Proposed Ballynalacken Windfarm Project

Environmental Impact Assessment Report

Chapter 16: Material Assets

Topic Chapter Authors:

March 2025

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Glossary of Terms

Term	Definition
Ballynalacken Windfarm Project	Ballynalacken Windfarm including 12 No. turbines, turbine foundations and hardstanding areas, Windfarm Site Roads, Internal Windfarm Cabling, Windfarm Control Building, Site Entrances, ancillary works at and for the windfarm, along with the Internal Cable Link, Tinnalintan Substation and ancillary works, and Ballynalacken Grid Connection and grid connection works to the Eirgrid Ballyragget Substation. The Project also involves works and activities along the turbine component haul route remote from the site, including the construction of a temporary Blade Transfer Area at HR8
Traffic Growth	The normal expected growth in traffic over time

List of Abbreviations

Abbreviation	Full Term
AADT	Annual Average Daily Traffic
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
ESB	Electricity Supply Board
HGV	Heavy Goods Vehicle

Abbreviation	Full Term
HV	High Voltage – i.e. 38kV, 110kV and 220kV (38,000, 110,000 and 220,000 volts respectively)
kV	Kilovolt
Km	Kilometre
LV	Low Voltage
MV	Medium Voltage – i.e. 10kV – 20kV (10,000 – 20,000 volts)
OHL	Overhead Line
TII	Transport Infrastructure Ireland
TTA	Traffic and Transport Assessment
UÉ	Uisce Éireann (formerly known as Irish Water, the Irish utilities service for water)

CHAPTER 16 MATERIAL ASSETS

EIAR 16.1 INTRODUCTION

EIAR 16.1.1 The Authors of this Chapter (Competent Experts)

The Material Assets chapter was written by Angeliki Kalatha and Adam Price of ORS, Ruairí Geary and David Tarrant of TLI Group, and Kevin Hayes and David McGrath of AiBridges.

Traffic and Transport: Angeliki holds an MSc in Civil Engineering from Aristotle University of Thessaloniki (A.U.Th.), 2014, and an MSc in Engineering Project Management from A.U.Th., 2016. She is a member of Engineers Ireland and the Technical Chamber of Greece. Angeliki is a Senior Transportation Engineer with ORS, bringing eight years of professional experience in transportation and infrastructure development. Adam Price holds a BEng (Hons) in Civil Engineering from DIT, 2012 and BEng Construction and Civils Works (2009) and is a qualified TII Road Safety Auditor (2015) (Auditor No AP275695). Adam works as Infrastructure Lead for ORS with over 12 years' experience in transportation and infrastructure development.

Public road network, electricity system, landline telephone network, water supply pipes and wastewater pipes: Ruairí Geary and David Tarrant, Chartered Engineers with TLI Group, which is a utility infrastructure consultancy and construction company, operating extensively within the utilities sector both in Ireland and internationally.

Radio and wireless telecommunication network links: The Telecommunications Impact Assessment & Aviation Impact Assessment will be managed by Kevin Hayes and David McGrath of Ai Bridges. Kevin is a senior radio planner / engineer with Ai Bridges and holds an M.Eng. , B.Eng. in Communications & & Electronic Engineering with over 30 years of experience in telecommunications network design, telecommunications software modelling services radio and roll-out of turnkey solutions for telecommunication projects. David McGrath is an Electronic and Software Design Engineer. Ai Bridges is a leading supplier of telecommunications software prediction modelling solutions and services for the Renewable industry sector and also provide comprehensive turnkey solutions and have extensive experience and knowledge of network design, implementation and deployment of telecommunications software solutions.

EIAR 16.1.2 Overview of Material Assets in the Local Environment

Material Assets address the potential effects of the proposed Ballynalacken Windfarm Project on roads and traffic and built services.

Road Users relate to pedestrians, cyclists, and drivers of motor vehicles using the local, Regional and National public road network. The traffic generated by the new development will access the site area through the existing regional roads R694 and R432, via the local roads L-5846, L-5845, L-58451, L-5840, L-5838, and L-58442. These local roads are generally rural in nature and experience light traffic.

Public Roads are all 2-way roads, with the trafficked pavement varying in width from 2.4 to 6m, with narrow verges, and are generally bounded by low level earthen embankments or hedgerows along either side. The road pavements consist of traditional surface-dressed flexible pavement ('tar and chippings'), with road surface water drained to open drains, generally running along each of the roadsides.

Local Built Services relate to the underground pipes and cables, and overhead lines which supply drinking water, electricity, telephone and broadband services to houses, businesses and community facilities. Water supply relates to the network of water mains and pipes which are part of the public Uisce Eireann network.

Electricity supply relates to both the local Low Voltage (LV), Medium Voltage (MV) such as the 20kV networks which supply local houses and businesses; and high voltage 38kV, 110kV and 220kV lines which form part of the electricity system. Local telephone supply relates to the overhead lines and underground telecommunication cables, which form part of the Eir network.

Airborne telecommunication networks are systems of interconnected communication equipment or devices that facilitate communication over long distances and relate to the wireless airborne signals from and between telecommunication masts which provide wireless services to private, public and commercial users.

EIAR 16.1.3 Sources of Information

Consultation, desktop studies and fieldwork were carried out in order to gather information on the baseline environment.

Table 16-1: Sources of Baseline Information for Material Assets

Type	Source
Consultation	Feedback was received from: • Infrastructure owners; ESB Networks, EirGrid, Eir, Uisce Éireann, Three Ireland, Gas Networks Ireland, 2RN, Broadcast Authority of Ireland, BT Ireland, Enet, Imagine Broadband, Tetra Ireland, Virgin Media and Vodafone Ireland. • Local residents and local landowners regarding water supply • National Federation of Group Water Schemes • Uisce Éireann Area Managers • Transport Infrastructure Ireland • Roads Department, Kilkenny County Council • Members of the public during the Public Information Day See Chapter 3: Consultation for further details.
Desktop	• Review of Uisce Éireann Services Mapping • Review of Eir Mapping • Review of ESBN Existing Asset Database • Review of EirGrid 110kV Functional Specifications • Review of ESB Networks Functional Specifications • Review of Gas Networks Ireland Mapping • Modelling of microwave radio link paths to/from Ballyouskill Telecommunication Masts • Radio Path Profile and Radio Link Budget analysis of microwave radio links • Kilkenny City & County Development Plan 2021-2027 • POWSCCAR 2022, CSO Database • RSA Collision Statistics Database • EPA Mapping Database Review of the other EIA Report Chapters as follows: • Chapter 5: Description of the Development • Chapter 8: Water • Traffic & Transport Assessment by ORS. Appendix 16.1: Traffic & Transport Assessment
Fieldwork	• Survey of all construction works areas for Ballynalacken Windfarm Project • GPS survey of all existing underground services and overhead lines, i.e. Uisce Eireann/Eir/ESBN/EirGrid networks within 20m of Ballynalacken Windfarm Project works areas • Passing Traffic Volume Data collection and assessment (ATC Tube Counts) • Junction Surveys • Survey of Buried Structures

EIAR 16.1.4 Legislation, Regulations & Guidance Documents

The recommendations in the guidelines and codes of practice listed below, have been considered during the preparation of this chapter:

- Transport Infrastructure Ireland (2014) *Traffic and Transport Assessment Guidelines*
- Transport Infrastructure Ireland (2013) *Design Manual for Roads and Bridges*
- Transport Infrastructure Ireland (2013) *Specification for the Reinstatement of Openings in National Roads*
- Ireland, Department of Transport (2021) *Traffic Signs Manual*
- Health and Safety Authority (2016) *Code of Practice for Avoiding Danger from Underground Services*
- Health and Safety Authority (2019) *Code of Practice for Avoiding Danger from Overhead Electricity Lines*
- Uisce Éireann (2020) *Connections and Developer Services – Code of Practice for Water Supply Infrastructure (A Design and Construction Guide for Developers)*
- Ireland, Department of Transport, Tourism and Sport (2017) *Guidelines for Managing Openings in Public Roads*

EIAR 16.1.5 Methodology Used

The evaluation for Material Assets in Section EIAR 16.3 has been carried out in accordance with the EPA guidance document *Guidance on the information to be contained in Environmental Impact Assessment Reports*, along with the ARVI approach for impact significance assessment developed under the EC IMPERIA LIFE11 Project. This methodology has been used to determine the importance and sensitivity of receptors, and the magnitude and significance of potential impacts. The methodology can be found in full in Appendix 16.4: Methodology for the evaluation of Material Assets.

EIAR 16.2 MATERIAL ASSETS PART 1: SCOPING FOR SENSITIVE ASPECTS OF MATERIAL ASSETS

The assessment of significant effects (or impacts) is an essential concept of the EIA Directive, and the primary objective of this EIA Report is to identify and evaluate the significant effects of the Project. Scoping has been carried out in accordance with the *Guidance on Scoping* (EC 2017) in order to focus the consideration of the impacts the Ballynalacken Windfarm Project may have on the environment to those which are significant or important enough to merit assessment, review and decision-making.

Scoping for the Environmental Topic – Material Assets has been carried out by the chapter authors, throughout the preparation of this Chapter, and includes scoping for the sensitive aspects of Material Assets (this Section EIAR 16.2), and later in this Chapter - scoping of impacts (see Section EIAR 16.3).

EIAR 16.2.1 Introduction to Scoping for Sensitive Aspects of Material Assets (Receptors)

The purpose of the scoping exercise, which comprises this Section EIAR 16.2, is to identify the relevant Sensitive Aspects (receptors) of Material Assets. In order to identify the relevant Sensitive Aspects, the scoping is carried out as follows:

1. An examination is carried out, in Section EIAR 16.2.2, of the potential sources of impacts resulting from the Project and the pathways for Impacts which link the sources of impacts to the receptors (Sensitive Aspects) of the impacts;

2. The zone of influence of the Project, within which the impacts of the Project could occur, is set out, with justification for same. The zone of influence is also called the 'Study Area' herein. The zones of influence are set out in Section EIAR 16.2.3 for the various Sensitive Aspects which occur in the environment.

3. A scoping examination of Sensitive Aspects which occur within the Study Area(s) is carried out in Section EIAR 16.2.4. The scoping examination results in a Sensitive Aspect being either scoped-in for detailed evaluation in **Part 2: Sensitive Aspect Evaluation Section EIAR (i.e. Section EIAR 16.3)** of this chapter or scoped-out from further consideration, for the following reasons:

EIAR 16.2.2 Identification of the Sources, Pathways and Receptors of Impacts

The evaluations within the EIAR identify potential impact sources and pathways between the Project and receptors (Sensitive Aspects) of the environment.

EIAR 16.2.2.1 Identification of Impact Sources

The 'source' is an origin of an impact and is associated with the Project. In order to identify the potential 'sources' of impact, the characteristics of the Ballynalacken Windfarm Project, i.e. the size and design, works, activities, use of materials and natural resources, and the emissions and wastes, associated with the construction, operation and decommissioning of the Project, as described in Chapter 5 of this EIA Report, have been examined, and it is considered that the following Project characteristics have potential to act as a 'source' of impact to the sensitive aspects of Material Assts:

Construction Stage Sources of Impact

- Road Widening Works
- Trenching works in public road corridor
- Vegetation clearance (entrances)Traffic management
- Construction/delivery traffic
- Relocation of telephone or electricity poles/lines
- Temporary removal of street furniture and light poles
- Diversion of telecommunication signals
- Movement of abnormal loads on the public road network

Operational Stage Sources of Impact

- Reopening of haul route works widening locations
- Movement of abnormal loads on the public road network
- Turbine Towers and Blades

Decommissioning Stage Sources of Impact

- Reopening of haul route works widening locations
- Movement of abnormal loads on the public road network.

EIAR 16.2.2.2 Identification of Impact Pathways

The 'pathway' is the means by which an impact can reach and affect a receptor. The characteristics of the baseline environment have been examined and it is considered that the following pathways could form a link between the Project (sources of impact) and the Sensitive Aspects (receptors):

- Physical contact
- Roadway
- Air (Telecommunications)

EIAR 16.2.2.3 Identification of Receptors

Any receptor in the environment which could be affected by a development is referred to as a 'Sensitive Aspect' in this EIA Report. The following Sensitive Aspects are relevant to the receiving environment and are subject to scoping in Section EIAR 16.2.3:

- Road Users
- Public Roads and Local Built Services
- Airborne Telecommunication Networks
- Aviation

The zone of influence in relation to these Sensitive Aspects is examined in Section EIAR 16.2.3 below, with a scoping exercise for each of the Sensitive Aspects presented in Section EIAR 16.2.4.

EIAR 16.2.3 Scoping of the Study Areas (Zone of Influence of the Project)

The scoping and evaluation focuses on the area or zone of influence around the Ballynalacken Windfarm Project within which the impacts of the Project could occur. This area/zone is referred to as the Study Area. The Study Areas for the Sensitive Aspects of the Material Assets environment are set out in the table below.

Table 16-2: Study Area of the Project in relation to sensitive aspects of the Material Assets environment

Sensitive Aspect	Ballynalacken Windfarm Project Zone of Influence/Study Area	Justification
Road Users	Regional Road R694 between Castlecomer and Ballyragget towns Regional Road R432 between Ballyragget and the junction with the Local Road L58442 Local Roads L5846, L5840, L5845, L58451 between the windfarm site entrances Local Road L58442 – entire length Local Road L5838 at the site entrance to the met mast location.	Road Users using public roads subject to road works, site access points or concentrated construction traffic (local roads only) may be affected by works and construction traffic movements associated with the Project works. Road Users along on public roads remote from the Project, and those who have acceptable alternative routes are not likely to be affected.
Public Roads and Local Built Services	Public Roads in the vicinity of the Windfarm used for material and turbine component transportation Public Roads subject to cable trenching, site entrances and road widening works Underground services within the Ballynalacken Windfarm construction works boundary, in the public road Overhead local telephone and electricity lines at site entrances, road work locations and at Haul Route Works locations	Public road pavements may be affected by roadworks and concentrated traffic. Road boundaries may be affected by site entrance and haul route works. Potential for direct physical damage to the service during construction works and loss of services to local residences, businesses and community facilities connected to these services.
Road Users at haul route works and activity locations	Boundary of the works at Haul Route Works locations	Potential for disruption of road users are limited to sections of road where works are taking place.
Airborne Telecommunication Networks	Signal paths and telecommunication links passing through the windfarm site.	Signals and telecommunication links being transmitted through the windfarm site area may be affected by the erection of the Ballynalacken Windfarm turbines.
Aviation	90km from radar stations 20km from private airfields / helipads	Based on professional judgement
Electricity Transmission & Distribution System	National electricity network within the Construction Works Boundary, and proposed connection point of the grid connection associated with the Project	Potential Direct contact with overhead lines during construction. Potential to enhance or strengthen the national electricity network

EIAR 16.2.4 Scoping of Sensitive Aspects

Any receptor in the local environment which could be affected by a development is a Sensitive Aspect. The various sensitive aspects of the Material Assets environment are scoped in the table below for potential to be affected by the Ballynalacken Windfarm Project. The scoping examination results in a Sensitive Aspect being either scoped-in for detailed evaluation in **Part 2: Sensitive Aspect Evaluation Section (i.e. Section EIAR 16.3)** of this chapter or scoped-out from further consideration, for the following reasons:

a) Where it is considered that a Sensitive Aspect is likely, or has potential, to be significantly affected by the Project, that Sensitive Aspect has been scoped in for detailed evaluation in Part 2 (Section EIAR 16.3).

b) Where it is considered that there is no potential for a Sensitive Aspect to be affected, or where the likely/potential impacts to that Sensitive Aspect will be Neutral (i.e. No impact/imperceptible impact) then that Sensitive Aspect has been scoped out from further consideration, and the rationale for scoping-out is provided in the table.

c) An exception is made for Sensitive Aspects which are not likely to be significantly affected but may be of particular or local concern and merit a detailed examination, these Sensitive Aspects are also scoped in for detailed evaluation in Part 2 (Section EIAR 16.3).

Table 16-3: Scoping of Sensitive Aspects

Sensitive Aspect	Is there a Pathway between the Project and the Sensitive Aspect?	Likely (or have potential) to be Significant?	Scope In/ Out	Scoping Result & Rationale *(scoped out only)*
Road Users	Yes	No, but of importance	Scope In	See Section EIAR 16.3.1 Part 2 Evaluation
Public Roads and Local Built Services (incl. overhead and underground telecoms, electricity and water supply)	Yes	Yes	Scope In	See Section EIAR 16.3.2 Part 2 Evaluation
Airborne Telecommunication Networks	Yes	Yes	Scope In	See Section EIAR 16.3.3 Part 2 Evaluation
Aviation	Yes	Yes	Scope In	See Section EIAR 16.3.3 Part 2 Evaluation
Road Users at haul route works and activity locations	Yes	No	Scope Out	Scoped Out: All roads assessed in terms of potential effects posed by the haulage of turbine component to the Ballynalacken Windfarm site were scoped out on the basis that the proposed enabling works are minor and temporary in nature. Street furniture predicted to act as an obstacle will be upgraded to socket foundations. Upgrade works will take place outside of peak hours, well in advance of the transportation of turbine components. There will be minor incidences of

				realignment of overhead services, mainly at Castlecomer, which will have no effect on road safety or structure. Several incidences of traffic management will be required during transportation, however the scheduling of such at off-peak times, along with their temporary nature will mean effects to road users will be imperceptible.
Electricity Transmission System and overhead electricity lines	Yes	No	Scope Out	Scoped Out: The addition of the Tinnalintan Substation and Ballynalacken Grid Connection will have an imperceptible impact on the electrical transmission system due to the size of the overall Irish transmission system. Works will be carried out in accordance with EirGrid standards. Overhead HV/MV Electricity Lines, will be protected during construction using Goal Posts as per standard construction practices.

EIAR 16.3 MATERIAL ASSETS PART 2: EVALUATION SECTION

This Evaluation Section examines the scoped-in Sensitive Aspects in greater detail, and comprises a baseline description and impact evaluation for each of the Sensitive Aspects, presented in the following order:

Section EIAR 16.3.1: Road Users

Section EIAR 16.3.2: Public Roads and Local Built Services

Section EIAR 16.3.3: Airborne Signals & Aviation

EIAR 16.3.1 SENSITIVE ASPECT: ROAD USERS

This detailed evaluation section for Road Users is presented as follows:

- Section EIAR 16.3.1.1 - description of the baseline environment of Road Users;
- Section EIAR 16.3.1.2 - evaluation of the impacts of Ballynalacken Windfarm Project on Road Users; and
- Section EIAR 16.3.1.3 – evaluation of cumulative impacts.

EIAR 16.3.1.1 Baseline Environment –Road Users

The context, characteristics, importance and sensitivity of *Road Users* are described in the subsections below. The trends and likely evolution (i.e. Do-Nothing scenario) for this Sensitive aspect are also considered.

The impact of the proposed Ballynalacken Windfarm on Road Users was evaluated by ORS and is presented below. Please refer also to Appendix 16.1: Traffic and Transport Assessment.

EIAR 16.3.1.1.1 Baseline Characteristics of Road Users

There are 3 no. population centres of significance within the study area, summarised as follows:

1) Kilkenny City – Highest population density within the county. The main interaction posed by the project within is the transportation of turbine components along the N10 and N77(ring road) national roads which by-pass the city.
2) Castlecomer – 4th largest town in County Kilkenny with a population of 1,496 according to the 2022 census. The main interaction posed by the project within Castlecomer Town is the transportation of turbine components through the town via the N78 and R694.
3) Ballyragget – 8th largest town in Kilkenny with a population of 1,116 according to the 2022 census. The main interaction posed by the project within Ballyragget Town is the delivery of construction materials through the town via the N77 onto either the R694 (to the windfarm) or the R432 (to the Tinnalintan/Moatpark area).

