil failure calculations or, on slopes, by slope failure calculations in accordance with DIN 4017. Settlement calculations are required in order to prevent the crane from standing at an incline that is greater than the maximum permitted by DIN 4019:2015. The crane loads are reduced to the specified permissible soil pressure by load distribution plates underneath the crawlers or outriggers.

The required geotechnical verifications of the load distribution shall be provided in each case for an area with the following dimensions:

- 1.5 m x 5 m
- 3 m x 5 m

The construction firm must check and document the specified deformation moduli for each stratum constructed. If the specified values are not achieved, improvement measures must be implemented. Generally, a static plate load test is recommended for each stratum constructed. The recommended values for the second deformation modulus (E_{V2}) and the ratio E_{V2}/E_{V1} reflect the plate load tests performed in accordance with German standard DIN 18134. This document summarises various aspects of the inspection to be performed, such as the plate diameter, max. pressure, load levels, E_V calculation formula, etc. Plate load tests that are performed on the basis of differing standards are not directly comparable.

The following points shall be checked and the results recorded:

- Structure of the construction site area (material and installation thickness)
- Sufficient compaction of the construction material
- Distances to ditches, pits and bodies of water
- Distances to cable routes and overhead lines

At least 1 plate load test per assembly area must be performed for the compaction check of the assembly area.

6.1.3.5 Storage area

The storage area serves to store assembly materials, containers, flat racks and rotor blades, among other things. This area is set up to the side of the crane platform. It does not have to be surfaced but it must be level, smooth and free of roots, trees and shrubs. Drainage measures must be in place. Practicability for telescopic handlers must be ensured.

Additional measures may be required for the correct mounting of the rotor blades. These additional measures, such as ballast surfaces, steel plates or load distribution plates, vary depending on the rotor blade and must be agreed with the ENERCON GPM.

6.1.3.6 Working levels (where necessary)

The carrier device used for constructing pile foundations or for ground improvement measures through vibro replacement/vibro compaction is located on the working level.

Tab. 6: Minimum requirements for the work area

Parameter	Requirement
Form: Circle	Coordination with ENERCON GPM
Surface evenness	≤ 1 %
Minimum bearing capacity	Coordination with ENERCON GPM

Parameter	Requirement
Binder course, deformation modulus (if required)	$E_{v2} \geq 80 \text{ MN/m}^2$
Binder course, Proctor density	$D_{Pr} \geq 100 \%$
Ratio E_{v2}/E_{v1}	≤ 2.3

The following tests must be carried out and recorded:

- Compaction (static plate load tests, dynamic probing)
- Distances to ditches, pits and bodies of water
- Distances to cable routes and overhead lines
- Surface gradients for drainage

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6.1.4 Clearing and safety area

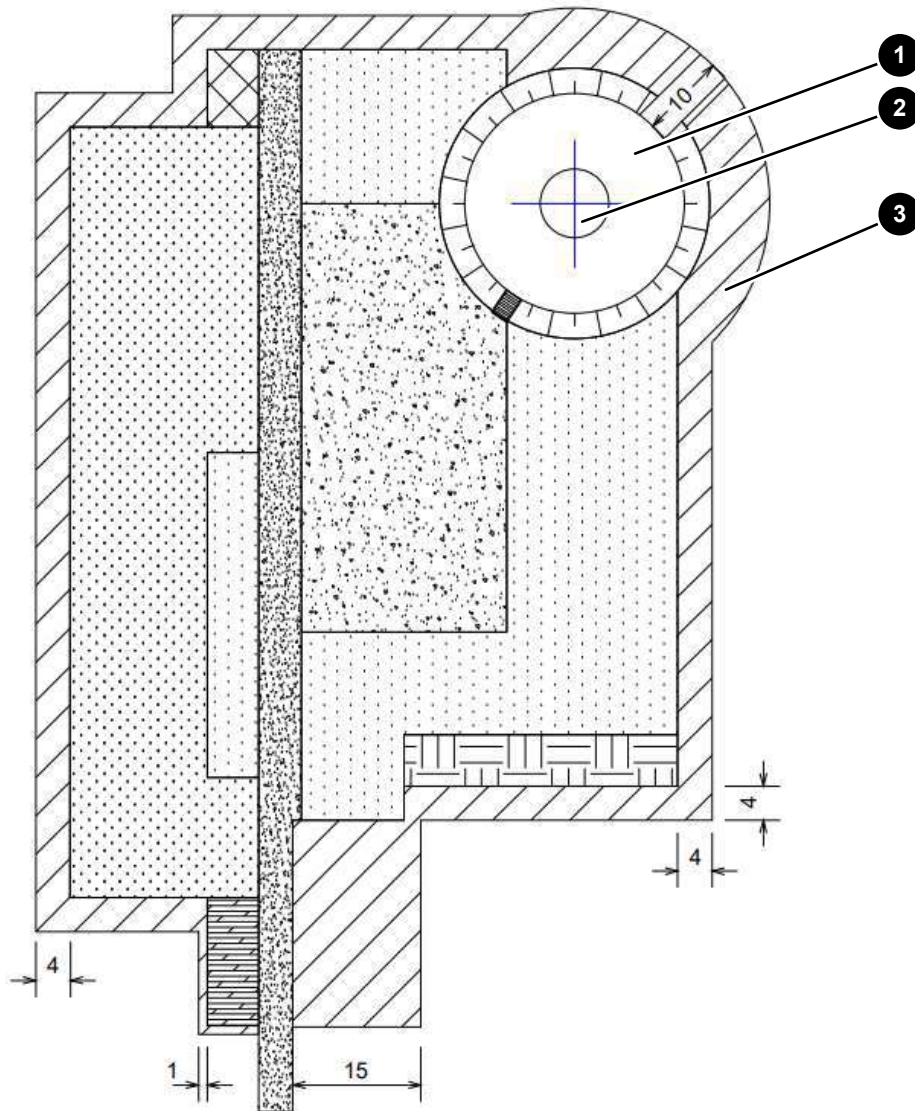


Fig. 12: Site clearing and safety area, dimensions (all dimensions in metres)

1	Foundation	2	Tower
3	Site clearing and safety area		

When erecting the WEC, a safety area must be kept clear around the foundation and the construction area, or the area must be cleared. No excavated soil may be stored in the clearing and safety area during construction work. The clearing and safety area can be partly reforested after the WEC has been installed. In the event of component replacement or dismantling, a section of this area must be kept clear or cleared again. The size and dimensions of this section must be agreed upon in coordination with the ENERCON GPM.

6.2 Crane jib assembly area

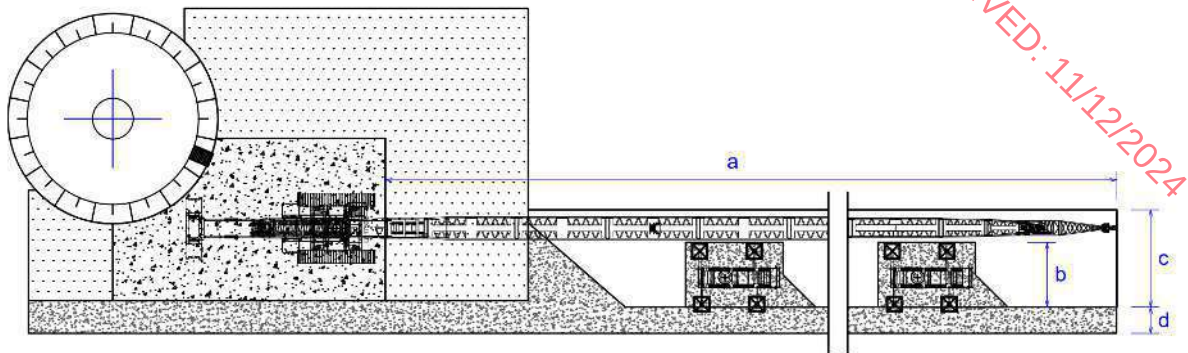


Fig. 13: Crane jib assembly area

a	140 m	Length of crane jib assembly area, starting from crane platform	b	10 m	Width of auxiliary crane platform
c	15 m	Total width of crane jib assembly area	d	4 m	Drivable width of road

The lattice tower jib of the main crane is assembled from individual components. It must be ensured that the lattice tower for the large crane can be set down in the event of rising wind speeds during assembly as well. This requires a clearing that is the same length as the lattice tower jib, which is the same height as the crane platform as standard. Lattice tower jibs can be installed only up to a certain gradient. If there are height differences in the crane jib assembly area, consult with the ENERCON GPM. This particularly applies to gradients between the basic unit and the lattice tower jib.

Auxiliary crane areas

The lattice tower jib of the large crane is assembled and erected with the support of an auxiliary crane. The auxiliary crane is positioned to the side of the lattice tower tip. In order to facilitate consecutive assembly of the individual jib components, a paved roadway is required for the auxiliary crane. If the access road to the crane platform is straight, long enough and if local conditions make lattice tower assembly possible, it is used for that purpose. If not, a temporary auxiliary road will be built. Approval by an authority may be required for the construction of the temporary road for lattice tower assembly. The customer must check in advance if this approval is necessary. In order to support the auxiliary crane and distribute its loads, auxiliary crane platforms measuring 10 m in width must be established at certain intervals, immediately adjacent to the access road or auxiliary road. The number and location of auxiliary crane areas is coordinated with the ENERCON GPM and crane service provider. If a crawler crane is used as an auxiliary crane, the access road must be widened correspondingly for the crane. This can be realised with gravel or plates, depending on the ground conditions.

Tab. 7: Requirements for the crane jib assembly area

Parameter	Requirement
Bearing capacity of the access road or auxiliary road	12 t axle load

Parameter	Requirement
Surface pressure of the auxiliary crane plat- forms	min. 135 kN/m ²

6.3 Alternative construction area

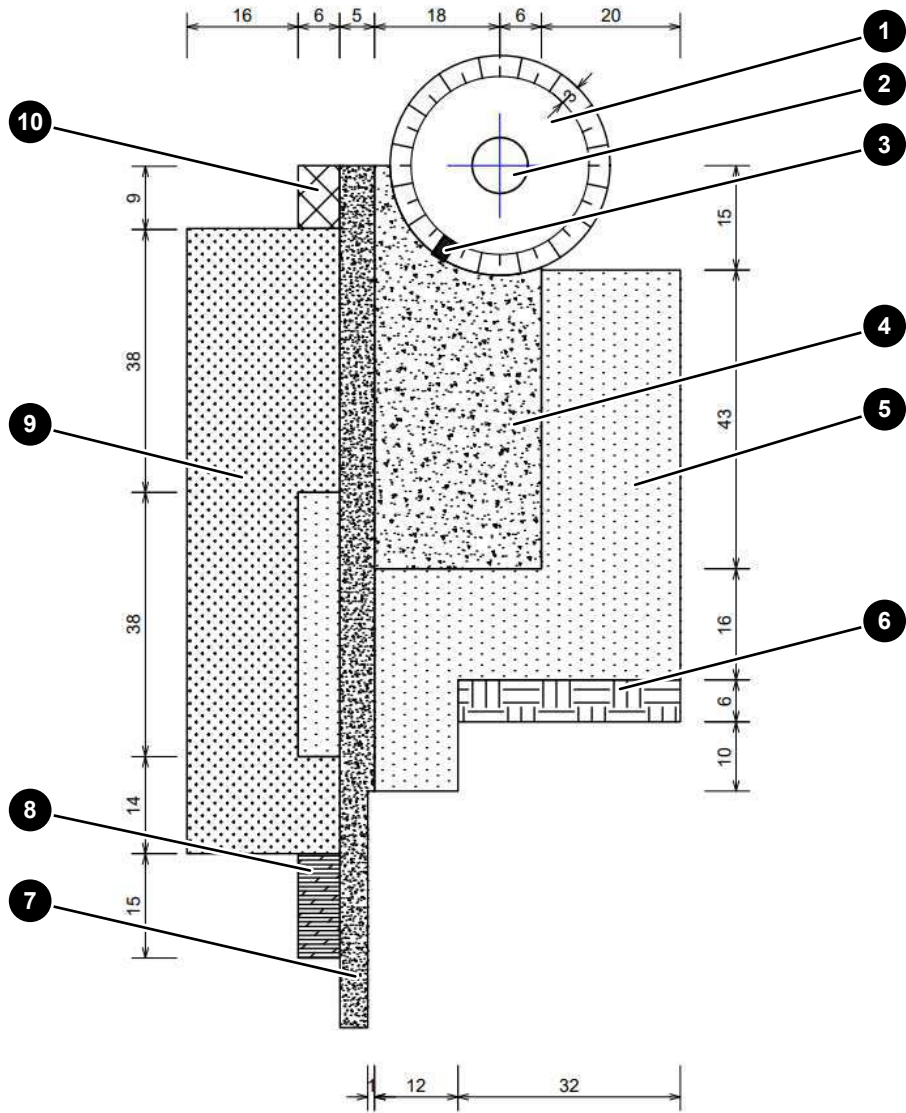


Fig. 14: Alternative working area at the WEC site, dimensions (all dimensions in metres)

1	Foundation	2	Tower
3	Stairs	4	Crane platform
5	Assembly area	6	Container area
7	Access roads	8	Parking area
9	Storage area	10	Waste collection point

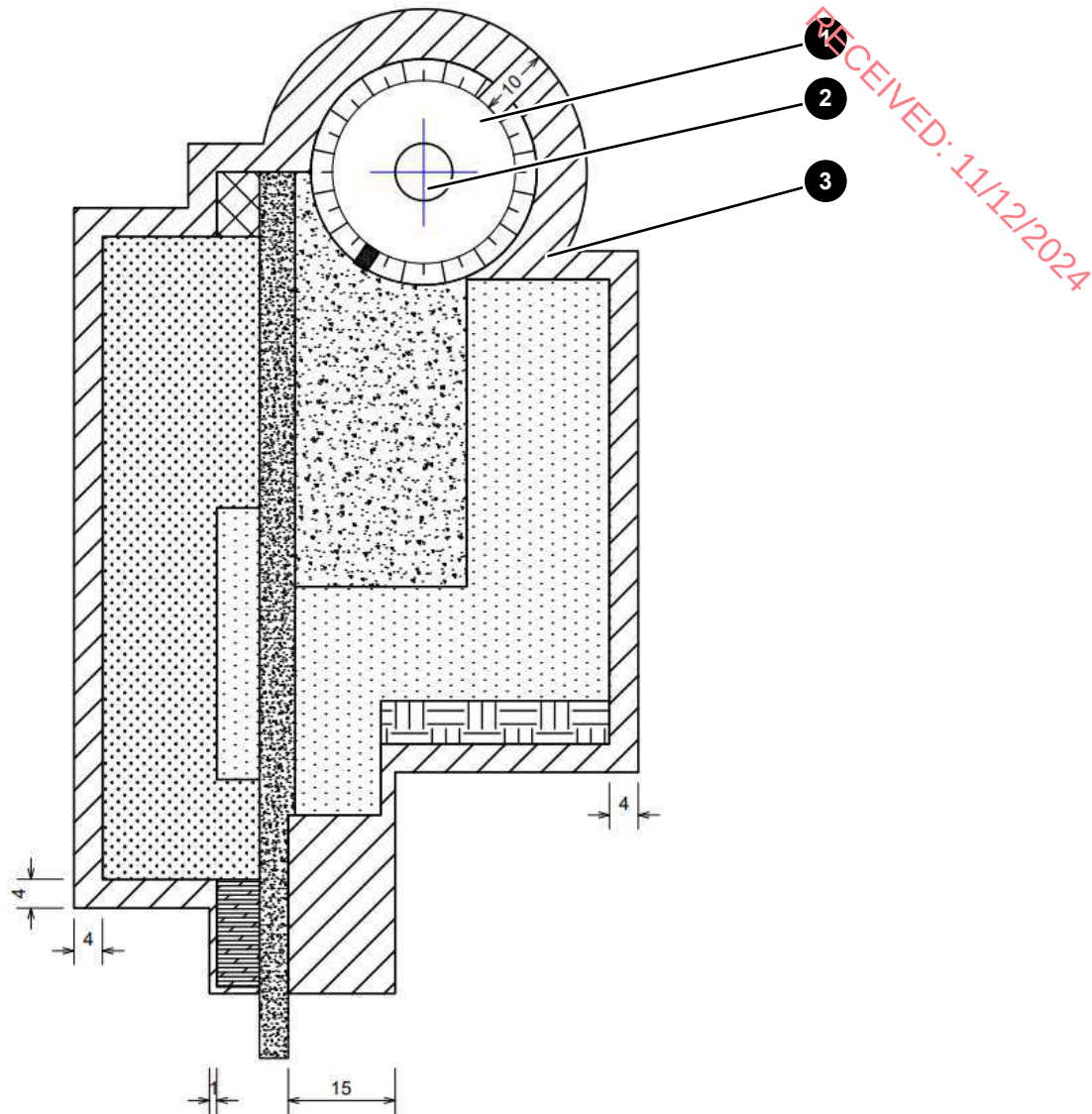


Fig. 15: Alternative site clearing and safety area, dimensions (all dimensions in metres)

1	Foundation	2	Tower
3	Site clearing and safety area		

The alternative construction areas shown here meet the same requirements for delivery and assembly as in the standard shown (fig. 11, p. 26 and fig. 12, p. 32). There are restrictions to the assembly direction of the jib: namely, here it can only be assembled in the direction opposite to the tower. Use of the alternative construction areas must be agreed with ENERCON.

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6.4 Optional rotor blade storage area

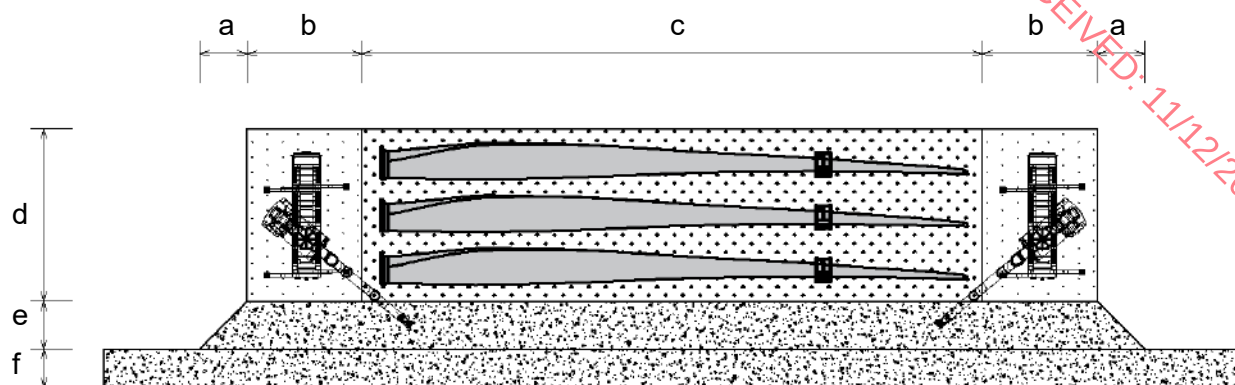


Fig. 16: Rotor blade storage area (construction diagram)

a	5 m	Length of funnel lay-by	b	12 m	Width of auxiliary crane platform
c	90 m	Length of rotor blade storage area	d	18 m	Width of rotor blade storage area/ length of auxiliary crane platform
e	5 m	Width of lay-by	f	4 m	Drivable width of road

The rotor blade storage area serves as temporary storage for rotor blades. The area can also be used for transferring rotor blades. The rotor blade storage area is located in a lay-by along the access road. The storage area is free of stumps and roots. An auxiliary crane is located on each of the two front sides of the storage area for moving the rotor blades. The rotor blade storage area does not replace the parking spaces for excess length transport vehicles required to be specially indicated (see *Parking areas for long transports*, p. 12).

The rotor blade storage area is included in the plans if no storage area can be constructed at the WEC location or if no just-in-time delivery of the rotor blades is possible due to the installation and logistics concept. The size of the rotor blade storage area and its position within the wind farm are derived from the installation and logistics concept and are agreed upon with the ENERCON GPM. The additional logistical costs are borne by the customer. If necessary, contractually agreed deadlines must be adjusted by the contractor.

Tab. 8: Requirements for the rotor blade storage area

Parameter	Requirement
Bearing capacity of the lay-by	12 t axle load
Minimum load-bearing capacity of the auxiliary crane platforms	min. 135 kN/m ²

7 Central contact point

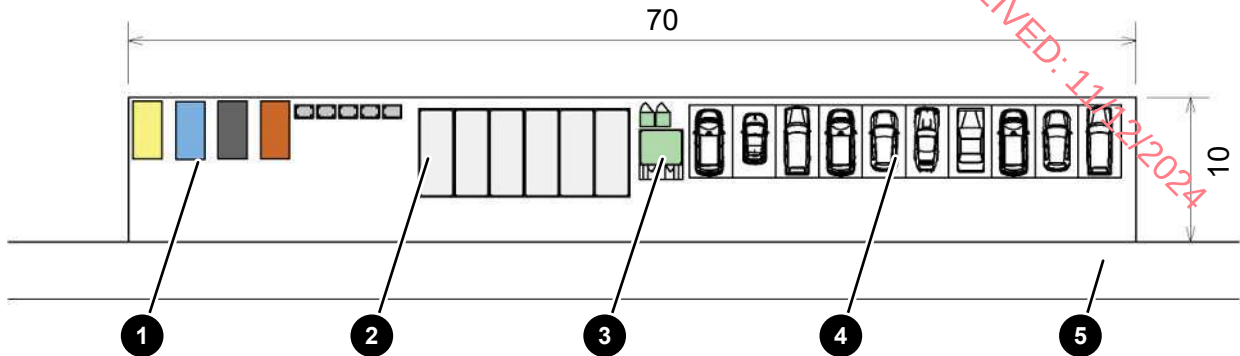


Fig. 17: Central contact point (all dimensions in metres)

1	Waste containers	2	Construction site containers
3	Sanitary facilities	4	Car parking spaces
5	Access road		

Central infrastructure is required in every wind farm. The central infrastructure includes the office container of the ENERCON CM, car parking spaces, waste containers and sanitary facilities. A dedicated space can be created for this to serve as a central facility. Existing spaces may also be used and may require adaptation. The office containers and waste containers do not have to be located in the same area. The waste containers must be accessible for loading and unloading by truck.

The area of the central contact point is gravelled or covered with steel or composite panels. The bearing capacity of the area is dimensioned for vehicles with an axle load of 12 t.

The construction site equipment, the location within the wind farm as well as dimensions and distances on the area are coordinated on a project-specific basis with the ENERCON GPM. Local conditions and country-specific regulations must be taken into account.

Subject to technical change without prior notice.

8 Access for service vehicles after commissioning

Once the WEC has been commissioned, ENERCON Service needs access (a ramp) for service vehicles, in order to bring heavy components such as yaw gears to the WEC. This ramp can be installed at the same time as dismantling the temporary assembly areas. When doing so, the specifications document D02768819 'Anforderungen Zusatzbelastung Fundamentanschüttung und Fundamentauflast für Servicetätigkeiten' (Additional load requirements for foundation soil cover/load for service activities) must be taken into account. This specification applies only for servicing after commissioning a WEC.

It is not permitted to have a ramp during the assembly phase.

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APPENDIX 2.2

FIRE RISK ASSESSMENT

VOLUME III

APPENDICES TO

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DECEMBER 2024

Cloonanny Wind Farm

FIRE RISK ASSESSMENT



Natural Forces
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Cloonanny Wind Farm
Fire Risk Assessment

Document History

Doc Name	Rev	Details	Author	Approved
FRA	0	Fire Risk Assessment	Emma Harris	Jonathan Coffey

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1. Introduction

The purpose of this Fire Risk Assessment is to assess the hazards associated with a fire in or near the proposed development. The assessment aims to identify the key fire risks associated with a battery energy storage system within the substation compound.

2. Responsibilities (Control of the Plan)

It is the responsibility of the site developer, to ensure the actions set out in this assessment is complied with. The developer is charged with the overall responsibility of ensuring the mitigation measures proposed within this Fire Risk Assessment and all planning conditions issued by a relevant planning authority or statutory body are adhered with throughout the construction and operational phase of the proposed development detailed below.

3. Development Description

A detailed description of the Proposed Development is contained within Chapter 2 of this EIAR and the Planning Statement that accompanies the planning application.

A 10-year permission is being sought by Natural Forces Renewable Energy 2 Limited (Natural Forces) for the development of a 14MW wind farm to be located in the townlands of Gorteenorna, Derryharrow, Corragarrow, Cloonanny Glebe, Co. Longford.

The development will consist of:

- i. The Construction of two Enercon E175 EP5 wind energy converters, each with an electrical rating of 7MW, an overall ground-to-blade tip height of 199.9 metres, a rotor blade diameter of 175 metres, hub height of 112.4 metres, associated foundations and hard-standing areas;
- ii. Construction of an 800m permanent internal site access road which will run from the L50462 to the wind energy converter hardstanding areas including a 9.1m clear span bridge crossing a local stream;
- iii. Construction of 1 No. 20kV substation compound comprising 2 No. modular substation buildings, a battery energy storage system (BESS) associated electrical works, foundation and hardstanding area;
- iv. A meteorological mast (met mast) with a height of 32 metres, and associated foundation and hardstanding area;
- v. Temporary alterations to the turbine component haul route, including junction accommodation works and temporary access roads to facilitate deliveries to the site entrances on the L50462 and the L5046;
- vi. Upgrade of the existing entrance on the L50462 for provision of a construction stage site entrance;
- vii. Installation of underground collector circuit and communications cabling which will run in underground cable trenches (c. 1m deep), from the proposed wind energy converters to the proposed substation compound;

Cloonanny Wind Farm Fire Risk Assessment

- viii. Demolition of a single storey derelict shed structure (c. 93 sqm GFA) to facilitate the turbine haul route
- ix. A temporary construction compound;
- x. All associated and ancillary site development, construction and operational works such as excavation, construction, wind turbine and electrical component repair replacement and maintenance, site reinstatement works , including the provision of a temporary construction compound, site drainage, spoil management, and hedge and tree trimming and cutting .

The proposed development has a total site area 17.28ha and will have an operational lifespan of 35-years from the date of commissioning

4. International Standards

The proposed development will be constructed in line with the International Standard sets International Electrotechnical Commission (IEC)¹.

The International Electrotechnical Commission (IEC)² is a global, not-for-profit membership organization that brings together more than 170 countries and coordinates the work of 20,000 experts globally.

The IEC work underpins quality infrastructure and international trade in electrical and electronic goods. Their work facilitates technical innovation, affordable infrastructure development, efficient and sustainable energy access, smart urbanization and transportation systems, climate change mitigation, and increases the safety of people and the environment.

The IEC provides a global, neutral and independent standardization platform to 20,000 experts globally. It administers 4 Conformity assessment systems whose members certify that devices, systems, installations, services and people work as required.

The IEC publishes IEC International Standards which together with conformity assessment provide the technical framework that allows governments to build national quality infrastructure and companies of all sizes to buy and sell consistently safe and reliable products in most countries of the world. IEC International Standards serve as the basis for risk and quality management and are used in testing and certification to verify that manufacturer promises are kept.

They provide instructions, guidelines, rules or definitions that are then used to design, manufacture, install, test & certify, maintain and repair electrical and electronic devices and systems.

¹ <https://www.iec.ch/about-us>

² <https://www.iec.ch/about-us>

Cloonanny Wind Farm Fire Risk Assessment

IEC International Standards are essential for quality and risk management; they help researchers understand the value of innovation and allow manufacturers to produce products of consistent quality and performance. IEC International Standards are always used by technical experts; they are always voluntary and based on the international consensus of experts from many countries.

International standards also form the basis for testing and certification.

International standards are also often adopted by countries or regions to become national or regional standards. For example, close to 80% of European electrical and electronic standards are in fact IEC International Standards.

On the other side, regulations are rules or directives that are made and maintained by a national or regional authority. Generally, compliance with regulations is a must.

It is quite common for technical regulations to refer to international standards because standards help avoid that the law becomes too detailed or descriptive. This approach allows laws to stay current because standards are regularly reviewed and updated.

Standards provide the technical frameworks, metrics and specifications regulators can reference in legislation. As technologies evolve, standards are revised, and legislation remains up to date.

Standards also provide governments with technical references in public tenders, lending confidence that products meet commonly agreed rules that match the requirements of many.

By incorporating IEC International Standards and testing and certification into their regulations, policy makers and regulators provide a platform that encourages the cooperation of competitors under common rules. This avoids island solutions and improves safety, affordability and interoperability.

5. Fire Risk Assessment

The key fire risks identified in relation to the substation and BESS compound are identified as;

- Component Failure
- Poor Operation and Maintenance Practices

6. Substation & BESS Compound Fire Risks

No. 1 20kV Substation and BESS compound (hereafter referred to as the compound) has been proposed within the development.

The compound will be made up of 2No. Modular Substations and 3 No. Bess Units Each BESS unit in the proposed development contains of 6 battery modules and 3No. Transformer and Inverters Units. This technology has been chosen due to strict safe regulations governing energy storage facilities / Lithium-Ion. Due to their design BESS containerised lithium-Ion units are easily installed and due to their technical characteristics, work well as energy storage systems for improving the penetration of renewable energy generation, as well as providing grid stability See Figure 1 Compound Layout below.

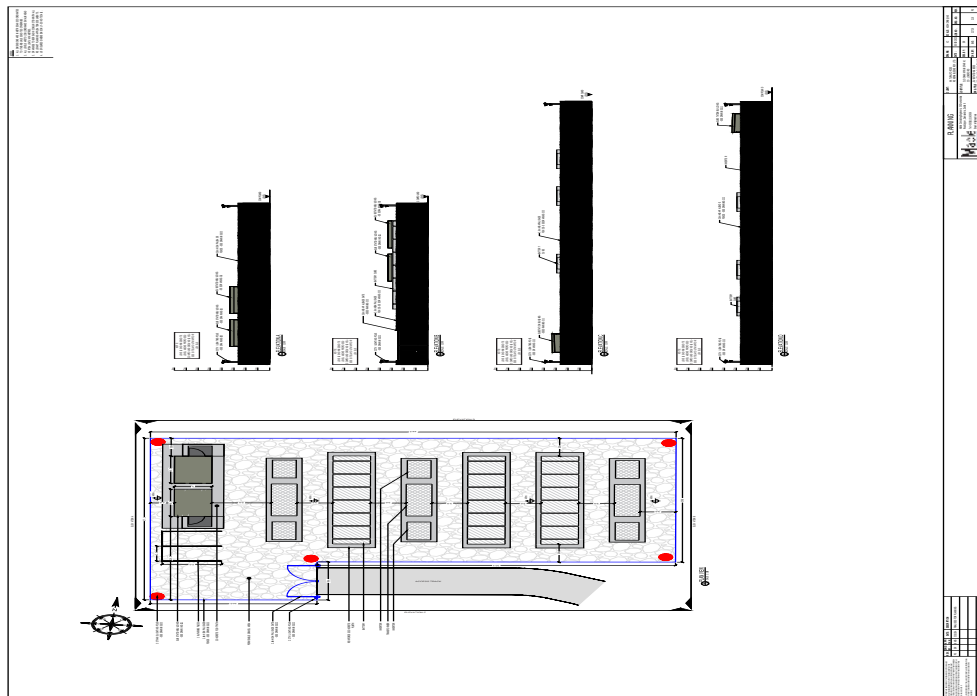


Figure 1 Compound Layout

Cloonanny Wind Farm Fire Risk Assessment

The energy storage compound will be compliant with all regulations and health and safety requirements governing energy storage facilities in the Republic of Ireland.

The BESS solution manufacturer will also comply with international standards such as;

- UN 38.3 (Transportation Testing for Lithium Batteries)
- UL 1642 (Standard for Safety – Lithium-ion Batteries)
- IEC 62619 (Secondary cells and batteries containing alkaline or other non-acid electrolytes Safety requirements for secondary lithium cells and batteries, for use in industrial applications).

Furthermore, the energy storage compound will also comply with standards such as;

- UL 1973 (Batteries for Use in Stationary Applications)
- IEC 62619-2017 including thermal runaway non-propagation and safety zone region operation limits and a failure mode analysis.
- The design will be compliant with UL 9540 (Energy Storage Systems and Equipment): this standard defines the safety requirements for battery installation in industrial and grid connected applications.

The containerised Lithium-Ion battery units used in the energy storage compound will be similar to that presented in Figure 2 BESS Container below, other infrastructure to be located within the energy storage compound includes, 1 No. battery switchgear containers and 2 No. Inverter & Transformer Units components pose a very minimal fire risk



Figure 2 BESS Container

The main risk at the development is fire of the battery cells within the BESS container. Each container has a built-in fire detection and suppression system. This system continually monitors the batteries and in an unlikely event of a fire it suppresses the fire using inert gas, see Figure 3 Typical BESS Fire Detection & Suppression System. The energy storage compound has been designed to ensuring there is adequate spacing between containers, the chance of a fire spreading between containers (which are made of metal and thus not easily flammable) is minimal.

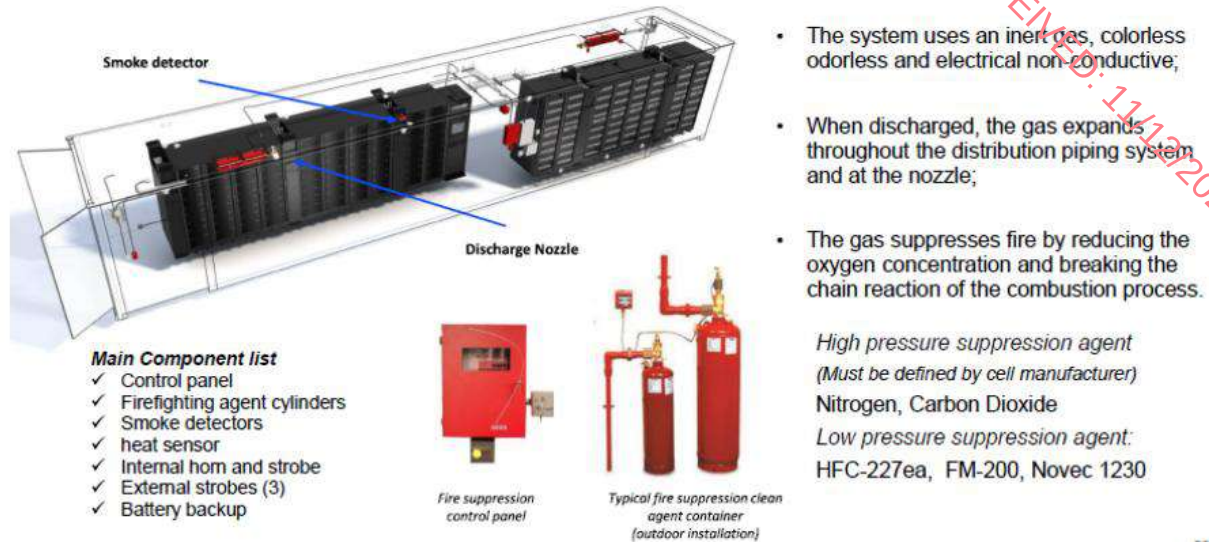


Figure 3 Typical BESS Fire Detection & Suppression System

7. Preventing Thermal Runaway in Batteries

Technology is available to make batteries safer and prevent the thermal runaway.

Proper Storage Temperature

One of the simplest ways to prevent thermal runaway is to store batteries at safe temperatures. The ideal storage temperature for most lithium-ion batteries. Most lithium-ion battery packs include a built-in battery management system (BMS). This BMS serves as the control center for the battery pack. It ensures that the battery is operating under safe conditions.

Battery management systems (BMS) monitor and manage cell voltage, cell current, cell temperature, cell charge balancing, charge control, and internal short circuit detection.

Essentially, the BMS is an electronic system that manages either a single cell or an entire battery pack. It monitors the state of the battery and reports the data. It also protects the battery (or cell) by controlling or balancing the environment of the battery (or cell).

For example, if the BMS detects that the temperature is too hot, it can regulate the temperature by controlling cooling fans. Alternatively, if the battery or cell cannot be cooled and safe conditions restored, the BMS shuts down necessary cells to protect the entire system.

8. Mitigation

Fire Mitigation Measures to be implemented during the design, construction and operation of the proposed development include but are not limited to:

Design;

- The project will be designed in compliance with international standards
- A BMS will be included in the project design

Construction;

- All works to take place in electrical areas will be risk assessed to ensure that the works being carried out will be safe and that the works will not result in a fire occurring.
- Any hot works that maybe carried out will be done under supervision and care to ensure that no fire is started. There will also be suitable fire extinguishers on standby to extinguish any small fire should it occur.
- Arc proof clothing, gloves and face visor to be worn as deemed necessary for the works being carried out.
- The proposed development has been designed and will be installed with multiple layers of safety and protection to meet IEC and local regulations / standards.
- The electrical installations at the proposed development will be installed, tested, commissioned and maintained by a competent electrician.
- All electrical components will be installed, tested, commissioned, stored, charged, maintained and used in accordance with the manufacturer's instructions.
- The design and construction of the development will be in full compliance with Eirgrid and ESB safety requirements and the developer will obtain a Fire Safety Certificate in accordance with the requirements of the Building Control Act.

Operations:

- All electrical inputs to main components will have circuit breakers and fuses to stop current flow if design specifications were to be exceeded.
- The inverters will be fitted with overvoltage and surge protection both on the DC generator side and the AC grid side. These protections will shield the proposed development from the potential impacts of faults on the national grid or lightning strikes at the site.
- Inverters will be monitored continuously for current leakage, ground faults, and the overall system insulation resistance to earth
- A Battery Management System (BMS) will be installed which will detect problems using cell and module voltage measurements and select temperature measurements within the batteries. Automatic disconnect of the batteries will occur if any unusual parameters are measured
- Thermal management systems will be installed to ensure all electrical installations are operating at their optimal temperature and will automatically reduce power input

if safe temperature ranges are exceeded. In addition, there will be 2 Heating, ventilation and air conditioning units servicing each BESS container within the energy storage compound.

- In the event of damaged cables or short circuits resulting from defective or damaged components, the inverters will automatically disconnect, and an alarm will be triggered which will alert an operations and maintenance team who will be responsible for the maintenance and safe operation.
- Key components will have continuous monitoring to ensure operation stays within the design rating.
- Operation and Maintenance activities on site will reinforce remote monitoring with bi-annual visual surveys of the entire farm and annual thermographic inspections of key components.
- The site will be a no smoking site both during construction and operation stages of the development.
- A CCTV security system will form part of the proposed development and will be monitored continuously. The proposed site will have perimeter security fencing and security gates.
- Fire extinguishers to be installed as per IS 291:2015. Additionally, at least 1 CO2 extinguisher to be provided next to each emergency exit.
- Continuous 24-hour remote monitoring of containers, including video surveillance and alert on detection of fire. Monitoring party to call emergency services where required
- Security or other responsible staff on site who may be called to take action in an emergency should be made aware of the location of the charging area, the means for isolating the power and the action to take in an emergency.
- Any battery that has been damaged, dented or pierced to be taken out of service immediately, segregated from other batteries and stored separate from flammable material while awaiting safe disposal
- A preventative maintenance schedule to be put in place on all electrical equipment.
- Good housekeeping will be maintained to prevent the build-up of any flammable materials on the site. This would also include appropriate landscaping to prevent a build-up of dry dead materials such as leaves, grass, etc.

No storage of flammable materials will take place within the proposed buildings on the site. Any oil required to be topped up in the transformers is to be brought to site during servicing of the equipment and any remaining or old oils are to be removed from site following completion of the servicing works.

9. Fire Brigade Access

The map included in Annex 1 of this Fire Risk Assessment provides an indicative access route to be utilised by the emergency services in the unlikely event of a fire. Before operations of the proposed development commence the developer will work with the local Authority, first responders and fire services to develop a plan how best to work together to deal with any problem that might arise at the development. This should involve incident pre-planning and the arranging of a site visit before the facility is operational.

10. Conclusion

Based on the findings of this risk assessment and the mitigation measures proposed the hazards associated with a fire in or near the proposed development is considered to be very low. This is due to the strict regulations for certification of the battery energy storage components and the applicable European and International standards for execution of electrical installations.

The proposed development will be unmanned and poses no potential danger to personnel likewise the nearest neighbouring property to the development is located over 100m from the site boundaries.

The development has been designed to reduce the risk of fire spreading throughout the development in the unlikely event of a fire in energy storage compound.

Likewise, energy storage has also been setback from the site boundaries to reduce the risk of fire spreading outside the confines of the site.

It is considered given the separation distance between the proposed project infrastructure and the nearest neighbouring properties that in the unlikely event of a fire there would be no potential fire risk outside of the proposed development boundaries

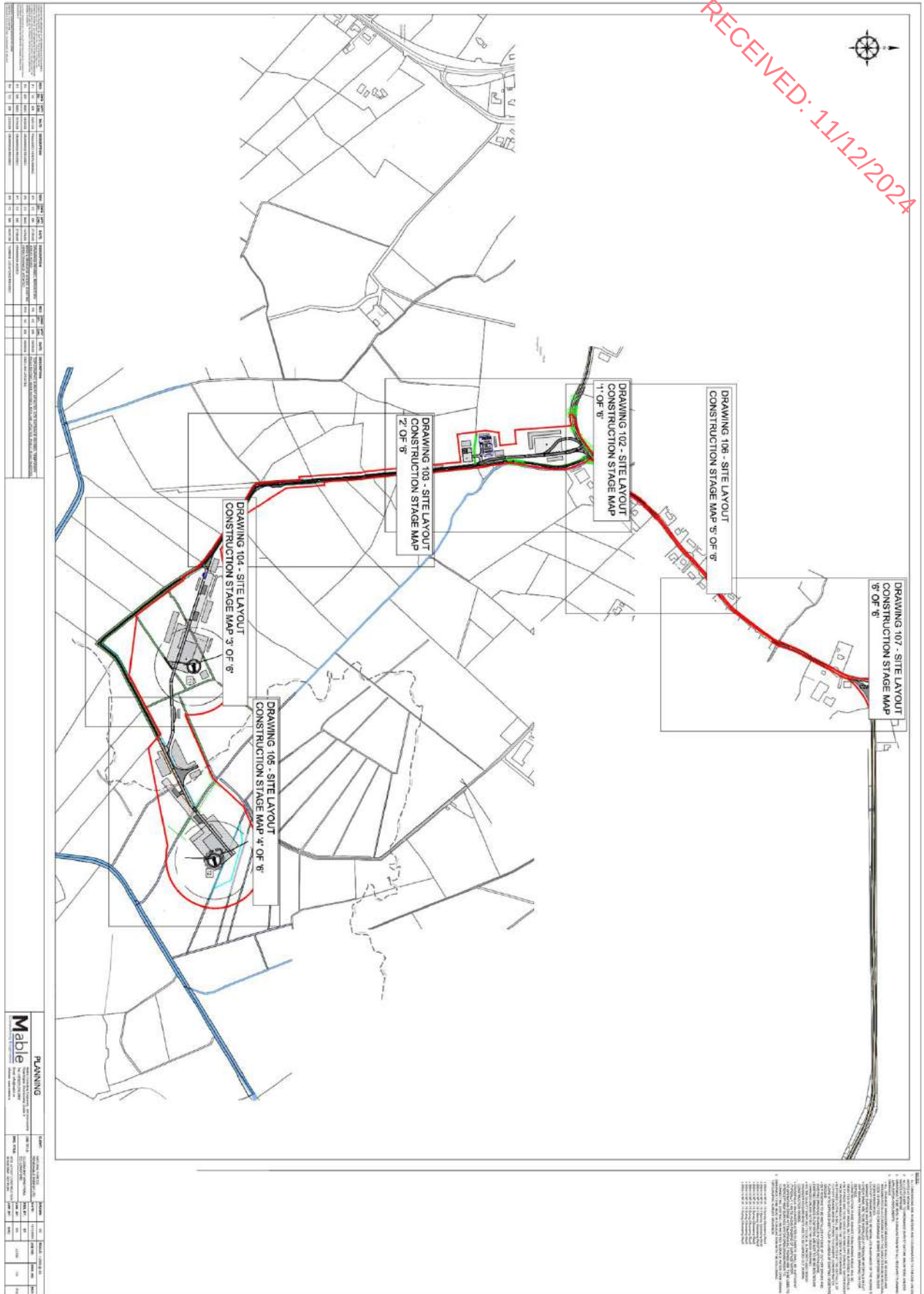
Cloonanny Wind Farm Fire Risk Assessment

Appendix 1: Site Access in the Event of a Fire



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Cloonanny Wind Farm Fire Risk Assessment



Appendix 2: Safety of Grid-Scale Battery Energy Storage Systems

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APPENDIX 2.3

DECOMMISSIONING AND REINSTATEMENT PLAN

VOLUME III

APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DECEMBER 2024

Cloonanny Wind Farm

Decommissioning and Reinstatement Plan



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Doc Name	Rev	Details	Author	Approved
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1. Introduction

The purpose of this report is to outline the decommissioning and reinstatement techniques to be adopted at the proposed development for site access roads, turbine foundations, crane hard standings and ancillary equipment.

Decommissioning and reinstatement works will be completed at the end of the wind farm life whereupon the turbines and structures will be removed and the landscape reinstated using appropriate present-day decommissioning and reinstatement practices and applicable future practices.

A Reinstatement Timetable is also included in section 4 of this document outlining the major stages during the decommissioning and reinstatement process.

2. Decommissioning Technique

The decommissioning of the wind farm project at the end of its life will be carried out in two phases. The precise timing and combination of these methods may vary according to future decommissioning techniques which are likely to undergo further development during the life of the wind farm.

The decommissioning phases are:

- Removal of above ground structures including wind turbine
- Removal of underground structures including foundations and cables.

2.1 Wind Turbine Removal

The removal of the wind turbines will primarily be a reversal of the erection of the turbines and will comply with the procedures and methods used in the erection of the turbines in terms of health, safety and environmental protection. The turbines will be dismantled to their constituent components using similar cranes to the erection process and transported from site using similar methods to that used during the erection phase of the project. The main turbine components including the steel towers, electrical cables, generators and unit transformers will have a retained financial value and will be sent for recycling for both the environmental and financial benefit. Non-recyclable components will be disposed of in a suitable licensed facility.

2.2 Additional Above Ground Structures

The modular substations and BESS units will be dismantled and removed from site. The area will then be reinstated and revegetated.

2.3 Turbine Foundations

Following removal of the wind turbines the turbine foundations will be removed in line with the requirements of the County Council. Based on current techniques this removal is likely to consist of stripping and storage of the overburden, removal of the foundation using rock breaking and mechanical demolition equipment, and replacement of the stored overburden. Reinstatement is covered further in Section 3 of this report. It is envisaged that current or future techniques for separation of the steel and concrete components of the foundations will be adopted, with the concrete being recycled for road-base, construction fill or similar purposes, and the reinforcement steel sent to an appropriate facility for recycling.

2.4 Crane Hardstanding's

Following the decommissioning of the above ground structures the crane hardstandings will no longer be required for the project. The stone shall be removed and recycled as road base or construction fill material and the area reinstated as described in section 3

2.5 Access Tracks

Access Tracks shall be grubbed up to a depth of 0.5m below ground level and the excavated material shall be used to regrade the hardstand area to match existing ground contours and profile. Additional inert material derived from demolition in other areas of the site may be used if sufficient material is available. Once the area has been profiled to match the surrounding ground, 200-300mm of topsoil shall be spread over the reinstated area. This area shall then be seeded out. If it is decided not to retain the access tracks on site for agriculture purposes, then these shall be removed using a similar method

2.6 Cables

The cables will be pulled back through the ducting and wound onto cable reels and removed from site for re-use elsewhere or recycled as appropriate. The ducting will be left in situ.

2.7 Met Mat

The decommissioning of the meteorological mast will involve the removal of wind measuring equipment, the separation of the lattice mast sections and their removal from the site for re-use in other projects or for recycling. The mast foundations shall be grubbed up to a depth of 1m below ground level and the excavated material shall be used to re-grade the area to match existing ground contours and profile. Excavations shall be backfilled with excavated material, soiled over and seeded out.

3. Reinstatement Technique

Two principle methods will be adopted to restore vegetation cover. The precise combination of these methods may vary according to the feature being reinstated (track, base or hard standing) and their application is described below under separate prescriptions. The reinstatement techniques are:

Topsoiling using material obtained from the area during excavation. Topsoil shall be lifted by mechanical excavator and laid along the route. Reseeding as per the surrounding area, in addition to invasion of bare ground by native species colonization from adjacent habitats. This process can be assisted by providing a roughened surface, which can trap seeds and soil to provide initial regeneration niches.

3.1 Site Access Roads

Upon decommissioning of the wind farm, the stone imported to the site for use in construction of the roads will be removed from site and recycled for use as road base material in line with best environmental practices. The subsoil, if present, shall be aerated and a layer of topsoil material gained during the construction of the project will be spread over the excavated area and this will either be encouraged to regenerate from the seed-bank within the topsoil or reseeded with an appropriate seed mix of local native species and land use. The area will be profiled to match the existing contours and to prevent ponding of rainwater. The developer will monitor the re-growth of vegetation and if necessary appropriate actions will be taken to ensure full re-growth, for example, protecting it from over-grazing. In areas where natural reseedling or

restoration cannot reasonably be undertaken or has been unsuccessful, reseed may be necessary. Wherever possible, a reseed mix will attempt to emulate the original vegetation cover and land use at time of decommissioning as closely as possible and an appropriate seed mix shall be approved, with the additional requirement for rapid ground cover to reduce erosion.

An alternative option that may be explored with the consent of the Planning Authority at the time of decommissioning is to leave the roads on site if the land use at time of decommissioning would benefit from doing so. The option is commonly favorable among farmers as it gives access to areas that would not normally be accessible. This option reduces the amount of excavation works required and minimizes the disruption to the surrounding area during decommissioning. All costings within this plan have been based on completely removing and reinstating the access roads.

3.2 Turbine Foundations

Following removal of the turbine bases the overburden shall be spread over the area of the turbine foundation. Any additional subsoil removed and stored during the construction of the bases shall be returned to the area and the original contours restored. The turbine foundation areas shall be reinstated with a minimum of 150 mm of topsoil removed from the area to form a level reinstatement between the adjacent unaffected land and the area of the turbine base profiled to match the existing contours and prevent ponding of rainwater. Re-vegetation shall be completed in a similar manner to roads reinstatement. The alternative to complete removal of the foundation is partial removal of the turbine foundation. The turbine foundation is made up of two sections/parts, the lower base and the upper base. With partial removal of the turbine foundation the upper base is removed to a depth of approximately 0.7 meters below ground level and the lower part of the base is left in place. The remaining foundation will be covered by soil and re-sodded with the same vegetation as exists in the surrounding area. This option reduces the amount of excavation works required and minimises the disruption to the surrounding area. This option would only be explored with the consent of the Planning Authority. All costings within this plan have been based on completely removing and reinstating the turbine foundation. The reinstatement of the turbine areas shall be conducted following decommissioning and removal of the turbines.

3.3 Crane Hardstands

Should the land use upon decommissioning of the wind farm be consistent with present land use and the hardstands would not benefit any future land use then the stone imported to the site for use in construction of the hardstands will be removed from site and recycled for use as road base material in line with environmentally friendly practices. Any stone from within the site which was used for road construction will be returned to its original location. The subsoil, if present, shall be aerated and a layer of topsoil material gained during the construction of the project will be spread over the excavated area and this will either be encouraged to regenerate from the seed-bank within the topsoil or reseeded with an appropriate seed mix of local native species and land use. The area will be profiled to match the existing contours and to prevent ponding of rainwater. The developer will monitor the re-growth of vegetation and if necessary appropriate actions will be taken to ensure full re-growth, for example, protecting it from over-grazing. In areas where natural reseeding or restoration cannot reasonably be undertaken or has been unsuccessful, reseeding may be necessary. Wherever possible, a reseed mix will attempt to emulate the original vegetation cover and land use at time of decommissioning as closely as possible and an appropriate seed mix shall be approved, with the additional requirement for rapid ground cover to reduce erosion. All costings within this plan have been based on completely removing and reinstating the crane hardstands.

3.4 Drainage

The aim of any drainage works carried out during the construction of the wind farm will be to maintain the existing hydrology of the site and protect the integrity of the works. Following the decommissioning and removal of the structures the drainage may be optimised for the follow on use of the land, or remain in place to maintain the hydrology of the area prior to the construction of the windfarm.

3.5 Reseeding

There may be areas where the preferred method of natural re-vegetation may be less effective or impractical, resulting in erosion problems. In these cases, reseeding may be necessary.

Wherever possible, a reseed mix will attempt to emulate the original vegetation cover and land use as closely as possible, with the additional requirement for rapid ground cover to reduce erosion and aid soil stabilisation.

4. Decommissioning and Reinstatement Timetable

Description	Expected Duration
Remove wind turbines	3 weeks
Remove turbine foundations	6 weeks
Remove electrical cables	1 week
Remove any ancillary structures, (modular substations and BESS Units)	1 week
Reinstate turbine foundation area	2 weeks
Reinstate hardstanding area *	2 weeks
Reinstate roads *	4 weeks
Reseeding	1 week

Note: the above tasks may take place concurrently *unless agreed with Planning authority to be retained for future land use.

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APPENDIX 3.1

ALTERNATIVES MAPS

VOLUME III

APPENDICES TO

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

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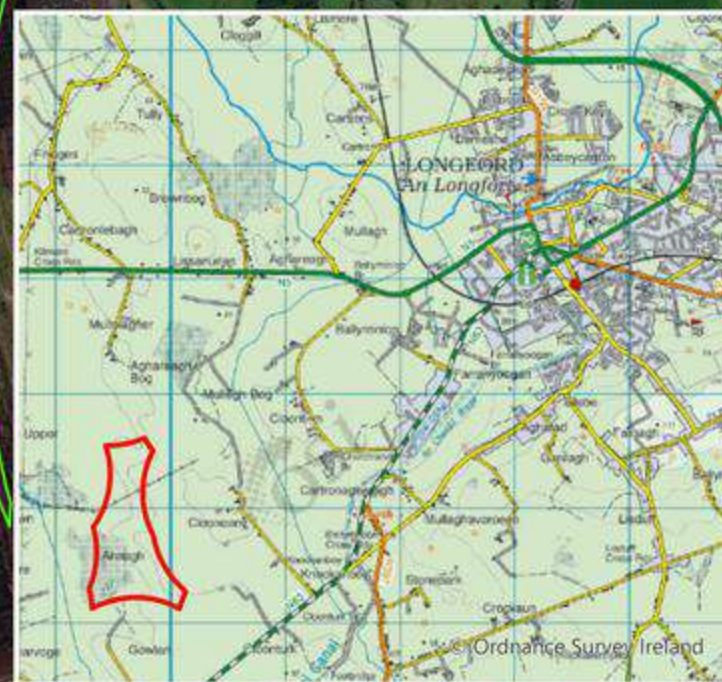
Site Prospecting Initial Turbine Locations

Option 1:

This option was not selected due to significant challenges posed by access and soil conditions, as well as its location adjacent to the Royal Canal pNHA.

Legend

- Site Prospecting Initial Turbine Locations
- ▬ proposed Natural Heritage Area (pNHA)
- ▭ 800m Setback



0 0.28 0.55 1.1 Kilometers

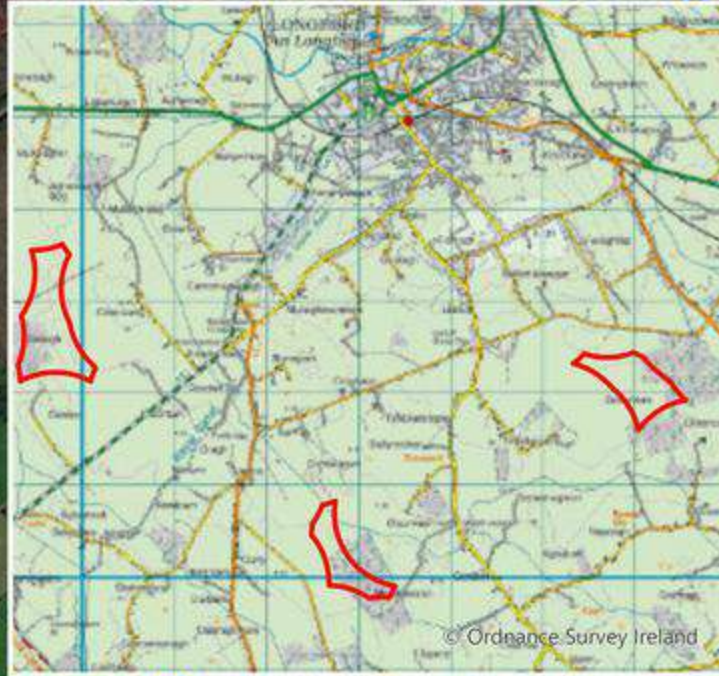
Site Prospecting Initial Turbine Locations

Option 2:

This option was not selected due to significant challenges related to access. Additionally, the nearest substation is located at an impractical distance.

Legend

- Site Prospecting Initial Turbine Locations
- ▬ proposed Natural Heritage Area (pNHA)
- ▨ Natural Heritage Area (NHA)
- ▨ Special Area of Conservation (SAC)
- ▭ 800m Setback



0 0.3 0.6 1.2 Kilometers

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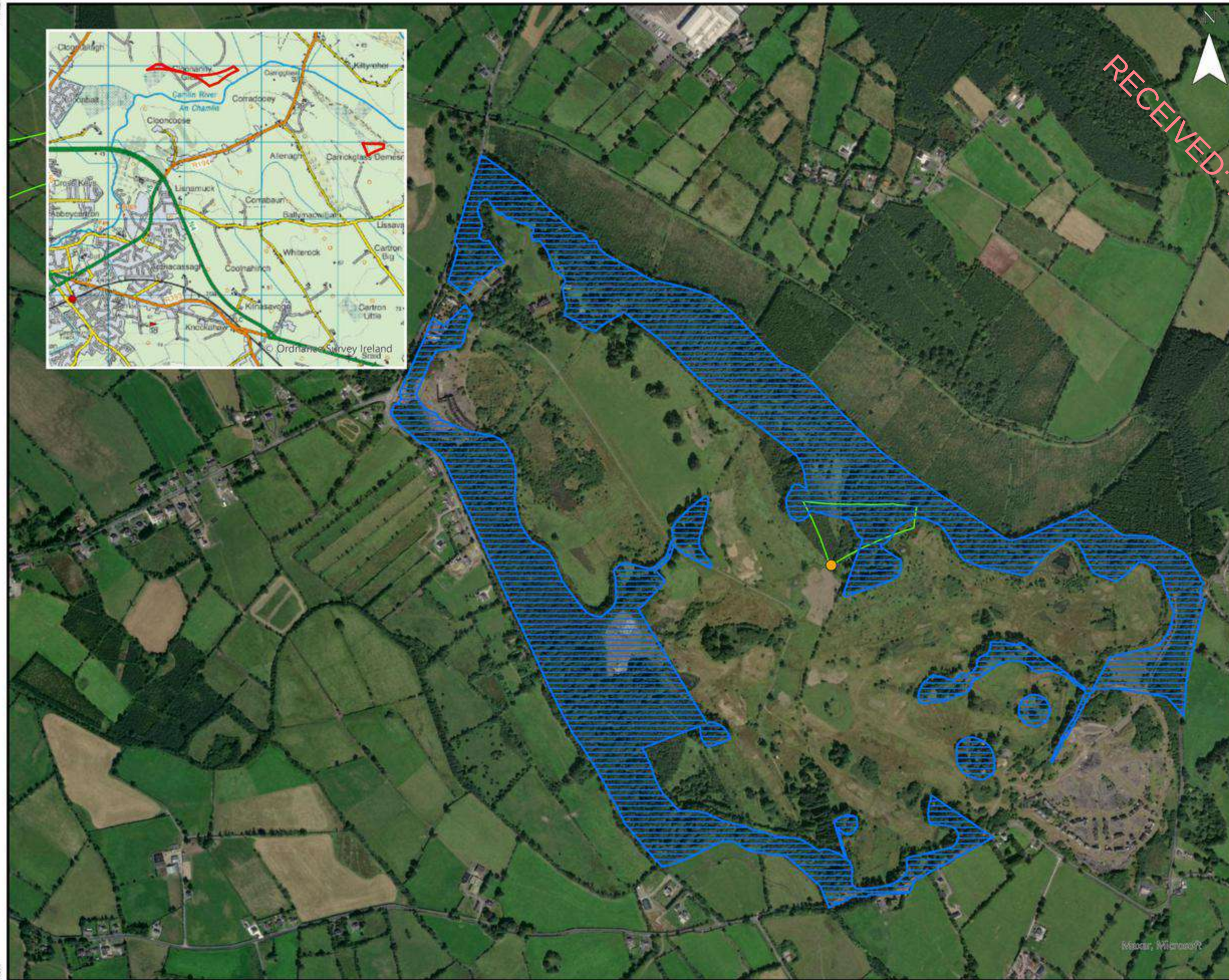
Site Prospecting Initial Turbine Locations

Option 3:

This option was not selected due to access constraints and its proximity to the Carrickglass Demesne pHNA.

Legend

- Site Prospecting Initial Turbine Locations
- ▨ proposed Natural Heritage Area (pNHA)
- ▭ 800m Setback



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Cloonanny Renewable Energy Project
Draft 4 Turbine Layout

- Draft 4 Turbine Layout
- 87.5m Turbine Rotor Diameter
- 800m Setback

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777284N
614358E

0 0.13 0.25 0.5 Kilometers

615977E
777284N

Cloonanny Renewable Energy Project
Draft 3 Turbine Layout

- Draft 3 Turbine Layout
- 87.5m Turbine Rotor Diameter
- 800m Setback

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Cloonanny Renewable Energy Project

Draft 3 Turbine Layout Telecom Links

- Draft 3 Turbine Layout
- 87.5m Turbine Rotor Diameter
- Three Ireland Telecoms
- Imagine Broadband Telecoms
- Eir Telecoms
- 2RN Telecoms
- Vodafone Link 4 (F1) (Cairn Hill - Cablecomm)
- Vodafone Link 3 (F1) (Cairn Hill - Longford ESB)
- Vodafone Link 2 (F1) (Cairn Hill - Longford Garda Stn)
- Vodafone Link 1 (F1) (Corlea - Brian Fallon HW)
- Enet Link 3 (F2) (Cairn Hill - Longford CoCo)
- Enet Link 2 (F2) (Cairn Hill - Bluebac)
- Enet Link 1 (F2) (Cairn Hill - Abbott)
- 800m Setback



Cloonanny Renewable Energy Project

Final Iteration Telecom Links

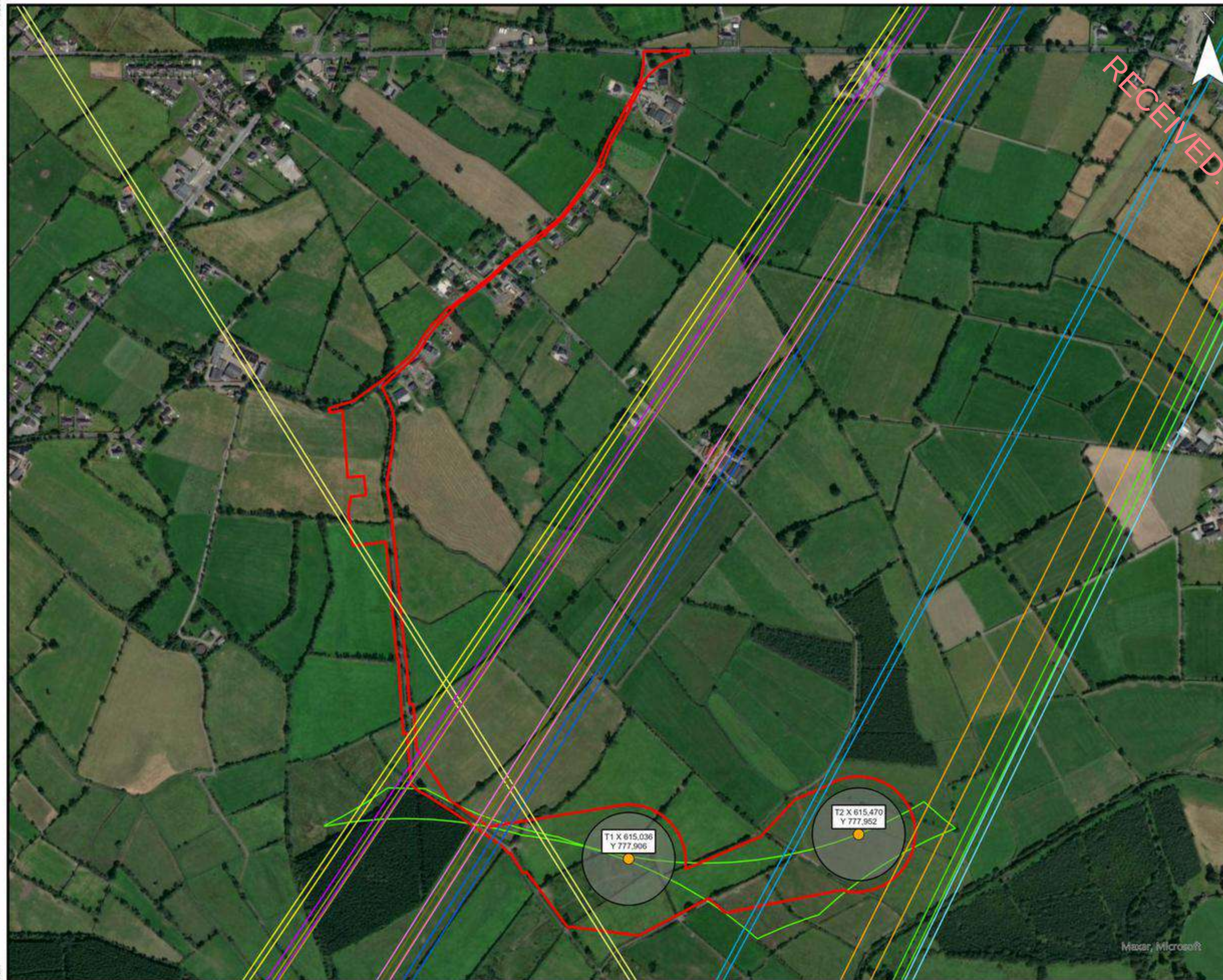
- Proposed Turbine Locations
- 87.5m Turbine Rotor Diameter
- Three Ireland Telecoms
- Imagine Broadband Telecoms
- Eir Telecoms
- 2RN Telecoms
- Vodafone Link 4 (F1) (Cairn Hill - Cablecomm)
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- Vodafone Link 1 (F1) (Corlea - Brian Fallon HW)
- Enet Link 3 (F2) (Cairn Hill - Longford CoCo)
- Enet Link 2 (F2) (Cairn Hill - Bluebac)
- Enet Link 1 (F2) (Cairn Hill - Abbott)
- Planning Boundary
- 800m Setback

779517N 613865E

616182E 779517N

777675N 613865E

616182E 777675N

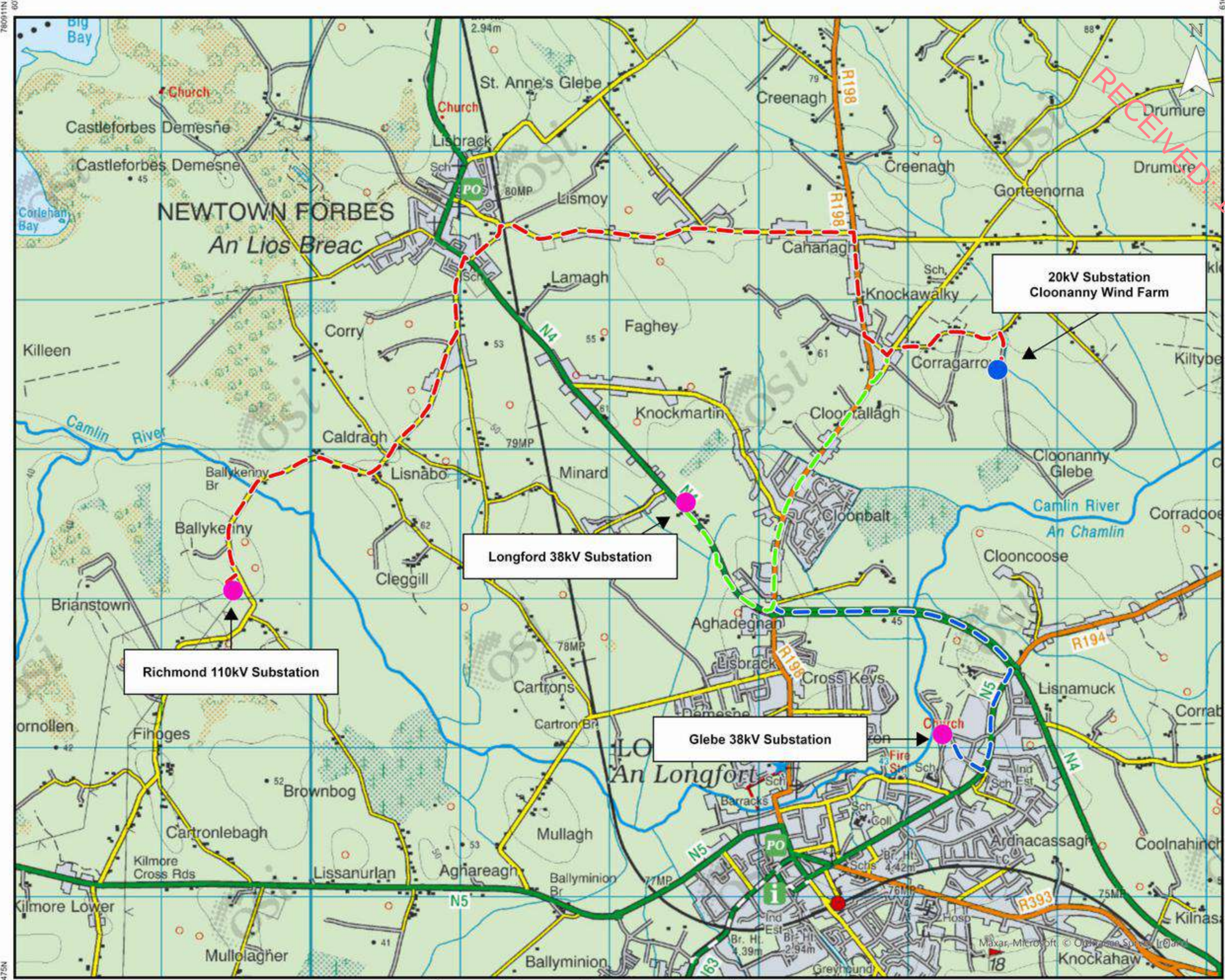


0 0.17 0.35 0.7 Kilometers

Cloonanny Renewable Energy Project

Grid Study

- Glebe 38kV Substation
- Longford 38kV Substation
- Richmond 110kV Substation
- 20kV Substation - Cloonanny Wind Farm
- Cloonanny to Richmond 110kV Substation (8.03km)
- Cloonanny to Longford 38kV Substation (3.96km)
- Cloonanny to Glebe 38kV Substation (5.85km)



20kV Substation
Cloonanny Wind Farm

Longford 38kV Substation

Richmond 110kV Substation

Glebe 38kV Substation

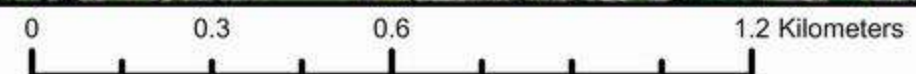
0 0.5 1 2 Kilometers

Cloonanny Renewable Energy Project
Grid Study

-  On-Site Substation Location
-  Cloonanny to Glebe 38kV Substation (5.85km)
-  Planning Boundary



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778054N
611805E

615884E
778054N

775710N
611805E

615884E
775710N

Cloonanny Renewable Energy Project

Grid Study

-  On-Site Substation Location
-  Cloonanny to Richmond 110kV Substation (8.03km)
-  Planning Boundary



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Cloonanny Renewable Energy Project

Grid Study

- On-Site Substation Location
- Cloonanny to Longford 38kV Substation (3.96km)
- Planning Boundary

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0 0.2 0.4 0.8 Kilometers

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APPENDIX 4.1

SHADOW FLICKER ASSESSMENT

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DECEMBER 2024

Cloonanny Wind Project

Shadow Flicker Report

Date: 28/07/2024



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Document History

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Shadow Flicker Report	I	Cloonanny Shadow Report Summary	Emma Harris	Jonathan Coffey

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This document has been prepared by

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1. Introduction

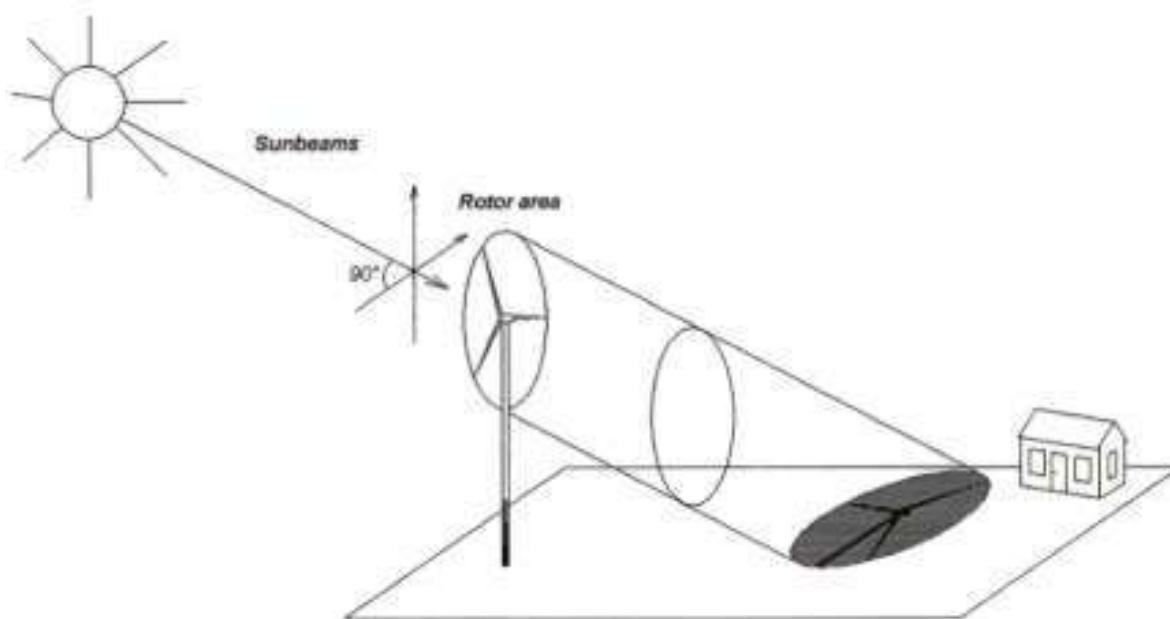
This report presents an investigation into potential shadow flicker impact at nearby receptors from the operation of the Cloonanny Wind Farm. The assessment has been undertaken by ENERCON GmbH on the behalf of Natural Forces Renewable Energy 2 Limited.

1.1 Background to Shadow Flicker

Like any solid or opaque objects, wind energy converters (WEC) cast shadows on the surrounding areas due to direct sun rays. The rotation of the blades generates an effect called shadow flickering by chopping the sunlight.

The effect of shadow flickering on certain areas surrounding the WEC depends on the position of the sun and the intensity of the sunbeams, the direction of the wind (i.e. position of nacelle) and the position of the WEC. Furthermore, shadow flickering can only be observed when the blades rotate.

Figure. 1: Presentation of the periodical shadow flicker caused by rotor blades of a turbine



1.1 Objectives

The objectives of this chapter are to describe:

- the relevant legislation and guidance;
- the methodology of the assessment;
- the existing environment;
- the potential impacts;
- the need for mitigation measures;
- any residual impacts.

2. STATEMENT OF COMPETENCE

This report has been prepared by Natural Forces. Since 2001, the company has developed, constructed, owned, and operated renewable energy projects across Canada, the United States, Ireland, and France, with approximately 300 MW currently in operation.

The shadow flicker modelling and assessment to inform this report has been prepared by Dipl.-Phys. Henriette Labsch and Christian Wiedenhöft M. Sc from the ENERCON GmbH Project Engineering / Wind & Site Engineering team. Both have significant experience in preparing technical studies including shadow flicker assessments for projects under development.

Jonathan Coffey, a Project Manager at Natural Forces, has reviewed the chapter. With over eleven years of experience in renewable energy development, Jonathan holds a BSc in Planning & Environmental Management from Technological University Dublin. He brings considerable expertise in project managing wind energy developments and conducting shadow flicker impact assessments.

3. RELEVANT LEGISLATION AND GUIDANCE

There are various sources of guidance regarding the assessment and management of shadow flicker impacts caused by wind turbines. Irish guidance relevant to the proposed development is outlined below.

3.1 Wind Energy Development Guidelines (2006)

The 2006 Guidelines state that:

‘Careful site selection, design and planning, and good use of relevant software, can help avoid the possibility of shadow flicker in the first instance. It is recommended that shadow flicker at neighbouring offices and dwellings within 500m should not exceed 30 hours per year or 30 minutes per day.

At distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low. Where shadow flicker could be a problem, developers should provide calculations to quantify the effect and where appropriate take measures to prevent or ameliorate the potential effect, such as by turning off a particular turbine at certain times.

‘Shadow flicker is not usually critical. However, in unusual circumstances, where the calculations indicate that occupied dwelling houses would be significantly affected, a condition requiring the nonoperation of turbines at times when predicted shadow flicker might adversely impact on any inhabited dwelling within 500m of a turbine may be appropriate. Conditions may also address limits on the number of hours per year or minutes per day that the shadow flicker should affect an inhabited dwelling.’

3.2 Draft Revised Wind Energy Development Guidelines (2019)

In December 2019, the Department of Housing, Planning, and Local Government published the draft revised Wind Energy Development Guidelines for public consultation. These proposed to fully eliminate the occurrence of shadow flicker at all surrounding receptors through the installation of automated turbine shut down software. However, as the 2019 Guidelines remain in draft form, and have not been formally adopted, the 2006 Guidelines remain the applicable guidelines under which all wind energy developments must currently be assessed.

4. METHODOLOGY

In order to establish the extent of shadow flicker on receptors within the vicinity of the proposed wind farm, a detailed shadow flicker assessment was carried out on the basis of the 2006 Guidelines and current industry best practice.

The shadow calculation programme WindPRO, in particular the module “Shadow” from the company EMD International A/S, Denmark was used to undertake this shadow flicker assessment.

4.1 Inputs

Emission Source

The following table shows the coordinates of the planned WEC. The parameters are also provided and are based on information provided by Enercon, the turbine supplier.

Table. 2: Coordinates of the planned WECs and parameters

				Irish Grid (IG) IRELAND65 (IE)		
WEC (No.)	Type	Hub Height [m]	Rotor Diameter [m]	Easting	Northing	Altitude [m]
WEC 01	E-175	112	175	615036	777906	47
WEC 02	E-175	112	175	615470	777952	44

It should be noted that if the locations or the hub heights of the planned WEC changes, the calculation is no longer valid and has to be recalculated.

Shadow Receptors

When completing this assessment 403 address points (potential shadow receptors) were considered, this represents address points within 10 rotor diameters of any wind energy converter.

The shadow receptors (SR) are defined as follows within the shadow flicker assessment:

Table. 1: Shadow Receptor

Direction Mode	Width [m]	Height [m]	Height a.g.l [m]	Degrees from south cw [°]	Slope of window [°]
Fixed Direction	1.0	1.0	2.0	-	0

Please see Appendix A for details of the shadow receptors and impacts.

4.2 Worse-case Scenario

The assessment for the proposed wind turbine was calculated on the basis of 'worst case scenario' given by the following assumptions:

- For the shadow calculation the program WindPRO (Version 3.6.361), in particular the module "Shadow" from the company EMD International A/S, Denmark is used.
- The minimum affecting angle is 3° above horizon.
- The maximum distance for shadow flicker are listed in Tab. 2: Summary of turbine parameters. This value equals the distance to the turbine in which 20 % of the surface area of the sun is covered by the rotor blade. In greater distance to the turbine the shadow is too diffuse to cast a disturbing shadow.
- The coordinates of the nearby shadow receptors (SR) are provided by the customer and considered in the calculation. In the written part of the report are only shown the receptors with exceeding limits.
- The contour height (z-level) of the terrain is considered.
- Further obstacles like forests or buildings remain unconsidered in the calculations. Therefore, a sight survey has to be done.
- The calculation was performed as "worst case" with following assumptions:
 - The sun shines always
 - The turbines operate perpendicular to the sun at all times.
 - The requirements of a worst-case scenario for a tolerable shadow flickering are 30 hours/year and 30/min per day within 500 m to the WEC.
- In addition, the "real case" was calculated with the following assumptions:
 - The average daily sunshine hours based on data of the meteorological Station CLONES.
 - The angle and operational times of the rotor plane are taken from customers calculations.

5. DESCRIPTION OF THE ENVIRONMENT

Shadow flicker is a phenomenon caused by wind turbines, where the rotating blades intermittently block sunlight, casting moving shadows on the ground and nearby structures. This effect occurs primarily when the sun is low on the horizon, and the turbine blades pass between the sun and an observer, creating a strobe-like effect of light and shadow. 403 receptors potential location were assessed, this represents all dwelling houses within a 10 rotor diameters of the proposed wind turbines. This location data was gathered from the Eircode database and verified via aerial images. It is important to note that there are no buildings within 500m of the turbines, ensuring compliance with the 2006 Guidelines and avoiding the most significant shadow flicker impact. The closest dwelling is situated c.800m away from the site.

6. STATEMENT OF POTENTIAL IMPACTS

The modelled results of the shadow flicker assessment identified 26 no. shadow flicker receptors exceeding the 30 minutes per day or 30 hours per year. The results indicated that shadow flicker may be experienced at receptive locations as indicated in the table below,

SR	X	Y	Worst Case Total Shadow Flicker (hours / year)	Worst Case Total Shadow Flicker (hours / day)	Real Case Total Shadow Flicker (hours / year)	Distance to T1	Distance to T2
CW	616006	777242	22.38	0.31	03.47	1.17	0.89
CZ	616136	777274	33.03	0.33	05.54	1.27	0.95
HX	616485	778067	21.28	0.39	03.41	1.46	1.02
IE	616510	778155	19.44	0.39	03.15	1.49	1.06
IM	616489	778315	22.21	0.45	03.29	1.51	1.08
IP	616426	778332	26.11	0.49	04.03	1.45	1.03
IR	616630	778391	16.46	0.39	02.35	1.67	1.24
IS	616686	778399	14.58	0.37	02.19	1.72	1.29
IT	616432	778425	26.28	0.49	04.01	1.49	1.07
IW	616350	778483	32.39	0.53	04.48	1.44	1.03
JD	616140	778599	57.35	0.54	07.22	1.31	0.93
JJ	614071	778670	28.03	0.34	03.25	1.23	1.57
JN	614114	778689	30.45	0.35	03.40	1.21	1.54
JO	615180	778698	54.19	1.23	04.55	0.81	0.80
JS	614009	778728	23.43	0.32	02.52	1.32	1.65
JT	613977	778728	21.56	0.31	02.40	1.34	1.68
JU	616156	778732	57.38	0.43	06.46	1.39	1.04
JW	615047	778734	41.04	0.57	03.47	0.83	0.89
JX	614164	778735	35.34	0.36	04.01	1.21	1.52
KH	614226	778833	45.02	0.35	04.31	1.24	1.52
KI	614635	778838	44.03	0.50	04.09	1.02	1.22
KL	614911	778855	28.32	0.39	02.33	0.96	1.06
KQ	614692	778892	35.14	0.36	03.17	1.05	1.22
KY	614697	778970	27.48	0.34	02.30	1.12	1.28
KZ	614788	778981	20.22	0.32	01.46	1.11	1.23
LB	614733	778989	23.15	0.33	02.02	1.13	1.27

It should be made clear, that these dwellings are located greater than 500m from the proposed development and the expected level of shadow flicker will not exceed the limits set out in the 2006 Guidelines.

Natural Forces is committed to a curtailment strategy for any turbine that causes an exceedance in the existing daily and annual shadow flicker thresholds at a distance of up to 10 rotor diameters from the proposed development. This is standard best practice on

windfarm sites. See Appendix B which details how Shadow Flicker Shutdown will be implemented

7. CUMULATIVE IMPACTS

With no operational or planned wind turbines in close proximity to the proposed site, there are no anticipated cumulative impacts. The nearest wind farm is Sliabh Bawn which is located approximately 20km away. Considering that shadow flicker generally occurs over short distances, this distance is deemed too far to result in cumulative shadow flicker impacts on receptors.

8. MITIGATION AND MONITORING MEASURES

Although the shadow flicker assessment indicates no expected shadow flicker exceedances at houses within 500 metres of the site, a shadow flicker shutdown system will be installed within the turbine to address any potential future shadow-related requirements. Please see Appendix B for the turbine supplier's technical description on shadow shutdown system.

A shadow flicker control system is an optional wind turbine sub-system, integrated with the control system of the turbine, which stops the turbine at appropriate times in order to avoid shadow flicker at sensitive receptors. Such technology has been available for a number of years and is now mature, proven and widely available.

9. RESIDUAL EFFECTS

The outlined mitigation measures will prevent residual effects from being significant. The shadow shutdown system effectively eliminates significant impacts from shadow flicker. The proposed measures will ensure shadow flicker levels at receptors stay below prescribed limits in the 2006 Guidelines. Furthermore, the operation and performance of the shadow flicker control measures will be monitored to confirm their effectiveness.

10. CONCLUSIONS

The assessment of potential shadow flicker impact at sensitive receptors near the Cloonanny Wind Farm was conducted according to relevant guidance, using industry-standard methods and tools. The detailed results of the shadow calculation and the map are attached in Appendix A which suggests that 26 dwellings could experience an exceedance of 30 hours of shadow flicker per year and/or 30 minutes in a day. It should be noted that this assessment remains in compliance with the 2006 Guidelines, as all affected properties are situated more than 500 metres away from the proposed turbines. Furthermore, the analysis was based on a worst-case scenario and did not take into account weather conditions (i.e. when there is total or partial cloud cover), local visual obstructions (such as trees, hedges, or other structures), turbine orientation and turbine operation. In reality, the amount of time when shadow flicker occurs will be less than that predicted. To ensure shadow flicker is adequately addressed, Natural Forces will equip both wind turbines with shadow flicker shutdown systems.

Appendix A: ENERCON Results of the Shadow Calculation and Shadow Map

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Shadow Flicker Assessment for

2x ENERCON E-175 EP5 E2 (7.00 MW)
with 111.6 m hub height

Commercial in Confidence

Site: Cloonanny (Ireland)

Report No.: O-16297_A02_WSE_Shadow_SR_a

Date: 17.07.2024

Company: WRD GmbH

Department: Wind & Site Engineering

Team: Noise Compatibility (NC)



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O-16297_A01_WSE_Shadow_SR_a	2024-05-23	Shadow Flicker Assessment	Initial Report
O-16297_A01_WSE_Shadow_SR_b	2024-06-06	Shadow Flicker Assessment	Other turbine type
O-16297_A02_WSE_Shadow_SR_a	2024-07-17	Shadow Flicker Assessment	New coordinates

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2024-07-17	Edited by	Dipl.-Phys. Henriette Labsch
2024-07-19	Approved by	Christian Wiedenhöft M. Sc.

Cloonanny

2x ENERCON E-175 EP5 E2 with 7.00 MW rated power

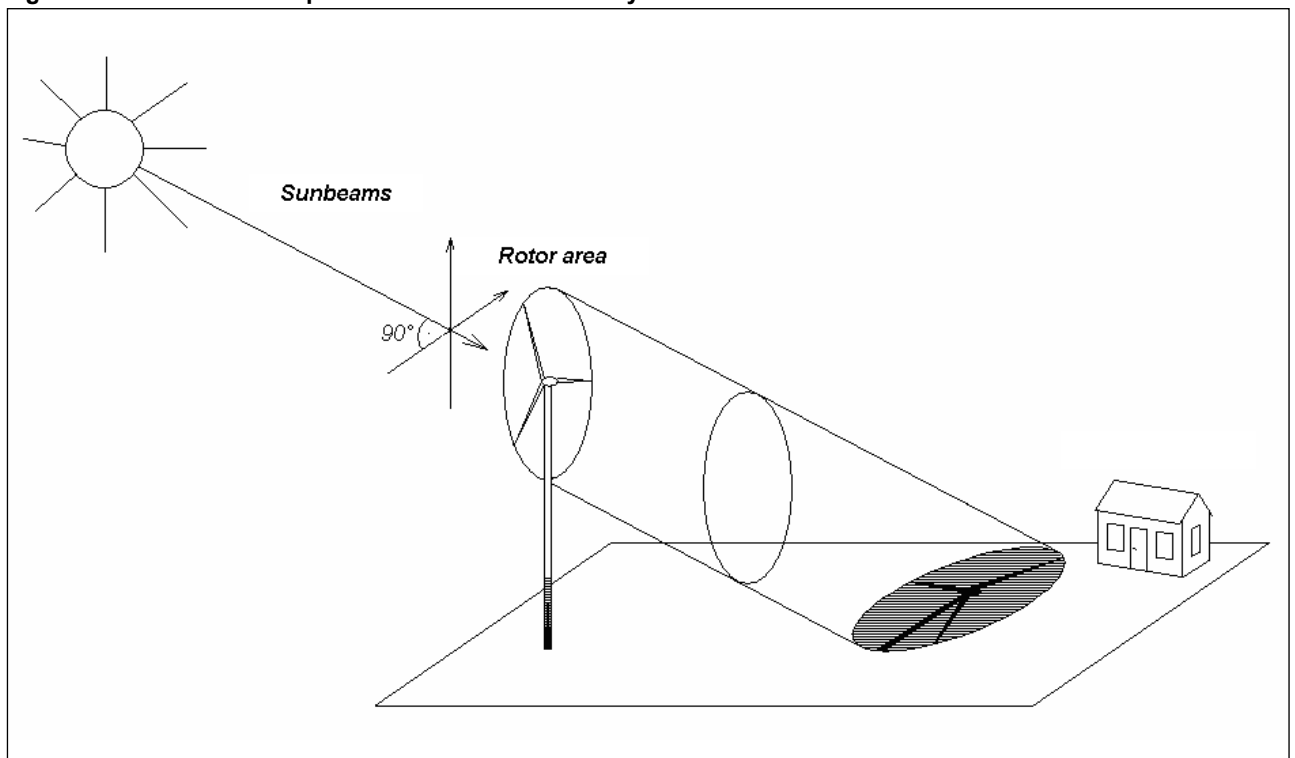
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Introduction

Like any solid or opaque objects, wind energy turbine cast shadows on the surrounding areas. The rotation of the blades generates an effect called shadow flicker by repeatedly cutting of the sun rays.

The effect of shadow flicker on certain areas surrounding the turbine depends on the position and intensity of the sun, the direction of the wind (i.e. position of nacelle) and the position of the turbine. Furthermore, shadow flicker can only be observed when the blades rotate.

Fig. 1: Presentation of the periodical shadow caused by rotor blades of a turbine



At present Germany is the only country with detailed recommendations on limits and conditions for calculating shadow impact. These documents result from a pilot study about the effects of shadow flicker on human beings.

Shadow Flicker Basics

The following basics for the shadow calculation are taken into account:

- For the shadow calculation the program WindPRO (Version 3.6.361), in particular the module “Shadow” from the company EMD International A/S, Denmark is used.
- The minimum affecting angle is 3° above horizon.
- The maximum distance for shadow flicker are listed in Tab. 2: Summary of turbine parameters. This value equals the distance to the turbine in which 20 % of the surface area of the sun is covered by the rotor blade. In greater distance to the turbine the shadow is too diffuse to cast a disturbing shadow.
- The coordinates of the nearby shadow receptors (SR) are provided by the customer and considered in the calculation. In the written part of the report are only shown the receptors with exceeding limits.
- The contour height (z-level) of the terrain is considered.
- Further obstacles like forests or buildings remain unconsidered in the calculations. Therefore, a sight survey has to be done.
- The calculation was performed as “worst case” with following assumptions:
 - The sun shines always
 - The turbines operate perpendicular to the sun at all times.
- In addition, the “real case” was calculated with the following assumptions:
 - The average daily sunshine hours based on data of the meteorological Station CLONES.
 - The angle and operational times of the rotor plane are taken from customers calculations.

Emission Sources

The following table shows the coordinates of the two planned turbines.

Tab. 1: Coordinates of the planned turbines

No.	Type	Hub height [m]	Irish ITM-IRENET95 (IE), geocentric, GRS80		Altitude [m agl]
			Easting	Northing	
WEC1	ENERCON E-175 EP5 E2 7000 kW	111.6	615 036	777 906	47
WEC2	ENERCON E-175 EP5 E2 7000 kW	111.6	615 470	777 952	45

Tab. 2: Summary of turbine parameters

Type	Hub height [m]	Rotor diameter [m]	Distance of influence [m]
ENERCON E-175 EP5 E2 7000 kW	111.6	175.0	1 741

Shadow Receptors

The shadow receptors (SR) are defined as follows:

Tab. 3: Shadow receptor - input

Direction mode	Width [m]	Height [m]	Height a.g.l. [m]	Degrees from south cw [°]	Slope of window [°]
Green house mode	0.1	0.1	2.0	-	0

Results of the shadow calculation

The shadow demands for a worst case 30 hours/year or 30 minutes/day are exceeded at the 26 shadow receptors in the following table. A shadow shut off system has to be installed in the planned turbines, in order to meet the shadow requirements.

Tab. 4: Results of the shadow calculation – worst case (yearly and daily) and real case [hh:mm]

SR	Worst Case Demand (hours / year)	Worst Case Total Shadow Flickering (hours / year)	Worst Case Demand (hours / day)	Worst Case Total Shadow Flickering (hours / day)	Real Case Total Shadow Flickering (hours / year)
CW	30:00	22:38	00:30	0:31	03:47
CZ	30:00	33:03	00:30	0:33	05:54
HX	30:00	21:28	00:30	0:39	03:41
IE	30:00	19:44	00:30	0:39	03:15
IM	30:00	22:21	00:30	0:45	03:29
IP	30:00	26:11	00:30	0:49	04:03
IR	30:00	16:46	00:30	0:39	02:35
IS	30:00	14:58	00:30	0:37	02:19
IT	30:00	26:28	00:30	0:49	04:01
IW	30:00	32:39	00:30	0:53	04:48
JD	30:00	57:35	00:30	0:54	07:22
JJ	30:00	28:03	00:30	0:34	03:25
JN	30:00	30:45	00:30	0:35	03:40
JO	30:00	54:19	00:30	1:23	04:55
JS	30:00	23:43	00:30	0:32	02:52
JT	30:00	21:56	00:30	0:31	02:40
JU	30:00	57:38	00:30	0:43	06:46
JW	30:00	41:04	00:30	0:57	03:47
JX	30:00	35:34	00:30	0:36	04:01
KH	30:00	45:02	00:30	0:35	04:31
KI	30:00	44:03	00:30	0:40	04:09
KL	30:00	28:32	00:30	0:39	02:33
KQ	30:00	35:14	00:30	0:36	03:17
KY	30:00	27:48	00:30	0:34	02:30
KZ	30:00	20:22	00:30	0:32	01:46
LB	30:00	23:15	00:30	0:33	02:02

The detailed results of the shadow calculation are attached in Appendix A. Appendix B shows the map rendering the shadow iso-lines of the worst case calculated.

The static shadow of the tower and nacelle is not considered in this report. The calculated results are only a prediction. They are made to the best of our knowledge.

If the locations or the hub heights of the planned turbines change, the calculation is no longer valid and has to be recalculated.

The technical description of the ENERCON Shadow Shutdown is attached in Appendix C.

Appendix A

Results of the Shadow Calculation Real case / Worst Case Additional / Total Shadow Flicker

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Project:

Cloonanny
O-16297
NC-SR
Natural Forces

Description:

This calculation was performed without visiting the site and is based solely on information provided by the developer or third party. ENERCON shall not be responsible and takes therefore no liability for the accuracy and sufficiency of any such data. In case of discrepancies of site coordinates or other relevant data, ENERCON does not take any responsibility for calculated shadow flicker at considered shadow receptors (SR). The calculation does include an elevation model.

If other wind farms are included like an existing wind farm, the real case calculation is based on the average operational hours of all turbines.

The calculated results are provided as a basis for information purposes only.

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Calculated:
2024-07-21 07:56/3.6.361

SHADOW - Main Result

Calculation: Additional / Total Shadow Impact: A02a

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) [CLONES]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.45	1.93	2.72	4.31	5.45	4.41	4.74	3.96	3.48	2.54	1.71	1.01

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
350	263	526	788	613	788	876	964	1 489	876	657	570	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: Höhenlinien: CONTOURLINE_Cloonanny_0.wpo (1)

Receptor grid resolution: 1.0 m

All coordinates are in

Irish ITM-IRENET95 (IE), geocentric, GRS80

WTGs

	Easting	Northing	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.					Calculation distance [m]	RPM
WEC1	615 036	777 906	47.0	ENERCON GmbH E-17...	Yes	ENERCON GmbH	E-175 EP5 E2-7 000	7 000	175.0	111.6	1 741	0.0
WEC2	615 470	777 952	45.0	ENERCON GmbH E-17...	Yes	ENERCON GmbH	E-175 EP5 E2-7 000	7 000	175.0	111.6	1 741	0.0

Shadow receptor-Input

No.	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	614 660	776 193	52.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0
B	614 701	776 202	52.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
C	614 756	776 243	54.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
D	614 778	776 244	54.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
E	614 729	776 244	53.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
F	614 699	776 247	53.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
G	614 674	776 248	52.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
H	614 898	776 266	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
I	614 768	776 274	54.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
J	614 760	776 274	54.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0
K	614 723	776 277	53.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
L	614 715	776 277	53.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
M	614 737	776 277	53.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
N	614 746	776 277	53.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
O	614 700	776 278	53.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0
P	614 691	776 278	53.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
Q	614 678	776 282	52.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
R	614 669	776 283	52.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
S	614 668	776 317	52.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
T	614 702	776 317	52.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
U	614 701	776 323	52.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
V	614 668	776 323	52.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
W	614 665	776 338	51.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
X	614 698	776 341	52.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
Y	614 664	776 343	51.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
Z	614 697	776 346	52.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AA	614 651	776 374	50.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AB	614 660	776 375	51.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AC	614 676	776 377	51.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0

To be continued on next page...



Scale 1:50 000
New WTG
Shadow receptor

Project:

Cloonanny
O-16297
NC-SR
Natural Forces

Description:

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Dreekamp 5

DE-26605 Aurich

04941/927-0

Henriette Labsch / Wind & Site Engineering

Calculated:

2024-07-21 07:56/3.6.361

SHADOW - Main Result

Calculation: Additional / Total Shadow Impact: A02a

...continued from previous page

No.	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]
AD	614 685	776 378	51.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AE	614 698	776 380	51.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AF	614 708	776 381	51.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AG	614 655	776 417	50.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AH	614 698	776 420	50.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AI	614 890	776 425	50.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AJ	614 652	776 440	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AK	614 649	776 457	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AL	616 574	776 625	65.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AM	614 815	776 673	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AN	614 849	776 686	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AO	614 897	776 731	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AP	616 478	776 768	59.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AQ	614 741	776 793	51.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AR	614 851	776 804	52.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AS	614 873	776 807	52.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AT	614 891	776 810	52.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AU	615 240	776 818	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AV	614 921	776 821	51.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AW	614 958	776 827	50.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AX	614 986	776 836	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AY	615 287	776 840	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
AZ	615 337	776 848	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BA	616 442	776 861	60.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BB	615 153	776 869	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BC	615 192	776 878	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BD	615 230	776 885	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BE	615 504	776 886	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BF	615 297	776 892	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BG	616 370	776 899	60.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BH	615 257	776 918	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BI	616 435	776 919	64.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BJ	615 561	776 920	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BK	615 475	776 926	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BL	615 591	776 930	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BM	616 422	776 947	65.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BN	615 624	776 950	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BO	614 795	776 953	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BP	616 412	776 973	64.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BQ	615 669	776 976	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BR	615 700	776 992	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BS	615 731	776 995	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BT	616 401	777 002	64.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BU	616 396	777 014	64.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BV	616 389	777 022	64.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BW	615 770	777 022	50.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BX	614 828	777 029	57.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BY	615 629	777 036	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
BZ	614 773	777 048	57.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CA	615 687	777 050	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CB	615 830	777 059	52.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CC	615 713	777 062	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CD	614 819	777 068	57.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CE	615 864	777 078	53.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CF	615 747	777 080	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CG	616 358	777 081	65.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CH	615 789	777 084	51.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CI	616 355	777 093	65.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CJ	615 910	777 100	54.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CK	615 802	777 106	51.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CL	614 796	777 113	58.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CM	614 773	777 137	59.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CN	613 601	777 146	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CO	614 750	777 155	59.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0

To be continued on next page...

Project:

Cloonanny
O-16297
NC-SR
Natural Forces

Description:

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Dreekamp 5

DE-26605 Aurich

04941/927-0

Henriette Labsch / Wind & Site Engineering

Calculated:

2024-07-21 07:56/3.6.361

SHADOW - Main Result

Calculation: Additional / Total Shadow Impact: A02a

...continued from previous page

No.	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]
CP	615 928	777 160	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CQ	613 798	777 162	47.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CR	614 615	777 182	59.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CS	613 774	777 198	47.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CT	616 224	777 203	65.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CU	615 944	777 219	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CV	616 190	777 222	65.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CW	616 006	777 242	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CX	613 768	777 265	46.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CY	616 273	777 268	65.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
CZ	616 136	777 274	65.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DA	613 374	777 389	50.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DB	613 383	777 402	51.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DC	613 392	777 415	52.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DD	613 402	777 427	52.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DE	613 361	777 431	52.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DF	613 400	777 451	52.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DG	613 425	777 452	51.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DH	613 437	777 468	50.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DI	613 355	777 476	54.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DJ	613 444	777 479	50.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DK	613 371	777 485	53.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DL	613 390	777 491	52.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DM	613 452	777 492	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DN	613 407	777 493	51.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DO	613 460	777 507	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DP	613 422	777 507	51.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DQ	613 345	777 513	55.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DR	613 468	777 520	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DS	613 357	777 522	54.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DT	613 434	777 527	50.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DU	613 373	777 528	53.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DV	613 474	777 532	49.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DW	613 480	777 541	49.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DX	613 489	777 551	49.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DY	613 408	777 560	50.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
DZ	613 500	777 562	48.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EA	613 334	777 564	55.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EB	613 506	777 569	48.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EC	613 383	777 570	51.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
ED	613 342	777 575	54.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EE	613 511	777 579	48.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EF	613 436	777 579	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EG	613 351	777 581	53.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EH	613 518	777 588	47.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EI	613 450	777 589	49.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EJ	613 465	777 596	49.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EK	613 524	777 597	47.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EL	613 474	777 600	48.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EM	613 320	777 601	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EN	613 416	777 601	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EO	613 495	777 601	48.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EP	613 530	777 606	47.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EQ	613 328	777 607	54.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
ER	613 335	777 613	54.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0
ES	613 537	777 614	47.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
ET	613 491	777 618	48.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EU	613 488	777 628	48.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EV	613 390	777 630	51.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EW	613 404	777 634	50.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EX	613 415	777 634	49.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EY	613 424	777 646	49.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
EZ	613 364	777 652	51.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FA	613 437	777 655	49.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0

To be continued on next page...

Project:

Cloonanny
O-16297
NC-SR
Natural Forces

Description:

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DE-26605 Aurich

04941/927-0

Henriette Labsch / Wind & Site Engineering

Calculated:

2024-07-21 07:56/3.6.361

SHADOW - Main Result

Calculation: Additional / Total Shadow Impact: A02a

...continued from previous page

No.	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]
FB	613 572	777 658	47.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FC	613 372	777 658	51.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FD	613 444	777 660	49.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FE	613 499	777 661	48.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FF	613 458	777 663	49.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FG	613 380	777 665	50.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FH	613 308	777 667	53.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FI	613 568	777 668	47.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FJ	613 493	777 669	48.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FK	613 389	777 672	50.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FL	613 555	777 678	47.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FM	613 485	777 678	48.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FN	613 400	777 680	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FO	613 320	777 681	52.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FP	613 407	777 687	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FQ	613 476	777 692	49.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FR	613 578	777 692	47.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FS	613 415	777 693	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FT	613 519	777 693	48.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FU	613 581	777 699	47.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FV	613 470	777 699	49.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FW	613 423	777 701	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FX	613 529	777 706	48.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FY	613 462	777 708	49.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
FZ	613 349	777 711	50.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GA	613 588	777 712	47.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GB	613 537	777 713	48.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GC	613 357	777 717	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GD	613 503	777 719	49.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GE	613 593	777 720	47.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GF	613 365	777 722	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GG	613 447	777 723	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GH	613 301	777 723	50.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GI	613 372	777 729	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GJ	613 606	777 736	47.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GK	613 383	777 737	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GL	613 482	777 737	49.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GM	613 523	777 737	49.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GN	613 490	777 744	49.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GO	613 560	777 744	48.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GP	613 396	777 746	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GQ	613 551	777 748	48.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GR	613 335	777 751	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GS	613 498	777 752	49.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GT	613 535	777 753	48.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GU	613 411	777 758	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GV	613 503	777 758	49.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GW	613 343	777 764	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GX	613 374	777 767	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GY	613 517	777 767	49.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
GZ	613 423	777 768	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HA	613 431	777 775	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HB	613 354	777 781	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HC	613 442	777 782	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HD	613 301	777 787	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HE	613 465	777 789	49.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HF	613 403	777 791	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HG	613 366	777 793	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HH	613 310	777 799	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HI	613 410	777 808	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HJ	613 380	777 812	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HK	613 329	777 820	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HL	613 377	777 824	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HM	613 340	777 834	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0

To be continued on next page...

Project:

Cloonanny
O-16297
NC-SR
Natural Forces

Description:

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Dreekamp 5

DE-26605 Aurich

04941/927-0

Henriette Labsch / Wind & Site Engineering

Calculated:

2024-07-21 07:56/3.6.361

SHADOW - Main Result

Calculation: Additional / Total Shadow Impact: A02a

...continued from previous page

No.	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]
HN	613 297	777 854	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HO	613 361	777 919	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HP	613 378	777 940	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HQ	613 400	777 970	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HR	613 332	777 980	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HS	613 418	777 996	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HT	613 435	778 018	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HU	617 091	778 042	53.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HV	613 456	778 048	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HW	613 358	778 051	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HX	616 485	778 067	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HY	617 047	778 068	52.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
HZ	613 477	778 072	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IA	613 384	778 094	50.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IB	616 996	778 115	51.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IC	613 411	778 126	51.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
ID	617 022	778 147	53.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IE	616 510	778 155	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IF	613 455	778 178	52.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IG	613 490	778 190	52.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IH	613 576	778 229	52.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0
II	616 765	778 267	49.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IJ	613 605	778 269	52.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IK	616 840	778 278	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IL	613 625	778 292	53.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IM	616 489	778 315	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IN	616 911	778 320	51.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IO	613 751	778 332	53.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IP	616 426	778 332	50.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IQ	616 751	778 361	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IR	616 630	778 391	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IS	616 686	778 399	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IT	616 432	778 425	52.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IU	616 701	778 439	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IV	616 708	778 473	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IW	616 350	778 483	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IX	616 718	778 519	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IY	613 636	778 547	58.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
IZ	616 723	778 551	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JA	613 767	778 578	58.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JB	616 661	778 589	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JC	613 857	778 593	57.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JD	616 140	778 599	57.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JE	616 677	778 623	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JF	613 771	778 623	59.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JG	613 654	778 647	59.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JH	616 692	778 651	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JI	613 751	778 660	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JJ	614 071	778 670	51.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JK	616 697	778 676	50.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JL	613 647	778 687	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JM	613 719	778 688	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JN	614 114	778 689	52.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JO	615 180	778 698	51.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JP	616 908	778 724	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JQ	613 644	778 725	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JR	613 902	778 726	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JS	614 009	778 728	54.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JT	613 977	778 728	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JU	616 156	778 732	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JV	613 763	778 734	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JW	615 047	778 734	54.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JX	614 164	778 735	53.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
JY	613 923	778 750	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0

To be continued on next page...

Project:

Cloonanny
O-16297
NC-SR
Natural Forces

Description:

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Dreerkamp 5

DE-26605 Aurich

04941/927-0

Henriette Labsch / Wind & Site Engineering

Calculated:

2024-07-21 07:56/3.6.361

SHADOW - Main Result

Calculation: Additional / Total Shadow Impact: A02a

...continued from previous page

No.	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]
JZ	613 840	778 752	57.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KA	613 718	778 765	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KB	613 818	778 767	58.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KC	613 868	778 773	56.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KD	616 784	778 777	50.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KE	613 696	778 780	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KF	613 884	778 794	55.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KG	613 908	778 832	55.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KH	614 226	778 833	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KI	614 635	778 838	52.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KJ	613 629	778 842	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KK	613 576	778 854	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KL	614 911	778 855	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KM	613 927	778 857	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KN	613 675	778 865	59.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KO	616 771	778 878	51.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KP	613 943	778 882	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KQ	614 692	778 892	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KR	613 672	778 895	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KS	613 965	778 906	56.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KT	613 611	778 907	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KU	613 666	778 943	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KV	613 987	778 943	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KW	614 031	778 961	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KX	613 663	778 967	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KY	614 697	778 970	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
KZ	614 788	778 981	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LA	616 660	778 982	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LB	614 733	778 989	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LC	614 235	779 013	58.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LD	614 235	779 013	58.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LE	614 759	779 018	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LF	614 834	779 021	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LG	614 047	779 025	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LH	614 776	779 042	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LI	614 856	779 044	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LJ	614 795	779 063	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LK	614 898	779 073	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LL	616 761	779 077	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LM	616 761	779 077	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LN	616 761	779 077	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LO	614 932	779 103	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LP	616 312	779 111	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LQ	614 950	779 126	54.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LR	616 574	779 129	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LS	614 085	779 133	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LT	614 241	779 133	57.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LU	616 547	779 141	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LV	616 522	779 150	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LW	614 972	779 151	54.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LX	614 274	779 167	56.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LY	616 653	779 169	54.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0
LZ	616 453	779 170	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MA	614 992	779 177	53.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MB	614 190	779 179	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MC	616 622	779 181	54.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MD	616 591	779 187	54.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0
ME	614 298	779 195	55.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MF	616 551	779 204	54.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MG	614 325	779 226	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MH	614 239	779 250	56.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MI	614 351	779 253	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MJ	616 444	779 258	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MK	614 250	779 267	56.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0

To be continued on next page...

Project:

Cloonanny
O-16297
NC-SR
Natural Forces

Description:

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Dreerkamp 5

DE-26605 Aurich

04941/927-0

Henriette Labsch / Wind & Site Engineering

Calculated:

2024-07-21 07:56/3.6.361

SHADOW - Main Result

Calculation: Additional / Total Shadow Impact: A02a

...continued from previous page

No.	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]
ML	614 212	779 267	57.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MM	616 377	779 274	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MN	614 222	779 282	56.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MO	614 266	779 283	55.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MP	614 373	779 290	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MQ	614 230	779 293	56.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MR	614 288	779 311	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MS	614 243	779 311	55.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MT	616 150	779 327	58.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MU	614 259	779 334	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MV	614 174	779 336	56.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MW	616 142	779 343	58.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MX	614 159	779 344	56.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MY	616 067	779 344	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
MZ	614 247	779 345	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NA	614 145	779 355	56.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NB	615 016	779 355	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NC	614 264	779 358	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
ND	614 347	779 361	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NE	614 130	779 362	57.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NF	614 279	779 368	55.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NG	614 418	779 375	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NH	615 995	779 375	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NI	614 325	779 385	55.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NJ	615 515	779 385	53.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NK	614 243	779 385	55.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NL	614 472	779 388	55.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NM	614 506	779 388	56.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NN	614 552	779 391	56.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NO	614 136	779 393	57.2	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NP	614 225	779 394	55.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NQ	614 254	779 395	55.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NR	614 206	779 395	55.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NS	614 186	779 396	55.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NT	614 170	779 396	56.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NU	614 151	779 398	56.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NV	614 795	779 403	55.7	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NW	614 832	779 405	55.6	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NX	616 080	779 415	59.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NY	616 084	779 432	58.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
NZ	616 032	779 439	59.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
OA	616 058	779 441	59.3	0.1	0.1	2.0	0.0	"Green house mode"	2.0
OB	616 083	779 446	58.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
OC	614 500	779 453	55.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
OD	614 533	779 454	56.8	0.1	0.1	2.0	0.0	"Green house mode"	2.0
OE	616 009	779 455	59.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
OF	614 489	779 456	55.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
OG	615 219	779 456	53.5	0.1	0.1	2.0	0.0	"Green house mode"	2.0
OH	614 676	779 459	57.1	0.1	0.1	2.0	0.0	"Green house mode"	2.0
OI	615 927	779 461	60.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
OJ	614 417	779 463	56.0	0.1	0.1	2.0	0.0	"Green house mode"	2.0
OK	615 978	779 472	57.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
OL	614 856	779 533	58.9	0.1	0.1	2.0	0.0	"Green house mode"	2.0
OM	614 476	779 545	55.4	0.1	0.1	2.0	0.0	"Green house mode"	2.0

Calculation Results

Shadow receptor

No.	Shadow, worst case		Shadow, expected values	
	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	0:00	0	0:00	0:00
B	0:00	0	0:00	0:00

To be continued on next page...

Project:

Cloonanny
O-16297
NC-SR
Natural Forces

Description:

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04941/927-0

Henriette Labsch / Wind & Site Engineering

Calculated:

2024-07-21 07:56/3.6.361

SHADOW - Main Result

Calculation: Additional / Total Shadow Impact: A02a

...continued from previous page

No.	Shadow, worst case		Shadow, expected values	
	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]
C	0:00	0	0:00	0:00
D	0:00	0	0:00	0:00
E	0:00	0	0:00	0:00
F	0:00	0	0:00	0:00
G	0:00	0	0:00	0:00
H	0:00	0	0:00	0:00
I	0:00	0	0:00	0:00
J	0:00	0	0:00	0:00
K	0:00	0	0:00	0:00
L	0:00	0	0:00	0:00
M	0:00	0	0:00	0:00
N	0:00	0	0:00	0:00
O	0:00	0	0:00	0:00
P	0:00	0	0:00	0:00
Q	0:00	0	0:00	0:00
R	0:00	0	0:00	0:00
S	0:00	0	0:00	0:00
T	0:00	0	0:00	0:00
U	0:00	0	0:00	0:00
V	0:00	0	0:00	0:00
W	0:00	0	0:00	0:00
X	0:00	0	0:00	0:00
Y	0:00	0	0:00	0:00
Z	0:00	0	0:00	0:00
AA	0:00	0	0:00	0:00
AB	0:00	0	0:00	0:00
AC	0:00	0	0:00	0:00
AD	0:00	0	0:00	0:00
AE	0:00	0	0:00	0:00
AF	0:00	0	0:00	0:00
AG	0:00	0	0:00	0:00
AH	0:00	0	0:00	0:00
AI	0:00	0	0:00	0:00
AJ	0:00	0	0:00	0:00
AK	0:00	0	0:00	0:00
AL	0:00	0	0:00	0:00
AM	0:00	0	0:00	0:00
AN	0:00	0	0:00	0:00
AO	0:00	0	0:00	0:00
AP	0:00	0	0:00	0:00
AQ	0:00	0	0:00	0:00
AR	0:00	0	0:00	0:00
AS	0:00	0	0:00	0:00
AT	0:00	0	0:00	0:00
AU	0:00	0	0:00	0:00
AV	0:00	0	0:00	0:00
AW	0:00	0	0:00	0:00
AX	0:00	0	0:00	0:00
AY	0:00	0	0:00	0:00
AZ	0:00	0	0:00	0:00
BA	0:00	0	0:00	0:00
BB	0:00	0	0:00	0:00
BC	0:00	0	0:00	0:00
BD	0:00	0	0:00	0:00
BE	0:00	0	0:00	0:00
BF	0:00	0	0:00	0:00
BG	5:43	40	0:13	0:54
BH	0:00	0	0:00	0:00
BI	10:53	52	0:18	1:46
BJ	0:00	0	0:00	0:00
BK	0:00	0	0:00	0:00
BL	0:00	0	0:00	0:00
BM	12:53	56	0:20	2:07

To be continued on next page...

Project:

Cloonanny
O-16297
NC-SR
Natural Forces

Description:

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DE-26605 Aurich

04941/927-0

Henriette Labsch / Wind & Site Engineering

Calculated:

2024-07-21 07:56/3.6.361

SHADOW - Main Result

Calculation: Additional / Total Shadow Impact: A02a

...continued from previous page

No.	Shadow, worst case		Shadow, expected values	
	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]
BN	0:00	0	0:00	0:00
BO	0:00	0	0:00	0:00
BP	15:02	59	0:22	2:30
BQ	0:00	0	0:00	0:00
BR	0:00	0	0:00	0:00
BS	0:00	0	0:00	0:00
BT	17:27	63	0:24	2:56
BU	18:19	64	0:24	3:05
BV	18:39	65	0:24	3:09
BW	0:00	0	0:00	0:00
BX	0:00	0	0:00	0:00
BY	0:00	0	0:00	0:00
BZ	0:00	0	0:00	0:00
CA	0:00	0	0:00	0:00
CB	0:00	0	0:00	0:00
CC	0:00	0	0:00	0:00
CD	0:00	0	0:00	0:00
CE	0:00	0	0:00	0:00
CF	0:00	0	0:00	0:00
CG	21:21	71	0:25	3:42
CH	0:00	0	0:00	0:00
CI	21:49	72	0:25	3:48
CJ	0:00	0	0:00	0:00
CK	0:00	0	0:00	0:00
CL	0:00	0	0:00	0:00
CM	0:00	0	0:00	0:00
CN	13:43	52	0:25	2:55
CO	0:00	0	0:00	0:00
CP	1:02	19	0:05	0:09
CQ	28:44	78	0:29	5:36
CR	0:00	0	0:00	0:00
CS	27:35	85	0:29	5:31
CT	27:51	79	0:29	4:55
CU	11:00	46	0:21	1:45
CV	29:19	79	0:30	5:10
CW	22:38	63	0:31	3:47
CX	20:34	65	0:30	4:21
CY	19:22	81	0:28	3:42
CZ	33:03	84	0:33	5:54
DA	6:51	30	0:21	1:19
DB	6:49	30	0:21	1:19
DC	6:54	30	0:22	1:19
DD	6:56	30	0:21	1:20
DE	6:26	30	0:21	1:14
DF	6:55	30	0:22	1:19
DG	7:20	31	0:22	1:24
DH	7:35	32	0:23	1:27
DI	6:12	28	0:21	1:10
DJ	7:43	31	0:23	1:28
DK	6:22	28	0:21	1:12
DL	6:43	30	0:21	1:16
DM	7:52	32	0:23	1:30
DN	6:58	29	0:22	1:19
DO	7:54	32	0:24	1:30
DP	7:09	30	0:22	1:21
DQ	5:57	28	0:20	1:08
DR	8:03	32	0:23	1:31
DS	6:10	29	0:21	1:10
DT	7:21	30	0:23	1:24
DU	6:21	29	0:21	1:12
DV	8:04	32	0:23	1:32
DW	8:15	32	0:24	1:34
DX	8:23	33	0:24	1:36

To be continued on next page...

Project:

Cloonanny
O-16297
NC-SR
Natural Forces

Description:

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DE-26605 Aurich

04941/927-0

Henriette Labsch / Wind & Site Engineering

Calculated:

2024-07-21 07:56/3.6.361

SHADOW - Main Result

Calculation: Additional / Total Shadow Impact: A02a

...continued from previous page

No.	Shadow, worst case		Shadow, expected values	
	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]
DY	7:09	30	0:23	1:22
DZ	8:36	32	0:24	1:38
EA	5:43	27	0:20	1:05
EB	8:43	34	0:25	1:40
EC	6:39	30	0:22	1:16
ED	5:53	26	0:20	1:07
EE	8:47	33	0:24	1:40
EF	7:21	30	0:23	1:24
EG	6:03	28	0:21	1:09
EH	8:56	34	0:25	1:42
EI	7:41	30	0:24	1:28
EJ	7:52	32	0:23	1:30
EK	9:00	34	0:25	1:43
EL	8:09	32	0:24	1:33
EM	0:00	0	0:00	0:00
EN	7:08	30	0:22	1:22
EO	8:26	34	0:25	1:37
EP	9:06	32	0:25	1:44
EQ	5:42	26	0:20	1:05
ER	5:54	27	0:21	1:08
ES	9:16	34	0:25	1:46
ET	8:20	33	0:24	1:36
EU	8:19	32	0:24	1:36
EV	6:39	28	0:22	1:16
EW	6:53	29	0:22	1:19
EX	7:11	30	0:23	1:23
EY	7:11	30	0:23	1:23
EZ	6:14	28	0:21	1:12
FA	7:26	30	0:23	1:26
FB	9:46	34	0:26	1:52
FC	6:22	28	0:22	1:13
FD	7:32	30	0:23	1:27
FE	8:30	32	0:24	1:38
FF	7:39	30	0:23	1:28
FG	6:28	28	0:21	1:15
FH	0:00	0	0:00	0:00
FI	9:38	34	0:26	1:51
FJ	8:11	30	0:24	1:34
FK	6:42	28	0:22	1:17
FL	9:26	33	0:26	1:49
FM	8:14	32	0:24	1:35
FN	6:53	30	0:22	1:20
FO	5:41	26	0:20	1:06
FP	6:55	29	0:23	1:20
FQ	7:53	32	0:24	1:31
FR	9:50	34	0:26	1:54
FS	6:57	28	0:22	1:20
FT	8:34	33	0:25	1:39
FU	9:47	35	0:27	1:53
FV	7:52	30	0:23	1:31
FW	7:05	30	0:23	1:22
FX	8:50	32	0:26	1:42
FY	7:38	30	0:24	1:28
FZ	6:10	27	0:22	1:11
GA	9:59	34	0:27	1:56
GB	8:58	34	0:25	1:44
GC	6:17	28	0:21	1:13
GD	8:17	31	0:25	1:36
GE	9:58	34	0:26	1:55
GF	6:28	28	0:22	1:15
GG	7:30	30	0:23	1:27
GH	0:00	0	0:00	0:00
GI	6:27	28	0:22	1:15

To be continued on next page...

Project:

Cloonanny
O-16297
NC-SR
Natural Forces

Description:

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04941/927-0

Henriette Labsch / Wind & Site Engineering

Calculated:

2024-07-21 07:56/3.6.361

SHADOW - Main Result

Calculation: Additional / Total Shadow Impact: A02a

...continued from previous page

No.	Shadow, worst case		Shadow, expected values	
	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]
GJ	10:15	36	0:27	1:59
GK	6:36	28	0:22	1:17
GL	7:56	30	0:24	1:32
GM	8:39	32	0:25	1:40
GN	8:01	32	0:24	1:33
GO	9:16	32	0:26	1:48
GP	6:44	28	0:22	1:18
GQ	9:07	34	0:26	1:46
GR	6:05	28	0:21	1:10
GS	8:03	30	0:25	1:33
GT	8:52	32	0:25	1:43
GU	6:55	30	0:23	1:20
GV	8:14	31	0:24	1:35
GW	6:04	26	0:21	1:10
GX	6:25	27	0:22	1:14
GY	8:33	32	0:25	1:39
GZ	7:04	28	0:23	1:22
HA	7:08	30	0:23	1:22
HB	6:08	26	0:21	1:10
HC	7:21	30	0:23	1:25
HD	5:32	25	0:20	1:03
HE	7:33	30	0:24	1:27
HF	6:46	29	0:23	1:18
HG	6:18	28	0:21	1:12
HH	5:42	26	0:21	1:05
HI	6:54	29	0:23	1:18
HJ	6:27	28	0:22	1:13
HK	5:55	26	0:21	1:07
HL	6:22	26	0:22	1:12
HM	5:54	26	0:21	1:06
HN	5:36	26	0:20	1:01
HO	6:09	26	0:22	1:04
HP	6:18	27	0:22	1:04
HQ	6:29	28	0:22	1:05
HR	5:49	26	0:21	0:58
HS	6:39	27	0:23	1:06
HT	6:49	28	0:23	1:08
HU	6:05	27	0:22	1:01
HV	7:10	29	0:24	1:11
HW	5:59	26	0:22	0:59
HX	21:28	49	0:39	3:41
HY	6:40	28	0:23	1:07
HZ	7:18	29	0:24	1:12
IA	6:11	27	0:22	1:01
IB	7:19	29	0:24	1:14
IC	6:18	26	0:22	1:02
ID	6:51	28	0:23	1:09
IE	19:44	46	0:39	3:15
IF	6:42	28	0:23	1:04
IG	7:08	29	0:24	1:08
IH	8:14	30	0:25	1:16
II	11:06	35	0:29	1:46
IJ	8:30	31	0:26	1:16
IK	9:37	33	0:27	1:32
IL	8:44	32	0:26	1:17
IM	22:21	46	0:45	3:29
IN	8:10	31	0:25	1:17
IO	10:57	36	0:29	1:35
IP	26:11	50	0:49	4:03
IQ	11:03	36	0:29	1:43
IR	16:46	41	0:39	2:35
IS	14:58	39	0:37	2:19
IT	26:28	52	0:49	4:01

To be continued on next page...

Project:

Cloonanny
O-16297
NC-SR
Natural Forces

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Calculated:
2024-07-21 07:56/3.6.361

SHADOW - Main Result

Calculation: Additional / Total Shadow Impact: A02a

...continued from previous page

No.	Shadow, worst case		Shadow, expected values	
	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]
IU	11:48	37	0:30	1:48
IV	11:32	37	0:29	1:45
IW	32:39	62	0:53	4:48
IX	11:10	36	0:29	1:40
IY	7:46	31	0:24	1:04
IZ	10:58	36	0:29	1:38
JA	9:59	36	0:27	1:21
JB	12:13	39	0:30	1:49
JC	17:15	56	0:29	2:19
JD	57:35	116	0:54	7:22
JE	11:42	38	0:29	1:43
JF	9:45	34	0:27	1:18
JG	7:45	32	0:24	1:02
JH	11:13	38	0:28	1:39
JI	9:09	35	0:26	1:12
JJ	28:03	76	0:34	3:25
JK	11:00	37	0:28	1:36
JL	7:29	32	0:24	0:59
JM	8:34	33	0:25	1:07
JN	30:45	82	0:35	3:40
JO	54:19	58	1:23	4:55
JP	6:55	30	0:23	1:01
JQ	7:24	31	0:23	0:58
JR	13:04	42	0:29	1:34
JS	23:43	73	0:32	2:52
JT	21:56	70	0:31	2:40
JU	57:38	106	0:43	6:46
JV	9:16	34	0:25	1:09
JW	41:04	62	0:57	3:47
JX	35:34	100	0:36	4:01
JY	19:23	66	0:29	2:22
JZ	11:12	40	0:27	1:21
KA	8:25	33	0:25	1:03
KB	10:27	38	0:26	1:15
KC	11:56	42	0:28	1:24
KD	8:56	34	0:25	1:16
KE	8:03	32	0:24	1:00
KF	12:19	43	0:28	1:25
KG	13:11	46	0:28	1:30
KH	45:02	106	0:35	4:31
KI	44:03	82	0:40	4:09
KJ	6:51	30	0:22	0:50
KK	6:14	30	0:21	0:46
KL	28:32	54	0:39	2:33
KM	14:00	48	0:28	1:34
KN	7:30	32	0:23	0:53
KO	9:00	36	0:25	1:12
KP	14:41	51	0:28	1:37
KQ	35:14	70	0:36	3:17
KR	7:31	34	0:23	0:53
KS	15:48	56	0:28	1:42
KT	6:32	32	0:21	0:46
KU	7:19	34	0:21	0:51
KV	17:16	70	0:28	1:46
KW	21:31	72	0:28	2:04
KX	7:11	33	0:21	0:49
KY	27:48	58	0:34	2:30
KZ	20:22	48	0:32	1:46
LA	10:56	42	0:25	1:23
LB	23:15	52	0:33	2:02
LC	29:10	86	0:30	2:46
LD	29:10	86	0:30	2:46
LE	17:53	44	0:30	1:32

To be continued on next page...

Project:

Cloonanny
O-16297
NC-SR
Natural Forces

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If other wind farms are included like an existing wind farm, the real case calculation is based on the average operational hours of all turbines.

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Calculated:
2024-07-21 07:56/3.6.361

SHADOW - Main Result

Calculation: Additional / Total Shadow Impact: A02a

...continued from previous page

No.	Shadow, worst case		Shadow, expected values	
	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]
LF	11:14	34	0:25	0:56
LG	22:28	62	0:28	2:04
LH	13:27	38	0:26	1:08
LI	6:17	24	0:19	0:30
LJ	9:16	32	0:23	0:46
LK	0:00	0	0:00	0:00
LL	8:40	38	0:22	1:05
LM	8:40	38	0:22	1:05
LN	8:40	38	0:22	1:05
LO	0:00	0	0:00	0:00
LP	17:50	46	0:28	1:44
LQ	0:00	0	0:00	0:00
LR	17:19	68	0:26	1:56
LS	16:10	46	0:26	1:22
LT	16:49	74	0:23	1:37
LU	18:56	64	0:26	2:03
LV	19:51	60	0:26	2:06
LW	0:00	0	0:00	0:00
LX	13:31	68	0:24	1:20
LY	13:24	68	0:24	1:33
LZ	19:48	52	0:27	1:59
MA	0:00	0	0:00	0:00
MB	4:42	22	0:16	0:22
MC	15:41	66	0:24	1:44
MD	17:22	62	0:25	1:52
ME	15:29	64	0:23	1:27
MF	18:27	57	0:25	1:55
MG	16:46	58	0:23	1:31
MH	0:00	0	0:00	0:00
MI	16:55	52	0:24	1:29
MJ	12:20	40	0:24	1:10
MK	0:00	0	0:00	0:00
ML	0:00	0	0:00	0:00
MM	6:27	28	0:18	0:35
MN	0:00	0	0:00	0:00
MO	0:00	0	0:00	0:00
MP	15:16	46	0:24	1:17
MQ	0:00	0	0:00	0:00
MR	0:00	0	0:00	0:00
MS	0:00	0	0:00	0:00
MT	0:00	0	0:00	0:00
MU	0:00	0	0:00	0:00
MV	0:00	0	0:00	0:00
MW	0:00	0	0:00	0:00
MX	0:00	0	0:00	0:00
MY	0:00	0	0:00	0:00
MZ	0:00	0	0:00	0:00
NA	0:00	0	0:00	0:00
NB	0:00	0	0:00	0:00
NC	0:00	0	0:00	0:00
ND	0:00	0	0:00	0:00
NE	0:00	0	0:00	0:00
NF	0:00	0	0:00	0:00
NG	0:00	0	0:00	0:00
NH	0:00	0	0:00	0:00
NI	0:00	0	0:00	0:00
NJ	0:00	0	0:00	0:00
NK	0:00	0	0:00	0:00
NL	0:00	0	0:00	0:00
NM	0:00	0	0:00	0:00
NN	0:00	0	0:00	0:00
NO	0:00	0	0:00	0:00
NP	0:00	0	0:00	0:00

To be continued on next page...

Project:

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If other wind farms are included like an existing wind farm, the real case calculation is based on the average operational hours of all turbines.

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SHADOW - Main Result

Calculation: Additional / Total Shadow Impact: A02a

...continued from previous page

No.	Shadow, worst case		Shadow, expected values	
	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]
NQ	0:00	0	0:00	0:00
NR	0:00	0	0:00	0:00
NS	0:00	0	0:00	0:00
NT	0:00	0	0:00	0:00
NU	0:00	0	0:00	0:00
NV	0:00	0	0:00	0:00
NW	0:00	0	0:00	0:00
NX	0:00	0	0:00	0:00
NY	0:00	0	0:00	0:00
NZ	0:00	0	0:00	0:00
OA	0:00	0	0:00	0:00
OB	0:00	0	0:00	0:00
OC	0:00	0	0:00	0:00
OD	0:00	0	0:00	0:00
OE	0:00	0	0:00	0:00
OF	0:00	0	0:00	0:00
OG	0:00	0	0:00	0:00
OH	0:00	0	0:00	0:00
OI	0:00	0	0:00	0:00
OJ	0:00	0	0:00	0:00
OK	0:00	0	0:00	0:00
OL	0:00	0	0:00	0:00
OM	0:00	0	0:00	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name		Worst case [h/year]	Expected [h/year]
WEC1	ENERCON GmbH E-175 EP5 E2 7000 175.0 !O! NH: 111.6 m (Ges:199.1 m) (7)		334:56	49:13
WEC2	ENERCON GmbH E-175 EP5 E2 7000 175.0 !O! NH: 111.6 m (Ges:199.1 m) (8)		326:10	38:57

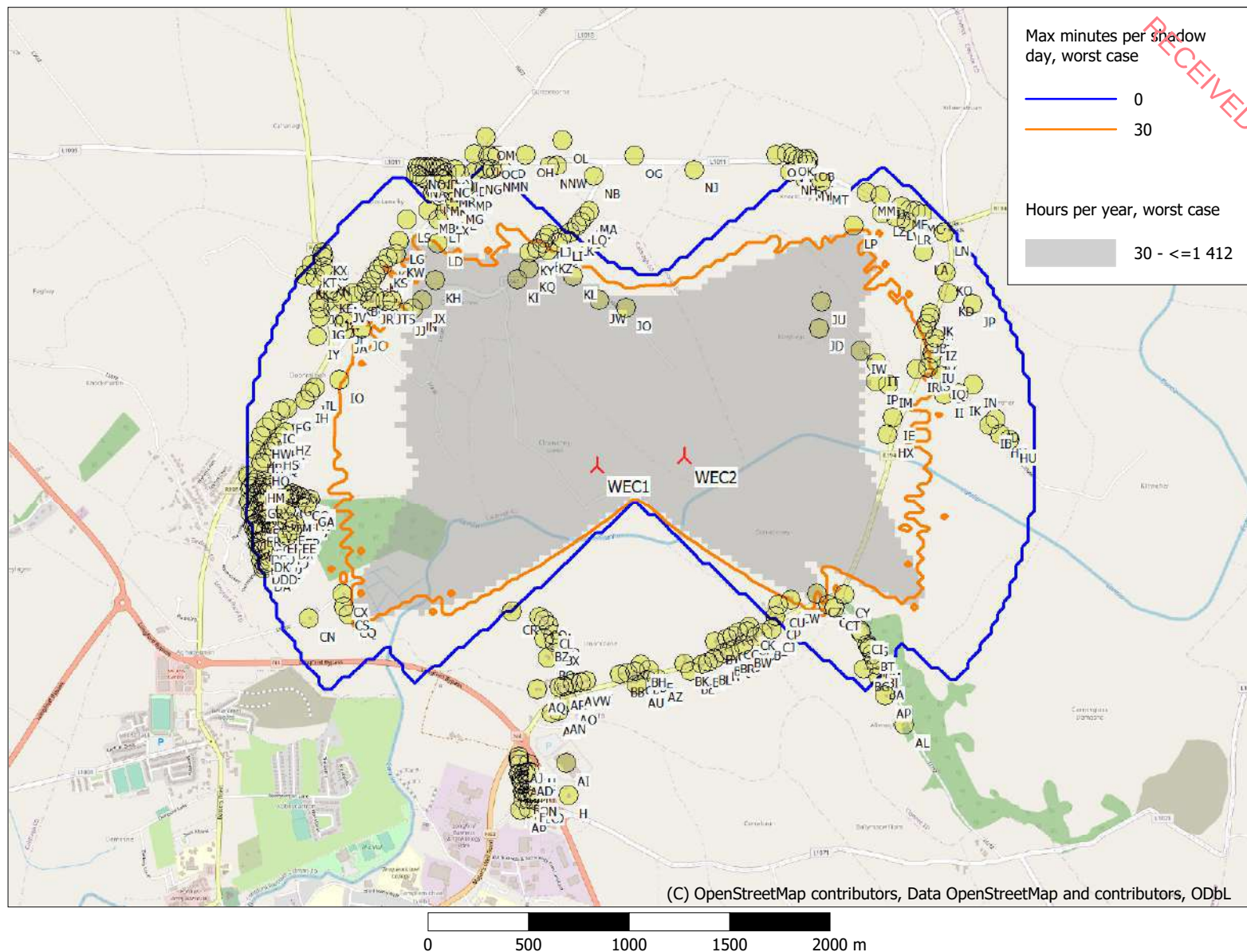
Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

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.

Appendix B

Shadow Map – Worst Case Additional / Total Shadow Flicker

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New WTG

Map: EMD OpenStreetMap, Print scale 1:30 000, Map center Irish ITM-IRENET95 (IE), geocentric, GRS80 East: 615 150 North: 777 900

Shadow receptor

Flicker map level: Höhenlinien: CONTOURLINE_Cloonanny_0.wpo (1)

Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 2.0 m

Project:

**Cloonanny
O-16297
NC-SR
Natural Forces**

Description:

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SHADOW - Map

Calculation:

Additional / Total Shadow Impact: A02a

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Appendix B: Shadow Flicker Shutdown

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Technical description

Shadow shutdown

ENERCON Platform Independent Control System (PI-CS)

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2.2	Measuring illuminance	4
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3	Safety	5
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1 General information

Periodic shadow flickering is the recurrent shading of direct sunlight by the movement of the wind energy converter's rotor blades. The occurrence of this effect depends on current local weather conditions, alignment of the nacelle according to the wind direction, the position of the sun and the wind energy converter operating times.

2 Operating principle

Shadow shutdown for wind energy converters with control system type PI-CS is effected via the ENERCON SCADA Edge Server.

The number and installation location of the sensors required for the respective project is determined and defined on a project-specific basis.

2.1 Determining potential shadow casting time

The shadow shutdown feature is based on a calendric system. The start and finish times of the maximum astronomical shadow casting at affected immission sites are computed considering site-specific parameters such as hub height, rotor diameter, wind energy converter coordinates, location of the immission site, and its topography.

The shutdown times determined on this basis are programmed in the ENERCON SCADA Edge Server.

Fine-tuning of these shutdown times is possible at any time for each immission site and time period.

2.2 Measuring illuminance

Periodic shadow flickering is dependent on sunlight. According to the Joint Working Group of the German Federal Government/Federal States on Immission Control (Bund/Länder-Arbeitsgemeinschaft für Immissionsschutz (LAI)), shadow flickering is likely when the sunlight is greater than 120 W/m^2 at the level vertical to the incidence direction.

The level of illuminance on a horizontal measuring surface is influenced by the position of the sun and the photometric equivalent. The latter is determined by refraction and atmospheric opacity; it also depends on the position of the sun. The illuminance depending on the sun's position can therefore only be approximated.

In order to measure the illuminance, the sensors are arranged such that at least one sensor is on the sunny side and one on the shadow side of the tower.

The highest and lowest illuminances, i.e. the light and shadow intensity, are determined from the measured values from the sensors.

Instead of using an inherently inaccurate measurement of illuminance to determine whether shadow flickering is likely to occur, the ratio of light intensity to shadow intensity and the shutdown intensity derived from this are used.

With an illuminance of 120 W/m^2 , the determined shutdown intensity is 36 %. This value is independent of the position of the sun. Once the ratio of light intensity to shadow intensity drops below 36 %, illuminance is greater than 120 W/m^2 . Shadow flickering occurs.

2.3 Automatic shutdown

Shadow shutdown is activated as soon as the shutdown intensity falls below the set value within the programmed timeframe. The measured illuminance is not averaged. Automatic shutdown also reacts when the shutdown intensity falls below the defined shutdown intensity even briefly. Filtering times can be used to define a delay in the response of the shadow shutdown feature. A parameter specifies for how long, on average, the ratio of light intensity to shadow intensity must be below the defined shutdown intensity in order for shadow shutdown to be activated.

If the light conditions change such that shadow flickering is no longer possible, shadow shutdown initially remains active. Shadow shutdown is deactivated and the wind energy converter restarts when the programmed timeframe has expired or when the value of the shutdown intensity is constantly exceeded during a specified time period. A parameter specifies for how long, on average, the ratio of light intensity to shadow intensity must be above the defined shutdown intensity in order for shadow shutdown to be deactivated.

2.4 Advanced functions

Shadow shutdown can also take place without taking the illuminance into account. In this case, shutdown of the wind energy converter is time-controlled according to the time windows programmed in the ENERCON SCADA Edge Server. This means the wind energy converter is also stopped if there is cloud cover.

A weekday function is available, allowing the shutdown to be limited to selected days of the week. This function is useful for wind energy converters near commercial areas or industrial estates, for example, where no work in spaces requiring protection is carried out at weekends.

Advanced functions can be implemented in targeted fashion for selected immission sites.

3 Safety

The function of the light sensors is automatically and continuously checked for plausibility during operation. If the measured values are not plausible, a message is generated.

Failure of a sensor, e.g. due to a broken cable or short-circuiting, results in the ratio of shadow to light intensity falling below the shutdown intensity value. The wind energy converter stops within the programmed timeframe and a message is generated.

4 Logging

Activation of the shadow shutdown system is recorded by the ENERCON SCADA Edge Server as a status message with the date, time and duration and is stored for several years.

If required, measured data from the light sensors is logged. The ratio of shadow to light intensity is recorded as an average per minute; the minimum and maximum values at one-minute intervals and the defined shutdown intensity are also recorded.

Appendix C: General Principal of Shadow Flicker

The principle of periodic shadow flickering, is the recurrent shading of direct sunlight by the movement of a wind turbines rotor blades. The occurrence of this effect depends on current local weather conditions, alignment of the nacelle according to the wind direction, the position of the sun and the wind energy converter operating times.

Technological Mitigation

The proposed turbine manufacturer has developed an advanced anti-shadow flicker function within the wind turbine control system, which described as a “Shadow Shutdown” function.

The principle of the function is to avoid periodic shadow flickering on dwellings or sensitive receptors. Shadow flicker as a concept, is the recurrent shading of direct sunlight by the movement of the wind turbine’s rotor blades. The occurrence of this effect depends on current local weather conditions, alignment of the nacelle according to the wind direction, the position of the sun and the wind energy converter operating.

The shadow shutdown is a function that is integrated into the control system of the turbine and specifically activated in the turbine where shadow shutdown is necessary i.e. an exceedance of shadow flicker limits

In order to establish when the wind turbine is to be shut down to avoid shadow flicker on a dwelling or sensitive receptor, a computerised model is developed mapping out the turbine location and the location of the relevant dwellings or sensitive receptors. The model then calculates the impact based on a calendric system. The start and finish times of the maximum astronomical shadow casting at affected dwellings or sensitive receptors are computed considering site-specific parameters such as hub height, rotor diameter, turbine coordinates, location of the dwellings or sensitive receptors, and its topography. The shutdown times determined are then programmed into the turbine control system.

Determination of Impacted Receptors

Annex A provide further details for the industry standard software package windPRO EDM International A/S, where a map illustrates the potentially impacted dwellings or sensitive receptors within the 30 minutes per day or 30 hours per year standard.

The exact dates and times of the shadow flicker events at each of the shadow flicker receptors listed above will not be possible based on the assumptions used to run the shadow flicker assessment.

- The sun is shining all the day, from sunrise to sunset
- The rotor plane is always perpendicular to the line from the WTG to the sun
- The WTG is always operating

Based on sun/shadow angles through-out the year it is expected that the shadow receptors may experience shadow flicker events during the months of May, June, July and August, these months are the time of year in which duration of sunlight is longest due to a combination of the tilt of axis and rotation of the earth.

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APPENDIX 5.1

VISUAL ASSESSMENT

VOLUME III

APPENDICES TO

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DECEMBER 2024



macroworks

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APPENDIX 5.1

VISUAL ASSESSMENT

Cloonanny Wind Farm
Co. Longford.

Prepared by Macro Works Ltd on behalf of McCutcheon Halley

October 2024 | Rev C

1

VISUAL ASSESSMENT

3

1.1 MAGNITUDE OF VISUAL IMPACTS AT REPRESENTATIVE VIEWPOINT LOCATIONS 3

Figure 1: Viewpoint Map 3

Table 1: Magnitude of Visual Impacts at Representative Viewpoint Locations 4

This LVIA should be read in conjunction with Chapter 5: Landscape and Visual Impact Assessment and the LVIA Photomontages produced by Macro Works Ltd



1. VISUAL ASSESSMENT

1.1 MAGNITUDE OF VISUAL IMPACTS AT REPRESENTATIVE VIEWPOINT LOCATIONS

The assessment of visual impacts at each of the selected viewpoints is aided by spatially accurate wireframe images and photomontages that have been produced in accordance with Scottish Natural Heritage (SNH) Visual representation of wind farms: Best Practice Guidelines (version 2.2 - 2017). The presented images for each viewpoint include;

1. Existing View (Contextual 90° included angle)
2. Wireframe view - proposed and cumulative turbines (Contextual 90° included angle)
3. Wireframe view (53.5° included angle)
4. Montage View (53.5° included angle)

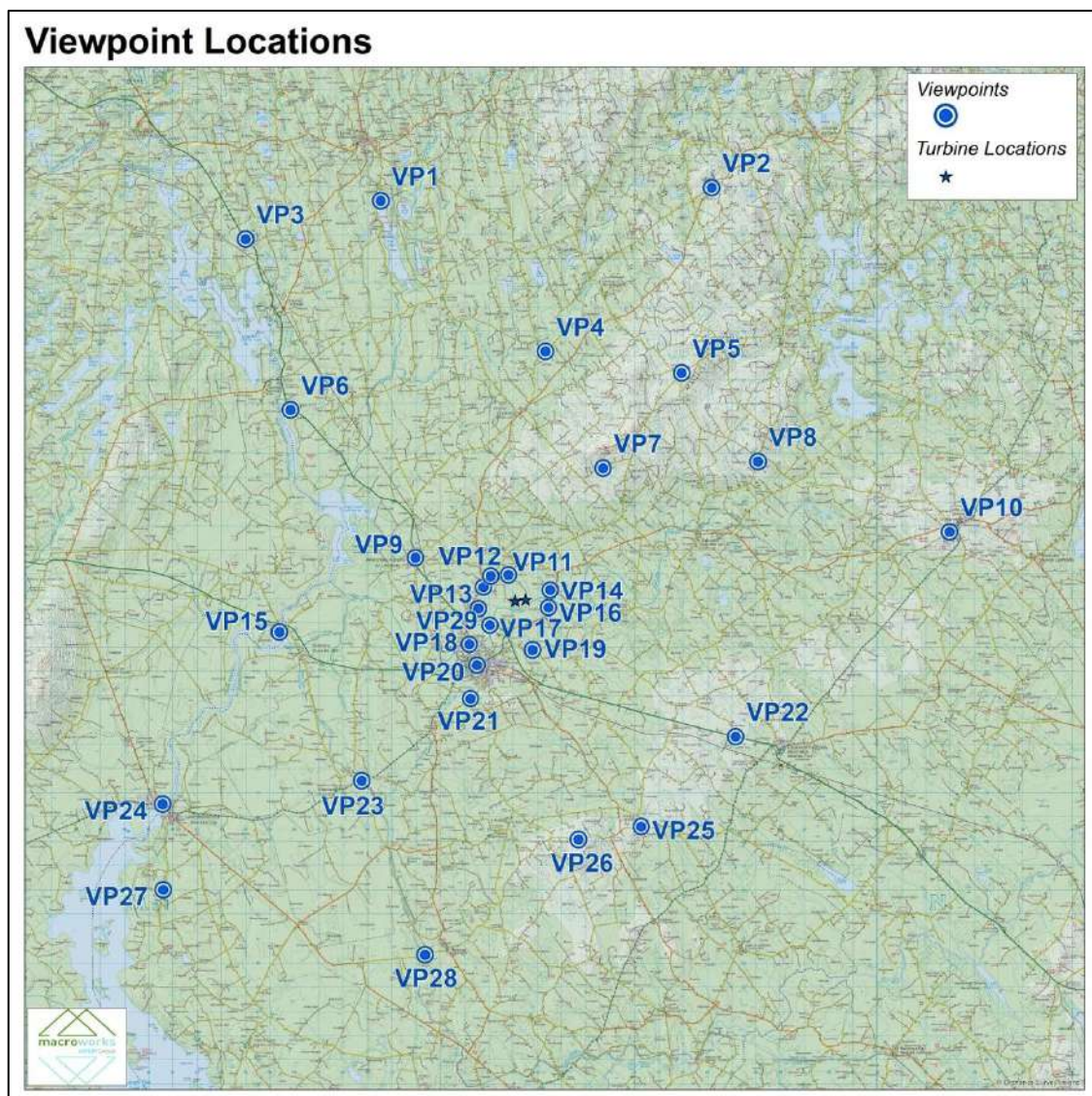


Figure 1: Viewpoint Map

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Table 1: Magnitude of Visual Impacts at Representative Viewpoint Locations

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE	SIGNIFICANCE / QUALITY / DURATION OF IMPACT
VP1	Rinn Lough This is a pleasant view over the length of Rinn lough from the northern end of the lough. The vegetated shores of the lough frame the view into the distance, screening much of the wider landscape. This viewpoint represents the higher amenity setting of the lough, the recreational users, the nearby scenic designation and local community.	High	The proposed turbines are partially visible, rising above the distant rolling terrain at a distance of more than 17km. There is a small section of intervening landform visible between the end of the lough and the proposed development which serves to separate the two. One turbine features full rotor visibility while the other is partially screened by vegetation. The proposed development is aligned off-centre to the main line of the lough, reducing its influence on the viewer setting and surrounding amenity. Due to the distance and limited visual presence, the magnitude of impact is deemed Low-negligible .	Slight / Negative / Long-term
VP2	R198 at Legga This is a partially contained view afforded from a section of the R198 regional road in the townland of Legga, representing the scenic designation along the regional road, and surrounding residences. The view is oriented south, across a small pastoral field contained in rough grazing. Several low rolling hills rise in the distance and contain the view's background, while the view is framed to the south over fields and hedgerows.	Medium	The proposed development will not be visible from here; therefore, the magnitude of visual impact is Negligible by default.	Imperceptible / Neutral / Long Term
VP3	N4 viewpoint at Fearnaght This is a broad panoramic vista to the south afforded from the crest of a hill to the east of Lough Bofin and Boderg, which is the key	Medium	The proposed turbines will be viewed as small background features at the considerable viewing distance of over 18km. Additionally, the proposed development is not viewed with the primary source of amenity, but is set away to the southeast, along the road	Slight-imperceptible / Negative / Long-term

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE	SIGNIFICANCE / QUALITY / DURATION OF IMPACT
	aspect of visual amenity in this instance. A series of dwellings line the eastern side of a short section of local access road that runs parallel to the N4 at this location and also enjoy this view. To the right hand side of the road marshy farmland and tree-lined hedgerows descend towards and partially screen the Lough in the middle distance. The Lough presents as a complex pattern of bays cloaked in riparian woodland, extending into the distance in a southwest direction.		corridor between the clutter of streetlights and signs lining the road corridor. Due to the distance and limited visual presence, the magnitude of impact is deemed Low-negligible .	
VP4	R198 at Drumlish This viewpoint is located along the R198 to the south of Drumlish, representing the local community as well as the small centre of population as they travel along this section of regional road. The view is framed by roadside vegetation, contained in the midground by gentle rolling landform.	Medium-Low	The wireframe view indicates visibility of one blade tip over the distant rolling landform, however this is entirely screened by vegetation across the intervening agricultural landscape. Therefore, the magnitude of impact is deemed Negligible .	Imperceptible / Neutral / Long-term
VP5	L1035 at Drumderg This viewpoint is representative of the cluster of scenic routes within the rolling upland areas to the north of the study area. It is a typical rural, rolling landscape setting with anthropogenic influence in the form of the transmission mast atop Cairn Hill (outside of the depicted view) and the small cluster of agricultural buildings in the distance. The wider landscape is partially screened by Cairn	Medium	Both turbines will be visible from here; partially screened by vegetation across the slope of Cairn Hill. The nacelle and full blade sets of both turbines will be visible, rising above the intervening landform with a low degree of contrast against the sky. It will be a small but distinctive new feature of the view and, due to being located off-centre to the longer distance views, is therefore deemed to have a sub-dominant visual presence in the context of this long distance, partially screened view. Therefore, the magnitude of visual impact is deemed Low .	Slight / Negative / Long-term

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE	SIGNIFICANCE / QUALITY / DURATION OF IMPACT
	Hill and wooded hedgerows, although views are allowed to open farmland in the distance.			
VP6	R371 at Osprey Park Located at the junction of the R371 and the access to the Shannon-side settlement of Osprey Park, this view is contained by layers of wooded hedgerows. The foreground is relatively open across the road corridor, contained in the middle distance by vegetation.	Medium-Low	The proposed development will not be visible from here, screened by vegetation typical of this area; therefore, the magnitude of visual impact is Negligible by default.	Imperceptible / Neutral / Long Term
VP7	L1031 at Corn Hill This is an elevated view from the southern face of Corn Hill north of Longford. The local road bordered by occasional mature trees and roadside scrub, descends away from the viewer in the foreground. Dense scrubby hedgerows quickly mask the view of the intervening pastoral fields on the lower slopes of the hill with only occasional glimpses of grassland. As the view opens up over the terrain, the dense mature intervening vegetation becomes stacked in perspective and cloaks the landscape all the way to the flat horizon.	Medium	In aesthetic terms the turbines are well spaced and clearly legible – with the exception of localised trees in the foreground. There is a simplicity to the way in which the turbines rise from the dark plinth of the ground plane at the horizon. This is also an anthropogenic rural landscape context within which the wind farm is not an incongruous feature. While the development will add a modern, more intensive land use to the view, it is clearly separated from the viewer and set within a modified landscape. Thus, it is not considered that the scheme will measurably detract from visual amenity at this location. For the reasons outlined above the magnitude of visual impact is deemed to be Low .	Slight / Negative / Long term
VP8	L1051 at Gelsagh This is a broad view located in the rolling hills to the northeast of the site, which host a number of designated views. Corn Hill and the distant silhouette of Slieve Bawn can be	Medium	The proposed turbines are located in the far middle ground of the view to the lefthand side of the Corn Hill, but peripheral to the main amenity and road alignment. The tower, nacelle and full blade sets of both turbines will be clearly visible, rising above the surrounding farmland with a low degree of contrast against the	Slight / Negative / Long Term

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE	SIGNIFICANCE / QUALITY / DURATION OF IMPACT
	seen to the west, while the south extends over undulating farmland sloping away from the viewer to form an even band of stacked hedgerows, concealing much of the surrounding pasture. There are pockets of built form visible in the foreground and across the wider landscape.		sky, except the lower sections which appear more clearly against the darker backdrop of the ground plane. It will be a small but distinctive new feature of the view and is likely to be readily noticeable and is therefore deemed to have a sub-dominant visual presence in the context of this vast vista. On balance, of the above reasons, the magnitude of visual impact is deemed to be Low .	
VP9	N4 at Newtown Forbes This view is located within the built centre of Newtown Forbes, slightly north of Castleforbes Demesne. Aligned down a local road which diverges off the N4, the angle of view will be experienced primarily by local residences, but glimpsed by those looking east travelling along the N4. The foreground is built up and enclosed as can be expected for a population centre.	Medium	The full blades sets of T1 and the partial blades of T2 emerge above and beyond the fore-to-middle ground context. In perspective, the turbines will rise to a lesser height than the nearer lighting poles, lattice mast, trees and residences, but they are likely to be more noticeable due to their movement and more distinctive form. The movement of the turbine blades have the potential to draw the attention of viewers, due to the alignment with the road corridor as well as moving parts, but within the context of a relatively complex street scene. Thus, the visual presence of the turbines and considerable foreground screening is in the order of co-dominant to sub-dominant. The turbine blade sets may give rise to a degree of visual clutter in conjunction with lighting and utility poles, roofs and treetops. Additionally, there is a degree of visual ambiguity associated with potential distance / contextual confusion as a result of the screened lower sections of the turbines. On balance of the reasons outlined above, the magnitude of visual presence is deemed to be Medium-low.	Moderate-slight / Negative / Long term
VP10	Granard Motte and Bailey This is a panoramic view from the top of a moat located adjacent to Saint Mary's Church on the edge of the settlement of Granard. Lower portions of the historic moat site are	High	The proposed development is a distinct, but small scale feature at this distance of nearly 18km and in the context of the vast view it is deemed to have a sub-dominant visual presence. There is some visual clutter through the stacking of the two turbines, resulting in	Moderate-slight / Negative / Long term

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE	SIGNIFICANCE / QUALITY / DURATION OF IMPACT
	identifiable in the foreground, along with communications infrastructure inside a fenced-off compound. Undulating farmland gently slopes away from the viewpoint, with the Kiernan Milling site a notable modern built feature in the midground. A sweeping view over the surrounding low-lying rural landscape is afforded to the east, south and west. Cartrongarrow Hill is identifiable to the southwest, Corn Hill to the west.		a the blades of each rotating over one another, however this is generally mitigated by distance. The broad, flat landscape in the view is capable of absorbing and integrating the proposed turbines into the view without becoming crowded or cluttered; on the contrary, the development is aligned with Keirnan Milling and as such keeps the more industrial land uses contained to a small section of the view, clearly separated by distance. Behind these, at a distance of nearly 40km, Sliabh Bawn wind farm has the potential to be visible along the horizon on clear days. Thus, it will have only a minor reduction to the visual amenity of this scene. Overall, the magnitude of visual impact is deemed to be Low.	11/12/2024
VP11	L50461 at Derryharrow This is a local community view, located to the north of the site at the periphery of Melview along one of the minor populated local roads. There is a well populated local road to the north-west viewpoint, while the viewpoint itself is located on a sparsely populated lane featuring some of the closest residences to the proposed development. The view itself looks past one such residence over fields in the foreground, lined with well treed hedgerows that limit views of the wider landscape. There are scattered residences visible in the distance, however these are highly enclosed by vegetation. Located on a slight rise, the landform gently slopes away from the viewer, divided by the previously described vegetation.	Medium-Low	Both proposed turbines compound visible here, prominently visible and rise above the near vegetation at a notable scale at a distance of 0.9km. They will generally have a dominant visual presence, reducing to co-dominant depending on the degree of roadside screening along the local road carriageway. The turbines are separated from the viewer and from the contrasting residential land uses by the mid-ground hedgerow and fall in the landform. The turbines do not appear over-scaled in the rolling context of the wider landscape, which successional layers of hedgerows can be seen. On balance of the above reasons, the combined magnitude of visual impact of all aspects of the proposed development is deemed High-medium.	Moderate / Negative / Long-term