As shown on Figure 16.1: Construction Material Haul Routes and Figure 16.2: Turbine Component Transport Route, there is 1 no. motorway (M9), 3 no. national routes (N10, N77 and N78), 2 no. regional routes (R694, R432), and several local roads in close proximity to the construction site and/or along haul routes for the turbine components. The traffic generated by the new development will access the site area through the regional roads R694 and R432, via the local roads L-5846, L-5845, L-5840, L-5838, L-58451 and L-58442. These local roads are generally rural in nature and experience light traffic.

Access to the windfarm site will be established through a combination of existing and newly created entrances from the public road. There will be a total of 11 No. site entrances, consisting of 8 No. existing entrances and 3 No. newly constructed entrance. These entrances will have varying widths to accommodate the passage of turbine components during the construction phase of the windfarm. To ensure safe access and visibility, the entrances will be setback 2.4m from the road. In some cases, existing trees and hedgerows will be pruned or removed as necessary to provide clear sightlines in both directions. This proactive approach

aims to enhance visibility and ensure the smooth and efficient movement of construction vehicles and equipment during the windfarm development. Detailed Site Entrance drawings are included in the Drawings Pack. See Drawings BWF- 25 to BWF-38

The following paragraphs provide a summary of the existing and proposed access points within the Ballynalacken Windfarm site, as well as the Windfarm's local road network.

EIAR Figures: (included at the end of this Chapter)

Figure 16.1: Construction Materials Haulage Route
Figure 16.2: Turbine Component Transport Route
Figure 16.3: Location of Road Works

EIAR 16.3.1.1.1.1 Regional Road R694

The R694 road is an 80 km/hr road which provides a connection between Castlecomer and Ballyragget to the west. The R694 in the vicinity of the proposed development site has a road carriageway width of approximately 6-7 metres with centreline and road edge markings, with a reduced speed within the town of Castlecomer and Ballyragget of 50km/hr.

Site Entrance 1 is located along this road. 100m of hedging will be setback to provide sightlines at this entrance

EIAR 16.3.1.1.1.2 Local Road L-58451

L-58451 is a local tertiary road with a carriageway width of approximately 2.40 metres, providing access to existing premises and to farm and forestry lands. It is important to note that there are currently no road markings, signage or street lighting on this public road**.**

At the end of this cul-de-sac road, there is an existing forestry entrance, which will be used as Site Entrance No.2

EIAR 16.3.1.1.1.3 Local Road L-5845

L-5845 road is a local secondary road characterised by a carriageway width of approximately 3.0 metres, flanked by agricultural land on both sides. Along this road, there is an existing entrance that leads to a farm lane, which will be used as Site Entrance No.3 and will provide access to the Windfarm Control Building. A short section of hedging will be setback to provide sightlines at this entrance. The speed limit in this area is set at 60 km/h. It is important to note that there are no properties located in close proximity to the entrance and no road markings present in the vicinity of the existing access point. Additionally, the L-5845 road serves as a gateway to the local road L-58451.

EIAR 16.3.1.1.1.4 Local Road L-5846

L-5846 is a local secondary road characterised by a carriageway width of approximately 3.50 metres, with agricultural lands on both sides. The speed limit on this road is 80 km/h. Along the L-5846, there is an existing field entrance on the southern side of the L-5846 that will be widened as Site Entrance No.4 to access to T6, T5, and to Temporary Borrow Pit No. 1. In addition, a new entrance (Site Entrance No.5) will be constructed along the northern side of the L-5846 road. Hedgerows will be removed to offer clear sightlines of 90 metres at each of these entrances. It is important to note that there are no street lighting or road markings present in the vicinity of either access point or domestic properties and sheds.

EIAR 16.3.1.1.1.5 Local Road L-5840 (Cromwell's Road)

L-5840 road is classified as a local secondary road and features a carriageway width of approximately 3 metres. Along this road, there is one new entrance to provide access to various locations such as T7 and temporary Construction Compound (Site Entrance No.6), and three existing entrances that provide access to T8 (Site Entrance No.7), and T9, T10, T11, T12, and Borrow Pit No. 2 (Site Entrance No.8 and Site Entrance No.9). The speed limit within this area is set at 60 km/h. Sightlines will be provided at all 4 No. Site Entrances along this road.

It is important to note that there are no properties in close proximity to these entrances. Furthermore, there are currently no road markings present in the vicinity of the existing access point.

EIAR 16.3.1.1.1.6 Regional Road R432

The R432 road is an 80 km/hr regional road, which runs north–south from the R430 in Abbeyleix, County Laois to the N77 in Ballyragget, County Kilkenny. The R432 in the vicinity of the proposed development site has a typical rural road carriageway width of 6.0 metres, with centreline and road edge markings.

The Ballynalacken Grid Connection cables will be installed under this road, and this road will also be used to access the Internal Cable Link construction works area and the Tinnalintan Substation site.

EIAR 16.3.1.1.1.7 Local Road L-58442

L-58442 is a local road with a carriageway width of approximately 3.50 meters. An existing field entrance will be utilised to provide access to the Tinnalintan Substation and temporary Construction Compound No.3. It is worth noting that there are no road markings, signage or street lighting present in the vicinity of the entrance. This existing entrance also provides access to local soccer club.

The Ballynalacken Grid Connection cables will be installed under this road between the Site Entrance No.11 to Tinnalintan Substation, with Internal Cable Link cables also to be installed under this road further east past the site entrance to the Tinnalintan Substation site

EIAR 16.3.1.1.1.8 Local Road L5838

Traffic on Local Road L5838 (Site Entrance No.10), will only be used for the construction and access to the met mast. Anticipated traffic volumes associated with the construction of the met mast site will be very small (15 no. loads in total), with 2 visits per year to inspect/maintain the mast.

EIAR 16.3.1.1.1.9 National Roads N10 and N78

These National roads are typical of National Roads in general and are in good condition with a well maintained surface along the route. The Blade Transfer (HR8) area is located adjacent to the N78. Construction access to the Blade Transfer area will be from an existing field gate on the Local Road L1844. Movement of blades to and from the Blade Transfer Area during turbine haulage will also utilise this entrance. This will negate the requirement for a new entrance off the National Road.

EIAR Figures: (included at the end of this Chapter)

Figure 16.1: Construction Materials Haulage Route
Figure 16.2: Turbine Component Transport Route
Figure 16.3: Location of Road Works

EIAR 16.3.1.1.2 Existing Traffic Flows

The 2023 typical baseline traffic volumes are provided in Table 16-4 below. These are total two-way vehicles at the road locations identified. Furthermore, the Annual Average Daily Traffic (AADT) volumes specifically pertaining to Heavy Goods Vehicles (HGVs) and their respective proportions (%) of the overall AADT are also provided.

In summary, the roads in the area are generally very lightly trafficked, reflecting the rural nature of the study area.

Table 16-4: Existing Traffic Volumes in Local Roads

Road Number	Total Vehicles			
	24Hr 2-way Average Annual Daily Traffic (2024 baseline)	AM Peak 2-way	PM Peak 2-way	2024 AADT HGV (%)
L-5846	134	11	16	23 (17%)
L-5840	31	2	4	3 (10%)
L-5845	61	4	6	5 (8%)
L-5838	77	8	10	10 (13%)
L-58442	73	7	8	3 (4%)

Based on the traffic counts obtained during 2022, 2023 and 2024 for the roads assessed, the travel distribution was established. Only a small percentage of traffic diverts towards the local roads L5840, L5846 and L5845 from the Regional Road R694. From Ballyragget, it has been observed that the majority of traffic travels along the R432 towards Ballyouskill and vice versa. Only a small percentage, approximately 7% of the traffic, diverts towards the local road L58442.

EIAR 16.3.1.1.2.1 Regional Roads

The existing rural road link AADT volume/capacity ratio for the R694 and the R432 Regional Road, in the vicinity of the proposed development site, is provided in Table below, on the basis of the TII DN-GEO-03031 June 2017, for the year 2024. These values are generally in line results of Automatic Tube Counters installed during traffic data collection.

Table 16-5: Existing Traffic Volumes in Regional Roads and Estimated Capacity

Road Location	Total Vehicles			
	Carriageway width (m)	Average Annual Daily Traffic Capacity (vehicle) For a Level of Service D	2024 Average Annual Daily Traffic	AADT Volume/Capacity Ratio
R694	6,0	5,000	1,236	24.7%
R432	6,0	5,000	1,015	20.3%

EIAR 16.3.1.1.3 Public Transport Provision

Given the nature and location of the development, it is not anticipated that trips will be made via walking, cycling or public transport and there are limited public transport options at present - with local bus stops in the towns of Ballyragget and Castlecomer, approximately 4km from the development site.

EIAR 16.3.1.1.4 Pedestrian & Cyclist Connectivity

Currently, the site lacks direct access for pedestrians or cyclists. The local roads in the area have speed limits of either 60 km/h or 80 km/h and are characterised by tall hedging, narrow sections, and winding narrow roads. Moreover, there are no dedicated cycle lanes or pedestrian footpaths on either side of any of the local road, or on the regional roads where they occur outside of Castlecomer and Ballyragget urban areas. Given these conditions, it is not feasible to anticipate pedestrian or cyclist access to the site without substantial investment in active travel infrastructure in the area.

Considering that the primary purpose of this development site is renewable wind energy production, and that the surrounding lands are either farmed or are commercial forestry plots, it is unlikely that this area will attract a significant number of on-site employees. Consequently, it is improbable that the local authorities will prioritise the implementation of active travel measures in this rural setting in the short to medium term.

Given the absence of pedestrian and cyclist infrastructure, coupled with the limited demand for active travel in the area, it is evident that the site's current rural setting does not warrant immediate active travel development.

In order to gain deeper insights into the current transportation modes and traffic patterns in the Ballynalacken area, an analysis of the Census 2016 data was conducted. The findings from the 2016 Census, indicate a significant reliance on cars as the primary mode of transportation, while bicycles were not reported as a means of travel. Additionally, the data revealed that approximately 2% of individuals chose walking as their mode of commuting to work, school, or college.

There are no waymarked trails along any of the local roads associated with the Project, however, local knowledge and observations during site visits identified that the L5840 (Cromwell's Road) is used as a local walking amenity.

EIAR 16.3.1.1.5 Existing Sources of Impacts to Road Users

There is no existing damage to the Public Road Network taking place at the Project site.

EIAR 16.3.1.1.6 Importance of Road Users & Sensitivity to Change

Importance: According to TII national roads are made up of motorways, primary roads and secondary roads. These are essential for the economic and social wellbeing of the country. This network connects the communities of Ballyragget and Castlecomer to Kilkenny City and to the M9 Motorway and allows people to travel for a variety of purposes such as employment, education, leisure, and cultural purposes, as well as enabling the movement of the goods and materials that are important for the Irish Economy.

According to the department of transport regional and local roads are important from economic, social and political perspectives. These roads serve an important economic role in the Irish context and also have valuable social and community functions. Regional routes will be the most highly valued routes in terms of the volume of road users who will use these roads on a daily basis.

Overall, the importance of the Public Roads to Road Users ranges from **High** (National Roads) to **Moderate** (Regional, Local Roads)

Sensitivity to Change: Road Users could be sensitive to changes in road use conditions such as substantial increases in traffic volumes, particularly HGVs; presence of roadworks and traffic management measures

such as stop-go systems; and a reduction in road pavement quality which could either increase journey times or reduce road safety. Based on the IMPERIA methodology, outlined in Appendix 16.4, taking into account the economic and societal value of the roads, and the number of road users using them, the Sensitivity of Road Users is evaluated as **Low** (local roads L58451, L5845, L5840, L58442, L5838) which have very low traffic levels) to **Moderate** (local roads with higher rates of traffic such as the L5846, and the Regional Roads R432 and R691), to **High** (national routes M8, N10, N78). The local road L58442 at Tinnalintan is evaluated as **Moderate**, due to the cul-de-sac nature of this road in the context of the requirement for roadworks to install the Internal Cable Link.

Cyclists or walkers are considered to be vulnerable road users and could be intimidated by the presence of heavy goods vehicles, particularly on narrow roads. Currently, the site lacks direct access for pedestrians or cyclists. There are a low number of people using Cromwell's Road as a walking amenity, and given the vulnerability of these road users, they are evaluated as having Moderate Sensitivity to the construction works, and Low sensitivity to the windfarm following its construction. In relation to the other local roads, the regional roads, the number of cyclists using these roads are expected to be very low, and as a result the Sensitivity of Cyclists or Walkers is considered to be Low.

EIAR 16.3.1.1.7 Evolution of the Baseline Environment (the 'Do-Nothing' scenario)

Trends in Key Indicators over time: TII Publication PE-PAG-02017 Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projections, published in October 2021 predicts increases in annual traffic volumes, in the region of 1-2% per annum. This growth rate is accounted for in Appendix 16.1 Traffic and Transport Assessment.

Climate Change: Vulnerabilities to climate change will vary depending on the specific service or infrastructure in question and may also vary depending on location, amongst other factors. Stakeholder engagement indicated that climate impacts were not experienced uniformly across transport modes. Land transport infrastructures (roads; rail; and active travel infrastructure) noted particular susceptibility to precipitation and associated risks such as flooding, landslides and subsidence. The most immediate climate-change related risks in Ireland are those associated with weather extremes, such as floods, precipitation and storms. In particular, systemic risks due to weather events leading to the breakdown of infrastructure networks and critical services such as transport, energy, communications, water supply, health and emergency services are expected.

EIAR 16.3.1.2 Impact Evaluation –Road Users

This Section comprises an evaluation of the likely significant impacts of the proposed Ballynalacken Windfarm Project on the receiving environment. Moderate, Slight, Imperceptible and Neutral Impacts are also taken into consideration.

The impacts are presented/evaluated as follows:

a) Significant Impacts which are likely or have potential to occur, are subject to detailed evaluation;

b) Moderate or Slight Impacts, which are likely or have potential to occur, are subject to detailed evaluation;

c) Non-significant impacts of local concern or considered important enough to merit detailed evaluation;

d) Neutral or Imperceptible Impacts are scoped out from detailed evaluation, and a short evaluation is provided in the table below. Unlikely Impacts are also scoped out.

Table 16-6: Scoping of Impacts to Public Roads & Road Users

Likely/Potential Impact	Evaluation	
Moderate or Slight Impacts, which are likely or have potential to occur - see detailed evaluation		
Construction Phase: Increased Journey Time or Disruption to Road Users using Local Roads		*Section 16.3.1.2.1 EIAR*
Construction Phase: Increased Journey Time or Disruption to Road Users using Regional Roads		*Section 16.3.1.2.2 EIAR*
Construction Phase: Disrupted Access to Property		*Section 16.3.1.2.3 EIAR*
All Phases: Increased risk of road accidents due to increased traffic and works in public road		*Section 16.3.1.2.4 EIAR*
Neutral or Imperceptible Impacts, or where no impact is likely to occur – evaluation below		
All Phases: Increased journey times for National road users (N10, N77, N78)	Imperceptible Impacts: Traffic management measures on national roads which may affect journey times for road users include stop/go systems at Haul Route Works and increases in traffic (particularly HGV traffic) as a result of material delivers to the construction sites. Impacts will be Imperceptible due to the negligible spatial extent and brief duration of Haul Route Works on national roads and due to the available capacity of all roads to accommodate larger traffic volumes.	
All Phases: Increased journey times and disruption for national road users due to transport of turbine components (N10, N78, Castlecomer Town)	Imperceptible Impacts: Due to the expected timing of turbine component deliveries outside of peak traffic hours, any delays or disruption associated with the transportation of turbine components will be brief, likely to affect a small number of road users (compared to the daily usage of these roads), with effects reversible with completion of the transportation. Traffic flow will be maintained around the abnormal load by Gardaí to ensure minimal effects on national road users. No significant impacts are likely to occur.	
Operational Phase: Improvement in public road networks due to increased County Budget	Imperceptible positive: The payment of c.€800,000 per annum in commercial rates will be used to maintain the public road network in good condition, this will include the national, regional and local roads which will be used to access the Project site by construction, operational and decommissioning personnel and delivery vehicles. However, in the context of the total length of public roads in County Kilkenny, this impact is considered Imperceptible positive.	
Operation & Decommissioning Phases:	Neutral Impacts: Vehicular movements during the operation or decommissioning phases are expected to be minimal, any requirements for road works will be very infrequent relating to infrequent maintenance or unplanned repairs (if they occur at all) to the Ballynalacken Grid Connection which would likely involve reopening	

Increased risk of road accidents due to increased traffic, road works, or deterioration of road pavements	joint bays for very short periods of time. Some or all of the Haul Route Works may be required to facilitate turbine component transportation associated with major maintenance works at the windfarm. All of these works will be isolated, and of brief/very temporary duration, happening infrequently during the operational/decommissioning phases of the Project. Overall, the effects to Road Users will be none to imperceptible.
Operation & Decommissioning Phases: Increased journey times for road users	Imperceptible Impacts: Operational and decommissioning traffic will be very low and will not increase journey times to local traffic during the operational/decommissioning phases. The requirement for works along the public road are limited to infrequent works at joint bays and haul route works locations, with works of brief duration, reversible with the completion of works, and happening infrequently during the operational/decommissioning phase. Overall, the effect to journey times will be none to imperceptible.

EIAR 16.3.1.2.1	**Increased Journey Time or Disruption to Road Users using Local Roads**
Sensitive Aspect:	Road Users on local roads
Importance:	**Low to Moderate** (as per Section EIAR 16.3.2.1)
Impact Source(s)	Construction traffic
Impact Pathway(s)	Roads - L58451, L5845, L5840, L5846, L5838, L58442, L1844
Project Stage	Construction Phase

Overview of Impact (general):

The increased in traffic volumes due to the use of the roads by construction delivery vehicles, the presence of road works and the slow speed and traffic management associated with component transportation, could result in delays and disruption to road users along Local Roads in the vicinity of the windfarm and cable routes.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

ORS Consulting Engineers carried out a Traffic and Transportation Assessment to evaluate the adequacy of the existing road network in accommodating the transportation demands of the development. The Assessment was carried out in accordance with TII Traffic & Transportation Assessment Guidelines, and modelled existing traffic conditions, future years traffic growth, trip generation and distribution and analyses the available capacity on roads. The findings of the Assessment in relation to increases in journey times for road users are summarises below. The full report can be found at the end of this chapter as Appendix 16.1 Traffic and Transportation Assessment.

Increases in Traffic on Local Roads: The anticipated peak traffic during the construction phase relates to the 12 days of concrete pours (i.e. one day of 82 concrete deliveries per turbine / 10 deliveries per hour). Traffic during the rest of the construction phase will be between 20 and 79 deliveries (average c.25) per day to the windfarm site over the 12 month period. Deliveries to the Tinnalintan Substation on the L58442 are expected to be between 5 and 20 deliveries over a 5 month period.

L58451, L5845, L5846, and L5840: There will be a significant increase in traffic volume on the local roads, even during 'normal' construction periods. However, it is important to note that the percentage changes in traffic conditions are high due to the extremely low existing traffic levels. The negative or adverse effects on the local roads associated with the construction works at the wind farm site are considered to be temporary in duration and reversible following completion of construction works, and while there will be a substantial increase in traffic volumes compared to the existing levels, the very low number of residents and properties along the affected sections of local road is a mitigating factor. Overall, the magnitude is evaluated as Moderate during normal construction traffic levels and Very High magnitude during peak concrete delivery days. It should be emphasised that despite the increase, the Average Annual Daily Traffic (AADT) volumes on the Local Roads would remain relatively low. The local road network will continue to operate within its carrying capacity even with the additional construction traffic, providing adequate capacity to accommodate the projected traffic volumes. See Figures 16.1: Construction Materials Haulage Route; Figure 16.2: Turbine Component Transport Route.

In relation to turbine component deliveries, due to the short lengths of the L58451, L5845, L5846 and L5840 local roads affected, and the very brief duration of any disruption to Road Users, it is considered that the magnitude of any effects to Road Users on Local Roads due to the transport of turbine components will be Low.

L58442: Deliveries to the Tinnalintan Substation and for cable route works on the L58442 will comprise between 5 and 20 deliveries over a 5 month period, with the majority of this traffic going to the Tinnalintan Substation. Taking into account the short length of this road, the width of the road between the regional road and the Site Entrance (No.11) to access Tinnalintan Substation, it is considered that any increased journey time as a result of increased traffic will be Low magnitude.

In relation to the **L5838**, construction traffic associated with the met mast will be very low (15 deliveries in total over 4 weeks), and Negligible magnitude.

L1844 will be used to access the Haul Route Works location at HR8. Due to the temporary duration of construction works for the blade transfer area, with very low numbers of vehicles accessing the site via the existing farm entrance on the local road, and the very low number of turbine component movements into/out

of HR8, and the carrying out of these movements during off-peak times, any impacts to Road Users on the L1844 will be negligible.

Presence of Road Works/Traffic Management: See Figure 16.3: Location of Road Works

L5845: The Internal Cable Link will cross the road at one location (1 day), the provision of 1 no. site entrance, road widening works (750m) and Haul Route Works (HR12 & HR13). During road widening works and cable crossing works a Stop/Go system with flagmen will be put in place for 1 week.

L5846: The Internal Cable Link will cross the road at two locations (1 day each), the provision of 2 no. site entrances and road widening works (850m), and Haul Route Works (HR13). During road widening works and cable crossing works a Stop/Go system with flagmen will be put in place for 1 week.

L5840: 4 no. site entrances (1 day each), road widening works (2150m) and Haul Route Works (HR13). During road widening works a Stop/Go system with flagmen will be put in place for 2-3 weeks.

Due to the minor extent of works, the brief to temporary (up to 3 weeks) duration, the low levels of traffic on these roads, and taking into account the narrow nature of these roads, with flagmen in place to facilitate traffic, it is evaluated that the magnitude of effects to Road Users on the L5840, L5845 and L5846 will be Low-Moderate. However, should these works be carried out during peak traffic periods (i.e. during concrete pours), the magnitude would be Very High.

L58442: Internal Cable Link trenching works (950m), Ballynalacken Grid Connection trenching works (390m) and the provision of 1 no. site entrance. Trenching works will be carried out mainly in the verges, with works completed at over a 3 weeks period. Works will proceed in a linear manner with an average of 80-100m completed each day. While the extent of road works is along the majority of this local road, due to the brief 3 weeks duration, the low levels of traffic on these roads, with flagmen in place to facilitate traffic, it is evaluated that the magnitude of effects to Road Users on the L5840, L5845 and L5846 will be Moderate.

L1844 will be used to access the Haul Route Works location at HR8, and the existing field entrance will be temporarily widened to 15m. Due to the minor extent of works and the very low numbers of vehicles accessing HR8 any impacts to Road Users on the L1844 will be negligible.

Impact Magnitude	Low - Moderate (general works) to Very High (concrete pour stage -2 weeks)	**Impact Significance: *(pre-mitigation)***	**Slight/Moderate (general) – Moderate (concrete pours)**

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

Design	Alternatives Considered: following concern over increased HGV traffic on local roads expressed by some members of the local community who attended the public information event in July 2024, an alternative haulage route for concrete and aggregate is now proposed which access' the windfarm site from the R694 (through Site Entrance No. 1) rather than using the local road network at Firoda Lower (L5846).
MM49	A Community Liaison Officer (CLO) will be appointed. The CLO will liaise with and keep the local community up-to-date with relevant construction work schedules, through the use of signage at selected Site Entrances, letter drops to nearest neighbours and through the Project website which will be kept up-to date. The CLO will be the point of contact for local residents for matters relating to construction traffic.
MM62	The Traffic Management Plan will be a key construction contract document and will be implemented to safely coordinate and manage traffic during the construction works. The Traffic Management Plan will be developed in coordination with Kilkenny County Council.
MM63	Flag-men will be used on public roads which will be subject to one lane closure. These flagmen will control the movement of traffic on the public road, so that road users can continue to use the public road network in a safe and efficient manner. The works will be carried out according to the Traffic Management Plan which forms part of the Ballynalacken Windfarm Project Environmental Management Plan.
MM64	Local residents likely to be affected by road works, will be kept up to date on works schedules by the Community Liaison Officer.

MM65	The largest traffic volumes are associated with the concrete pours for the turbine foundations. No other deliveries to the windfarm will be scheduled to occur on the same days as the concrete pours.
MM66	The site entrance works, haul route work and road widening works on the L58451, L5845, L5846 and L5840 will not be carried out during peak delivery periods. Where feasible to do so, the road widening works will be carried out prior to the main construction period at the windfarm site. In addition, any works on the public road will be completed under licence from Kilkenny County Council Road Section.
MM67	The works along the cable routes on the Local Road L58442 will be carried out during off-peak hours.

Effectiveness of Mitigation:

The use of the new access road in Byrnesgrove to avoid 2.5km of local roads in the area reduces the number of Road Users in the local community which could be affected by increased HGV traffic. Clear communication with property owners along the local roads affected by construction traffic will ensure property owners affected by increased traffic and peak traffic will have sufficient advanced notice allowing them to plan accordingly. The carrying out of cabling works during off-peak hours will also minimise any impacts to journey times for road users on the L58442 in Tinnalintan/Ballymartin. The scheduling of deliveries (not to occur) during the 12 no. concrete pour days also controls the worst-case scenario traffic flows on these 12 peak delivery days. Overall, with mitigation measures in place, it is evaluated that the residual impacts will be Slight – Moderate.

Residual Impact Significance *(post-mitigation)*:	**Slight - Moderate**

EIAR 16.3.1.2.2	**Increased Journey Time or Disruption to Road Users using Regional Roads**
Sensitive Aspect:	Road Users on regional roads
Importance:	**Moderate** (as per Section EIAR 16.3.1.1)
Impact Source(s)	Construction traffic
Impact Pathway(s)	Roads – R694, R432
Project Stage	Construction Phase

Overview of Impact (general):

The increased in traffic volumes due to the use of the roads by construction delivery vehicles, the presence of road works and the slow speed and traffic management associated with component transportation could result in delays and disruption to road users along regional roads R694 and R432, particularly during peak traffic periods.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

ORS Consulting Engineers carried out a Traffic and Transportation Assessment to evaluate the adequacy of the existing road network in accommodating the transportation demands of the development. The Assessment was carried out in accordance with TII Traffic & Transportation Assessment Guidelines. The assessment models existing traffic conditions, future years traffic growth, trip generation and distribution and capacity analysis. The findings of the Traffic and Transportation Assessment in relation to increases in journey times for road users is provided below. The full report can be found at the end of this chapter as Appendix 16.1 Traffic and Transportation Assessment. See also Figures 16.1: Construction Materials Haulage Route; Figure 16.2: Turbine Component Transport Route.

Increases in Traffic on Regional Roads: the anticipated peak traffic during the construction phase relates to the 12 days of concrete pours (i.e. one day of 70 concrete deliveries per turbine). This peak period is expected to increase passing traffic by up to 62.5% during the AM period and 59% during the PM period on R694. In relation to concrete pours for the Tinnalintan Substations, concrete deliveries are expected to increase passing traffic by up to 4% during the AM period and 4.6% during the PM period on R432. The rural road link Annual Average Daily Traffic (AADT) capacities for the R694 and the R432 Regional Roads, in the vicinity of the proposed development site are indicative and estimated at 5,000 vehicles. The R694 and R432 would continue to operate within their TII rural road link AADT capacities, with highest 2025 volume/capacity ratios of 33% (R694) and 21%(R432). Traffic during the rest of the construction phase will not result in noticeable effects on journey times with between 20 and 79 deliveries (average c.25) per day over the 12 month period. Overall, the findings indicate that these two weeks of peak construction traffic will result in a brief Moderate magnitude negative effect on the R694 regional road network during the 12 no. concrete pour days, and Low negative magnitude during the remainder of the construction phase, and on the R432.

Presence of Road Works/Traffic Management: See Figure 16.3: Location of Road Works

R432: Ballynalacken Grid Connection trenching works (907m) and construction of joint bays. Trenching and joint bay construction works on the R432 for the Ballynalacken Grid Connection are conservatively expected to proceed at an average rate of 80-100m per day, and will take c.2-3 weeks to complete. Works will be facilitated through the utilisation of one-lane closures with flagmen at the road works locations to facilitate traffic management. Due to the relatively minor extent of works, the temporary (c.2-3 week) duration, with traffic facilitated using stop/go flagmen systems, the magnitude of any effects on Road Users is evaluated as Low-Moderate on the R432.

R694: Provision of 1 no. site entrance and haul route works (HR10-HR11). Haul route works on the R694 include vegetation trimming, removal of street furniture, temporary relocation of overhead lines and the provision of hardcore at widened bends and junctions. Apart from vegetation trimming, these works mainly take place adjacent to the public road corridor and are expected to have minimal impact on journey times for road users. Duration of works and traffic management proposed for works on the R694 are expected to be 1-2 days at each location. Due to the very small extent of works, the brief (1-2 days at each location) duration, with traffic facilitated using stop/go flagmen systems, the magnitude of any effects on Road Users is evaluated as Low on the R694

Turbine Component Deliveries will use the R694 between Castlecomer and Site Entrance No.1 at Byrnesgrove. The minor groundworks at HR10, tree trimming associated with HR11 and works at Site Entrance No.1 will have

been completed prior to the commencement of turbine component transportation. During turbine component deliveries, there will be temporary removal of signage and bollards to accommodate the movement, however these activities are unlikely to affect traffic flow. The transportation of the turbine components along the regional road will proceed at slow speed, and road traffic will be controlled to facilitate the movement of the abnormal loads, however the transport of turbine components is expected to be carried out during off-peak hours and under Garda escort with traffic management in place which will limit the disruption to traffic. Due to the infrequent and low number of transportation events, carried out during off-peak hours, it is evaluated that any impacts to Road Users will be brief, infrequent and reversible and of Low-Moderate magnitude.

Overall, it is considered that the overall magnitude of the effect (Increased Journey Time or Disruption of Road Users) along the regional road network due to increased construction traffic, presence of road works and disruptions during turbine component transportation will be Moderate

Impact Magnitude	Low - Moderate	**Impact Significance: *(pre-mitigation)***	**Moderate**

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

MM62	The Traffic Management Plan will be a key construction contract document and will be implemented to safely coordinate and manage traffic during the construction works. The Traffic Management Plan will be developed in coordination with Kilkenny County Council.
MM65	The largest traffic volumes are associated with the concrete pours for the turbine foundations. No other deliveries to the windfarm will be scheduled to occur on the same days as the concrete pours.
MM63	Flag-men will be used on public roads which will be subject to one lane closure. These flagmen will control the movement of traffic on the public road, so that road users can continue to use the public road network in a in a safe and efficient manner. The works will be carried out according to the Traffic Management Plan which forms part of the Ballynalacken Windfarm Project Environmental Management Plan.
MM49	A Community Liaison Officer (CLO) will be appointed. The CLO will liaise with and keep the local community up-to-date with relevant construction work schedules, through the use of signage at selected Site Entrances, letter drops to nearest neighbours and through the Project website which will be kept up-to date. The CLO will be the point of contact for local residents for matters relating to construction traffic.

Effectiveness of Mitigation:

Due to the nature of the pouring of concrete for the turbine foundations, it is unlikely that peak periods of traffic on the R694 can be avoided, and residual impacts are likely to remain at Moderate for the 12 no. days of concrete deliveries for the turbine foundations. However, the scheduling of other deliveries (not to occur) during the 12 no. concrete pour days will control the worst-case scenario traffic flows on these 12 peak delivery days. Along the grid connection route on the R432, the use of flagmen will ensure that disruption to Road Users travelling past road works will be minimised. The delivery of turbine components during off-peak hours under Garda escort will minimise any disruption or increased journey times for road users along the regional road during the deliveries. With the implementation of the above measures, the residual impact will be Slight-Moderate

Residual Impact Significance *(post-mitigation)*:	**Slight – Moderate**

EIAR 16.3.1.2.3	**Disrupted Access to Property**
Sensitive Aspect:	Road Users
Importance:	**Moderate** (as per Section EIAR 16.3.2.1)
Impact Source(s)	Road works on the R432, L5845, L5840, L5846, and L58442
Impact Pathway(s)	Roadway
Project Stage	Construction Phase

Overview of Impact (general):

The presence of roadworks on local roads could result in disrupted access to properties, particularly along cable routes where a cable. See Figure 16.3: Location of Road Works

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

Ballynalacken Grid Connection works are anticipated to affect 7 no. residential/farm properties on the R432, and 5 no. properties on the L58442. Internal Cable Link Works along the L58442 are anticipated affect an additional 9 no. properties. There are 2 no. residential properties affected on the L5845 local roads in the vicinity of the windfarm. Road works could potentially affect access to a property for 3-4 hours. Due to the brief duration of any loss of access to properties and the low number of local residential/farm properties potentially affected, with the reversibility of effect with the backfilling of the trench or completion of road widening works at the access points, it is considered that magnitude of any effects will be Low.

Impact Magnitude	Low	**Impact Significance: *(pre-mitigation)***	**Slight**

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

MM49	A Community Liaison Officer (CLO) will be appointed. The CLO will liaise with the local community and keep them up-to-date with relevant construction work schedules, through the use of signage at selected Site Entrances, letter drops to nearest neighbours and through the Project website which will be kept up-to date. The CLO will be the point of contact for local residents for matters relating to traffic and access.
MM60	Cabling works within the public road network and public road widening will be carried out in co-ordination with Kilkenny County Council and in accordance with "Guidelines for the Opening, Backfilling and Reinstatement of Openings in Public Roads (Department of Transport, Tourism & Sport, 2017).
MM62	The Traffic Management Plan will be a key construction contract document and will be implemented to safely coordinate and manage traffic during the construction works. The Traffic Management Plan will be developed in coordination with Kilkenny County Council.
MM63	Flag-men will be used on public roads which will be subject to one lane closure. These flagmen will control the movement of traffic on the public road, so that road users can continue to use the public road network in a in a safe and efficient manner. The works will be carried out according to the Traffic Management Plan which forms part of the Ballynalacken Windfarm Project Environmental Management Plan.
MM64	Local residents likely to be affected by road works, will be kept up to date on works schedules by the Community Liaison Officer.
MM68	Trenches will be excavated to a distance of c.20m ahead of the ducting works, instead of 50m, where trenches are likely to block access to a property. In addition, steel plating will be available to cover the open trench to ensure access to property is maintained.
MM69	On the L58442 local road along the Internal Cable Link, smaller plant and machinery will be used and this plant and machinery will move off the road (i.e. into a field entrance or gateway) to facilitate access to local residents and maintain access to properties along the full length of the road. The Community Liaison Officer will liaise with local residents in order to determine the peak traffic hours

	for the local road, and the construction schedule for the Internal Cable Link will reflect the peak usage patterns of the road so that works can occur outside of peak usage periods.

Effectiveness of Mitigation:

The reduction in the length of open trenches in front of property access points will more than half the length of time that access could be blocked. The use of steel plates to provide access to vehicles across open trench will ensure no loss of access occurs. Clear communication with property owners will ensure property owners affected will have sufficient advanced notice allowing them to plan accordingly, make any necessary arrangements, the communication with property owners along the L58442 will inform the scheduling of works to occur outside of road usage times. It is considered that with the implementation of the above measures, that there will be no disruption or imperceptible disruption to properties during works.

Residual Impact Significance *(post-mitigation)*:	**Neutral**

EIAR 16.3.1.2.4	**Increased risk of road accidents**
Sensitive Aspect:	Road Users
Importance:	**Moderate** (as per Section EIAR 16.3.2.1)
Impact Source(s)	Excavations of public road pavements, road widening work, trenching works, dust/dirt, damage to road pavements
Impact Pathway(s)	Roadway
Project Stage	Construction Phase

Overview of Impact (general):

The presence of roadworks and increased traffic on public roads and the potential deposit of dirt and dust on roads could potentially increase the risk of road accidents

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

Material haulage will access the site through Site Entrance No. 1. With the exception of Site Entrance No. 1, all site entrances are off local roads. All Site Entrances and sightlines have been designed to achieve the required sightlines (145m on Regional Roads and 90m on the Local Roads) with the exception of Site Entrance No. 3 looking south (60m achieved) and Site Entrance No. 11 looking east (60m achieved). In general, local roads are very lightly trafficked, therefore the presence of vehicular movements into site entrances are unlikely to increase the risk of road accidents.

Access to the Blade Transfer Area is off the adjacent local road and not from the national road N78. The transport of the turbine components will be under escort, with Gardaí managing the movement of traffic around the convoy. As a result it is unlikely that there will be an increase in road accident risk.

Works on public roads in the study area include trenching works, road widening works and construction of site entrances. Safety signage will be erected at each works location and flagmen will be assigned to manage traffic flows. All road works will be completed under licence from Kilkenny County Council Road Section. Any Licence will include safety signage measures as standard. It is considered that there is a low potential for increased risk of road accidents.

Increased traffic and the deposition of dirt and dust on local roads can decrease the quality of pavement surfaces, potentially increasing the risk of road accidents.

Taking into consideration the low number of cyclists using the affected roads, the modest increase in traffic volumes on regional roads and in Castlecomer and Ballyragget urban areas (where most cyclists and pedestrians are likely to occur), the existing road capacity, and the enforcement of speed limits for construction vehicles, the impact on the safety of pedestrians and cyclists is anticipated to be Negligible. On local roads in the vicinity of works, pedestrians were recorded and observed using the L5846 Cromwells Road as a walking amenity, due to the narrowness of this road, it is considered that there is potential for increased risk of road accidents.