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE	SIGNIFICANCE / QUALITY / DURATION OF IMPACT
VP12	L1018 at Melview The viewpoint is located along one of the most populated local roads at Melview. There is a line of residences located along the north-western side of the road (180 degrees to the depicted view), with two medium sized fields in the foreground, lined with well treed hedgerows that limit views of the wider landscape. There are scattered residences visible to the south, in the midground, on the far side of the nearest fields. This view is typical of the wider surrounds, with pasture under pressure from residential development, indeed, there is a development to north of the viewpoint, fragmenting the patch of pasture contained within between the two forementioned local roads wider extents of Melview. While there is some degree of agricultural character retained by the larger farm buildings (not within the depicted view), the wider landscape features little visible built form, highly screened by scattered blocks of forestry visible between broadleaf hedgerow and woodland.	Medium-Low	This view is representative of this section of local road, where varied screening is expected. As can be seen in the wireframe view, the of the proposed turbines will be visible here at a considerable scale from this distance of just over 1.5km. While the substation and BESS is likely to be fully screened due to the low lying nature and dense screening, the turbines will be viewed over the vegetated surroundings and filtered between roadside trees. Where visible, the proposed turbines will have a dominant to co-dominant visual presence in this view, mitigated by the contextual separation, through being located on the far side of the field, road, and beyond the visible residences. Aesthetically, the proposed turbines present here in a clear and comprehensible manner with little notable negative aesthetic effects. They are well spaced, with only a small degree of shrinking through the additional distance to T2. The proposed turbines appear slightly stunted as vegetation partially screen their towers. This causes the lower sweep of the blades to appear to brush the surrounding vegetation due to the slight slope, and vegetation across the foreground. The minor degree of resulting visual irritation is mitigated by the small number of turbines. The proposed development will generate an increase in the intensity land use development across the view, however, as above, the turbines are clearly separated from the viewer by the open foreground and legible land use transition. Therefore, the magnitude of visual impact is deemed Medium.	Moderate / Negative / Long-term
VP13	R198 at west of site This view is located south of the junction of the L1018 and R198, between Melview and Clonbalt Wood. The primary viewers are	Medium-Low	The proposed development is clearly visible over the midground hedgerow, located 1.6km from the viewer and R198 corridor. The proposed turbines are considered to have a sub-dominant visual	Moderate-slight / Negative / Long-term

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE	SIGNIFICANCE / QUALITY / DURATION OF IMPACT
	residents of Melview and surrounds travelling to and from Longford. The viewpoint is also representative of road users along the R198 who may experience glimpses to the east as they travel along the road corridor. In summer vegetation this is a relatively enclosed road corridor, with a low hedgerow lined by trees screening much of the surrounding landscape.		presence. As discussed, viewing opportunities at this location will be fleeting. Aesthetically, the proposed turbines present here in a clear and comprehensible manner. They are well spaced, with a minor scale difference through the additional distance T1, which serves to highlight the space between them. The main source of negative visual impacts are the lower sweep of the blades which appear to brush the surrounding vegetation. The proposed development will generate an increase in the scale and intensity of built development across the view, however, as above, the turbines are clearly separated from the viewer by the open foreground. Therefore, on balance of the reasons outlined above, the magnitude of visual impact is deemed Medium-low.	11/12/2024
VP14	Lane at Kiltybegs This viewpoint is located along a rural lane that primarily services the cluster of farmyards and associated buildings which diverge in a radial manner from the end of the lane. Additionally, typical of the surrounds, there are some smaller, standalone residences being constructed closer to the R194. The viewpoint is located adjacent to one such residence, with an eastward view truncated by tree-lined hedgerows. The view opens to the southeast where the landform slopes down towards the Camlin River corridor.	Medium-Low	The proposed turbines are viewed here at a distance of c. 1.0km and will be a prominent feature of this westward view, more so where not screened in the foreground. While the proposed turbines are clearly located within the immediate landscape context, they do not appear over-scaled or with any sense of overbearing. The primary source of visual conflict is the perceived proximity to the residences in the viewer context. This is partially mitigated by the vegetation visible between the viewpoint and T1, while T2 is locally obscured but still identifiable based on the visible extents of the blades and tower. Aesthetically, the proposed turbines are locally obscured, they rotate well above the midground landform and vegetation – with the exception of an established tree in the foreground. Although this is restricted to the viewpoint location rather than the wider lane, this is a fair representation of views which can be experienced in the surroundings through roadside and midground screening.	Moderate / Negative / Long term

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE	SIGNIFICANCE / QUALITY / DURATION OF IMPACT
			The mitigating factor is the distance and perspective given by the separation and consequent height of the turbines to one another, which serves to take some pressure off the transition between two different scale land uses. Overall, the turbines will generate a notable increase in the intensity of land use within the view, therefore the magnitude of visual impact is deemed High-medium .	
VP15	Termonbarry Lock This is a pleasant view, located on the banks of the Shannon at Termonbarry. The foreground is occupied by the Shannon itself, with the buoys and weir/lock the only built form across the middle of the view. The opposite shore is lined by vegetation before the landform rises slightly to reveal pasture and scattered residences. There are strong recreation, natural amenity and heritage values associated with the viewpoint and wider surrounds.	High-Medium	The proposed development will not be visible from here, screened by vegetation and landform; therefore, the magnitude of visual impact is Negligible by default.	Imperceptible / Neutral / Long Term
VP16	R194 at Carrickglass Demesne - Requested View This view was included to represent the historic setting and gates of Carrickglass Demesne along the R194. The road corridor is often enclosed by established vegetation typical of a demesne landscape, however this viewpoint was selected where large trees are set back from the road, scattered across pasture and around the historic walled garden (NIAH 13400913) and workers cottage (NIAH 13400911). The condition of the structure and surrounds imply this is not	Medium	The partial blade sets of both turbines are visible, although the lower section of both are screened by the established vegetation across the view. This same vegetation limits views to the wider landscape, resulting in some minor confusion as to the setting of the proposed development within the wider landscape. However, the same screening forms a visual barrier between the modern development and the historic features. In this context the proposed development is deemed to have a co-dominant to dominant visual presence. It should also be noted that the proposed development is viewed at right angles to the road corridor and therefore outside of the drivers primary field of view.	Moderate / Negative / Long term

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE	SIGNIFICANCE / QUALITY / DURATION OF IMPACT
	a highly frequented site or tourism feature, but rather a setting which adds elements of historic amenity to the wider context and local identity. The same can be said of the Manor Gates (NIAH 13401417) and Gate Lodge (NIAH 13401416) which are located on the opposite side of the road, 180 degrees to the depicted view.		Aesthetically, the proposed turbines present here in a clear and comprehensible manner. They are well spaced, with a minor scale difference through the additional distance T1, which serves to highlight the space between them. The main source of negative visual impacts are the lower sweep of the blades which appear to brush the surrounding vegetation. The proposed development will generate an increase in the scale and intensity of built development across the view, however, as above, the turbines are clearly separated from the viewer by the open foreground. Therefore, the magnitude of visual impact is deemed Medium .	
VP17	N4 at Camlin River, Longford Located along the N4, this is a fairly typical view from a main corridor across the midlands. The foreground and primary viewer experience is contained to the road corridor and hard shoulder, lined with screening vegetation. Beyond this, through the gap in vegetation over the Camlin River, the gently rolling terrain can be seen cloaked in a mix of pasture, with Corn Hill visible in the distance.	Medium-Low	Both turbines are visible at a moderate scale and proximity, rotating above the rolling river corridor and vegetation where they are viewed in silhouette against the sky. The proposed turbines are viewed here at a distance of c. 1.5km and will be a prominent feature where glimpsed by road users. The substation and BESS compound is screened by the conifer plantation in the middle ground. Whilst the proposed turbines will be a prominent feature of this view, they do not appear over-scaled or with any sense of overbearing. The staggered perspective between the two turbines highlights the generous spacing between them.. Importantly from this location, dense built form typical of a population centre is generally contained to the southwest of the N4, while the north features some scattered residences, it is generally defined by larger agricultural and forestry land uses. As such, the turbines join larger scale land uses across the periphery of a population centre, where they are considered to have a co-dominant to dominant visual presence. Aesthetically, the proposed turbines are viewed in a clear and comprehensible manner, where they rotate well above the	Moderate / Negative / Long term

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE	SIGNIFICANCE / QUALITY / DURATION OF IMPACT
			surrounding landscape. The proposed turbines present with even spacing characteristics with some sense of perspective in this relatively uncomplicated rural vista. Overall, whilst the turbines will generate a notable increase in the intensity of land use, they will not appear out of place in this larger land use context. On balance of the reasons outlined above, the magnitude of visual impact is deemed High-medium .	
VP18	R198 at Abbeycarton, Longford – Requested View This view is located within Longford, in the Architectural Conservation Area to the northwest of the town and was requested by the project archaeologist/heritage consultant. The view is enclosed by the established park-like surrounds and large houses. In the foreground the heritage and amenity values are compromised by roadworks, however these are a temporary feature and are accounted for as such in the assessment.	Medium	The proposed development will not be visible from here, screened by vegetation and built form; therefore, the magnitude of visual impact is Negligible by default.	Imperceptible / Neutral / Long Term
VP19	L1071 at Corraunaun, Longford Located across the rolling rural context of the east of Longford, occupied by lifestyle properties, the foreground features roadside hedgerows, partially screening the residential properties across the midground. There is some depth of view allowed to the north, however the ground plane and any sense of perspective is screened by the roadside hedgerow.	Medium-Low	Both turbines are visible above the hub, although the lower section of both are screened by the established vegetation and built form across the view. This same vegetation limits to the wider landscape, resulting in some ambiguity as to the setting of the proposed development within the wider landscape. With this considered, the proposed development is deemed to have a co-dominant visual presence, slightly mitigated by the set back from the viewer and road corridor. It should also be noted that the proposed development is viewed at right angles to the road corridor and therefore outside of the driver field of view, as such,	Moderate-slight / Negative / Long term

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE	SIGNIFICANCE / QUALITY / DURATION OF IMPACT
			the primary viewers are the local residents or those travelling at slower speeds. Aesthetically, the proposed turbines are viewed through a partially developed foreground, between residences. It is not an ideal scenario to have only partial views of blade sets rotating along the near-vegetated horizon, as this can generate a notable sense of visual ambiguity as to the actual location of the proposed turbines. In this instance, this sense of ambiguity is partially mitigated by the sense of distance and scale provided by the larger trees in the midground. In addition, the partially visible turbine blade sets will increase the intensity of development in the local landscape and generate some negative aesthetic effects. Therefore, on balance of the reasons outlined above, and in consideration of the more than 2km distance to the viewer, the magnitude of visual impact is deemed Medium-low.	11/12/2024
VP20	St Mel's Cathedral, Longford - Requested View This view was requested by the project archaeologist/heritage consultant. Located on the steps of St Mel's Cathedral, looking towards St Mel's College, the view is slightly elevated but contained by built form and established trees of the college.	Medium	Although the wireframe view indicates potential visibility, this is screened by the established trees surrounding the view. Where filtered or partial views are allowed, the visual impact will be mitigated by distance and the separation of the viewer setting and the proposed development. The main façade and plaza at St Mels faces south away from the wind farm where it will not be a consideration of the setting or views of/from St Mels. Therefore, the magnitude of visual impact is Negligible.	Imperceptible / Neutral / Long Term
VP21	L1127 at Aghafad, Longford This is an elevated, highly developed view looking across Longford from the south, representing the nearby scenic designation. While the foreground is occupied by the road corridor and GAA parking, the rolling	Medium	The proposed development can be viewed beyond and to the right of the main centre of Longford and St Mel's Cathedral, framing Corn Hill in the distance. The distance and visible intervening landscape serves to separate the turbines from the viewer context and perceptually place the turbines within the rural hinterland of Longford.. The proximity to the settlement is not a negative	Moderate-slight / Negative / Long term

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE	SIGNIFICANCE / QUALITY / DURATION OF IMPACT
	landform allows clear views to Corn Hill and St Mel's Cathedral. The horizontal extent of the view is limited by roadside vegetation and the slope of the landform behind the viewer (180 degrees to the depicted view), while the foreground is somewhat cluttered with power and phone lines.		association as the generation of energy is related to the consumption of it within population centres. At a distance of 4.4 km (T1), the proposed development is deemed to have a sub-dominant visual presence. Aesthetically, the turbines are well spaced and the clear visibility of T1 adds clarity to the scale and location of T2, which is partially screened by intervening built form. Therefore, the magnitude of impact is deemed Medium-Low.	11/12/2024
VP22	N4 at Edgeworthstown Located on the N4 at the outskirts of Edgeworthstown, this view is slightly elevated over surrounding landform to the north and west. Tree-lined hedgerows line the surrounding pasture, screening much of the surrounding landform and layering over the horizon.	Medium-Low	The proposed development will not be visible from here, screened by vegetation and landform; therefore, the magnitude of visual impact is Negligible by default.	Imperceptible / Neutral / Long Term
VP23	N63 at Royal Canal This view to the northeast from the N63 is afforded from a low rise in terrain along the Royal Canal embankment. The Canal Corridor itself is more enclosed, with a moderate to high degree of canal-side vegetative screening affording only glimpses of the farmed fields just beyond. In this instance there is a slight incline within the fields to the midground of the view, which contains longer distance visibility. The tree-lined hedgerow	Medium	While the proposed development is indicated to be visible in the wireframe view, the vegetation across the rolling surrounds provide additional screening. Although the canal bridge to the southwest of the viewer is slightly elevated relative to this viewpoint, it is fully obscured by canal side vegetation, as is the canal itself. The vegetation obscures potential visibility to such a degree that it is not discernible; therefore, the magnitude of visual impact is Negligible .	Imperceptible / Neutral / Long Term

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE	SIGNIFICANCE / QUALITY / DURATION OF IMPACT
	and residence across the ridgeline further screen the wider surrounds.			
VP24	Harbour Lane, Ballyleague This is an pleasant, open view in the context of Ballyleague & Lanesborough looking north-eastwards along the Shannon from harbour, slightly north of the main street bridge (N63). River-side moorings and a marina occupy the north-western bank of the river, whilst a less formal area of riparian vegetation occupies the other bank. Beyond a dense stand of trees in the fore-to-middle ground rises the significant profile of the Lanesborough power station – itself a locally iconic feature.	Medium	The proposed development will not be visible from here, screened by vegetation and landform; therefore, the magnitude of visual impact is Negligible by default.	Imperceptible / Neutral / Long Term
VP25	St Patrick's Church, Ardagh Village This is a pleasant village scene from the centre of Ardagh Village. There are glimpses to the surrounding landscape, which a generous overlay of heritage character in the cottages, demesne walls and church grounds. There is a strong sense of care with the manicured gardens and lawns, which add to the heritage and amenity values of the view.	High-Medium	The proposed development will not be visible from here, screened by vegetation and built form; therefore, the magnitude of visual impact is Negligible .	Imperceptible / Neutral / Long Term
VP26	L5209 at Lisduff This is a broad, elevated view from the Longford Designated View on Cartrongarrow Hill. The sloping ground in the foreground reveals long-distance views over a farmed and settled lowland landscape in the middle	Medium	The proposed turbines are located in the far middle ground of the view to the lefthand side of the Corn Hill. The tower, nacelle and full blade sets will be clearly visible, rising above the surrounding farmland and forestry. It will be a small but distinctive feature of the view and is likely to be noticed but not hold the viewers' attention and is deemed to have a sub-dominant visual presence in the context of this vast vista. The proposed turbines will be a	Slight / Negative / Long Term

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE	SIGNIFICANCE / QUALITY / DURATION OF IMPACT
	ground and into the distance. A low ridge and Corn Hill rises gently on the distant skyline.		new built feature within the view, but of a now familiar form in the wider rural context. The turbines will present unambiguously in this broad elevated view, and will become a minor visual node within the panorama of the lowland plane in which they stand. On balance, of the above reasons, the magnitude of visual impact is deemed to be Low .	
VP27	L1167 at Carrowroe This is a slightly elevated vista from a local road east of Lough Ree. In the foreground, the view extends over a series of fields contained in rough grazing and improved grassland that are defined by scrubby tree-lined hedgerows. A series of more mature broadleaf treelines merge together in perspective to create a dense band of vegetation across the eastern extents of the view. More open visibility is afforded to the northeast across lower field boundaries and the silhouette of Corn Hill can be seen in the far distance.	Medium	The proposed development will be partially visible over the intervening vegetation at a distance of 18km. The turbines are offset from Corn Hill, the one feature of the otherwise level horizon. Due to the distance and intervening vegetation, the proposed development is deemed to have a sub-dominant to minimal visual presence in the context of this vast vista. The turbines will present as a minor and distant built feature within the context of a broad and productive lowland setting where they do not appear out of place. On balance, of the above reasons, the magnitude of visual impact is deemed to be Low-negligible .	Slight-imperceptible / Negative / Long Term
VP28	L1136 at Mosstown Harbour This is a slightly elevated view along a short section of the Royal Canal at Mosstown Harbour, west of Keenagh. A small amenity area with picnic tables and a car park is contained in the lower foreground. The canal veers to the northwest at a distance of approximately 90m to the north where the viewing corridor is then truncated by canal-side vegetation.	Medium	The proposed development will not be visible from here, screened by vegetation and landform; therefore, the magnitude of visual impact is Negligible by default.	Imperceptible / Neutral / Long Term

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE	SIGNIFICANCE / QUALITY / DURATION OF IMPACT
VP29	Clonbalt Wood This is a contained, typical view from within the Clonbalt Wood residential area, to the north of Longfrod and the N4, accessed off the R198. The foreground is open across the public roadways, while the midground is partially occupied by a utility/rubbish area. The background and extent of view is shortened by two-story residences and the surrounding vegetation. The view is representative of the local residents.	Medium-Low	The proposed development will not be visible from here, screened by vegetation and built form; therefore, the magnitude of visual impact is Negligible.	Imperceptible / Neutral / Long Term

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APPENDIX 5.2

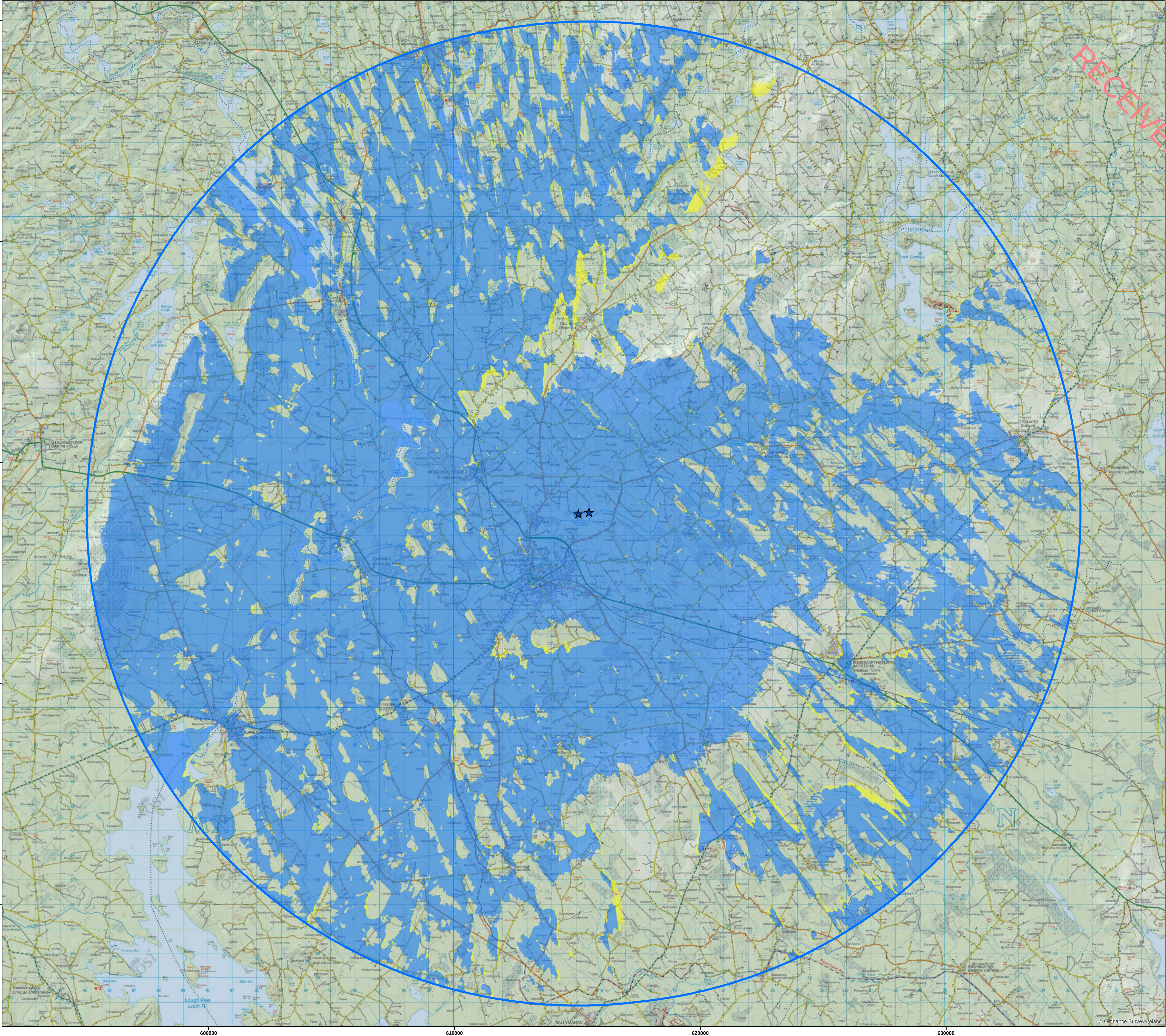
ZONE OF THEORETICAL VISIBILITY MAPS

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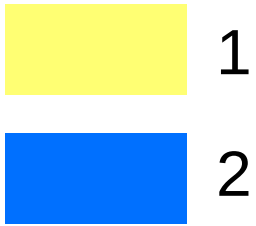
ZTV (Zone of Theoretical Visibility) indicating the areas that have a potential view of the proposed turbines at Cloonanny Wind Farm (Tip Height 200m)



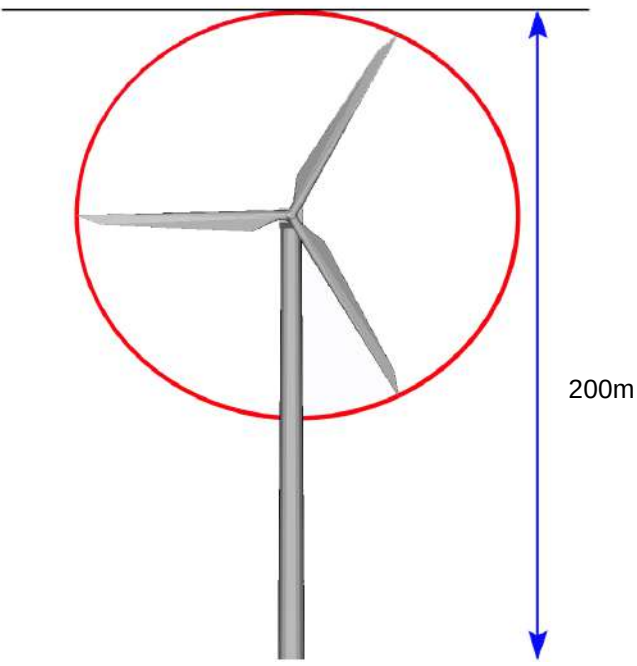
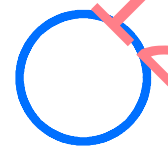
Proposed Turbines



No. Turbines Visible



20km Extent



This ZTV map is based on the potential to see any part of the proposed turbine/s from the tip to base in a theoretical bare-ground scenario i.e. without accounting for screening by vegetation and/or buildings.

Observer Height assumed: 1.7m to eye-level height
Tip Height: 200m

Scale: 1:75,000 if printed @ A1 size



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APPENDIX 6.1

Traffic and Transport Assessment

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APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DECEMBER 2024



Stephen Reid Consulting

Traffic and Transportation

RECEIVED: 20/12/2024

Proposed Windfarm at Cloonanny Glebe, Co Longford

Traffic and Transportation Assessment

Client: Natural Forces Renewable Energy 2 Limited

RECEIVED: 11/12/2024

Rev	Date	Purpose of Issue	Checked	Approved
-	18.09.2024	Initial Draft	SR	
1	26.09.2024	Final Draft for Review	SR	
2	24.11.2024	Revised Final Draft	SR	SR
3	03.12.2024	Final Issue for Planning	SR	SR

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Appendices

Appendix 1: Traffic Count Survey Data

Appendix 2: Traffic Flow Diagrams

1 INTRODUCTION

1.1 BACKGROUND

Stephen Reid Consulting Traffic and Transportation (SRC) has been retained by Natural Forces Renewable Energy 2 Limited (Natural Forces) to provide traffic consulting engineering services in relation to this project which relates to a planning application and associated EIAR, for the following:

A 10-year permission is being sought by the applicant for the development of a 14MW wind farm in the townland of Cloonanny Glebe, Co. Longford. The proposed development will have an operational lifespan of 35-years from the date of commissioning.

The wind farm location in the context of the surrounding area and road network in Co Longford is indicated in Figure 1.1.

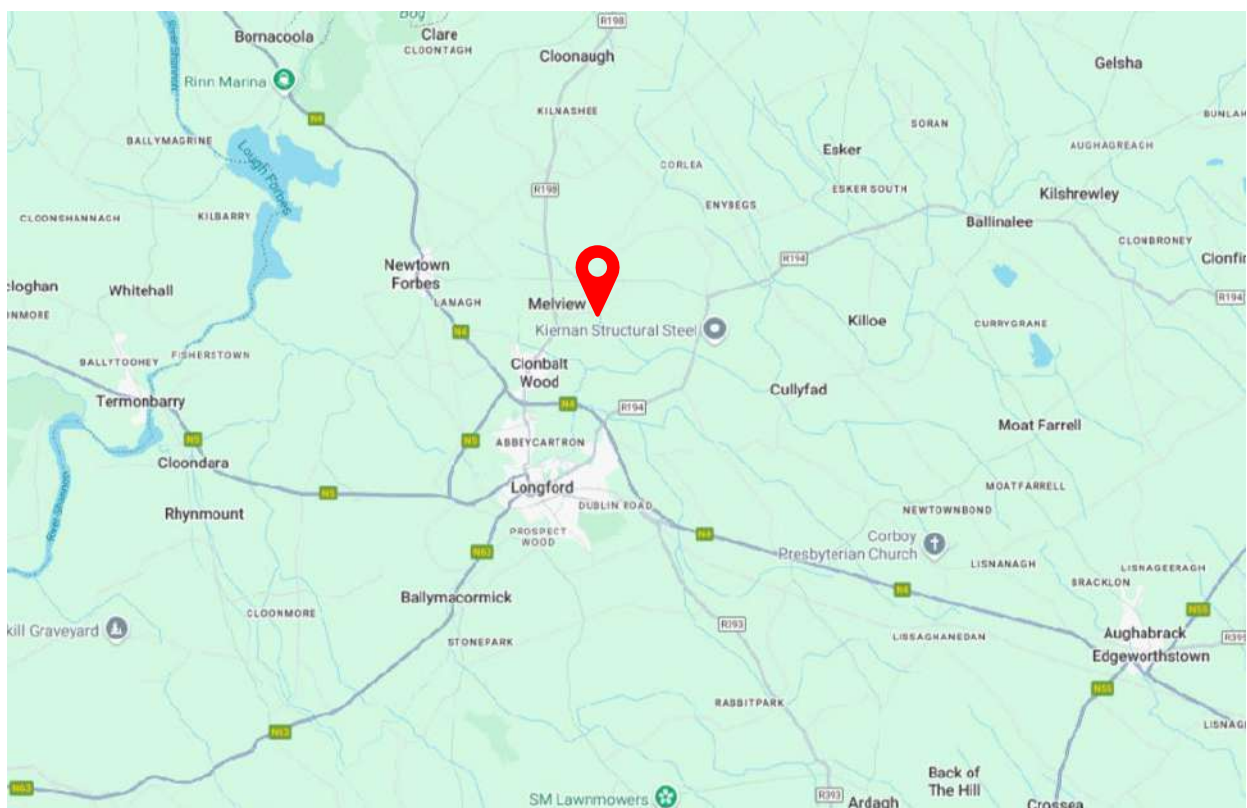


Figure 1.1: Wind Farm site, Cloonanny Glebe, Co Longford (source: google maps)

Chapter 16 of the County Development Plan 2021-2027 (Longford County Council) identifies under '16.2.5 Other Assessments' *"For certain developments due to the site location and or the type of development additional other assessments may be required as part of planning proposals"*. The list of assessments that may be required include Traffic & Transport Assessment (TTA)

The TII Guidelines for TTAs (PE-PDV-02045) provide a suggested format and headings for a TTA, noting that some elements may be less relevant depending on the proposals and receiving environment, set out as follows:

- *Non-Technical Summary*
- *Existing Conditions – Current traffic, critical links and junctions, committed transport proposals in area, other surrounding proposed development.*
- *Proposed Development – Size and use.*
- *Person Trip Generation – identifying the total person trips by all modes by peak and variation over days of week.*
- *Traffic Forecasting – methodology used, reason for the determination of growth rates applied.*
- *Modal Split – allocating the person trips to the modes of travel using an evidence based approach*
- *Trip Distribution – Catchment area, transfer trips, pass-by trips, combined trips.*
- *Trip Assignment – Turning movements at site entrance and at critical junctions in area.*
- *Assessment – Analytical assessment of the impact of the development proposals on the transport network should be presented.*
- *Road Impact – Analysis of junction capacity, including queue lengths and reserve capacity at base year, year of opening, year of opening plus 5 years and year of opening plus 15 years. Alternative designs for critical junctions should be detailed where necessary.*
- *Cumulative Impacts - Analysis of all committed developments in the area. Road Safety – Historical data, effect of development. Road Safety Impact Assessment (RSIA) and Road safety audit will be required for any proposed changes to the road layout in some circumstances.*
- *Environmental Impact – Including measures to mitigate impact.*
- *Internal Layout – Circulation, pedestrian routes, visibility and road width, traffic management and speed control measures.*
- *Parking – Numbers, special needs percentage, layout, and service areas.*
- *Public Transport – Provision, access from site.*
- *Pedestrians / Cyclists – Accessing the site, routes through the site and cycle parking. Accessibility and Integration – Access to local area, community severance.*
- *Access for People with Disabilities – Any specific provisions.*
- *Mitigation – Range of solutions to reducing transport impact of the proposal.”*

In the case of this development proposal, the assessment will focus on the impact of the traffic generated by the construction of the Wind Farm (materials deliveries, construction worker travel to/from the sites and impacts on the haulage/delivery route road network including temporary measures such as easing bends and temporary haul roads to address geometry constraints for abnormal/long load deliveries such as turbine blades and tower sections).

It should be noted that the actual delivery of these outsize/abnormal loads will be under controlled conditions with escort vehicles and temporary traffic management/temporary closure of sections of roads on the delivery access route to mitigate risk to construction staff, delivery drivers and other road users. These will be infrequent activities during the overall construction programme, with movements by road occurring in lower traffic periods of the day to minimise impact and disruption to public road traffic and the general amenity of the area.

When construction and commissioning works are completed, the day-to-day level of vehicular traffic generated on the road network by the two proposed wind energy generators (the turbines) and the substation will be negligible, relating only to occasional maintenance/periodic inspections, with staff accessing the site by van. The location and safety of the access to the completed site has also been considered for post-construction ‘operational’ stage.

2 NON-TECHNICAL SUMMARY

Application

The application is for a ten-year permission for development on lands measuring 17.28ha located at the L5046 and L50462 in the townlands of Cloonanny Glebe, Corragarrow, Derryharrow and Gorteenorna, Co. Longford.

The proposed development will consist of the following:

- i. Demolition of a single-storey derelict shed structure (c. 93 sqm GFA) to facilitate the turbine haul route
- ii. Construction of two E175 EP5 wind energy converters, each with an electrical rating of 7MW, an overall ground-to-blade tip height of 199.9 metres, a rotor blade diameter of 175 metres, hub height of 112.4 metres, associated foundations and hard-standing areas;
- iii. Construction of an 800m permanent internal site access road which will run from the L50462 to the wind energy converter hardstanding areas including a 9.1m clear span bridge crossing a local stream;
- iv. Construction of 1 No. meteorological mast with a height of 32 metres, associated foundation and hardstanding area;
- v. Construction of 1 No. 20kV Substation Compound comprising 2 No. Modular Buildings each measuring 13.5 sqm in area and 3.5m in height, a Battery Energy Storage System (BESS) comprising 3 storage modules on reinforced concrete plinths, with a height of 2.8 metres and associated electrical works, foundation and hardstanding area;
- vi. Temporary alterations to the L5046 and L50462 public roads and temporary access roads to facilitate the turbine component haul route, including temporary widening of sections of the L5046 and L50462.
- vii. Installation of underground collector circuit and communications cabling in underground cable trenches, from the proposed wind energy converter to the proposed on-site substation;
- viii. All associated and ancillary site development, excavation, construction, and reinstatement works, including the provision of a temporary construction compound, site drainage, spoil management, fencing, lighting, hedge and tree trimming and cutting and operational maintenance;
- ix. This application is seeking a 35- year operational life from the date of commissioning of the entire wind farm.

Current Vehicle Access

Cloonanny Glebe is a rural townland and is located approximately 3km to the northeast of Longford town centre. The key roads are identified in Figure 2.1 and described below.

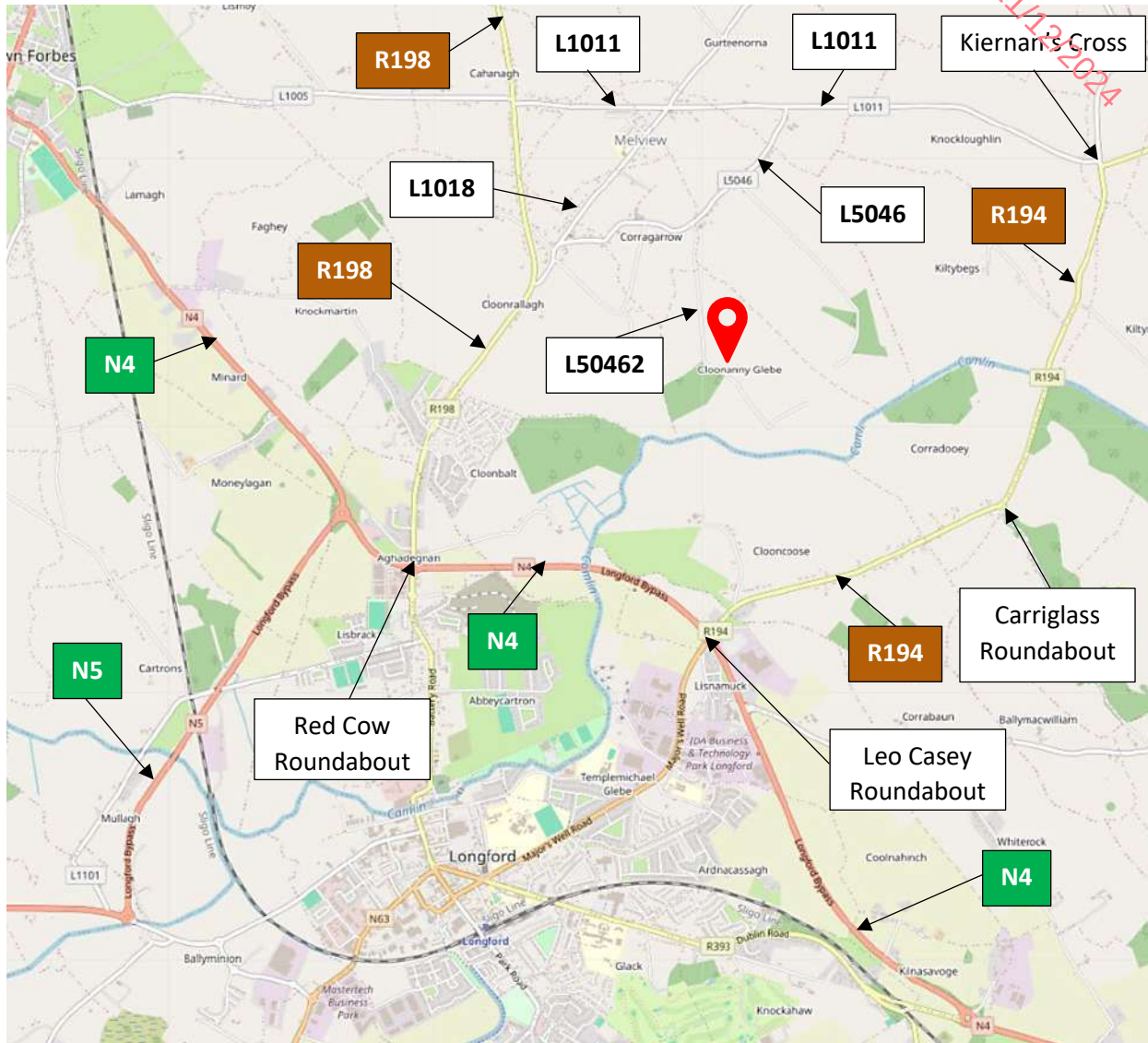


Figure 2.1: Site Location at Cloonanny Glebe and Surrounding Road Network, Co Longford
(source: Openrouteservice.org, 2024)

The site area is accessed via the L50462, which is a narrow laneway extending southwards for just over 1km from the L5046 local road. There are no dwellings or farm buildings noted along the L50462 and it is only used for infrequent agricultural vehicle access to several field gates (there is grass growing along the centre of the road between the wheel track zones and it is not suitable for frequent two-way vehicular traffic, with passing opportunities limited to localised widening at field gate accesses).

The L5046 connects with the L1011 to the north east of the L50462 junction, and also connects with the L1018 to the south west of the L50462 junction. The typical cross-section of the L5046 road ranges between 4m and 5m with some areas of localised widening at agricultural yards or dwelling frontages. The section of the L5046 road to the southwest of the L50462 junction could be described a 'sinuous'

with a series of bends in the alignment, while the section of the L5046 to the northeast of the junction and the L1011 is generally straighter with only minor bends in the alignment.

The northern end of the L5046 intersects with the L1011, which traverses the area in a generally east-west orientation, linking the R198 at its western end and the R194 at its eastern end, via the skewed cross roads with the L1018 at Melview. The R194 junction (Kiernan's Cross) is located 1.75km to the east of L5046 junction.

The R194 regional road extends northeastward from the N4 and Longford town to Ballinalee, and continues in a generally eastwards heading, intersecting with the N55 at Granard before continuing onto Co Cavan. The N4 is approximately 3.7km by road from Kiernan's Cross.

To the west of the Cloonanny Glebe/Melview area, the L1018 connects to the R198, southwest of the L5046 junction. The R198 extends northwards from Longford Town to Drumlish and then northeastwards into Co Cavan at Arvagh.

Current Use

The application site comprises agricultural lands. The surrounding area is generally rural with individual or small clusters of dwellings and agricultural buildings along the L5046, L1011, R198 and R194.

There are larger residential estates located adjacent to either side of the R194 at Clonbalt, to the north of the N4 junction, with dedicated right turn storage lanes at the grouped access junctions.

Melview National School is located to the south west of the L1011/LL1018 junction.

Existing Traffic Volumes

Automatic Traffic Counters (ATCs) were installed on the R198, L1011 (east of the R198), L1011 (west of the R194), and the R194, from Friday 26th April 2024 to provide 7 continuous days of flow and speed data for the road (a virtual week).

These counts determined the existing network weekday morning and evening peak hours occur at 08.00-09.00 and 17.00-18.00.

The baseline 2024 average daily traffic volumes and HGV content on each of the road links from this data is as follows.

- R198 (north of N4) = 7,417 vehicles (ADT) with 3.56% HGV
- L1011 (east of R198) = 885 vehicles (ADT), with 3.45% HGV
- L1011 (west of R194 Kiernan's Cross – (Haul delivery Node 205-206) = 1,386 vehicles (ADT), with 4.44% HGV
- R194 (south west of Carrickglass roundabout - Haul delivery Node 202-203) = 4,994 vehicles (ADT) with 3.22% HGV

In addition to the ATC data collected at the four sites, the TII traffic counter website was also reviewed as there is a Permanent Traffic Counter site on the east section of the N4 Longford Bypass (site ID: TMU N04 110.0 W), which relates to Haul delivery Node 201-202. This identified an ADT of 13,788 vehicles, with 9.80% HGV.

Proposed Development Access

There are a number of locations where there will be temporary works to facilitate the large item deliveries (turbine blades and tower sections), which typically result in a stone area to the side of an existing public road where there are bends in the horizontal alignment or a turn from one section of the road network onto another, to allow for the swept path envelope of the long delivery vehicle. A section of the L50462 will also be temporarily widened from 3m to 5m to accommodate two-way traffic.

These sections will be reinstated and returned to current use (typically farming land and hedgerow/field boundary) following completion of the delivery stage of the wind generator equipment).

The project also includes construction of an 800m permanent internal site access road which will run from the L50462 to the wind energy converter hardstanding areas including a 9.1m clear span bridge crossing a local stream.

Proposed Traffic Volumes

The 'Do Something' traffic volumes will relate primarily to the construction Phases of the windfarm development, being a mix of construction staff commuting to/from the site and materials deliveries. Following completion of the construction there will be a reduced level of staff on site for commissioning and then during the operational life of the windfarm it is expected there will be a negligible level of traffic activity (limited to occasional maintenance access by vans or cars).

Therefore, the focus is on the construction period (estimated to be from 2026-2028) with a peak of daily activity during 2027 (across months 12-16).

Development Impact

The proposed construction would not be expected to result in any significant detrimental impacts on traffic link flow or Level of Service (LOS) capacity or impacts on operational capacity of the key road network on a day to day basis during the construction period, with the infrequent, scheduled abnormal load delivery operations typically undertaken out-of-hours under escort with An Garda Siochana temporary control/closure of roads while the turbine components are transported on sections of the public road network.

Other Planned/Committed Developments

A detailed review of planning applications in the project area and surrounding County area has been undertaken to determine possible cumulative impacts on the road network during construction.

It is noted from that review that there are no current permitted projects which are likely to have a material impact on the traffic volumes on the proposed delivery haul route via the R194, L1011 and L5046, with only domestic dwelling related permissions within 1.5km of the wind farm site.

There is a grant of permission for continuance of a quarry at Killoe, 4.5km to the northwest of the Cloonanny site, but it is considered that this would maintain the existing operations at that location and would therefore be no change to the 2024 baseline traffic flows in the receiving road network.

There is a proposed N4 Upgrade scheme 'Mullingar to Longford (Roosky)' which has an emerging preferred route corridor to the south of the wind farm site, and it is noted that the underground grid connection route proposed all pass across the 300m route corridor zone.

Depending on the progress and timeframe for implementing the wind farm and road upgrade projects, a detailed assessment will be undertaken prior to commencing works to ensure the selected grid connection route can be implemented without impacting on the delivery of the N4 upgrade project.

Measures to Improve Sustainability

Where excavated material can be reused within the construction site areas this would be stored and reused to reduce volume of material brought to landfill elsewhere.

It is noted that the number of construction staff will peak at approximately 25 persons at the main windfarm and substation worksite, and having regard to the rural location of the worksite, opportunities for work commuting travel by modes other than private car or van are limited, although it is expected that construction site staff based in the local area (either resident or living there temporarily) will tend to carpool/share journeys where practical to do this.

3 SITE LOCATION & EXISTING CONDITIONS

3.1 GENERAL

The proposed windfarm site at Cloonanny Glebe and the surrounding lands to the north east of Longford town are illustrated in Figure 3.1. The site has an area of approximately 16.69 hectares (ha) and comprises a number of private land parcels

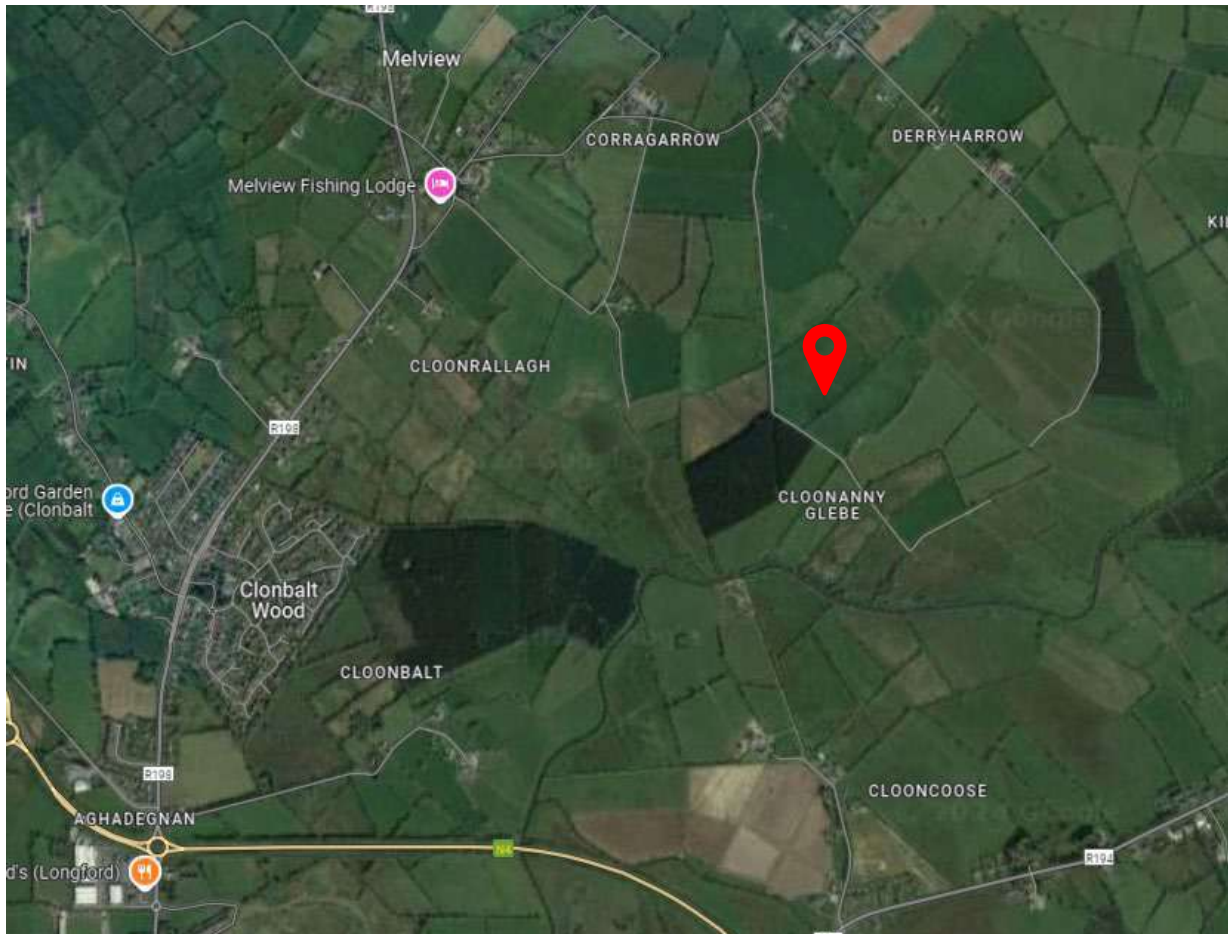


Figure 3.1: Existing Cloonanny Glebe Lands and Surrounding Uses, Co Longford
(source: google.ie/maps)

3.2 RECEIVING ENVIRONMENT – EXISTING LAND USE, ROAD NETWORK AND ACCESSIBILITY

Existing Land Use

Cloonanny Glebe is a rural townland and is located approximately 3km to the northeast of Longford town centre.

The application site comprises agricultural lands. The surrounding area is generally rural with individual or small clusters of dwellings and agricultural buildings along the L5046, L1011, R198 and R194.

There are larger residential estates located adjacent to either side of the R194 at Clonbalt, to the north of the N4 junction, with dedicated right turn storage lanes at the grouped access junctions.

Melview National School is located to the south west of the L1011/LL1018 junction.

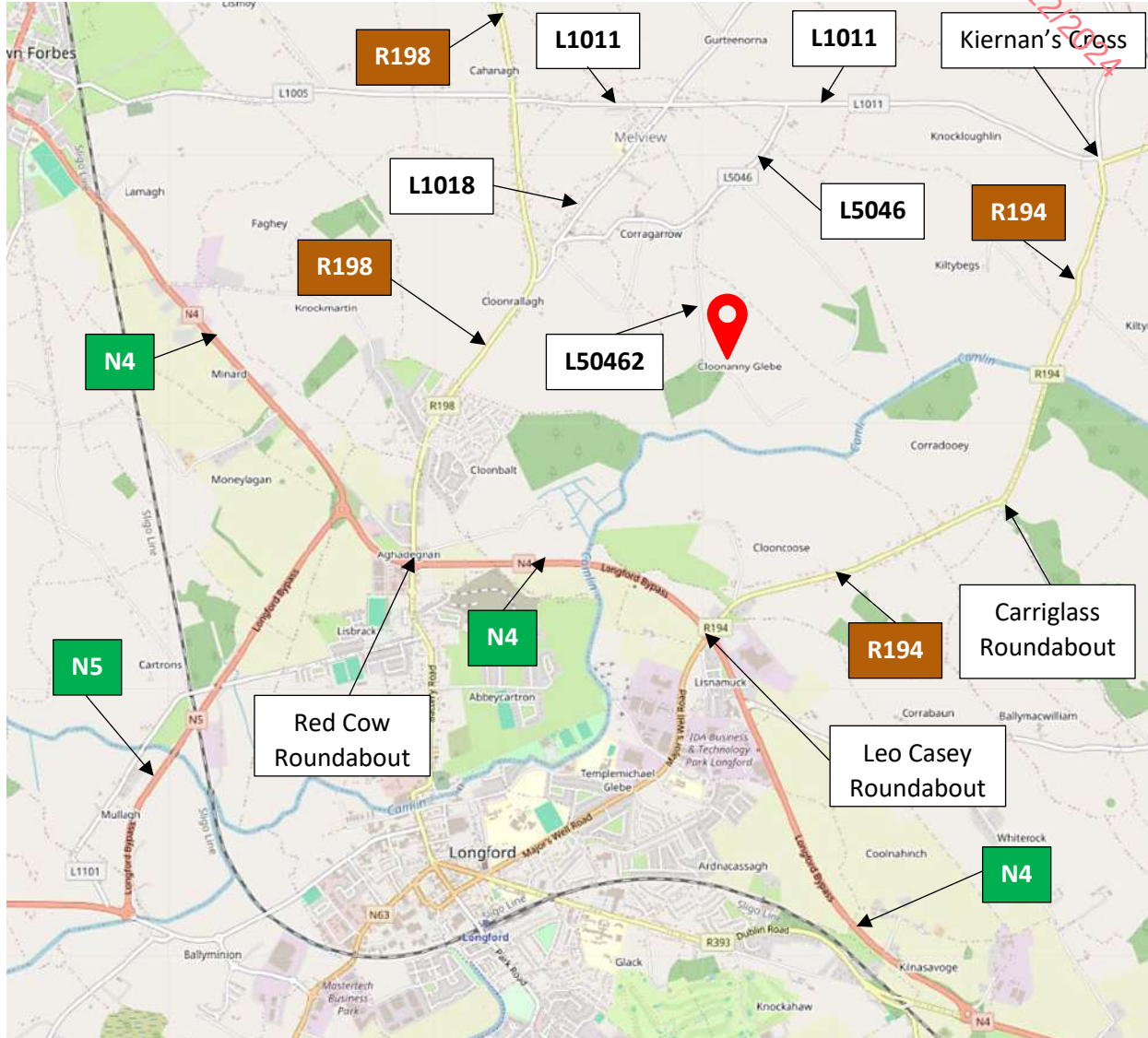


Figure 3.2: Site Location in context of Existing Road Network (source: Openrouteservice.org, 2024)

Road Network and Existing Access

L50462:

The site area is accessed via the L50462, which is a narrow laneway extending southwards for just over 1km from the L5046 local road. There are no dwellings or farm buildings noted along the L50462 and it is only used for infrequent agricultural vehicle access to several field gates (there is grass growing along the centre of the road between the wheel track zones and it is not suitable for frequent two-way vehicular traffic, with passing opportunities limited to localised widening at field gate accesses).

L5046:

The L5046 connects with the L1011 to the north east of the L50462 junction, approximately 830m measured by road, and also connects with the L1018 to the south west of the L50462 junction, approximately 775m measured by road.

The typical cross-section of the L5046 road ranges between 4m and 5m with some areas of localised widening at agricultural yards or dwelling frontages. The section of the road to the southwest of the L50462 junction could be described a 'sinuous' with a series of bends in the alignment, while the section between the junction and the L1011 is generally straighter with only minor bends in the alignment.

L1011:

The northern end of the L5046 intersects with the L1011, which traverses the area in a generally east-west orientation, linking the R198 at its western end and the R194 at its eastern end, via the skewed cross roads with the L1018 at Melview. The R194 junction (Kiernan's Cross) is located 1.75km to the east of L5046 junction (distance measured by road).

R194:

The R194 regional road extends northeastward from the Leo Casey Roundabout, connecting Longford town and the N4 Longford Bypass to Ballinallee, and then continues in a generally eastwards heading, intersecting with the N55 at Granard before continuing onto Co Cavan. The Leo Casey Roundabout is approximately 3.7km by road from Kiernan's Cross.

The fourth arm of this 60m outer diameter roundabout connects to Longford town centre via the N63 (the Majors Well/Ballinallee Road), entering the town centre area at St Mel's Cathedral.

Approximately 1.75km from the N4 junction there is a four arm roundabout on the R194 at Carrickglass (one arm is the access to the former Carrig Glas Golf Resort). This is a compact roundabout with a 27.5m outer diameter and a central roundabout with a concrete apron for longer HGV overrun.

L1018:

To the west of the Cloonanny Glebe/Melview area, the L1018 connects to the R198, 250m from the L5046 junction.

R198:

The R198 extends northwards from Longford Town to Drumlish and then northeastwards into Co Cavan at Arvagh. Approaching the L1018 from the south, the R198 has a right turn storage lane (ghost island hatching).

The R198 intersects with the N4 Longford Bypass at the 'Red Cow' Roundabout, 1.7km to the south of the L1018 junction.

N4 Longford Bypass:

The N4 Bypass continues northwestwards from this 60m outer diameter roundabout to the Charlotte Brooke Roundabout, where the N5 section of the Longford Bypass terminates, with the N4 continuing northwestwards to Sligo., via Newton Forbes and Carrick on Shannon. The N5 extends westerly via Co Roscommon to Castlebar in Co Mayo.

The N4 is typically a two-lane wide single carriageway with hard shoulders (total cross section width of 13m-14m), while the R198 is a two lane single carriageway with narrower sections of hard shoulder/edge of carriageway markings (typical cross-section width of 6.5m-7m). The L1011 is a two-lane single carriageway with a typical cross-section width of 5.75m-6.5m).

Current Traffic Speeds/Speed Limits:

The R194 is currently subject to a 50 km/h speed limit from the N4 roundabout for a distance of approximately 330m, before increasing to a 60 km/h limit, which extends to a point approximately 100m to the northeast of the Carrickglass roundabout, and then to a 80km/h speed limit from there. It is noted from speed survey data collected in April 2024 on the 60km/h section to the southwest of the Carrickglass roundabout that the 85th percentile speed of traffic on the R198 is 79.6 km/h (in excess of the current 60 km/h limit on that section of the road).

The R198 is currently subject to a 50 km/h speed limit from the N4 roundabout for a distance of approximately 1km, before increasing to a 60 km/h limit, which extends to a point approximately 100m to the southwest of the L1018 junction, and then to a 80km/h speed limit from there. It is noted from speed survey data collected in April 2024 on the 60km/h section to the southwest of the 60/80 speed limit change that the 85th percentile speed of traffic on the R198 is 80.6 km/h (in excess of the current 60 km/h limit on that section of the road).

The April 2024 speed survey data for the L1011 (node 205-206), to the west of the R194 junction identified an 85th percentile speed of the is 88.5km/h, which is above the posted speed limit of 80km/h, although it is noted this route will have to be reduced to a default rural L-road speed limit of 60km/h as part of the speed limit review which LCC are to have in place by end of 2024.

As the Cloonanny Glebe site is in a rural area there are no footpaths or street lighting provisions along the local roads. There are some sections of footpath and streetlighting on the R194 (near the N4 junction) and the R198 has footpath provision from the N4 to the 60/80 speed limit change and streetlighting to the L1018 junction.

3.3 EXISTING TRAFFIC VOLUMES

Automatic Traffic Counters (ATCs) were installed on the R198, the L1011 (east of the R198) and L1011 (west of the R194), and the R194, from Friday 26th April 2024 to provide 7 continuous days of flow and speed data for the road (a virtual week).

The counter locations are illustrated in Figure 3.2.

The full data outputs are at Appendix 1 of this TTA.



Figure 3.2: April 2024 Traffic Counter Locations (source: google.ie/maps)

These counts determined the existing network weekday peak hours occur at 08.00-09.00 and 17.00-18.00 (which is to be expected as these coincide with commuter traffic to/from Longford town).

The average daily traffic (ADT) two-way total volumes and HGV content on each of the road links are as follows:

- (1) R198 (north of N4) = 7,417 vehicles (ADT) with 3.56% HGV
- (2) L1011 (east of R198) = 885 vehicles (ADT), with 3.45% HGV
- (3) L1011 (west of R194 Kiernan's Cross – (Haul delivery Node 205-206) = 1,386 vehicles (ADT), with 4.44% HGV
- (4) R194 (south west of Carrickglass roundabout - Haul delivery Node 202-203) = 4,994 vehicles (ADT) with 3.22% HGV

In addition to the ATC data collected at the four sites, the TII traffic counter website was also reviewed as there is a Permanent Traffic Counter site on the east section of the N4 Longford Bypass (site ID: TMU N04 110.0 W), which relates to Haul delivery Node 201-202.

This identified an ADT of 13,788 vehicles, with 9.80% HGV for the same 7-day period commencing 26th April 2024.

A review of the same site in September 2024 (after the summer schools break) confirmed a similar average daily traffic volume, and therefore the April/May 2024 data collected at the 4 ATC sites is considered to be robust and appropriate as a baseline set of data for this TTA.

4 PROPOSED DEVELOPMENT

4.1 GENERAL

The application is for a ten-year permission for development on lands measuring 17.28ha located at the L5046 and L50462 in the townlands of Cloonanny Glebe, Corragarrow, Derryharrow and Gorteenorna, Co. Longford.

The proposed development will consist of the following:

- i. Demolition of a single-storey derelict shed structure (c. 93 sqm GFA) to facilitate the turbine haul route
- ii. Construction of two E175 EP5 wind energy converters, each with an electrical rating of 7MW, an overall ground-to-blade tip height of 199.9 metres, a rotor blade diameter of 175 metres, hub height of 112.4 metres, associated foundations and hard-standing areas;
- iii. Construction of an 800m permanent internal site access road which will run from the L50462 to the wind energy converter hardstanding areas including a 9.1m clear span bridge crossing a local stream;
- iv. Construction of 1 No. meteorological mast with a height of 32 metres, associated foundation and hardstanding area;
- v. Construction of 1 No. 20kV Substation Compound comprising 2 No. Modular Buildings each measuring 13.5 sqm in area and 3.5m in height, a Battery Energy Storage System (BESS) comprising 3 storage modules on reinforced concrete plinths, with a height of 2.8 metres and associated electrical works, foundation and hardstanding area;
- vi. Temporary alterations to the L5046 and L50462 public roads and temporary access roads to facilitate the turbine component haul route, including temporary widening of sections of the L5046 and L50462.
- vii. Installation of underground collector circuit and communications cabling in underground cable trenches, from the proposed wind energy converter to the proposed on-site substation;
- viii. All associated and ancillary site development, excavation, construction, and reinstatement works, including the provision of a temporary construction compound, site drainage, spoil management, fencing, lighting, hedge and tree trimming and cutting and operational maintenance;
- ix. This application is seeking a 35- year operational life from the date of commissioning of the entire wind farm.

4.2 CONSTRUCTION PROGRAMME

The Mable Construction and Environmental Plan (CEMP) provides a detailed breakdown of the construction activities and duration.

At the time of preparing this report, it is expected construction of the development will take approximately 24 months from starting on-site to final commissioning of the Wind Turbines.

All vegetation clearance that is required for the construction works will be undertaken outside of the bird breeding season, which runs from the 1st of March to the 31st of August. To comply with this requirement a section of the initial Civil Engineering Works may be carried out as advance enabling works in the months from September to February. Table 4-1 below details the works in a number of key phases.

Phase	Activity	Estimated Duration
1	Detailed Design Stage – For Construction - Detailed Civil, Structural and Electrical Design Works - Planning Compliance Works - Environmental Compliance Works - Pre-Construction Surveys	6 months
2	Civil Engineering Enabling Works - Setting out site boundaries - Tree and hedge cutting - Site entrance works to create access - Temporary Construction Compound - Advance drainage works and silt control measures	2 months
3	Civil Engineering Main Site Works - Upgrade and Widening of Public Road in Vicinity of Site - Access Road Construction - Crane Hardstand Construction - Drainage Works - Initial Reinstatement Works (Pre-Turbine Delivery) - Final Reinstatement Works (Post-Turbine Delivery)	10 months (Pre-Turbine Delivery) 2 months (Post-Turbine Delivery)
4	Structural Engineering Works - Wind Turbine Foundation Construction - Met Mast Foundation Construction - Substation Construction - BESS Construction	5 months
5	Turbine Circuit Connector Ducting and Cabling	2 months
6	Turbine Delivery Route Works	2 months
7	Turbine Delivery, Erection and Commissioning	6 months
8	Site Electrical Works - Employer (IPP) Electrical Installations & Commissioning - ESB Networks Electrical Installations & Commissioning	4 months
9	Grid Connection Works - Ducting Works - Cable Installation Works - Final Connection Works in ESB Substation	5 months
10	Wind Farm Final Commissioning	1 month
Total Duration on Site (Some Phases will be carried out in parallel)		24 months

Table 4.1: Phasing and Construction Programme for Wind Farm (source: Mable Engineering)

As noted above some of these construction phases will run in parallel. This is illustrated by the Gantt Chart reproduced from the Mable CEMP.

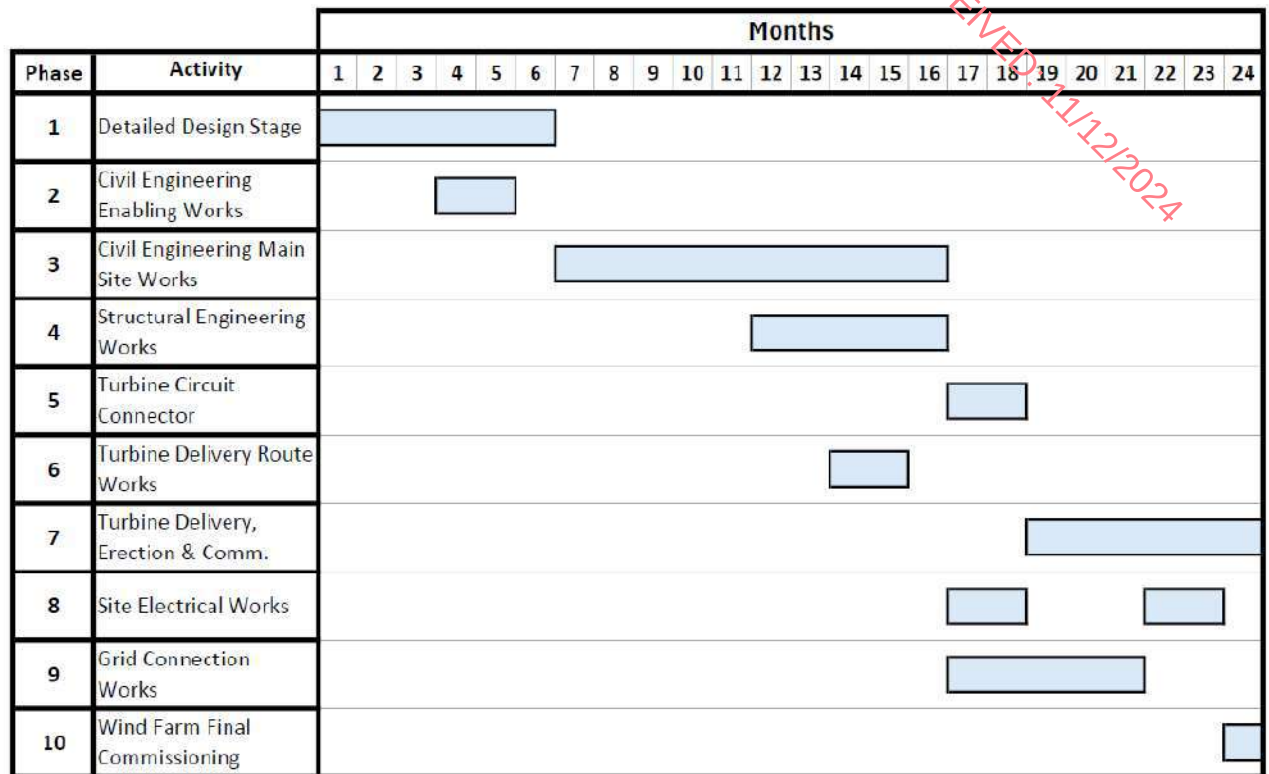


Figure 4.1: Gantt Chart showing Construction Phasing for Wind Farm (source: Mable Engineering)

The hours of construction activity will be limited to avoid unsociable hours, where possible. Construction operations shall generally be restricted to between 07:00hrs and 19:00hrs on weekdays and between 07:00hrs and 14:00hrs on Saturdays.

However, to ensure that optimal use is made of good weather periods or at critical periods within the programme (i.e., concrete pours or to accommodate delivery of large turbine components along public routes), it may be necessary on occasion to work outside of these hours. Any such out of hours work will be agreed in advance with LCC and there will be advance warning published through the LCC website, local media/social media and with VMS on the affected routes.

Based on information from similar previous projects, it is anticipated that approximately 25 persons will be directly employed during peak construction activities on the wind farm site with 5 persons directly employed during the grid connection works.

Therefore, the day-to-day construction staff traffic generated by the main windfarm site during the two year build period will not be significant.

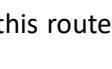
existing roads or lands adjacent to the road (e.g., right-of-way, easement, or over sections), which typically are not part of the road. The road is an existing public road which

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At construction stage a transportation plan will be prepared by the Wind Turbine component delivery company. Permits for moving the abnormal loads on the public roads to the Wind Farm site will be obtained from An Garda Síochána and the applicable local authorities on the selected haulage route.

The selected haulage route from Belview to the Cloonanny site is 280km, and is summarised as follows:

- Starting at Belview Port;
- N29 (via Slieverue Roundabout and Luffany Roundabout) to the N25 Waterford City Bypass;
- N25 to N9;
- N9 National Road to M9 Motorway;
- M9 Motorway and Merge onto M7 Motorway;
- Continue on M7 Motorway to N7 National Road;
- N7 National Road and merge onto northbound M50 Motorway at Junction 9;
- At M50 junction 7 exit onto N4 National Road;
- N4 National Road to M4 Motorway;
- M4 Motorway to N4 National Road;
- Exit N4 National Road onto R194 Regional Road (at Leo Casey Roundabout);
- Turn left at Kiernans cross junction onto the L1011;
- Turn left onto L5046;
- Turn left onto L50462;

The swept path assessment carried out by Mable has informed both the delivery route from the N4 and the temporary land take.

These sections will be reinstated and returned to current use (typically farming land and hedgerow/field boundary) following completion of the delivery stage of the wind generator equipment).

The temporary areas will be barriered off so that they cannot be accessed by general traffic or other road users and the barriers will be repositioned suitably by the TTM and escort vehicle staff at times when the areas are required to accommodate the swept path envelopes of long/abnormal load vehicles delivering to the windfarm site and staging areas.

There are 2 No. proposed permanent site entrances off the L50462; one leading to the Substation and Meteorological Mast (on the western side of the laneway), and one leading to Wind Turbines T1 and T2 (located to the south east side of the road).

There are 2 No. proposed temporary site entrances; one off the local road L5046 and one off the L50462. Both site entrances are for the proposed abnormal load temporary access road located to the west of the L5046/ L50462 junction. The L50462 entrance will also serve as the entrance to the Temporary Construction Compound. Both temporary site entrances will be removed, and the areas reinstated on completion of the Wind Turbine deliveries. These entrances are shown on the Mable planning drawings.

On the L50462 the existing width of 3m is to be increased to 5m by installing a 2m wide stoned area with a Clause 804 capping finish, along the west side of the road, to accommodate two-way vehicle access, with passing bay areas located

The project also includes construction of an 800m permanent internal site access road which will run from the L50462 to the wind energy converter hardstanding areas including a 9.1m clear span bridge crossing a local stream.

The temporary arrangement of the access roads and hard standing/compound areas along the L50462 to the south of the L5046 during the construction phase can be seen on Mable Series 100 drawings, while the permanent arrangement including the 800m long 5m internal roadway servicing the two energy converter sites is on Mable Series 120 drawings.

By providing a relocated vehicle access route during construction, the existing section of the L50462 to the south of the L5046 can be retained as a non-traffic route to accommodate walkers and cyclists, separating them from vehicular traffic movements, particularly HGV construction traffic.

The hedge/boundary treatment at the access from the L50462 to the internal access road will accommodate exit visibility sightlines for vehicle traffic exiting from the site to the L50462 in the operational period after completion of the construction works.

5 TRAFFIC GENERATION OF PROPOSAL

5.1 TRIP GENERATION METHODOLOGY

As noted in section 4, the peak of construction activity will result in 25 construction staff on the wind farm and associated site accessed off the L50462, and therefore the day-to-day traffic generated by commuting staff will be low. As staff will generally start between 07.00 and 08.00 each working day, and finish between 18.00 and 19.00 each working day, they will be travelling on the local road network prior to the AM peak hour and after the PM peak hour, at times when background flows are typically much lower than the peak hour volumes.

Staff arriving to work will park in the compound at the wind farm site and will not park on the public roads in the area of the wind farm site or at temporary works areas. Staff working at temporary works areas will travel from the main compound to these sites using a contractor vehicle (i.e. a van or small flatbed truck) which will be parked within the temporary works area so that it does not impact on road users on the public road.

As part of construction of the proposed development, a significant amount of stone and aggregate fill material will be required. This will be used to construct Wind Turbine Foundation Formations, Substation Compound, Access Roads, Hardstands and Construction Compounds. Table 4-2 of the Mable CEMP contains estimates of the stone fill material requirements at the various main infrastructure locations, which will total 10,260 cubic metres.

Stone and aggregate fill will be delivered to site via ridged and articulated tipper lorries. The peak period for stone and aggregate fill deliveries will be during internal access road construction. During this period there will be up to 5 deliveries to site per hour for a period of approximately 1 week. Outside this period there will be up to 10 deliveries of stone and aggregates to site per day.

Infrastructure	Material Requirements (m ³)
Access Roads	6500
Substation Compound	55
Temporary Construction Compound	315
Turbine Hardstand	1590
Turbine Foundations	1200
Cable Trench	600
Total	10260

Extract of Table 4-2 from Mable CEMP with estimated volumes of stone required

Table 4-3 of the Mable CEMP noted that there will be an estimated 15,298 cubic metres of topsoil and 13,136 cubic metres of subsoil excavated at the site to create the formation levels, based on site investigation data on the suitability and bearing capacity of the substrata.

The strategy is for all excavated material generated during construction to be retained on site and, where appropriate, incorporated into the works. Upon completion of the construction works, all remaining excavated material will be integrated into the final landscaping, blending seamlessly with the existing terrain to avoid leaving any mounds of spoil around the site.

The quantity of turbine components required for the Cloonanny project are set out in Table 4-5 of the Mable CEMP (see extract below):

Turbine Component	Number Per Turbine	Number of Turbines	Total Number	Weight (ton)	Dimensions (m)
Generator Half Section: 12h	1	2	2	71	10.38 x 4.99 x 2.6
Generator Half Section: 6h	1	2	2	71	10.38 x 4.99 x 2.3
Main Bearing Unit	1	2	2	30	4 x 3.66 x 2.86
Nacelle	1	2	2	76.8	14.25 x 4.99 x 3.44
Rotor Hub	1	2	2	51.6	4.9 x 4.55 x 3.95
Rotor Blade	3	2	6	31.8	87.53 x 4.09 x 3.88
Tower Section 1	1	2	2	70.4	32 x 4.9 x 5.05
Tower Section 2	1	2	2	78.3	28.75 x 4.9 x 5.05
Tower Section 3	1	2	2	76.9	21.07 x 4.91 x 5.06
Tower Section 4	1	2	2	77.5	15.35 x 4.92 x 5.07
Tower Section 5	1	2	2	89.4	10.11 x 4.95 x 5.10

Extract of Table 4-5 from Mable CEMP with turbine component requirements for this project

A typical turbine foundation will require 110 tonnes of steel reinforcement and 650 cubic m of concrete, although the final design could result in a piled solution.

The 32m Meteorological Mast will require 15 tonnes of reinforcing steel while the substation/BESS foundation will require 6 tonnes of reinforcing steel.

5.2 OTHER/COMMITTED DEVELOPMENT TRAFFIC GENERATION

From a review of planning applications in the project area and surrounding County area, including similar types of development which would have a temporary impact on the road network during construction, it was noted that there are a number of domestic dwelling related planning permissions within approximately 1.5km of the site (LCC Reg Ref. 2413, 22177, 21331, 21117 and 19240) but none of these are considered to have a material impact on the traffic volumes on the proposed delivery haul route via the R194, L1011 and L5046.

There is a grant of permission for continuance of a quarry 4.5km at Killoe to the northwest of the Cloonanny site (LCC Reg. Ref. 2017), but it is considered that this would maintain the existing operations at that location and would therefore be no change to the 2024 baseline traffic flows in the receiving road network.

As the traffic impacts of the Cloonanny windfarm development are all related to the construction phase with negligible levels of post-construction and commissioning operational traffic predicted, longer term or 'design year' traffic impacts will be tending towards nil for this project and therefore cumulative traffic impacts are not relevant after the completion of the construction activities.

5.3 FUTURE N4 MULLINGAR TO LONGFORD (ROOSKY) UPGRADE PROJECT

Westmeath County Council, working in partnership with Longford County Council and in association with Transport Infrastructure Ireland, are in the process of developing a new N4 road scheme along a section of the N4 between Mullingar and Longford (Roosky). The scheme is currently at the emerging preferred route corridor stage with a 300m wide corridor within which the road and associated infrastructure would be constructed.

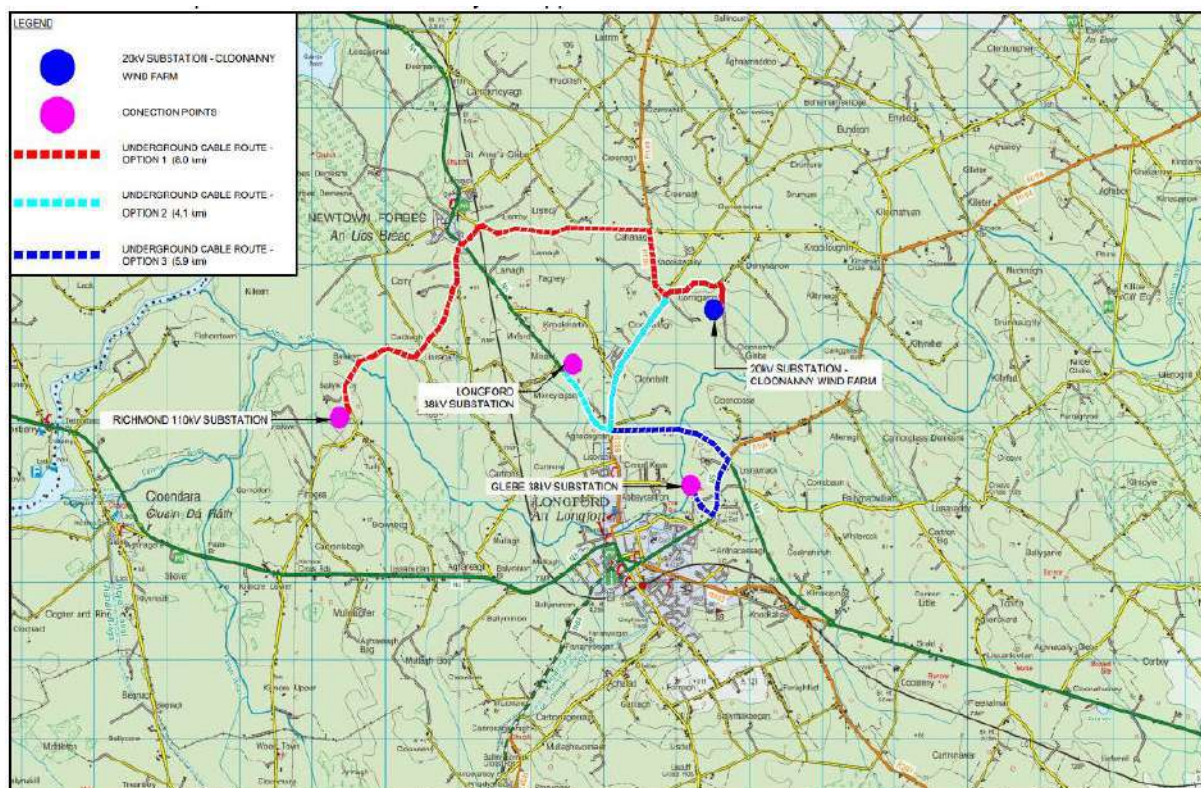
The proposed development within the red line boundary does not interfere with the route corridor.

The proposed underground grid connection (UGC) currently has three proposed route options, each of which will pass through (under) the N4 route corridor.

- Option 1 - Connection to Existing Richmond 110kV Substation.
- Option 2 - Connection to Existing Longford 38kV Substation.
- Option 3 - Connection to Existing Glebe 38kV Substation.

A detailed description for each option is contained in the Mable CEMP and depending on the option selected the UGC will consist of approximately 5.9km or 8km of underground cable consisting of 1 No. 125mm diameter uPVC cable duct installed in an excavated trench, approximately 0.95m deep and 0.325m wide, with variations on this design to adapt to bridge crossings, service crossings and watercourse crossings, etc. The cable duct will accommodate 1 No. power cable.

The CEMP contains an overview of the grid connection route Options as follows:



Each of the three Route options have been discussed between Mable Consulting Engineers and LCC Roads Department Engineers as part of the pre-planning consultation in August 2024, and final considerations on the capacity/upgrades of existing substations with factor into the final route selected.

The UGC works will be designed to take this into account, i.e. using directional drilling if the new alignment is in place prior to the UGC, or with appropriate depth and protection measures if the UGC is in place before the new road construction.

LCC noted concerns with the extent of road that would be impacted by the construction of an underground route to the more westerly Richmond substation (the 8km route), and possible conflicting demands for capacity and access to substations from other renewable energy generation projects.

Mable agreed to discuss with the Developer and review the options for connecting to alternative Substations, as well as co-ordinating of any future Grid works with the other Renewable Energy projects being planned in the area.

Prior to the commencement of the grid connection works, the developer will liaise with TII to ensure that the grid route does not create issues regarding the construction of the new road. Further detail on the grid connection crossing of the new road alignment will be confirmed at construction stage.

6 IMPACT OF PROPOSED DEVELOPMENT

6.1 FUTURE YEAR NETWORK TRAFFIC

To assess the impact of the development, allowing for the planning assessment and determination process to run through much of 2025, it is expected that construction would commence in early 2026 and be completed by early 2028.

To calculate the future year traffic, the existing background traffic from the 2024 traffic counts has been factored up, using the growth factors in the TII PAG Unit 5.3 document 'Travel Demand Projections' (PE-PAG-02017-3, October 2021).

The rates of background traffic increase are selected from Table 6.2 of the TII document, which sets out link-based growth rates for each County (excluding the Metropolitan areas of the cities), in periods from 2016-2030, 2030-2040, and 2040 onwards.

The annual County Longford 'Central Growth Rates' for the assessment years are as follows:

- 2016-2030 1.0134 (LV = light vehicles) 1.0313 (HV = heavy vehicles)

With consideration of the proposed construction programme, assuming a start date in early 2026 and completion in early 2028, it is noted that the peak period of traffic construction delivery and staff on site would occur in months 12-16 (i.e. in 2027) and therefore the resultant 'Do Nothing' and 'Do Something' ADT flows for 2027, are presented in the following section, with the 2024 baseline flows factored as follows to derive 2027 'Do Nothing' flows:

- Compound traffic growth factors for 2024-2027 LV = +4.07% HV = +9.69%

The breakdown of these factored flows in terms of LV, HV and total vehicles is set out in Table 6.1 and also illustrated in Diagrams 1 and 2, at Appendix 2 of this report.

1.0407 1.0969 TII Factors

	2024 Baseline				2027 'Do Nothing'			
	ADT	HV%	LV	HV	LV	HV	ADT	HV%
N4 Longford Bypass (east of R194)	13,788	9.80%	12,437	1,351	12,943	1,482	14,425	10.27%
R194 between N4 and L1011	4,994	3.22%	4,833	161	5,030	176	5,206	3.39%
L1011 west of R194	1,386	4.40%	1,325	61	1,379	67	1,446	4.63%
L1011 east of R198/west of L1018	885	3.45%	854	31	889	33	923	3.63%
R198 north of N4	7,417	3.56%	7,153	264	7,444	290	7,734	3.75%

**Table 6.1: 2024 Baseline Daily Traffic and Factored 2027 Daily Traffic
'Do Nothing' Two-Way Link Flows**

6.2 CONSTRUCTION ACTIVITY AND 'POST DEVELOPMENT' TRAFFIC FLOWS

The TII Guidelines for Transport Assessments state that the thresholds for junction analysis in Transport Assessments are as follows:

- "Traffic to and from the development exceeds 10% of the existing two-way traffic flow on the adjoining highway."

- "Traffic to and from the development exceeds 5% of the existing two-way traffic flow on the adjoining highway, where traffic congestion exists or will exist within the assessment period or in other sensitive locations".

As noted in the previous section, the development traffic is primarily related to the construction period.

On occasional/infrequent days when there are turbine component deliveries and TTM/temporary closures on the final few km of the delivery route, or on days of foundation/turbine base concrete pours, when there would have to be a regular supply of ready-mixed concrete to the work site to maintain a continuous pour over a number of hours, there would be a short-term higher impact but this would not be typical across a period of days, weeks or months during the contract and therefore would not represent an average daily traffic scenario.

The general construction activities during the peak phase of civils work in 2027 will generate a daily volume of activity as follows:

- 20 car and van arrivals and 20 car and van departures (staff travel, based on 25 staff, arriving by car or van with a vehicle occupancy rate of 1.25)
- 15 truck arrivals and 15 truck departures, in a mix of articulated tripper trucks and articulated flatbed trucks.

For the purpose of this assessment, it is assumed that all HGV deliveries will use the R194, L1011 and L5046 to access the site, while construction staff are expected to arrive and depart using both the R194 and R198 routes, primarily to/from the N4 roundabouts and Longford town (so these are split equally between both routes).

The resultant daily (ADT) link flows and percentage increase in daily (ADT) link flows due to the typical daily construction activity during the peak Phase in 2027 is set out in Table 6.2 below.

	2027 'Do Nothing'			2027 'Do Something – Construction Stage'			
	LV	HV	ADT	LV	HV	ADT	%increase
N4 Longford Bypass (east of R194)	12,943	1,482	14,425	12,963	1,512	14,475	+0.35%
R194 between N4 and L1011	5,030	176	5,206	5,050	206	5,256	+0.93%
L1011 west of R194	1,379	67	1,446	1,399	97	1,496	+3.46%
L1011 east of R198/west of L1018	889	33	923	889	33	923	0%
R198 north of N4	7,444	290	7,734	7,464	290	7,754	+0.26%

**Table 6.2: 2027 Daily Traffic
'Do Nothing' and 'Do Something – Construction Stage' Two-Way Link Flows**

6.3 DISCUSSION OF IMPACTS

The previous section has demonstrated that typical construction activities at the Cloonanny Glebe wind farm site will not result in any significant detrimental impacts on traffic link flow or Level of Service (LOS) capacity or impacts on operational capacity of the R194 or the L1011, being 0.93% and 3.46% of the weekday daily flow (24hr total) on each link respectively. There will be a 0.35% increase on the N4 to the

east of the R194/Leo Casey Roundabout (which assumes all deliveries arrive and depart on this route), and a 0.26% increase on the R198 between the N4 and the L1018 (construction staff commuting trips).

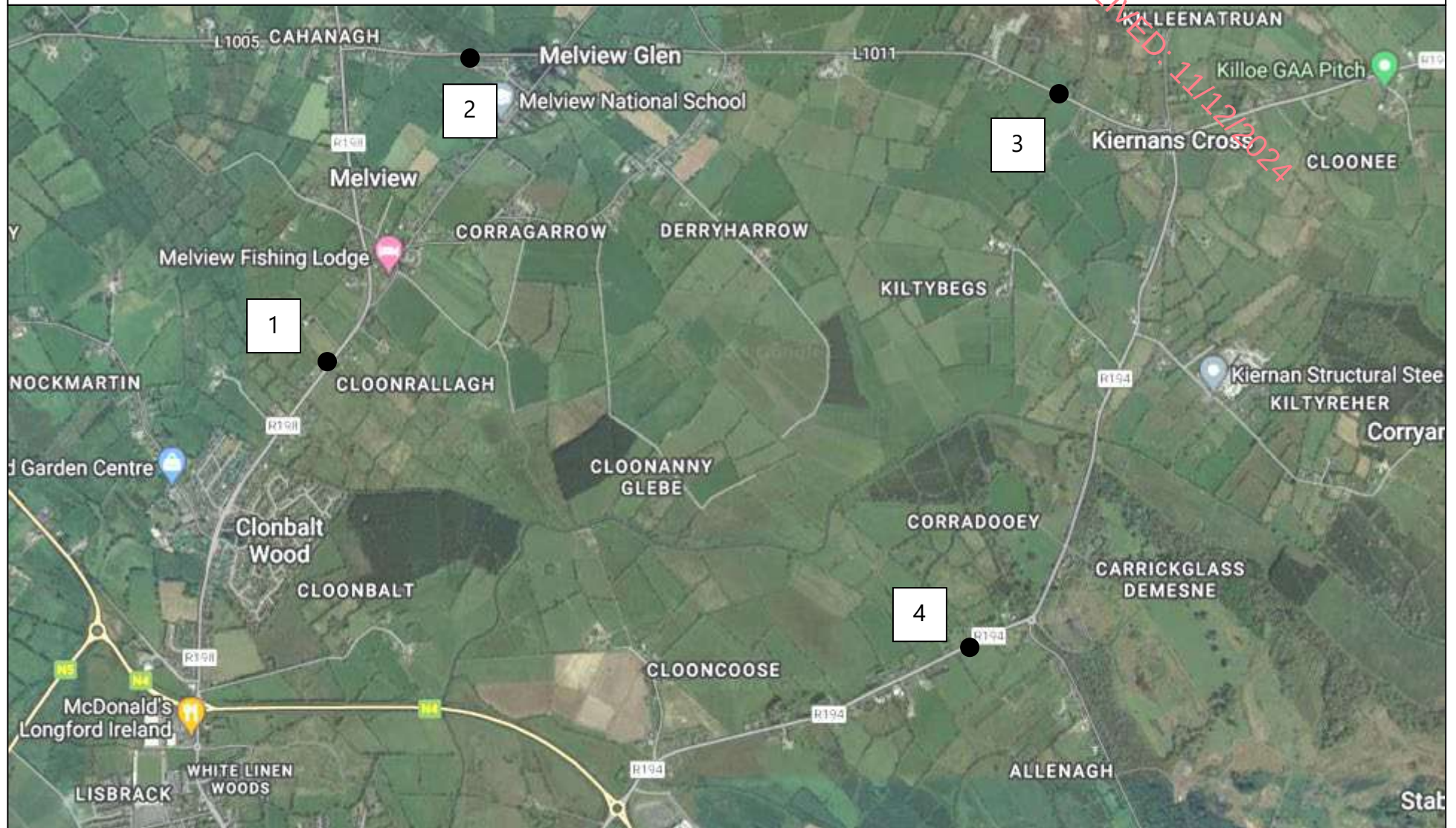
As stated above these are worst-case scenario figures related to a 0% backloading operation in terms of soils excavation/stone delivery (assumes excavated/stripped soils are stockpiled on site and reused on site during the restoration and landscaping works).

While the highest percentage impact will occur on the L1011 (between Kiernans Cross and the L5046) and on the L5046 to the north of L50462 access junction, it should be recognised that this is against a very low baseline flow for a two-way local rural road.

From the foregoing, it is clear that the proposed development will not have any significant traffic impacts on the road network during the weekday peak periods or in terms of daily traffic flow, being below the 5% lower trigger threshold set out in the TII TTA Guidelines for detailed capacity assessment, and the volume of off-peak movements are also at a level which will not result in operational issues for the road network or impact on road user safety.

RECEIVED: 11/12/2024

Appendices



Job number:

TRA/24/048

Client:

Stephen Reid Consulting

Job Date:

Week Commencing
Friday 26th April 2024

Drawing No:

TRA/24/048-01

Author:

SPW

traffinomics



CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

SUMMARY

WEEK COMMENCING:

Friday 26 April 2024

TRA/24/048

SITE 01

LOCATION: R198 Drumlish Road - (Google Maps Ref: 53°45'12.1"N 7°47'41.5"W)

SPEED SURVEY SUMMARY:

NORTHBOUND 85% Speed = 80.19 km/h, 95% Speed = 88.47 km/h, Median = 68.22 km/h

Maximum = 139.6 km/h, Minimum = 8.6 km/h, Mean = 69.1 km/h

SOUTHBOUND 85% Speed = 81.00 km/h, 95% Speed = 89.46 km/h, Median = 68.67 km/h

Maximum = 147.9 km/h, Minimum = 12.7 km/h, Mean = 69.3 km/h

VOLUMETRIC VEHICLE COUNTS:

Direction	Time	Friday 26 April 2024	Saturday 27 April 2024	Sunday 28 April 2024	Monday 29 April 2024	Tuesday 30 April 2024	Wednesday 1 May 2024	Thursday 2 May 2024	No. Vehicles	7 day Mean
NORTHBOUND	07-19	3375	2840	2028	3074	3081	3126	3161	20685	2955
SOUTHBOUND	07-19	3531	2948	2170	3152	3212	3258	3275	21546	3078
NORTHBOUND	00-00	4338	3567	2639	3760	3840	3926	4059	26129	3733
SOUTHBOUND	00-00	4242	3534	2652	3708	3832	3883	3939	25790	3684

PEAK FLOW SUMMARY:

Peak	AM	IP	PM
Most Frequent Peak Hour	0900	1400	1700
Average Vehicles per Peak Hour	211	289	403

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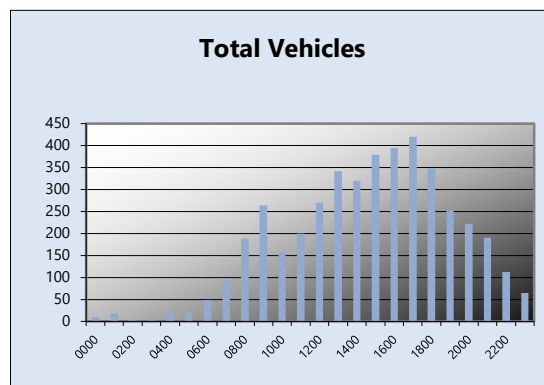
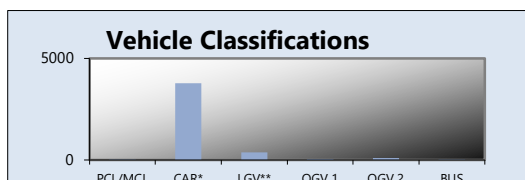
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

Friday 26 April 2024
TRA/24/048

**SITE 01
NORTHBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	9	1	0	0	0	10	10
0100	0	17	1	0	0	0	18	18
0200	0	4	0	0	0	0	4	4
0300	0	3	0	0	0	0	3	3
0400	0	16	1	0	2	0	19	22
0500	0	16	2	0	1	0	19	20
0600	0	44	3	1	0	0	48	49
0700	1	62	19	6	4	1	93	101
0800	2	157	15	6	6	2	188	199
0900	0	224	33	1	4	2	264	272
1000	0	125	22	2	7	1	157	168
1100	0	162	23	6	9	0	200	215
1200	1	226	29	4	8	2	270	284
1300	0	302	30	1	6	3	342	353
1400	0	280	28	1	7	4	320	334
1500	0	315	44	5	12	3	379	400
1600	1	348	30	6	8	1	394	408
1700	0	368	36	5	11	0	420	437
1800	2	318	21	1	5	1	348	354
1900	0	233	12	2	5	0	252	260
2000	1	206	15	0	0	0	222	221
2100	0	185	6	0	0	0	191	191
2200	0	100	9	0	3	0	112	116
2300	0	59	6	0	0	0	65	65
07-19	7	2887	330	44	87	20	3375	3525
06-22	8	3555	366	47	92	20	4088	4245
06-00	8	3714	381	47	95	20	4265	4426
00-00	8	3779	386	47	98	20	4338	4503

Peaks	Time	Vehicles	PCU's
AM	0900	264	271.7
IP	1300	342	353.3
PM	1700	420	436.8



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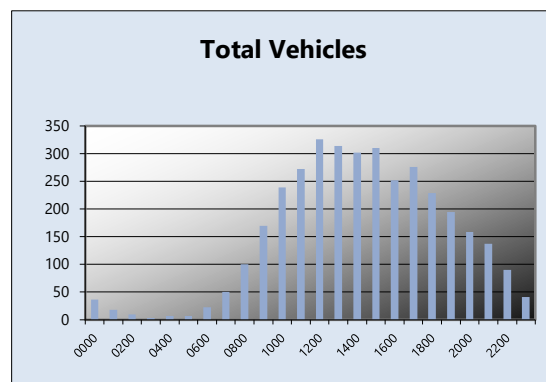
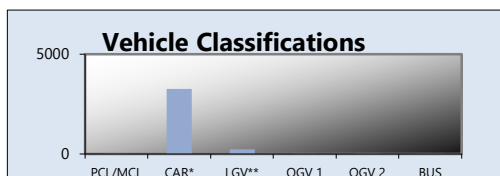
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Saturday 27 April 2024
TRA/24/048**

**SITE 01
NORTHBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	33	4	0	0	0	37	37
0100	0	17	1	0	0	0	18	18
0200	0	10	0	0	0	0	10	10
0300	0	3	0	0	0	0	3	3
0400	0	5	1	0	1	0	7	8
0500	0	5	2	0	0	0	7	7
0600	0	22	1	0	0	0	23	23
0700	0	39	7	1	1	2	50	54
0800	1	84	15	0	0	0	100	99
0900	0	155	10	1	4	0	170	176
1000	0	205	24	3	6	1	239	249
1100	1	241	25	0	5	0	272	278
1200	1	292	28	3	2	0	326	329
1300	1	293	16	1	2	1	314	317
1400	0	279	20	1	1	1	302	305
1500	1	290	9	5	4	1	310	318
1600	0	238	13	0	1	0	252	253
1700	2	251	21	1	1	0	276	276
1800	0	218	8	1	1	1	229	232
1900	0	183	12	0	0	0	195	195
2000	0	152	5	0	2	0	159	162
2100	0	131	5	1	0	0	137	138
2200	0	89	1	0	0	0	90	90
2300	0	36	5	0	0	0	41	41
07-19	7	2585	196	17	28	7	2840	2886
06-22	7	3073	219	18	30	7	3354	3403
06-00	7	3198	225	18	30	7	3485	3534
00-00	7	3271	233	18	31	7	3567	3618

Peaks	Time	Vehicles	PCU's
AM	0900	170	175.7
IP	1200	326	329.3
PM	1700	276	276.2



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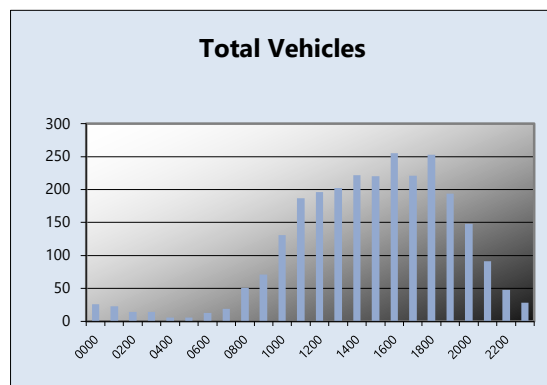
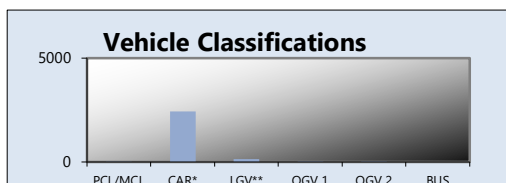
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Sunday 28 April 2024
TRA/24/048**

**SITE 01
NORTHBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	20	6	0	0	0	26	26
0100	0	20	3	0	0	0	23	23
0200	0	12	2	0	0	0	14	14
0300	0	13	1	0	0	0	14	14
0400	0	5	1	0	0	0	6	6
0500	0	3	3	0	0	0	6	6
0600	0	13	0	0	0	0	13	13
0700	0	17	1	0	1	0	19	20
0800	2	44	4	0	1	0	51	51
0900	0	68	3	0	0	0	71	71
1000	0	120	10	0	1	0	131	132
1100	9	168	8	0	2	0	187	182
1200	3	181	10	0	2	0	196	196
1300	5	191	4	2	0	0	202	199
1400	3	210	8	1	0	0	222	220
1500	0	208	9	1	2	0	220	223
1600	3	241	8	1	2	0	255	256
1700	0	204	16	0	1	0	221	222
1800	0	234	14	3	2	0	253	257
1900	1	181	10	1	1	0	194	195
2000	0	140	7	1	0	0	148	149
2100	0	86	4	1	0	0	91	92
2200	0	43	5	0	0	0	48	48
2300	0	23	5	0	0	0	28	28
07-19	25	1886	95	8	14	0	2028	2030
06-22	26	2306	116	11	15	0	2474	2478
06-00	26	2372	126	11	15	0	2550	2554
00-00	26	2445	142	11	15	0	2639	2643

Peaks	Time	Vehicles	PCU's
AM	0900	71	71
IP	1400	222	220.1
PM	1600	255	257.1



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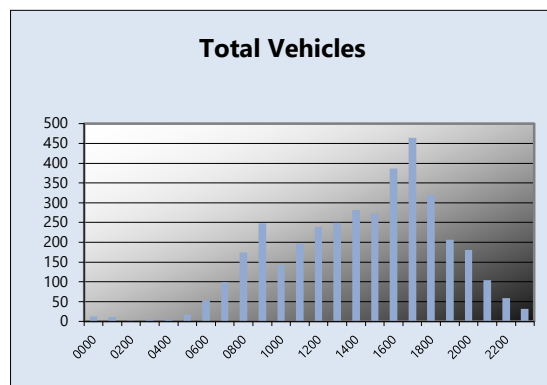
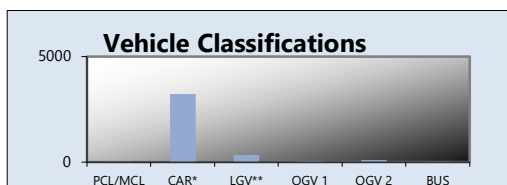
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Monday 29 April 2024
TRA/24/048**

**SITE 01
NORTHBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	11	0	0	1	0	12	13
0100	0	11	0	0	0	0	11	11
0200	0	2	0	0	0	0	2	2
0300	0	3	2	0	0	0	5	5
0400	0	3	1	0	1	0	5	6
0500	0	17	0	0	0	0	17	17
0600	0	42	9	0	1	0	52	53
0700	1	70	19	4	4	1	99	106
0800	0	154	10	1	6	3	174	185
0900	0	204	28	3	10	3	248	266
1000	0	120	14	1	7	1	143	154
1100	0	153	29	1	11	2	196	213
1200	5	194	24	3	13	0	239	253
1300	0	215	20	4	8	2	249	263
1400	3	228	34	6	8	3	282	296
1500	0	231	20	6	13	2	272	294
1600	1	331	35	8	10	2	387	405
1700	0	419	37	2	4	2	464	472
1800	0	291	28	0	1	1	321	323
1900	3	182	12	1	8	0	206	215
2000	1	174	5	0	1	0	181	182
2100	0	94	9	0	1	0	104	105
2200	0	54	4	0	1	0	59	60
2300	0	31	1	0	0	0	32	32
07-19	10	2610	298	39	95	22	3074	3231
06-22	14	3102	333	40	106	22	3617	3786
06-00	14	3187	338	40	107	22	3708	3878
00-00	14	3234	341	40	109	22	3760	3933

Peaks	Time	Vehicles	PCU's
AM	0900	248	265.5
IP	1400	282	296
PM	1700	464	472.2



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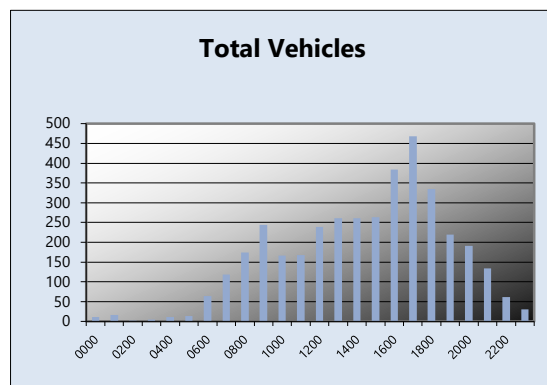
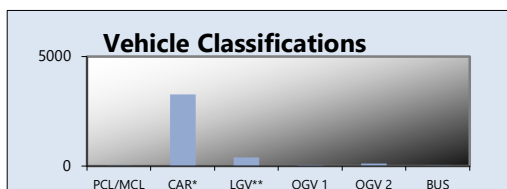
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Tuesday 30 April 2024
TRA/24/048**

**SITE 01
NORTHBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	10	1	0	0	0	11	11
0100	0	16	0	0	0	0	16	16
0200	0	1	1	0	0	0	2	2
0300	0	4	1	0	0	0	5	5
0400	0	9	2	0	0	0	11	11
0500	0	13	0	0	1	0	14	15
0600	0	55	6	1	2	0	64	67
0700	0	89	18	4	7	1	119	131
0800	0	136	23	2	10	3	174	191
0900	0	203	29	4	7	1	244	256
1000	0	130	25	4	6	1	166	177
1100	0	141	14	3	7	2	167	180
1200	0	196	30	4	8	1	239	252
1300	0	233	16	2	9	1	261	275
1400	1	219	30	2	6	3	261	272
1500	0	219	25	2	15	3	264	288
1600	0	332	34	6	9	3	384	402
1700	1	398	60	3	5	1	468	476
1800	2	291	27	3	11	0	334	348
1900	0	202	14	0	3	1	220	225
2000	1	174	13	0	3	0	191	194
2100	0	123	10	0	1	0	134	135
2200	0	56	5	0	0	0	61	61
2300	1	26	3	0	0	0	30	29
07-19	4	2587	331	39	100	20	3081	3247
06-22	5	3141	374	40	109	21	3690	3869
06-00	6	3223	382	40	109	21	3781	3959
00-00	6	3276	387	40	110	21	3840	4019

Peaks	Time	Vehicles	PCU's
AM	0900	244	256.1
IP	1300	261	274.7
PM	1700	468	476.2



TRAFFINOMICS LIMITED

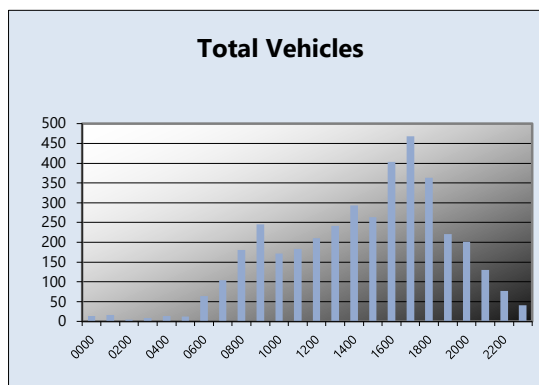
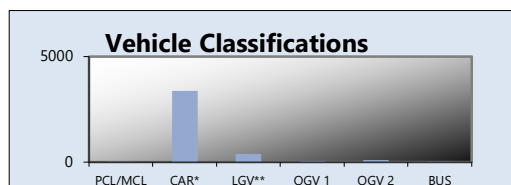
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Wednesday 1 May 2024
TRA/24/048**

**SITE 01
NORTHBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	13	0	0	0	0	13	13
0100	0	16	0	0	0	0	16	16
0200	0	4	0	0	0	0	4	4
0300	0	6	1	0	1	0	8	9
0400	0	11	2	0	0	0	13	13
0500	0	9	1	2	0	0	12	13
0600	0	51	7	2	4	0	64	70
0700	0	76	14	4	7	3	104	118
0800	0	154	17	3	2	4	180	188
0900	0	205	30	2	6	2	245	256
1000	0	145	17	4	3	2	171	179
1100	0	151	26	3	3	0	183	188
1200	0	183	17	3	6	2	211	222
1300	0	205	29	0	7	1	242	252
1400	0	255	24	3	10	1	293	309
1500	0	209	36	7	9	2	263	280
1600	0	349	36	1	16	1	403	425
1700	0	409	47	3	8	1	468	481
1800	1	323	31	4	3	1	363	369
1900	1	197	19	0	2	2	221	225
2000	3	183	12	0	3	0	201	203
2100	0	124	4	0	2	0	130	133
2200	1	68	7	0	1	0	77	78
2300	0	38	2	0	0	1	41	42
07-19	1	2664	324	37	80	20	3126	3268
06-22	5	3219	366	39	91	22	3742	3898
06-00	6	3325	375	39	92	23	3860	4017
00-00	6	3384	379	41	93	23	3926	4086

Peaks	Time	Vehicles	PCU's
AM	0900	245	255.8
IP	1400	293	308.5
PM	1700	468	480.9



TRAFFINOMICS LIMITED

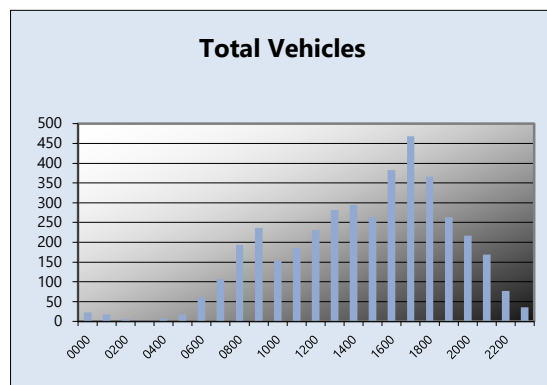
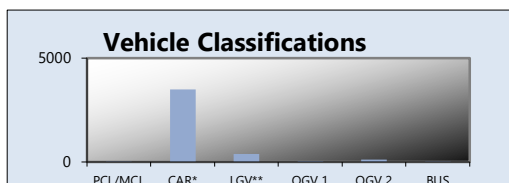
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Thursday 2 May 2024
TRA/24/048**

**SITE 01
NORTHBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	20	2	1	0	0	23	24
0100	0	18	0	0	0	0	18	18
0200	0	6	0	0	0	0	6	6
0300	0	1	0	0	0	0	1	1
0400	0	6	1	0	0	0	7	7
0500	0	16	1	1	0	0	18	19
0600	0	52	6	0	4	0	62	67
0700	1	83	15	3	5	0	107	114
0800	0	158	23	2	8	2	193	206
0900	0	207	17	4	5	3	236	248
1000	0	119	24	2	7	1	153	164
1100	0	150	27	5	4	0	186	194
1200	0	192	28	2	9	0	231	244
1300	0	234	35	3	8	1	281	294
1400	0	245	32	5	8	4	294	311
1500	0	225	24	5	8	2	264	279
1600	1	318	43	4	15	1	382	404
1700	0	407	44	6	9	2	468	485
1800	0	325	30	2	8	1	366	378
1900	1	238	16	1	8	0	264	274
2000	4	199	11	1	2	0	217	217
2100	0	157	9	0	3	0	169	173
2200	1	74	2	0	0	0	77	76
2300	0	31	5	0	0	0	36	36
07-19	2	2663	342	43	94	17	3161	3320
06-22	7	3309	384	45	111	17	3873	4051
06-00	8	3414	391	45	111	17	3986	4163
00-00	8	3481	395	47	111	17	4059	4237

Peaks	Time	Vehicles	PCU's
AM	0900	236	247.5
IP	1400	294	310.9
PM	1700	468	484.7



TRAFFINOMICS LIMITED

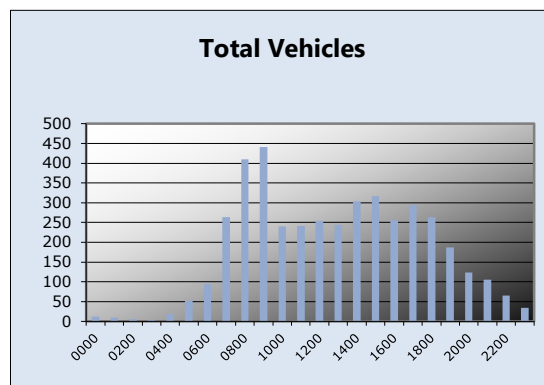
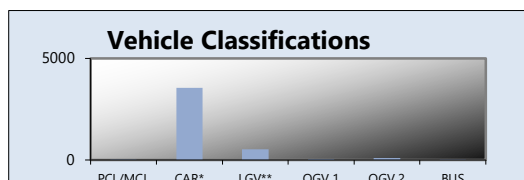
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Friday 26 April 2024
TRA/24/048**

**SITE 01
SOUTHBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	11	0	0	1	0	12	13
0100	0	8	2	0	0	0	10	10
0200	0	5	1	0	0	0	6	6
0300	0	3	0	0	0	0	3	3
0400	0	12	2	1	4	0	19	25
0500	0	43	6	1	3	0	53	57
0600	0	68	17	3	6	0	94	103
0700	0	201	38	9	14	2	264	289
0800	1	351	43	4	7	4	410	424
0900	0	386	41	2	10	2	441	457
1000	1	190	38	4	5	2	240	250
1100	0	193	34	4	7	4	242	257
1200	0	210	34	3	6	2	255	266
1300	2	199	32	5	5	1	244	252
1400	2	235	49	1	11	5	303	321
1500	1	267	39	2	4	4	317	326
1600	1	216	32	1	5	1	256	263
1700	0	255	33	3	3	1	295	301
1800	0	232	29	2	1	0	264	266
1900	0	166	18	0	2	1	187	191
2000	0	114	9	0	0	0	123	123
2100	1	90	13	0	1	0	105	106
2200	0	58	6	0	1	0	65	66
2300	0	30	4	0	0	0	34	34
07-19	8	2935	442	40	78	28	3531	3674
06-22	9	3373	499	43	87	29	4040	4196
06-00	9	3461	509	43	88	29	4139	4297
00-00	9	3543	520	45	96	29	4242	4411

Peaks	Time	Vehicles	PCU's
AM	0900	441	457
IP	1400	303	321.2
PM	1700	295	301.4



TRAFFINOMICS LIMITED

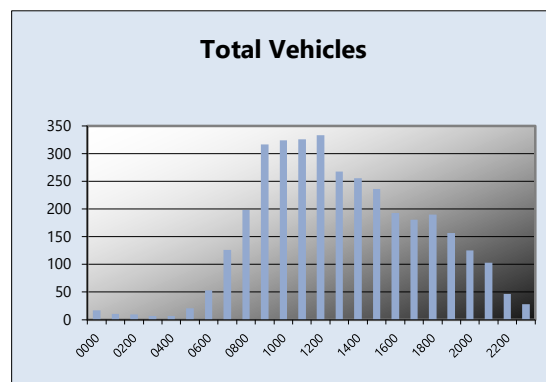
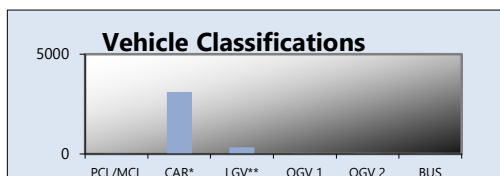
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Saturday 27 April 2024
TRA/24/048**

**SITE 01
SOUTHBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	14	3	0	0	0	17	17
0100	0	9	2	0	0	0	11	11
0200	0	10	0	0	0	0	10	10
0300	0	6	1	0	0	0	7	7
0400	0	6	0	0	1	0	7	8
0500	0	17	2	0	2	0	21	24
0600	0	42	9	0	2	0	53	56
0700	0	107	15	1	2	1	126	130
0800	2	171	23	1	1	0	198	198
0900	1	274	35	1	4	2	317	324
1000	0	285	33	2	4	0	324	330
1100	0	286	33	1	5	1	326	334
1200	1	282	40	1	8	1	333	344
1300	1	234	25	3	4	1	268	275
1400	1	225	28	2	0	0	256	256
1500	0	219	16	0	0	1	236	237
1600	0	179	11	1	1	1	193	196
1700	0	163	15	1	1	1	181	184
1800	0	171	17	0	1	1	190	192
1900	2	136	16	3	0	0	157	157
2000	0	115	9	0	1	0	125	126
2100	0	99	4	0	0	0	103	103
2200	0	42	5	0	0	0	47	47
2300	0	23	5	0	0	0	28	28
07-19	6	2596	291	14	31	10	2948	3001
06-22	8	2988	329	17	34	10	3386	3442
06-00	8	3053	339	17	34	10	3461	3517
00-00	8	3115	347	17	37	10	3534	3594

Peaks	Time	Vehicles	PCU's
AM	0900	317	323.9
IP	1200	333	344.1
PM	1600	193	195.8



TRAFFINOMICS LIMITED

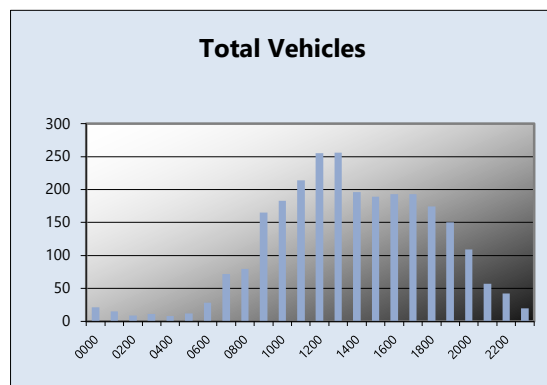
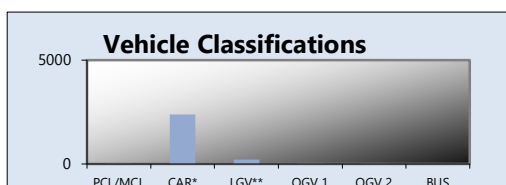
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Sunday 28 April 2024
TRA/24/048**

**SITE 01
SOUTHBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	17	4	0	0	0	21	21
0100	0	11	4	0	0	0	15	15
0200	0	9	0	0	0	0	9	9
0300	0	10	1	0	0	0	11	11
0400	0	6	2	0	0	0	8	8
0500	0	10	2	0	0	0	12	12
0600	0	25	2	0	1	0	28	29
0700	0	65	4	1	2	0	72	75
0800	0	75	5	0	0	0	80	80
0900	2	149	10	1	3	0	165	168
1000	5	161	16	1	0	0	183	180
1100	3	189	20	1	1	0	214	213
1200	2	231	22	0	0	0	255	253
1300	1	237	16	1	1	0	256	257
1400	0	179	14	1	2	0	196	199
1500	0	175	13	0	1	0	189	190
1600	0	167	23	1	2	0	193	196
1700	0	178	14	0	1	0	193	194
1800	0	158	13	2	1	0	174	176
1900	0	138	12	0	0	0	150	150
2000	0	99	10	0	0	0	109	109
2100	0	52	5	0	0	0	57	57
2200	0	35	6	1	0	0	42	43
2300	0	15	5	0	0	0	20	20
07-19	13	1964	170	9	14	0	2170	2182
06-22	13	2278	199	9	15	0	2514	2528
06-00	13	2328	210	10	15	0	2576	2590
00-00	13	2391	223	10	15	0	2652	2666

Peaks	Time	Vehicles	PCU's
AM	0900	165	167.8
IP	1300	256	257
PM	1600	193	196.1



TRAFFINOMICS LIMITED

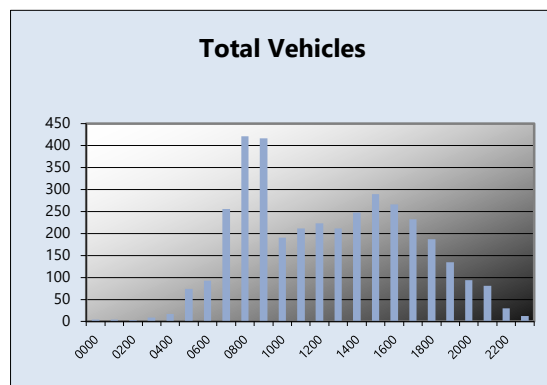
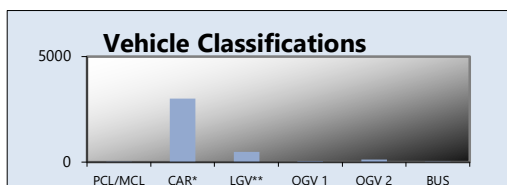
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Monday 29 April 2024
TRA/24/048**

**SITE 01
SOUTHBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	4	0	0	0	0	4	4
0100	0	4	0	0	0	0	4	4
0200	0	2	1	0	0	0	3	3
0300	0	4	2	0	3	0	9	13
0400	0	11	2	0	4	0	17	22
0500	0	55	10	1	8	0	74	85
0600	2	69	19	0	3	0	93	95
0700	2	207	30	9	6	2	256	269
0800	0	354	53	1	10	3	421	438
0900	1	361	42	2	8	2	416	429
1000	0	154	25	2	9	1	191	205
1100	1	158	35	4	11	3	212	231
1200	1	170	32	5	13	2	223	244
1300	1	164	33	4	8	1	211	224
1400	2	189	40	4	11	2	248	265
1500	0	233	42	4	6	4	289	303
1600	4	205	44	2	7	4	266	277
1700	0	205	20	3	2	2	232	238
1800	1	159	24	0	2	1	187	190
1900	0	116	17	0	2	0	135	138
2000	2	82	10	0	0	0	94	92
2100	0	77	4	0	0	0	81	81
2200	0	26	2	1	1	0	30	32
2300	0	10	2	0	0	0	12	12
07-19	13	2559	420	40	93	27	3152	3310
06-22	17	2903	470	40	98	27	3555	3716
06-00	17	2939	474	41	99	27	3597	3760
00-00	17	3019	489	42	114	27	3708	3891

Peaks	Time	Vehicles	PCU's
AM	0800	421	437.5
IP	1400	248	264.7
PM	1600	266	276.9



TRAFFINOMICS LIMITED

**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

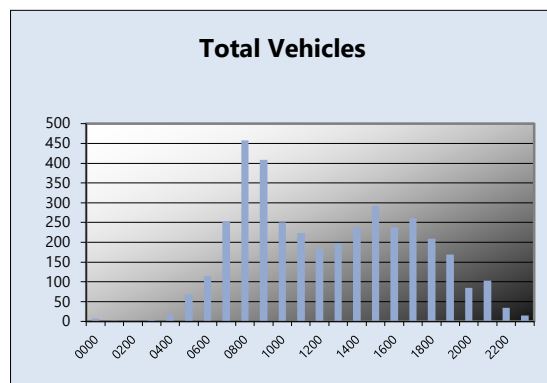
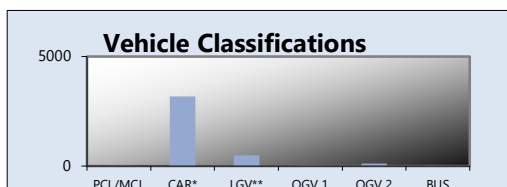
**Tuesday 30 April 2024
TRA/24/048**

**SITE 01
SOUTHBOUND**

RECEIVED: 11/12/2024

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	6	1	0	0	0	7	7
0100	0	1	1	0	0	0	2	2
0200	0	1	0	0	0	0	1	1
0300	0	4	0	0	0	1	5	6
0400	0	9	3	0	4	0	16	21
0500	0	57	7	1	3	0	68	72
0600	0	93	16	2	4	0	115	121
0700	0	184	45	10	13	1	253	276
0800	0	396	46	3	9	4	458	475
0900	0	338	53	2	13	3	409	430
1000	0	197	40	2	11	1	251	267
1100	0	172	37	1	12	1	223	240
1200	0	143	30	2	6	2	183	194
1300	0	166	21	3	7	0	197	208
1400	1	189	34	2	10	3	239	255
1500	0	246	35	1	5	5	292	304
1600	0	197	29	3	8	0	237	249
1700	0	226	31	0	3	1	261	266
1800	0	185	23	0	1	0	209	210
1900	0	153	15	0	1	0	169	170
2000	0	79	6	0	0	0	85	85
2100	0	93	8	1	1	0	103	105
2200	1	28	4	1	0	0	34	34
2300	0	14	1	0	0	0	15	15
07-19	1	2639	424	29	98	21	3212	3374
06-22	1	3057	469	32	104	21	3684	3855
06-00	2	3099	474	33	104	21	3733	3904
00-00	2	3177	486	34	111	22	3832	4014

Peaks	Time	Vehicles	PCU's
AM	0800	458	475.2
IP	1400	239	255.2
PM	1700	261	265.9



TRAFFINOMICS LIMITED

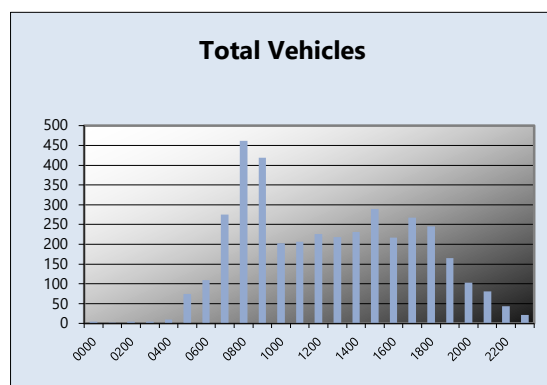
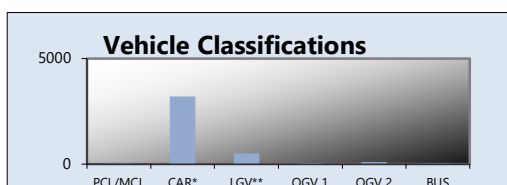
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Wednesday 1 May 2024
TRA/24/048**

**SITE 01
SOUTHBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	4	1	0	0	0	5	5
0100	0	2	0	0	0	0	2	2
0200	0	3	1	0	0	0	4	4
0300	0	3	1	0	1	0	5	6
0400	0	6	2	1	1	0	10	12
0500	0	57	7	0	10	0	74	87
0600	0	83	18	3	5	1	110	119
0700	0	210	48	11	4	2	275	288
0800	0	379	66	2	12	2	461	480
0900	1	353	51	3	11	0	419	434
1000	0	165	29	2	4	3	203	212
1100	1	163	32	0	8	3	207	220
1200	0	177	40	3	6	0	226	235
1300	0	174	29	5	9	1	218	233
1400	0	191	27	2	10	1	231	246
1500	0	244	33	2	6	4	289	302
1600	1	168	32	5	9	2	217	232
1700	0	229	31	1	4	2	267	275
1800	1	215	25	1	1	2	245	248
1900	0	152	12	0	0	1	165	166
2000	1	89	13	0	0	0	103	102
2100	0	72	9	0	0	0	81	81
2200	0	37	6	1	0	0	44	45
2300	0	17	4	1	0	0	22	23
07-19	4	2668	443	37	84	22	3258	3405
06-22	5	3064	495	40	89	24	3717	3873
06-00	5	3118	505	42	89	24	3783	3940
00-00	5	3193	517	43	101	24	3883	4056

Peaks	Time	Vehicles	PCU's
AM	0800	461	479.6
IP	1400	231	246
PM	1700	267	274.7



TRAFFINOMICS LIMITED

**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

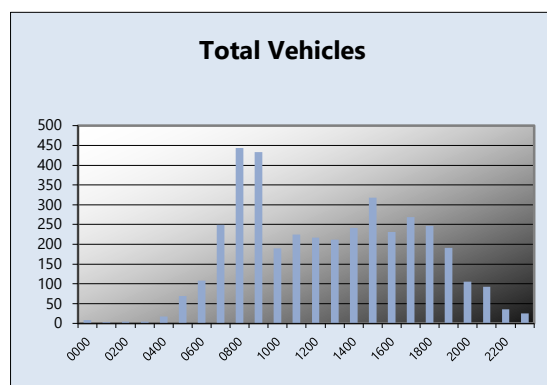
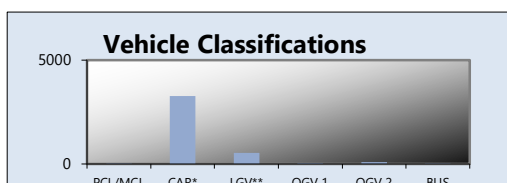
**Thursday 2 May 2024
TRA/24/048**

**SITE 01
SOUTHBOUND**

RECEIVED: 11/12/2024

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	5	1	1	0	1	8	10
0100	0	3	0	0	0	0	3	3
0200	0	5	0	0	0	0	5	5
0300	0	3	0	1	1	0	5	7
0400	0	13	2	0	2	0	17	20
0500	0	56	8	0	5	0	69	76
0600	0	83	16	0	9	0	108	120
0700	0	201	32	9	4	3	249	262
0800	0	373	59	3	7	2	444	457
0900	0	374	50	3	5	1	433	442
1000	0	149	28	3	8	2	190	204
1100	0	180	35	2	5	2	224	234
1200	0	181	28	2	6	0	217	226
1300	0	169	36	3	4	0	212	219
1400	0	181	45	4	9	2	241	257
1500	1	260	41	6	7	3	318	332
1600	1	191	33	1	4	1	231	237
1700	0	227	31	4	6	1	269	280
1800	2	222	22	0	1	0	247	247
1900	0	170	19	0	1	1	191	193
2000	0	88	15	1	1	1	106	109
2100	0	78	14	0	0	0	92	92
2200	0	29	6	0	0	0	35	35
2300	0	22	3	0	0	0	25	25
07-19	4	2708	440	40	66	17	3275	3395
06-22	4	3127	504	41	77	19	3772	3908
06-00	4	3178	513	41	77	19	3832	3968
00-00	4	3263	524	43	85	20	3939	4088

Peaks	Time	Vehicles	PCU's
AM	0800	444	456.6
IP	1400	241	256.7
PM	1700	269	279.8



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CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

SITE 01
NORTHBOUND

WEEK COMMENCING:

Friday 26 April 2024
TRA/24/048

TIME PERIOD	Friday 26 April 2024	Saturday 27 April 2024	Sunday 28 April 2024	Monday 29 April 2024	Tuesday 30 April 2024	Wednesday 1 May 2024	Thursday 2 May 2024	Average
0000	10	37	26	12	11	13	23	19
0100	18	18	23	11	16	16	18	17
0200	4	10	14	2	2	4	6	6
0300	3	3	14	5	5	8	1	6
0400	19	7	6	5	11	13	7	10
0500	19	7	6	17	14	12	18	13
0600	48	23	13	52	64	64	62	47
0700	93	50	19	99	119	104	107	84
0800	188	100	51	174	174	180	193	151
0900	264	170	71	248	244	245	236	211
1000	157	239	131	143	166	171	153	166
1100	200	272	187	196	167	183	186	199
1200	270	326	196	239	239	211	231	245
1300	342	314	202	249	261	242	281	270
1400	320	302	222	282	261	293	294	282
1500	379	310	220	272	264	263	264	282
1600	394	252	255	387	384	403	382	351
1700	420	276	221	464	468	468	468	398
1800	348	229	253	321	334	363	366	316
1900	252	195	194	206	220	221	264	222
2000	222	159	148	181	191	201	217	188
2100	191	137	91	104	134	130	169	137
2200	112	90	48	59	61	77	77	75
2300	65	41	28	32	30	41	36	39
07-19	3375	2840	2028	3074	3081	3126	3161	2955
06-22	4088	3354	2474	3617	3690	3742	3873	3548
06-00	4265	3485	2550	3708	3781	3860	3986	3662
00-00	4338	3567	2639	3760	3840	3926	4059	3733

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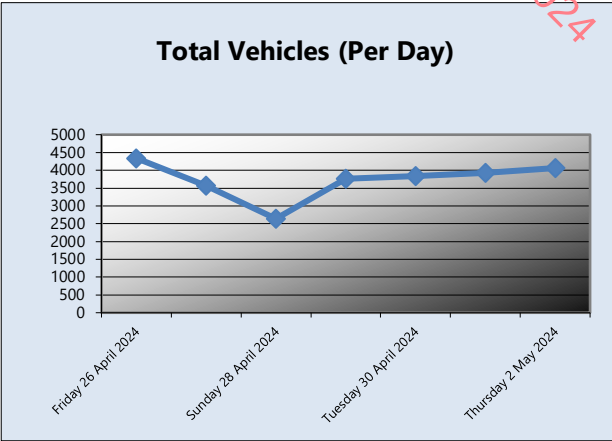
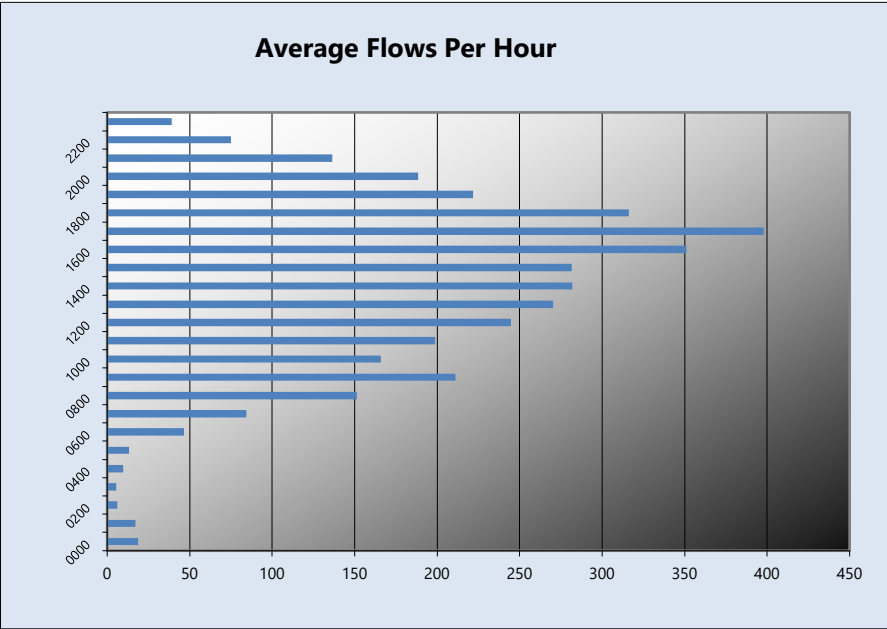
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CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

SITE 01
NORTHBOUND

WEEK COMMENCING: **Friday 26 April 2024**
TRA/24/048

RECEIVED: 11/12/2024



Peak Time & Volumetric Count Data

	Friday 26 April 2024	Saturday 27 April 2024	Sunday 28 April 2024	Monday 29 April 2024	Tuesday 30 April 2024	Wednesday 1 May 2024	Thursday 2 May 2024	Mode/ Average
AM								
Time	0900	0900	0900	0900	0900	0900	0900	0900
Vehicles	264	170	71	248	244	245	236	211
IP								
Time	1300	1200	1400	1400	1300	1400	1400	1400
Vehicles	342	326	222	282	261	293	294	289
PM								
Time	1700	1700	1600	1700	1700	1700	1700	1700
Vehicles	420	276	255	464	468	468	468	403

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CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

SITE 01
SOUTHBOUND

WEEK COMMENCING:

Friday 26 April 2024
TRA/24/048

TIME PERIOD	Friday 26 April 2024	Saturday 27 April 2024	Sunday 28 April 2024	Monday 29 April 2024	Tuesday 30 April 2024	Wednesday 1 May 2024	Thursday 2 May 2024	Average
0000	12	17	21	4	7	5	8	11
0100	10	11	15	4	2	2	3	7
0200	6	10	9	3	1	4	5	5
0300	3	7	11	9	5	5	5	6
0400	19	7	8	17	16	10	17	13
0500	53	21	12	74	68	74	69	53
0600	94	53	28	93	115	110	108	86
0700	264	126	72	256	253	275	249	214
0800	410	198	80	421	458	461	444	353
0900	441	317	165	416	409	419	433	371
1000	240	324	183	191	251	203	190	226
1100	242	326	214	212	223	207	224	235
1200	255	333	255	223	183	226	217	242
1300	244	268	256	211	197	218	212	229
1400	303	256	196	248	239	231	241	245
1500	317	236	189	289	292	289	318	276
1600	256	193	193	266	237	217	231	228
1700	295	181	193	232	261	267	269	243
1800	264	190	174	187	209	245	247	217
1900	187	157	150	135	169	165	191	165
2000	123	125	109	94	85	103	106	106
2100	105	103	57	81	103	81	92	89
2200	65	47	42	30	34	44	35	42
2300	34	28	20	12	15	22	25	22
07-19	3531	2948	2170	3152	3212	3258	3275	3078
06-22	4040	3386	2514	3555	3684	3717	3772	3524
06-00	4139	3461	2576	3597	3733	3783	3832	3589
00-00	4242	3534	2652	3708	3832	3883	3939	3684

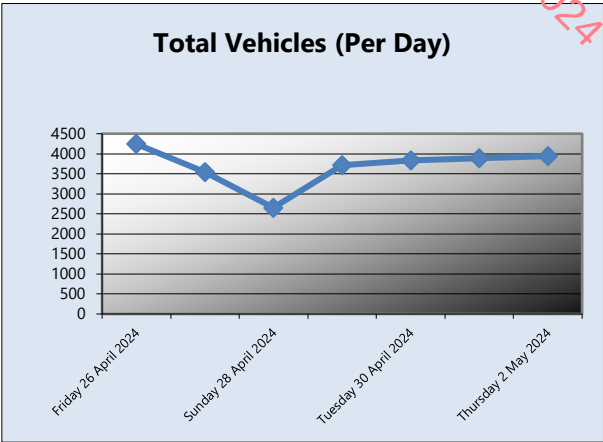
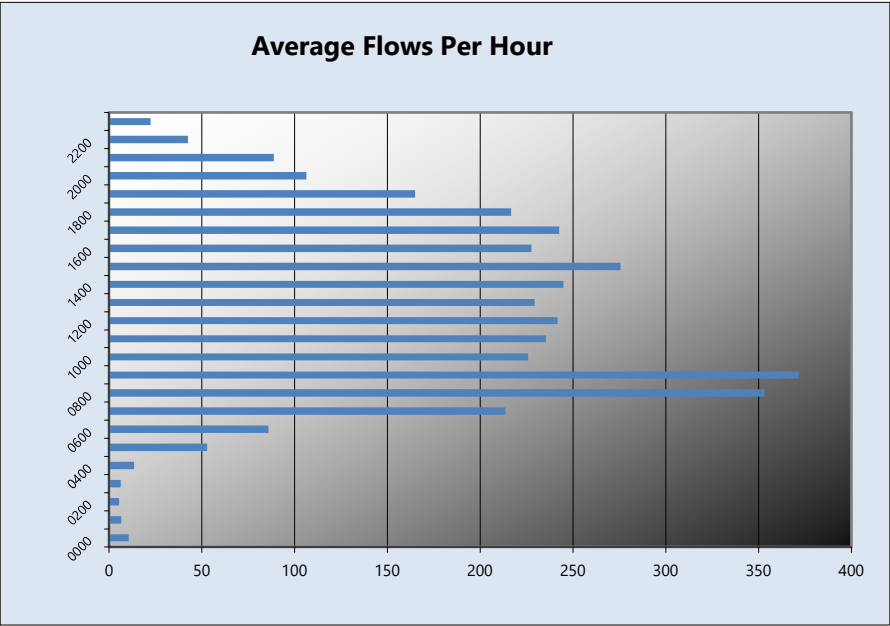
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CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

SITE 01
SOUTHBOUND

WEEK COMMENCING: Friday 26 April 2024
TRA/24/048



Peak Time & Volumetric Count Data

	Friday 26 April 2024	Saturday 27 April 2024	Sunday 28 April 2024	Monday 29 April 2024	Tuesday 30 April 2024	Wednesday 1 May 2024	Thursday 2 May 2024	Mode/ Average
AM								
Time	0900	0900	0900	0800	0800	0800	0800	0800
Vehicles	441	317	441	421	458	461	444	426
IP								
Time	1400	1200	1300	1400	1400	1400	1400	1400
Vehicles	303	333	256	248	239	231	241	264
PM								
Time	1700	1600	1600	1600	1700	1700	1700	1700
Vehicles	295	193	193	266	261	267	269	249

CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

WEEK COMMENCING:

Friday 26 April 2024

TRA/24/048

SITE 01
NORTHBOUND

Profile:

Filter time: 00:00 26th April 2024 => 23:59 2nd May 2024

Speed range: 0 - 200 km/h.

Separation: Greater than 4.00 seconds. - (Headway)

Units: Metric (meter, kilometer, m/s, km/h, kg, tonne)

Vehicles = 16704

Maximum = 139.6 km/h, Minimum = 8.6 km/h, Mean = 69.1 km/h

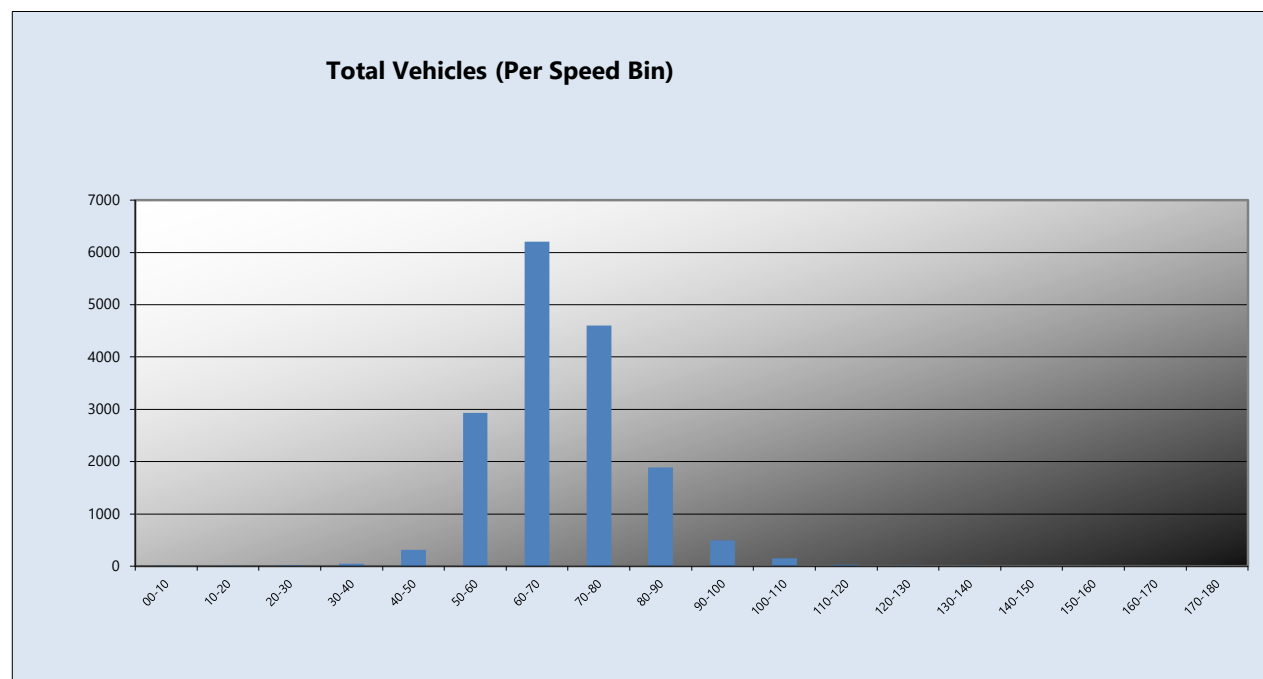
85% Speed = 80.19 km/h, 95% Speed = 88.47 km/h, Median = 68.22 km/h

20 km/h Pace = 57 - 77, Number in Pace = 11195 (67.02%)

Variance = 125.11, Standard Deviation = 11.19 km/h

Speed Bins:

Speed KPH	Bin	
	No.	%
00-10	1	0.0
10-20	10	0.1
20-30	18	0.1
30-40	47	0.3
40-50	310	1.9
50-60	2935	17.6
60-70	6210	37.2
70-80	4603	27.6
80-90	1887	11.3
90-100	490	2.9
100-110	155	0.9
110-120	30	0.2
120-130	5	0.0
130-140	3	0.0
140-150	0	0.0
150-160	0	0.0
160-170	0	0.0
170-180	0	0.0



CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

WEEK COMMENCING:

Friday 26 April 2024

TRA/24/048

SITE 01
SOUTHBOUND

Profile:

Filter time: 00:00 26th April 2024 => 23:59 2nd May 2024

Speed range: 0 - 200 km/h.

Separation: Greater than 4.00 seconds. - (Headway)

Units: Metric (meter, kilometer, m/s, km/h, kg, tonne)

Vehicles = 15924

Maximum = 147.9 km/h, Minimum = 12.7 km/h, Mean = 69.3 km/h

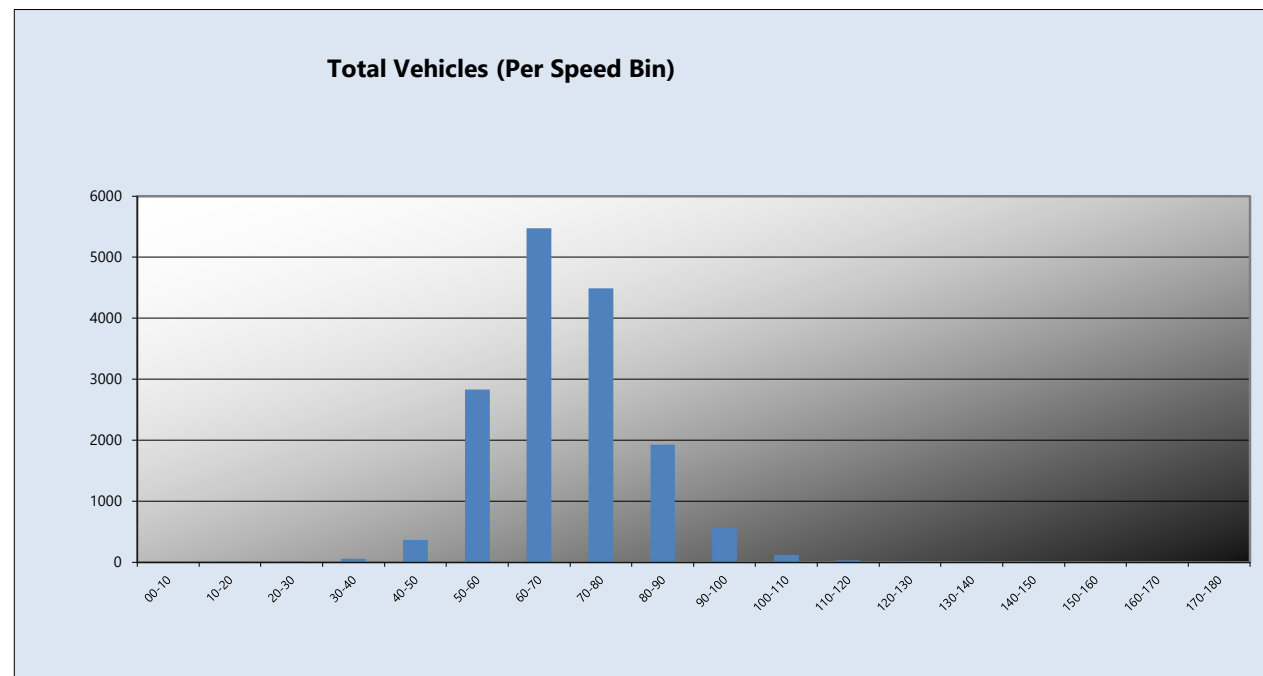
85% Speed = 81.00 km/h, 95% Speed = 89.46 km/h, Median = 68.67 km/h

20 km/h Pace = 58 - 78, Number in Pace = 10255 (64.40%)

Variance = 135.55, Standard Deviation = 11.64 km/h

Speed Bins:

Speed KPH	Bin	
	No.	%
00-10	0	0.0
10-20	7	0.0
20-30	21	0.1
30-40	58	0.4
40-50	371	2.3
50-60	2835	17.8
60-70	5473	34.4
70-80	4495	28.2
80-90	1932	12.1
90-100	566	3.6
100-110	121	0.8
110-120	33	0.2
120-130	9	0.1
130-140	2	0.0
140-150	1	0.0
150-160	0	0.0
160-170	0	0.0
170-180	0	0.0



CLASSIFICATION SCHEMES:

Scheme F Classification Scheme (Non-metric)

Scheme F is an attempt to implement the FWHA's visual classification scheme as an axle-based classification scheme. This is one of several interpretations.

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Vehicle Class	Class	Vehicle Type	No. of Axles	Axle spacing in feet				
				Axle 1 to 2	Axle 2 to 3	Axle 3 to 4	Axle 4 to 5	Axle 5 to 6
PCL/MCL	1	motorcycle	2	<6.0				
CAR*	2	passenger car	2	6.0 - 10.0				
		car + 1 axle trailer	3	<10.0	10.0 - 18.0			
		car + 2 axle trailer	4	<10.0		<3.5		
LGV**	3	pickup	2	10.0 - 15.0				
		pickup + 1 axle trailer	3	10.0 - 15.0	10.0 - 18.0			
		pickup + 2 axle trailer	4	10.0 - 15.0		<3.5		
		pickup + 3 axle trailer	5	9.9 - 15.0			<3.5	
BUS	4	bus	2	>20.0				
		bus	3	>19.0				
OGV 1	5	single unit truck - dual rear axle	2	14.9 - 20.0			<3.5	
	6	3 axle truck	3		<18.0			
OGV 2	7	4 axle truck	4					
	8	2S1	3		>18.0			
		2S2	4		>5.0	>3.5		
		3S1	4		<5.0	>10.0		
	9	3S2	5		<6.1		3.5 - 8.0	
		5 axle combination	5					
	10	6 axle combination	6			3.5 - 5.0		
		3S3	6					
	11	2S1-2	5		>6.0			
	12	3S1-2	6					>10.0
	13	truck	7 or more					

Car* Cars and LGV based cars

LGV** Light Goods Vehicles with the exception of LGV based on cars

CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

SUMMARY

WEEK COMMENCING:

Friday 26 April 2024

TRA/24/048

SITE 02

LOCATION: L1011 East of Cahanagh - (Google Maps Ref: 53°45'51.5"N 7°47'12.7"W)

SPEED SURVEY SUMMARY:

EASTBOUND 85% Speed = 90.36 km/h, 95% Speed = 98.27 km/h, Median = 76.95 km/h Maximum = 159.7 km/h, Minimum = 11.4 km/h, Mean = 76.8 km/h

WESTBOUND 85% Speed = 94.38 km/h, 95% Speed = 103.32 km/h, Median = 79.74 km/h Maximum = 170.2 km/h, Minimum = 10.5 km/h, Mean = 80.0 km/h

VOLUMETRIC VEHICLE COUNTS:

Direction	Time	Friday 26 April 2024	Saturday 27 April 2024	Sunday 28 April 2024	Monday 29 April 2024	Tuesday 30 April 2024	Wednesday 1 May 2024	Thursday 2 May 2024	No. Vehicles	7 day Mean
EASTBOUND	07-19	401	252	248	329	358	366	379	2333	333
WESTBOUND	07-19	451	297	269	374	394	401	410	2596	371
EASTBOUND	00-00	485	333	318	412	440	450	508	2946	421
WESTBOUND	00-00	552	380	347	452	486	508	526	3251	464

PEAK FLOW SUMMARY:

Peak	AM	IP	PM
Most Frequent Peak Hour	0800	1400	1700
Average Vehicles per Peak Hour	36	34	37

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**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

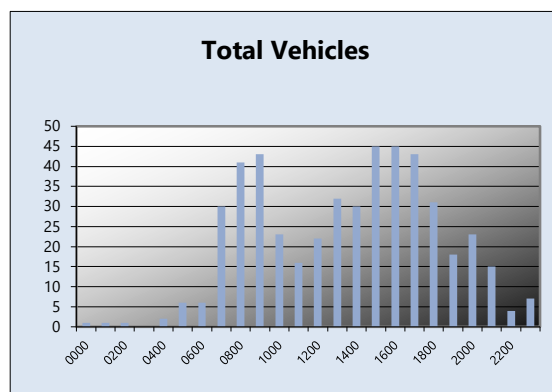
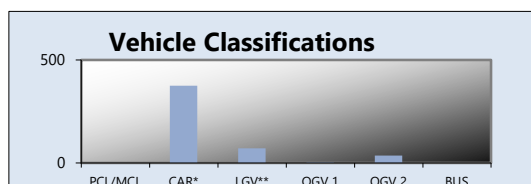
Friday 26 April 2024
TRA/24/048

**SITE 02
EASTBOUND**

RECEIVED: 11/12/2024

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	1	0	0	0	0	1	1
0100	0	1	0	0	0	0	1	1
0200	0	1	0	0	0	0	1	1
0300	0	0	0	0	0	0	0	0
0400	0	0	0	0	2	0	2	5
0500	0	4	1	0	1	0	6	7
0600	0	5	1	0	0	0	6	6
0700	0	24	4	0	2	0	30	33
0800	0	30	5	1	5	0	41	48
0900	0	36	6	0	1	0	43	44
1000	0	19	2	0	2	0	23	26
1100	0	9	3	1	3	0	16	20
1200	0	12	6	1	3	0	22	26
1300	0	26	5	0	1	0	32	33
1400	0	24	4	0	2	0	30	33
1500	0	30	11	0	4	0	45	50
1600	0	33	9	1	2	0	45	48
1700	0	32	9	0	2	0	43	46
1800	0	30	0	0	1	0	31	32
1900	0	13	3	0	2	0	18	21
2000	0	20	2	0	1	0	23	24
2100	0	15	0	0	0	0	15	15
2200	0	3	0	0	1	0	4	5
2300	0	6	1	0	0	0	7	7
07-19	0	305	64	4	28	0	401	439
06-22	0	358	70	4	31	0	463	505
06-00	0	367	71	4	32	0	474	518
00-00	0	374	72	4	35	0	485	533

Peaks	Time	Vehicles	PCU's
AM	0900	43	48
IP	1300	32	33.3
PM	1600	45	48.1



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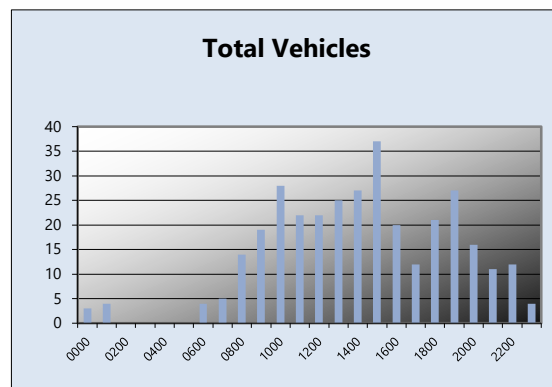
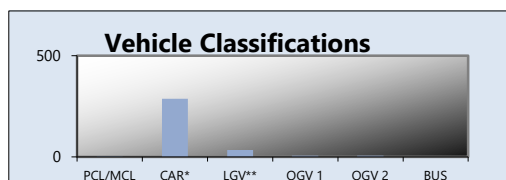
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

Saturday 27 April 2024
TRA/24/048

**SITE 02
EASTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	2	1	0	0	0	3	3
0100	0	4	0	0	0	0	4	4
0200	0	0	0	0	0	0	0	0
0300	0	0	0	0	0	0	0	0
0400	0	0	0	0	0	0	0	0
0500	0	0	0	0	0	0	0	0
0600	0	3	1	0	0	0	4	4
0700	0	5	0	0	0	0	5	5
0800	0	9	3	1	1	0	14	16
0900	0	14	4	0	1	0	19	20
1000	0	25	2	0	1	0	28	29
1100	0	20	1	0	1	0	22	23
1200	0	20	2	0	0	0	22	22
1300	1	20	4	0	0	0	25	24
1400	0	21	6	0	0	0	27	27
1500	0	32	5	0	0	0	37	37
1600	0	19	0	0	1	0	20	21
1700	0	11	0	1	0	0	12	13
1800	0	16	3	1	1	0	21	23
1900	1	25	0	1	0	0	27	27
2000	0	14	1	1	0	0	16	17
2100	0	10	1	0	0	0	11	11
2200	0	12	0	0	0	0	12	12
2300	0	4	0	0	0	0	4	4
07-19	1	212	30	3	6	0	252	261
06-22	2	264	33	5	6	0	310	319
06-00	2	280	33	5	6	0	326	335
00-00	2	286	34	5	6	0	333	342

Peaks	Time	Vehicles	PCU's
AM	0900	19	20.3
IP	1400	27	27
PM	1800	21	22.8



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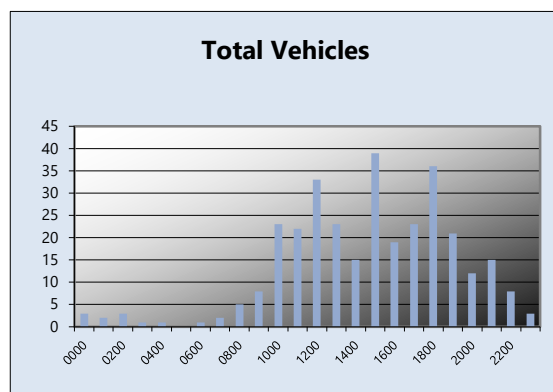
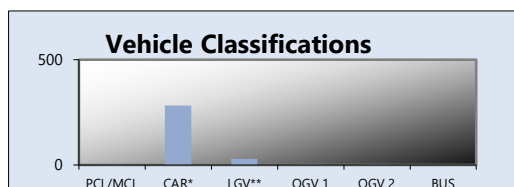
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Sunday 28 April 2024
TRA/24/048**

**SITE 02
EASTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	3	0	0	0	0	3	3
0100	0	2	0	0	0	0	2	2
0200	0	3	0	0	0	0	3	3
0300	0	1	0	0	0	0	1	1
0400	0	0	1	0	0	0	1	1
0500	0	0	0	0	0	0	0	0
0600	0	1	0	0	0	0	1	1
0700	0	2	0	0	0	0	2	2
0800	0	3	2	0	0	0	5	5
0900	0	8	0	0	0	0	8	8
1000	0	17	4	0	2	0	23	26
1100	0	18	4	0	0	0	22	22
1200	1	30	2	0	0	0	33	32
1300	2	19	2	0	0	0	23	21
1400	0	15	0	0	0	0	15	15
1500	0	36	3	0	0	0	39	39
1600	0	17	2	0	0	0	19	19
1700	0	23	0	0	0	0	23	23
1800	0	31	4	1	0	0	36	37
1900	0	20	0	1	0	0	21	22
2000	0	10	1	1	0	0	12	13
2100	0	12	2	0	1	0	15	16
2200	0	8	0	0	0	0	8	8
2300	0	2	1	0	0	0	3	3
07-19	3	219	23	1	2	0	248	249
06-22	3	262	26	3	3	0	297	300
06-00	3	272	27	3	3	0	308	311
00-00	3	281	28	3	3	0	318	321

Peaks	Time	Vehicles	PCU's
AM	0900	8	8
IP	1200	33	32.2
PM	1800	36	36.5



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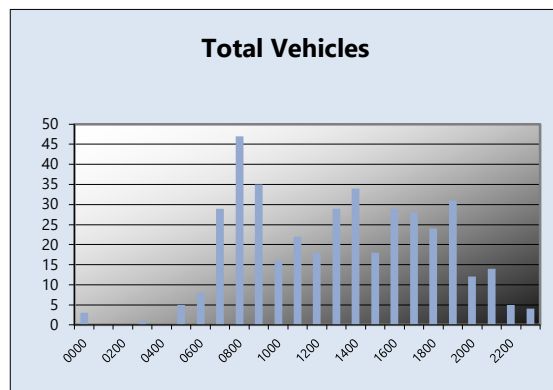
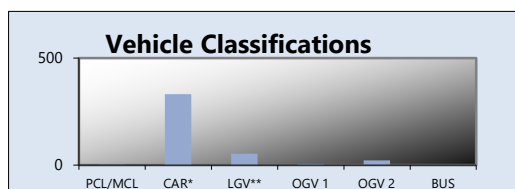
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Monday 29 April 2024
TRA/24/048**

**SITE 02
EASTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	3	0	0	0	0	3	3
0100	0	0	0	0	0	0	0	0
0200	0	0	0	0	0	0	0	0
0300	0	1	0	0	0	0	1	1
0400	0	0	0	0	0	0	0	0
0500	0	3	1	0	1	0	5	6
0600	0	6	0	0	2	0	8	11
0700	0	24	5	0	0	0	29	29
0800	0	31	7	2	7	0	47	57
0900	0	28	5	1	1	0	35	37
1000	0	11	4	0	1	0	16	17
1100	0	17	4	0	1	0	22	23
1200	0	13	5	0	0	0	18	18
1300	0	22	5	0	2	0	29	32
1400	1	28	3	0	2	0	34	36
1500	0	13	3	0	2	0	18	21
1600	0	26	2	1	0	0	29	30
1700	0	25	2	0	1	0	28	29
1800	0	20	4	0	0	0	24	24
1900	0	28	1	0	2	0	31	34
2000	0	9	2	0	1	0	12	13
2100	0	14	0	0	0	0	14	14
2200	0	5	0	0	0	0	5	5
2300	0	4	0	0	0	0	4	4
07-19	1	258	49	4	17	0	329	352
06-22	1	315	52	4	22	0	394	424
06-00	1	324	52	4	22	0	403	433
00-00	1	331	53	4	23	0	412	443