Impact Magnitude	Low increase in risk	**Impact Significance:** ***(pre-mitigation)***	**Moderate**

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

SM09	Confirmatory condition surveys involving pre-construction and post-construction inspections, high-definition video surveys and FWD surveys will be undertaken along the routes of concentrated construction traffic between the R694 and the windfarm Site Entrances and along the route of the Internal Cable Link and of the Ballynalacken Grid Connection route.
MM46	To ensure that local roads are kept clean, and site roadways are clear of mud, a road sweeper and dry wheel washes will be used. The dry wheel washes will be installed near the entrance to the public road at Site Entrance No.s 4, 5, and 9. All HGVs and other delivery vehicles, will drive over the wheel wash before leaving the site. The loose debris will be removed regularly from under the dry wheel washes, this material will be removed off site to a licenced facility.
MM58	The roadside boundary will be maintained during the construction phase and following the removal of the boundary to provide a widened transport area or to provide sightlines, a post and mesh boundary fence will be erected. This boundary will be removed immediately before the

	transportation of abnormal loads and reinstated immediately after the transportation has been completed.
MM59	Hedgerows and roadside vegetation within the visibility splays will be trimmed and maintained to ensure proper visibility of site entrances.
MM60	Cabling works within the public road network and public road widening will be carried out in co-ordination with Kilkenny County Council and in accordance with "Guidelines for the Opening, Backfilling and Reinstatement of Openings in Public Roads (Department of Transport, Tourism & Sport, 2017).
MM61	Any damage to structures or road pavements along cable routes and along concentrated construction haul routes, because of the construction works and deliveries to the works areas, will be repaired to at least as good a condition as pre-works.
MM62	The Traffic Management Plan will be a key construction contract document and will be implemented to safely coordinate and manage traffic during the construction works. The Traffic Management Plan will be developed in coordination with Kilkenny County Council.
MM63	Flag-men will be used on public roads which will be subject to one lane closure. These flagmen will control the movement of traffic on the public road, so that road users can continue to use the public road network in a in a safe and efficient manner. The works will be carried out according to the Traffic Management Plan which forms part of the Ballynalacken Windfarm Project Environmental Management Plan.
MM64	Local residents likely to be affected by road works, will be kept up to date on works schedules by the Community Liaison Officer.
MM66	The site entrance works, haul route work and road widening works on the L58451, L5845, L5846 and L5840 will not be carried out during peak delivery periods. Where feasible to do so, the road widening works will be carried out prior to the main construction period at the windfarm site. In addition, any works on the public road will be completed under licence from Kilkenny County Council Road Section.
MM34	Road traffic speed limits of 30km/hr along the local roads L5840 and L5845 at the windfarm site and along the L58442 in Tinnalintan.

Effectiveness of Mitigation:

Based on a comprehensive traffic analysis (See Appendix 16.1) considering the trip generation and road works associated with the Ballynalacken Windfarm Project, it has been determined that with the implementation of suitable temporary traffic management measures, regular road condition surveys, the widening of the local roads at the windfarm site, the regular cleaning of public roads at site entrances, and the repair of any damage to the road network, that any potential negative impacts on road safety will be effectively mitigated and that the Project can proceed without compromising road safety in the surrounding area.

Residual Impact Significance *(post-mitigation)*:	**No Likely Increase in Road Safety Risk**

EIAR 16.3.1.3 Cumulative Impact on Road Users with Other Projects

EIAR 16.3.1.3.1 Introduction to the Cumulative Evaluation for Road Users

The Ballynalacken Windfarm Project (*whose effects range from Neutral to Moderate, as per Section EIAR 16.3.1.2*) is examined hereunder for potential to have cumulative effects on Road Users with other existing and permitted projects, and projects advanced in the planning system. These projects are referred to as 'Other Projects' herein.

A Cumulative Study Area is set out below and Other Projects located within this Study Area are identified and examined for in-combination effects with the Ballynalacken Windfarm Project. The potential for off-site and secondary consequential development is also considered.

EIAR 16.3.1.3.2 Cumulative Study Areas

The cumulative study area is comprised of the R432, R694, L58451, L5845, L5846, L5840 and L58442 public roads.

Public roads already subject to road works or concentrated construction traffic at the site access points may also be affected by road works and construction traffic movement associated with Other Projects. As there are no perceptible impacts on the L5838 in relation to the met mast, there are no likely cumulative impacts with other projects.

EIAR 16.3.1.3.3 Evaluation of Cumulative Impacts

The Other Projects which occur within the Cumulative Study Area are identified in the table below and in Figure 16.7: Other Projects within the Road Users, Public Roads & Local Built Services Cumulative Study Area *(included at end of this chapter).*

The Ballynalacken Windfarm Project is examined below for cumulative effects with each of the Other Projects within the Cumulative Study Area. An evaluation of the collective cumulative impact of the Ballynalacken Windfarm Project in-combination with all the Other Projects then follows.

Table 16-7: Evaluation of Ballynalacken Windfarm Project cumulatively with Other Projects

Other Project/ Activity	Status	Evaluation of Cumulative Impact
Laois-Kilkenny Grid Reinforcement Project	Under Construction	Neutral Cumulative Impact: No cumulative impacts are expected to occur as the construction works for this grid reinforcement project will be complete prior to the commencement of the Ballynalacken Windfarm Project.
Grid Connections for Farranrory Wind Farm, Ballyragget & Parksgrove Solar Farms	Consented	See Section EIAR 16.3.1.3.4
Offsite Project – Forestry Replant Lands (outside of cumulative geographical boundary	Future activity	No Cumulative Impact: Replant lands are located outside of the cumulative study area, therefore these works will not cause cumulative impacts with the Ballynalacken Windfarm Project.
Secondary Project – Other Energy Projects connecting to Tinnalintan Substation	Potential future project, unknown	No Likely Cumulative Impact: Future connections of other energy projects which may arise due to the existence of the Tinnalintan Substation are currently not known, and in any case are likely to be constructed after the Tinnalintan Substation is built, therefore cumulative impacts unlikely to occur.

EIAR 16.3.1.3.4 Road Users on the R432 - Cumulative Evaluation

There are no Other Projects planned or with haulage routes along the regional road R694 or the local roads L58451, L5845, L5840, L5846, L5838 at the windfarm site, or the L58442 at Tinnalintan/Ballymartin. The potential for cumulative impacts to Road Users only relates to the R432.

R432: Although it is unlikely to occur, there is potential that the grid connections for the Farranrory Wind Farm and Parksgrove Solar Farm, Ballyragget Solar Farm could all be constructed during the same time period as the Ballynalacken Windfarm Grid Connection. When road works and increased traffic from all of these works (where they all occur at the same time on the R432) is considered cumulatively, it is evaluated that the collective cumulative impact on journey times would be Moderate, temporary and reversible following completion of all road works.

There will be no cumulative disruption of access to property with the Farranrory Wind Farm or Parksgrove and Ballyragget Solar Farms Grid Connection as the grid connections for these Other Projects do not overlap with the Ballynalacken Grid Connection.

In terms of damage to road pavements, each of the grid connections for the respective projects listed above will result in multiple road opening and reinstatement works. The R432 would be considered a secondary route into and out of Ballyragget and provides connectivity to a series of sparsely populated rural villages in Co. Kilkenny and Co. Laois – moderate sensitivity would apply. The predicted cumulative effects of multiple road openings due to the Other Project road opening works would increase the spatial extent and magnitude of this impact on the R432 slightly however cumulatively the impact would remain Moderate.

The Ballynalacken Windfarm Project includes the mitigation measures MM61 which ensures any damage to road pavements or buried structures are repaired to at least as good a condition as pre-works, MM62 which ensures that a Traffic & Transportation Management Plan is agreed with Kilkenny County Council and implemented during construction works, the Traffic & Transportation Management Plan will include measures for the installation of advanced signage and the use of flagmen at road work locations to facilitate the safe and timely passage of traffic around the works. Overall, the implementation of mitigation measures for the Ballynalacken Windfarm Project will lead to a residual cumulative impact of **Slight**.

EIAR 16.3.2 SENSITIVE ASPECT: PUBLIC ROADS AND LOCAL BUILT SERVICES

This detailed evaluation section for Public Roads and Local Built Services is presented as follows:

- Section EIAR 16.3.2.1 - description of the baseline environment of Public Roads and Local Built Services;
- Section EIAR 16.3.2.2 - evaluation of the impacts of Ballynalacken Windfarm Project on Public Roads and Local Built Services; and
- Section EIAR 16.3.2.3 – evaluation of cumulative impacts.

EIAR 16.3.2.1 Baseline Environment Public Roads and Local Built Services

The context, characteristics, importance and sensitivity of *Public Roads and Local Built Services* are described in the subsections below. The trends and likely evolution (i.e. Do-Nothing scenario) for this Sensitive aspect are also considered.

The impact of the proposed Ballynalacken Windfarm on Public Roads and Local Built Services was evaluated by TLI and is presented below.

EIAR 16.3.2.1.1 Baseline Characteristics of Public Roads and Local Built Services

Public Roads: The Regional Roads R694 and R432 and Local Roads L5840, L5845, L5846, L58451 and L58442 will be used to gain access to the Project site. In addition, road works will occur on these roads to install cable trenches and/or to widen the width of the public road in order to facilitate the delivery of turbine components. These roads are identified on Figure 16.1: Construction Materials Haulage Route. These roads are described in the subsections below.

Site Entrances: Access to the Project site will be established through a combination of existing and newly created entrances from the public road. There will be a total of 11 No. site entrances, consisting of 8 No. existing entrances and 3 No. newly constructed entrances. These entrances will have varying widths to accommodate the passage of turbine components during the construction phase of the windfarm. To ensure safe access and visibility, the entrances will be setback 2.4m from the road. In some cases, existing trees and hedgerows will be pruned or removed as necessary to provide clear sightlines in both directions.

Buried Structures: There are also two buried structures along cable routes, a masonry culvert (W2) under the L58442 along the Internal Cable Link route, and a masonry arch bridge (W3) under the R432 along the Ballynalacken Grid Connection route. The cables will be installed in the road surface over both of these structures, or by directionally drilling under the masonry arch bridge (W3).

Local Built Services: During consultations with Uisce Éireann, ESBN and Eir, a number of underground services were identified and mapped, and verified during site investigations. Properties in the area which are likely to be connected to these built services were also identified through desktop and field surveys. See Figure 16.4: Local Underground Services. Overhead Services are sparsely present throughout the construction works boundary, and are limited to local lines which occur along the road boundaries on the L5845, L58442 and along the R432. A 38kV OHL and 110kV OHL also cross the route of the Internal Cable Link above the L58442. See Figure 16.5: Built Services – Overhead Services.

Turbine Component Haul Route Works: Remote from the site, some works along the turbine component haulage route will take place within or adjacent to the public road corridor on the N10, N77 and along the R432. The turbine component haulage route and the location of Haul Route Works is identified on Figure 16.2: Turbine Component Transport Route. There are overhead lines present along the Turbine Component Haul Route, in particular in the town of Castlecomer where it is proposed to manoeuvre of a blade lifter (HR9 and HR10).

EIAR Figures: (included at the end of this Chapter)

Figure 16.1: Construction Materials Haulage Route
Figure 16.2: Turbine Component Transport Route
Figure 16.3: Location of Road Works

EIAR 16.3.2.1.1.1 Regional Road R694

The R694 road is an 80 km/hr road which provides a connection between Castlecomer and Ballyragget to the west. The R694 in the vicinity of the proposed development site has a road carriageway width of approximately 6-7 metres with centreline and road edge markings, with a reduced speed within the town of Castlecomer and Ballyragget of 50km/hr.

Site Entrance 1 is located along this road. 100m of hedging will be setback to provide sightlines at this entrance

EIAR 16.3.2.1.1.2 Local Road L-58451

L-58451 is a local tertiary road with a carriageway width of approximately 2.40 metres, providing access to existing premises and to farm and forestry lands. It is important to note that there are currently no road markings, signage or street lighting on this public road**.**

At the end of this cul-de-sac road, there is an existing forestry entrance, which will be used as Site Entrance No.2

EIAR 16.3.2.1.1.3 Local Road L-5845

L-5845 road is a local secondary road characterised by a carriageway width of approximately 3.0 metres, flanked by agricultural land on both sides. Along this road, there is an existing entrance that leads to a farm lane, which will be used as Site Entrance No.3 and will provide access to the Windfarm Control Building. A short section of hedging will be setback to provide sightlines at this entrance. The speed limit in this area is set at 60 km/h. It is important to note that there are no properties located in close proximity to the entrance and no road markings present in the vicinity of the existing access point. Additionally, the L-5845 road serves as a gateway to the local road L-58451.

EIAR 16.3.2.1.1.4 Local Road L-5846

L-5846 is a local secondary road characterised by a carriageway width of approximately 3.50 metres, with agricultural lands on both sides. The speed limit on this road is 80 km/h. Along the L-5846, there is an existing field entrance on the southern side of the L-5846 that will be widened as Site Entrance No.4 to access to T6, T5, and to Temporary Borrow Pit No. 1. In addition, a new entrance (Site Entrance No.5) will be constructed along the northern side of the L-5846 road. Hedgerows will be removed to offer a clear sightlines of 90 metres at each of these entrances. It is important to note that there are no street lighting or road markings present in the vicinity of either access point or domestic properties and sheds.

EIAR 16.3.2.1.1.5 Local Road L-5840 (Cromwell's Road)

L-5840 road is classified as a local secondary road and features a carriageway width of approximately 3 metres. Along this road, there is one new entrance to provide access to various locations such as T7 and temporary Construction Compound (Site Entrance No.6), and three existing entrances that provide access to T8 (Site Entrance No.7), and T9, T10, T11, T12, and Borrow Pit No. 2 (Site Entrance No.8 and Site Entrance No.9). The speed limit within this area is set at 60 km/h. Sightlines will be provided at all 4 No. Site Entrances along this road.

It is important to note that there are no properties in close proximity to these entrances. Furthermore, there are currently no road markings present in the vicinity of the existing access point.

EIAR 16.3.2.1.1.6 Regional Road R432

The R432 road is an 80 km/hr regional road, which runs north–south from the R430 in Abbeyleix, County Laois to the N77 in Ballyragget, County Kilkenny. The R432 in the vicinity of the proposed development site has a typical rural road carriageway width of 6.0 metres, with centreline and road edge markings.

The Ballynalacken Grid Connection cables will be installed under this road, and this road will also be used to access the Internal Cable Link construction works area and the Tinnalintan Substation site.

EIAR 16.3.2.1.1.7 Local Road L-58442

L-58442 is a local road with a carriageway width of approximately 3.50 meters. An existing field entrance will be utilised to provide access to the Tinnalintan Substation and temporary Construction Compound No.3. It is worth noting that there are no road markings, signage or street lighting present in the vicinity of the entrance. This existing entrance also provides access to local soccer club.

The Ballynalacken Grid Connection cables will be installed under this road between the Site Entrance No.11 to Tinnalintan Substation, with Internal Cable Link cables also to be installed under this road further east past the site entrance to the Tinnalintan Substation site

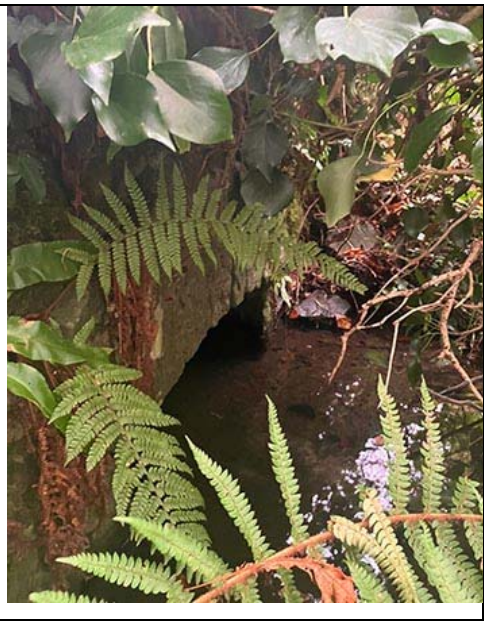
EIAR 16.3.2.1.1.8 Local Road L5838

Traffic on Local Road L5838 (Site Entrance No.10), will only be used for the construction and access to the met mast. Anticipated traffic volumes associated with the construction of the met mast site will be very small (15 no. loads in total), with 2 visits per year to inspect/maintain the mast.

EIAR 16.3.2.1.1.9 National Roads N10 and N78

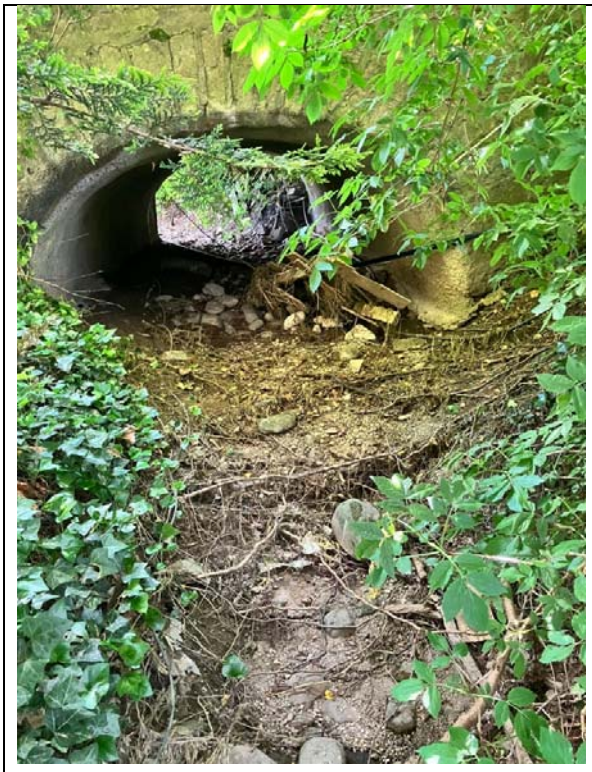
These National roads are typical of National Roads in general and are in good condition with a well maintained surface along the route. The Blade Transfer (HR8) area is located adjacent to the N78. Construction access to the Blade Transfer area will be from an existing field gate on the Local Road L1844. Movement of blades to and from the Blade Transfer Area during turbine haulage will also utilise this entrance. This will negate the requirement for a new entrance off the National Road.

EIAR 16.3.2.1.1.10 Buried Structure under L58442



There are some pvc pipe culverts and one masonry culvert below the L58442. All culverts have been surveyed and are in good condition. The pictures above are of the masonry culvert at W2. The Internal Cables Link will be installed above this structure.

EIAR 16.3.2.1.1.11 Buried Structure under the R432



The above photograph shows bridge under the R432. The Grid Connection will be installed in the deck of this structure within the road corridor, or by directionally drilling under the bridge.

EIAR Figures: (included at the end of this Chapter)

Figure 16.1: Construction Materials Haulage Route
Figure 16.2: Turbine Component Transport Route
Figure 16.3: Location of Road Works

EIAR 16.3.2.1.2 Existing Sources of Impacts to Public Roads and Local Built Services

There is no existing damage to the Public Roads and Local Built Services is taking place at the Project site.

EIAR 16.3.2.1.3 Importance of Public Roads and Local Built Services & Sensitivity to Change

Importance: It is considered that public electricity and water supply is highly valued, as it is likely to be the sole source of water for most Uisce Éireann customers, and the sole source of electricity. While there are alternatives available for communication and broadband services, the Eir network is the nonetheless considered to be valued locally.

According to the Department of Transport, Regional and Local Roads are important from economic, social and political perspectives. These roads serve an important economic role in the Irish context and also have valuable social and community functions. Regional routes will be the most highly valued routes in terms of the volume of road users who will use these roads on a daily basis.

Overall, the importance of the Public Roads and Local Built Services are considered to be **Moderate**.

Sensitivity to Change: Public Roads and Local Built Services are sensitive to any temporary loss of built services due to damage to roads, pipes, cables or overhead lines or due to planned outages in service supply.

Based on the IMPERIA methodology, outlined in Appendix 16.4, Public Roads and Local Built Services are evaluated as having **Moderate** Sensitivity due to the low number of users on the roads and the very low number of Uisce Eireann, Eir and ESBN customers potentially affected.