Peaks	Time	Vehicles	PCU's
AM	0800	47	57.1
IP	1400	34	35.8
PM	1600	29	29.5



TRAFFINOMICS LIMITED

**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

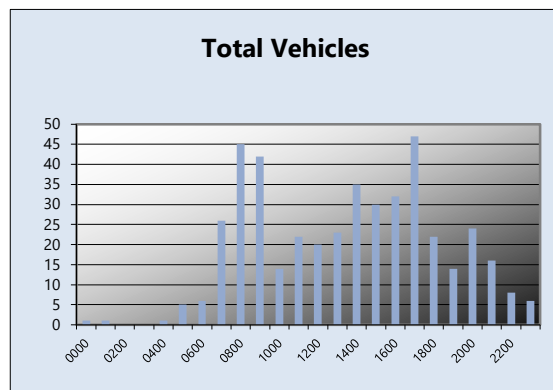
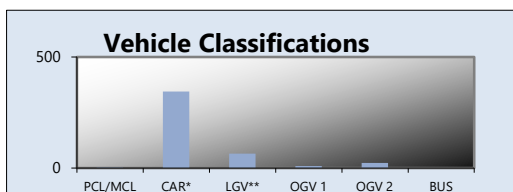
Tuesday 30 April 2024
TRA/24/048

**SITE 02
EASTBOUND**

RECEIVED: 11/12/2024

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	0	1	0	0	0	1	1
0100	0	0	1	0	0	0	1	1
0200	0	0	0	0	0	0	0	0
0300	0	0	0	0	0	0	0	0
0400	0	0	0	0	1	0	1	2
0500	0	2	2	0	1	0	5	6
0600	0	6	0	0	0	0	6	6
0700	0	22	3	0	1	0	26	27
0800	0	30	7	0	8	0	45	55
0900	0	39	3	0	0	0	42	42
1000	0	10	2	1	1	0	14	16
1100	0	17	3	0	2	0	22	25
1200	0	17	2	0	1	0	20	21
1300	0	17	4	1	1	0	23	25
1400	1	26	5	2	1	0	35	37
1500	0	18	9	0	3	0	30	34
1600	0	23	8	0	1	0	32	33
1700	0	39	7	1	0	0	47	48
1800	0	19	1	2	0	0	22	23
1900	0	11	2	0	1	0	14	15
2000	0	20	3	0	1	0	24	25
2100	0	15	1	0	0	0	16	16
2200	0	8	0	0	0	0	8	8
2300	0	5	0	1	0	0	6	7
07-19	1	277	54	7	19	0	358	385
06-22	1	329	60	7	21	0	418	448
06-00	1	342	60	8	21	0	432	463
00-00	1	344	64	8	23	0	440	473

Peaks	Time	Vehicles	PCU's
AM	0800	45	55.4
IP	1400	35	36.5
PM	1700	47	47.5



TRAFFINOMICS LIMITED

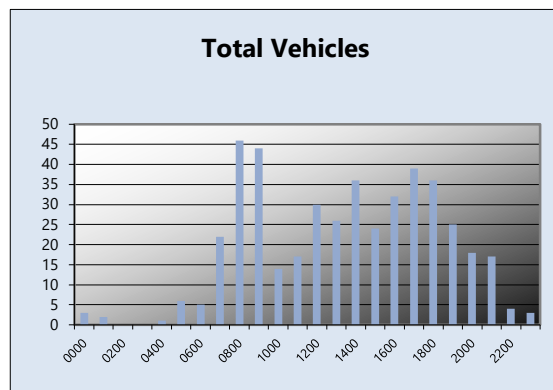
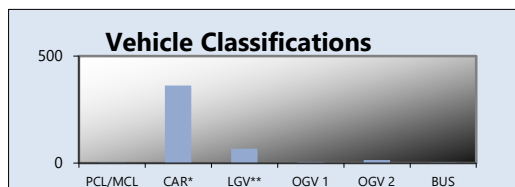
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Wednesday 1 May 2024
TRA/24/048**

**SITE 02
EASTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	3	0	0	0	0	3	3
0100	0	2	0	0	0	0	2	2
0200	0	0	0	0	0	0	0	0
0300	0	0	0	0	0	0	0	0
0400	0	0	0	0	1	0	1	2
0500	0	5	0	1	0	0	6	7
0600	0	4	0	0	1	0	5	6
0700	0	15	6	1	0	0	22	23
0800	0	36	8	0	2	0	46	49
0900	0	37	5	1	1	0	44	46
1000	0	11	2	0	1	0	14	15
1100	0	10	6	0	1	0	17	18
1200	0	25	5	0	0	0	30	30
1300	0	23	2	0	1	0	26	27
1400	0	29	6	0	1	0	36	37
1500	0	15	8	0	1	0	24	25
1600	2	24	4	0	1	1	32	33
1700	0	32	4	1	2	0	39	42
1800	0	32	4	0	0	0	36	36
1900	0	21	3	0	1	0	25	26
2000	0	16	2	0	0	0	18	18
2100	0	15	2	0	0	0	17	17
2200	0	4	0	0	0	0	4	4
2300	0	3	0	0	0	0	3	3
07-19	2	289	60	3	11	1	366	381
06-22	2	345	67	3	13	1	431	449
06-00	2	352	67	3	13	1	438	456
00-00	2	362	67	4	14	1	450	470

Peaks	Time	Vehicles	PCU's
AM	0800	46	48.6
IP	1400	36	37.3
PM	1700	39	42.1



TRAFFINOMICS LIMITED

**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

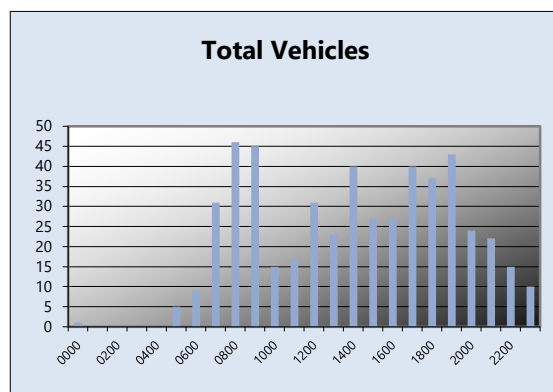
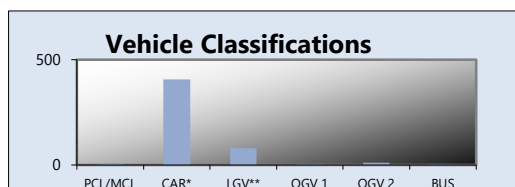
Thursday 2 May 2024
TRA/24/048

**SITE 02
EASTBOUND**

RECEIVED: 11/12/2024

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	1	0	0	0	0	1	1
0100	0	0	0	0	0	0	0	0
0200	0	0	0	0	0	0	0	0
0300	0	0	0	0	0	0	0	0
0400	0	0	0	0	0	0	0	0
0500	0	4	1	0	0	0	5	5
0600	0	7	1	0	1	0	9	10
0700	0	24	6	0	1	0	31	32
0800	0	33	9	0	4	0	46	51
0900	0	38	7	0	0	0	45	45
1000	1	9	5	0	0	0	15	14
1100	0	10	7	0	0	0	17	17
1200	1	21	8	1	0	0	31	31
1300	0	21	2	0	0	0	23	23
1400	1	31	8	0	0	0	40	39
1500	0	22	4	0	1	0	27	28
1600	0	20	4	0	3	0	27	31
1700	1	30	8	1	0	0	40	40
1800	1	31	4	1	0	0	37	37
1900	1	37	5	0	0	0	43	42
2000	0	23	0	0	1	0	24	25
2100	0	22	0	0	0	0	22	22
2200	0	14	1	0	0	0	15	15
2300	0	9	0	0	0	1	10	11
07-19	5	290	72	3	9	0	379	388
06-22	6	379	78	3	11	0	477	488
06-00	6	402	79	3	11	1	502	514
00-00	6	407	80	3	11	1	508	520

Peaks	Time	Vehicles	PCU's
AM	0800	46	51.2
IP	1400	40	39.2
PM	1700	40	39.7



TRAFFINOMICS LIMITED

**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

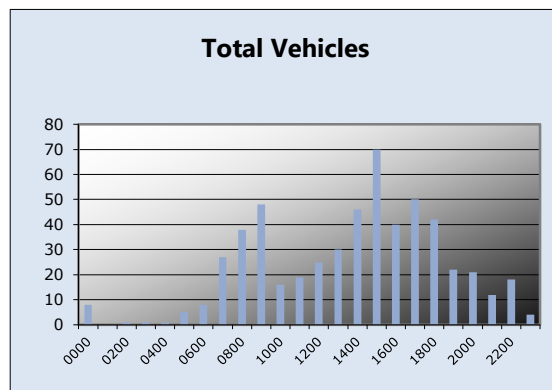
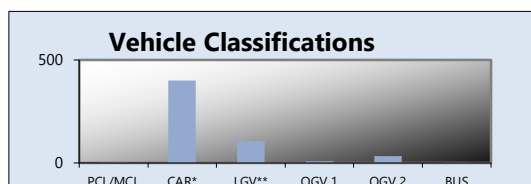
Friday 26 April 2024
TRA/24/048

**SITE 02
WESTBOUND**

RECEIVED: 11/12/2024

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	2	5	1	0	0	0	8	6
0100	0	0	0	0	0	0	0	0
0200	0	0	0	1	0	0	1	2
0300	0	1	0	0	0	0	1	1
0400	0	1	0	0	0	0	1	1
0500	0	3	0	0	2	0	5	8
0600	0	6	1	0	1	0	8	9
0700	0	17	9	0	1	0	27	28
0800	0	29	7	0	2	0	38	41
0900	0	35	8	0	4	1	48	54
1000	0	14	1	0	1	0	16	17
1100	0	8	7	1	3	0	19	23
1200	0	17	4	2	2	0	25	29
1300	1	23	3	1	2	0	30	32
1400	0	30	11	0	5	0	46	53
1500	0	49	12	2	7	0	70	80
1600	0	33	6	0	1	0	40	41
1700	0	39	9	1	1	0	50	52
1800	0	32	10	0	0	0	42	42
1900	0	16	6	0	0	0	22	22
2000	0	16	5	0	0	0	21	21
2100	0	9	2	0	1	0	12	13
2200	0	15	3	0	0	0	18	18
2300	0	3	1	0	0	0	4	4
07-19	1	326	87	7	29	1	451	492
06-22	1	373	101	7	31	1	514	558
06-00	1	391	105	7	31	1	536	580
00-00	3	401	106	8	33	1	552	598

Peaks	Time	Vehicles	PCU's
AM	0900	48	54.2
IP	1400	46	52.5
PM	1700	50	51.8



TRAFFINOMICS LIMITED

**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

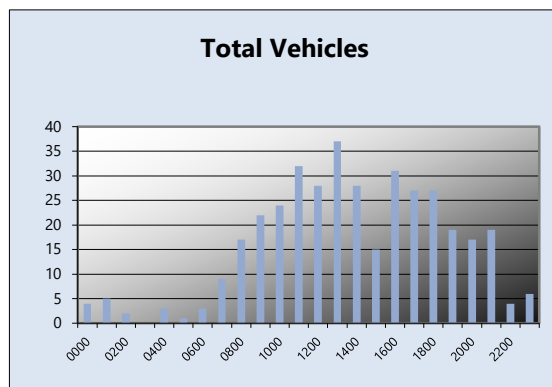
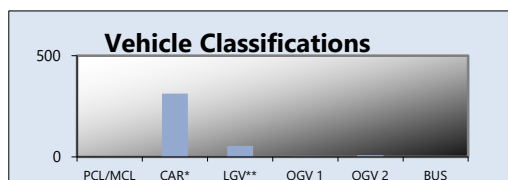
Saturday 27 April 2024
TRA/24/048

**SITE 02
WESTBOUND**

RECEIVED: 11/12/2024

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	3	1	0	0	0	4	4
0100	0	5	0	0	0	0	5	5
0200	0	2	0	0	0	0	2	2
0300	0	0	0	0	0	0	0	0
0400	0	3	0	0	0	0	3	3
0500	0	1	0	0	0	0	1	1
0600	0	3	0	0	0	0	3	3
0700	0	6	2	0	1	0	9	10
0800	0	12	3	0	2	0	17	20
0900	0	19	3	0	0	0	22	22
1000	0	18	5	0	1	0	24	25
1100	0	25	6	1	0	0	32	33
1200	0	25	3	0	0	0	28	28
1300	0	30	6	0	1	0	37	38
1400	0	22	5	0	1	0	28	29
1500	0	10	4	0	1	0	15	16
1600	0	24	6	1	0	0	31	32
1700	0	25	1	0	1	0	27	28
1800	0	25	1	0	1	0	27	28
1900	0	14	5	0	0	0	19	19
2000	0	15	2	0	0	0	17	17
2100	0	18	1	0	0	0	19	19
2200	0	4	0	0	0	0	4	4
2300	0	5	1	0	0	0	6	6
07-19	0	241	45	2	9	0	297	310
06-22	0	291	53	2	9	0	355	368
06-00	0	300	54	2	9	0	365	378
00-00	0	314	55	2	9	0	380	393

Peaks	Time	Vehicles	PCU's
AM	0900	22	22
IP	1300	37	38.3
PM	1600	31	31.5



TRAFFINOMICS LIMITED

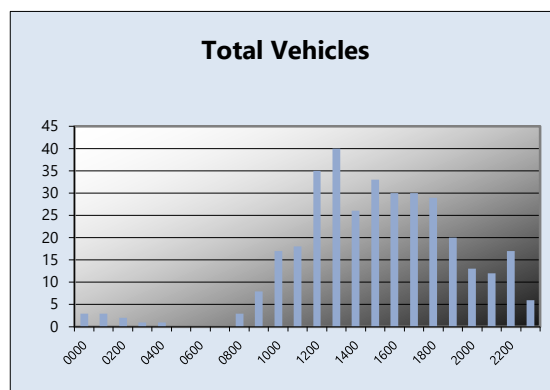
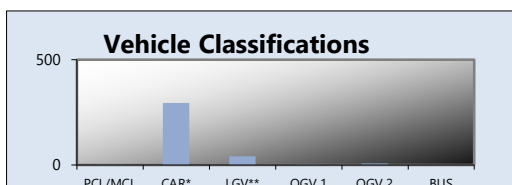
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Sunday 28 April 2024
TRA/24/048**

**SITE 02
WESTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	3	0	0	0	0	3	3
0100	0	1	2	0	0	0	3	3
0200	0	2	0	0	0	0	2	2
0300	0	1	0	0	0	0	1	1
0400	0	1	0	0	0	0	1	1
0500	0	0	0	0	0	0	0	0
0600	0	0	0	0	0	0	0	0
0700	0	0	0	0	0	0	0	0
0800	0	3	0	0	0	0	3	3
0900	1	6	1	0	0	0	8	7
1000	1	14	2	0	0	0	17	16
1100	0	16	2	0	0	0	18	18
1200	0	29	6	0	0	0	35	35
1300	1	35	3	1	0	0	40	40
1400	0	23	3	0	0	0	26	26
1500	0	32	1	0	0	0	33	33
1600	0	21	8	0	1	0	30	31
1700	0	26	3	0	1	0	30	31
1800	0	26	2	0	1	0	29	30
1900	0	14	3	1	2	0	20	23
2000	0	11	2	0	0	0	13	13
2100	0	11	1	0	0	0	12	12
2200	0	15	2	0	0	0	17	17
2300	0	4	1	0	1	0	6	7
07-19	3	231	31	1	3	0	269	271
06-22	3	267	37	2	5	0	314	319
06-00	3	286	40	2	6	0	337	343
00-00	3	294	42	2	6	0	347	353

Peaks	Time	Vehicles	PCU's
AM	0900	8	7.2
IP	1300	40	39.7
PM	1600	30	31.3



TRAFFINOMICS LIMITED

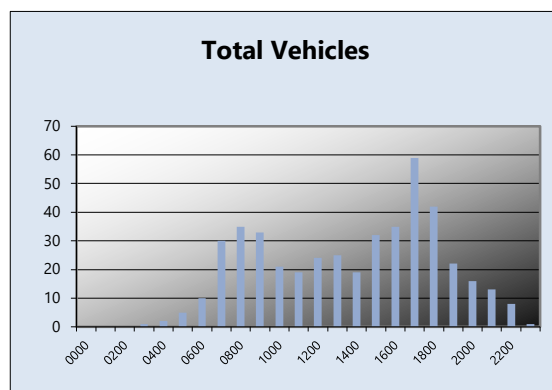
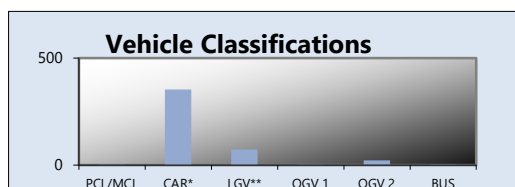
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Monday 29 April 2024
TRA/24/048**

**SITE 02
WESTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	0	0	0	0	0	0	0
0100	0	0	0	0	0	0	0	0
0200	0	0	0	0	0	0	0	0
0300	0	0	1	0	0	0	1	1
0400	0	2	0	0	0	0	2	2
0500	0	2	1	0	2	0	5	8
0600	0	7	2	0	1	0	10	11
0700	0	21	6	1	2	0	30	33
0800	0	30	4	0	1	0	35	36
0900	0	26	5	0	2	0	33	36
1000	0	13	6	0	2	0	21	24
1100	0	14	3	0	1	1	19	21
1200	0	16	6	1	0	1	24	26
1300	0	23	2	0	0	0	25	25
1400	0	11	7	0	1	0	19	20
1500	0	24	6	0	2	0	32	35
1600	0	29	5	0	1	0	35	36
1700	0	47	9	0	3	0	59	63
1800	1	37	3	0	1	0	42	43
1900	0	18	2	0	2	0	22	25
2000	0	12	4	0	0	0	16	16
2100	0	12	1	0	0	0	13	13
2200	0	8	0	0	0	0	8	8
2300	0	0	0	0	1	0	1	2
07-19	1	291	62	2	16	2	374	397
06-22	1	340	71	2	19	2	435	462
06-00	1	348	71	2	20	2	444	472
00-00	1	352	73	2	22	2	452	483

Peaks	Time	Vehicles	PCU's
AM	0800	35	36.3
IP	1300	25	25.5
PM	1700	59	62.9



TRAFFINOMICS LIMITED

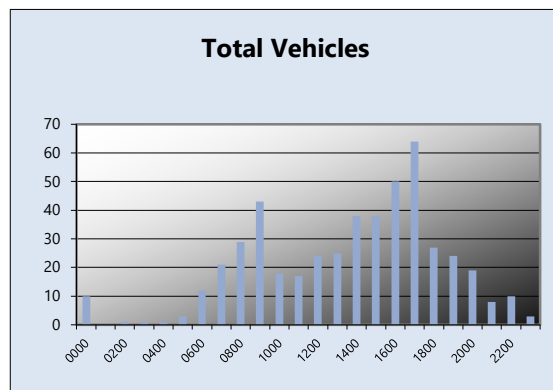
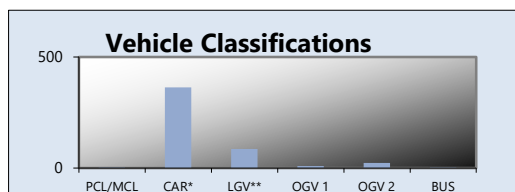
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

Tuesday 30 April 2024
TRA/24/048

**SITE 02
WESTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	1	7	2	0	0	0	10	9
0100	0	0	0	0	0	0	0	0
0200	0	1	0	0	0	0	1	1
0300	0	1	0	0	0	0	1	1
0400	0	1	0	0	0	0	1	1
0500	0	2	1	0	0	0	3	3
0600	0	10	1	0	1	0	12	13
0700	0	13	5	2	1	0	21	23
0800	0	24	3	0	2	0	29	32
0900	0	36	4	1	2	0	43	46
1000	0	13	3	1	1	0	18	20
1100	1	10	5	0	1	0	17	18
1200	0	18	3	0	2	1	24	28
1300	0	17	6	1	1	0	25	27
1400	0	24	13	0	1	0	38	39
1500	0	29	6	0	3	0	38	42
1600	0	34	10	2	4	0	50	56
1700	0	49	13	1	1	0	64	66
1800	0	20	4	1	2	0	27	30
1900	0	20	3	0	1	0	24	25
2000	0	19	0	0	0	0	19	19
2100	0	5	3	0	0	0	8	8
2200	0	10	0	0	0	0	10	10
2300	0	1	1	0	1	0	3	4
07-19	1	287	75	9	21	1	394	426
06-22	1	341	82	9	23	1	457	492
06-00	1	352	83	9	24	1	470	506
00-00	2	364	86	9	24	1	486	521

Peaks	Time	Vehicles	PCU's
AM	0900	43	46.1
IP	1400	38	39.3
PM	1700	64	65.8



TRAFFINOMICS LIMITED

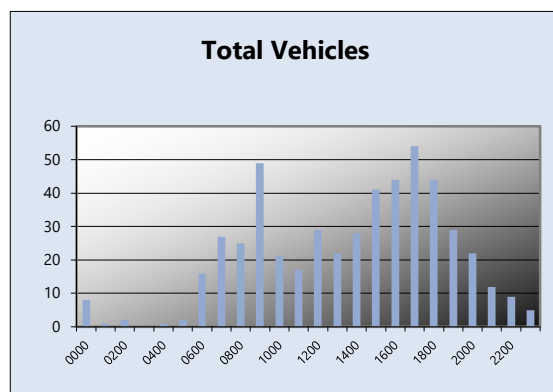
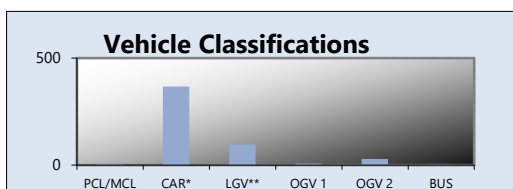
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Wednesday 1 May 2024
TRA/24/048**

**SITE 02
WESTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	1	5	2	0	0	0	8	7
0100	0	1	0	0	0	0	1	1
0200	0	1	1	0	0	0	2	2
0300	0	0	0	0	0	0	0	0
0400	0	1	0	0	0	0	1	1
0500	0	1	1	0	0	0	2	2
0600	0	10	4	0	2	0	16	19
0700	0	20	7	0	0	0	27	27
0800	0	18	5	0	2	0	25	28
0900	0	37	9	1	2	0	49	52
1000	1	15	3	0	2	0	21	23
1100	0	10	6	0	1	0	17	18
1200	0	22	6	1	0	0	29	30
1300	1	14	4	0	3	0	22	25
1400	0	20	5	0	3	0	28	32
1500	0	29	7	2	2	1	41	46
1600	1	28	10	3	1	1	44	47
1700	1	38	10	0	5	0	54	60
1800	2	35	6	0	1	0	44	44
1900	0	21	6	0	2	0	29	32
2000	0	20	1	0	1	0	22	23
2100	0	10	2	0	0	0	12	12
2200	0	8	1	0	0	0	9	9
2300	0	3	1	0	1	0	5	6
07-19	6	286	78	7	22	2	401	430
06-22	6	347	91	7	27	2	480	516
06-00	6	358	93	7	28	2	494	531
00-00	7	367	97	7	28	2	508	544

Peaks	Time	Vehicles	PCU's
AM	0900	49	52.1
IP	1200	29	31.9
PM	1700	54	59.7



TRAFFINOMICS LIMITED

**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

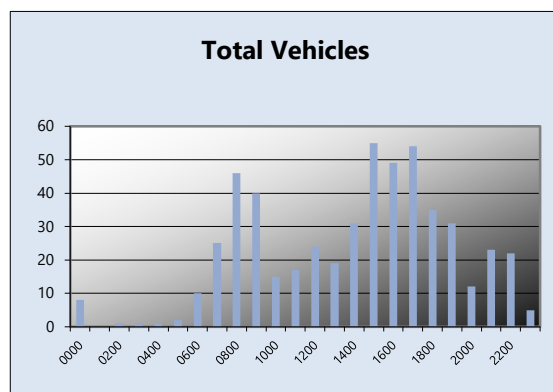
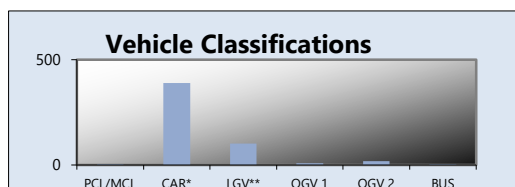
Thursday 2 May 2024
TRA/24/048

**SITE 02
WESTBOUND**

RECEIVED: 11/12/2024

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	1	5	1	1	0	0	8	8
0100	0	0	0	0	0	0	0	0
0200	0	0	1	0	0	0	1	1
0300	0	0	1	0	0	0	1	1
0400	0	1	0	0	0	0	1	1
0500	0	2	0	0	0	0	2	2
0600	0	7	2	0	1	0	10	11
0700	0	19	5	1	0	0	25	26
0800	0	33	10	0	2	1	46	50
0900	0	30	5	3	2	0	40	44
1000	0	9	5	0	0	1	15	16
1100	0	10	7	0	0	0	17	17
1200	0	18	5	1	0	0	24	25
1300	0	12	7	0	0	0	19	19
1400	1	26	4	0	0	0	31	30
1500	0	44	7	1	3	0	55	59
1600	0	31	12	0	5	1	49	57
1700	0	38	11	1	3	1	54	59
1800	1	32	2	0	0	0	35	34
1900	0	24	5	0	2	0	31	34
2000	1	10	1	0	0	0	12	11
2100	0	20	3	0	0	0	23	23
2200	0	15	6	1	0	0	22	23
2300	0	3	1	0	1	0	5	6
07-19	2	302	80	7	15	4	410	435
06-22	3	363	91	7	18	4	486	515
06-00	3	381	98	8	19	4	513	543
00-00	4	389	101	9	19	4	526	556

Peaks	Time	Vehicles	PCU's
AM	0800	46	49.6
IP	1400	31	30.2
PM	1700	54	59.4



TRAFFINOMICS LIMITED

CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

SITE 02
EASTBOUND

WEEK COMMENCING:

Friday 26 April 2024
TRA/24/048

TIME PERIOD	Friday 26 April 2024	Saturday 27 April 2024	Sunday 28 April 2024	Monday 29 April 2024	Tuesday 30 April 2024	Wednesday 1 May 2024	Thursday 2 May 2024	Average
0000	1	3	3	3	1	3	1	2
0100	1	4	2	0	1	2	0	1
0200	1	0	3	0	0	0	0	1
0300	0	0	1	1	0	0	0	0
0400	2	0	1	0	1	1	0	1
0500	6	0	0	5	5	6	5	4
0600	6	4	1	8	6	5	9	6
0700	30	5	2	29	26	22	31	21
0800	41	14	5	47	45	46	46	35
0900	43	19	8	35	42	44	45	34
1000	23	28	23	16	14	14	15	19
1100	16	22	22	22	22	17	17	20
1200	22	22	33	18	20	30	31	25
1300	32	25	23	29	23	26	23	26
1400	30	27	15	34	35	36	40	31
1500	45	37	39	18	30	24	27	31
1600	45	20	19	29	32	32	27	29
1700	43	12	23	28	47	39	40	33
1800	31	21	36	24	22	36	37	30
1900	18	27	21	31	14	25	43	26
2000	23	16	12	12	24	18	24	18
2100	15	11	15	14	16	17	22	16
2200	4	12	8	5	8	4	15	8
2300	7	4	3	4	6	3	10	5
07-19	401	252	248	329	358	366	379	333
06-22	463	310	297	394	418	431	477	399
06-00	474	326	308	403	432	438	502	412
00-00	485	333	318	412	440	450	508	421

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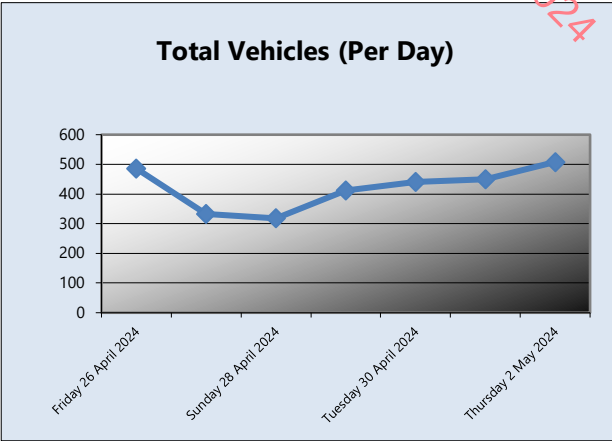
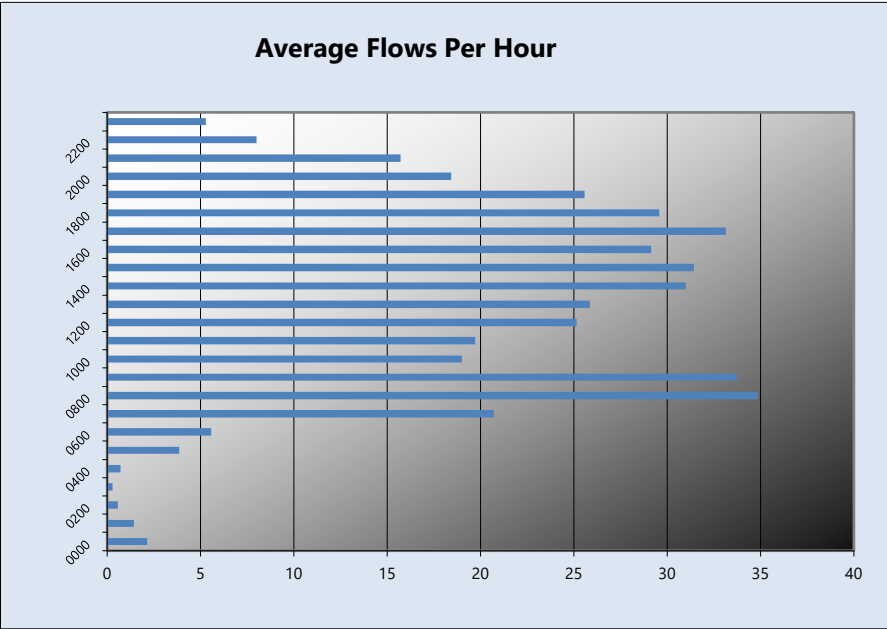
CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

SITE 02
EASTBOUND

WEEK COMMENCING:

Friday 26 April 2024
TRA/24/048

RECEIVED: 11/12/2024



Peak Time & Volumetric Count Data

	Friday 26 April 2024	Saturday 27 April 2024	Sunday 28 April 2024	Monday 29 April 2024	Tuesday 30 April 2024	Wednesday 1 May 2024	Thursday 2 May 2024	Mode/ Average
AM								
Time	0900	0900	0900	0800	0800	0800	0800	0800
Vehicles	43	19	8	47	45	46	46	36
IP								
Time	1300	1400	1200	1400	1400	1400	1400	1400
Vehicles	32	27	33	34	35	36	40	34
PM								
Time	1600	1800	1800	1600	1700	1700	1700	1700
Vehicles	45	21	36	29	47	39	40	37

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**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**SITE 02
WESTBOUND**

WEEK COMMENCING:

**Friday 26 April 2024
TRA/24/048**

TIME PERIOD	Friday 26 April 2024	Saturday 27 April 2024	Sunday 28 April 2024	Monday 29 April 2024	Tuesday 30 April 2024	Wednesday 1 May 2024	Thursday 2 May 2024	Average
0000	8	4	3	0	10	8	8	6
0100	0	5	3	0	0	1	0	1
0200	1	2	2	0	1	2	1	1
0300	1	0	1	1	1	0	1	1
0400	1	3	1	2	1	1	1	1
0500	5	1	0	5	3	2	2	3
0600	8	3	0	10	12	16	10	8
0700	27	9	0	30	21	27	25	20
0800	38	17	3	35	29	25	46	28
0900	48	22	8	33	43	49	40	35
1000	16	24	17	21	18	21	15	19
1100	19	32	18	19	17	17	17	20
1200	25	28	35	24	24	29	24	27
1300	30	37	40	25	25	22	19	28
1400	46	28	26	19	38	28	31	31
1500	70	15	33	32	38	41	55	41
1600	40	31	30	35	50	44	49	40
1700	50	27	30	59	64	54	54	48
1800	42	27	29	42	27	44	35	35
1900	22	19	20	22	24	29	31	24
2000	21	17	13	16	19	22	12	17
2100	12	19	12	13	8	12	23	14
2200	18	4	17	8	10	9	22	13
2300	4	6	6	1	3	5	5	4
07-19	451	297	269	374	394	401	410	371
06-22	514	355	314	435	457	480	486	434
06-00	536	365	337	444	470	494	513	451
00-00	552	380	347	452	486	508	526	464

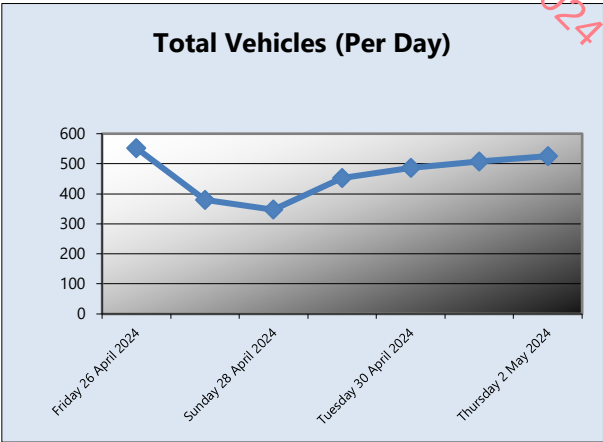
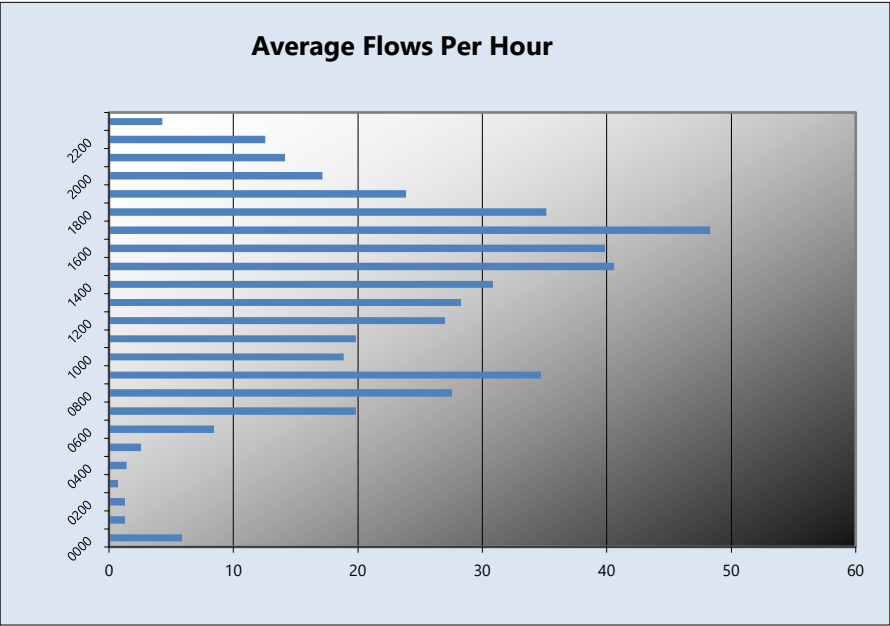
RECEIVED: 11/12/2024

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CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

SITE 02
WESTBOUND

WEEK COMMENCING: Friday 26 April 2024
TRA/24/048



Peak Time & Volumetric Count Data

	Friday 26 April 2024	Saturday 27 April 2024	Sunday 28 April 2024	Monday 29 April 2024	Tuesday 30 April 2024	Wednesday 1 May 2024	Thursday 2 May 2024	Mode/ Average
AM								
Time	0900	0900	0900	0800	0900	0900	0800	0900
Vehicles	48	22	48	35	43	49	46	42
IP								
Time	1400	1300	1300	1300	1400	1200	1400	1400
Vehicles	46	37	40	25	38	29	31	35
PM								
Time	1700	1600	1600	1700	1700	1700	1700	1700
Vehicles	50	31	30	59	64	54	54	49

CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

WEEK COMMENCING:

Friday 26 April 2024

TRA/24/048

SITE 02
EASTBOUND

Profile:

Filter time: 00:00 26th April 2024 => 23:59 2nd May 2024

Speed range: 0 - 200 km/h.

Separation: Greater than 4.00 seconds. - (Headway)

Units: Metric (meter, kilometer, m/s, km/h, kg, tonne)

Vehicles = 2801

Maximum = 159.7 km/h, Minimum = 11.4 km/h, Mean = 76.8 km/h

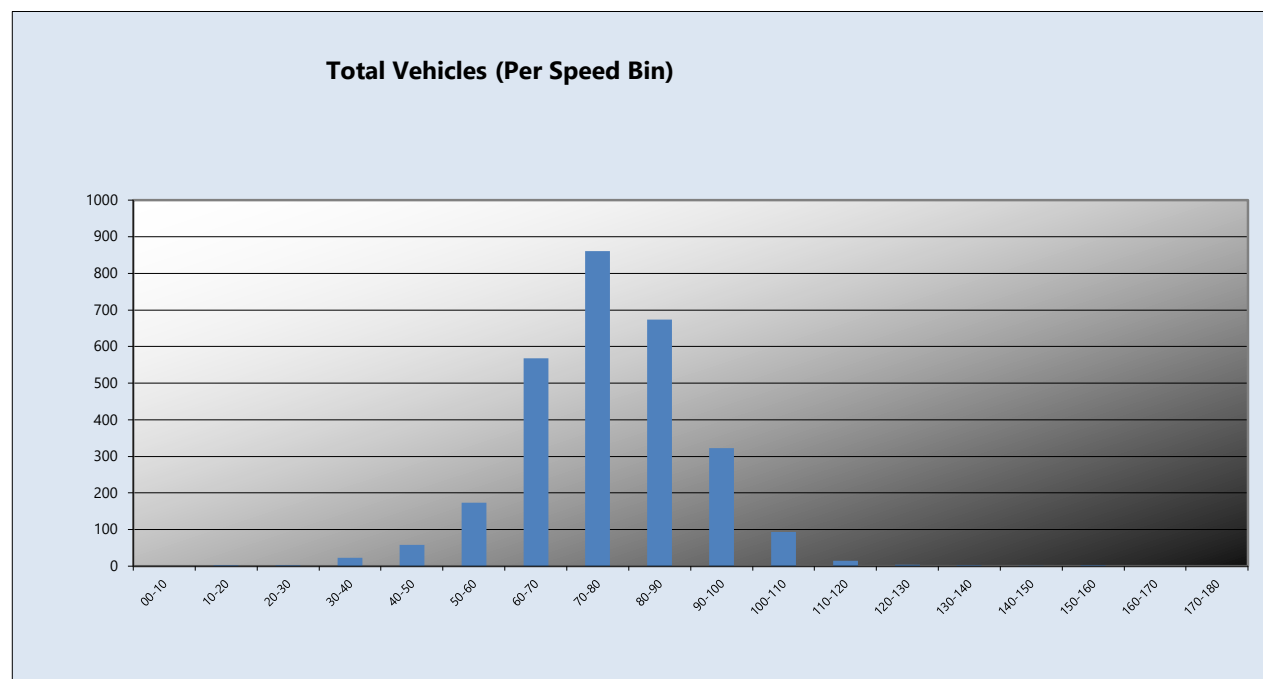
85% Speed = 90.36 km/h, 95% Speed = 98.27 km/h, Median = 76.95 km/h

20 km/h Pace = 68 - 88, Number in Pace = 1603 (57.23%)

Variance = 190.85, Standard Deviation = 13.81 km/h

Speed Bins:

Speed KPH	Bin	
	No.	%
00-10	0	0.0
10-20	2	0.1
20-30	2	0.1
30-40	23	0.8
40-50	58	2.1
50-60	174	6.2
60-70	568	20.3
70-80	861	30.7
80-90	674	24.1
90-100	322	11.5
100-110	93	3.3
110-120	15	0.5
120-130	4	0.1
130-140	2	0.1
140-150	1	0.0
150-160	2	0.1
160-170	0	0.0
170-180	0	0.0



CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

WEEK COMMENCING:

Friday 26 April 2024

TRA/24/048

SITE 02
WESTBOUND

Profile:

Filter time: 00:00 26th April 2024 => 23:59 2nd May 2024

Speed range: 0 - 200 km/h.

Separation: Greater than 4.00 seconds. - (Headway)

Units: Metric (meter, kilometer, m/s, km/h, kg, tonne)

Vehicles = 2961

Maximum = 170.2 km/h, Minimum = 10.5 km/h, Mean = 80.0 km/h

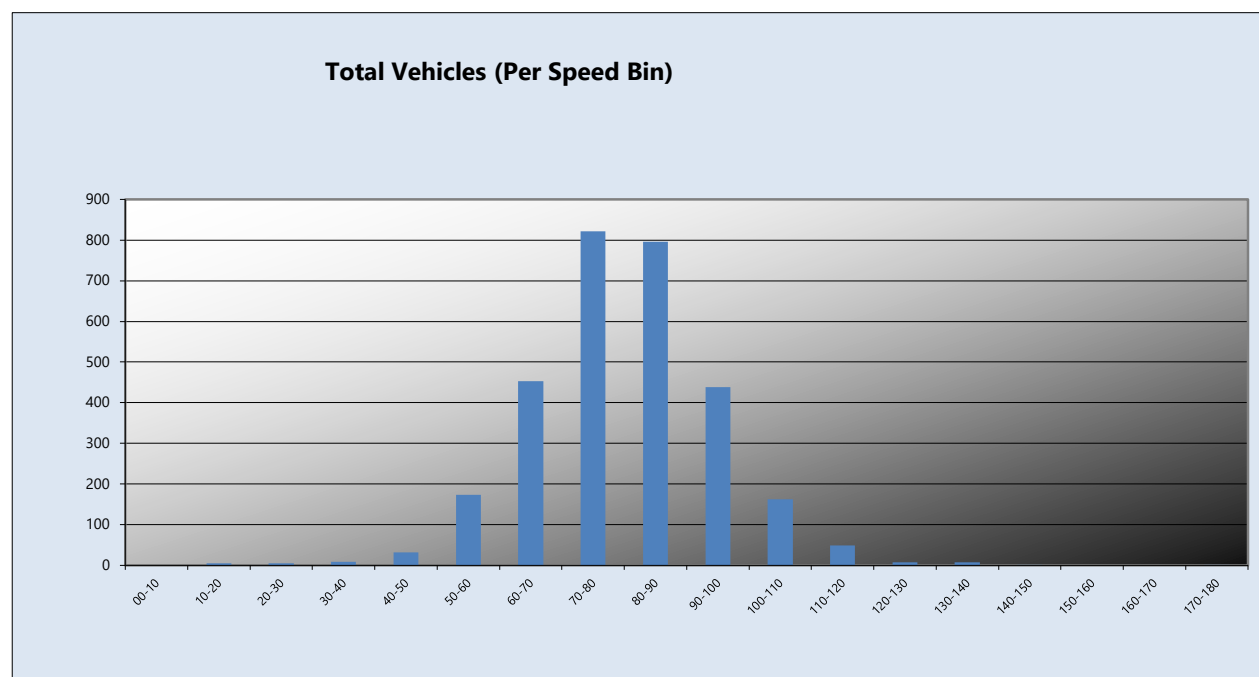
85% Speed = 94.38 km/h, 95% Speed = 103.32 km/h, Median = 79.74 km/h

20 km/h Pace = 70 - 90, Number in Pace = 1625 (54.88%)

Variance = 213.38, Standard Deviation = 14.61 km/h

Speed Bins:

Speed KPH	Bin	
	No.	%
00-10	0	0.0
10-20	5	0.2
20-30	5	0.2
30-40	9	0.3
40-50	32	1.1
50-60	173	5.8
60-70	453	15.3
70-80	821	27.7
80-90	796	26.9
90-100	438	14.8
100-110	163	5.5
110-120	49	1.7
120-130	8	0.3
130-140	7	0.2
140-150	1	0.0
150-160	0	0.0
160-170	0	0.0
170-180	1	0.0



CLASSIFICATION SCHEMES:

Scheme F Classification Scheme (Non-metric)

Scheme F is an attempt to implement the FWHA's visual classification scheme as an axle-based classification scheme. This is one of several interpretations.

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Vehicle Class	Class	Vehicle Type	No. of Axles	Axle spacing in feet				
				Axle 1 to 2	Axle 2 to 3	Axle 3 to 4	Axle 4 to 5	Axle 5 to 6
PCL/MCL	1	motorcycle	2	<6.0				
CAR*	2	passenger car	2	6.0 - 10.0				
		car + 1 axle trailer	3	<10.0	10.0 - 18.0			
		car + 2 axle trailer	4	<10.0		<3.5		
LGV**	3	pickup	2	10.0 - 15.0				
		pickup + 1 axle trailer	3	10.0 - 15.0	10.0 - 18.0			
		pickup + 2 axle trailer	4	10.0 - 15.0		<3.5		
		pickup + 3 axle trailer	5	9.9 - 15.0			<3.5	
BUS	4	bus	2	>20.0				
		bus	3	>19.0				
OGV 1	5	single unit truck - dual rear axle	2	14.9 - 20.0			<3.5	
	6	3 axle truck	3		<18.0			
OGV 2	7	4 axle truck	4					
	8	2S1	3		>18.0			
		2S2	4		>5.0	>3.5		
		3S1	4		<5.0	>10.0		
	9	3S2	5		<6.1		3.5 - 8.0	
		5 axle combination	5					
	10	6 axle combination	6			3.5 - 5.0		
		3S3	6					
	11	2S1-2	5		>6.0			
	12	3S1-2	6					>10.0
	13	truck	7 or more					

Car* Cars and LGV based cars

LGV** Light Goods Vehicles with the exception of LGV based on cars

CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

SUMMARY

WEEK COMMENCING:

Friday 26 April 2024

TRA/24/048

SITE 03

LOCATION: L1011 West of Kiernan's Cross - (Google Maps Ref: 53°45'47.4"N 7°45'11.5"W)

SPEED SURVEY SUMMARY:

EASTBOUND 85% Speed = 88.74 km/h, 95% Speed = 96.95 km/h, Median = 77.09 km/h Maximum = 149.6 km/h, Minimum = 6.6 km/h, Mean = 76.6 km/h

WESTBOUND 85% Speed = 88.29 km/h, 95% Speed = 96.57 km/h, Median = 75.87 km/h Maximum = 149.0 km/h, Minimum = 6.2 km/h, Mean = 75.4 km/h

VOLUMETRIC VEHICLE COUNTS:

Direction	Time	Friday 26 April 2024	Saturday 27 April 2024	Sunday 28 April 2024	Monday 29 April 2024	Tuesday 30 April 2024	Wednesday 1 May 2024	Thursday 2 May 2024	No. Vehicles	7 day Mean
EASTBOUND	07-19	684	437	405	549	577	545	583	3780	540
WESTBOUND	07-19	715	501	406	562	573	583	619	3959	566
EASTBOUND	00-00	821	574	522	685	728	694	768	4792	685
WESTBOUND	00-00	858	618	513	676	723	746	774	4908	701

PEAK FLOW SUMMARY:

Peak	AM	IP	PM
Most Frequent Peak Hour	0800	1400	1700
Average Vehicles per Peak Hour	53	50	68

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**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

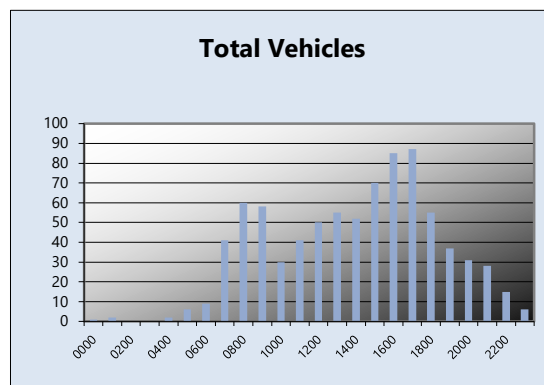
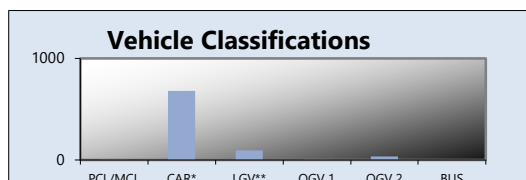
Friday 26 April 2024
TRA/24/048

**SITE 03
EASTBOUND**

RECEIVED: 11/12/2024

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	1	0	0	0	0	1	1
0100	0	2	0	0	0	0	2	2
0200	0	0	0	0	0	0	0	0
0300	0	0	0	0	0	0	0	0
0400	0	0	1	0	1	0	2	3
0500	0	3	0	0	3	0	6	10
0600	1	7	1	0	0	0	9	8
0700	0	32	6	1	2	0	41	44
0800	0	48	6	1	5	0	60	67
0900	0	48	8	0	2	0	58	61
1000	0	24	4	0	2	0	30	33
1100	0	33	5	0	3	0	41	45
1200	0	36	11	0	3	0	50	54
1300	0	46	8	1	0	0	55	56
1400	0	43	6	1	2	0	52	55
1500	0	55	11	0	4	0	70	75
1600	0	74	8	0	3	0	85	89
1700	0	74	11	0	2	0	87	90
1800	0	51	3	0	1	0	55	56
1900	0	32	2	1	2	0	37	40
2000	1	27	2	0	1	0	31	32
2100	0	27	1	0	0	0	28	28
2200	0	12	2	0	1	0	15	16
2300	0	5	1	0	0	0	6	6
07-19	0	564	87	4	29	0	684	724
06-22	2	657	93	5	32	0	789	832
06-00	2	674	96	5	33	0	810	854
00-00	2	680	97	5	37	0	821	870

Peaks	Time	Vehicles	PCU's
AM	0800	60	67
IP	1300	55	55.5
PM	1700	87	89.6



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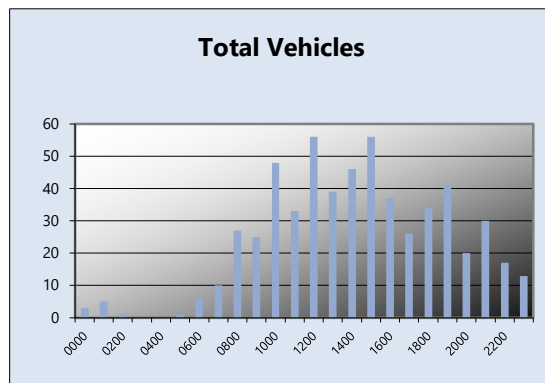
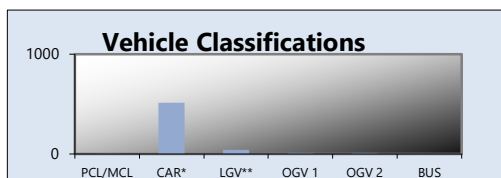
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Saturday 27 April 2024
TRA/24/048**

**SITE 03
EASTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	3	0	0	0	0	3	3
0100	0	5	0	0	0	0	5	5
0200	0	1	0	0	0	0	1	1
0300	0	0	0	0	0	0	0	0
0400	0	0	0	0	0	0	0	0
0500	0	1	0	0	0	0	1	1
0600	0	5	1	0	0	0	6	6
0700	0	9	0	1	0	0	10	11
0800	0	22	4	0	1	0	27	28
0900	0	21	3	0	1	0	25	26
1000	0	41	3	2	2	0	48	52
1100	1	28	2	1	1	0	33	34
1200	2	50	3	1	0	0	56	55
1300	0	37	2	0	0	0	39	39
1400	0	38	8	0	0	0	46	46
1500	0	47	6	2	1	0	56	58
1600	0	35	1	0	1	0	37	38
1700	0	25	1	0	0	0	26	26
1800	0	30	3	0	1	0	34	35
1900	1	37	2	1	0	0	41	41
2000	0	19	0	1	0	0	20	21
2100	0	27	3	0	0	0	30	30
2200	0	17	0	0	0	0	17	17
2300	0	13	0	0	0	0	13	13
07-19	3	383	36	7	8	0	437	449
06-22	4	471	42	9	8	0	534	546
06-00	4	501	42	9	8	0	564	576
00-00	4	511	42	9	8	0	574	586

Peaks	Time	Vehicles	PCU's
AM	0800	27	28.3
IP	1200	56	54.9
PM	1600	37	38.3



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**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

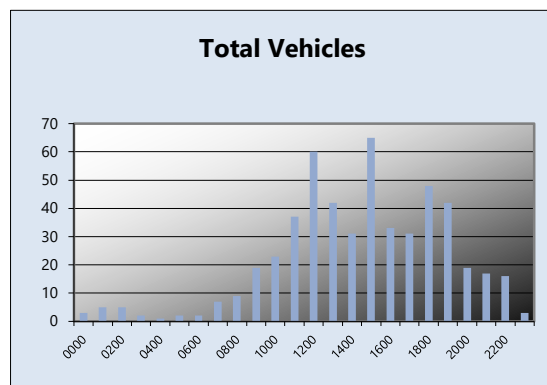
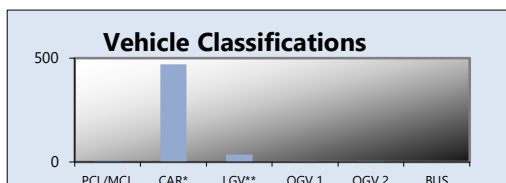
**Sunday 28 April 2024
TRA/24/048**

**SITE 03
EASTBOUND**

RECEIVED: 11/12/2024

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	3	0	0	0	0	3	3
0100	0	5	0	0	0	0	5	5
0200	0	5	0	0	0	0	5	5
0300	0	2	0	0	0	0	2	2
0400	0	0	1	0	0	0	1	1
0500	0	0	2	0	0	0	2	2
0600	0	2	0	0	0	0	2	2
0700	0	6	1	0	0	0	7	7
0800	2	4	3	0	0	0	9	7
0900	1	18	0	0	0	0	19	18
1000	0	16	5	0	2	0	23	26
1100	1	34	2	0	0	0	37	36
1200	1	56	2	0	1	0	60	61
1300	0	38	4	0	0	0	42	42
1400	0	31	0	0	0	0	31	31
1500	0	62	3	0	0	0	65	65
1600	2	28	3	0	0	0	33	31
1700	0	30	0	0	1	0	31	32
1800	1	40	5	2	0	0	48	48
1900	1	40	1	0	0	0	42	41
2000	0	17	2	0	0	0	19	19
2100	0	17	0	0	0	0	17	17
2200	0	14	2	0	0	0	16	16
2300	0	3	0	0	0	0	3	3
07-19	8	363	28	2	4	0	405	405
06-22	9	439	31	2	4	0	485	484
06-00	9	456	33	2	4	0	504	503
00-00	9	471	36	2	4	0	522	521

Peaks	Time	Vehicles	PCU's
AM	0900	19	18.2
IP	1200	60	60.5
PM	1800	48	48.2



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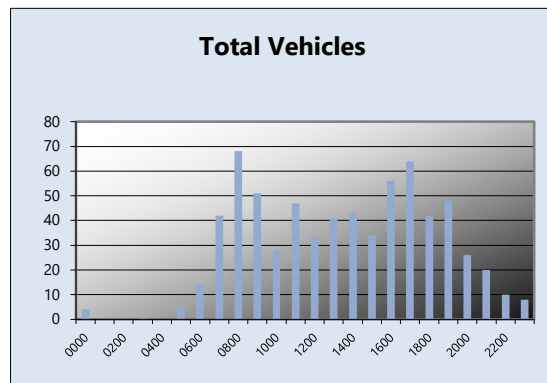
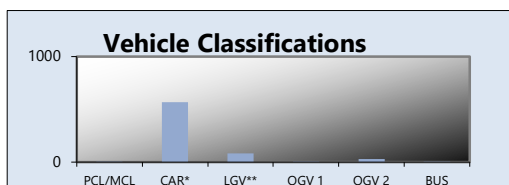
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Monday 29 April 2024
TRA/24/048**

**SITE 03
EASTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	4	0	0	0	0	4	4
0100	0	0	0	0	0	0	0	0
0200	0	0	0	0	0	0	0	0
0300	0	1	0	0	0	0	1	1
0400	0	0	0	0	0	0	0	0
0500	0	2	1	0	2	0	5	8
0600	0	8	4	0	2	0	14	17
0700	0	32	10	0	0	0	42	42
0800	0	52	7	1	7	1	68	79
0900	0	36	12	0	3	0	51	55
1000	0	23	3	0	2	0	28	31
1100	0	38	8	0	1	0	47	48
1200	0	27	5	1	0	0	33	34
1300	0	34	4	1	2	0	41	44
1400	1	37	4	0	1	0	43	44
1500	0	25	5	1	3	0	34	38
1600	0	52	4	0	0	0	56	56
1700	0	57	5	0	2	0	64	67
1800	0	38	4	0	0	0	42	42
1900	1	44	3	0	0	0	48	47
2000	0	23	1	1	1	0	26	28
2100	0	19	0	0	1	0	20	21
2200	0	9	1	0	0	0	10	10
2300	0	8	0	0	0	0	8	8
07-19	1	451	71	4	21	1	549	579
06-22	2	545	79	5	25	1	657	691
06-00	2	562	80	5	25	1	675	709
00-00	2	569	81	5	27	1	685	722

Peaks	Time	Vehicles	PCU's
AM	0800	68	78.6
IP	1400	43	44.1
PM	1700	64	66.6



TRAFFINOMICS LIMITED

**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

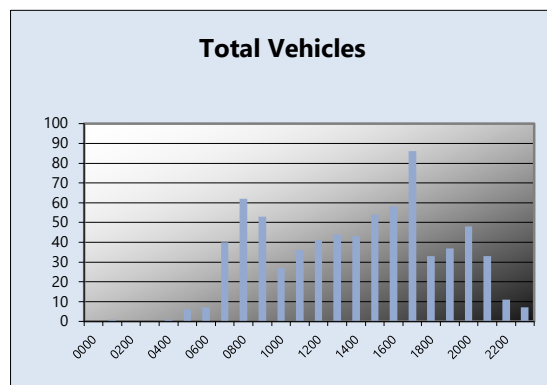
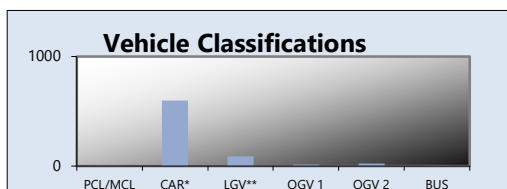
**Tuesday 30 April 2024
TRA/24/048**

**SITE 03
EASTBOUND**

RECEIVED: 11/12/2024

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	0	0	0	0	0	0	0
0100	0	1	0	0	0	0	1	1
0200	0	0	0	0	0	0	0	0
0300	0	0	0	0	0	0	0	0
0400	0	0	0	0	1	0	1	2
0500	0	4	1	0	1	0	6	7
0600	0	6	1	0	0	0	7	7
0700	0	30	7	2	1	0	40	42
0800	0	43	8	1	9	1	62	75
0900	0	48	5	0	0	0	53	53
1000	0	21	4	1	1	0	27	29
1100	0	30	3	0	2	1	36	40
1200	0	35	4	1	1	0	41	43
1300	0	37	4	2	1	0	44	46
1400	1	33	7	2	0	0	43	43
1500	0	42	9	0	3	0	54	58
1600	1	45	10	1	1	0	58	59
1700	0	74	10	1	1	0	86	88
1800	0	29	3	1	0	0	33	34
1900	0	32	4	0	1	0	37	38
2000	0	43	4	0	1	0	48	49
2100	0	28	4	0	1	0	33	34
2200	0	10	1	0	0	0	11	11
2300	0	6	0	1	0	0	7	8
07-19	2	467	74	12	20	2	577	609
06-22	2	576	87	12	23	2	702	738
06-00	2	592	88	13	23	2	720	757
00-00	2	597	89	13	25	2	728	767

Peaks	Time	Vehicles	PCU's
AM	0800	62	75.2
IP	1300	44	46.3
PM	1700	86	87.8



TRAFFINOMICS LIMITED

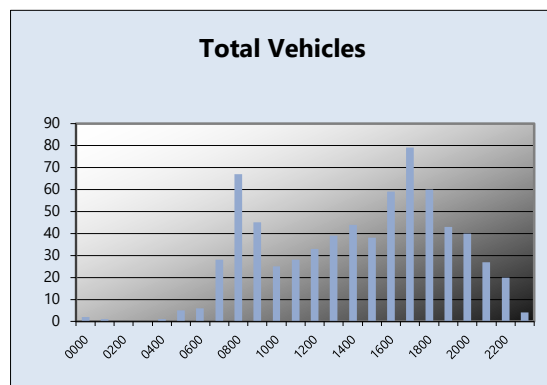
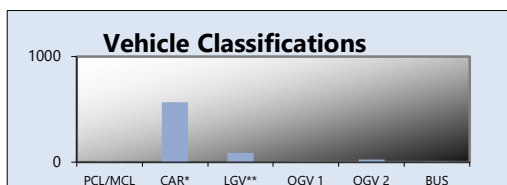
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Wednesday 1 May 2024
TRA/24/048**

**SITE 03
EASTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	2	0	0	0	0	2	2
0100	0	1	0	0	0	0	1	1
0200	0	0	0	0	0	0	0	0
0300	0	0	0	0	0	0	0	0
0400	0	0	0	0	1	0	1	2
0500	0	2	0	0	3	0	5	9
0600	0	5	0	0	1	0	6	7
0700	0	24	4	0	0	0	28	28
0800	0	52	9	3	3	0	67	72
0900	0	37	6	0	2	0	45	48
1000	0	19	4	1	1	0	25	27
1100	0	19	8	0	1	0	28	29
1200	0	26	7	0	0	0	33	33
1300	0	31	5	1	2	0	39	42
1400	0	38	5	0	1	0	44	45
1500	0	27	10	0	1	0	38	39
1600	1	44	9	1	3	1	59	64
1700	0	68	9	0	2	0	79	82
1800	1	53	6	0	0	0	60	59
1900	0	38	3	1	1	0	43	45
2000	2	36	2	0	0	0	40	38
2100	1	24	1	0	1	0	27	28
2200	1	18	1	0	0	0	20	19
2300	0	4	0	0	0	0	4	4
07-19	2	438	82	6	16	1	545	568
06-22	5	541	88	7	19	1	661	686
06-00	6	563	89	7	19	1	685	709
00-00	6	568	89	7	23	1	694	724

Peaks	Time	Vehicles	PCU's
AM	0800	67	72.4
IP	1400	44	45.3
PM	1700	79	81.6



TRAFFINOMICS LIMITED

**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

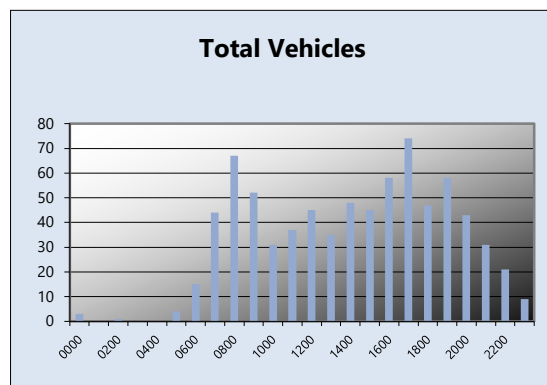
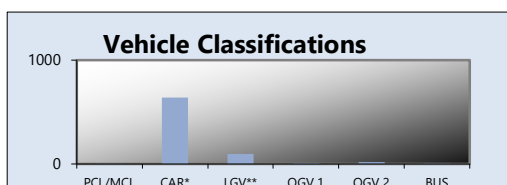
Thursday 2 May 2024
TRA/24/048

**SITE 03
EASTBOUND**

RECEIVED: 11/12/2024

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	3	0	0	0	0	3	3
0100	0	0	0	0	0	0	0	0
0200	0	1	0	0	0	0	1	1
0300	0	0	0	0	0	0	0	0
0400	0	0	0	0	0	0	0	0
0500	0	2	0	0	2	0	4	7
0600	0	10	4	0	1	0	15	16
0700	0	29	11	1	3	0	44	48
0800	0	54	6	3	4	0	67	74
0900	0	48	4	0	0	0	52	52
1000	0	23	7	0	1	0	31	32
1100	0	30	7	0	0	0	37	37
1200	1	32	11	1	0	0	45	45
1300	0	30	3	1	1	0	35	37
1400	1	40	7	0	0	0	48	47
1500	0	38	6	0	1	0	45	46
1600	0	50	4	0	3	1	58	63
1700	2	61	10	1	0	0	74	73
1800	0	40	7	0	0	0	47	47
1900	0	52	4	0	2	0	58	61
2000	1	41	1	0	0	0	43	42
2100	0	28	2	0	1	0	31	32
2200	0	20	1	0	0	0	21	21
2300	0	8	0	0	0	1	9	10
07-19	4	475	83	7	13	1	583	601
06-22	5	606	94	7	17	1	730	753
06-00	5	634	95	7	17	2	760	784
00-00	5	640	95	7	19	2	768	794

Peaks	Time	Vehicles	PCU's
AM	0800	67	73.7
IP	1400	48	47.2
PM	1700	74	72.9



TRAFFINOMICS LIMITED

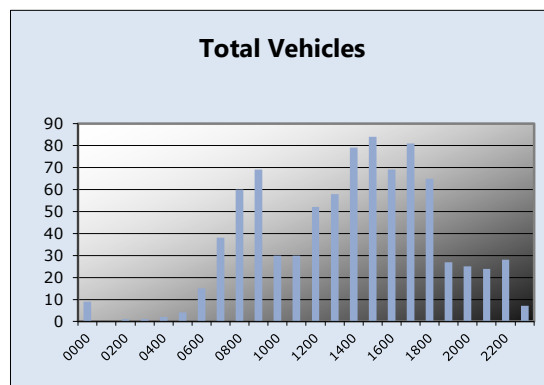
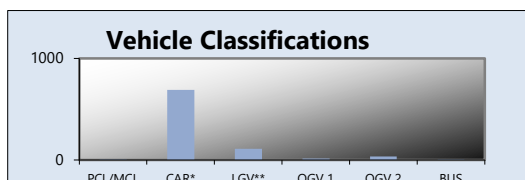
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

Friday 26 April 2024
TRA/24/048

**SITE 03
WESTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	2	6	1	0	0	0	9	7
0100	0	0	0	0	0	0	0	0
0200	0	0	0	1	0	0	1	2
0300	0	1	0	0	0	0	1	1
0400	0	2	0	0	0	0	2	2
0500	0	2	0	0	2	0	4	7
0600	0	14	1	0	0	0	15	15
0700	0	28	9	0	1	0	38	39
0800	0	50	7	0	3	0	60	64
0900	0	54	9	1	4	1	69	76
1000	0	24	5	0	1	0	30	31
1100	0	18	9	0	3	0	30	34
1200	0	40	7	3	2	0	52	56
1300	1	47	6	1	3	0	58	62
1400	0	60	13	2	4	0	79	85
1500	0	59	12	4	9	0	84	98
1600	0	56	10	0	3	0	69	73
1700	0	75	6	0	0	0	81	81
1800	0	53	10	2	0	0	65	66
1900	0	24	3	0	0	0	27	27
2000	0	22	3	0	0	0	25	25
2100	1	22	0	0	1	0	24	25
2200	0	27	1	0	0	0	28	28
2300	0	7	0	0	0	0	7	7
07-19	1	564	103	13	33	1	715	765
06-22	2	646	110	13	34	1	806	856
06-00	2	680	111	13	34	1	841	891
00-00	4	691	112	14	36	1	858	910

Peaks	Time	Vehicles	PCU's
AM	0900	69	75.7
IP	1400	79	85.2
PM	1700	81	81



TRAFFINOMICS LIMITED

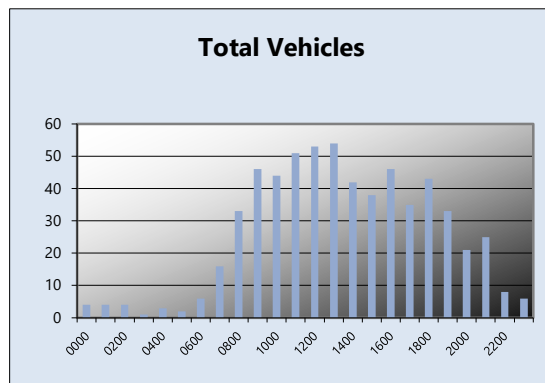
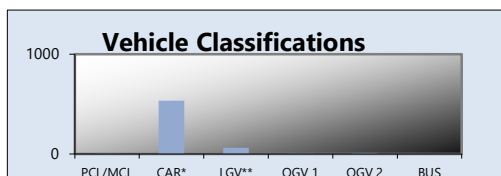
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Saturday 27 April 2024
TRA/24/048**

**SITE 03
WESTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	4	0	0	0	0	4	4
0100	0	4	0	0	0	0	4	4
0200	0	4	0	0	0	0	4	4
0300	0	1	0	0	0	0	1	1
0400	0	3	0	0	0	0	3	3
0500	0	2	0	0	0	0	2	2
0600	0	6	0	0	0	0	6	6
0700	0	13	2	0	1	0	16	17
0800	0	27	3	1	2	0	33	36
0900	1	43	2	0	0	0	46	45
1000	0	37	6	0	1	0	44	45
1100	0	44	6	1	0	0	51	52
1200	0	46	6	0	1	0	53	54
1300	3	42	7	1	1	0	54	53
1400	0	35	6	0	1	0	42	43
1500	0	30	7	0	1	0	38	39
1600	0	40	4	2	0	0	46	47
1700	0	29	3	2	1	0	35	37
1800	0	40	2	0	1	0	43	44
1900	1	29	3	0	0	0	33	32
2000	0	19	2	0	0	0	21	21
2100	0	25	0	0	0	0	25	25
2200	0	7	1	0	0	0	8	8
2300	0	5	1	0	0	0	6	6
07-19	4	426	54	7	10	0	501	514
06-22	5	505	59	7	10	0	586	599
06-00	5	517	61	7	10	0	600	613
00-00	5	535	61	7	10	0	618	631

Peaks	Time	Vehicles	PCU's
AM	0900	46	45.2
IP	1300	54	54.3
PM	1600	46	47



TRAFFINOMICS LIMITED

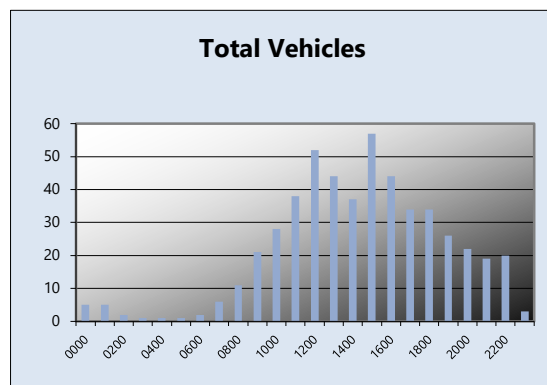
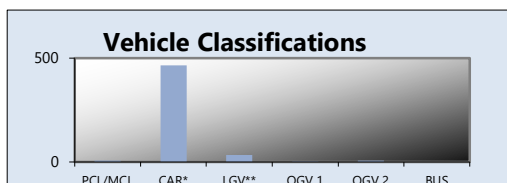
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Sunday 28 April 2024
TRA/24/048**

**SITE 03
WESTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	5	0	0	0	0	5	5
0100	0	4	1	0	0	0	5	5
0200	0	2	0	0	0	0	2	2
0300	0	1	0	0	0	0	1	1
0400	0	1	0	0	0	0	1	1
0500	0	0	1	0	0	0	1	1
0600	0	2	0	0	0	0	2	2
0700	0	6	0	0	0	0	6	6
0800	0	11	0	0	0	0	11	11
0900	1	19	1	0	0	0	21	20
1000	3	25	0	0	0	0	28	26
1100	0	37	1	0	0	0	38	38
1200	0	48	4	0	0	0	52	52
1300	1	41	1	1	0	0	44	44
1400	0	36	1	0	0	0	37	37
1500	0	54	2	0	1	0	57	58
1600	0	37	6	0	1	0	44	45
1700	0	30	3	0	1	0	34	35
1800	0	30	3	0	1	0	34	35
1900	1	21	1	1	2	0	26	28
2000	1	18	3	0	0	0	22	21
2100	0	18	1	0	0	0	19	19
2200	0	16	4	0	0	0	20	20
2300	0	2	0	0	1	0	3	4
07-19	5	374	22	1	4	0	406	408
06-22	7	433	27	2	6	0	475	478
06-00	7	451	31	2	7	0	498	503
00-00	7	464	33	2	7	0	513	518

Peaks	Time	Vehicles	PCU's
AM	0900	21	20.2
IP	1200	52	52
PM	1600	44	45.3



TRAFFINOMICS LIMITED

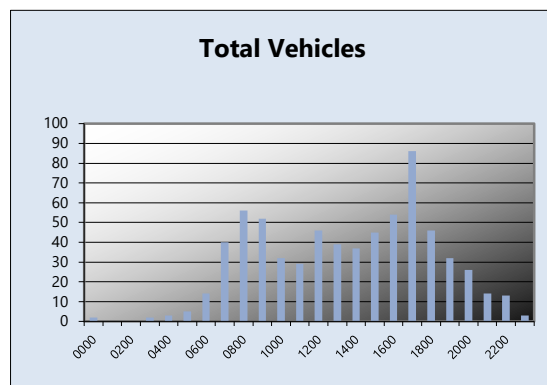
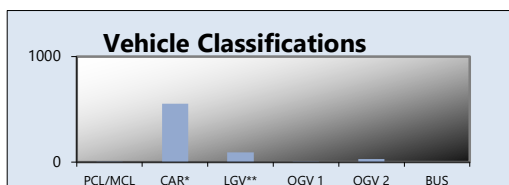
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Monday 29 April 2024
TRA/24/048**

**SITE 03
WESTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	2	0	0	0	0	2	2
0100	0	0	0	0	0	0	0	0
0200	0	0	0	0	0	0	0	0
0300	0	1	1	0	0	0	2	2
0400	0	3	0	0	0	0	3	3
0500	0	1	1	0	3	0	5	9
0600	0	10	3	0	1	0	14	15
0700	0	30	8	0	2	0	40	43
0800	0	48	5	0	3	0	56	60
0900	0	43	5	0	4	0	52	57
1000	0	24	6	1	1	0	32	34
1100	0	23	3	1	2	0	29	32
1200	0	37	9	0	0	0	46	46
1300	0	33	4	0	2	0	39	42
1400	0	28	8	0	1	0	37	38
1500	0	33	10	1	1	0	45	47
1600	1	40	11	0	2	0	54	56
1700	0	74	11	0	1	0	86	87
1800	0	41	2	1	2	0	46	49
1900	0	28	2	1	1	0	32	34
2000	0	25	1	0	0	0	26	26
2100	0	13	1	0	0	0	14	14
2200	0	13	0	0	0	0	13	13
2300	0	2	0	0	1	0	3	4
07-19	1	454	82	4	21	0	562	591
06-22	1	530	89	5	23	0	648	680
06-00	1	545	89	5	24	0	664	697
00-00	1	552	91	5	27	0	676	713

Peaks	Time	Vehicles	PCU's
AM	0800	56	59.9
IP	1200	46	46
PM	1700	86	87.3



TRAFFINOMICS LIMITED

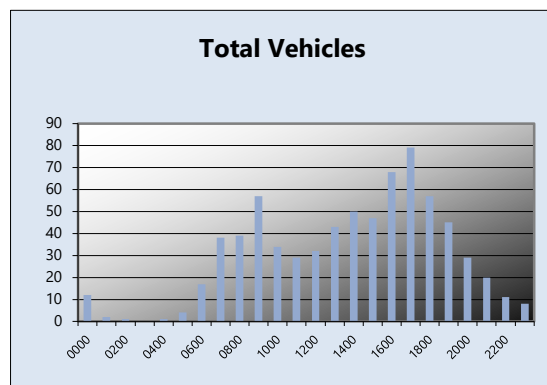
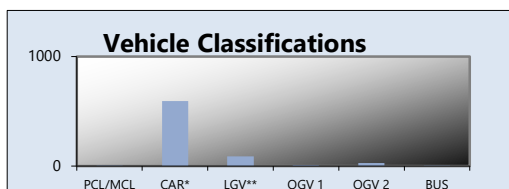
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Tuesday 30 April 2024
TRA/24/048**

**SITE 03
WESTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	1	9	2	0	0	0	12	11
0100	0	2	0	0	0	0	2	2
0200	0	1	0	0	0	0	1	1
0300	0	0	0	0	0	0	0	0
0400	0	1	0	0	0	0	1	1
0500	0	2	1	1	0	0	4	5
0600	0	13	3	0	1	0	17	18
0700	0	29	7	1	1	0	38	40
0800	0	37	1	0	1	0	39	40
0900	0	50	3	1	3	0	57	61
1000	0	27	6	0	1	0	34	35
1100	0	20	8	0	1	0	29	30
1200	0	27	2	0	2	1	32	36
1300	0	33	7	1	2	0	43	46
1400	0	40	9	0	1	0	50	51
1500	0	34	9	1	3	0	47	51
1600	0	51	11	2	4	0	68	74
1700	0	65	10	0	4	0	79	84
1800	0	48	4	1	4	0	57	63
1900	0	43	2	0	0	0	45	45
2000	0	26	2	0	1	0	29	30
2100	0	19	1	0	0	0	20	20
2200	0	10	1	0	0	0	11	11
2300	0	6	1	0	1	0	8	9
07-19	0	461	77	7	27	1	573	613
06-22	0	562	85	7	29	1	684	726
06-00	0	578	87	7	30	1	703	747
00-00	1	593	90	8	30	1	723	766

Peaks	Time	Vehicles	PCU's
AM	0900	57	61.4
IP	1400	50	51.3
PM	1700	79	84.2



TRAFFINOMICS LIMITED

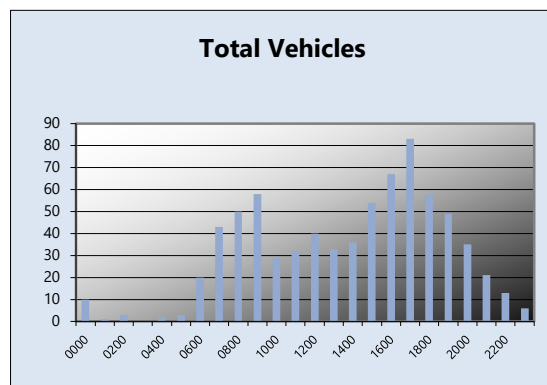
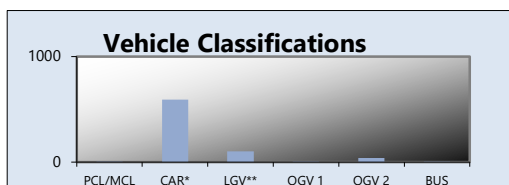
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Wednesday 1 May 2024
TRA/24/048**

**SITE 03
WESTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	1	8	1	0	0	0	10	9
0100	0	1	0	0	0	0	1	1
0200	0	2	1	0	0	0	3	3
0300	0	0	0	0	0	0	0	0
0400	0	2	0	0	0	0	2	2
0500	0	0	1	0	2	0	3	6
0600	0	12	5	1	2	0	20	23
0700	0	33	10	0	0	0	43	43
0800	0	39	6	0	5	0	50	57
0900	0	48	6	1	3	0	58	62
1000	0	21	6	0	2	0	29	32
1100	0	24	6	1	1	0	32	34
1200	0	31	8	0	1	0	40	41
1300	1	25	5	0	2	0	33	35
1400	0	28	6	0	2	0	36	39
1500	0	41	7	1	4	1	54	61
1600	0	49	13	3	2	0	67	71
1700	2	65	9	0	7	0	83	91
1800	1	51	6	0	0	0	58	57
1900	1	43	2	0	3	0	49	52
2000	0	34	1	0	0	0	35	35
2100	0	19	2	0	0	0	21	21
2200	0	11	2	0	0	0	13	13
2300	0	5	0	0	1	0	6	7
07-19	4	455	88	6	29	1	583	622
06-22	5	563	98	7	34	1	708	753
06-00	5	579	100	7	35	1	727	773
00-00	6	592	103	7	37	1	746	794

Peaks	Time	Vehicles	PCU's
AM	0900	58	62.4
IP	1200	40	41.3
PM	1700	83	90.5



TRAFFINOMICS LIMITED

**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

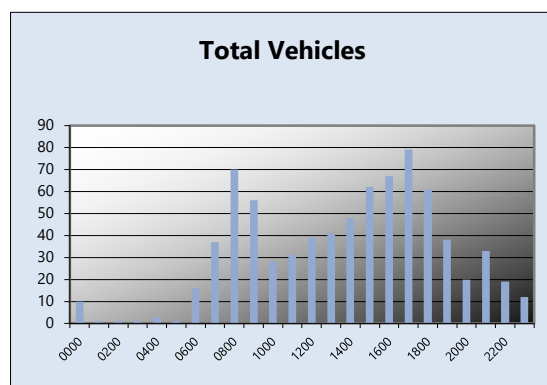
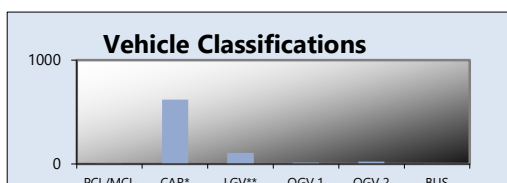
**Thursday 2 May 2024
TRA/24/048**

**SITE 03
WESTBOUND**

RECEIVED: 11/12/2024

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	1	8	1	0	0	0	10	9
0100	0	1	0	0	0	0	1	1
0200	0	0	1	0	0	0	1	1
0300	0	0	1	0	0	0	1	1
0400	0	3	0	0	0	0	3	3
0500	0	1	0	0	0	0	1	1
0600	0	13	2	0	1	0	16	17
0700	0	30	7	0	0	0	37	37
0800	0	52	13	2	2	1	70	75
0900	0	45	8	1	2	0	56	59
1000	0	23	4	0	0	1	28	29
1100	0	23	8	0	0	0	31	31
1200	0	30	7	1	1	0	39	41
1300	0	32	9	0	0	0	41	41
1400	0	38	8	1	0	1	48	50
1500	0	50	7	1	4	0	62	68
1600	1	46	11	1	7	1	67	77
1700	0	61	10	4	3	1	79	86
1800	0	55	4	1	1	0	61	63
1900	0	35	2	0	1	0	38	39
2000	0	17	3	0	0	0	20	20
2100	0	31	1	0	1	0	33	34
2200	0	18	1	0	0	0	19	19
2300	0	10	1	0	1	0	12	13
07-19	1	485	96	12	20	5	619	655
06-22	1	581	104	12	23	5	726	766
06-00	1	609	106	12	24	5	757	798
00-00	2	622	109	12	24	5	774	815

Peaks	Time	Vehicles	PCU's
AM	0800	70	74.6
IP	1400	48	49.5
PM	1700	79	85.9



TRAFFINOMICS LIMITED

CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

SITE 03
EASTBOUND

WEEK COMMENCING:

Friday 26 April 2024
TRA/24/048

TIME PERIOD	Friday 26 April 2024	Saturday 27 April 2024	Sunday 28 April 2024	Monday 29 April 2024	Tuesday 30 April 2024	Wednesday 1 May 2024	Thursday 2 May 2024	Average
0000	1	3	3	4	0	2	3	2
0100	2	5	5	0	1	1	0	2
0200	0	1	5	0	0	0	1	1
0300	0	0	2	1	0	0	0	0
0400	2	0	1	0	1	1	0	1
0500	6	1	2	5	6	5	4	4
0600	9	6	2	14	7	6	15	8
0700	41	10	7	42	40	28	44	30
0800	60	27	9	68	62	67	67	51
0900	58	25	19	51	53	45	52	43
1000	30	48	23	28	27	25	31	30
1100	41	33	37	47	36	28	37	37
1200	50	56	60	33	41	33	45	45
1300	55	39	42	41	44	39	35	42
1400	52	46	31	43	43	44	48	44
1500	70	56	65	34	54	38	45	52
1600	85	37	33	56	58	59	58	55
1700	87	26	31	64	86	79	74	64
1800	55	34	48	42	33	60	47	46
1900	37	41	42	48	37	43	58	44
2000	31	20	19	26	48	40	43	32
2100	28	30	17	20	33	27	31	27
2200	15	17	16	10	11	20	21	16
2300	6	13	3	8	7	4	9	7
07-19	684	437	405	549	577	545	583	540
06-22	789	534	485	657	702	661	730	651
06-00	810	564	504	675	720	685	760	674
00-00	821	574	522	685	728	694	768	685

RECEIVED: 11/12/2024

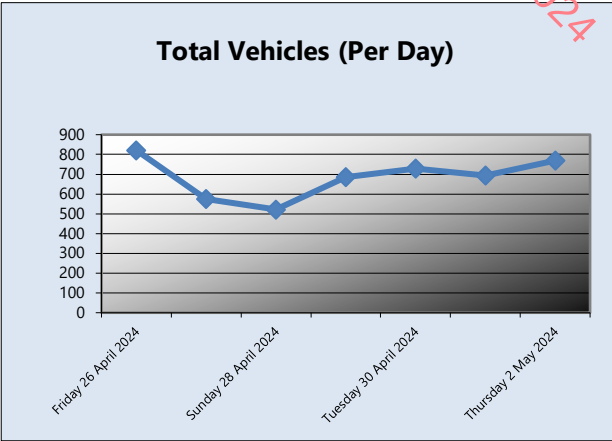
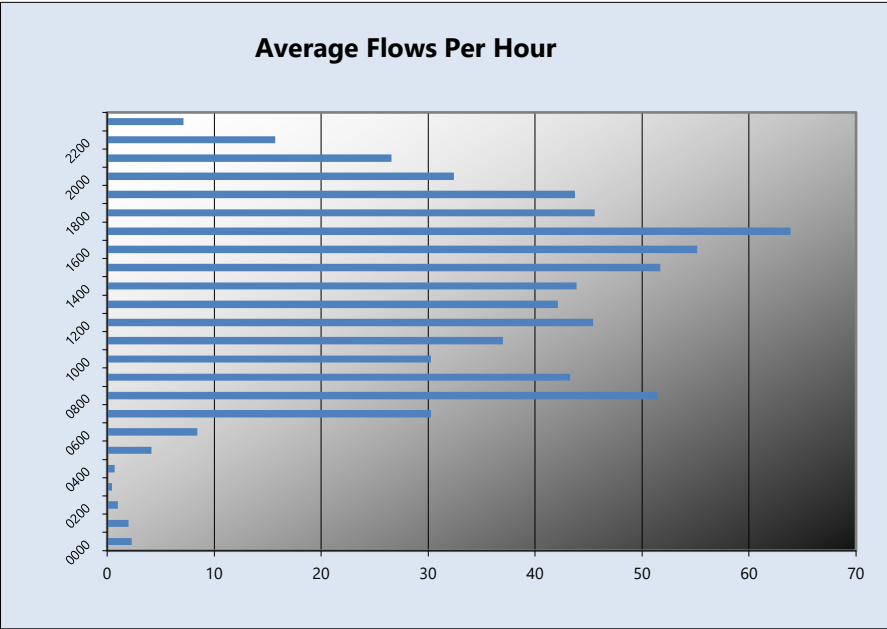
Traffinomics Limited for
Stephen Reid Consulting

CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

SITE 03
EASTBOUND

WEEK COMMENCING: Friday 26 April 2024
TRA/24/048

RECEIVED: 11/12/2024



Peak Time & Volumetric Count Data

	Friday 26 April 2024	Saturday 27 April 2024	Sunday 28 April 2024	Monday 29 April 2024	Tuesday 30 April 2024	Wednesday 1 May 2024	Thursday 2 May 2024	Mode/ Average
AM								
Time	0800	0800	0900	0800	0800	0800	0800	0800
Vehicles	60	27	19	68	62	67	67	53
IP								
Time	1300	1200	1200	1400	1300	1400	1400	1400
Vehicles	55	56	60	43	44	44	48	50
PM								
Time	1700	1600	1800	1700	1700	1700	1700	1700
Vehicles	87	37	48	64	86	79	74	68

TRAFFINOMICS LIMITED

CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

SITE 03
WESTBOUND

WEEK COMMENCING:

Friday 26 April 2024
TRA/24/048

TIME PERIOD	Friday 26 April 2024	Saturday 27 April 2024	Sunday 28 April 2024	Monday 29 April 2024	Tuesday 30 April 2024	Wednesday 1 May 2024	Thursday 2 May 2024	Average
0000	9	4	5	2	12	10	10	7
0100	0	4	5	0	2	1	1	2
0200	1	4	2	0	1	3	1	2
0300	1	1	1	2	0	0	1	1
0400	2	3	1	3	1	2	3	2
0500	4	2	1	5	4	3	1	3
0600	15	6	2	14	17	20	16	13
0700	38	16	6	40	38	43	37	31
0800	60	33	11	56	39	50	70	46
0900	69	46	21	52	57	58	56	51
1000	30	44	28	32	34	29	28	32
1100	30	51	38	29	29	32	31	34
1200	52	53	52	46	32	40	39	45
1300	58	54	44	39	43	33	41	45
1400	79	42	37	37	50	36	48	47
1500	84	38	57	45	47	54	62	55
1600	69	46	44	54	68	67	67	59
1700	81	35	34	86	79	83	79	68
1800	65	43	34	46	57	58	61	52
1900	27	33	26	32	45	49	38	36
2000	25	21	22	26	29	35	20	25
2100	24	25	19	14	20	21	33	22
2200	28	8	20	13	11	13	19	16
2300	7	6	3	3	8	6	12	6
07-19	715	501	406	562	573	583	619	566
06-22	806	586	475	648	684	708	726	662
06-00	841	600	498	664	703	727	757	684
00-00	858	618	513	676	723	746	774	701

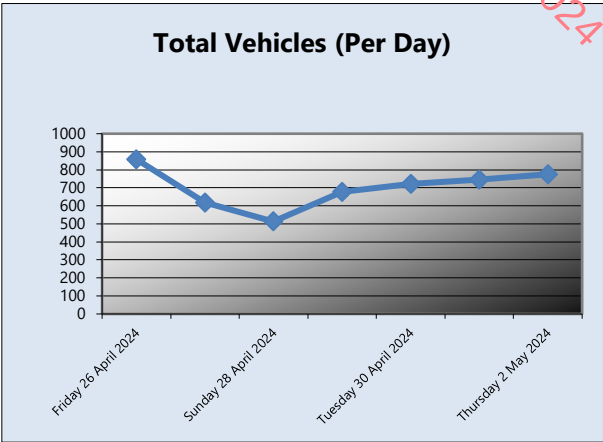
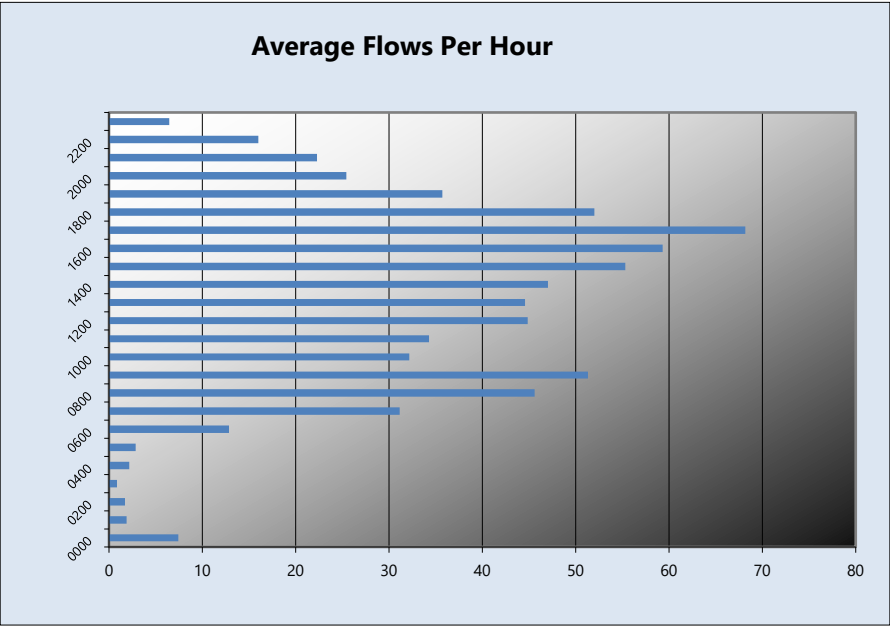
RECEIVED: 11/12/2024

Traffinomics Limited for
Stephen Reid Consulting

CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

SITE 03
WESTBOUND

WEEK COMMENCING: Friday 26 April 2024
TRA/24/048



Peak Time & Volumetric Count Data

	Friday 26 April 2024	Saturday 27 April 2024	Sunday 28 April 2024	Monday 29 April 2024	Tuesday 30 April 2024	Wednesday 1 May 2024	Thursday 2 May 2024	Mode/ Average
AM								
Time	0900	0900	0900	0800	0900	0900	0800	0900
Vehicles	69	46	69	56	57	58	70	61
IP								
Time	1400	1300	1200	1200	1400	1200	1400	1400
Vehicles	79	54	52	46	50	40	48	53
PM								
Time	1700	1600	1600	1700	1700	1700	1700	1700
Vehicles	81	46	44	86	79	83	79	71

CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

WEEK COMMENCING:

Friday 26 April 2024

TRA/24/048

SITE 03
EASTBOUND

Profile:

Filter time: 00:00 26th April 2024 => 23:59 2nd May 2024

Speed range: 0 - 200 km/h.

Separation: Greater than 4.00 seconds. - (Headway)

Units: Metric (meter, kilometer, m/s, km/h, kg, tonne)

Vehicles = 4254

Maximum = 149.6 km/h, Minimum = 6.6 km/h, Mean = 76.6 km/h

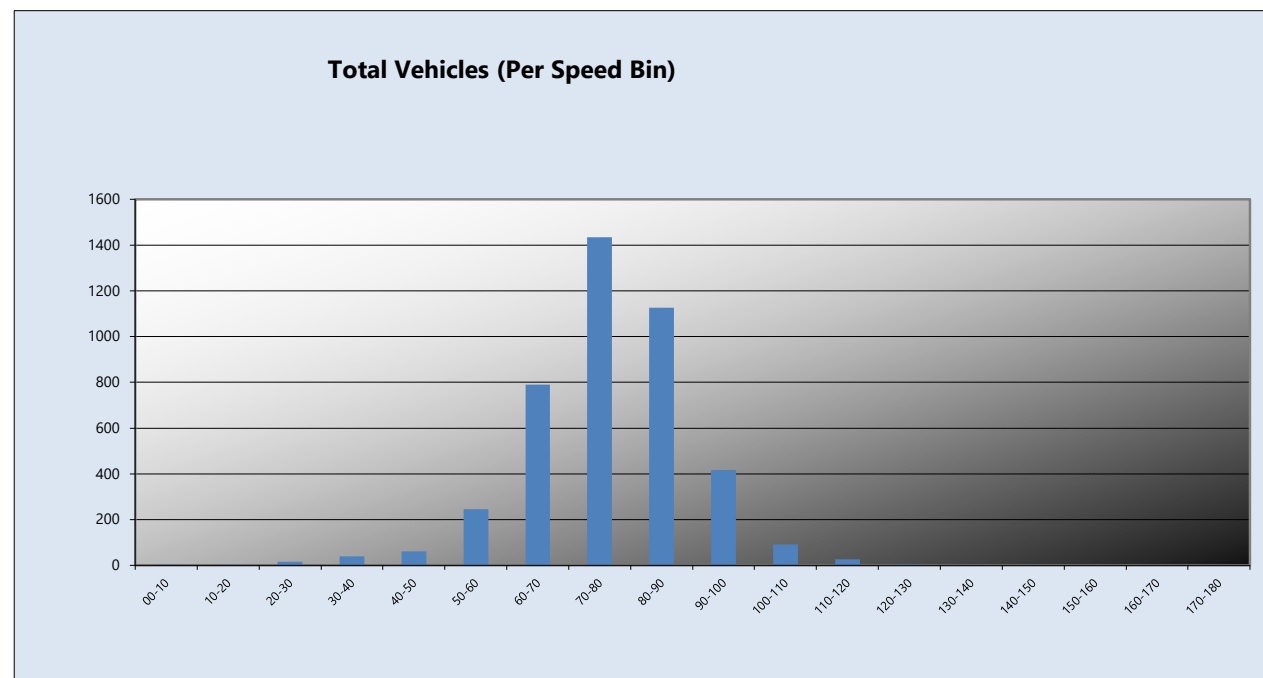
85% Speed = 88.74 km/h, 95% Speed = 96.95 km/h, Median = 77.09 km/h

20 km/h Pace = 68 - 88, Number in Pace = 2595 (61.00%)

Variance = 170.76, Standard Deviation = 13.07 km/h

Speed Bins:

Speed KPH	Bin	
	No.	%
00-10	1	0.0
10-20	2	0.0
20-30	15	0.4
30-40	39	0.9
40-50	60	1.4
50-60	246	5.8
60-70	790	18.6
70-80	1435	33.7
80-90	1126	26.5
90-100	416	9.8
100-110	92	2.2
110-120	27	0.6
120-130	4	0.1
130-140	0	0.0
140-150	1	0.0
150-160	0	0.0
160-170	0	0.0
170-180	0	0.0



CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

WEEK COMMENCING:

Friday 26 April 2024

TRA/24/048

SITE 03
WESTBOUND

Profile:

Filter time: 00:00 26th April 2024 => 23:59 2nd May 2024

Speed range: 0 - 200 km/h.

Separation: Greater than 4.00 seconds. - (Headway)

Units: Metric (meter, kilometer, m/s, km/h, kg, tonne)

Vehicles = 4476

Maximum = 149.0 km/h, Minimum = 6.2 km/h, Mean = 75.4 km/h

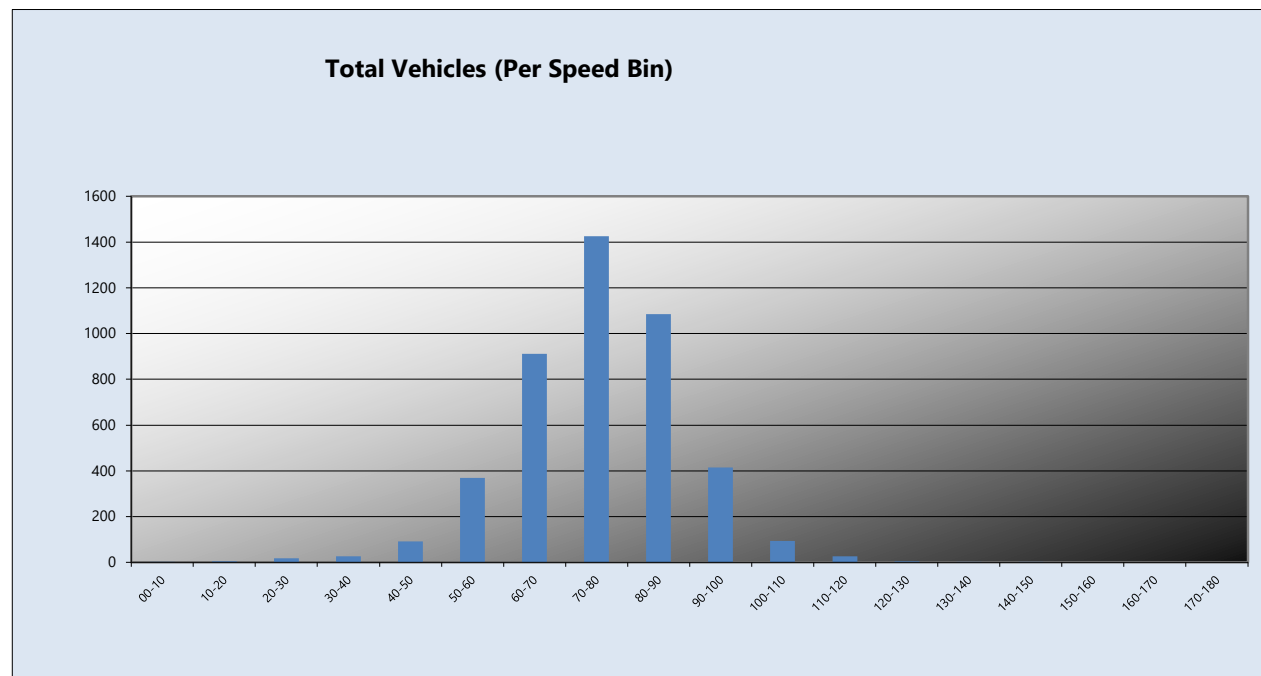
85% Speed = 88.29 km/h, 95% Speed = 96.57 km/h, Median = 75.87 km/h

20 km/h Pace = 66 - 86, Number in Pace = 2592 (57.91%)

Variance = 183.74, Standard Deviation = 13.55 km/h

Speed Bins:

Speed KPH	Bin	
	No.	%
00-10	1	0.0
10-20	5	0.1
20-30	17	0.4
30-40	27	0.6
40-50	92	2.1
50-60	368	8.2
60-70	912	20.4
70-80	1426	31.9
80-90	1084	24.2
90-100	415	9.3
100-110	93	2.1
110-120	27	0.6
120-130	5	0.1
130-140	2	0.0
140-150	2	0.0
150-160	0	0.0
160-170	0	0.0
170-180	0	0.0



CLASSIFICATION SCHEMES:

Scheme F Classification Scheme (Non-metric)

Scheme F is an attempt to implement the FWHA's visual classification scheme as an axle-based classification scheme. This is one of several interpretations.

RECEIVED: 11/12/2023

Vehicle Class	Class	Vehicle Type	No. of Axles	Axle spacing in feet				
				Axle 1 to 2	Axle 2 to 3	Axle 3 to 4	Axle 4 to 5	Axle 5 to 6
PCL/MCL	1	motorcycle	2	<6.0				
CAR*	2	passenger car	2	6.0 - 10.0				
		car + 1 axle trailer	3	<10.0	10.0 - 18.0			
		car + 2 axle trailer	4	<10.0		<3.5		
LGV**	3	pickup	2	10.0 - 15.0				
		pickup + 1 axle trailer	3	10.0 - 15.0	10.0 - 18.0			
		pickup + 2 axle trailer	4	10.0 - 15.0		<3.5		
		pickup + 3 axle trailer	5	9.9 - 15.0			<3.5	
BUS	4	bus	2	>20.0				
		bus	3	>19.0				
OGV 1	5	single unit truck - dual rear axle	2	14.9 - 20.0			<3.5	
	6	3 axle truck	3		<18.0			
OGV 2	7	4 axle truck	4					
	8	2S1	3		>18.0			
		2S2	4		>5.0	>3.5		
		3S1	4		<5.0	>10.0		
	9	3S2	5		<6.1		3.5 - 8.0	
		5 axle combination	5					
	10	6 axle combination	6			3.5 - 5.0		
		3S3	6					
	11	2S1-2	5		>6.0			
	12	3S1-2	6					>10.0
	13	truck	7 or more					

Car* Cars and LGV based cars

LGV** Light Goods Vehicles with the exception of LGV based on cars

CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

SUMMARY

WEEK COMMENCING:

Friday 26 April 2024

TRA/24/048

SITE 04

LOCATION: R198 West of Carriglass Roundabout - (Google Maps Ref: 53°44'39.5"N 7°45'22.0"W)

SPEED SURVEY SUMMARY:

EASTBOUND 85% Speed = 84.06 km/h, 95% Speed = 91.71 km/h, Median = 72.99 km/h Maximum = 130.3 km/h, Minimum = 11.4 km/h, Mean = 73.1 km/h

WESTBOUND 85% Speed = 75.24 km/h, 95% Speed = 80.64 km/h, Median = 66.60 km/h Maximum = 124.5 km/h, Minimum = 16.5 km/h, Mean = 66.6 km/h

VOLUMETRIC VEHICLE COUNTS:

Direction	Time	Friday 26 April 2024	Saturday 27 April 2024	Sunday 28 April 2024	Monday 29 April 2024	Tuesday 30 April 2024	Wednesday 1 May 2024	Thursday 2 May 2024	No. Vehicles	7 day Mean
EASTBOUND	07-19	2277	1709	1533	2092	2077	2038	2215	13941	1992
WESTBOUND	07-19	2332	1800	1608	2202	2169	2187	2313	14611	2087
EASTBOUND	00-00	2891	2158	1994	2563	2497	2591	2755	17449	2493
WESTBOUND	00-00	2904	2192	1916	2613	2550	2596	2741	17512	2502

PEAK FLOW SUMMARY:

Peak	AM	IP	PM
Most Frequent Peak Hour	0800	1400	1700
Average Vehicles per Peak Hour	120	201	267

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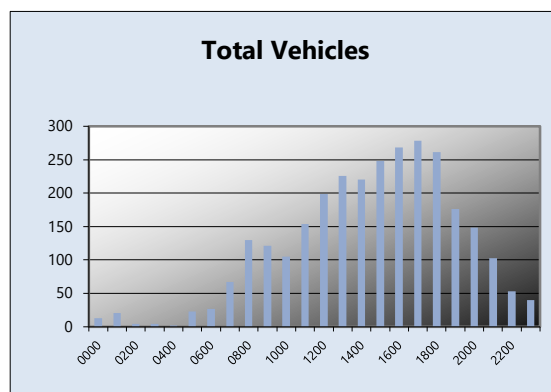
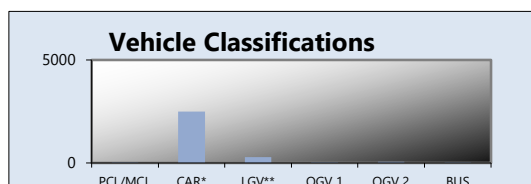
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

Friday 26 April 2024
TRA/24/048

**SITE 04
EASTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	10	1	0	2	0	13	16
0100	1	18	0	1	1	0	21	22
0200	0	2	2	0	0	0	4	4
0300	0	3	0	0	1	0	4	5
0400	0	1	1	0	0	0	2	2
0500	0	17	6	0	0	0	23	23
0600	0	23	3	0	1	0	27	28
0700	0	54	7	2	4	0	67	73
0800	0	105	17	4	3	1	130	137
0900	0	92	20	1	7	1	121	132
1000	0	84	18	1	2	0	105	108
1100	1	125	21	1	5	1	154	161
1200	1	166	22	2	8	0	199	210
1300	0	198	22	2	3	1	226	232
1400	1	181	25	5	7	1	220	232
1500	0	215	20	2	11	0	248	263
1600	2	239	24	1	2	0	268	270
1700	0	242	31	2	3	0	278	283
1800	1	243	15	1	1	0	261	262
1900	0	162	13	0	1	0	176	177
2000	2	134	8	1	2	1	148	151
2100	0	98	3	1	1	0	103	105
2200	0	48	5	0	0	0	53	53
2300	0	33	6	1	0	0	40	41
07-19	6	1944	242	24	56	5	2277	2362
06-22	8	2361	269	26	61	6	2731	2823
06-00	8	2442	280	27	61	6	2824	2916
00-00	9	2493	290	28	65	6	2891	2988

Peaks	Time	Vehicles	PCU's
AM	0800	130	136.9
IP	1300	226	231.9
PM	1700	278	282.9



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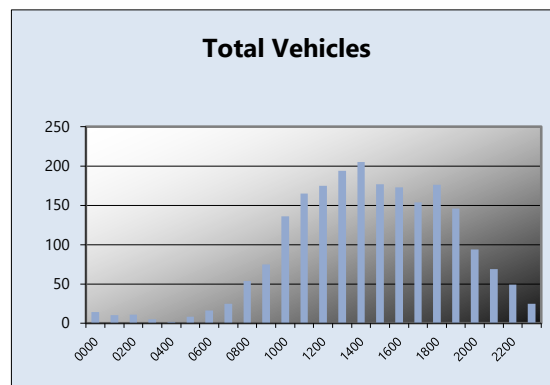
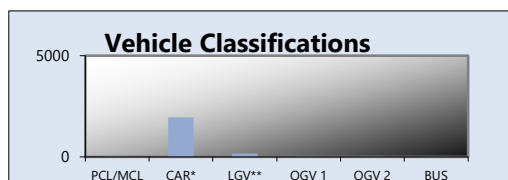
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Saturday 27 April 2024
TRA/24/048**

**SITE 04
EASTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	13	0	0	0	1	14	15
0100	1	8	1	0	0	0	10	9
0200	0	11	0	0	0	0	11	11
0300	0	3	1	0	1	0	5	6
0400	0	2	0	0	0	0	2	2
0500	0	7	1	0	0	0	8	8
0600	0	15	1	0	0	0	16	16
0700	0	19	6	0	0	0	25	25
0800	0	46	7	1	0	0	54	55
0900	0	66	8	1	0	0	75	76
1000	0	122	13	0	1	0	136	137
1100	1	152	9	1	2	0	165	167
1200	1	155	17	1	1	0	175	176
1300	1	176	17	0	0	0	194	193
1400	1	186	16	0	2	0	205	207
1500	1	158	17	0	1	0	177	178
1600	1	158	10	2	2	0	173	176
1700	1	140	13	0	0	0	154	153
1800	1	164	9	1	1	0	176	177
1900	1	140	5	0	0	0	146	145
2000	0	85	8	1	0	0	94	95
2100	0	63	4	1	1	0	69	71
2200	0	47	2	0	0	0	49	49
2300	0	22	2	1	0	0	25	26
07-19	8	1542	142	7	10	0	1709	1719
06-22	9	1845	160	9	11	0	2034	2046
06-00	9	1914	164	10	11	0	2108	2120
00-00	10	1958	167	10	12	1	2158	2172

Peaks	Time	Vehicles	PCU's
AM	0900	75	75.5
IP	1400	205	206.8
PM	1800	176	177



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**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

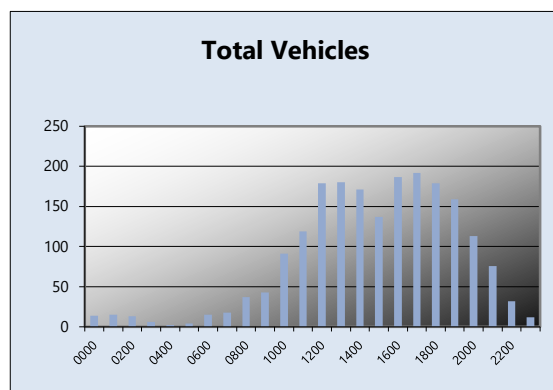
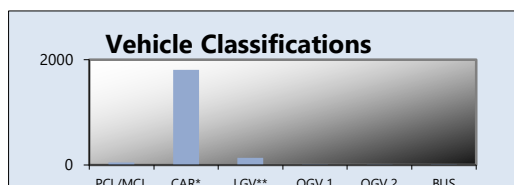
**Sunday 28 April 2024
TRA/24/048**

**SITE 04
EASTBOUND**

RECEIVED: 11/12/2024

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	13	1	0	0	0	14	14
0100	0	12	3	0	0	0	15	15
0200	0	11	1	0	1	0	13	14
0300	0	6	0	0	0	0	6	6
0400	0	2	0	0	0	0	2	2
0500	0	4	0	0	0	0	4	4
0600	0	14	1	0	0	0	15	15
0700	0	11	6	0	1	0	18	19
0800	0	31	4	0	1	1	37	39
0900	2	33	6	0	2	0	43	44
1000	2	79	7	0	3	0	91	93
1100	4	104	10	1	0	0	119	116
1200	5	163	11	0	0	0	179	175
1300	27	142	9	0	2	0	180	161
1400	4	156	10	1	0	0	171	168
1500	1	129	7	0	0	0	137	136
1600	0	178	9	0	0	0	187	187
1700	0	178	14	0	0	0	192	192
1800	0	166	13	0	0	0	179	179
1900	0	149	10	0	0	0	159	159
2000	0	107	6	0	0	0	113	113
2100	0	74	2	0	0	0	76	76
2200	0	29	3	0	0	0	32	32
2300	0	11	1	0	0	0	12	12
07-19	45	1370	106	2	9	1	1533	1511
06-22	45	1714	125	2	9	1	1896	1874
06-00	45	1754	129	2	9	1	1940	1918
00-00	45	1802	134	2	10	1	1994	1973

Peaks	Time	Vehicles	PCU's
AM	0900	43	44
IP	1300	180	175
PM	1700	192	192



Traffinomics Limited for
Stephen Reid Consulting

TRAFFINOMICS LIMITED

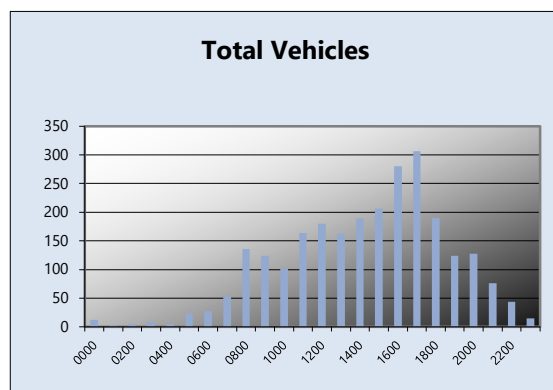
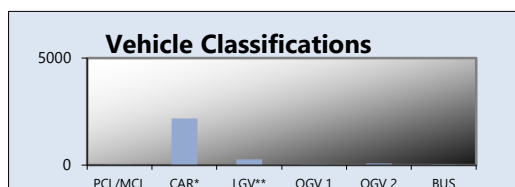
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Monday 29 April 2024
TRA/24/048**

**SITE 04
EASTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	11	0	0	0	1	12	13
0100	0	2	0	0	1	0	3	4
0200	0	4	1	0	0	0	5	5
0300	0	5	2	0	1	0	8	9
0400	0	3	2	0	0	0	5	5
0500	0	22	2	0	0	0	24	24
0600	0	22	5	0	0	0	27	27
0700	0	45	3	3	2	0	53	57
0800	0	103	22	4	7	0	136	147
0900	0	101	10	3	10	0	124	139
1000	0	78	18	0	5	0	101	108
1100	0	132	21	1	8	2	164	177
1200	0	153	20	1	6	0	180	188
1300	0	141	19	0	3	0	163	167
1400	1	158	20	4	6	0	189	198
1500	1	170	26	4	5	0	206	214
1600	1	241	32	3	3	0	280	285
1700	0	277	23	1	5	0	306	313
1800	0	169	15	4	2	0	190	195
1900	0	113	9	1	1	0	124	126
2000	1	114	12	0	1	0	128	129
2100	0	70	6	0	0	0	76	76
2200	0	42	2	0	0	0	44	44
2300	0	13	0	0	2	0	15	18
07-19	3	1768	229	28	62	2	2092	2186
06-22	4	2087	261	29	64	2	2447	2544
06-00	4	2142	263	29	66	2	2506	2605
00-00	4	2189	270	29	68	3	2563	2666

Peaks	Time	Vehicles	PCU's
AM	0800	136	147.1
IP	1400	189	198
PM	1700	306	313



TRAFFINOMICS LIMITED

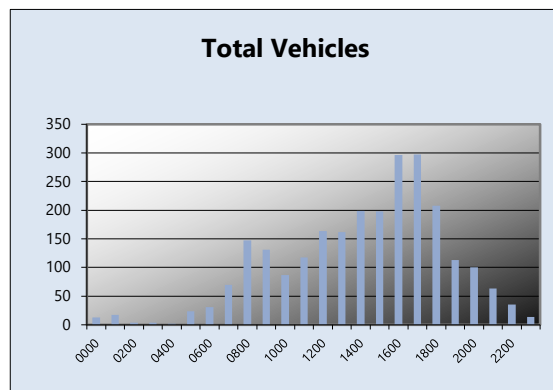
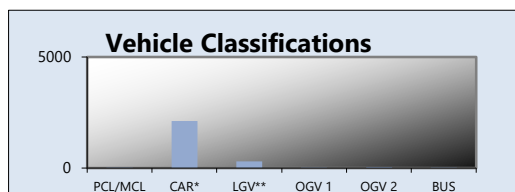
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

Tuesday 30 April 2024
TRA/24/048

**SITE 04
EASTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	11	1	0	1	0	13	14
0100	1	14	0	0	2	0	17	19
0200	0	3	1	0	0	0	4	4
0300	0	3	0	0	1	0	4	5
0400	0	2	0	0	0	0	2	2
0500	0	19	5	0	0	0	24	24
0600	0	26	3	0	2	0	31	34
0700	0	54	13	2	1	0	70	72
0800	0	113	27	2	5	0	147	155
0900	0	104	19	4	3	1	131	138
1000	0	60	21	0	6	0	87	95
1100	0	92	18	2	6	0	118	127
1200	0	142	14	1	5	2	164	173
1300	0	142	15	2	3	0	162	167
1400	0	166	28	1	3	1	199	204
1500	0	157	32	0	8	1	198	209
1600	1	254	34	4	2	1	296	301
1700	1	266	28	1	1	0	297	298
1800	1	188	18	1	0	0	208	208
1900	0	99	12	0	2	0	113	116
2000	0	96	3	1	0	0	100	101
2100	0	60	3	0	0	0	63	63
2200	0	32	1	0	2	0	35	38
2300	0	14	0	0	0	0	14	14
07-19	3	1738	267	20	43	6	2077	2147
06-22	3	2019	288	21	47	6	2384	2459
06-00	3	2065	289	21	49	6	2433	2511
00-00	4	2117	296	21	53	6	2497	2579

Peaks	Time	Vehicles	PCU's
AM	0800	147	154.5
IP	1400	199	204.4
PM	1700	297	300.8



Traffinomics Limited for
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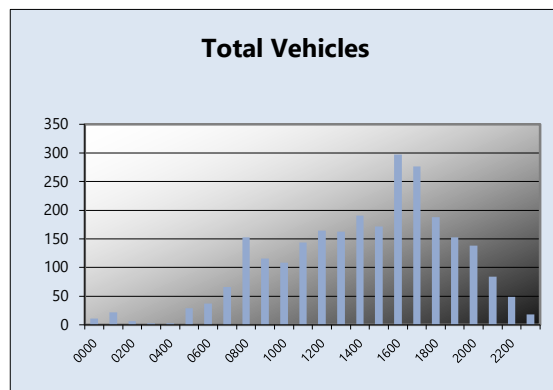
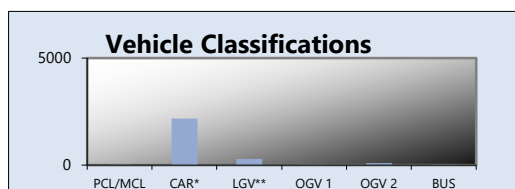
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Wednesday 1 May 2024
TRA/24/048**

**SITE 04
EASTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	8	1	0	2	0	11	14
0100	1	18	0	1	2	0	22	24
0200	0	5	1	0	0	0	6	6
0300	0	2	0	0	1	0	3	4
0400	0	2	1	0	0	0	3	3
0500	0	23	5	0	1	0	29	30
0600	0	25	6	1	5	0	37	44
0700	0	52	9	3	2	0	66	70
0800	0	111	28	5	9	0	153	167
0900	0	85	20	1	9	1	116	129
1000	0	84	15	2	6	1	108	118
1100	1	109	22	3	9	0	144	156
1200	1	144	12	1	5	1	164	171
1300	1	143	14	2	3	0	163	167
1400	0	154	28	1	8	0	191	202
1500	1	144	18	2	5	2	172	181
1600	0	246	38	5	8	0	297	310
1700	1	235	30	2	7	1	276	286
1800	0	168	16	1	3	0	188	192
1900	0	141	8	1	3	0	153	157
2000	1	126	10	1	0	0	138	138
2100	1	77	6	0	0	0	84	83
2200	0	46	3	0	0	0	49	49
2300	0	16	1	0	1	0	18	19
07-19	5	1675	250	28	74	6	2038	2150
06-22	7	2044	280	31	82	6	2450	2573
06-00	7	2106	284	31	83	6	2517	2641
00-00	8	2164	292	32	89	6	2591	2722

Peaks	Time	Vehicles	PCU's
AM	0800	153	167.2
IP	1400	191	201.9
PM	1600	297	309.9



TRAFFINOMICS LIMITED

**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

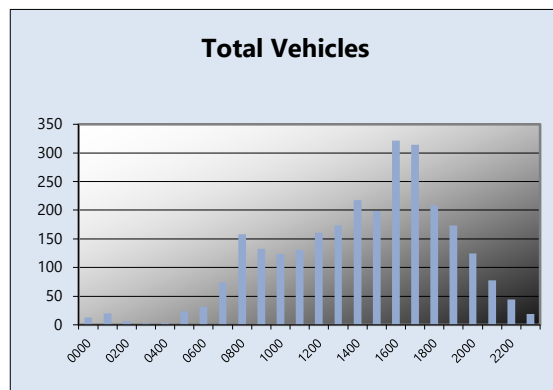
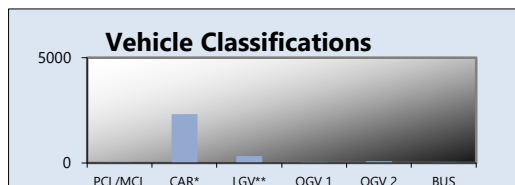
Thursday 2 May 2024
TRA/24/048

**SITE 04
EASTBOUND**

RECEIVED: 11/12/2024

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	11	2	0	0	0	13	13
0100	2	16	0	1	1	0	20	20
0200	0	5	1	0	0	0	6	6
0300	0	2	1	0	0	0	3	3
0400	0	4	0	0	0	0	4	4
0500	0	20	3	0	0	0	23	23
0600	0	22	6	1	3	0	32	36
0700	0	56	10	3	5	0	74	82
0800	1	124	27	1	5	0	158	164
0900	0	101	22	1	8	1	133	145
1000	0	97	15	3	9	0	124	137
1100	0	103	17	2	9	0	131	144
1200	0	134	18	3	6	0	161	170
1300	0	148	16	2	6	1	173	183
1400	0	179	28	3	8	0	218	230
1500	0	160	27	2	10	0	199	213
1600	0	271	41	4	5	0	321	330
1700	0	279	31	0	3	1	314	319
1800	1	186	18	3	1	0	209	211
1900	0	159	11	1	2	0	173	176
2000	0	110	15	0	0	0	125	125
2100	0	69	7	0	2	0	78	81
2200	0	39	4	0	0	1	44	45
2300	0	15	4	0	0	0	19	19
07-19	2	1838	270	27	75	3	2215	2327
06-22	2	2198	309	29	82	3	2623	2746
06-00	2	2252	317	29	82	4	2686	2810
00-00	4	2310	324	30	83	4	2755	2879

Peaks	Time	Vehicles	PCU's
AM	0800	158	164.2
IP	1400	218	229.9
PM	1600	321	329.5



TRAFFINOMICS LIMITED

**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

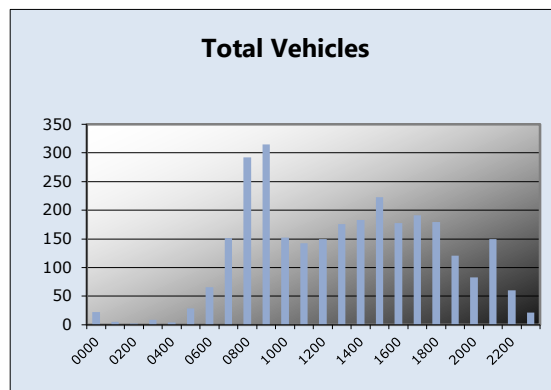
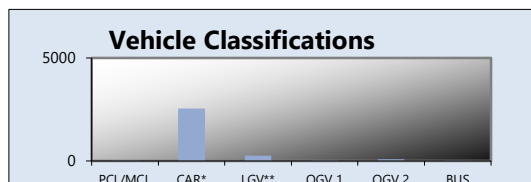
Friday 26 April 2024
TRA/24/048

**SITE 04
WESTBOUND**

RECEIVED: 11/12/2024

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	21	1	0	0	0	22	22
0100	0	5	0	0	0	0	5	5
0200	0	2	0	0	0	0	2	2
0300	0	8	1	0	0	0	9	9
0400	0	1	1	0	2	0	4	7
0500	0	24	4	0	1	0	29	30
0600	2	55	5	0	4	0	66	70
0700	0	121	21	1	8	0	151	162
0800	0	258	23	4	6	1	292	303
0900	0	285	22	2	6	0	315	324
1000	0	126	19	2	5	0	152	160
1100	1	118	16	1	6	0	142	150
1200	0	117	21	2	10	0	150	164
1300	0	151	15	3	6	1	176	186
1400	1	158	17	2	4	1	183	189
1500	1	195	18	2	6	1	223	232
1600	0	158	15	0	4	1	178	184
1700	0	170	17	3	1	0	191	194
1800	0	159	17	2	1	0	179	181
1900	4	107	8	1	1	0	121	120
2000	0	82	1	0	0	0	83	83
2100	0	144	5	1	0	0	150	151
2200	0	54	5	1	0	0	60	61
2300	0	19	2	0	0	0	21	21
07-19	3	2016	221	24	63	5	2332	2429
06-22	9	2404	240	26	68	5	2752	2851
06-00	9	2477	247	27	68	5	2833	2933
00-00	9	2538	254	27	71	5	2904	3008

Peaks	Time	Vehicles	PCU's
AM	0900	315	323.8
IP	1400	183	189.4
PM	1700	191	193.8



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Stephen Reid Consulting

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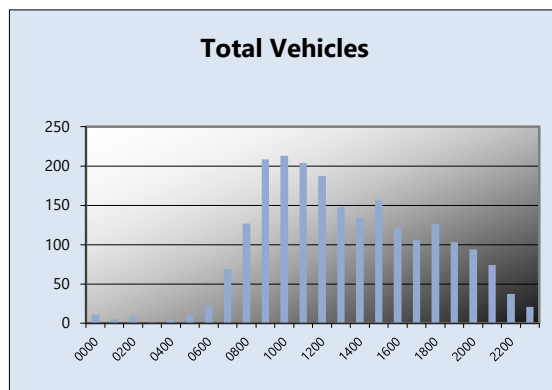
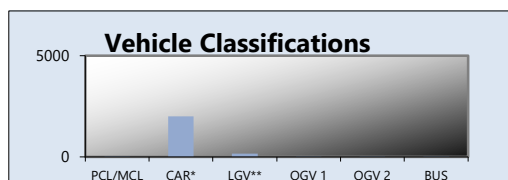
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

Saturday 27 April 2024
TRA/24/048

**SITE 04
WESTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	9	2	0	0	0	11	11
0100	0	5	0	0	0	0	5	5
0200	0	7	1	0	0	0	8	8
0300	0	1	0	0	0	0	1	1
0400	0	1	3	0	0	0	4	4
0500	0	10	1	0	0	0	11	11
0600	0	22	1	0	0	0	23	23
0700	0	59	8	1	1	0	69	71
0800	1	115	9	1	1	0	127	128
0900	1	195	9	1	1	1	208	210
1000	5	189	17	2	0	0	213	210
1100	1	186	13	0	4	0	204	208
1200	2	170	12	2	1	0	187	188
1300	0	133	15	0	0	0	148	148
1400	1	121	10	2	0	0	134	134
1500	0	146	9	1	0	0	156	157
1600	2	111	9	0	0	0	122	120
1700	0	96	9	1	0	0	106	107
1800	0	114	11	1	0	0	126	127
1900	1	97	4	1	0	0	103	103
2000	0	89	4	1	0	0	94	95
2100	0	67	6	1	0	0	74	75
2200	0	34	3	0	0	0	37	37
2300	0	18	2	1	0	0	21	22
07-19	13	1635	131	12	8	1	1800	1807
06-22	14	1910	146	15	8	1	2094	2102
06-00	14	1962	151	16	8	1	2152	2160
00-00	14	1995	158	16	8	1	2192	2200

Peaks	Time	Vehicles	PCU's
AM	0900	208	210
IP	1200	187	187.7
PM	1800	126	126.5



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**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

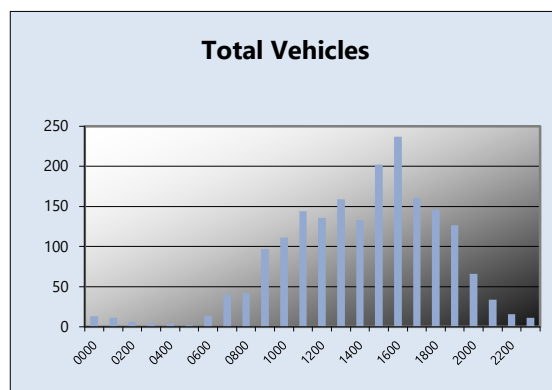
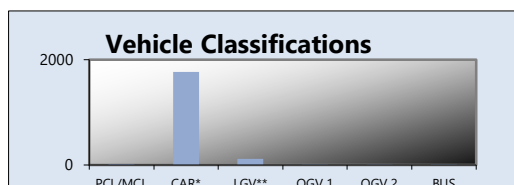
**Sunday 28 April 2024
TRA/24/048**

**SITE 04
WESTBOUND**

RECEIVED: 11/12/2024

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	12	1	0	0	0	13	13
0100	0	10	1	0	0	0	11	11
0200	0	3	3	0	0	0	6	6
0300	0	4	0	0	0	0	4	4
0400	0	3	1	0	0	0	4	4
0500	0	2	0	0	0	0	2	2
0600	0	14	0	0	0	0	14	14
0700	0	36	2	0	1	1	40	42
0800	0	36	3	1	2	0	42	45
0900	1	87	9	0	0	0	97	96
1000	5	97	9	0	0	0	111	107
1100	3	134	7	0	0	0	144	142
1200	2	125	8	1	0	0	136	135
1300	2	149	7	0	1	0	159	159
1400	1	123	8	0	1	0	133	134
1500	0	194	8	0	0	0	202	202
1600	0	219	16	0	2	0	237	240
1700	2	153	5	0	1	0	161	161
1800	0	132	13	1	0	0	146	147
1900	1	117	8	0	1	0	127	128
2000	0	61	3	1	1	0	66	68
2100	0	31	3	0	0	0	34	34
2200	0	15	1	0	0	0	16	16
2300	0	9	1	0	1	0	11	12
07-19	16	1485	95	3	8	1	1608	1608
06-22	17	1708	109	4	10	1	1849	1851
06-00	17	1732	111	4	11	1	1876	1880
00-00	17	1766	117	4	11	1	1916	1920

Peaks	Time	Vehicles	PCU's
AM	0900	97	96.2
IP	1300	159	158.7
PM	1600	237	239.6



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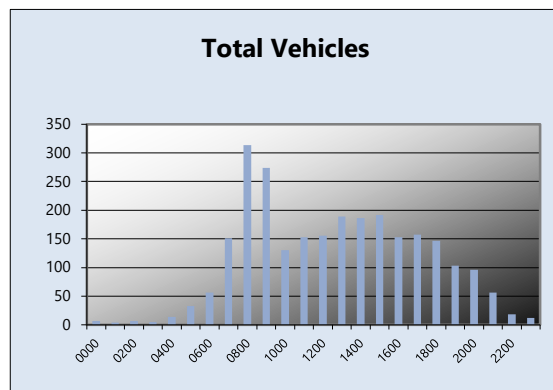
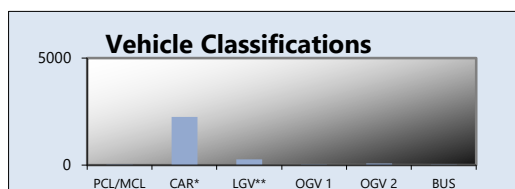
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Monday 29 April 2024
TRA/24/048**

**SITE 04
WESTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	7	0	0	0	0	7	7
0100	0	4	0	0	0	0	4	4
0200	0	4	0	0	2	1	7	11
0300	0	5	0	0	0	0	5	5
0400	1	8	5	0	0	0	14	13
0500	2	23	5	0	3	0	33	35
0600	0	50	5	0	1	0	56	57
0700	0	126	19	2	4	0	151	157
0800	0	273	27	9	4	1	314	325
0900	0	235	25	3	10	1	274	290
1000	0	113	8	2	7	0	130	140
1100	0	126	18	0	8	1	153	164
1200	0	131	18	1	6	0	156	164
1300	0	160	19	1	9	0	189	201
1400	0	160	21	1	3	1	186	191
1500	1	169	16	2	4	0	192	197
1600	1	131	16	3	2	0	153	156
1700	0	136	19	1	1	0	157	159
1800	0	127	18	0	2	0	147	150
1900	1	86	15	0	1	0	103	104
2000	0	90	6	0	0	0	96	96
2100	0	49	6	1	0	0	56	57
2200	0	16	0	0	2	0	18	21
2300	0	11	1	0	0	0	12	12
07-19	2	1887	224	25	60	4	2202	2295
06-22	3	2162	256	26	62	4	2513	2608
06-00	3	2189	257	26	64	4	2543	2641
00-00	6	2240	267	26	69	5	2613	2716

Peaks	Time	Vehicles	PCU's
AM	0800	314	324.7
IP	1300	189	201.2
PM	1700	157	158.8



TRAFFINOMICS LIMITED

**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

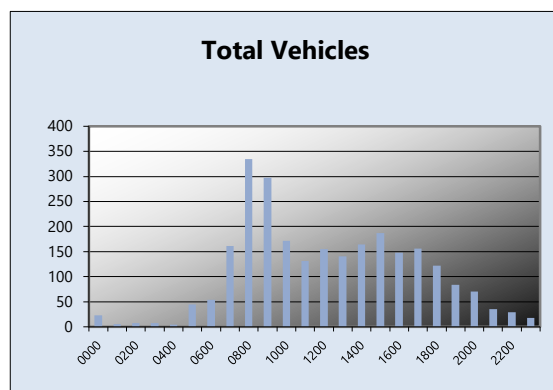
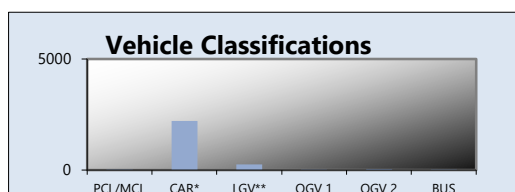
Tuesday 30 April 2024
TRA/24/048

**SITE 04
WESTBOUND**

RECEIVED: 11/12/2024

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	22	1	0	0	0	23	23
0100	0	3	2	0	0	0	5	5
0200	0	6	1	0	0	0	7	7
0300	0	6	0	0	1	0	7	8
0400	0	3	1	0	0	0	4	4
0500	0	38	5	1	1	0	45	47
0600	1	42	7	1	3	0	54	58
0700	0	137	18	2	4	0	161	167
0800	0	294	32	4	4	1	335	343
0900	1	260	32	1	3	0	297	301
1000	0	151	12	1	7	1	172	183
1100	0	110	13	3	5	0	131	139
1200	0	138	9	0	8	0	155	165
1300	0	122	12	1	6	0	141	149
1400	1	145	13	3	2	0	164	167
1500	0	167	13	3	2	2	187	193
1600	1	118	24	3	2	0	148	151
1700	0	133	16	3	3	1	156	162
1800	0	110	11	0	1	0	122	123
1900	0	72	10	1	1	0	84	86
2000	0	62	7	0	1	0	70	71
2100	0	31	3	0	1	0	35	36
2200	0	27	2	0	0	0	29	29
2300	0	17	0	0	1	0	18	19
07-19	3	1885	205	24	47	5	2169	2245
06-22	4	2092	232	26	53	5	2412	2496
06-00	4	2136	234	26	54	5	2459	2544
00-00	4	2214	244	27	56	5	2550	2638

Peaks	Time	Vehicles	PCU's
AM	0800	335	343.2
IP	1400	164	167.3
PM	1700	156	162.4



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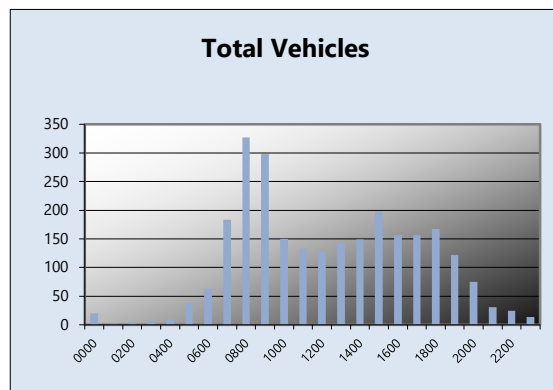
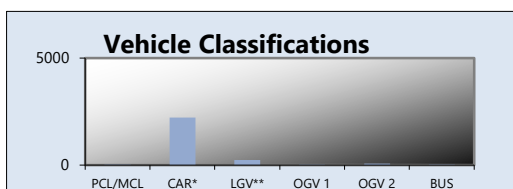
**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

**Wednesday 1 May 2024
TRA/24/048**

**SITE 04
WESTBOUND**

TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	20	0	0	0	0	20	20
0100	0	2	0	0	0	0	2	2
0200	0	4	1	0	0	0	5	5
0300	0	5	0	0	1	0	6	7
0400	1	6	2	0	1	0	10	11
0500	0	35	2	0	1	0	38	39
0600	0	51	9	0	2	0	62	65
0700	0	150	22	2	9	0	183	196
0800	0	293	23	3	5	3	327	338
0900	0	260	23	3	12	0	298	315
1000	0	125	14	2	9	0	150	163
1100	0	111	13	1	6	2	133	143
1200	0	108	11	3	5	0	127	135
1300	0	119	18	2	3	1	143	149
1400	1	123	15	4	6	0	149	158
1500	0	170	18	3	7	0	198	209
1600	1	116	26	4	8	1	156	169
1700	0	135	18	1	2	0	156	159
1800	0	150	13	1	3	0	167	171
1900	1	115	3	1	1	1	122	124
2000	1	67	6	1	0	0	75	75
2100	0	28	2	1	0	0	31	32
2200	0	24	0	0	0	0	24	24
2300	0	13	1	0	0	0	14	14
07-19	2	1860	214	29	75	7	2187	2304
06-22	4	2121	234	32	78	8	2477	2599
06-00	4	2158	235	32	78	8	2515	2637
00-00	5	2230	240	32	81	8	2596	2721

Peaks	Time	Vehicles	PCU's
AM	0800	327	338
IP	1400	149	158
PM	1800	167	171.4



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**CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS**

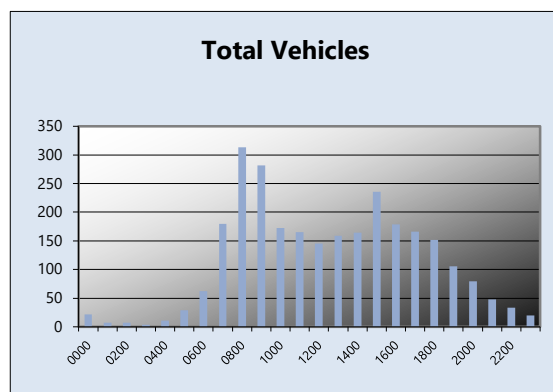
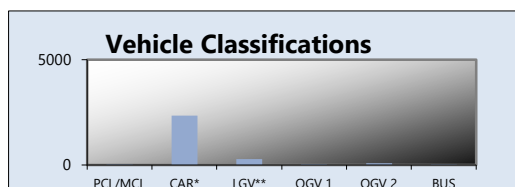
Thursday 2 May 2024
TRA/24/048

**SITE 04
WESTBOUND**

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TIME	PCL/MCL	CAR*	LGV**	OGV 1	OGV 2	BUS	TOTAL	PCU
0000	0	22	0	0	0	0	22	22
0100	0	7	0	0	0	0	7	7
0200	0	6	1	0	0	0	7	7
0300	0	4	0	0	0	0	4	4
0400	0	8	3	0	0	0	11	11
0500	0	24	5	0	0	0	29	29
0600	3	42	10	0	7	0	62	69
0700	0	143	25	1	10	1	180	195
0800	0	275	22	6	9	1	313	329
0900	0	252	25	0	4	1	282	288
1000	0	147	14	2	9	0	172	185
1100	0	132	21	2	10	0	165	179
1200	1	114	22	3	5	0	145	152
1300	1	138	14	2	4	0	159	164
1400	0	135	19	1	9	0	164	176
1500	0	195	29	3	9	0	236	249
1600	1	150	24	2	2	0	179	182
1700	0	144	17	3	2	0	166	170
1800	0	139	12	0	1	0	152	153
1900	0	95	11	0	0	0	106	106
2000	2	68	4	1	3	1	79	83
2100	0	47	1	0	0	0	48	48
2200	0	33	0	0	0	0	33	33
2300	0	17	3	0	0	0	20	20
07-19	3	1964	244	25	74	3	2313	2422
06-22	8	2216	270	26	84	4	2608	2728
06-00	8	2266	273	26	84	4	2661	2781
00-00	8	2337	282	26	84	4	2741	2861

Peaks	Time	Vehicles	PCU's
AM	0800	313	328.7
IP	1400	164	176.2
PM	1600	179	181.8



TRAFFINOMICS LIMITED

CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

SITE 04
EASTBOUND

WEEK COMMENCING:

Friday 26 April 2024
TRA/24/048

TIME PERIOD	Friday 26 April 2024	Saturday 27 April 2024	Sunday 28 April 2024	Monday 29 April 2024	Tuesday 30 April 2024	Wednesday 1 May 2024	Thursday 2 May 2024	Average
0000	13	14	14	12	13	11	13	13
0100	21	10	15	3	17	22	20	15
0200	4	11	13	5	4	6	6	7
0300	4	5	6	8	4	3	3	5
0400	2	2	2	5	2	3	4	3
0500	23	8	4	24	24	29	23	19
0600	27	16	15	27	31	37	32	26
0700	67	25	18	53	70	66	74	53
0800	130	54	37	136	147	153	158	116
0900	121	75	43	124	131	116	133	106
1000	105	136	91	101	87	108	124	107
1100	154	165	119	164	118	144	131	142
1200	199	175	179	180	164	164	161	175
1300	226	194	180	163	162	163	173	180
1400	220	205	171	189	199	191	218	199
1500	248	177	137	206	198	172	199	191
1600	268	173	187	280	296	297	321	260
1700	278	154	192	306	297	276	314	260
1800	261	176	179	190	208	188	209	202
1900	176	146	159	124	113	153	173	149
2000	148	94	113	128	100	138	125	121
2100	103	69	76	76	63	84	78	78
2200	53	49	32	44	35	49	44	44
2300	40	25	12	15	14	18	19	20
07-19	2277	1709	1533	2092	2077	2038	2215	1992
06-22	2731	2034	1896	2447	2384	2450	2623	2366
06-00	2824	2108	1940	2506	2433	2517	2686	2431
00-00	2891	2158	1994	2563	2497	2591	2755	2493

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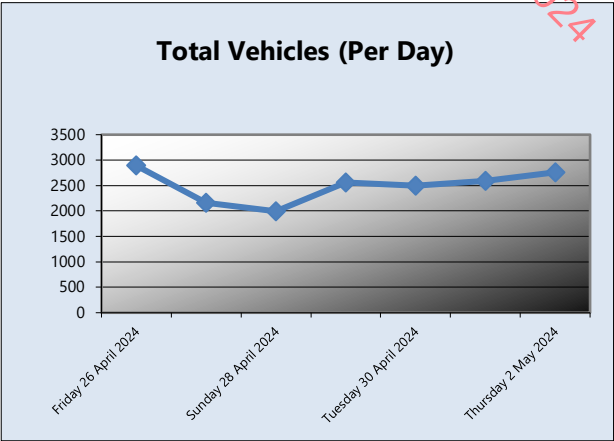
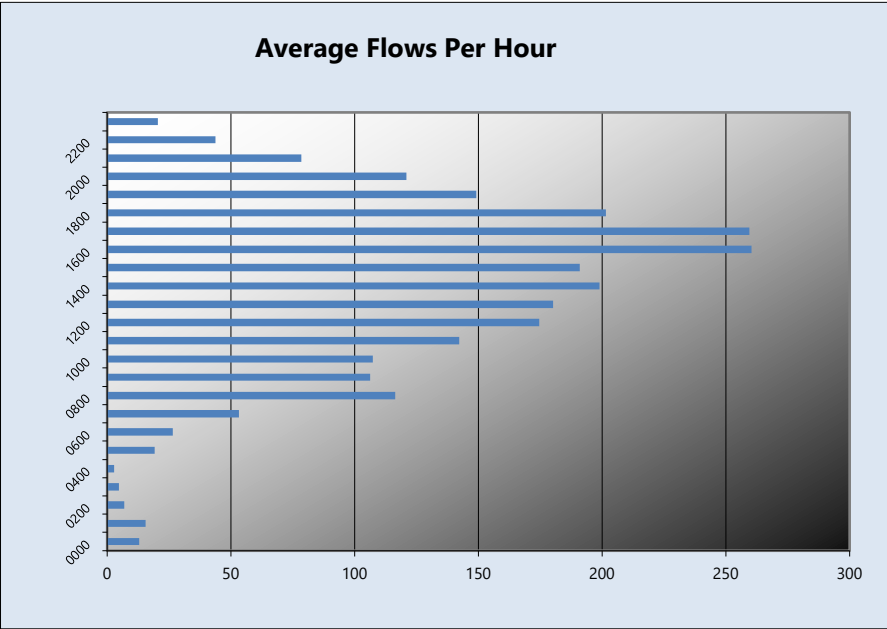
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CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

SITE 04
EASTBOUND

WEEK COMMENCING: Friday 26 April 2024
TRA/24/048

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Peak Time & Volumetric Count Data

	Friday 26 April 2024	Saturday 27 April 2024	Sunday 28 April 2024	Monday 29 April 2024	Tuesday 30 April 2024	Wednesday 1 May 2024	Thursday 2 May 2024	Mode/ Average
AM								
Time	0800	0900	0900	0800	0800	0800	0800	0800
Vehicles	130	75	43	136	147	153	158	120
IP								
Time	1300	1400	1300	1400	1400	1400	1400	1400
Vehicles	226	205	180	189	199	191	218	201
PM								
Time	1700	1800	1700	1700	1700	1600	1600	1700
Vehicles	278	176	192	306	297	297	321	267

TRAFFINOMICS LIMITED

CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

SITE 04
WESTBOUND

WEEK COMMENCING:

Friday 26 April 2024
TRA/24/048

TIME PERIOD	Friday 26 April 2024	Saturday 27 April 2024	Sunday 28 April 2024	Monday 29 April 2024	Tuesday 30 April 2024	Wednesday 1 May 2024	Thursday 2 May 2024	Average
0000	22	11	13	7	23	20	22	17
0100	5	5	11	4	5	2	7	6
0200	2	8	6	7	7	5	7	6
0300	9	1	4	5	7	6	4	5
0400	4	4	4	14	4	10	11	7
0500	29	11	2	33	45	38	29	27
0600	66	23	14	56	54	62	62	48
0700	151	69	40	151	161	183	180	134
0800	292	127	42	314	335	327	313	250
0900	315	208	97	274	297	298	282	253
1000	152	213	111	130	172	150	172	157
1100	142	204	144	153	131	133	165	153
1200	150	187	136	156	155	127	145	151
1300	176	148	159	189	141	143	159	159
1400	183	134	133	186	164	149	164	159
1500	223	156	202	192	187	198	236	199
1600	178	122	237	153	148	156	179	168
1700	191	106	161	157	156	156	166	156
1800	179	126	146	147	122	167	152	148
1900	121	103	127	103	84	122	106	109
2000	83	94	66	96	70	75	79	80
2100	150	74	34	56	35	31	48	61
2200	60	37	16	18	29	24	33	31
2300	21	21	11	12	18	14	20	17
07-19	2332	1800	1608	2202	2169	2187	2313	2087
06-22	2752	2094	1849	2513	2412	2477	2608	2386
06-00	2833	2152	1876	2543	2459	2515	2661	2434
00-00	2904	2192	1916	2613	2550	2596	2741	2502

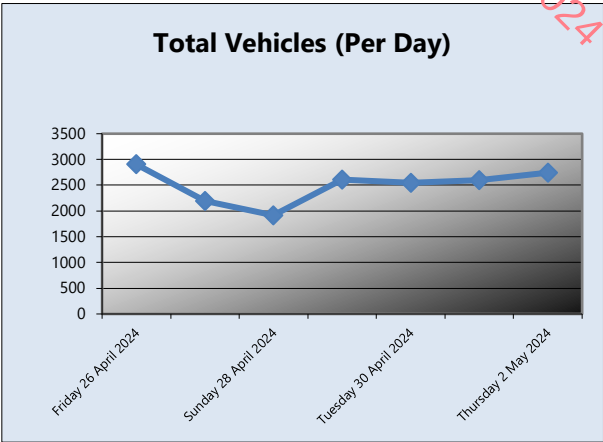
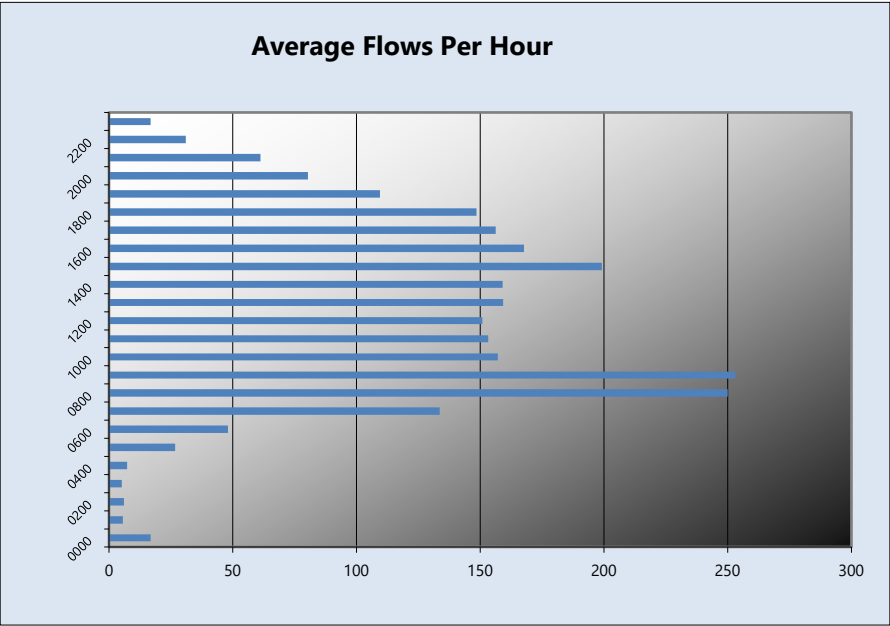
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CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

SITE 04
WESTBOUND

WEEK COMMENCING: Friday 26 April 2024
TRA/24/048



Peak Time & Volumetric Count Data

	Friday 26 April 2024	Saturday 27 April 2024	Sunday 28 April 2024	Monday 29 April 2024	Tuesday 30 April 2024	Wednesday 1 May 2024	Thursday 2 May 2024	Mode/ Average
AM								
Time	0900	0900	0900	0800	0800	0800	0800	0800
Vehicles	315	208	315	314	335	327	313	304
IP								
Time	1400	1200	1300	1300	1400	1400	1400	1400
Vehicles	183	187	159	189	164	149	164	171
PM								
Time	1700	1800	1600	1700	1700	1800	1600	1700
Vehicles	191	126	237	157	156	167	179	173

CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

WEEK COMMENCING:

Friday 26 April 2024

TRA/24/048

SITE 04
EASTBOUND

Profile:

Filter time: 00:00 26th April 2024 => 23:59 2nd May 2024

Speed range: 0 - 200 km/h.

Separation: Greater than 4.00 seconds. - (Headway)

Units: Metric (meter, kilometer, m/s, km/h, kg, tonne)

Vehicles = 12593

Maximum = 130.3 km/h, Minimum = 11.4 km/h, Mean = 73.1 km/h

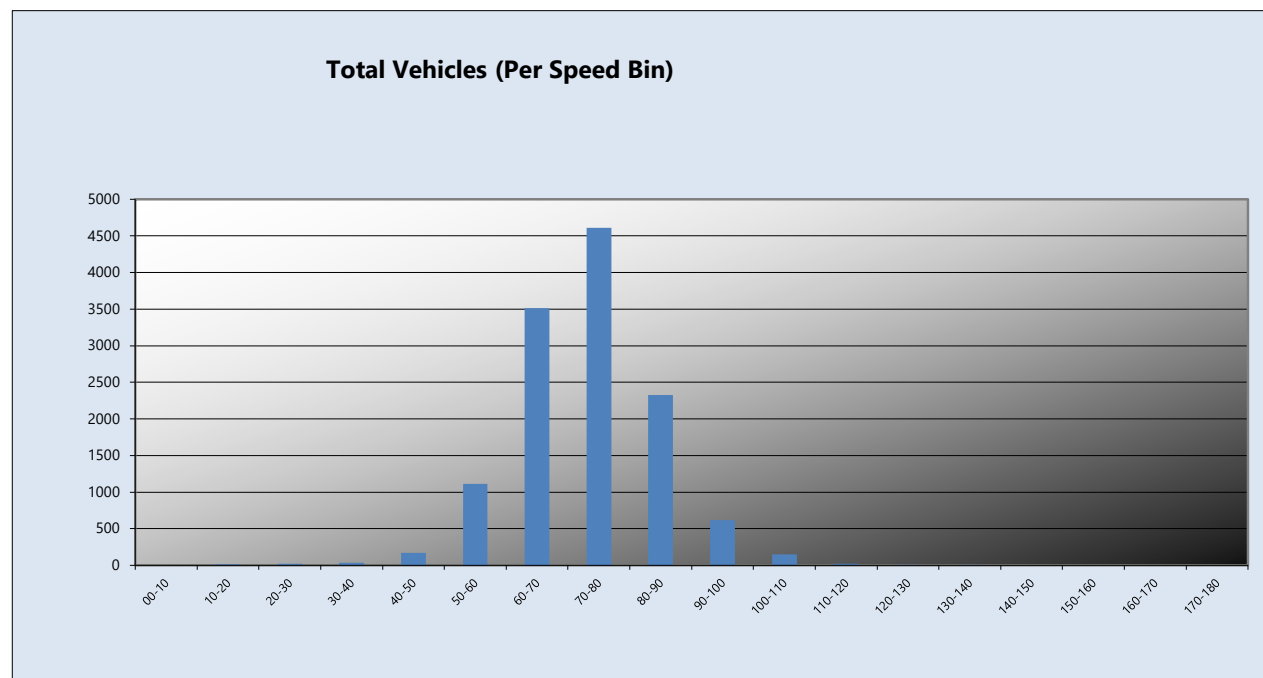
85% Speed = 84.06 km/h, 95% Speed = 91.71 km/h, Median = 72.99 km/h

20 km/h Pace = 62 - 82, Number in Pace = 8264 (65.62%)

Variance = 127.38, Standard Deviation = 11.29 km/h

Speed Bins:

Speed KPH	Bin	
	No.	%
00-10	0	0.0
10-20	12	0.1
20-30	18	0.1
30-40	32	0.3
40-50	171	1.4
50-60	1113	8.8
60-70	3514	27.9
70-80	4612	36.6
80-90	2323	18.4
90-100	618	4.9
100-110	151	1.2
110-120	22	0.2
120-130	6	0.0
130-140	1	0.0
140-150	0	0.0
150-160	0	0.0
160-170	0	0.0
170-180	0	0.0



CLOONANNY WINDFARM TRAFFIC COUNT/SPEED SURVEYS
AUTOMATIC TRAFFIC COUNTS

WEEK COMMENCING:

Friday 26 April 2024

TRA/24/048

SITE 04
WESTBOUND

Profile:

Filter time: 00:00 26th April 2024 => 23:59 2nd May 2024

Speed range: 0 - 200 km/h.

Separation: Greater than 4.00 seconds. - (Headway)

Units: Metric (meter, kilometer, m/s, km/h, kg, tonne)

Vehicles = 11353

Maximum = 124.5 km/h, Minimum = 16.5 km/h, Mean = 66.6 km/h

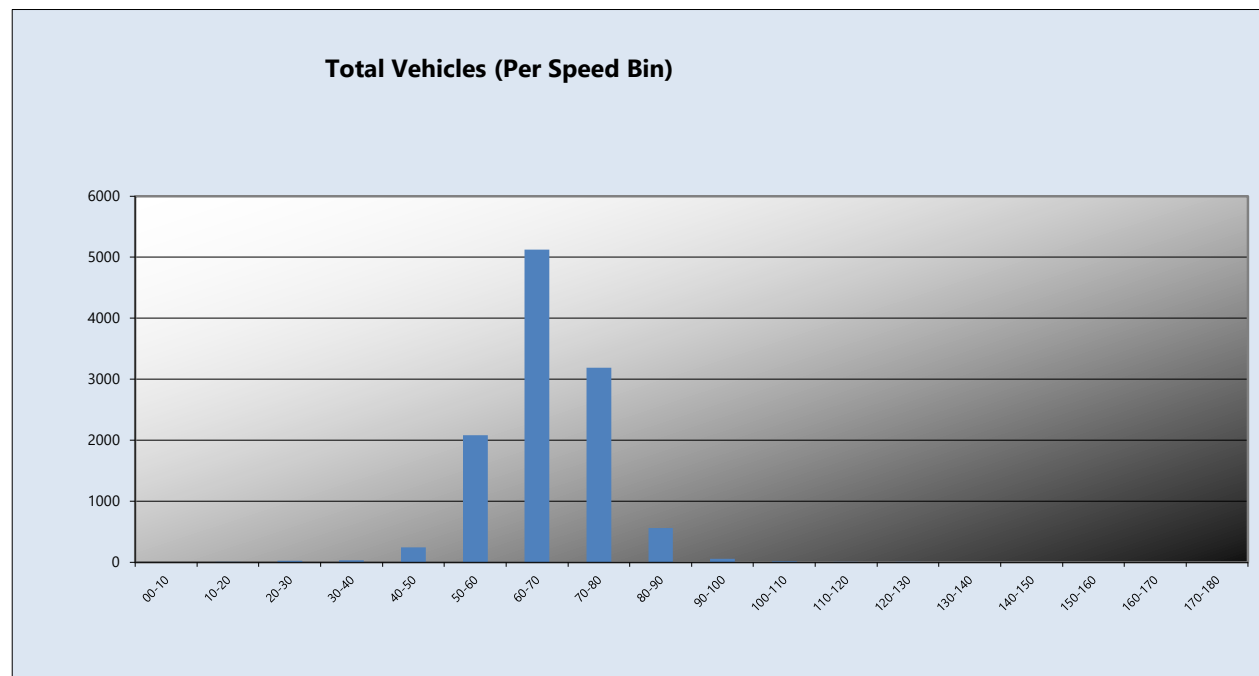
85% Speed = 75.24 km/h, 95% Speed = 80.64 km/h, Median = 66.60 km/h

20 km/h Pace = 57 - 77, Number in Pace = 8734 (76.93%)

Variance = 80.03, Standard Deviation = 8.95 km/h

Speed Bins:

Speed	Bin	
KPH	No.	%
00-10	0	0.0
10-20	1	0.0
20-30	26	0.2
30-40	36	0.3
40-50	244	2.1
50-60	2085	18.4
60-70	5125	45.1
70-80	3193	28.1
80-90	562	5.0
90-100	60	0.5
100-110	17	0.1
110-120	3	0.0
120-130	1	0.0
130-140	0	0.0
140-150	0	0.0
150-160	0	0.0
160-170	0	0.0
170-180	0	0.0



CLASSIFICATION SCHEMES:

Scheme F Classification Scheme (Non-metric)

Scheme F is an attempt to implement the FWHA's visual classification scheme as an axle-based classification scheme. This is one of several interpretations.