EIAR 16.3.2.1.4 Evolution of the Baseline Environment (the 'Do-Nothing' scenario)

Trends in Key Indicators over time:

The public road network is continually maintained throughout the year by Kilkenny County Council. This trend is likely to continue. No new road schemes proposed in the vicinity of the works.

Irish Water are currently undertaking a national programme of works on their networks to reduce leakage and improve water supply nationally. While no improvement plans are currently underway on the network along the R432/L58442, there is potential for improvement works to take place in the future.

The local electricity distribution network is being continuously upgraded through refurbishment programs and expanded through new connections, though this is happening slowly, particularly in rural areas such as the study area. The transmission system network has undergone substantial upgrade and improvement in the area in recent years with the build out of the Laois-Kilkenny Reinforcement Project which included the construction of a GIS substation and new 110kV overhead lines. An extension of the existing substation compound at Moatpark is currently proposed in the planning system. No other upgrade or improvement works on the transmission system are currently proposed.

In recent years the popularity and adoption of mobile telephones and mobile broadband has grown significantly and the dependence on fixed line telephone service using traditional overhead lines or underground cables was decreasing, although the rollout of National Broadband has seen the upgrade of the overhead network to include fibre-optic cables to supply fibre broadband to homes and businesses connected to the network. This trend is likely to continue into the future.

The number of residences, businesses and community facilities in the area is likely to increase slowly in line with increases in the population of the area. According to Chapter 17 Population & Human Health (Section EIAR 17.3.1.1.4) *Census and CSO data relating to population and standard of living provide insight into key trends in the Study Area. Five of the six EDs contained in the Study Area recorded population growth of 1% - 5% between 2016 and 2022. This is lower than the national average (8%) and reflects the rural nature of the area. Durrow ED was the one exception, recording growth of 10% over the period. The Ballynalacken Windfarm Project will be operated on a permanent basis. It is expected that the local population will grow in line with, albeit possibly at a slower rate, the national average.* As population trends and network upgrades are happening slowly, it is assumed that the existing baseline environment for Public Roads and Local Built Services, described above, will be the receiving environment during the construction stage of the subject development.

Climate Change: An increase in unpredictable extreme weather events (i.e. storms, flooding) has the potential to affect the structural integrity of road pavements and buried structures, while local service users could be affected by interrupted electricity and internet supply as a result of falling trees.

EIAR 16.3.2.2 Impact Evaluation – Public Roads and Local Built Services

This Section comprises an evaluation of the likely significant impacts of the proposed Ballynalacken Windfarm Project on the receiving environment. Moderate, Slight, Imperceptible and Neutral Impacts are also taken into consideration.

The impacts are presented/evaluated as follows:

a) Significant Impacts which are likely or have potential to occur, are subject to detailed evaluation;

b) Moderate or Slight Impacts, which are likely or have potential to occur, are subject to detailed evaluation;

c) Non-significant impacts of local concern or considered important enough to merit detailed evaluation;

d) Neutral or Imperceptible Impacts are scoped out from detailed evaluation, and a short evaluation is provided in the table below. Unlikely Impacts are also scoped out.

Table 16-8: Scoping of Impacts to Public Roads and Local Built Services

Likely/Potential Impact	**Evaluation**
Non-significant impacts considered important enough (or of local concern) – see detailed evaluation	
Construction Phase: Damage to Regional and Local road pavements	*Section 16.3.2.2.1 EIAR*
Construction Phase: Damage to bridges and culverts	*Section 16.3.2.2.2 EIAR*
Construction Phase: Loss of local public water supply	Section 16.3.2.2.3 EIAR
Construction Phase: Loss of local electricity or telephone/fibre services	*Section 16.3.2.2.4 EIAR*
Neutral or Imperceptible Impacts, or where no impact is likely to occur – evaluation below	
Construction Phase: Damage to National Road pavements or decrease in structural integrity	No Likely Impact: For roads M9, N10, N77 and N78 due to imperceptible impacts. Road openings are not scheduled for any of these route corridors. Haul route works on these roads are minor, limited to the temporary removal of street furniture and vegetation and the provision of hardcore at 4 no. roundabouts. While an increase in HGV movements is anticipated, each of these roads are structurally capable of accommodating the increase in heavy vehicle movements. These National roads are in good condition with a well-maintained surface along the route. Deterioration of the structural integrity of these roads as a result of construction traffic or transportation of turbine components is not anticipated.
All Phases: Damage to road boundaries	Neutral Impact: The principal interaction between project activities and the road boundary relates to the set-back of certain roads to allow for sufficient sightlines at the site entrances and road widening works along the L5845, L5846 and L5840m. The road at site entrances will be widened either side of the new site entrances to provide sufficient sightlines. The design of the site entrances includes the reinstatement of the roadside boundary using post and mesh fencing behind the sightlines. The preliminary design of the site entrances has been agreed with Kilkenny County Council Roads Department, and the final design will be confirmed with Kilkenny County Council prior to the commencement of construction works. Road widening works will involve the permanent removal of a c.0.5m of roadside verge and underlying soils on both sides of the existing road carriageway, and the laying of hardcore along the excavated verges to create a suitable load-bearing surface. There will be no removal of roadside boundary fences required, therefore no effect is anticipated.

	Widening will occur at certain locations along the turbine component haul route, particularly at junctions with fencing removed temporarily. In addition, the existing field entrance at HR8 will be widened to accommodate the movement of the blade trailers. These boundaries will be reinstated along the original alignment with post and mesh fencing with socket fittings. The junctions and entrances may need to be temporarily rewidened for (infrequent) turbine component transport during the operation phase. Junctions and entrances will again be widened to facilitate decommissioning activities during the decommissioning phase.
Construction, Operation & Decommissioning Phases: Damage to road L5838	Imperceptible Impacts: The L5838 will be used for construction, operation and decommissioning of the Met Mast. Traffic associated with the Met Mast will be very small therefore impact to the L5838 will be imperceptible.
Operation & Decommissioning Phases: Damage to road pavements, bridges and culverts	Imperceptible Impacts: Following the completion of construction works, due to the very low traffic volumes associated with the Project, deterioration (wear and tear) to the local or regional road network or buried structures are not expected to occur. No further road opening works or works near buried structures are required during the windfarm's (including the Internal Cable Link) operational or decommissioning phases. Following its construction and commissioning, the Ballynalacken Grid Connection will become an asset on the national electricity system, owned and operated by ESBN/Eirgrid, the operation of the underground 110kV cables will involve very infrequent planned maintenance/ unplanned repairs, testing and maintenance of cables. These works will be carried out via the joint bays installed along the R432, and therefore no effect is anticipated on the public road pavement.
Operation & Decommissioning Phases: Interrupted or disrupted access to property	No Likely Impact: Due to neutral impacts. There are no works associated with the operation or decommissioning phases which have the potential to interrupt or disrupt access to property. Any infrequent maintenance or unplanned repairs (if they occur at all) to the Ballynalacken Grid Connection are expected to involve reopening joint bays for very short periods of time, however no joint bays for underground cabling are located across any property entrances with just 2 no. joint bays expected on the R432 public road corridor. No potential for impact.
Operation & Decommissioning Phases: Loss of public water, telephone/fibre, electricity supply	Neutral Impact: With the exception of Site Entrance No. 1 and No. 11, there are no other instances of overhead lines in the vicinity of the windfarm. Any haulage of large machines during the operation and decommissioning will be planned and goal posts erected if required. No damage to the overhead lines are likely to occur. Any works done to accommodate the blade haulage through Castlecomer town (HR9 and HR10) are likely to still be in place during the operation and decommissioning phases. While some lines might require realignment, any impact is anticipated to be very short term and reversible.

EIAR 16.3.2.2.1	**Damage to Regional and Local Road Pavements**
Sensitive Aspect:	Public Roads and Local Built Services
Importance:	**Moderate** (as per Section EIAR 16.3.1.1)
Impact Source(s)	Excavations of public roads and road pavements, excavations for cable trenches and joint bays, construction/delivery traffic
Impact Pathway(s)	Roads – R432, L5845, L58451, L5846, L5840, L58442
Project Stage	Construction Phase

Overview of Impact (general):

Road pavements comprise the hard surfacing of the road, along with the supporting subgrade underneath. The roadside verge and drainage influence the quality of road edges and road condition. Road pavements can be damaged by excavations of the surface and also by large volumes of additional traffic. The use, widening or opening of site access points can also lead to deterioration of the road edge.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

Road works and works adjacent to public road pavements

R694: The R694 will be used to access the windfarm site, with the provision of 1 no. site entrance at Byrnesgrove – Site Entrance No.1. Works will also take place immediately adjacent to the road pavement at Haul Route Works HR10 where a hardcore area will be provided at a junction just outside of Castlecomer town. Due to the use of hardcore at the new site entrance and at HR10, these works are expected to have a negligible impact on the structural integrity of the road edge. No road openings are required for the R694 pavement.

L5840: 4 no. site entrances, road widening works (2150m) and Haul Route Works (HR12).

L5845: Trenching works for the Internal Cable Link (crossing the road at one location), the provision of 1 no. site entrance, road widening works (750m) and Haul Route Works (HR12 & HR13).

L5846: Trenching works for the Internal Cable Link (crossing the road at two locations), the provision of 2 no. site entrances and road widening works (850m).

L58442: Provision of 1 no. site entrance at an existing field entrance, and trenching works for the Internal Cable Link (950m) and Ballynalacken Grid Connection (390m) in the road pavement or road verge, and the construction of Joint Bays along the routes on the public road.

R432: Cable trenching works for Ballynalacken Grid Connection between the L58442 and the existing Eirgrid Ballyragget Substation at Moatpark (907m in total). Works also include the construction of joint bays along the route.

Cable trenching works will involve the excavation of a trench 0.6m wide and 1.25m deep and the provision of joint bays at regular intervals along the cable routes. These joint bays will be temporarily reinstated after the joint bay is constructed; after cable pulling; and after cable jointing. Following the electrical commissioning, the road surface over the joint bays will be permanently reinstated. Due to the existing stability of these roads, and the progressive linear nature of the works with the trenches backfilled daily, no instability of the pavement is expected to occur. In relation to the quality of the road pavement above the trench, without mitigation in place to reinstate the road surface, effects are likely to be of Moderate magnitude.

Road widening works (L5840, L5845 and L5846) will involve the permanent removal of approximately 0.5m of roadside verge and underlying soils on both sides of the existing road carriageway, and the provision of a public road pavement widened to 4.5m to facilitate the delivery of turbine components and construction materials to the project site. This is likely to result in a positive impact on road structures, though given the low usage of the roads, any effects will be Low positive.

Road edges at site entrances or haul route works locations are not expected to be materially affected due to the use of hardcore to provide a widened surface to accommodate access requirements at/to the site. Any impacts to the edge of road pavements will be Low magnitude.

Increase in traffic/HGV movements

Regional Roads are in good condition with a well-maintained surface along the route. Deterioration of the structural integrity of these roads as a result of construction traffic or transportation of turbine components is not anticipated. Local roads vary in condition from good to moderate, with evidence of uneven surfaces and

puddles at certain locations. These roads are built on firm ground and primarily of 'cut and fill' construction. The deterioration of road edges or reduction in the integrity of road pavements due to the additional construction traffic is not expected to occur. While an increase in HGV movements is anticipated, the road is structurally capable of accommodating the increase in heavy vehicle movements as a result of the construction of the Ballynalacken Windfarm Project.

Impact Magnitude	Low – Moderate	**Impact Significance: *(pre-mitigation)***	**Slight - Moderate**

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

SM09	Confirmatory condition surveys involving pre-construction and post-construction inspections, high-definition video surveys and FWD surveys will be undertaken along the routes of concentrated construction traffic between the R694 and the windfarm Site Entrances and along the route of the Internal Cable Link and of the Ballynalacken Grid Connection route.
MM61	Any damage to structures or road pavements along cable routes and along concentrated construction haul routes, because of the construction works and deliveries to the works areas, will be repaired to at least as good a condition as pre-works.
MM46	To ensure that local roads are kept clean, and site roadways are clear of mud, a road sweeper and dry wheel washes will be used. The dry wheel washes will be installed near the entrance to the public road at Site Entrance No.s 4, 5, and 9. All HGVs and other delivery vehicles, will drive over the wheel wash before leaving the site. The loose debris will be removed regularly from under the dry wheel washes, this material will be removed off site to a licenced facility.
MM34	Road traffic speed limits of 30km/hr along the local roads L5840 and L5845 at the windfarm site and along the L58442 in Tinnalintan.
MM59	Hedgerows and roadside vegetation within the visibility splays will be trimmed and maintained to ensure proper visibility of site entrances.
MM60	Cabling works within the public road network and public road widening will be carried out in co-ordination with Kilkenny County Council and in accordance with "Guidelines for the Opening, Backfilling and Reinstatement of Openings in Public Roads (Department of Transport, Tourism & Sport, 2017).

Effectiveness of Mitigation:

Measures to control speeds, maintain sightlines, and keep roads clean will help to reduce the potential for damage to road pavements. However, by conducting both pre-condition and post-condition surveys, this will allow for the accurate evaluation of all post-construction reinstatement works on public roadways. The road reinstatement following the completion of works within the public road corridor, will ameliorate any impacts to road pavements, and it is therefore considered that no permanent impacts to road pavements as a result of construction activities are likely to occur.

Residual Impact Significance *(post-mitigation)*:	**Neutral**

EIAR 16.3.2.2.2	**Damage to bridges and culverts**
Sensitive Aspect:	Public Roads and Local Built Services
Importance:	**Moderate** (as per Section EIAR 16.3.1.1)
Impact Source(s)	Excavations of public roads and road pavements, excavations for cable trenches, construction/delivery traffic
Impact Pathway(s)	Roads
Project Stage	Construction Phase

Overview of Impact (general):

Bridges and culverts within the Ballynalacken Windfarm construction works areas provide crossing structures over watercourses. These structures are important from a transport and travel perspective and are important for road safety. They have the potential to be impacted negatively upon by construction works associated with the Ballynalacken Windfarm Project.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

There is 1 no. bridge and 1 no. culvert located on the public road which have the potential to be impact upon by the proposed development.

Bridge at W3 on the R432: Watercourse crossing W3 is a single-arch masonry bridge located on the R432 along the Ballynalacken Grid Connection route. The bridge structure was found to be in good condition during surveys. It is proposed to cross this buried structure by either trenching over the existing bridge or by directional drilling under the bridge. If the grid connection is installed in the deck of the bridge then the cables will be laid in flat formation in order to minimise the depth of the excavation and the interaction with the bridge structure. The flat formation cable trench will be 1.2m wide and 0.7m deep within the public road pavement over the bridge. Additional road surface will be placed over the bridge to build up the cover over the cables. For safety reasons, the bridge parapets will be increased in height. The works to the parapet walls will involve the construction of masonry walls in keeping with the vernacular character of the existing parapets. See Drawing Number - BWF-39 in the Drawings Pack. This structure is also considered in Chapter 15 Cultural Heritage.

If the grid connection is installed under the bridge structure using directional drilling, this will involve the opening of 2 drill pits on the public road on each side of the bridge, c. 50m from the bridge, and drilling cores for the cable ducts to a depth of minimum 2m under the watercourse under the bridge.

It is considered that either option (i.e. in the deck or by directional drilling) to instal the Ballynalacken Grid Connection cables will have no impact upon the structural integrity of the buried structure at W3.

Culvert at W2 on the L58442: Watercourse crossing W2 is a small masonry culvert located on the L58442 along the route of the Internal Cable Link. Surveys of the culvert show adequate cover to install cable over the structure. It is proposed to cross this watercourse by trenching over the existing culvert, installing the cables in flat formation in a trench 0.75m wide and 0.68m deep within the public road pavement over the culvert. This structure is also considered in Chapter 15 Cultural Heritage. It is considered that the installation of the Internal Cable Link cables will have no impact upon the structural integrity of the buried structure at W2.

There are also a number of small pipe culverts crossing under the L58442 and L5845. The cable trench will be installed under these pipes, which are typically pvc pipes. No impacts to these drains are expected to occur.

As these buried structures are not located along the proposed turbine component haul route, nor the route of any significant construction traffic, impacts to the buried structures from an increase in traffic volumes are not anticipated.

Impact Magnitude	Negligible	**Impact Significance:** ***(pre-mitigation)***	**No Likely Impact**

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

MM60	Cabling works within the public road network and public road widening will be carried out in co-ordination with Kilkenny County Council and in accordance with "Guidelines for the Opening, Backfilling and Reinstatement of Openings in Public Roads (Department of Transport, Tourism & Sport, 2017).

MM61	Any damage to structures or road pavements along cable routes and along concentrated construction haul routes, because of the construction works and deliveries to the works areas, will be repaired to at least as good a condition as pre-works.
Effectiveness of Mitigation: Standard construction practices will include the full permanent reinstatement of the road surface over these buried structures in accordance with typical conditions of a Road Opening Licence and in accordance with the Department of Transport, Tourism & Sport *Guidelines for Managing Openings in Public Roads*. The repair of any damage to culverts to at least as good a condition as pre-works will ameliorate any effects to the buried structures.	
Residual Impact Significance *(post-mitigation)*:	**Neutral**

EIAR 16.3.2.2.3	**Loss of local public water supply**		
Sensitive Aspect:	Public Roads and Local Built Services		
Importance:	**Moderate** (as per Section EIAR 16.3.2.1)		
Impact Source(s)	Excavations		
Impact Pathway(s)	Physical contact		
Project Stage	Construction Phase		

Overview of Impact (general):

Excavation works associated with the construction of the Ballynalacken Grid Connection are proposed for the R432 and L58442, beneath which Uisce Éireann water mains infrastructure is located.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

The Ballynalacken Grid Connection trenching crosses an Uisce Éireann lateral line at four locations (two along the R432, one along the L58442 and one in agricultural field). c.12 no. properties are serviced by these Uisce Éireann lateral lines. In accordance with the feedback received from Uisce Éireann during pre-planning consultation, it is proposed to install the Ballynalacken Grid Connection Cable below the Uisce Éireann lateral lines. See Drawing Number – BWF-24 in the Drawings Pack.

Should a disruption to supply occur due to accidental rupture of an Uisce Éireann water pipe, very few properties would be affected due to limited extent of network affected, and any effects would be temporary (1 day) and reversible. Given the temporary duration of the works, the limited extent of the Uisce Éireann network potentially affected and the brief duration of any potential effects, the magnitude of any effects will be Low.

Impact Magnitude	Low	**Impact Significance:** ***(pre-mitigation)***	**Imperceptible**

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

SM10	Confirmatory consultations with Uisce Eireann, Eir, ESB Networks, and Gas Networks Ireland and confirmatory ground surveys at service locations will be carried out ahead of, and throughout, the cabling, site entrance and haul route works in close proximity to existing overhead and underground services.
MM49	A Community Liaison Officer (CLO) will be appointed. The CLO will liaise with the local community and keep them up-to-date with relevant construction work schedules, through the use of signage at selected Site Entrances, letter drops to nearest neighbours and through the Project website which will be kept up-to date. The CLO will be the point of contact for local residents for matters relating to the construction works.
MM57	'Goal Posts' will be used to identify and highlight the height of nearby overhead lines; all excavation works and use of large plant in close proximity to services will be supervised by a banksman; and a stock of repair materials will be kept at active works locations along the public road.

Effectiveness of Mitigation:

Through Project Design Measures including the supervision of works, consultation with Uisce Éireann and confirmatory surveys of works locations ahead of works and stocking of repair materials at works locations, it is unlikely that any potential impacts to public water supply will occur.