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Vehicle Class	Class	Vehicle Type	No. of Axles	Axle spacing in feet				
				Axle 1 to 2	Axle 2 to 3	Axle 3 to 4	Axle 4 to 5	Axle 5 to 6
PCL/MCL	1	motorcycle	2	<6.0				
CAR*	2	passenger car	2	6.0 - 10.0				
		car + 1 axle trailer	3	<10.0	10.0 - 18.0			
		car + 2 axle trailer	4	<10.0		<3.5		
LGV**	3	pickup	2	10.0 - 15.0				
		pickup + 1 axle trailer	3	10.0 - 15.0	10.0 - 18.0			
		pickup + 2 axle trailer	4	10.0 - 15.0		<3.5		
		pickup + 3 axle trailer	5	9.9 - 15.0			<3.5	
BUS	4	bus	2	>20.0				
		bus	3	>19.0				
OGV 1	5	single unit truck - dual rear axle	2	14.9 - 20.0			<3.5	
	6	3 axle truck	3		<18.0			
OGV 2	7	4 axle truck	4					
	8	2S1	3		>18.0			
		2S2	4		>5.0	>3.5		
		3S1	4		<5.0	>10.0		
	9	3S2	5		<6.1		3.5 - 8.0	
		5 axle combination	5					
	10	6 axle combination	6			3.5 - 5.0		
		3S3	6					
	11	2S1-2	5		>6.0			
	12	3S1-2	6					>10.0
	13	truck	7 or more					

Car* Cars and LGV based cars

LGV** Light Goods Vehicles with the exception of LGV based on cars



Proposed Windfarm, Cloonanny Glebe, Co Longford – Traffic & Transport Assessment

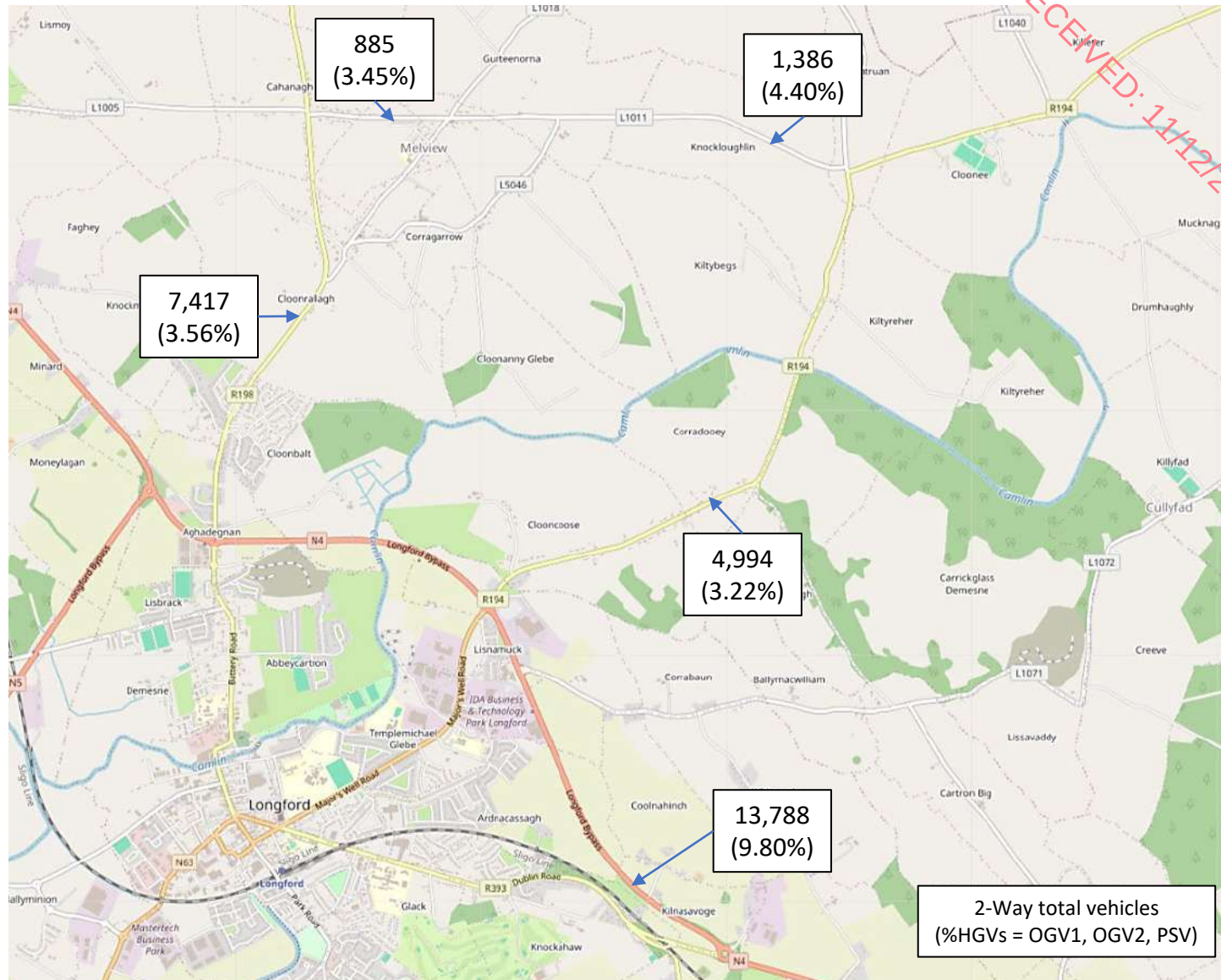


Diagram 1: 2024 Average Daily Traffic



Proposed Windfarm, Cloonanny Glebe, Co Longford – Traffic & Transport Assessment

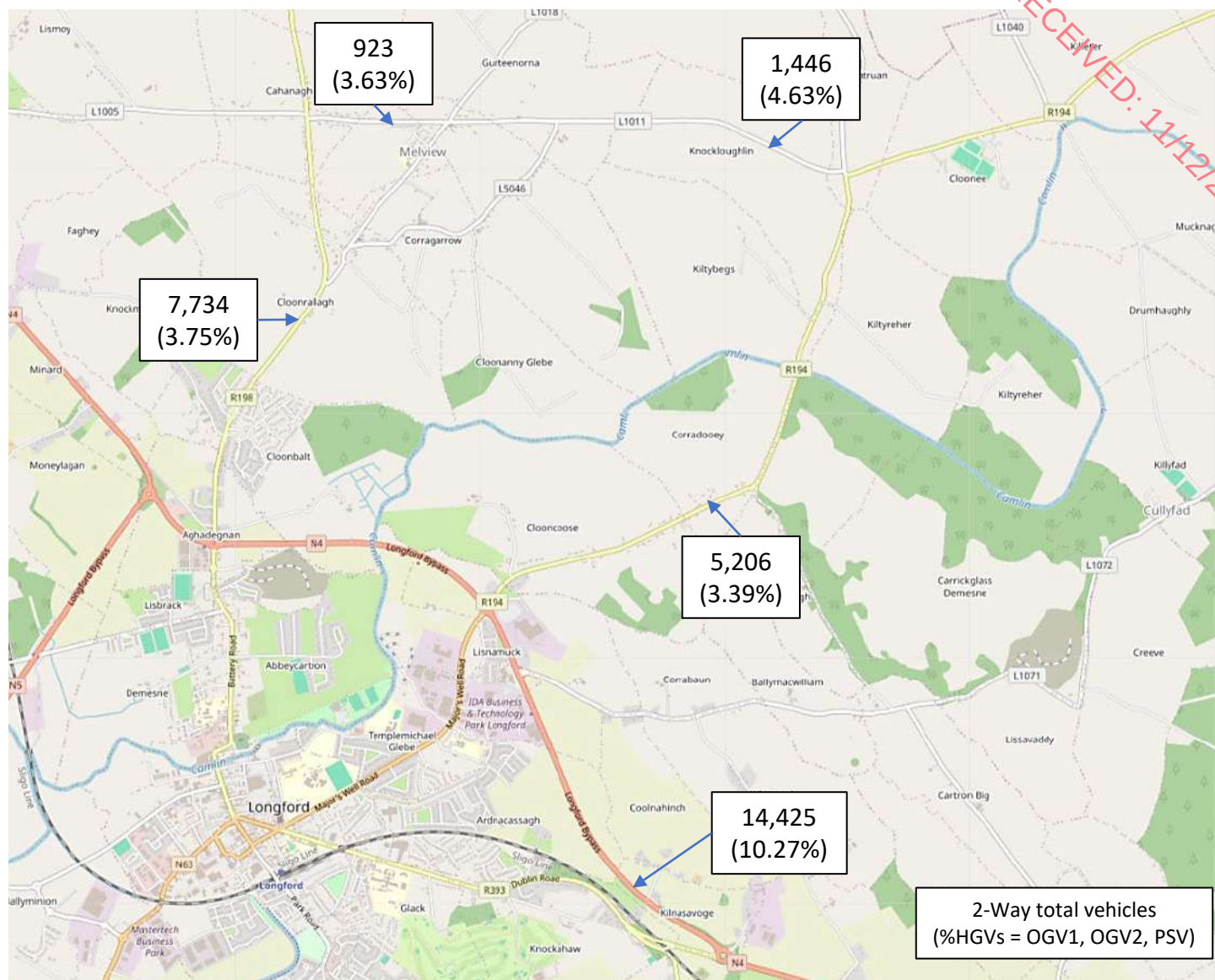


Diagram 2: 2027 Forecast Average Daily Traffic 'Do Nothing'

(From Diagram 1 x TII LV and HV growth factors)



Proposed Windfarm, Cloonanny Glebe, Co Longford – Traffic & Transport Assessment

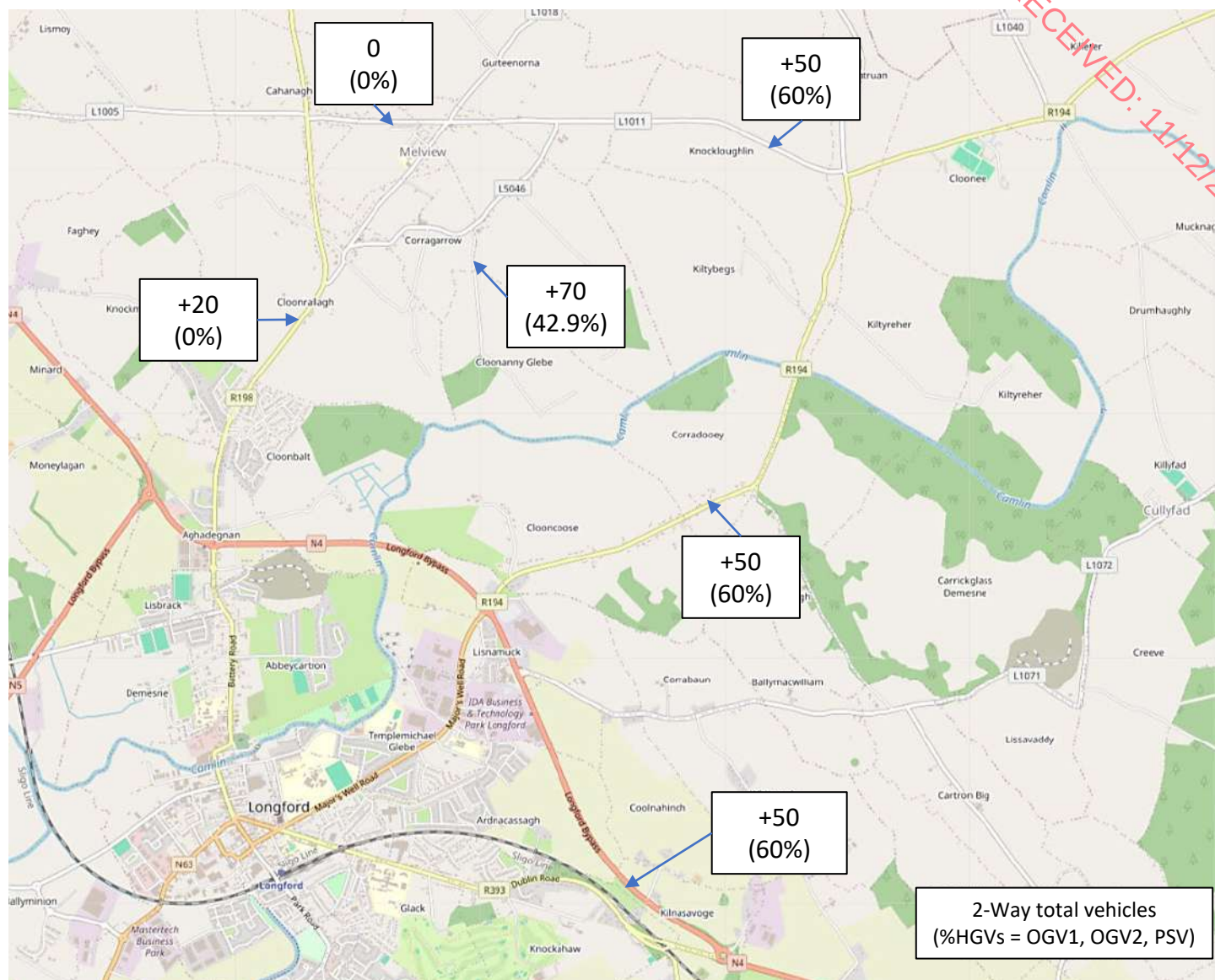


Diagram 3: 2027 Forecast Average Daily Construction Traffic –Peak Activity Phase



Proposed Windfarm, Cloonanny Glebe, Co Longford – Traffic & Transport Assessment

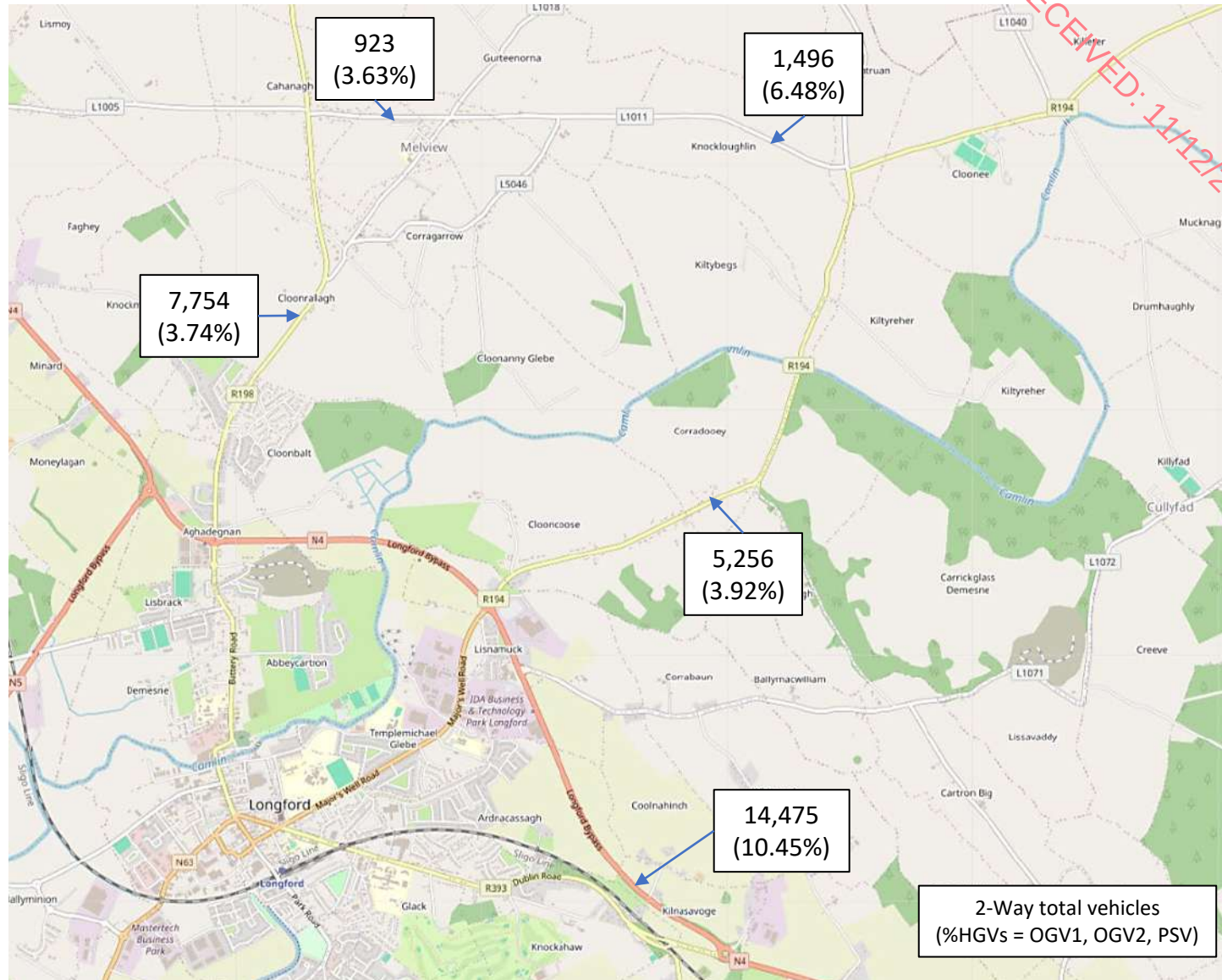


Diagram 4: 2027 Forecast Average Daily Traffic 'Do Something' – Peak Activity Phase

(From Diagram 2 + Diagram 3)

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APPENDIX 7.1

CLOONANNY WIND FARM EMI IMPACT ASSESSMENT REPORT

VOLUME III

APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DECEMBER 2024

 Total Professional Solutions	Procedure: 001	Rev: 4.0
Title: Cloonanny EMI Impact Assessment	Approved: KH	Date: 12/04/24

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Report

Cloonanny Wind Farm EMI Impact Assessment Report

Document Number:

Author: DMG/PT

Approved for Release: Rev 4.0 KH **Date:** 12/04/24

Document Filename: *Cloonanny Wind Farm EMI Impact Assessment.*

 Total Broadband Solutions	Procedure: 001	Rev: 4.0
Title: Cloonanny EMI Impact Assessment	Approved: KH	Date: 12/04/24

Executive Summary

Ai Bridges was commissioned to evaluate the possible impacts that the proposed wind farm at Cloonanny, Co Longford could have on existing telecommunications operator networks. The scope of work included field and desktop surveys to determine telecommunications network infrastructure that could be impacted by the proposed development. Consultations with telecom operators were also undertaken to assist in identifying network infrastructure that could be impacted by the proposed wind farm.

Telecommunications mast-sites with network infrastructure that could potentially be impacted by the development were identified and a field survey of each of these sites was carried out. During the field surveys, radio antennas with bearings in the direction of the wind farm were recorded. The findings of the field surveys are provided in Appendix B of this report.

During the consultation process, nineteen telecom operators were contacted. At the time of writing this report, thirteen of these operators have responded to the consultation request. The responses received from each of the telecom operators can be found in Section 3 of this report.

Using the information obtained during the field survey assessments and consultation process a desktop impact analysis was carried out and all of the telecommunication operator networks were analysed using radio planning \ modelling software. Results from the impact analysis indicate that there are twelve radio links that cross over/near the proposed development. The twelve radio links (listed below) have been modelled in 3D and the possible impact due to the proposed turbine layout has been assessed.

The results of the network analysis indicate that none of the twelve radio links would be impacted by the proposed turbine layout.

Operator	Radio Link Description	Impact of Proposed Turbine Layout
2RN	Cairn Hill to Maghera	No Impact
2RN	Cairn Hill to Coolderry	No Impact
Enet	Cairn Hill to Abbott Longford.	No impact.
Enet	Cairn Hill to Bluebac Longford.	No impact.
Enet	Cairn Hill to Longford Co Co.	No impact.
Imagine Broadband	Cairn Hill to Longford Town Shopping Centre.	No impact.
Three Ireland	Templemichael to Cairn Hill.	No impact.
Vodafone	Corlea to Brian Fallon Hardware	No impact.
Vodafone	Cairn Hill to Longford Garda	No impact
Vodafone	Cairn Hill to Longford ESB	No impact.
Vodafone	Cairn Hill to Cablecomm.	No impact.
Eir	Cairn Hill to Cablecomm.	No impact.

Table 1. Impacts of proposed Turbine Layouts on existing Radio Links

 Total Broadcast Solutions	Procedure: 001	Rev: 4.0
Title: Cloonanny EMI Impact Assessment	Approved: KH	Date: 12/04/24

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Section 5 - Desktop Survey Analysis.....	17
Section 6 - Conclusions	30

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 Total Professional Solutions	Procedure: 001	Rev: 4.0
Title: Cloonanny EMI Impact Assessment	Approved: KH	Date: 12/04/24

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Section 1 - Wind Farm Site Information

AiBridges <i>Total Procedural Solutions</i>	Procedure: 001	Rev: 4.0
Title: Cloonanny EMI Impact Assessment	Approved: KH	Date: 12/04/24

1. Introduction

In this section a brief summary of the wind farm site is provided. Details regarding the site's geographic location and the proposed wind turbine dimensions are presented.

1.1 Wind Farm Site Information

The proposed wind farm development is located approximately 2.5 km northeast of Longford Town. The co-ordinates of the turbines assessed in this report are provided in Appendix A. The dimensions of the turbines assessed in this report are provided in Table 2 below.

Wind Farm	Number of Turbines	Turbine Hub Height	Turbine Rotor Diameter	Turbine Tip Height
Cloonanny	2	112 m	175 m	200 m

Table 2. Wind Farm Turbine Details

The location of the proposed wind farm development is shown below in Figure 1.



Figure 1. Location of proposed wind farm.

 Total Professional Solutions	Procedure: 001	Rev: 4.0
Title: Cloonanny EMI Impact Assessment	Approved: KH	Date: 12/04/24

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Section 2 - Methodology

 Total Professional Solutions	Procedure: 001	Rev: 4.0
Title: Cloonanny EMI Impact Assessment	Approved: KH	Date: 12/04/24

2. Introduction

In this section a brief summary of the Telecommunication Impact Study Methodology is provided.

2.1 Methodology

There are four primary stages in preparing and compiling a communication impact study:

- Telecom Operator Consultations
- Field Surveys
- Desktop Survey Network Modelling and Analysis
- Report Generation

A summary of each of these stages is provided below:

Telecom Operator Consultations

Consultations are commenced with telecom operators who are requested to raise any concerns they have regarding the impact of the proposed wind farm on their networks. The consultation process is used to assist in identifying telecoms infrastructure that could be impacted by the proposed wind farm development.

Field Surveys

Field surveys are undertaken and the co-ordinates of communication masts are recorded. During the field surveys of the communication sites, approximations of antenna size, bearing and height are made for the antennas installed on each of the masts surveyed.

Desktop Survey and Analysis

A desktop survey is carried out to plot the wind turbines in a radio planning tool. The radio planning tool uses GIS and terrain mapping databases to enable accurate modelling. A selection of mast-site coordinates is then obtained and inputs from various operators \ service providers are converted from Irish National Grid (Easting and Northing in meters) to degrees minutes seconds format and then imported into the radio planning tool.

This provides a means of graphically showing telecommunications sites in the vicinity relative to the proposed wind farm site at Cloonanny. Figure 2 below shows the proposed wind farm site boundary plotted in the radio planning tool.

AiBridges <i>Total Broadband Solutions</i>	Procedure: 001	Rev: 4.0
Title: Cloonanny EMI Impact Assessment	Approved: KH	Date: 12/04/24

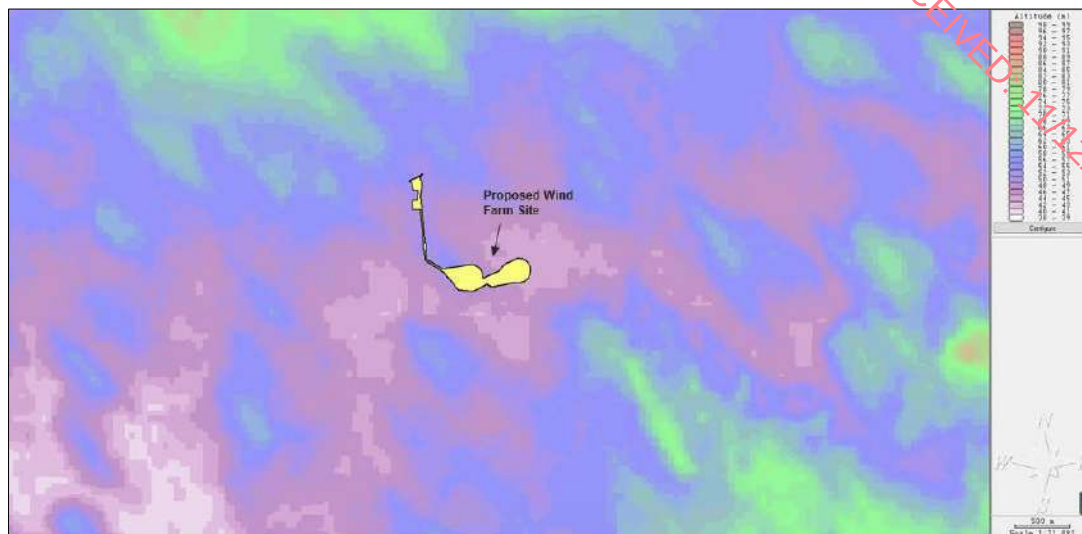


Figure 2. Wind Farm Boundary plotted in Radio Planning Software

The findings from the consultations and field surveys are collated and the communications networks requiring further analysis are identified. Network modeling is used to assess the impact of the turbines on the communications networks.

The results from the network modeling are used to determine if mitigation measures are required. Figure 3 below shows an example of a microwave radio link that crosses over/near the wind farm boundary modelled in radio planning software.

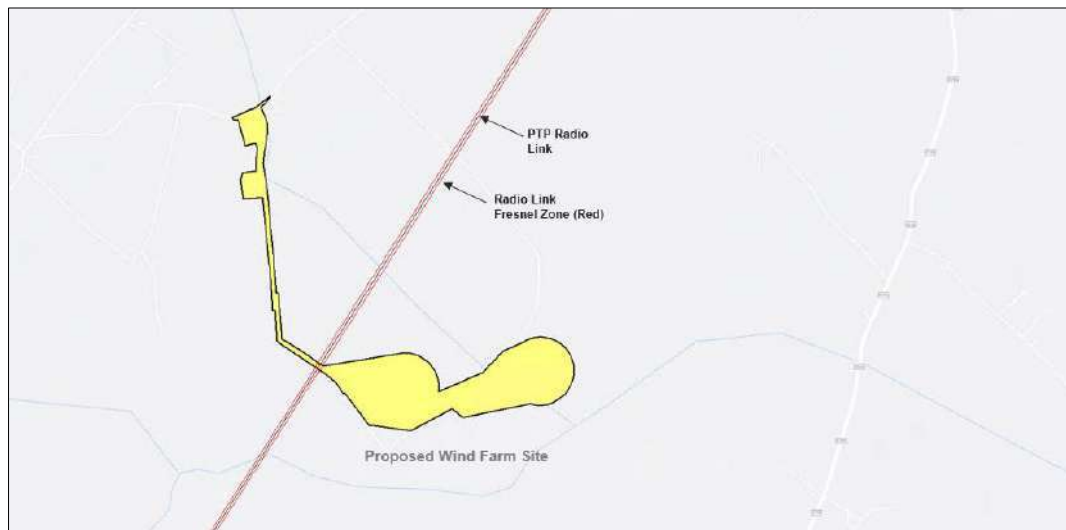


Figure 3. Example of microwave radio link crossing over/near the proposed wind farm boundary modelled in radio planning software.

Report Generation

The final stage of the communications impact study process is to collate the data and present the findings & analysis into a report for submission.

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Section 3 - Telecom Operator Consultations

 Total Procedural Solutions	Procedure: 001	Rev: 4.0
Title: Cloonanny EMI Impact Assessment	Approved: KH	Date: 12/04/24

3. Introduction

In this section the consultation process undertaken with telecom operators is described. The response received from each operator is also provided.

3.1 Telecom Operator Consultations

Consultations beginning in June 2023 were undertaken with telecom network operators to assist in identifying telecommunication infrastructure that could be impacted by the proposed wind farm.

The operators were requested to raise any concerns they may have regarding impacts to their networks due to the proposed wind farm development. Table 3 lists the telecom operators contacted and the issues raised by the operators. The responses received from each of the Telecom Operators are provided in Sections 3.1.1 to 3.1.19.

ID	Operator	Response Received (Yes/No)	Issues raised by Operator \ Observations.
1	2RN	Yes	2RN have raised a concern regarding one UHF radio link and one PTP microwave radio link.
2	Airwave	Yes	No issues.
3	An Garda Síochána	No	No response. (No response expected.)
4	Coimisiún na Meán	Yes	No issues.
5	BT Ireland	Yes	No issues.
6	CIE/Irish Rail	No	No response. (No response expected.)
7	Dept. of Defence	No	No response. (DoD is a statutory consultee and have previously stated that they will only respond to the Planning Authority under an RFI at Planning Application Stage.)
8	Eir	Yes	Eir have raised a concern regarding one Licensed PTP microwave radio link.
9	Enet	Yes	Enet have raised a concern regarding three Licensed PTP microwave radio links.
10	ESB Networks	No	No response. (Reminder sent Week 28 2023)
11	Imagine Broadband	Yes	Imagine Broadband have raised a concern regarding one Licensed PTP microwave radio link.
12	Air Navigation Ireland (formerly of the IAA)	Yes	No issues.
13	Uisce Éireann	Yes	No issues.
14	Longford Co Co	No	No response. (No response expected.)
15	Tetra Ireland (TI)	Yes	No issues.
16	Three Ireland	Yes	Three Ireland have raised a concern regarding one Licensed PTP microwave radio link.
17	Viatel	Yes	No issues.
18	Virgin Media	No	No response. (Reminder sent Week 28 2023)
19	Vodafone Ireland	Yes	Vodafone have raised a concern regarding four Licensed PTP microwave radio link.

Table 3. Telecom Operators Consulted

 Total Broadband Solutions	Procedure: 001	Rev: 4.0
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3.1.1 2RN Response to Consultations

2RN provided the following email response to consultations:

*"We have two links passing over the area outlined in your email below.
Due to the risk of interference to broadcast services in the area we would also ask that a protocol be signed between 2rn and the developer should the site go ahead."*

Link Name / ID	Band MHz/GHz	Link Length	Site A					Site B				
			Lat	Long	Easting	Northing	Ant Height	Lat	Long	Easting	Northing	Ant Height
CHL_MGH DTT	658MHz	115km	53.807227	-7.715351			406m AMSL	52.968795	-8.718379			414m AMSL
CHL_COD	6GHz	60.6	53.807227	-7.715351			288m AMSL	53.320410	-8.125628			111m AMSL

3.1.2 Airwave Response to Consultations

Airwave provided the following email response to consultations:

"Airwave have no infrastructure in this area."

3.1.3 An Garda Síochána Response to Consultations

To date no response has been received.

3.1.4 Coimisiún na Meán Response to Consultations

The BAI provided the following email response to consultations:

"Coimisiún na Meán 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."

3.1.5 BT Ireland Response to Consultations

BT provided the following email response to consultations:

"The planned development will have no impact on the BT Ireland microwave network."

3.1.6 CIE/Irish Rail Response to Consultations

To date no response has been received.

3.1.7 Department of Defence Response to Consultations

To date no response has been received.

3.1.8 Eir Response to Consultations

Eir provided the following email response to consultations:

"With this area, we have one link present if you can maintain a buffer area back from the link:"

#	Band	A-end			Height		B-end			Height
Link1	11Ghz	LD_4270	53°48'26.07"N	7°42'55.63"W	25	<—>	LD_4335	53°43'43.99"N	7°48'0.72"W	9

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3.1.9 Enet Response to Consultations

Enet provided the following email response to consultations:

"We have the below links passing through this area:"

Link Name / ID	Band MHz\GHz	Link Length	Site A					Site B				
			Lat	Long	Easting	Northing	Ant Height	Lat	Long	Easting	Northing	Ant Height
RTE Cairn Hill – Abbott Laboratories Longford	15GHz	8.66km	53.807213	-7.715414			15m	53.737389	-7.773167			10m
RTE Cairn Hill – Bluebac Consulting Longford	23GHz	9.04km	53.807213	-7.715414			15m	53.735972	-7.780861			8m
RTE Cairn Hill – Enet Longford Colo	18GHz	10.2km	53.807213	-7.715414			15m	53.729556	-7.798583			10m

3.1.10 ESB Networks Response to Consultations

To date no response has been received.

3.1.11 Imagine Broadband Response to Consultations

Imagine Broadband provided the following email response to consultations:

"At present Imagine have one microwave link traversing this location. We require a 50m set back from our centre path. This may be reduced if proposed wind turbines are not located inside fresnel zone clearances.

I have forwarded your mail to our RF planning team. They will reply if needed."



	LD001 RTE Cairn Hill	LD004 PVT Longford Town Centre
Latitude	53 48 25.96 N	53 43 49.05 N
Longitude	007 42 55.92 W	007 48 10.11 W
Decimal Lat	53.807212	53.73029167
Decimal Long	7.715534	7.80280833
Elevation (m)	268.53	70.87
Antenna height (m)	39.00	23.70
Frequency (MHz)	18000.00	
Path length (km)	10.26	

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3.1.12 Air Navigation Ireland Response to Consultations

Air Navigation Ireland provided the following email response to consultations:

"No issue for NavAids."

3.1.13 Uisce Éireann Response to Consultations

Uisce Éireann provided the following email response to consultations:

"I can confirm that there are no Uisce Éireann radio links traversing the proposed Wind Farm development"

3.1.14 Longford County Council Response to Consultations

To date no response has been received.

3.1.15 Tetra Ireland (TI) Response to Consultations

Tetra Ireland provided the following email response to consultations:

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

3.1.16 Three Ireland Response to Consultations

Three Ireland provided the following email response to consultations:

"We have one link that passes through this area. This is a vital link for us in the region. Please see details below."

Link Name / ID	Band MHz\GHz	Link Length	Site A					Site B				
			Lat	Long	Easting	Northing	Ant Height	Lat	Long	Easting	Northing	Ant Height
16062	18	9276	53.73249	-7.77759	214,731	275,877	23	53.80724	-7.71544	218,799	284,212	63



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3.1.17 Viatel Response to Consultations

Viatel provided the following email response to consultations:

"No impact, thank you."

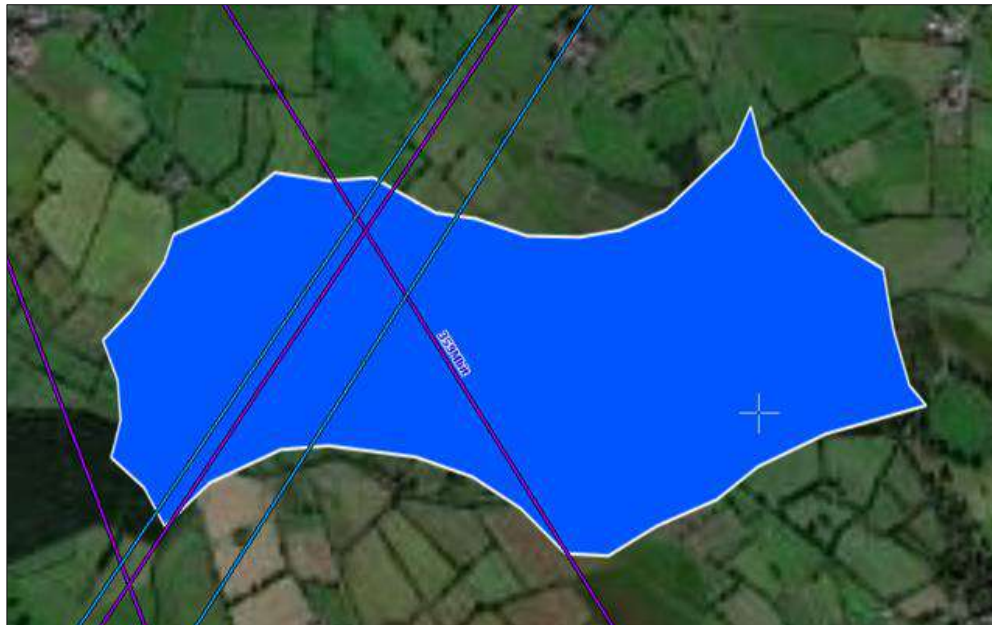
3.1.18 Virgin Media Response to Consultations

To date no response has been received.

3.1.19 Vodafone Ireland Response to Consultations

Vodafone provided the following email response to consultations:

"Please find all links that may be effected by Cloonanny Wind Farm Development, Co Longford with reference to the KML file."



LD010-LD055	LD010	22m	212517 Easting	281766 Northing	LD055	10m	217337 Easting	274095 Northing	Freq Band	26
LDCNH-LD554_GCN	LDCNH	30m	218797 Easting	284211 Northing	LD554_GCN	15m	213155 Easting	275864 Northing	Freq Band	18
LDCNH-LD050	LDCNH	28m	218797 Easting	284211 Northing	LD050	26m	212892 Easting	275374 Northing	Freq Band	26
LDCNH-LD056	LDCNH	20m	218797 Easting	284211 Northing	LD056	12m	213241 Easting	275472 Northing	Freq Band	18

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Section 4 - Field Surveys

AiBridges <i>Total Broadband Solutions</i>	Procedure: 001	Rev: 4.0
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4. Introduction

To assess the accuracy of the network information (radio link co-ordinates, antenna heights etc.) provided by the telecom operators, field surveys of the telecom-mast sites in the vicinity of the proposed wind farm were carried out. During the field surveys, radio antennas with bearings in the direction of the wind farm were recorded.

The telecom mast-sites surveyed for this study (labelled Mast-Site A to Mast-Site M) are shown relative to the proposed wind farm site in Figure 4 below. The findings from the field surveys of the mast-sites are presented in Appendix B of this report.



Figure 4. Telecom Mast-Sites Surveyed.

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Section 5 - Desktop Survey Analysis

AiBridges Total Broadcast Solutions	Procedure: 001	Rev: 4.0
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5. Introduction

Based on the findings of the consultation process, there are six Telecom Operators with networks in the vicinity of the proposed development that require a detailed technical analysis:

- 2RN Network
- Enet Network
- Imagine Broadband Network
- Three Ireland Network
- Vodafone Network
- Eir Network

Sections 5.1 to 5.6 below outlines the desktop survey analysis findings* for the Telecom Operator Networks listed above.

5.1 2RN Network Analysis

The 2RN network in the vicinity of the proposed wind farm consists of one DTT Off-air radio link and one PTP microwave radio link. The radio links are listed in Table 4 below and a Plan View of the 2RN network is shown in Figure 5.

Link No.	Operator	Link Description
1	2RN	UHF DTT off-air radio link from Cairn Hill to Maghera
2	2RN	PTP microwave radio link from Cairn Hill to Coolderry

Table 4. 2RN Radio Links requiring Analysis

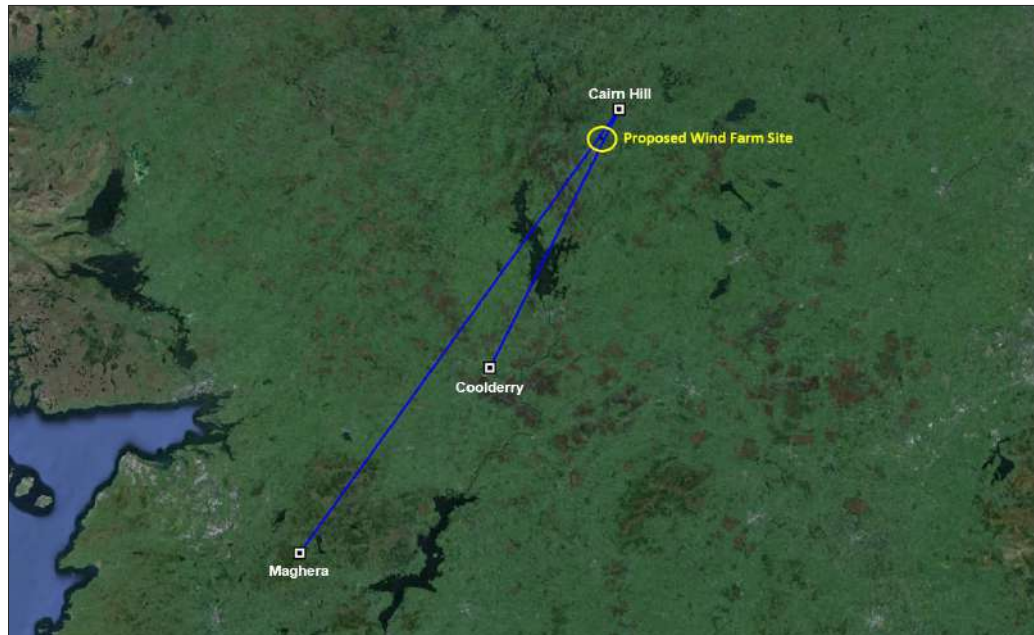


Figure 5. 2RN Radio Network – Plan View

* The Desktop Survey Analysis findings are subject to accuracy of the information (GPS co-ordinates, turbine dimensions, etc.) provided to Ai Bridges.

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To assess the potential impact of the proposed turbine layout, the 2RN radio network has been modelled in 3D and the Clearance Distances between the Fresnel Zone(s) of the radio link(s) and the blade-tip of the nearest turbines have been calculated. The results of this 3D network analysis are presented in Sections 5.1.1 that follows.

5.1.1 2RN 3D Network Analysis (2-Turbine Layout)

The findings of the 3D analysis indicate that there is a clearance distance 50.6m between the blade-tip of T02 and the Fresnel Zone of the of the radio link between Cairn Hill and Coolderry. As the turbines will not obstruct the radio paths of the links there will be no impact on the 2RN radio network due to the proposed wind farm development.

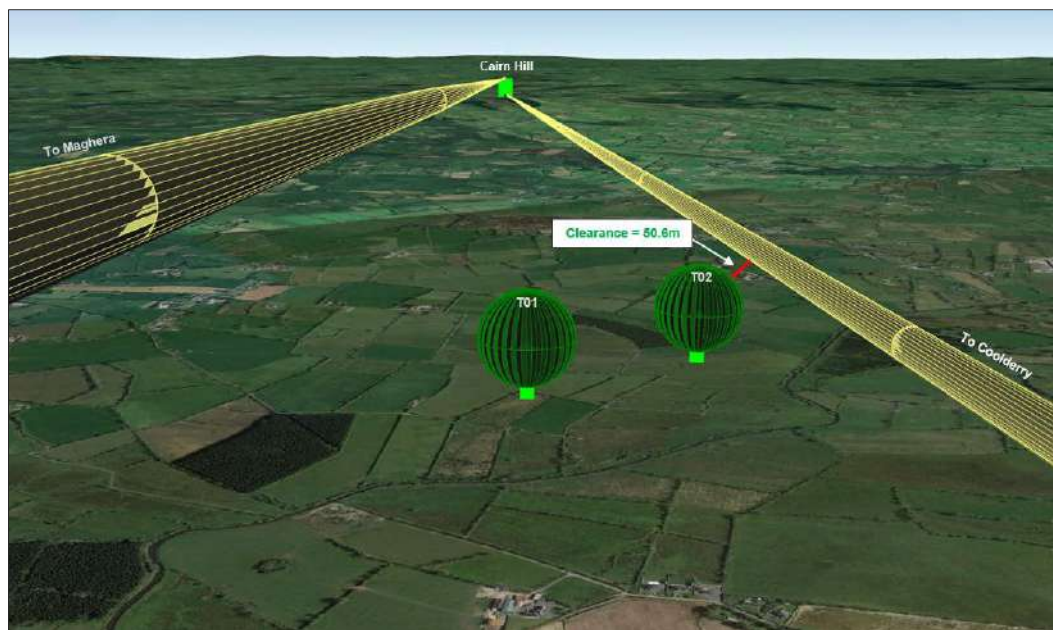


Figure 6. 3D View of 2RN Radio Network

Table 5 below provides a summary of the radio link interference analysis findings for the proposed turbine layout.

Link No.	Description	Impact due to proposed Turbine Layout (Clearance distance to nearest turbine)
1	Cairn Hill to Maghera	No impact. (Clearance to T01 > 100 m)
2	Cairn Hill to Coolderry	No impact. (Clearance to T02 = 50.6 m)

Table 5. Network Analysis Summary – 2RN

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5.2 Enet Network Analysis

The Enet network in the vicinity of the proposed wind farm consists of three Point-to-Point (PTP) microwave radio links. The radio links are listed in Table 6 below and a Plan View of the Enet network is shown in Figure 9.

Link No.	Operator	Link Description
1	Enet	PTP microwave radio link from Cairn Hill to Abbott Longford.
2	Enet	PTP microwave radio link from Cairn Hill to Bluebac Longford.
3	Enet	PTP microwave radio link from Cairn Hill to Longford Co Co.

Table 6. Enet Radio Links requiring Analysis



Figure 7. Enet Radio Network – Plan View

To assess the potential impact of the proposed turbine layout, the Enet radio network has been modelled in 3D and the Clearance Distances between the Fresnel Zone(s) of the radio link(s) and the blade-tip of the nearest turbines have been calculated. The results of this 3D network analysis are presented in Section 5.2.1 that follows.

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5.2.1 Enet 3D Network Analysis (2-Turbine Layout)

The findings of the 3D analysis indicate that there is a clearance distance 16.2 m between the blade-tip of T02 and the Fresnel Zone of the of the radio link between Cairn Hill and Bluebac. As the turbines will not obstruct the radio paths of any of the three links there will be no impact on the Enet radio network due to the proposed wind farm development.

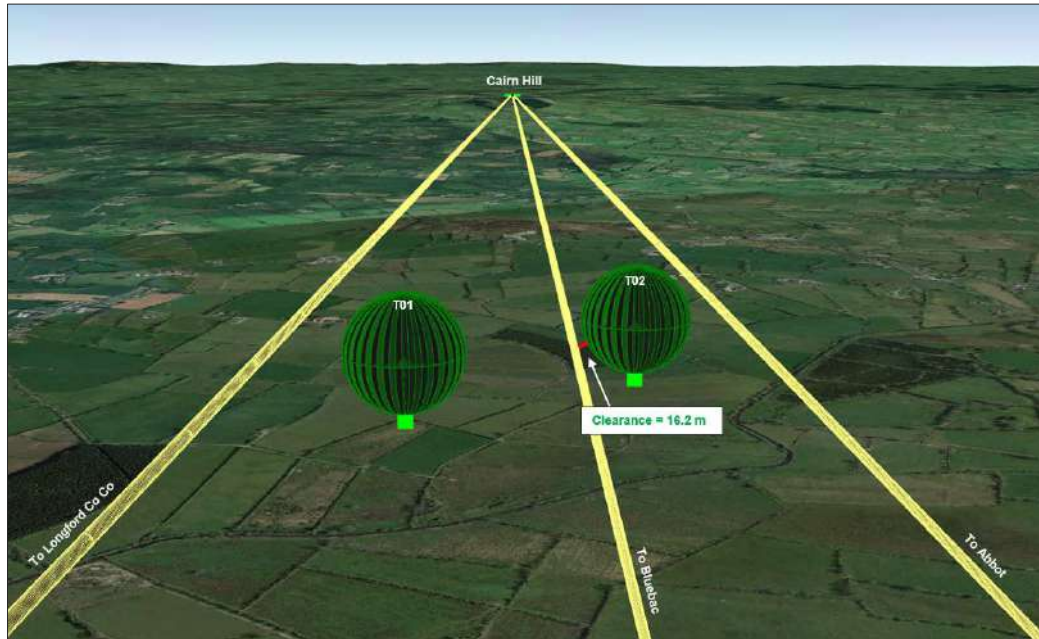


Figure 8. 3D View of Enet Radio Network

Table 7 below provides a summary of the radio link interference analysis findings for the proposed turbine layout.

Link No.	Description	Impact due to proposed Turbine Layout (Clearance distance to nearest turbine)
1	Cairn Hill to Abbott	No impact. (Clearance to T02 > 50 m)
2	Cairn Hill to Bluebac	No impact. (Clearance to T02 = 16.2 m)
3	Cairn Hill to Longford Co Co	No impact. (Clearance to T01 > 50 m)

Table 7. Network Analysis Summary – Enet

AiBridges <i>Total Broadband Solutions</i>	Procedure: 001	Rev: 4.0
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5.3 Imagine Broadband Network Analysis

The Imagine Broadband network in the vicinity of the proposed wind farm consists of one Point-to-Point (PTP) microwave radio link. The radio link is listed below in Table 8 and a Plan View of the Three Ireland network is shown in Figure 9.

Link ID	Operator	Link Description
1	Imagine Broadband	PTP microwave radio link from Cairn Hill to Longford Town Shopping Centre.

Table 8. Imagine Broadband Radio Links requiring Analysis

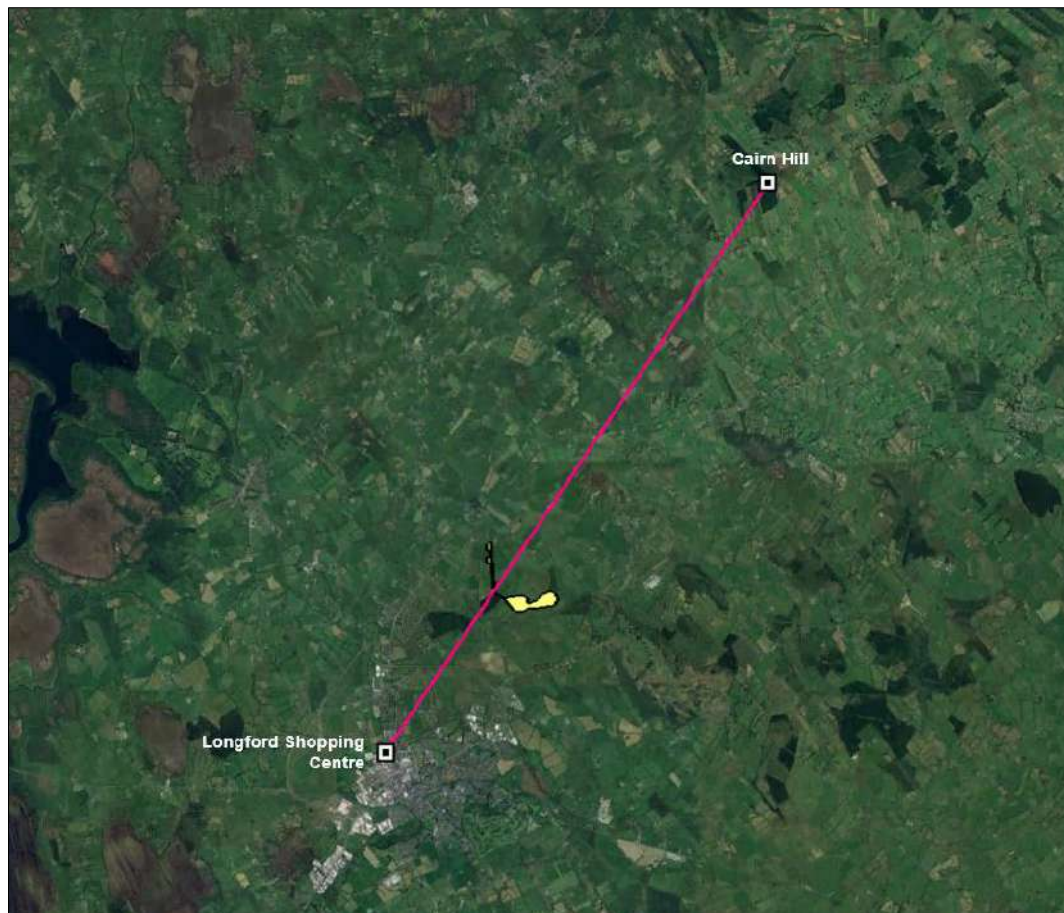


Figure 9. Imagine Broadband Radio Network – Plan View

To assess the potential impact of the proposed turbine layout, the Imagine Broadband radio network has been modelled in 3D and the Clearance Distance between the Fresnel Zone of the radio link and the blade-tip of the nearest turbine has been calculated. The results of this 3D network analysis are presented in Section 5.3.1 that follows.

AiBridges <i>Total Broadband Solutions</i>	Procedure: 001	Rev: 4.0
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5.3.1 Imagine Broadband 3D Network Analysis (2-Turbine Layout)

The findings of the 3D analysis indicate that there is a clearance distance over 100 m between the blade-tip of T01 and the Fresnel Zone of the of the radio link between Cairn Hill and Longford Shopping Centre. As the turbines will not obstruct the radio path of the link there will be no impact on the Imagine Broadband radio network due to the proposed wind farm development.

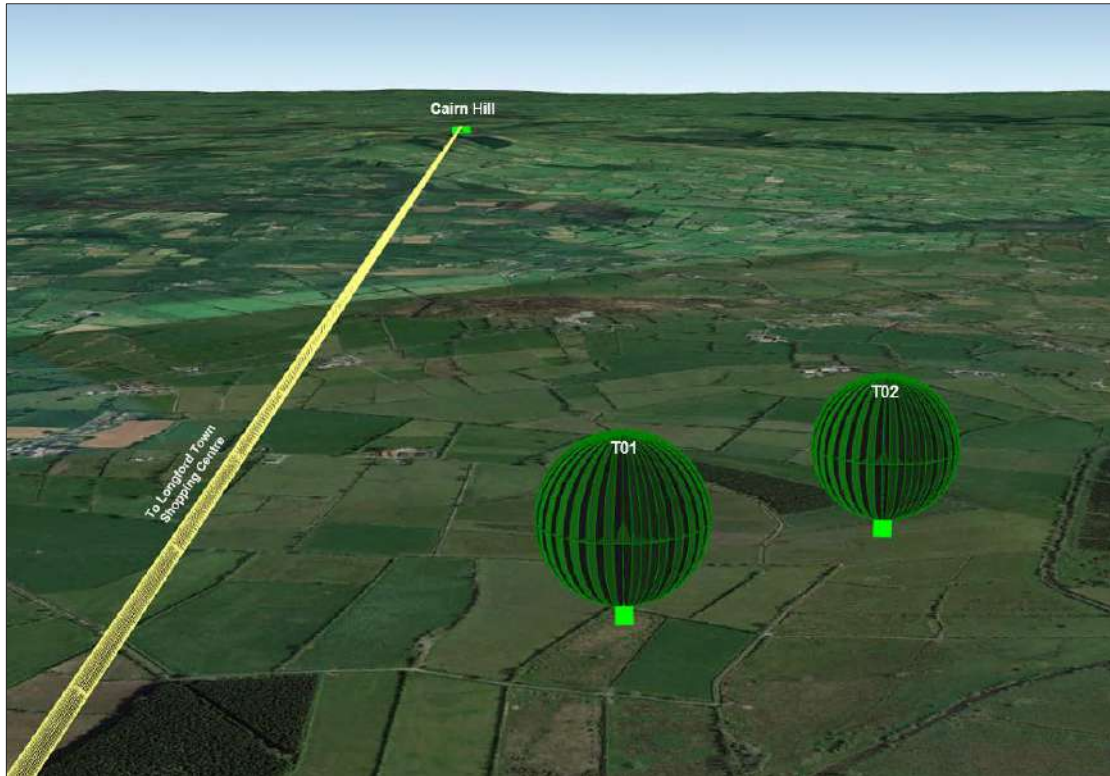


Figure 10. 3D View of Imagine Broadband Radio Network

Table 9 below provides a summary of the radio link interference analysis findings for the proposed turbine layout.

Link No.	Description	Impact due to proposed Turbine Layout (Clearance distance to nearest turbine)
1	Cairn Hill to Longford Town Shopping Centre.	No impact (Clearance > 100 m)

Table 9. Network Analysis Summary – Imagine Broadband

AiBridges <i>Total Broadcast Solutions</i>	Procedure: 001	Rev: 4.0
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5.4 Three Ireland Network Analysis

The Three Ireland network in the vicinity of the proposed wind farm consists of one Point-to-Point (PTP) microwave radio link. The radio link is listed below in Table 10 and a Plan View of the Three Ireland network is shown in Figure 17.

Link ID	Operator	Link Description
1	Three Ireland	PTP microwave radio link from Templemichael Business Park to Cairn Hill.

Table 10. Three Ireland Radio Links requiring Analysis

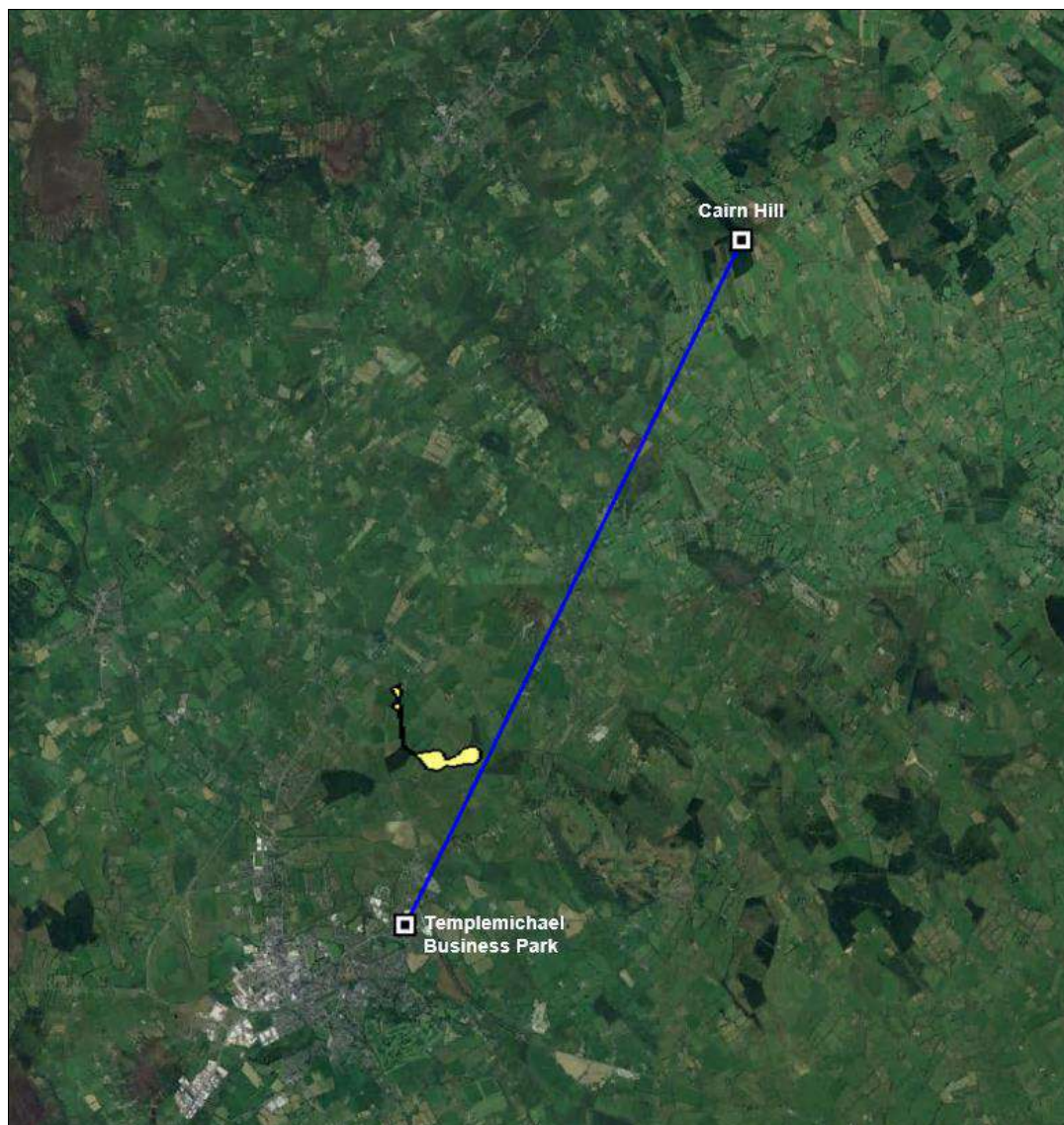


Figure 11. Three Ireland Radio Network – Plan View

To assess the potential impact of the proposed turbine layout, the Three Ireland radio network has been modelled in 3D and the Clearance Distance between the Fresnel Zone of the radio link and the blade-tip of the nearest turbine has been calculated. The results of this 3D network analysis are presented in Section 5.4.1 that follows.

AiBridges Total Broadcast Solutions	Procedure: 001	Rev: 4.0
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5.4.1 Three Ireland 3D Network Analysis (2-Turbine Layout)

The findings of the 3D analysis indicate that there is a clearance distance over 50 m between the blade-tip of T02 and the Fresnel Zone of the of the radio link between Cairn Hill and Templemichael Business Park. As the turbines will not obstruct the radio path of the link there will be no impact on the Three Ireland radio network due to the proposed wind farm development.

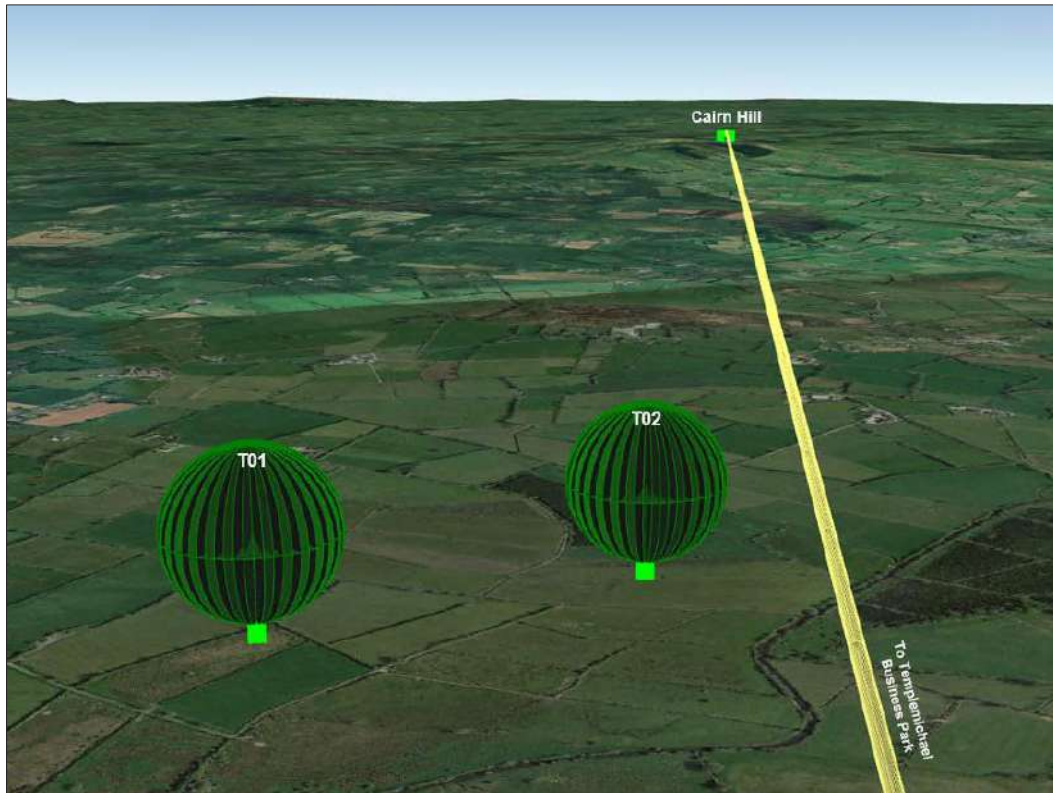


Figure 12. 3D View of Three Ireland Radio Network - 2-Turbine Layout

Table 11 below provides a summary of the radio link interference analysis findings for the proposed turbine layout.

Link No.	Description	Impact due to proposed Turbine Layout (Clearance distance to nearest turbine)
1	Templemichael Business Park to Cairn Hill	No impact. (Clearance > 50 m)

Table 11. Network Analysis Summary – Three Ireland

AiBridges Total Broadcast Solutions	Procedure: 001	Rev: 4.0
Title: Cloonanny EMI Impact Assessment	Approved: KH	Date: 12/04/24

5.5 Vodafone Ireland Network Analysis

The Vodafone network in the vicinity of the proposed wind farm consists of one Point-to-Point (PTP) microwave radio link. The radio link is listed below in Table 12 and a Plan View of the Vodafone network is shown in Figure 21.

Link ID	Operator	Link Description
1	Vodafone	PTP microwave radio link from Corlea to Brian Fallon Hardware.
2	Vodafone	PTP microwave radio link from Cairn Hill to Longford Garda Station.
3	Vodafone	PTP microwave radio link from Cairn Hill to Longford ESB.
4	Vodafone	PTP microwave radio link from Cairn Hill to Cablecomm.

Table 12. Vodafone Radio Links requiring Analysis



Figure 13. Vodafone Radio Network – Plan View

To assess the potential impact of the proposed turbine layout, the Vodafone radio network has been modelled in 3D and the Clearance Distances between the Fresnel Zone(s) of the radio link(s) and the blade-tip of the nearest turbines have been calculated. The results of this 3D network analysis are presented in Section 5.5.1 that follows.

AiBridges Total Broadband Solutions	Procedure: 001	Rev: 4.0
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5.5.1 Vodafone 3D Network Analysis (2-Turbine Layout)

The findings of the 3D analysis indicate that there is a clearance distance 32.5 m between the blade-tip of T01 and the Fresnel Zone of the of the radio link between Corlea to Brian Fallon Hardware. As the turbines will not obstruct the radio paths of any of the four links there will be no impact on the Vodafone radio network due to the proposed wind farm development.



Figure 14. 3D View of Vodafone Radio Network

Table 13 below provides a summary of the radio link interference analysis findings for the proposed turbine layout.

Link No.	Description	Impact due to proposed Turbine Layout (Clearance distance to nearest turbine)
1	Corlea to Brian Fallon Hardware	No impact. (Clearance to T01 = 32.5 m)
2	Cairn Hill to Longford Garda Station.	No impact (Clearance to T01 > 50 m)
3	Cairn Hill to Longford ESB.	No impact (Clearance to T01 > 50 m)
4	Cairn Hill to Cablecomm.	No impact (Clearance to T01 > 50 m)

Table 13. Network Analysis Summary – Vodafone

AiBridges Total Broadcast Solutions	Procedure: 001	Rev: 4.0
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5.6 Eir Network Analysis

The Eir network in the vicinity of the proposed wind farm consists of one Point-to-Point (PTP) microwave radio link. The radio link is listed below in Table 14 and a Plan View of the Three Ireland network is shown in Figure 16.

Link ID	Operator	Link Description
1	Eir	PTP microwave radio link from Cairn Hill to Cablecomm.

Table 14. Eir Radio Links requiring Analysis



Figure 15. Eir Radio Network – Plan View

To assess the potential impact of each of the proposed turbine layouts, the Eir radio network has been modelled in 3D and the Clearance Distance between the Fresnel Zone of the radio link and the blade-tip of the nearest turbine has been calculated. The results of this 3D network analysis are presented in Section 5.6.1 that follows.

AiBridges <i>Total Broadcast Solutions</i>	Procedure: 001	Rev: 4.0
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5.6.1 Eir 3D Network Analysis (2-Turbine Layout)

The findings of the 3D analysis indicate that there is a clearance distance over 50 m between the blade-tip of T01 and the Fresnel Zone of the of the radio link between Cairn Hill and Cablecomm. As the turbines will not obstruct the radio path of the link there will be no impact on the Eir radio network due to the proposed wind farm development.

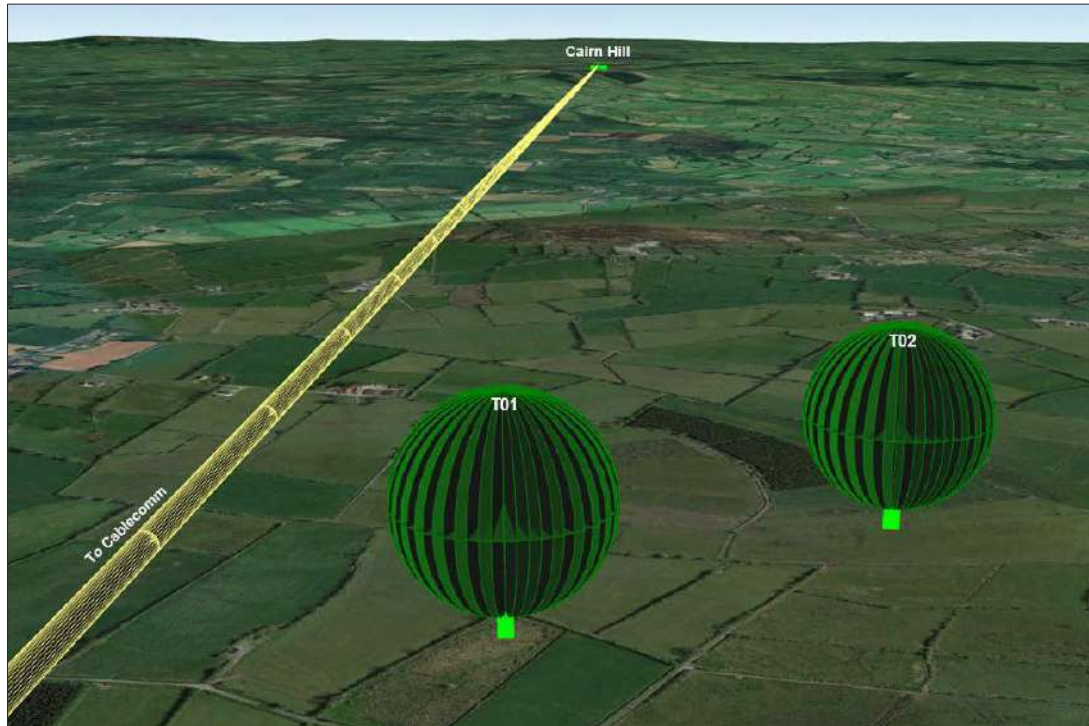


Figure 16. 3D View of Eir Radio Network

Table 15 below provides a summary of the radio link interference analysis findings for the proposed turbine layout.

Link No.	Description	Impact due to proposed Turbine Layout (Clearance distance to nearest turbine)
1	Cairn Hill to Cablecomm.	No impact (Clearance to T01 > 50m)

Table 15. Network Analysis Summary – Eir

 Total Broadcast Solutions	Procedure: 001	Rev: 4.0
Title: Cloonanny EMI Impact Assessment	Approved: KH	Date: 12/04/24

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Section 6 - Conclusions

AiBridges <i>Total Broadband Solutions</i>	Procedure: 001	Rev: 4.0
Title: Cloonanny EMI Impact Assessment	Approved: KH	Date: 12/04/24

6. Conclusions

From the findings made in this report the following conclusions have been made:

- Results from the telecom operator consultations and desktop survey analysis indicate that there are twelve radio links that cross over/near the proposed wind farm site.
- 3D network analysis indicates that the proposed turbine layout would not impact any of the twelve radio links that cross over the proposed development site.

Operator	Radio Link Description	Impact of Turbine Layout
2RN	Cairn Hill to Maghera	No Impact Clearance to nearest Turbine > 100 m
2RN	Cairn Hill to Coolderry	No Impact Clearance to nearest Turbine (T02) = 50.6 m
Enet	Cairn Hill to Abbott Longford.	No Impact Clearance to nearest Turbine > 50 m
Enet	Cairn Hill to Bluebac Longford.	No Impact Clearance to nearest Turbine (T02) = 16.2 m
Enet	Cairn Hill to Longford Co Co.	No Impact Clearance to nearest Turbine > 50 m
Imagine Broadband	Cairn Hill to Longford Town Shopping Centre.	No Impact Clearance to nearest Turbine > 50 m
Three Ireland	Templemichael to Cairn Hill.	No Impact Clearance to nearest Turbine > 50 m
Vodafone	Corlea to Brian Fallon Hardware	No Impact Clearance to nearest Turbine (T01) = 32.5 m
Vodafone	Cairn Hill to Longford Garda	No Impact Clearance to nearest Turbine > 50 m
Vodafone	Cairn Hill to Longford ESB	No Impact Clearance to nearest Turbine > 50 m
Vodafone	Cairn Hill to Cablecomm.	No Impact Clearance to nearest Turbine > 50 m
Eir	Cairn Hill to Cablecomm.	No Impact Clearance to nearest Turbine > 50 m

Table 16. Network Analysis Summary

- A 3D view of the turbine layout relative to the twelve radio links that pass over the proposed development site is shown below in Figure 17.

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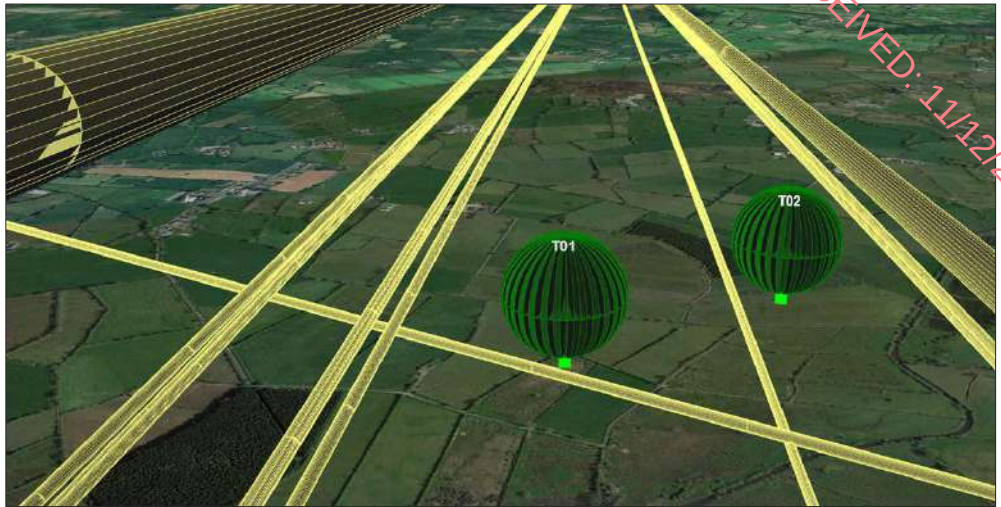


Figure 17. 3D View of radio links relative to proposed turbine layout.

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APPENDIX A – Wind Farm Turbine Coordinates

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Appendix A – Wind Farm Turbine Co-ordinates

The development is in the pre-planning stage and the Final Turbine Layout is yet to be finalized. The turbine layout considered in this Telecommunications Impact Study is provided below.

Turbine ID	Co-ordinates (ITM)	
	Easting	Northing
T01	615,036	777,906
T02	615,470	777,952

Tabel A1. Wind Farm Layout - Turbine Co-ordinates

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APPENDIX B – Field Survey Findings

AiBridges <i>Total Broadband Solutions</i>	Procedure: 001	Rev: 4.0
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Appendix B – Field Survey Findings

The telecom mast-sites surveyed for this Telecoms Impact Study are shown relative to the proposed wind farm site in Figure 18 below.



Figure 18. Telecom Mast-Sites shown relative to proposed wind farm.

The findings from the field surveys of each of the mast-sites are presented below.

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Mast-Site A (Cairn Hill)

Telecommunications Mast-Site A is located at Cairn Hill, County Longford, and is approximately 7 km northeast of the proposed wind farm. A photo of the mast-structure at this location is shown below. The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 17.



Figure 19. Mast-Site A

Mast ID	Telecom operators with radio links in direction of proposed wind farm
Mast A	2RN, Enet, Imagine Broadband, Three Ireland, Vodafone

Table 17. Field Survey Summary – Mast-Site A

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Mast-Site B (Corlea)

Telecommunications Mast-Site B is located in the townland of Corlea and is approximately 4 km northwest of the proposed wind farm. A photo of the mast at this location is shown in the figure below. The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 18.



Figure 20. Mast-Site B

Mast ID	Telecom operators with radio links in direction of proposed wind farm
Mast B	Vodafone

Table 18. Field Survey Summary – Mast-Site B

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Mast-Site C (Brian Fallon Hardware)

Telecommunications Mast-Site C is located at the Brian Fallon Hardware Store, outside of Longford Town and is approximately 4 km southeast of the proposed wind farm. A photo of the mast-structure at this location is shown in the figure below. The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 19.



Figure 21. Mast-Site C

Mast ID	Telecom operators with radio links in direction of proposed wind farm
Mast C	Vodafone

Table 19. Field Survey Summary – Mast-Site C

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Mast-Site D (Abbotts, Longford)

Telecommunications Mast-Site D is located at the Abbott Laboratories facility in Longford Town and is approximately 1 km south of the proposed wind farm.

Access into the Abbott grounds was not possible on the day of survey; however a street-side view of the facility is shown below in the Figure below. The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 20.



Figure 22. Mast-Site D

Mast ID	Telecom operators with radio links in direction of proposed wind farm
Mast D	Enet

Table 20. Field Survey Summary – Mast-Site D

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Mast-Site E (Bluebac, Longford)

Telecommunications Mast-Site E is located at Bluebac Consulting in Longford Town and is approximately 1 km south of the proposed wind farm site. A photo of the mast-structure at this location is shown in the figure below. The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 21.



Figure 23. Mast-Site E

Mast ID	Telecom operators with radio links in direction of proposed wind farm
Mast E	Enet

Table 21. Field Survey Summary – Mast-Site E

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Mast-Site F (Templemichael Business Park)

Telecommunications Mast-Site F is located in Templemichael Business Park, Co Longford and is approximately 2 km south of the proposed wind farm. A photo of the mast-structure at this location is shown in the figure below. The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 22.



Figure 24. Mast-Site F

Mast ID	Telecom operators with radio links in direction of proposed wind farm
Mast F	Three Ireland

Table 22. Field Survey Summary – Mast-Site F

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Mast-Site G (Longford Garda Station)

Telecommunications Mast-Site G is located at the rear of Longford Town Garda Station and is approximately 2 km southwest of the proposed wind farm. A photo of the mast-structure at this location is shown in the figure below. The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 23.



Figure 25. Mast-Site G

Mast ID	Telecom operators with radio links in direction of proposed wind farm
Mast G	Enet

Table 23. Field Survey Summary – Mast-Site G

AiBridges Total Broadband Solutions	Procedure: 001	Rev: 4.0
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Mast-Site H (Longford Town Shopping Centre)

Telecommunications Mast-Site H is located at the on the roof of Longford Town Shopping Centre and is approximately 2 km southwest of the proposed wind farm. Access to the roof of the Shopping Centre was not possible on the day of survey; however a street-side view of the site is shown in the figure below. The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 24.



Figure 26. Mast-Site H

Mast ID	Telecom operators with radio links in direction of proposed wind farm
Mast H	Imagine Broadband

Table 24. Field Survey Summary – Mast-Site H

AiBridges Total Broadcast Solutions	Procedure: 001	Rev: 4.0
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Mast-Site I (Longford County Council)

Telecommunications Mast-Site I is located at the Longford County Council Offices in Longford Town and is approximately 2 km southwest of the proposed wind farm. A photo of the mast-structure at this location is shown in the figure below. The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 23.