Residual Impact Significance *(post-mitigation)*:	**Neutral**

EIAR 16.3.2.2.4	**Loss of local electricity or telephone/fibre services**
Sensitive Aspect:	Public Roads and Local Built Services
Importance:	**Moderate** (as per Section EIAR 16.3.2.1)
Impact Source(s)	Excavations, movement of machinery, facilitating works for component transport
Impact Pathway(s)	Physical contact, physical removal
Project Stage	Construction Phase (mainly), also Operational and Decommissioning Phases in relation to turbine component transportation events.

Overview of Impact (general):

Excavation and groundworks along the public road corridor or on adjacent lands have potential to physically damage overhead or underground electricity or telephone/fibre cables or lines. At some locations, a planned outage or redirection of the services will be required in order to remove overhead lines at some locations along the turbine component haul route.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

Vicinity of the Ballynalacken Windfarm/Internal Cable Link/Ballynalacken Grid Connection

With the exception of Site Entrance No. 1 and No. 11, there are no other instances of overhead lines in the vicinity of the windfarm. Along the Internal Cable Link Route there are a number of overhead electricity lines, and overhead telephone lines alongside the road boundary. The Ballynalacken Grid Connection works will also take place in close proximity to overhead lines, and in addition there is an underground Eir and ESB services mapped along the route. It is considered unlikely that the overhead lines would be damaged, as standard construction practices would include the use of goal-posts to identify the overhead line, in order to minimise the risk of the machine operator coming into contact with it. Similarly, it is standard practice for a banksman to supervise excavation works in the public road, and therefore unlikely that the underground cables would be damaged. However, in a worst case scenario where lines or cables are damaged during construction works, any effects to end users would be brief and reversible with the repair of any damage and restoration of supply, the number of users affected would be very low, and it is therefore considered that the magnitude would be Low.

Castlecomer town

As part of the haulage of wind turbine blades, a blade lifter will be use to navigate the turbine blades through Castlecomer Town. This manoeuvre will be conducted under Garda escort and coordinated with Kilkenny County Council. In order to lift the blade into the air the overhead lines in The Square, along High Street and Barrack Street of Castlecomer Town, will need to be removed through realignment or rerouting.

The photographs below show the overhead line infrastructure which would need to be relocated in Castlecomer town. This will be done in consultation with the service providers.

HR9 - High Street & The Square

HR10 - Barrack Street

Should a disruption to supply occur during realignment or rerouting, then, the effects to end users of these services would be brief (1 day) and reversible with the restoration of service. In addition, these works would be planned, and therefore service users can be warned ahead of the works. Overall, it is considered that any effects to Built Services and end users in Castlecomer town would have a Low magnitude.

Impact Magnitude	Low	**Impact Significance: *(pre-mitigation)***	**Imperceptible**

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

MM70	Service owners of overhead lines in Castlecomer town will be consulted prior to the commencement of haul route works in the town, to request that the overhead lines are rerouted or realigned so that the lines do not impede the turbine component transportation. End users will be notified of any planned outages.

Effectiveness of Mitigation:

The carrying out of the re-routing/realignment of overhead services in coordination with the service owners will minimise the impacts on the end users of these services, and any impacts will be imperceptible or none.

Residual Impact Significance *(post-mitigation)*:	**Neutral**

EIAR 16.3.2.3 Cumulative Impact on Public Roads and Local Built Services with Other Projects

EIAR 16.3.2.3.1 Introduction to the Cumulative Evaluation for Public Roads and Local Built Services

The Ballynalacken Windfarm Project (*whose effects are Neutral, as per Section EIAR 16.3.2.2*) is examined hereunder for potential to have cumulative effects on Public Roads and Local Built Services with other existing and permitted projects, and projects advanced in the planning system. These projects are referred to as 'Other Projects' herein.

A Cumulative Study Area is set out below and Other Projects located within this Study Area are identified and examined for in-combination effects with the Ballynalacken Windfarm Project. The potential for off-site and secondary consequential development is also considered

EIAR 16.3.2.3.2 Cumulative Study Areas

Local Service Users connected to:

- Underground pipes or cables within the Ballynalacken Windfarm construction works boundary
- Overhead lines within 7m of the Ballynalacken Windfarm construction works boundary to allow for machinery movement.

The extent of the study area is from the fault point to the nearest valve/transformer/cabinet.

Local road users on public roads associated with Ballynalacken Windfarm may also be affected by Other Projects. The potential for cumulative effects are limited to those local service users that can be directly affected by the Ballynalacken Windfarm Project in the first instance.

EIAR 16.3.2.3.3 Evaluation of Cumulative Impacts

The Other Projects which occur within the Cumulative Study Area are identified in the table below and in Figure 16.7: Other Projects within the Road Users, Public Roads & Local Built Services Cumulative Study Area *(included at end of this chapter).*

The Ballynalacken Windfarm Project is examined below for cumulative effects with each of the Other Projects within the Cumulative Study Area. An evaluation of the collective cumulative impact of the Ballynalacken Windfarm Project in-combination with all the Other Projects then follows.

Table 16-9: Evaluation of Ballynalacken Windfarm Project cumulatively with Other Projects

Other Project	Status	Evaluation of Cumulative Impact
Laois-Kilkenny Grid Reinforcement Project	Under Construction	Neutral Cumulative Impact: No cumulative impacts are expected to occur as the construction works for this grid reinforcement project will be complete prior to the commencement of the Ballynalacken Windfarm Project.
Grid Connections for Farranrory Wind Farm, Ballyragget/ Parksgrove Solar Farm	Consented	See Section EIAR 16.3.2.3.4
Offsite Project – Forestry Replant Lands (outside of cumulative geographical boundary)	Future activity	No Cumulative Impact: Replant lands are located outside of the cumulative study area, therefore these works will not cause cumulative impacts with the Ballynalacken Windfarm Project.

Other Project	Status	Evaluation of Cumulative Impact
Secondary Project – Other Energy Projects connecting to Tinnalintan Substation	Future project, unknown	No Likely Cumulative Impact: the potential for a future project to connect to the Tinnalintan Substation is not foreseeable during the construction phase of the Ballynalacken Project, and therefore the likelihood of cumulative impacts occurring can be excluded.

EIAR 16.3.2.3.3.1 Cumulative Evaluation: Multiple Works on/adjacent to the R432

The only Other Projects likely to interact with the Ballynalacken Windfarm Project is the underground cabling works associated with the grid connections of Farranrory Wind Farm and Ballyragget & Parksgrove Solar Farms on the Regional Road R432 as all could potentially connect to the Ballyragget 110kV Substation during the same general time period. There is potential for the damage of overhead or underground services as a result of any or all of the works associated with these projects. However, it is considered that due to the low number of end users potentially affected, with repair of damage to underground pipes, cables or overhead lines generally straightforward with service reinstated within 1-2 days, that any combined loss of services due to damage from more than one project, is considered to be reversible and brief in duration and of Low magnitude, and therefore Imperceptible cumulative significance.

EIAR 16.3.3 SENSITIVE ASPECT: AIRBORNE SIGNALS & AVIATION

This detailed evaluation section for Airborne Signals & Aviation is presented as follows:

- Section EIAR 16.3.3.1 - description of the baseline environment of Airborne Signals & Aviation;
- Section EIAR 16.3.3.2 - evaluation of the impacts of Ballynalacken Windfarm Project on Airborne Signals & Aviation; and
- Section EIAR 16.3.3.3 – evaluation of cumulative impacts.

EIAR 16.3.3.1 Baseline Environment – Airborne Signals & Aviation

The context, characteristics, importance and sensitivity of *Airborne Signals & Aviation* are described in the subsections below. The trends and likely evolution (i.e. Do-Nothing scenario) for this Sensitive aspect are also considered.

The impact of the proposed Ballynalacken Windfarm on Airborne Signals and Aviation was evaluated by AiBridges and is presented below. Please refer also to Appendix 16.2: Telecommunications Impact Assessment Report.

EIAR 16.3.3.1.1 Existing Airborne Telecommunication Networks

Airborne telecommunication networks are systems of interconnected communication equipment or devices that facilitate communication over long distances and relate to the wireless airborne signals from and between telecommunication masts which provide wireless services to private, public and commercial users.

Preliminary consultations with 15 telecom operators was carried out, the responses received are outlined in the table below:

ID	Operator	Issues Raised
1	2RN	No issues regarding transmission links. However, 2RN have requested that a protocol document be signed should the wind farm go ahead (regarding the TV broadcast service in the area).
2	Broadcast Authority of Ireland (BAI)	No issues
8	Irish Aviation Authority (IAA)	No response. (No response expected.)
9	Kilkenny County Council	No response. (No response expected.)
15	ComReg	No response received.
14	Vodafone Ireland	No issues.
3	BT Ireland	No issues
13	Virgin Media	No issues.
5	Enet	No issues.
4	Eir	Eir have raised a concern regarding three Licensed PTP microwave radio links.
6	ESB Networks	ESB have stated that the proposed wind turbines “may cause significant impact to ESB’s various radio networks”.
7	Imagine Broadband	Imagine Broadband have raise a concern regarding two Licensed PTP microwave radio links.
10	Tetra Ireland (TI)	Tetra Ireland have raise a concern regarding the proximity of the turbines to their basestation at Ballyouskill.

11	Three Ireland	Three Ireland have raised a concern regarding two Licensed PTP microwave radio links.
12	Viatel	No response.

Following the concerns raised by Eir, ESB, Imagine Broadband, Tetra Ireland, and Three Ireland, surveys were undertaken of the Ballyouskill Masts to gather information on the size, bearing and height of the antennas installed on each of the masts, and then desktop modelling was then carried out using a telecommunications industry radio planning tool. The radio planning tool graphically shows the airborne signals in relation to the turbines.

The modelling resulted in the adjustment of the turbine locations and informed the final layout of the wind turbines, and in general, the final layout of the wind turbines avoids airborne signals at the site. Two Point to Point (PTP) microwave radio links remain potentially affected by the wind turbines, however effective mitigation strategies are available for both of these links:

- Eir PTP microwave radio link between Ballyouskill and Kilmadum;
- ESB Networks PTP radio link between Ballyouskill and Glencoumwood.

The modelling can be found in full in Appendix 16.2 Telecommunications Impact Assessment Report

EIAR Figures (included at the end of this Chapter)

Figure 16.6: Location of Telecom Infrastructure

EIAR 16.3.3.1.2 Aviation

Aviation relates to aircraft and helicopters and associated airports, radar stations and private airfields/heliports.

In order to evaluate the potential for the Ballynalacken turbines to affect aviation, a review of public and private airport/airfield and helipad locations was undertaken, and the location of the proposed wind farm in relation to the exclusion zones around airfields and helipads was determined. This process is detailed in Appendix 16.3 Aviation Review Statement, and a summary of the findings is presented below:

Waterford Airport: AiBridges examined the location of the Ballynalacken turbines in relation to Waterford Airport and found that the nearest Ballynalacken turbine is c.71km to the airport, and as a result will be located outside the Outer Horizontal Surface; outside the Total Manoeuvring Area (extends 45km around the airport) which is used for circling and manoeuvring by aircraft; outside the Building Restricted Area; outside the Minimum Sector Altitude sectors for the airport, and c.71km from the communication equipment and antennaes at the airport. Therefore, it is evaluated that the proposed Ballynalacken turbines will not affect the operation of Waterford Airport.

However, the proposed turbines would be required to be included in the IAA Electronic Air Navigation Obstacle Dataset. This is standard protocol for wind turbines and any other tall structures in Ireland.

Radar Surveillance Systems at Shannon, Dublin Airport and Woodcock Hill (northwest of Limerick): the proposed turbines will be over 90km from these radar stations, and as a result the turbines will be located within ''Zone 4 – No Assessment'' area, and no effects on these radar stations is expected.

Irish Air Corps: the proposed Ballynalacken Windfarm is located outside of the restricted areas around Baldonnel airfield and therefore would have no impact on the Irish Air Corps activities.

Garda Air Support Unit (GASU): the GASU operates out of Casement Aerodrome at Baldonnel and currently comprises a fixed wing aircraft and two helicopters. The GASU responds to a range of incidents including immediate threat to life, criminal/terrorist/serious public disorder, tasks leading to the prevention or

detection of crime, evidence/intelligence gathering and traffic management/monitoring. It is considered unlikely that GASU would be carrying out low-level flight activity over the Ballynalacken area, and in any case, these aircraft would be equipped with a range of Global Navigation Satellite Systems (GNSS) which will provide pilots with accurate navigation information including data to avoid obstacles such as the Ballynalacken turbines – should they be permitted. Also in good weather, pilots could potentially use the Ballynalacken Windfarm as a visual landmark to aid in Visual Flight Rules navigation. No impact is expected to occur to the activities of the Garda Air Support Unit as a result of the Ballynalacken turbines.

Emergency Aeromedical Service (EAS) operates from Custume Barracks in Atholone, and uses a helicopter for time-critical medical emergencies. The proposed windfarm is located c.4.5km northwest of Castlecomer, County Kilkenny, and in an area that is relatively sparsely populated, and it is considered that EAS helicopter landings are highly unlikely to occur at the windfarm site as it consists of forestry/agricultural land and is largely rural. In the unlikely event of EAS operations in the general area, the pilot would seek a Helicopter Landing Site (HLS) that is clear of wires, loose objects and is relatively clear of obstacles (e.g. trees). The chosen HLS should also have good road access to link up with the local ambulance service. The local Brookville AFC soccer pitch at Tinnalintan, the GAA pitch at Ballinakill or the soccer pitch at Deen Celtic in Castlecomer (would be a much more suitable HLS for any such emergency landings in the Ballynalacken area. Therefore, no impacts to the operation of the Emergency Aeromedical Service is likely to occur.

Private Airfields/Helipads: It was found that there are three private airfields /heliports within 20 km of the proposed wind farm site; Kilkenny Airfield (c.17.7km to the south), Abbeyleix Airfield (c.7.6km to the northwest) and Midlands Heliport (c.5.6km to the north-northeast). Due to the separation distances from the turbines, it is evaluated that the proposed wind farm is sufficiently far from each of these private aviation installations and therefore there would be no impact on the use of these private airfields and heliports due to the proposed wind turbines. Furthermore, pilots flying to/from these private aviation installations would be required by law to fly by Visual Flight Rules (VFR) and in accordance with the IAA *Rules of The Air*, which state that it is the pilot's legal responsibility to be aware of and avoid any obstacles in his/her flight path and therefore he/she would be required to be aware of wind turbines if flying to/from the airfield / helipad in question.

In summary, there will be no effect on public or private airports, airfields or heliports, no effect on the operations of the Irish Air Corps, the Garda Air Support Unit or the Emergency Aeromedical Service, and consequently these receptors are not considered further herein.

EIAR Appendices: (included at the end of this Chapter)

Appendix 16.2 Telecommunications Impact Assessment Report

Appendix 16.3 Aviation Review Statement

EIAR 16.3.3.1.3 Existing Sources of Impacts to Airborne Signals & Aviation

No existing damage to Airborne Signals or Aviation is taking place at the Project site.

EIAR 16.3.3.1.4 Importance of Airborne Signals & Aviation and Sensitivity to Change

Telecom networks and aviation play an important role in modern society, providing essential communication and transport services to individuals, businesses, and state bodies and organisations, enabling people to communicate with each other across vast distances, aiding global communication, trade and commerce.

Airborne signals can be affected by the presence of structures, where these structures are located within the Frenzel zones of a PTP link path.

Using the IMPERIA ARVI approach to assess the importance/sensitivity, it is considered that the Eir and ESB airborne telecom signals **Moderate** sensitivity, while the local broadband service to have **Low** sensitivity to change.

EIAR 16.3.3.1.5 Evolution of the Baseline Environment (the 'Do-Nothing' scenario)

In recent years, telecom networks and aviation navigation tools have evolved significantly, driven by advances in technology and changing communication needs. Modern networks use advanced technologies like 5G, fiber-optic cables on the Eir telephone line network, satellite communications and cloud computing to provide faster, more reliable communication services to users. These trends are likely to continue into the future.

EIAR 16.3.3.2 Impact Evaluation – Airborne Signals & Aviation

This Section comprises an evaluation of the likely significant impacts of the proposed Ballynalacken Windfarm Project on the receiving environment. Moderate, Slight, Imperceptible and Neutral Impacts are also taken into consideration.

The impacts are presented/evaluated as follows:

a) Significant Impacts which are likely or have potential to occur, are subject to detailed evaluation;

b) Moderate or Slight Impacts, which are likely or have potential to occur, are subject to detailed evaluation;

c) Non-significant impacts of local concern or considered important enough to merit detailed evaluation;

d) Neutral or Imperceptible Impacts are scoped out from detailed evaluation, and a short evaluation is provided in the table below. Unlikely Impacts are also scoped out.

Table 16-10: Scoping of Impacts to Airborne Signals

Likely/Potential Impact	**Evaluation**	
Moderate or Slight Impacts, which are likely or have potential to occur – see detailed evaluation		
Operation Phase: Interference with ESB Networks PTP microwave radio link		*Section EIAR 16.3.3.2.1*
Operation Phase: Interference with Eir PTP microwave radio link		*Section EIAR 16.3.3.2.2*
Non-significant impacts of local concern or considered important enough to merit detailed evaluation		
Operational Phase: Obstruction of Tetra Ireland Network signals		*Section EIAR 16.3.3.2.3*
Neutral or Imperceptible Impacts, or where no impact is likely to occur – evaluation below		
Operational Phase: Obstruction of Imagine Broadband signals	Neutral Impact: The potential impact of the turbines on the Imagine Broadband network (2 links, both Ballyouskill to ESB Portlaoise) has been modelled in 3D and it has been determined that there is sufficient clearance distances between the 2nd Fresnel zone of the radio links and the blade tip of the nearest turbine. Therefore, the turbines will not obstruct Imagine Broadband radio links.	
Operational Phase: Obstruction of Three Ireland signals	Neutral Impact: The potential impact of the turbines on the Three Ireland network (2 links, Ballyouskill – Ardra, Ballyouskill-Portlaoise) has been modelled in 3D and it has been determined that there is sufficient clearance distances between the 2nd Fresnel zone of the radio links and the blade tip of the nearest turbine. Therefore, the turbines will not Three Ireland radio links.	

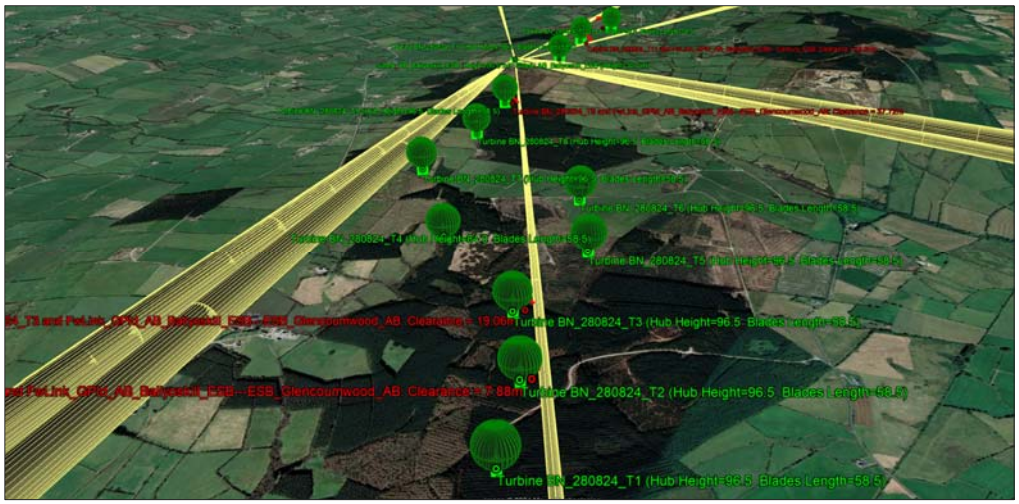
EIAR 16.3.3.2.1	**Interference with ESB Networks PTP microwave radio link**
Sensitive Aspect:	Airborne Signals & Aviation
Importance:	**Moderate** (as per Appendix 16.2, Section EIAR 16.3.3.1)
Impact Source(s)	Operational Ballynalacken Turbines
Impact Pathway(s)	Air
Project Stage	Operation Phase

Overview of Impact (general):

If the turbines are erected in the signal path, the link may be affected, either partially or wholly. A summary of the result of software modelling of ESB Network radio links is presented here, and the full analysis can be found in Appendix 16.2 Telecommunications Impact Assessment Report.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

ESB Networks have nine radio links from two Ballyouskill Masts. Analysis has shown that due to the separation distance of the proposed wind turbines to eight of the nine links, no impacts are expected to occur to the Ballyouskill to Slieve Bloom/Carbury/Portlaoise AO/Monavea 38kV/Ballyhale 38kV/Castlecomer 38kV/Rosehill/Talbots Inch radio links. The only ESB Networks link which could be affected by the propsed Ballynalacken wind turbines is the Ballyouskill – Glencoumwood radio link. As shown on the 3D model below, Turbine T02 located in close proximity to the link path.



While there is potential for obstruction and therefore loss of this link, effective mitigation is available.

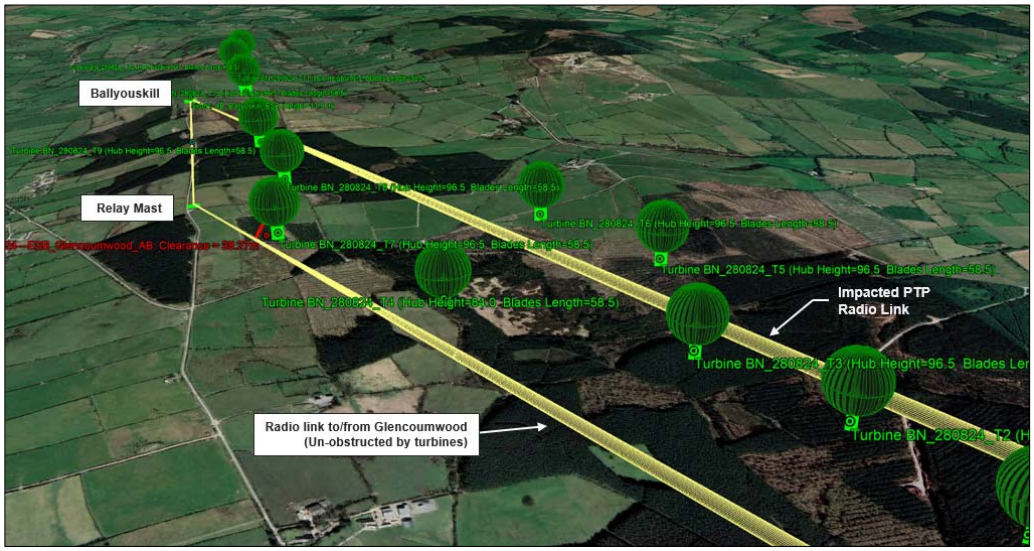
Impact Magnitude	Moderate	**Impact Significance:** ***(pre-mitigation)***	**Moderate**

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

Design	The location of the turbines was designed with AiBridges to avoid telecom signals as far as possible.
MM56	Telecom operators will be contacted prior to the erection of the permitted wind turbines to confirm (1) requirement for mitigation measure, and (2) form of mitigation measure to be implemented – i.e. one or a combination of (a) change of telecom equipment on the existing masts; (b) change of signal pathways; (c) erection of and installation of telecom apparatus on a new telecom relay pole within the windfarm site boundary; (d) installation of telecom apparatus onto the windfarm met mast.

Effectiveness of Mitigation:

In relation to the Ballyouskill – Glencoumwood radio link, Radio Path Profile and Radio Link Budget analysis has shown that re-routing the service via the proposed relay mast located within the windfarm development site (see below figure) is achievable and will mitigate any potential impacts to the service. With the implementation of the above mitigation measure, there will be no effects on ESB signals at the windfarm site.



Residual Impact Significance *(post-mitigation)*:	**No Impact**

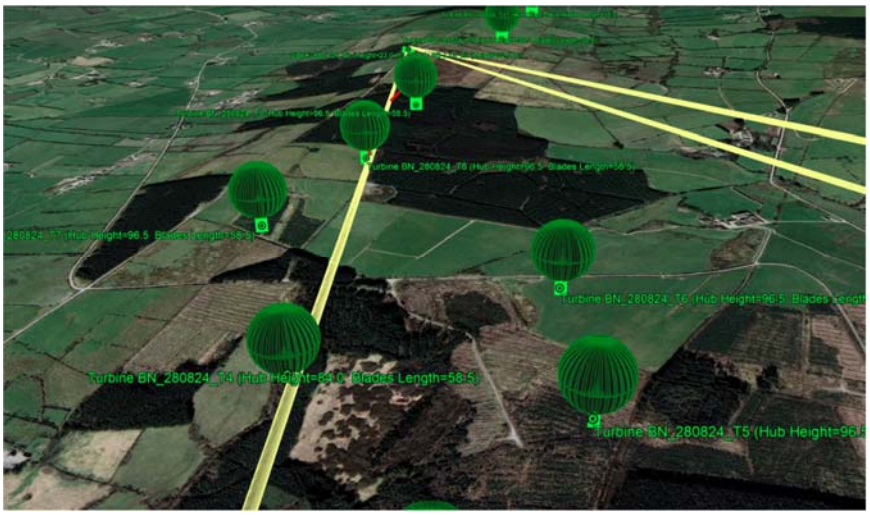
EIAR 16.3.3.2.2	**Interference with Eir PTP microwave radio link**
Sensitive Aspect:	Airborne Signals & Aviation
Importance:	**Moderate** (as per Appendix 16.2, Section EIAR 16.3.3.1)
Impact Source(s)	Operational Ballynalacken Turbines
Impact Pathway(s)	Air
Project Stage	Operation Phase

Overview of Impact (general):

If the turbines are erected in the signal path, the link may be affected, either partially or wholly. A summary of the result of software modelling of Eir radio links is presented here, and the full analysis can be found in Appendix 16.2 Telecommunications Impact Assessment Report.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

Eir have three links from a Ballyouskill Mast which are aligned in the direction of the wind turbines. Analysis has shown that due to the separation distance of the proposed wind turbines to two of the links (Ballyouskill to Ardra, Ballyouskill to Upper Coolbawn), that these two links will not be affected. The only Eir link which could be affected by the propsed Ballynalacken wind turbines is the Eir Ballyouskill – Kilmadum microwave radio link. As shown on the 3D model below, there are a number of turbines located in close proximity:



While there is potential for obstruction and therefore loss of this link, effective mitigation is available.

Impact Magnitude	Moderate	**Impact Significance:** ***(pre-mitigation)***	**Moderate**

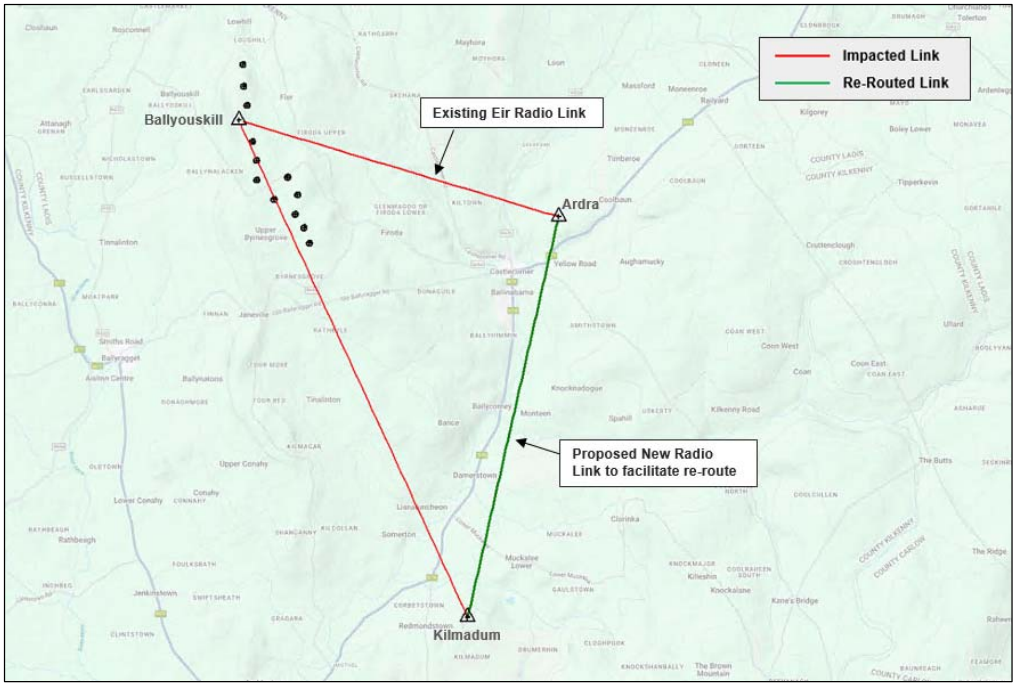
Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

Design	The location of the turbines was designed with AiBridges to avoid telecom signals as far as possible.
MM56	Telecom operators will be contacted prior to the erection of the permitted wind turbines to confirm (1) requirement for mitigation measure, and (2) form of mitigation measure to be implemented – i.e. one or a combination of (a) change of telecom equipment on the existing masts; (b) change of signal pathways; (c) erection of and installation of telecom apparatus on a new telecom relay pole within the windfarm site boundary; (d) installation of telecom apparatus onto the windfarm met mast.

Effectiveness of Mitigation:

A Radio Path Profile and Radio Link Budget analysis has shown that re-routing the service via alternative Eir POP site at Ardra (option (b) in MM56 above; see below figure) is achievable and will mitigate any potential impacts

to the service. This mitigation will avoid any impacts on the Eir signal by rerouting of the signal around the turbines. With the implementation of the above mitigation measure, there will be no effects on Eir signals at the windfarm site.



Residual Impact Significance *(post-mitigation)*:	**No Impact**

EIAR 16.3.3.2.3	**Interference with Tetra Ireland Network signals**		
Sensitive Aspect: Importance:	Airborne Signals & Aviation **Moderate** (as per Appendix 16.2, Section EIAR 16.3.3.1)		
Impact Source(s)	Operational Ballynalacken Turbines		
Impact Pathway(s)	Air		
Project Stage	Operation Phase		
Overview of Impact (general): Tetra Ireland implement 500m exclusion zones around the masts that they use, one of these masts is at Ballyouskill, and T10 is within the 500m zone, and could potentially cause a degradation in signal levels (i.e. a shadowing impact) to the northeast of the Ballyouskill Mast. A summary of the result of field surveys and analysis is presented here, and the full analysis can be found in Appendix 16.2 Telecommunications Impact Assessment Report.			
Examination of the Impact of the Proposed Ballynalacken Windfarm Project: Field surveys of Tetra Ireland signals in the areas surrounding the Ballyouskill Mast were carried out by AiBridges, these surveys found that there are other Tetra base stations (LACs) in the locality providing additional coverage in the area to the northeast of Ballyouskill. Field survey data and desktop analysis shows that even with the exclusion of the TETRA signals from the Ballyouskill Mast (LAC 4401), that there is relatively good TETRA coverage in the area and that there is adequate signal from the other 21 neighbouring cells even if turbine T10 causes a degradation of service from the Tetra base station at the Ballyouskill Mast. Therefore, the Ballynalacken wind turbines, including Turbine T10, are not expected to affect the availability of Tetra Ireland services in the areas around the wind farm site, as any potential deterioration in signals from the Ballyouskill Mast will be offset by coverage from neighbouring Tetra basestations in the surrounding area.			
Impact Magnitude	N/a	Impact Significance: *(pre-mitigation)*	**Neutral**
Mitigation and Monitoring Measures: None required			
Residual Impact Significance *(post-mitigation)*:			**Neutral**

EIAR 16.3.3.3 Cumulative Impact on Airborne Signals & Aviation with Other Projects & Activities

EIAR 16.3.3.3.1 Introduction to the Cumulative Evaluation for Airborne Signals & Aviation

The Ballynalacken Windfarm Project (*whose effects range from No Impact to Neutral, as per Section EIAR 16.3.3.2*) is examined hereunder for potential to have cumulative effects on Airborne Signals & Aviation with other existing and permitted projects, and projects advanced in the planning system. These projects are referred to as 'Other Projects' herein.

A Cumulative Study Area is set out below and Other Projects located within this Study Area are identified and examined for in-combination effects with the Ballynalacken Windfarm Project. The potential for off-site and secondary consequential development is also considered.

EIAR 16.3.3.3.2 Cumulative Study Areas

Other tall structures and wind turbines within 200m of the Point to Point (PTP) links associated with the ESB Networks Ballyouskill-Glencoumwood radio link and the Eir Ballyouskill-Kilmadum radio link.

EIAR 16.3.3.3.3 Evaluation of Cumulative Impacts

There are no other existing, consented or proposed wind farms or other tall structures within 200m of the PTP links identified above. Therefore, there is no potential for cumulative impacts with Other Projects.

EIAR 16.4 Summary Conclusion

ROAD USERS: All roads with enabling works, haulage activities or underground cabling scheduled during the construction and operation of the Ballynalacken Wind Farm were assessed with respect to societal value, vulnerability for changes and the magnitude of the potential impacts. Nine impacts were considered, with 4 no. impacts scoped in for further assessment: Increased Journey Time or Disruption to Road Users using Local Roads; Increased Journey Time or Disruption to Road Users using Regional Roads; Disrupted Access to Property; and Increased risk of road accidents due to increased traffic and works in public road. Impacts adjudged to be neutral or imperceptible were scoped out.

The effect of delays to be expected by Road Users due to road works, is evaluated as Slight – Moderate due to the lightly trafficked nature and extent of available capacity on all roads; the maintenance of local access to properties on the roads, the temporary duration and the application of traffic management measures and use of flagmen to minimise traffic delays. **The Cumulative Impact** with Ballynalacken Windfarm Project, Farranrory Wind Farm and Ballyragget & Parksgrove Solar Farms Grid Connections is evaluated as **Slight**.

It is anticipated that there will be no likely increased risk of road accidents as a result of works during any phase of the Ballynalacken Windfarm Project due to the modest increase in traffic volumes, the existing road capacity, the erection of safety signage, sightlines at site entrances and turbine components being transported under Garda escort.

PUBLIC ROADS AND LOCAL BUILT SERVICES: During excavation works for cables trenches and joint bays for the grid connection between the Tinnalintan Substation and the 110kV Ballyragget Substation, existing water pipes under the road could be damaged and supply interrupted. Restricted access to properties for a period of 3 no. weeks for a small number of residents will also arise from these works. The likely impact is evaluated as **Neutral** due to the implementation of project design environmental protection measures such as confirmatory consultations with Irish Water, Eir and ESB; review of all relevant infrastructure mapping before works; confirmatory ground surveys at service locations to be carried out ahead of works; excavations will be hand dug within 500mm of pipes; a banksman will accompany each excavator to oversee all excavation works and close contact with the local manager of the Ballyragget Public Water Supply will be maintained by the Environmental Clerk of Works throughout the installation of the Ballynalacken Grid Connection. **Likely Cumulative effects will be Imperceptible** due to project design measures including timing of works and several mitigation measures proposed.

AIRBORNE SIGNALS & AVIATION: Airborne telecommunication signals can be affected by wind turbines where the turbine towers or blades are located in the path of a microwave radio link. The design and layout of the turbines has been developed with AiBridges to ensure that airborne telecommunication signals from the existing telecom masts at Ballyouskill are avoided as much as possible by the turbines. This has been achieved for the most part, and the turbine locations have avoided the vast majority of the signals coming from the masts. However, the turbines are sited close to two microwave radio point-to-point (PTP) link paths and it has been evaluated that there is potential for the turbines to obstruct these PTP links. These links are the ESB Networks Ballyouskill – Glencoumwood PTP radio link, and the Eir Ballyouskill-Kilmadum PTP radio link. Mitigation measures have been put forward which will effectively mitigate the impact to these links and the residual impact will be No Impact to the ESB Networks or Eir links. Due to the availability of service coverage provided by other masts in the surrounding area, there will be no effect on Tetra Ireland services in the Ballynalacken area.

Aviation was also considered, and it was evaluated that due to the separation of the wind turbines from airports, radar stations, airfields and heliports that there is no potential for impacts to these aviation assets. The potential for impacts to the Irish Air Corps, the Garda Air Support Unit and the Emergency Aeromedical Services was also considered, however, due to the separation distance from the bases associated with these services and the location of the Ballynalacken Windfarm, the potential for impacts has been excluded.

Overall, it is evaluated that the impact on the Environmental Factor, Material Assets, will be Slight.

EIAR 16.4.1 Statement on Certainty and Sufficiency of Information Provided

A clear documentary trail is provided throughout this chapter and chapter appendices to the competency of data and methods used and the rationale for selection of same. The information used to compile this chapter is collated from site-specific investigations, data and documents generated by public bodies and statutory agencies. The online baseline data was verified in the field.

The information which informed the baseline descriptions and impact evaluations was collated from data and maps (mapped water mains, overhead lines and underground cables etc) which were obtained through consultation with the service owners, i.e. Eir, ESBN, Irish Water etc. In all cases the most recent data and publications are relied upon. The location of services identified on the Eir, ESBN and Irish Water mapping were confirmed through surveys of the entire underground Ballynalacken Grid Connection route along the public road network.

The assessment follows industry-standard procedures, guidelines and best practices for the Assessment of Traffic and Transportation impacts.

The information which informed the baseline descriptions and impact evaluations was collated from site visits and surveys of the local and regional road network and surveys of bridge and culvert crossing structures, carried out in 2022 and 2023, and through consultation with the Roads Department of Kilkenny County Council.

The information which informed the baseline descriptions and impact evaluations for airborne telecommunication signals was collated from field and desktop surveys of masts and signal paths in the area and through consultation with telecom operators. No significant limitations or difficulties were encountered.

In respect of Material Assets, no material limitations or difficulties were encountered during the course of the studies carried out to inform the assessment of impacts of the Ballynalacken Windfarm Project on Material Assets.

EIAR 16.5 Reference List for Material Assets

Environmental Protection Agency (2022) *Guidelines on the information to be contained in Environmental Impact Assessment Reports*, available: https://www.epa.ie/publications/monitoring--assessment/assessment/EIAR_Guidelines_2022_Web.pdf.

Health and Safety Authority (2016) *Code of Practice for Avoiding Danger from Underground Services*.

Health and Safety Authority (2019) *Code of Practice for Avoiding Danger from Overhead Electricity Lines*, available: https://www.hsa.ie/eng/publications_and_forms/publications/codes_of_practice/avoiding_danger_from_overhead_electricity_lines.pdf

Ireland, Department of Transport (2021) *Traffic Signs Manual*, available: https://www.trafficsigns.ie/tsm-cur.