Figure 27. Mast I

Mast ID	Telecom operators with radio links in direction of proposed wind farm
Mast I	Enet

Table 25. Field Survey Summary – Mast I

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Mast-Site J (Crossan Cables)

Telecommunications Mast-Site J is located at Cablecomm in Longford Town and is approximately 2 km southwest of the proposed wind farm. A photo of the mast-structure at this location is shown in the figure below. The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 26.



Figure 28. Mast J

Mast ID	Telecom operators with radio links in direction of proposed wind farm
Mast J	Eir, Vodafone

Table 26. Field Survey Summary – Mast J

AiBridges Total Broadcast Solutions	Procedure: 001	Rev: 4.0
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Mast-Site K (Longford ESB)

Telecommunications Mast-Site K is located within the grounds of ESB Longford and is approximately 2.5 km southwest of the proposed wind farm. A photo of the mast-structure at this location is shown in the figure below. The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 27.



Figure 29. Mast K

Mast ID	Telecom operators with radio links in direction of proposed wind farm
Mast K	Vodafone

Table 27. Field Survey Summary – Mast K

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Mast-Site L (Coolderry)

Telecommunications Mast-Site L is located in townland of Gortnashavoge (in the parish of Coolderry), Co Roscommon and is approximately 53 km southwest of the proposed wind farm. A photo of the mast-structure at this location is shown in the figure below. The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 28.

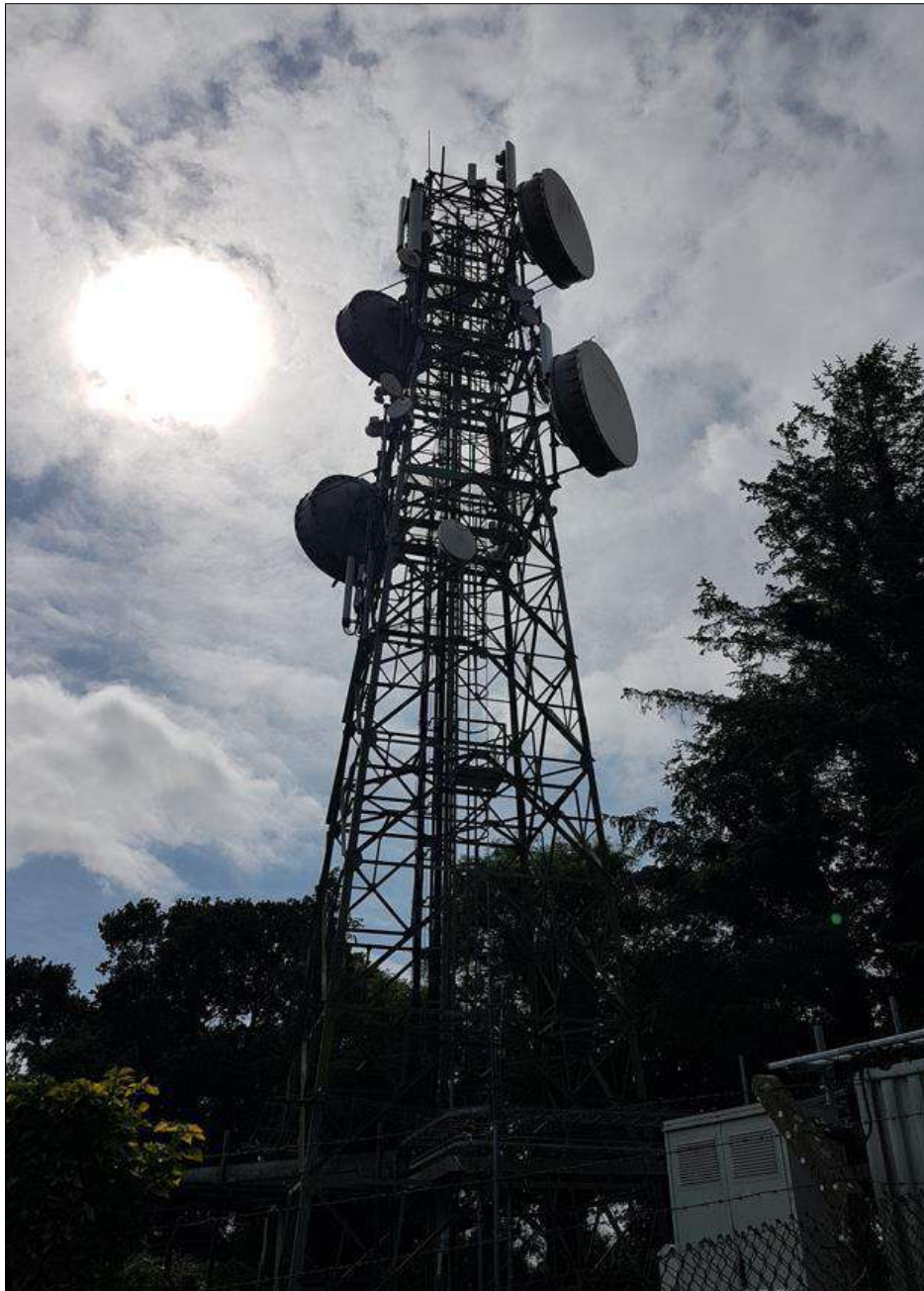


Figure 30. Mast L

Mast ID	Telecom operators with radio links in direction of proposed wind farm
Mast L	2RN

Table 28. Field Survey Summary – Mast L

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Mast-Site M (Maghera)

Telecommunications Mast-Site M is located on Maghera Mountain, Co Clare and is approximately 107 km southwest of the proposed wind farm. A photo of the mast-structure at this location is shown in the figure below. The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 29.



Figure 31. Mast M

Mast ID	Telecom operators with radio links in direction of proposed wind farm
Mast M	2RN

Table 29. Field Survey Summary – Mast M

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APPENDIX 7.2

CLOONANNY WIND FARM

AVIATION REVIEW STATEMENT

VOLUME III

APPENDICES TO

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DECEMBER 2024

 Total Communications Solutions	Procedure: 001	Rev: 3.0
Cloonanny Wind Farm – Aviation Review Statement	Approved: KH	Date: 01/11/2024

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Report

Cloonanny Wind Farm Aviation Review Statement

Document Number: 002/CY/1024

Author: PT\DMG

Approved for Release: Rev 3.0 KH **Date:** 01/11/2024

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Executive Summary

Ai Bridges Ltd have been commissioned to review the possible impacts of the proposed wind farm on aviation systems in the vicinity of the proposed wind farm development at Cloonanny.

As part of the review, the following subjects were considered:

- Annex 14 - Obstacle Limitation Surfaces (OLS)
- Annex 15 – Aerodrome Surfaces
- Building Restricted Areas (BRA)
- Minimum Sector Altitudes (MSA)
- Instrument Flight Procedures
- Permitted Wind Farms in vicinity of Proposed Wind Farm
- Communications, Navigation and Radar Surveillance Systems Safeguarding
- Flight Inspection and Calibration
- Aeronautical Obstacle Warning Light Scheme
- Irish Air Corps / Department of Defence Safeguarding
- Garda Air Support Unit (GASU) and Emergency Aeromedical Service (EAS)

Annex 14 - Obstacles Limitation Surfaces (OLS)

A review shows that the proposed wind farm would be located outside the Outer Horizontal Surface of the Ireland West Runway Obstacle Limitation Surfaces (OLS), as defined in ICAO (International Civil Aviation Organization) Annex 14.

As the proposed wind farm is situated outside the Outer Horizontal Surface and there is no penetration of the take-off or approach surfaces, it is unlikely that there will be any impacts to the OLS surfaces for Ireland West Airport.

Annex 15 - Aerodrome Surfaces

Following a review of “Terrain and Obstacle Requirements” as defined in ICAO Annex 15, turbines at the proposed development would need to be registered if they are more than 100 meters above terrain. The distance from the centre point (ARP – Airport Reference Point) of Ireland West Airport to the boundary of Area 1 of the Annex 15 Aerodrome Surface is 45km. This area encloses the TMA area i.e. Total Maneuvering Area and this is used for circling and maneuvering by aircraft. Should the proposed wind farm be permitted, the turbines would be outside 45km of Ireland West Airport’s ARP and would not cause an impact on the Annex 15 Aerodrome Surface. However, the proposed turbines would be required to be included in the IAA Electronic Air Navigation Obstacle Dataset.

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Building Restricted Areas (BRA)

A Building Restricted Area is the airspace surrounding an aviation facility that needs to be clear from physical intrusions. The purpose of the safeguarded areas is to identify developments with the potential for causing unacceptable interference to navigation facilities. A review shows that the proposed wind farm is over 60 km from the Ireland West BRA. At this distance there will be no impacts to the BRA due to wind turbines at Cloonanny.

Minimum Sector Altitudes (MSA)

The Minimum Sector Altitudes (MSA) is the lowest altitude which may be used that will provide a minimum obstacle clearance of 1000ft above all obstacles within a sector of 25 nautical miles (46km) from the VOR/DME at Ireland West Airport. As the proposed wind farm is located outside the MSA Sectors for Ireland West Airport, there should be no impact on the published MSA altitudes.

Instrument Flight Procedures

There are 16 published Instrument Flight Procedures for flights to/from Ireland West Airport. Due to the distance of the proposed wind farm from the airport, and as there are existing obstacles nearer to the airport than the proposed development, there should be no impacts to these flight procedures.

Communications and Navigation Systems

As the proposed wind farm is approximately 70 km from the Localizer and transmitting antennas at Ireland West Airport, it is very unlikely that wind turbines at the proposed development will have any impact on these ATS communications and radio navigational aids.

Radar Surveillance Sensors

For Radar Surveillance Systems, EUROCONTROL Guidelines require a 16 km safe distance from the surveillance radar system (SSR), for a “Zone 4 - No Assessment” condition. It has been highlighted in the analysis that turbines located at the proposed farm would be located at a minimum distance of 100 km from the radar stations at Dooncarton, Shannon, Woodcock Hill and Dublin Airport and in Assessment Zone 4 of the EUROCONTROL Guidelines. As turbines at the proposed development would be located in Assessment Zone 4, a detailed impact assessment on Radar Surveillance Systems will not be required by the IAA.

Flight Inspection and Calibration

Flight checks are conducted annually to ensure that flight procedures and associated navigational aids are safe and accurate. These flight checks are carried out by an IAA approved

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Flight Inspection Service Provider. The checks are carried out during annual inspections consisting of radial and orbital test flights around Ireland West Airport for calibration of instrument landing systems. It is unlikely that the Flight Inspection Procedures will be impacted as the proposed wind farm is sufficiently far from the airport runways and the flight inspection procedures should already account for the existing obstacles (e.g. terrain and existing wind farms).

Aeronautical Obstacle Warning Light Scheme

In the event of a grant of planning consent the IAA are likely to request lighting of the proposed wind turbines in the interest of aviation safe-guarding as the proposed development would be considered as an en-route obstacle.

Irish Air Corps / Department of Defence (DoD) Safeguarding

The Irish Air Corps position on wind farms / tall structures are outlined in the paper which was published in 2014: “Air Corps Wind Farm/ Tall Structures Position Paper”. In the position paper the Irish Air Corps outlines restricted areas where they would object to the installation of wind turbines /tall structures. The areas defined by the Air Corps have been mapped and analysis shows that the proposed wind farm site is located within a critical low-level flying route (i.e. within 3 NM of the N4).

Although the proposed wind farm site at Cloonanny is located within 3 NM of the N4 National Primary Road, it should be noted that low-level flights along the N4 are likely to avoid the proposed development site, as flight plans in this area would be required to take into consideration the proximity of the Telecoms mast site at Cairn Hill. This telecoms mast site would be considered a significant aviation obstacle and would offer shielding to the proposed development at Cloonanny. It should also be noted that in 2023 Longford County Council permitted a wind turbine at Lissanore, with is located within 3NM of the N4 (and c.14 km from Cloonanny).

The proposed turbines at Cloonanny should have no impacts on IAC low-level flights, as flight along the N4 should stay on the southern side of the N4 to avoid Cairn Hill and the permitted turbine at Lissanore (when constructed).

Garda Air Support Unit (GASU) and Emergency Aeromedical Service (EAS)

The standard concerns that are being raised in recent consultations with the Irish Air Corps also highlight the potential for obstacles that could impact the operations of the Garda Air Support Unit (GASU) and the Emergency Aeromedical Service (EAS). An assessment of GASU and EAS operations indicates that they are unlikely to be impacted by the proposed wind farm development.

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Abbreviations

AGL	Above Ground Level
AMSL	Above Mean Sea Level
ARP	Airport Reference Point
BRA	Building Restricted Area
DME	Distance Measuring Equipment
DoD	Department of Defence
EAS	Emergency Aeromedical Service
GASU	Garda Air Support Unit
GP	Glide Path
HLS	Helicopter Landing Site
IAC	Irish Air Corps
ICAO	International Civil Aviation Organization
IFP	Instrument Flight Procedure
ILS	Instrument Landing System
OLS	Obstacle Limitation Surface
PSR	Primary Surveillance Radar
RWY	Runway
SID	Standard Instrument Departure Route
STAR	Standard Arrival Route
SSR	Secondary Surveillance Radar
NATS	National Air Traffic Services (UK)
NM	Nautical Miles
VOR	VHF Omni-directional Range Station

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1. Introduction

This section provides a brief summary of the proposed wind farm development at Cloonanny and of the nearest significant aviation installation at Ireland West Airport.

1.1 Wind Farm Site Information

The proposed wind farm development is located in County Longford approximately 70 km southeast of Ireland West Airport. Figure 1 shows the proposed wind farm site with respect to Ireland West Airport and the IAA radar stations at Dooncarton, Shannon, Woodcock Hill and Dublin Airport.



Figure 1. Location of proposed wind farm at Cloonanny

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1.2 Ireland West Airport

Table 1. below shows the co-ordinates of Ireland West Airport and the distance from the Airport reference Point (ARP) to the proposed wind farm site. Ireland West Airport operates in Class C controlled airspace with Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) Flight rules.

Location	Installation	Description	Airport Ref. Point ARP	ARP Distance to Proposed Wind Farm
Ireland West Airport, Charlestown, Co Mayo	International Airport	Single Asphalt Runway Airspace: Class C	53 54 37 N 08 49 06 W (Mid-point of Runway 08/26).	70.2 km

Table 1. Ireland West Airport Details

The aeronautical navigation aids at the aerodrome include DVOR/DME, NDB, ILS LOC and ILS GP.



Figure 2. Ireland West International Airport

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2. Aviation Review

In this section a review of the following a review of the following Aviation topics is provided.

- Annex 14 - Obstacle Limitation Surfaces (OLS)
- Annex 15 – Aerodrome Surfaces
- Building Restricted Areas (BRA)
- Minimum Sector Altitudes (MSA)
- Instrument Flight Procedures
- Permitted Wind Farms in vicinity of proposed Wind Farm
- Communications, Navigation and Radar Surveillance Systems Safeguarding
- Flight Inspection and Calibration
- Aeronautical Obstacle Warning Light Scheme
- Irish Air Corps / DoD Safeguarding
- Garda Air Support Unit (GASU) and Emergency Aeromedical Service (EAS)

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2.1 Annex 14 Obstacle Limitation Surfaces (OLS)

A review of the Annex 14 Obstacles Limitation Surfaces (OLS) was first carried out by first plotting the proposed wind farm location and the airport obstacle surfaces. The obstacle limitation surfaces for Ireland West Airport are plotted based on the following:

- Annex 14 to the Convention on International Civil Aviation Aerodromes Volume I - Aerodrome Design and Operations Seventh Edition July 2016”
- Certification Specifications and Guidance Material for Aerodromes Design CS-ADR-DSN Issue 4, 8th of December 2017

Figure 3 below shows the OLS in relation to the proposed Cloonanny wind farm. The distance from the ARP at Ireland West Airport (i.e the runway centre-point), to the nearest point of the proposed wind farm is 70 km. The analysis of the OLS plots indicates that turbines at the proposed wind farm would not penetrate the Outer Horizontal Surface which extends to 15km from the Airport Reference Point (ARP) or runway centre-point.

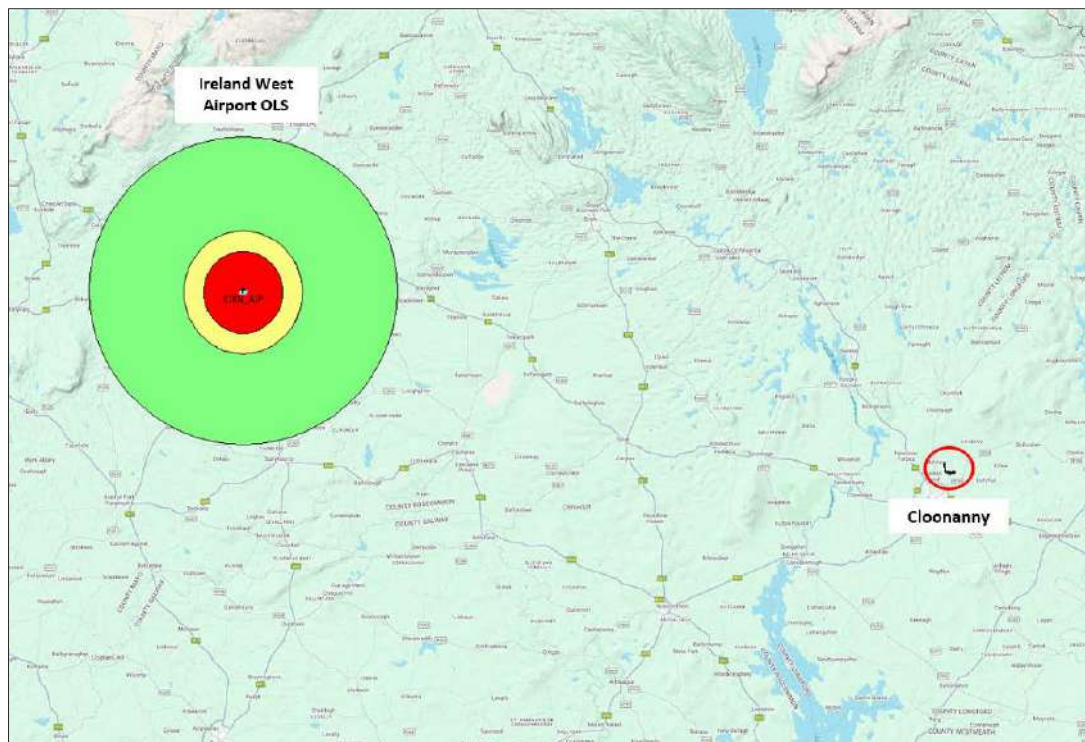


Figure 3. Cloonanny Wind Farm in relation to Ireland West Airport OLS.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Annex 14 Obstacle Limitation Surfaces	No action.	None

Table 2. Aviation Impact Review - Annex 14 Obstacle Limitation Surfaces

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2.2 Annex 15 Aerodrome Surfaces

Turbines at the proposed wind farm would not penetrate the ICAO Annex 15 Aerodrome Surface as shown in Figure 4. The “Terrain and Obstacle Requirements Area” is defined in ICAO Annex 15 as an area of up to 45km from the Aerodrome ARP. (An illustration of ICAO Annex 15 Area 1 and Area 2 Surface is provided in Appendix A).

As the nearest turbine at the proposed wind farm would be more than 45km from the ARP at Ireland West Airport, there will be no penetration of the Annex 15 surface for the Ireland West Aerodrome. All obstacles, if they are more than 100 meters above terrain for a distance of up to 45km from the ARP, need to be registered in the IAA Air Navigation Obstacle Data Set. This area is known as the TMA area i.e. Terminal Maneuvering Area and is shown in Figure 4.



Figure 4. Annex 15 Aerodrome Surface and IAA Electronic Air Navigation Obstacle Data Set

It should also be noted that there are other existing tall structures (obstacles) nearer to the airport, e.g. the operational wind farms at Sliabh Bawn, Largan Hill, Roosky, Ballykinava, Cloontoa, Magheramore, Cuillilea, and Lenanavea.

These existing obstacles would shield any potential impacts from the proposed wind farm at Cloonanny. The IAA Electronic Air Navigation Obstacle Data Set permitted obstacles are shown relative to the proposed wind farm in Figure 5.

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Figure 5. Permitted Obstacles in vicinity of Cloonanny Wind Farm

Although there are other obstacles closer to the airport than the proposed wind farm, all new obstacles must be considered and assessed to see if they cause a “hazard to air navigation” and all Terrain Obstacle Data (including man-made obstacles) have to be considered by the relevant Aviation Authorities.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Annex 15 Aerodrome Surfaces	The proposed wind turbines would be required to be included in the IAA Obstacle Data Set.	None

Table 3. Aviation Impact Review - Annex 15 Aerodrome Surfaces

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2.3 Building Restricted Areas (BRA)

A Building Restricted Area is the airspace surrounding an aviation facility that needs to be clear from physical intrusions. The purpose of the safeguarded areas is to identify developments with the potential for causing unacceptable interference to navigation facilities.

The navigation facilities to be considered at Ireland West Airport are the ILS Localisers, Glidepaths and DMEs that provide guidance for aircraft landing on runways 08 and 26. The minimum safeguarded areas for these facilities are defined by the International Civil Aviation Organisation (ICAO) in the document ICAO EUR DOC 015, Section 7. The BRA parameters as specified by the ICAO are provided in Appendix B of this report.

Figure 6 below illustrates that the proposed wind farm at Cloonanny is over 60 km from the Ireland West BRA (safeguarded area for Runway 26). At this distance turbines at the proposed wind farm will have no impact on the navigation facilities associated with the Building Restricted Area for Ireland West Airport.



Figure 6. Proposed Wind Farm relative to Ireland West Airport BRA (RWY 26)

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Building Restricted Areas	No action.	None

Table 4. Aviation Impact Review - Building Restricted Areas

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2.4 Minimum Sector Altitudes

A review of the Minimum Sector Altitudes (MSA) shows that turbines at the proposed wind farm would not be inside 25 nautical miles of the VOR/DME at Ireland West Airport. The MSA provides a minimum obstacle clearance of 1000 ft above the highest obstacle within specified sectors.

The proposed wind farm is located outside the MSA Sectors for Ireland West Airport as shown in Figure 7. Therefore, there will be no impact on the published MSA altitude figures.

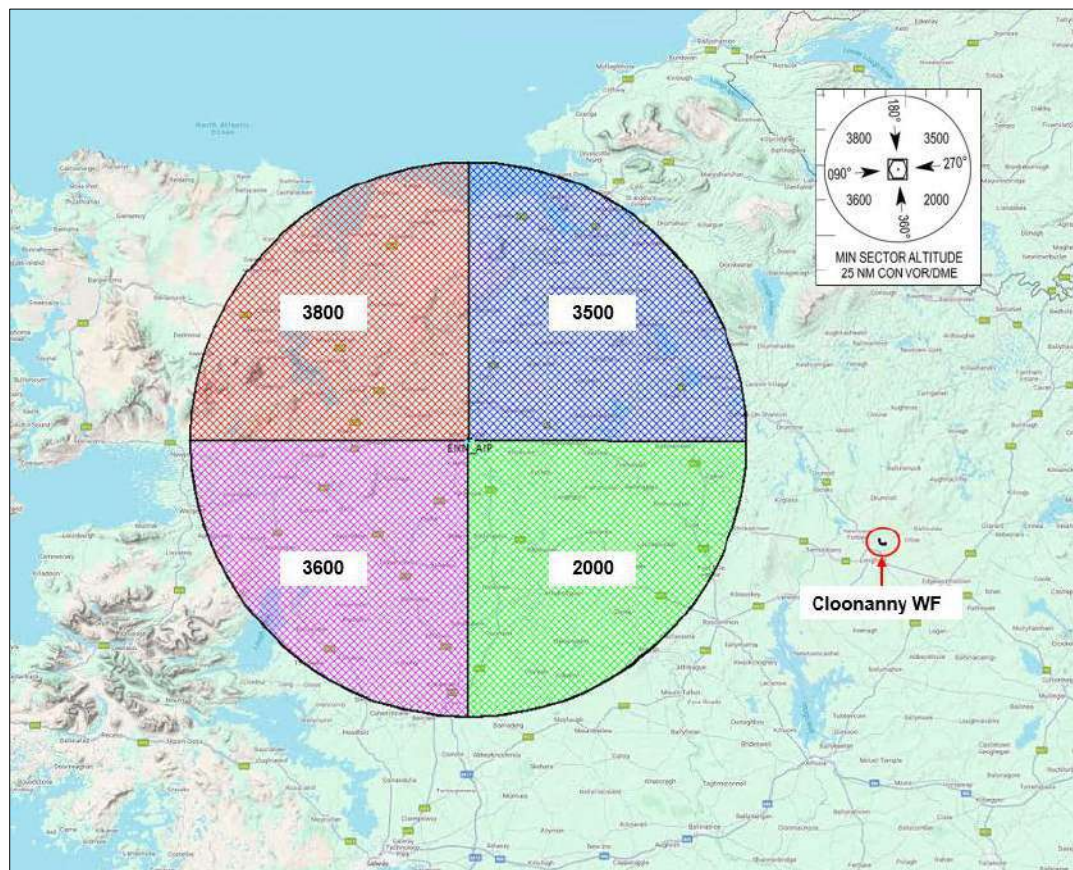


Figure 7. Ireland West Airport (EIKN) Minimum Sector Altitudes

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Minimum Sector Altitudes	No action	None

Table 5. Aviation Impact Review - Minimum Sector Altitudes

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2.5 Instrument Flight Procedures

There are 16 published Instrument and Visual Flight Procedures for arrivals to and departures from Ireland West Airport. Due to the distance of the proposed wind farm from the Airport (and as there are existing obstacles (e.g. telecom masts and existing wind farms)) it is unlikely that there will be any impacts on the Instrument Flight Procedures for flights to/from Ireland West Airport. Table 6 below lists the Instrument Flight Procedures for Ireland West Airport.

Aerodrome	Aerodrome Procedure	Chart ID	Impacts
Ireland West	Precision Approach Terrain Chart RWY 26– ICAO	EIKN AD 2.24-3	No Impacts.
Ireland West	RNAV Standard Departure Chart Instrument (SID) RWY 26 - ICAO	EIKN AD 2.24-4.1	No Impacts.
Ireland West	RNAV Standard Departure Instrument (SID) Chart RWY 08 - ICAO	EIKN AD 2.24-5.1	No Impacts.
Ireland West	RNAV Standard Arrival Chart Instrument (STAR) RWY 26 - ICAO	EIKN AD 2.24-6.1	No Impacts.
Ireland West	RNAV Standard Arrival Chart Instrument (STAR) RWY 08- ICAO	EIKN AD 2.24-7.1	No Impacts.
Ireland West	Instrument Approach Chart RNP RWY 26 (ACFT CAT A, B, C, D) - ICAO	EIKN AD 2.24-8	No Impacts.
Ireland West	Instrument Approach Chart ILS A CAT 1and CAT 11 or LOC RWY 26 (ACFT CAT A, B, C, D) – ICAO	EIKN AD 2.24-9.1	No Impacts.
Ireland West	Instrument Approach Chart ILS B CAT 1 and 11 RWY 26 (ACFT CAT A, B, C, D) – ICAO	EIKN AD 2.24-10.1	No Impacts.
Ireland West	Instrument Approach Chart VOR RWY 26 (ACFT CAT A, B, C, D) - ICAO	EIKN AD 2.24-11.1	No Impacts.
Ireland West	Instrument Approach Chart NDB RWY 26 (ACFT CAT A, B, C, D) - ICAO	EIKN AD 2.24-12.1	No Impacts.
Ireland West	Instrument Approach Chart NDB RWY 26 (ACFT CAT A, B, C, D) - ICAO	EIKN AD 2.24-13.1	No Impacts.
Ireland West	Instrument Approach Chart RNP RWY 08 (ACFT CAT A, B, C, D) - ICAO	EIKN AD 2.24-14	No Impacts.
Ireland West	Instrument Approach Chart VOR RWY 08 (ACFT CAT A, B, C, D) - ICAO	EIKN AD 2.24-15.1	No Impacts.
Ireland West	Instrument Approach Chart NDB RWY 08 (ACFT CAT A, B, C, D) - ICAO	EIKN AD 2.24-16.1	No Impacts.
Ireland West	Instrument Approach Chart NDB RWY 08 (ACFT CAT A, B, C, D) - ICAO	EIKN AD 2.24-17.1	No Impacts.
Ireland West	Visual Approach Chart – ICAO	EIKN AD 2.24-19	No Impacts.

Table 6. Instrument and Visual Flight Procedures – Ireland West Airport

A detailed instrument flight procedure analysis is outside of the scope of this report; however, from the desktop assessment conducted it is envisaged that adjustments to the MSA figures will not be required by the Air Navigation Service Provider (ANSP) and it is unlikely that they will require a detailed assessment on the possible impact of the proposed wind farm on flight procedures.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Instrument Flight Procedures	No action	None

Table 7. Aviation Impact Review - Instrument Flight Procedures

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2.6 Permitted Wind Farms in vicinity of Proposed Wind Farm

The Planning References for the permitted wind farms in the vicinity of the proposed wind farm are shown below in Table 8. None of these wind farms required a Full Assessment of Instrument Flight Procedures.

Wind Farm	Planning Reference	Description
Lissanore	https://www.eplanning.ie/LongfordCC/AppFileRefDetails/2360010/0	Permitted Wind Farm
Sliabh Bawn	https://www.eplanning.ie/roscommoncc/	Operational Wind Farm
Largan Hill	https://www.eplanning.ie/roscommoncc/	Operational Wind Farm
Roosky	https://www.eplanning.ie/roscommoncc/	Operational Wind Farm
Ballykinava	https://www.eplanning.ie/mayocc/	Operational Wind Farm
Cloontoa,	https://www.eplanning.ie/mayocc/	Operational Wind Farm
Magheramore	https://www.eplanning.ie/mayocc/	Operational Wind Farm
Lenanavea	https://www.eplanning.ie/mayocc/	Operational Wind Farm

Table 8. Permitted Wind Farms in vicinity of Proposed Wind Farm

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2.7 Communication and Navigation Systems

The AIP document EIKN AD 2-18/19 provides the information for communication and navigation facilities for Ireland West Airport. The table below shows the channel frequencies for the ATS communications Facilities and the Radio Navigation and Landing Aids for the airport.

Aerodrome	ATS communications Facilities Channel Frequency	Radio Navigation and Landing Aids Channel Frequency	Approximate Distance to Localizer and Transmitting antennas	Impacts of wind farm
Ireland West	118MHz –131MHz	110KHz – 330MHz	70 km	No impacts

Table 9. Impacts on Communications and Navigation Systems

As the proposed wind farm is approximately 70 km from the Localizers and transmitting antennas, it is very unlikely that turbines at the proposed wind farm will have any impact on these ATS communications and radio navigational aids. Typically, interference to VHF communications systems will only occur when obstacles are in close proximity to the VHF transmitter e.g. less than 500m

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Communication and Navigation Systems	No action	None

Table 10. Aviation Impact Review - Communication and Navigation Systems

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2.8 Radar Surveillance Sensors

The tables below show the Irish Aviation Authority Assessment Zone arrangement for the two types of aviation radar surveillance systems; Primary Surveillance Radar (PSR) and Secondary Surveillance Radar (SSR).

Zone	Description	Assessment Requirements
Zone 1	0 - 500m	Safeguarding
Zone 2	500m - 15km and in radar line of sight	Detailed Assessment
Zone 3	Further than 15km and in radar line of sight	Simple Assessment
Zone 4	Not in radar line of sight	No Assessment

Table 11. PSR Zone Arrangements

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

Table 12. SSR Zone Arrangements

The EUROCONTROL Guidelines require a 16 km safe distance for a “Zone 4 - No Assessment” condition and detailed assessments are required for any proposed wind within 16km of a secondary surveillance radar.

It should be noted that in the UK, NATS (Air Traffic Control) safeguards SSR to a distance of 10km. The guidelines used by NATS (*CAP 764: Chapter 2: Impact of wind turbines on aviation*) state that:

“Wind turbine effects on SSR are traditionally less than those on PSRs but can be caused due to the physical blanking and diffracting effects of the turbine towers, depending on the size of the turbines and the wind farm. These effects are typically only a consideration when the turbines are located very close to the SSR i.e. less than 10 km.”

To determine which Assessment Zones are applicable to the proposed wind farm a desktop assessment was carried out. The nearest radar surveillance sites to the proposed wind farm development are at Dooncarton, Shannon, Woodcock Hill and Dublin Airport. These radar sites are shown relative to the proposed wind farm in Figure 8 below.

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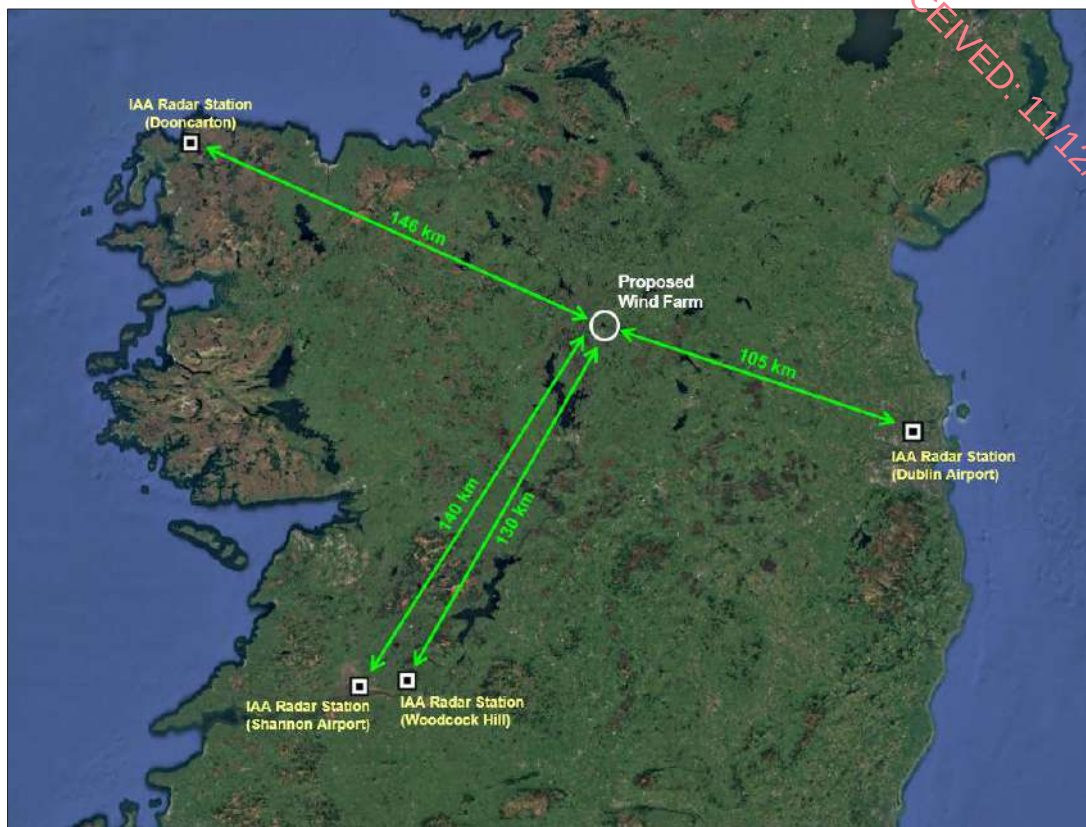


Figure 8. Radar Surveillance Sites relative to Cloonanny Wind Farm.

A review of each radar station is provided in Sections 2.8.1 to 2.8.4 that follow. The findings of the review indicate that the proposed wind farm is sufficiently far from the radar stations that there would be no impacts, and a detailed radar assessment would not be required by the IAA.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Radar Surveillance Sensors	No action	None

Table 13. Aviation Impact Review - Radar Surveillance Sensors

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2.8.1 Dooncarton Radar Assessment

The radar surveillance site at Dooncarton consists of a SSR system located in the six-story circular reinforced concrete communications tower shown in Figure 9. The SSR antennas are housed in the dome-shaped structure at the top of the tower.



Figure 9. Dooncarton Radar Station

Table 14 below shows the (EuroControl & NATS) assessment zone applicable to the nearest point where a turbine could potentially be located. The applicable assessment zone has been based on distance from the Radar Station and whether a radar line-of-sight condition exists.

Wind Farm ID	Distance to PSR/SSR Radar Station	Radar LOS Assessment (EuroControl Guidelines)	Radar LOS Assessment (NATS Guidelines – UK)
Cloonanny	146 km	Detailed Assessment Not Required	Detailed Assessment Not Required

Table 14. EuroControl / UK Safeguarding Guidelines – Dooncarton Radar Station

As the table above shows, the proposed wind farm is within Assessment Zone 4 as specified by the EUROCONTROL guidelines, which would indicate that a detailed technical assessment would not be required for the impact on the SSR radar station at Dooncarton.

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2.8.2 Shannon Airport Radar Assessment

The radar surveillance site at Shannon Airport consists of a PSR and an SSR. The PSR and the SSR antennas are co-located on the same structure at Shannon Airport (Figure 10).



Figure 10. Shannon Airport Radar Station

Table 15 below shows the (EuroControl & NATS) assessment zone applicable to the nearest point where a turbine could potentially be located. The applicable assessment zone has been based on distance from the Radar Station and whether a radar line-of-sight condition exists.

Wind Farm ID	Distance to PSR/SSR Radar Station	Radar LOS Assessment (EuroControl Guidelines)	Radar LOS Assessment (NATS Guidelines – UK)
Cloonanny	105 km	Detailed Assessment Not Required	Detailed Assessment Not Required

Table 15. EuroControl / UK Safeguarding Guidelines – Shannon Airport Radar Station

As the table above shows, the proposed wind farm is within Assessment Zone 4 as specified by the EUROCONTROL guidelines, which would indicate that a detailed technical assessment would not be required for the impact on the PSR/SSR radar station at Shannon Airport.

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2.8.3 Woodcock Hill Radar Assessment

The radar surveillance site at Woodcock Hill consists of a SSR system housed in the dome-shaped structure shown in Figure 11.



Figure 11. Woodcock Hill Radar Station

Table 16 below shows the (EuroControl & NATS) assessment zone applicable to the nearest point where a turbine could potentially be located. The applicable assessment zone has been based on distance from the Radar Station and whether a radar line-of-sight condition exists.

Wind Farm ID	Distance to PSR/SSR Radar Station	Radar LOS Assessment (EuroControl Guidelines)	Radar LOS Assessment (NATS Guidelines – UK)
Cloonanny	130 km	Detailed Assessment Not Required	Detailed Assessment Not Required

Table 16. EuroControl / UK Safeguarding Guidelines – Woodcock Hill Radar Station

As the table above shows, the proposed wind farm is within Assessment Zone 4 as specified by the EUROCONTROL guidelines, which would indicate that a detailed technical assessment would not be required for the impact on the SSR radar station at Woodcock Hill.

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2.8.4 Dublin Airport Radar Assessment

The radar surveillance site at Dublin Airport consists of two PSR/SSR (MSSR) radar stations as shown below in Figure 12 and Figure 13.



Figure 12. Dublin Airport MSSR Radar Station #1



Figure 13. Dublin Airport MSSR Radar Station #2

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Table 17 below shows the (EuroControl & NATS) assessment zone applicable to the nearest point where a turbine could potentially be located. The applicable assessment zone has been based on distance from the Radar Station and whether a radar line-of-sight condition exists.

Wind Farm ID	Distance to PSR/SSR Radar Station	Radar LOS Assessment (EuroControl Guidelines)	Radar LOS Assessment (NATS Guidelines – UK)
Cloonanny	140 km	Detailed Assessment Not Required	Detailed Assessment Not Required

Table 17. EuroControl / UK Safeguarding Guidelines – Dublin Airport Radar (Station #1 and #2)

As the table above shows, the proposed wind farm is within Assessment Zone 4 as specified by the EUROCONTROL guidelines, which would indicate that a detailed technical assessment would not be required for the impact on the PSR/SSR at Dublin Airport.

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2.9 Flight Inspection and Calibration

Flight checks are conducted annually to ensure that flight procedures and associated navigational aids are safe and accurate. These flight checks are carried out by an IAA approved Flight Inspection Service Provider. The checks are carried out during annual inspections consisting of radial and orbital test flights around Ireland West Airport for calibration of instrument landing systems.

It is unlikely that the Flight Inspection Procedures will be impacted as the proposed wind farm is sufficiently far from the airport runways and the flight inspection procedures should already account for the existing obstacles (e.g. terrain and existing wind farms).

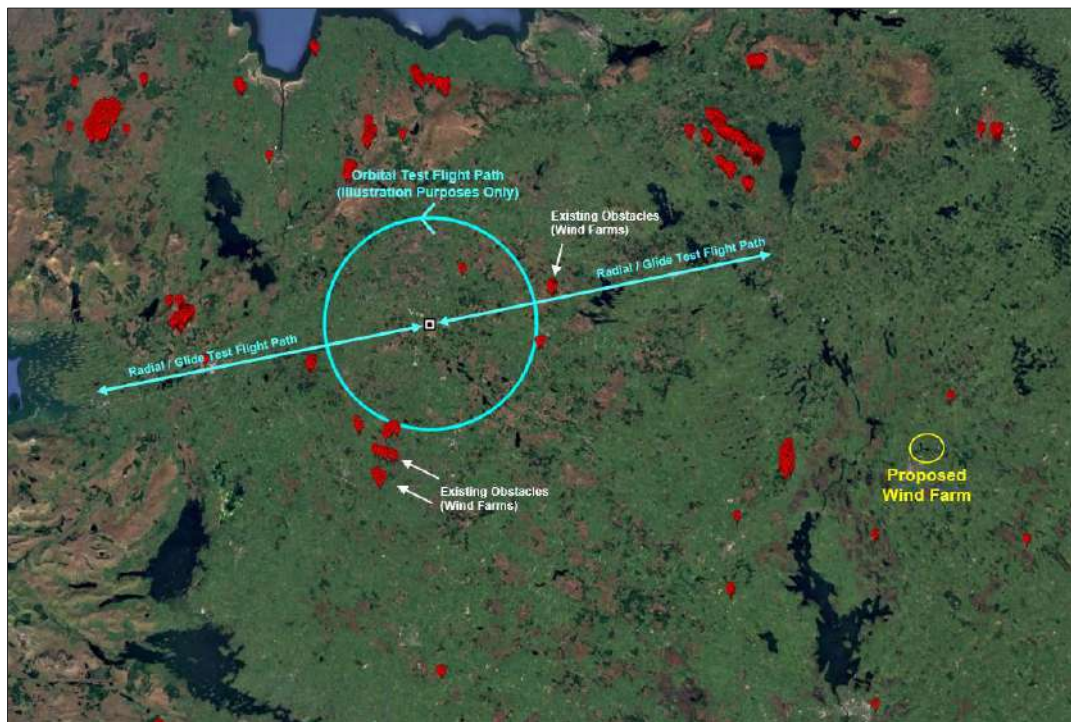


Figure 14. Flight Inspection and Calibration Test Procedures should account for existing obstacles (e.g. terrain and existing wind farms)

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Flight Inspection and Calibration	No action	None

Table 18. Aviation Impact Review - Flight Inspection and Calibration

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2.10 Aeronautical Obstacle Warning Light Scheme

In the event of a grant of planning consent the IAA-ANSP would require the lighting of the proposed wind turbines in the interest of aviation safe-guarding as the proposed development may be considered as an en-route obstacle. The developers of the proposed turbines would intend to implement an aeronautical obstacle warning light.

It is recommended that lighting requirements should be in accordance with Chapter Q – Visual Aids for denoting Obstacles; CS ADR.DSN.Q.851 and GM.ADR.DSN.Q.851 (Pages 729/730) of the EASA Easy Access Rules for Aerodromes (Reg (EU) No. 139/2014) where it states that

“Applicability: When considered as an obstacle a wind turbine should be marked and/or lighted.”

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Aeronautical Obstacle Warning Light Scheme	It is likely that the IAA would request that the wind farm, if permitted, would be fitted with Aeronautical Obstacle Warning Lights in accordance with industry standards. Subject to further consultation with the IAA.	None

Table 19. Aviation Impact Review - Aeronautical Obstacle Warning Light Scheme

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2.11 Irish Air Corps / DoD Safeguarding

The Irish Air Corps (IAC) Position Paper “Air Corps Wind Farm/ Tall Structures Position Paper” published on 08th August 2014, states that the Air Corps are likely to oppose to the erection of wind farms / tall structures within 3 NM of their low-level flying routes (See Figure 15).

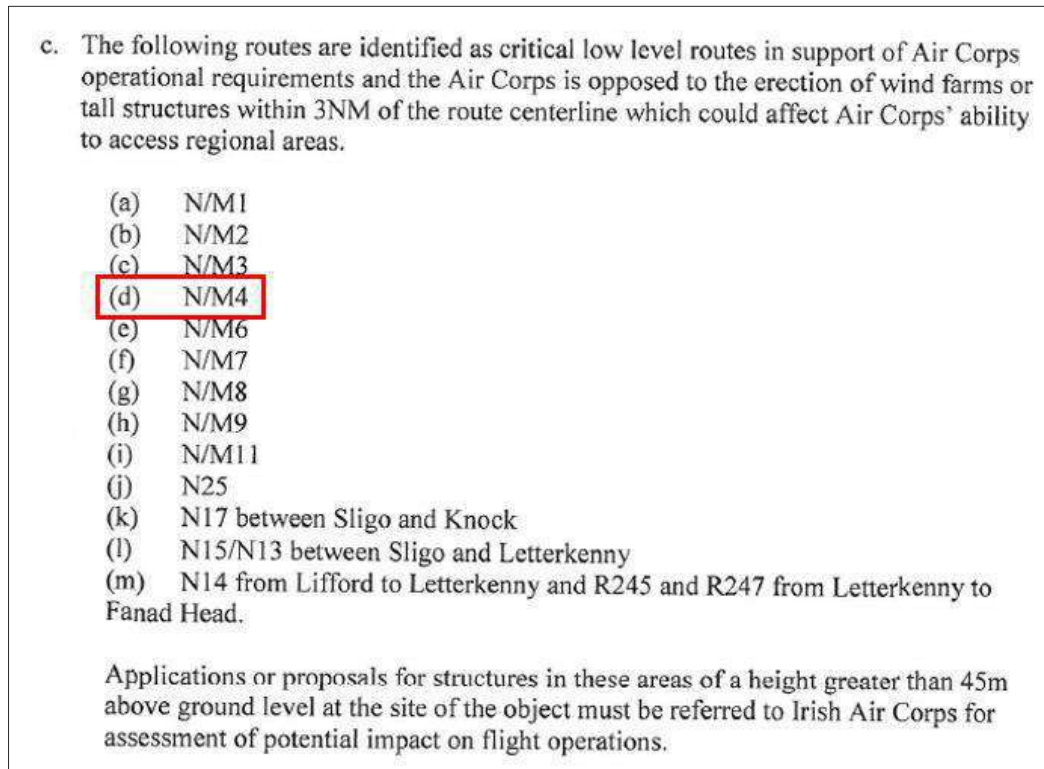


Figure 15. Irish Air Corps - Critical Low-Level Route (N4)

The nearest of the Air Corps restricted areas to the proposed wind farm is the low-level flight route around the N4. The proposed development is located within the restricted area (3NM) around the N4, as shown in Figure 16 below. As the wind farm would be in a restricted area, the Irish Air Corps may raise concerns in relation to the proposed development.

Although the proposed wind farm at Cloonanny is situated in an IAC restricted area (i.e. within 3 NM of the N4, it should be noted that there are many precedents of wind farms that are located within IAC restricted areas.

Some examples of operational wind farms that are located in IAC restricted areas are provided below in Sections 2.11.1 and 2.11.2.

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2.11.1 Lissanore Wind Farm

In 2023, Longford County Council gave permission for a wind turbine at Lissanore, Co Longford. The turbine at Lissanore is located within 3 NM of the N4 as shown below in Figure 16 and is c.14km from Cloonanny.

Low level flights are unlikely to occur north of the N4 (in the vicinity of Cloonanny), as pilots would be required to avoid the permitted Lissanore turbine. Pilots would also be required to avoid the high terrain and telecoms mast-site at Cairn Hill (which has a published altitude of 1361 ft AMSL).

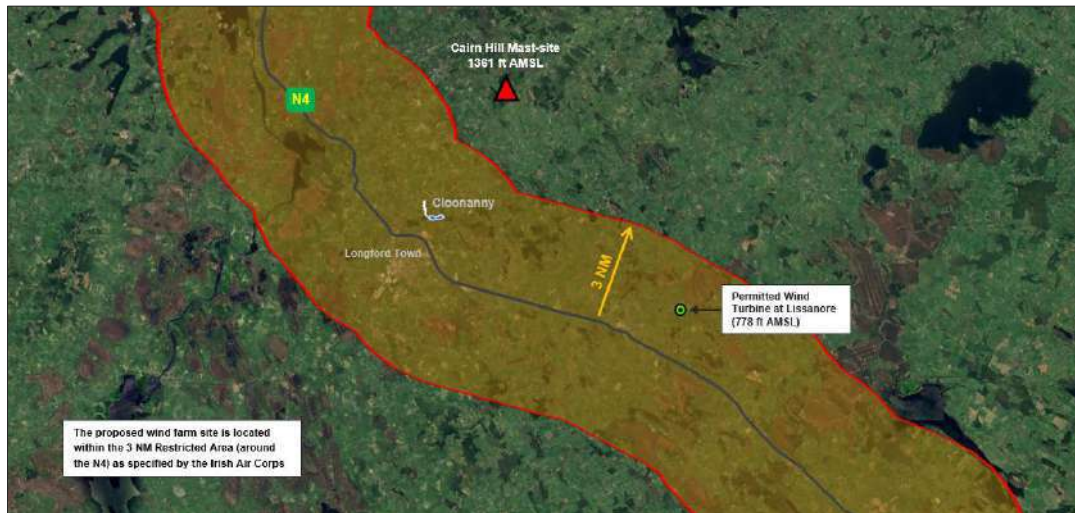


Figure 16. Irish Air Corps - Critical Low-Level Route (N4)

2.11.2 Operational Wind Farms within 3NM of M7/M8

Additional examples of existing wind farms that are located within IAC restricted areas include: Monaincha and Jaroma (within 3 NM of M7), and Lisheen II, Lisdowney and Kill Hill (within 3 NM of M8).

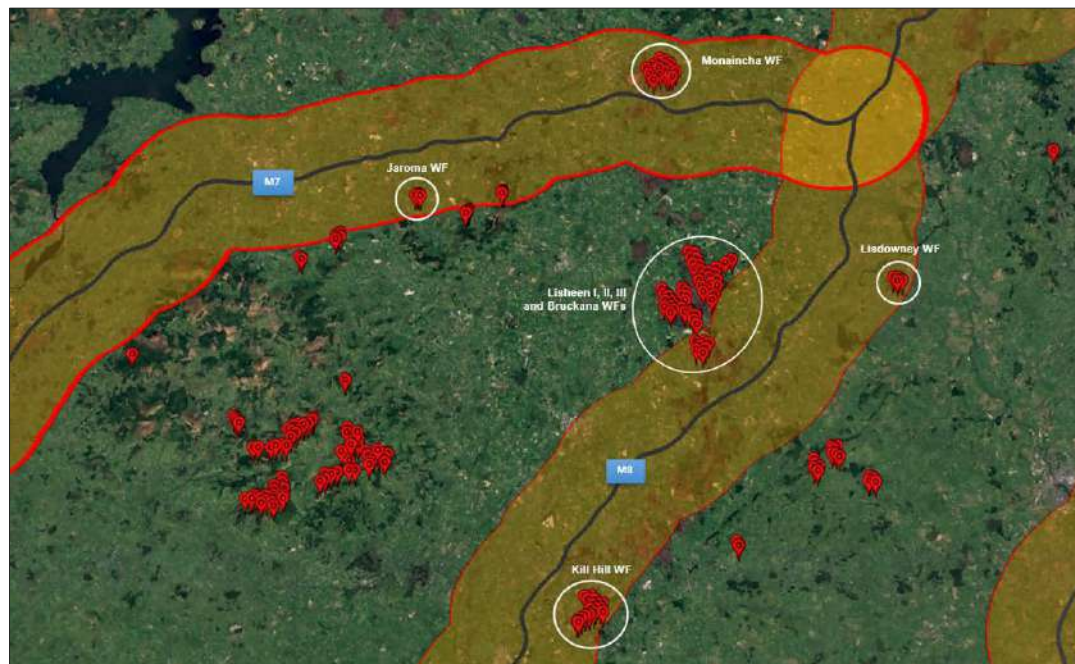


Figure 17. Existing Wind Farms located within 3NM of IAC Low Level Routes

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2.11.3 Desktop Analysis of Navigational Flight Aids:

- The proposed wind farm site is not located in a direct flight path from Baldonnel to any of the regional airports (e.g. Shannon, Ireland West, Kerry, Cork, Sligo, Donegal, Waterford) and IAC low-level flights are unlikely to pass directly over the proposed wind farm site.
- IAC low-level flights along the N4 motorway are unlikely to pass over the proposed wind farm site at Cloonanny, as pilots would be required to avoid the high terrain and Telecoms Mast-site at Cairn Hill (which has a published altitude of 1361 ft AMSL). It should also be noted that when the permitted turbine at Lissanore is constructed, pilots would be required to take a flight route south of the N4.
- Cairn Hill is a prominent regional mast site for the state broadcaster (RTE/2RN) and national cellular mobile radio network and this site would be an existing aviation obstacle that would offer shielding to the proposed development at Cloonanny. All pilot flight plans would have to consider Cairn Hill as an existing and significant aviation obstacle. Pilots would likely keep south of the N4 and should the proposed development be approved, the resulting turbines could serve as a navigational aid as part of VFR rules for flying.
- In good weather conditions, a wind farm at Cloonanny could potentially be used as a visual landmark to aid Visual Flight Rules (VFR) navigation. The addition of wind turbines at Cloonanny could make it easier for pilots to identify their flight position along the N4.
- All modern aircraft are equipped with a range of Global Navigation Satellite Systems (GNSS), e.g. GPS, GLNASS, Galileo, etc. These GNSS systems provide pilots with accurate navigation information including data to avoid obstacles during VFR operations. Should the proposed wind farm be permitted, the turbine location would be submitted to the IAA and aviation charts and GNSS databases would be updated accordingly.
- An aviation obstacle warning light scheme would provide a further marker in addition to the light warning scheme already in existence on the 2RN broadcast transmission tower at Cairn Hill. A pilot could safely maneuver a flight to the south of the N4 without being impacted by a wind farm at the proposed location.
- As previously described, low-level flights along the N4 motorway are unlikely to pass over the proposed wind farm site at Cloonanny. A more likely low-level flight route is illustrated in Figure 18 which would avoid the high terrain and Telecoms Mast-site at Cairn Hill and the permitted turbine at Lissanore.

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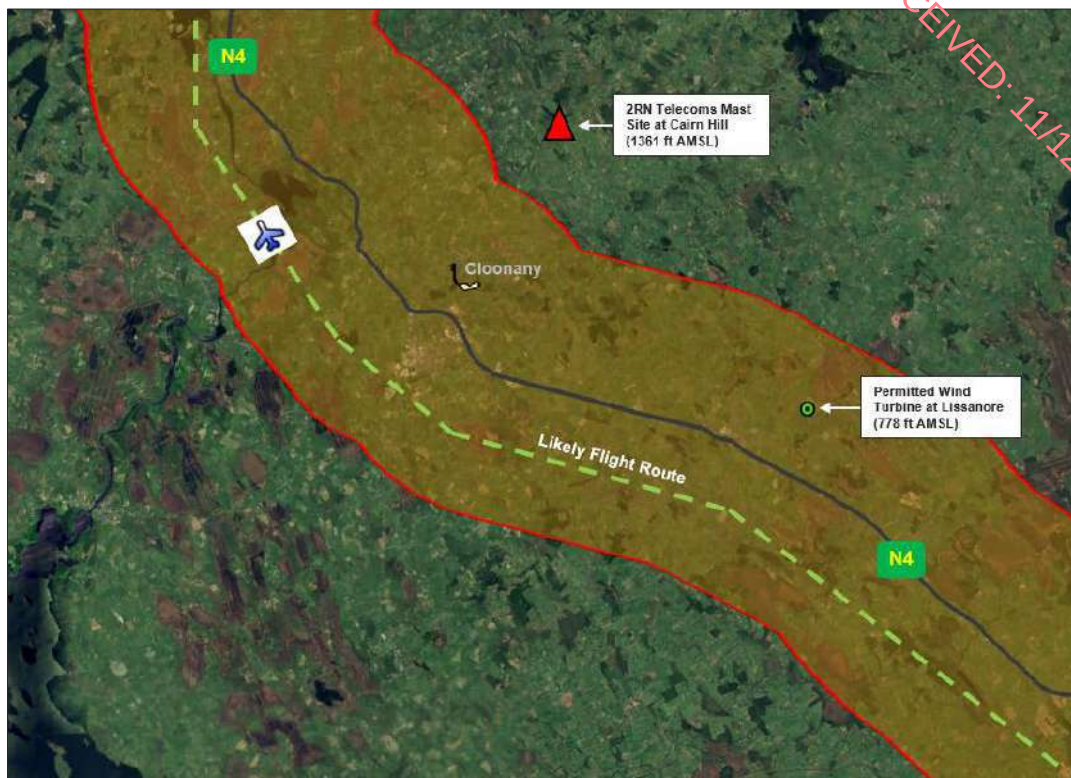


Figure 18. IAC Low-Level flights are likely to avoid flying north of the N4 near Cloonanny (to remain clear of the major aviation obstacle at Cairn Hill)

For the reasons outlined above any impacts on Air Corps operations in the area are expected to be negligible, subject to a further detailed technical assessment.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Irish Air Corps / DoD Safeguarding	Mitigation measures are unlikely to be required, as IAC low-level flights are unlikely to fly over the Cloonanny area given the proximity of the existing aviation obstacle (i.e. the 2RN telecoms mast) at Cairn Hill and the permitted turbine at Lissanore. The 2RN telecoms mast site would be considered a significant aviation obstacle and would offer shielding to the proposed development at Cloonanny.	None

Table 20. Aviation Impact Review - Irish Air Corps / DoD Safeguarding

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2.12 Garda Air Support Unit (GASU) and Emergency Aeromedical Service (EAS)

The standard concerns that are being raised in recent consultations with the Air Corps also highlight the potential for obstacles that could impact the operations of the Garda Air Support Unit (GASU) and the Emergency Aeromedical Service (EAS). The excerpt below is taken from a response received from the IAC in relation to a third-party wind farm project:

“Having consulted with the subject matter experts in the Irish Air Corps, the Department of Defence wishes to make the following observations:

- *The Department of Defence cannot support, based on military advises, the erection of wind farms or other tall structures within 3 NM of roads identified as critical low level routes in support of operational requirements. The erection of obstacles within low-level helicopter routes could affect the Irish Air Corps ability to access regional areas and to fulfil its role.*
- *If this proposed development was to go to the planning stage, the Department of Defence would be obligated to raise the following concerns and advise the planning authorities that the proposed windfarm*
 - a) *lies wholly within 3 nautical miles of the [Motorway/National Road] which is identified as a critical low level route used by state aircraft on operational taskings. A windfarm or any other tall structures within a low-level route will be an obstacle to state aircraft not operating within the civil rules of the air;*
 - b) *The [Motorway/National Road] low level route requires protection from obstacles for low level state aircraft on operational tasking's such as:*
 - (i) *The Garda Air Support Unit (GASU)*
 - (ii) *The Emergency Aeromedical Service (EAS)”*

An assessment of the possible impacts of the proposed wind farm on the Garda Air Support Unit and the Emergency Aeromedical Service operations is provided in Sections 2.12.1 and 2.12.2 that follow.

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2.12.1 The Garda Air Support Unit (GASU)

The Garda Air Support Unit is based at Casement Aerodrome, Baldonnell and is typically deployed to incidents in the following cases:

- Immediate threat to life
- Incidents of a criminal, terrorist or other nationally important nature
- Immediate threat of serious public disorder
- Tasks leading to the prevention or detection of crime
- Evidence gathering
- Intelligence gathering
- Photographic tasks
- Traffic Management/Monitoring

The unit consists of one fixed-wing aircraft (a Pilatus Britten-Norman BN 2T-4S Defender 4000) and two helicopters (Eurocopter EC 135 T2).



Figure 19. GASU - Pilatus Britten-Norman BN 2T-4S Defender 4000



Figure 20. GASU - Eurocopter EC135 T2

As there is no airport in the Cloonanny / Longford region it is unlikely that a fixed-wing aircraft would be used in a low-level flight capacity over the region. In the unlikely event that that a fixed-wing aircraft is flying in the Cloonanny area, it should be noted that all modern aircraft are equipped with a range of Global Navigation Satellite Systems (GNSS), e.g. GPS, GLNASS, Galileo, etc. These GNSS systems provide pilots with accurate navigation information including data to avoid obstacles during VFR operations. Should the proposed wind farm at Cloonanny

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be permitted the turbine locations would be submitted to the IAA and aviation charts and GNSS databases would be updated accordingly.

GASU helicopters would also be fitted with GNSS systems which would clearly identify any potential objects in the operational area (e.g. wind turbines). Also, in good weather conditions, a wind farm at Cloonanny could potentially be used as a visual landmark to aid Visual Flight Rules (VFR) navigation which would actually make it easier for pilots to identify their flight position.

If a helicopter is required to land in the area north of Longford Town, the pilot would seek a Helicopter Landing Site (HLS) that is clear of wires, loose objects and is relatively clear of obstacles. The chosen HLS should have good road access to link up with the local ambulance. A good example of a HLS would be a local football field. It would be highly unlikely that the Cloonanny site location would ever be considered as a HLS due to its terrain and road access. The GAA football field at Pearse Park (as marked in Figure 21) would be a much more suitable HLS for any such emergency landings in Longford Town.



Figure 21. Longford Town – Possible HLS

GASU Aircraft	Impact of proposed wind farm - Opinion
Fixed-wing Airplane (Pilatus Britten-Norman BN 2T-4S Defender 4000)	Low – Fixed-wing aircraft are unlikely to be deployed in low level activity in the subject area. In addition, the aircraft would be equipped with modern communications systems and navigational equipment. Should the wind farm be permitted, the turbines would be fitted with aeronautical lighting and would be clearly marked in aviation charts.
Helicopter (Eurocopter EC135 T2)	Low – The aircraft would be equipped with modern communications systems and navigational equipment. Should the wind farm be permitted, the turbines would be fitted with aeronautical lighting and would be clearly marked in aviation charts. Should an emergency landing be required in the subject area, the GAA pitch at Pearse Park is likely to be used as a HLS.

Table 21. Impact of proposed wind farm on GASU Operations

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2.12.2 The Emergency Aeromedical Service (EAS)

The air ambulance service in Ireland is known as the Emergency Aeromedical Service (EAS). The EAS crew (which include National Ambulance Service (NAS) paramedics) deal with time-critical emergency callouts to major emergencies such as road collisions and urgent medical events. The EAS currently operate two air ambulance helicopters operating from two bases:

- Custume Barracks, Athlone, Co Westmeath.
- Rathcoole Aerodrome, Rathcoole, Mallow, Co Cork.

The two helicopter borne emergency air ambulances consist of an Air Corps operated aircraft based at Custume Barracks in Athlone, and an aircraft located at Rathcoole Aerodrome in North County Cork. The nearest EAS base to the proposed wind farm at Cloonanny is the base in Athlone. The flight times from the EAS base at Athlone are shown in Figure 22.



Figure 22. EAS – Flying Times from Athlone

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The proposed wind farm is located north of Longford Town, therefore it would have no impact on flights from Athlone to Longford Town.

For any call-outs to areas north of Longford (e.g. Co. Cavan), the helicopter pilot would be aware of the existing 2RN mast Cairn Hill and would be required to fly above it (or avoid the area completely). The height of the 2RN mast is 1361 ft AMSL well above the maximum elevation of any of the proposed turbines at Cloonanny.

In addition, should the proposed wind farm at Cloonanny be permitted the turbine locations would be submitted to the IAA and aviation charts and GNSS databases would be updated accordingly. EAS helicopters would also be fitted with GNSS systems which would clearly identify any potential objects in the operational area (e.g. wind turbines). For these reasons, turbines at the proposed wind farm should have no impact on EAS flights from Athlone to areas north of Longford Town.

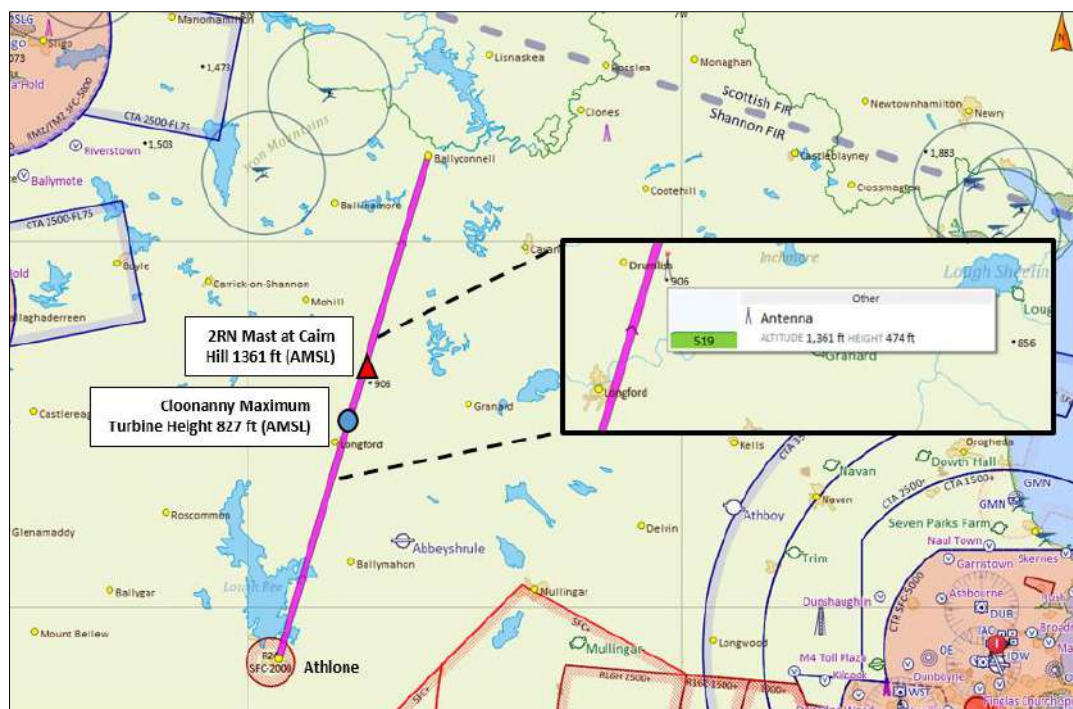


Figure 23. Sample Flight route over Cloonanny from EAS base (Athlone) towards Co Cavan

EAS Aircraft	Impact of proposed wind farm – Opinion
Helicopter (Eurocopter EC135)	Low – The aircraft would be equipped with modern communications systems and navigational equipment. Should the wind farm be permitted, the turbines would be fitted with aeronautical lighting and would be clearly marked in aviation charts. EAS flights from Athlone to areas north of Longford (e.g. Co Cavan) would be required to fly above the 2RN mast at Cairn Hill which considerably higher than any of the turbines for the proposed wind farm Should an emergency landing be required in the subject area, the GAA pitch at Pearse Park is likely to be used as a HLS.

Table 22. Impact of proposed wind farm on EAS Operations

 AiBridges Total Communications Solutions	Procedure: 001	Rev: 3.0
Cloonanny Wind Farm – Aviation Review Statement	Approved: KH	Date: 01/11/2024

3. Summary

A summary of the aviation review for the proposed wind farm at Cloonanny is provided in Table 23 below.

Item	Impact	Summary
Annex 14 - Obstacle Limitation Surfaces (OLS)	None	The proposed turbines are located outside the OLS Surfaces for Ireland West Airport.
Annex 15 - Aerodrome Surfaces	Observ.	Turbines at the proposed wind farm would not penetrate the ICAO Annex 15 Aerodrome Surface for Ireland West Airport. All obstacles, if more than 100 meters above terrain for a distance of 45km from center point of Ireland West Airport, need to be registered in the IAA Air Navigation Obstacle Data Set. The IAA may request that the turbines be included in the IAA Aeronautical Electronic Obstacle Data Sets. It should be noted that other existing tall structures nearer to Ireland West Airport (e.g. existing turbines at Sliabh Bawn, Roosky, Largan Hill etc.) are also located within the ICAO Annex 15 Aerodrome Surface and are already listed in the IAA Aeronautical Electronic Obstacle Data Sets.
Building Restricted Areas	None	A review shows that Cloonanny is over 60 km from the BRA for Ireland West Airport. At this distance there would be no impacts due to the proposed wind farm.
Minimum Sector Altitudes (MSA)	None	A review of the Minimum Sector Altitudes (MSA) shows that the proposed wind farm is outside 25 nautical miles from the VOR/DME at Ireland West Airport. Therefore the MSA of the relevant sector will not be affected and there will be no impact on the published MSA altitude figures.
Instrument Flight Procedures	None	A review shows that the instrument flight procedures for RWY 08 and RWY 26 standard instrument departures are unlikely to be impacted for precision aircraft.
Communication and Navigation Systems	None	As the proposed wind farm is over 50km from the Localizer and transmitting antenna at Ireland West Airport, it is very unlikely that the proposed development will have any impact on these ATS communications and radio navigational aids.
Radar Surveillance Systems	None	The proposed wind turbines would be located in Assessment Zone 4 (EuroControl guidelines) for SSR and PSR instruments and a detailed Impact Assessment will not be required
Flight Inspection and Calibration	None	The annual Flight Inspection Procedures will not be impacted by the proposed wind farm as the proposed site is sufficiently far from the ARP at Ireland West Airport that there would be no impacts. In addition, the Flight Inspection Procedures should already account for existing obstacles.
Aeronautical Obstacle Warning Light Scheme	None	It is possible that the IAA may request that the wind farm, if permitted, would be fitted with Aeronautical Obstacle Warning Lights in accordance with industry standards. Subject to further consultation with the IAA.
Irish Air Corps / DoD Safeguarding	Observ.	The proposed wind farm is located within an IAC low-level flight restricted area around the N4. However, mitigation measures are unlikely to be required, as IAC low-level flights are unlikely to fly over the Cloonanny area, given the proximity of the existing significant aviation obstacle at Cairn Hill (i.e. the 2RN broadcast transmitter mast) and the permitted wind turbine at Lissanore). All pilots would be required to be aware of existing aviation obstacles and would likely fly south of the N4 to stay clear of the telecoms mast-site at Cairn Hill.
Garda Air Support Unit and Emergency Aeromedical Service	None	An assessment of GASU and EAS operations indicate that they are unlikely to be impacted by the proposed wind farm development.

Table 23. Cloonanny Wind Farm – Aviation Review Summary

AiBridges Total Communications Solutions	Procedure: 001	Rev: 3.0
Cloonanny Wind Farm – Aviation Review Statement	Approved: KH	Date: 01/11/2024

APPENDIX A - ICAO Annex 15 Area 1 and Area 2 Surfaces.

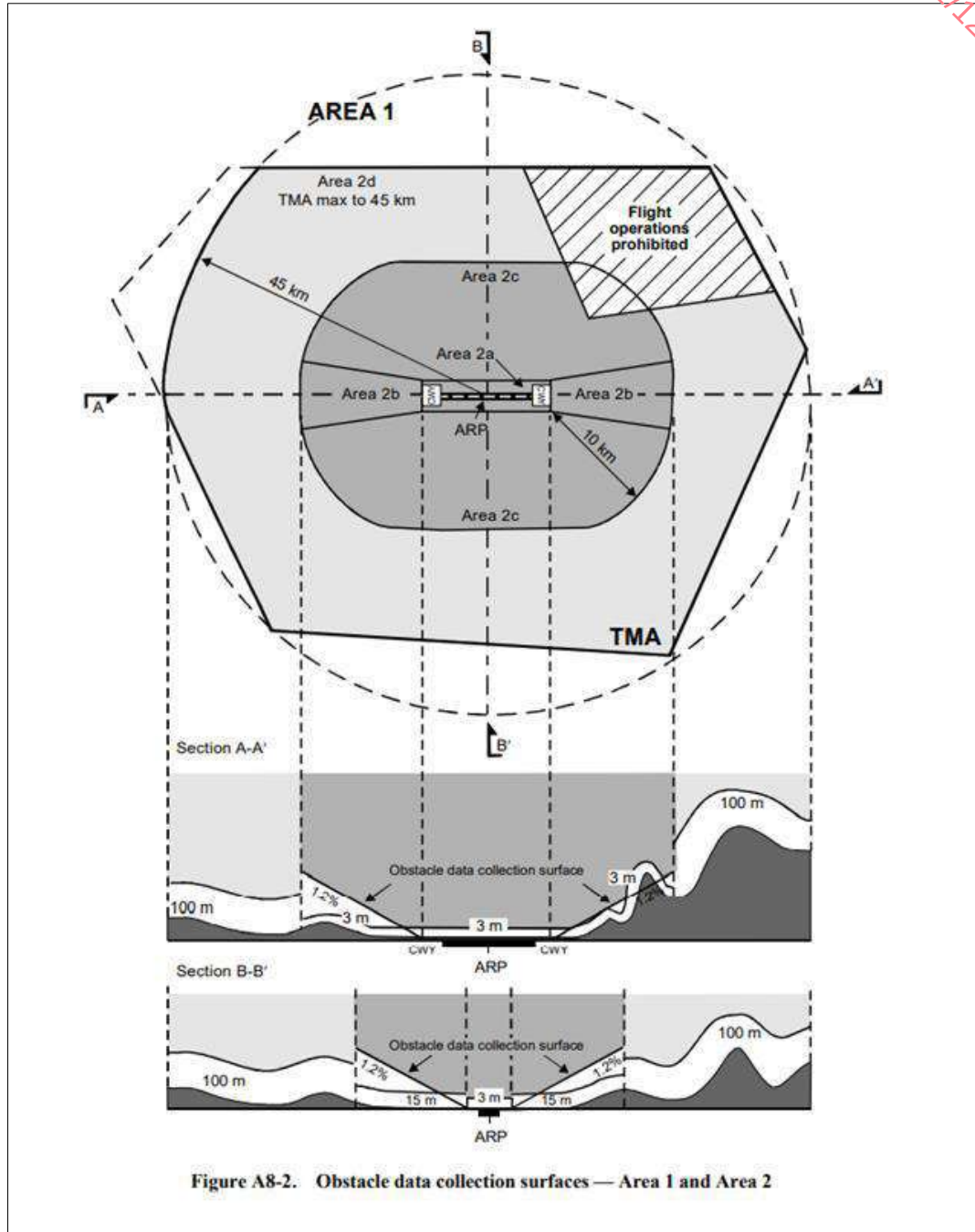


Figure A1 - ICAO Annex 15 Area 1 and Area 2 Surfaces.

AiBridges Total Communications Solutions	Procedure: 001	Rev: 3.0
Cloonanny Wind Farm – Aviation Review Statement	Approved: KH	Date: 01/11/2024

APPENDIX B - ICAO Building Restricted Areas.

Figure B1 below shows an example BRA shape for directional facilities. Table B1 provides harmonized guidance figures for the directional navigational facilities in accordance with Figure B1.

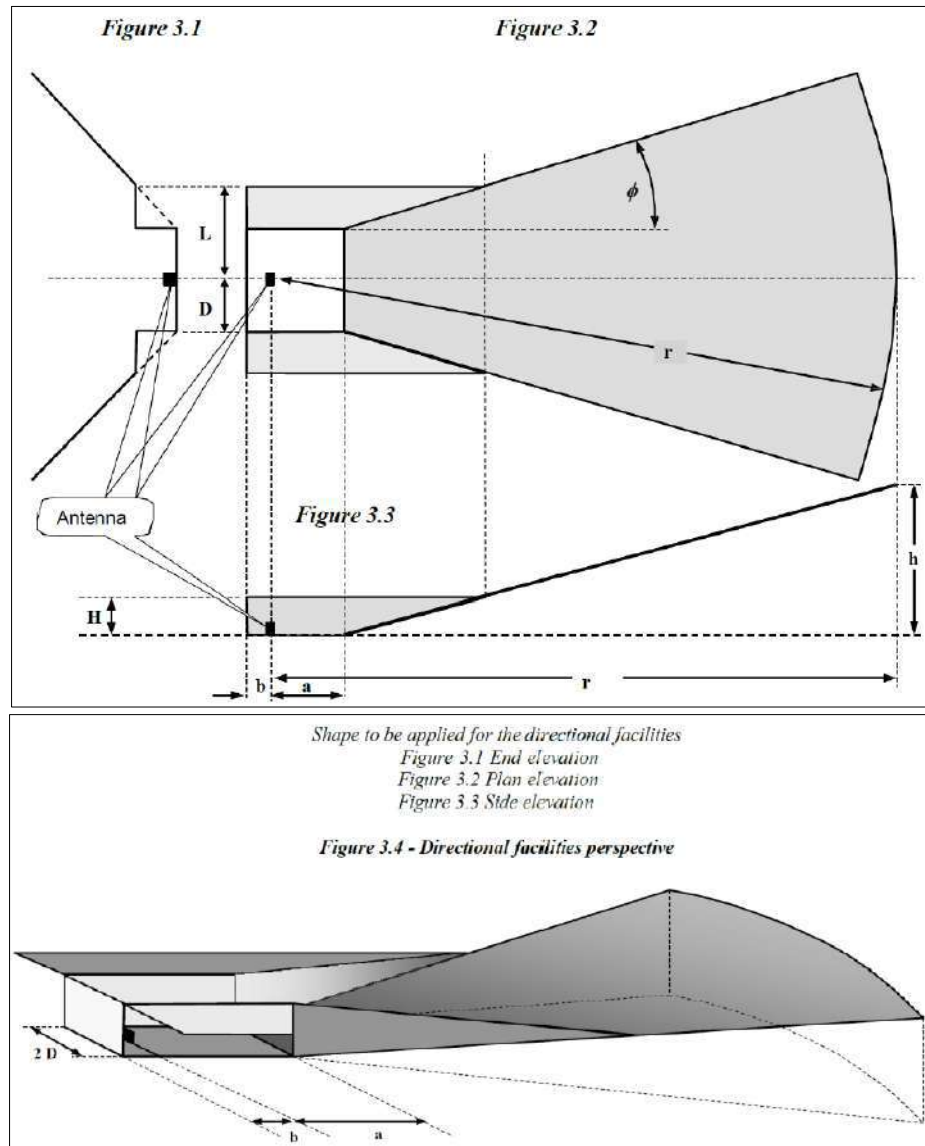


Figure B1 - Example BRA shape for directional facilities (ICAO EUR DOC 015 Figures 3.1-3.4)

Type of navigation facilities	A (m)	b (m)	h(m)	r (m)	D (m)	H (m)	L (m)	ϕ (°)
ILS LLZ (medium aperture single frequency)	Distance to threshold	500	70	a+6000	500	10	2300	30
ILS LLZ (medium aperture dual frequency)	Distance to threshold	500	70	a+6000	500	20	1500	20
ILS GP M-Type (dual frequency)	800	50	70	6000	250	5	325	10
MLS AZ	Distance to threshold	20	70	a+6000	600	20	1500	40
MLS EL	300	20	70	6000	200	20	1500	40
DME (directional antennas)	Distance to threshold	20	70	a+6000	600	20	1500	40

Table B1 - Harmonized guidance figures for the directional navigational facilities (ICAO EUR DOC 015 Table 2)