Ireland, Department of Transport, Tourism and Sport (2017) *Guidelines for Managing Openings in Public Roads*.

Ireland, Department of Transport, Tourism and Sport (2019) *Climate Change Sectoral Adaptation Plan for the Transport Sector, prepared under the National Adaptation Framework*, available: https://efaidnbmnnnibpcajpcglclefindmkaj/https://assets.gov.ie/39222/284b27f3507a411b982d8aff91e1bf49.pdf.

Transport Infrastructure Ireland (2013) *Design Manual for Roads and Bridges*.

Transport Infrastructure Ireland (2013) *Specification for the Reinstatement of Openings in National Roads*.

Transport Infrastructure Ireland (2014) *Traffic and Transport Assessment Guidelines*.

Transport Infrastructure Ireland (2019) *Requirements for the Reinstatement of Openings in National Roads*, available: https://efaidnbmnnnibpcajpcglclefindmkaj/https://www.tiipublications.ie/library/CC-PAV-04007-01.pdf.

Transport Infrastructure Ireland (2021) *Planning and Evaluation PE-PAG-02017 Project appraisal guidelines for national roads unit 5.3 – travel demand projections*.

Uisce Éireann (2020) *Connections and Developer Services – Code of Practice for Water Supply Infrastructure (A Design and Construction Guide for Developers)*.

EIAR 16.6 List of Figures for Material Assets

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Figure 16.2	Turbine Component Transport Route
Figure 16.3	Location of Road Works
Figure 16.4	Built Services – Underground Services
Figure 16.5	Built Services – Overhead Services
Figure 16.6	Location of Telecom Infrastructure
Figure 16.7	Other Projects within the Road Users, Public Roads & Local Built Services Cumulative Study Area

EIAR 16.7 List of Appendices for Material Assets

APPENDICES (overleaf)

Appendix 16.1:	Traffic and Transport Assessment
Appendix 16.2	Telecommunications Impact Assessment Report
Appendix 16.3	Aviation Review Statement
Appendix 16.4	Methodology for the evaluation of Material Assets

Figures for Material Assets

EIAR Chapter 16: Material Assets

Figure 16.1 - Construction Materials Haulage Route

Legend:

- Ballynalacken Windfarm Project
- L5845 Public Road Identification Number
- Construction Materials Haulage Route

HR8 - Blade Transfer Area

Site Entrance No.10
L5838
T12
T11
Site Entrance No.9
T10
Borrow Pit No.2
L5840
T9
Site Entrance No.4
Site Entrance No.8
L5846
T8
Site Entrance No.7
Site Entrance No.5
Construction Compound No.1
T6
Site Entrance No.6
T7
Borrow Pit No.1
Construction Compound No.2
T5
T4
Site Entrance No.3
L5846
T3
L5845
Commons
T2
L58451
Site Entrance No.2
T1
R694
Site Entrance No.11
L58442
Internal Cable Link
Ballynalacken Grid Connection
R432
Construction Compound No.3
Site Entrance No.1
R694
R694
R694
Eirgrid Ballyragget Substation
BALLYRAGGET
Béal Átha Ragad
CASTLECOMER
Caisleán an Chor
N78
N

EIAR Chapter 16: Material Assets

Figure 16.2 - Turbine Component Transport Route

Legend:

- Ballynalacken Windfarm Project
- L5845 — Public Road Identification Number
- Turbine Component Haul Route

Site Entrance No.9
Site Entrance No.8
Site Entrance No.7
Site Entrance No.6
Site Entrance No.3
Site Entrance No.5
Site Entrance No.4
Site Entrance No.2
Site Entrance No.1
L5840
L5846
L5845
L58451
R694
HR8 - Temporary Entrance from the L1844
CASTLECOMER
Caisleán an Chomair
BALLYRAGGET
Béal Átha Ragad
KILKENNY
CILL CHAINNIGH
N78
N77
N10
M9
Durrow
Darú
Freshford
Achadh Ur
Threecastles
Báthán Ó nDuach
Leighlinbridge
Leithghlinn an Droichid
Gowresbridge
N

EIAR Chapter 16: Material Assets

Figure 16.3 - Location of Road Works

Legend:

- Ballynalacken Windfarm Project
- Ballynalacken Windfarm Project (Haul Route Works)
- Public Road Widening Works
- Houses
- L5845 Public Road Identification Number

Ballynalacken Grid Connection

Eirgrid Ballyragget Substation

Site Entrance No.11

Internal Cable Link

Public Road Widening Works

Site Entrance No.9

Site Entrance No.8

Site Entrance No.7

Site Entrance No.6

Site Entrance No.4

Site Entrance No.5

Site Entrance No.3

Site Entrance No.2

Site Entrance No.1

L58442

L5840

L5846

L5845

L58451

R432

R694

HR1

HR2

HR3

HR4

HR5

HR6

HR7

HR8 - Temporary Entrance from the L1844

HR9

HR10

HR11

HR12

HR13

N78

N77

N10

M9

EIAR Chapter 16: Material Assets

Figure 16.4 - Built Services - Underground Services

Legend:

- Ballynalacken Windfarm Project
- Ballynalacken Windfarm Project (Haul Route Works)
- Eir - Underground Line
- Uisce Eireann - Lateral Mains
- Uisce Eireann - Lateral Lines
- ESB - Underground Line

T12
T11
T10
T9
T8
T7
T6
T5
T4
T3
T2
T1

Internal Cable Link

Ballynalacken Grid Connection

Eirgrid Ballyragget Substation

Ballyoskill
Ballynalacken
Ballymartin
Ballymartin Cross Rds
Commons
Firoda Upper
Glenmagoo
Fulacht Fia
Byrnesgrove
Garrannagully
Sraleagh
Tinnalintan
Coole
Gorteenara
Glashagal Br
Holy Well
Glashagal River
Nicholastown
Russellstown
Glebe
Rathduff
Electricity Stn.
Motte
Cromwellstown
Ballyconra
R694
River An Fheoir
Nore
313
303
262
253
144
N

EIAR Chapter 16: Material Assets

Figure 16.5 - Built Services - Overhead Services

Legend:

- Ballynalacken Windfarm Project
- Ballynalacken Windfarm Project (Haul Route Works)
- Eir Overhead Line
- ESB Overhead Line
- Laois-Kilkenny Reinforcement Project
- Moatpark-Loan 38kV Overhead Line

T12
T11
T10
T9
T8
T7
T6
T5
T4
T3
T2
T1

Internal Cable Link

Ballynalacken Grid Connection

Eirgrid Ballyragget Substation

Ballynafunshin
Earlsgarden
Attanagh
Áth Tanaí
Grenan
Glebe
Nicholastown
Russellstown
Gorteenara
Glashagal Br
Coole
Tinnalintan
Ballyhoskill
Ballynalacken
Ballymartin Cross Rds
Ballymartin
Commons
Firoda Upper
Glenmagoo
Fulacht Fia
Byrnesgrove
Garrannaguilly
Sraleagh
Rathduff
Ballyconra
Owenbeg River
An Abhainn Bheag
Glashagal River
River Nore
R694

N

EIAR Chapter 16: Material Assets

Figure 16.6 - Location of Telecom Infrastructure

Legend:

- Ballynalacken Windfarm Project
- Existing Airborne Telecommunication Networks

T12
T11
T10
T9
T8
T7
T6
T5
T4
T3
T2
T1

Ballyoskill
Firoda Upper
Nicholastown
Ballynalacken
Gorteenara
Glashagal River
Ballymartin Cross Rds
Ballymartin
Commons
Glenmagoo or
Tinnalintan
Holy Well
Cromwell Road
R694
N

EIAR Chapter 16: Material Assets

Figure 16.7 - Other Projects within the Road Users, Public Roads & Local Built Services Cumulative Study Area

Legend:

- Ballynalacken Windfarm Construction Works Area
- 7m Study Area
- Overhead Lines
- Underground Lines

Other Projects:

- Laois-Kilkenny Grid Reinforcement Project
- Farranrory Wind Farm Grid Connection
- Ballyragget & Parksgrove Solar Farm and Grid Connection

Site Entrance No.10
L5838
Site Entrance No.9
L5840
Site Entrance No.8
Site Entrance No.4
L5846
Site Entrance No.7
Site Entrance No.5
Site Entrance No.6
Laois-Kilkenny Grid Reinforcement Project
Site Entrance No.3
L5846
L5845
L58451
Site Entrance No.2
R694
L58442
Site Entrance No.11
R432
R694
Site Entrance No.1
Ballyragget & Parksgrove Solar Farm and Grid Connection
Farranrory Wind Farm Grid Connection
BALLYRAGGET
N

Appendix 16.1: Traffic and Transport Assessment

Appendix to Chapter 16: Material Assets

Appendix 16.1: Traffic and Transport Assessment

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ENGINEERING A SUSTAINABLE FUTURE

Traffic and Transport Assessment
Proposed Ballynalacken Windfarm Project
Co. Kilkenny

Document Control Sheet

Client:	Ecopower Limited
Document No:	230742-ORS-XX-XX-RP-TR-13g-001

Revision	Status	Author:	Reviewed by:	Approved By:	Issue Date
P01	S2	AGK	LD	AP, DMC	28/07/2023
P02	S2	AGK	AP	DMC	18/06/2024
P03	S2	AGK	AP	DMC	25/06/2024
P04	S2	AGK	AP	DMC	11/10/2024

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Executive Summary

ORS were engaged by Ecopower Developments Limited (EDL) to undertake a Traffic and Transport Assessment (TTA) of the proposed Ballynalacken Windfarm Project. The proposed Ballynalacken Windfarm Project involves the construction of a 12-turbine windfarm and grid connection along with associated ancillary works.

This Traffic and Transportation report has been prepared in accordance with TII Traffic & Transportation Assessment Guidelines. The main objectives are (i) to evaluate and quantify the effects of construction, operational, and decommissioning traffic along with the temporary measures which will be implemented at specific locations to accommodate the delivery of turbine components, associated with the Ballynalacken Windfarm Project on the existing local road network (ii) to assess the adequacy of the existing road network in accommodating the transportation demands of the development; and (iii) to assess the adequacy of remedial actions to mitigate the impact on the road network during the construction phase of the Ballynalacken Windfarm.

In order to gather the necessary data for this assessment, a comprehensive classified traffic survey was conducted in the vicinity of the project. This survey involved the use of temporary Automatic Traffic Counters (ATC) to collect traffic data, including vehicle classification and speeds. These counts were carried out during 2022, 2023 and 2024 and were provided to ORS by EDL. Additional traffic turning counts were obtained for three designated junctions, one located in Castlecomer and two in Ballyragget, in order to provide a more comprehensive understanding of traffic patterns at these specific junctions. The combined information from these surveys and counts formed the foundation for the detailed analysis conducted in this transportation assessment. In addition, 2022 Census website was consulted to obtain information regarding transport options within the local area, and the Kilkenny County Council planning website was also consulted to include any proposed developments in the area that will affect the road network in the vicinity of the site.

To ensure accuracy, the analysis incorporated the relevant Traffic Growth Factors provided by Transport Infrastructure Ireland (TII) specific to Co. Kilkenny. These factors account for projected future growth on the road network, ensuring a comprehensive and realistic assessment of the traffic impact. The impact of traffic on junctions has been assessed using the advanced software module PICADY (Priority Intersection Capacity and Delay) on *Junctions10*. These junction simulations allowed for a thorough evaluation of the traffic conditions based on the assumed likely earliest and latest commencement years of 2025 and 2035.

Based on a comprehensive traffic analysis considering the trip generation associated with the Ballynalacken Windfarm Project, it has been determined that with the implementation of suitable temporary traffic management measures and regular road condition surveys, any potential negative impacts on traffic capacity, transportation, and road safety will be effectively mitigated and that the Project can proceed without compromising traffic flow, transportation infrastructure, or road safety in the surrounding area. The analysis confirms that the construction, operation and decommissioning phases of the project will have an acceptable adverse effect on the existing road network.

16.1 Introduction

This Traffic and Transportation Assessment has been prepared by ORS on behalf of Ecopower Developments Limited for the Ballynalacken Windfarm Project in Kilkenny County. The purpose of this assessment is to address the traffic, transportation, and construction/operational/decommissioning access issues associated with the development of the Ballynalacken Windfarm Project.

While windfarms offer numerous advantages in terms of renewable energy generation and environmental sustainability, one notable challenge is the transportation of large wind turbines. These turbines, due to their size, require careful planning and coordination to ensure safe and efficient transport from manufacturing sites to the windfarm location. The transportation of wind turbine components often involves the widening of bends/junctions along the public road network to accommodate the tower and blade components, with the transportation of the components requiring planning and coordination with An Garda Siochána.

While the operation of windfarms is largely carried out remotely with low volumes of traffic associated with the maintenance of the sites, the construction of windfarms can result in temporary increases in traffic due to the transportation of aggregates and concrete to the site. Due to the often remote upland location of windfarms in Ireland, this increase in traffic often occurs on narrow local road networks.

Therefore, a comprehensive traffic and transport assessment is crucial to identify potential impacts, evaluate the existing road infrastructure's capacity within the study area, to accommodate the transportation requirements, and recommend appropriate mitigation measures. The Study Area in this case are the Regional Roads and Local Roads used during the material and turbine component transportation (identified in blue on Figure 3 below.) The implementation of the identified mitigation measures will also ensure that the transportation of wind turbines for the Ballynalacken Windfarm Project is conducted in a manner that minimises disruptions, ensures public safety, and optimises the efficiency of the overall operation.

The evaluations and findings are based on site visits and observations of the existing road network, and review of traffic count data and junction surveys conducted by EDL.

This report follows the principles set out in:

- TII Publication PE-PDV-02045 ‘Traffic and Transport Assessment Guidelines’;
- TII Design Manual for Roads and Bridges;
- Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade separated, and compact grade separated junctions) (TII DN-GEO-03060 June 2017);
- Rural Road Link Design (TII DN-GEO-03031 May 2023);
- Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projections (TII PE-PAG-02017 October 2016);
- Guidelines for Managing Openings in Public Roads (April 2017);
- Kilkenny County Development Plan 2021 – 2027; and
- Castlecomer Local Area Plan 2018.

16.1.1 Objectives of this TTA

The comprehensive traffic and transport assessment is necessary to evaluate and address the potential impact on traffic, transportation, and access associated with the construction, operation and decommissioning of the Ballynalacken Windfarm. By considering factors such as the existing road network, traffic volumes and vehicle characteristics the assessment aims to identify any required mitigation measures to ensure the safe and efficient management of traffic throughout the various project phases. The assessment will also contribute to minimising disruptions and ensuring the overall success of the windfarm project.

Hence, the assessment will centre its attention on the local road network, with particular emphasis on the key regional roads and the three critical junctions depicted below in Figures 1 and 2.

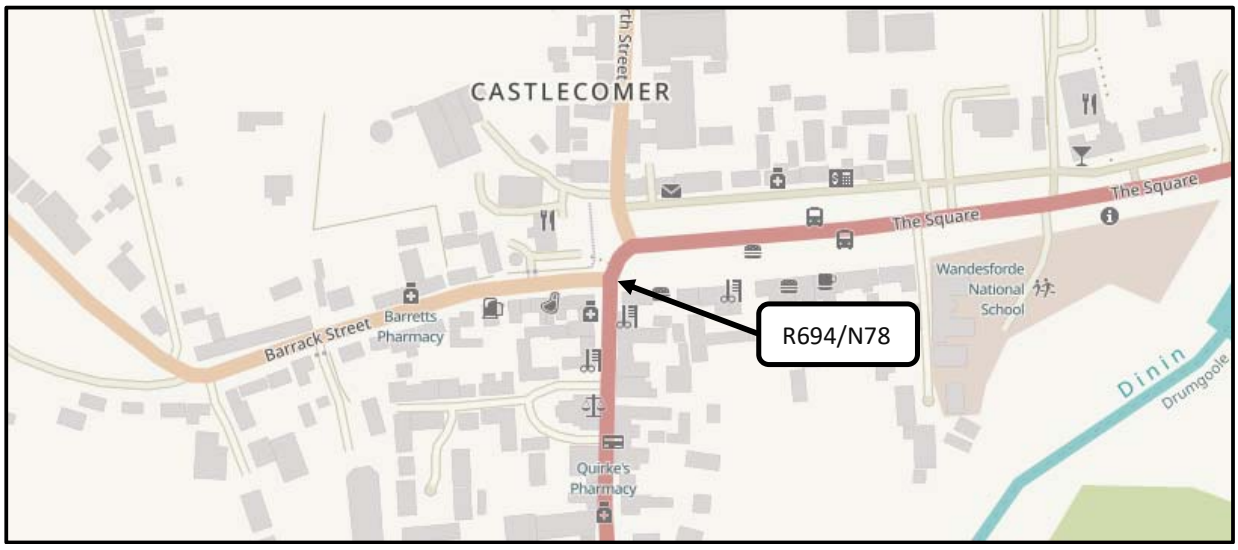

Figure 1: Locations of Junctions Analysed in Castlecomer

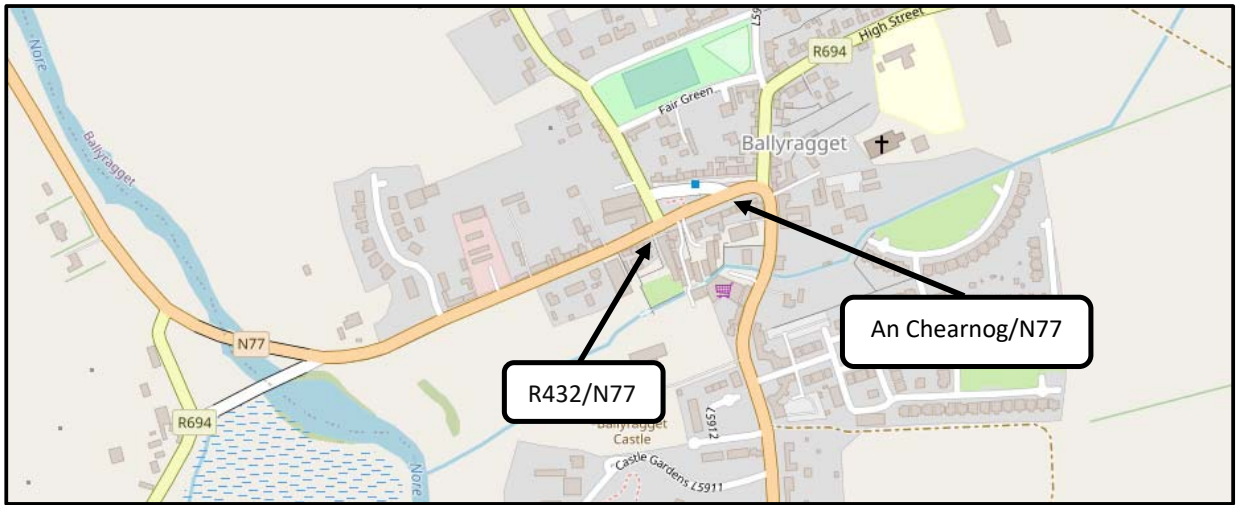

Figure 2: Locations of Junctions Analysed in Ballyragget

Therefore, in summary, the objectives of this report are to assess;

- The prevailing traffic conditions on the public road network in the vicinity of the Proposed Development;
- The existing and predicted future baseline traffic volumes on the surrounding local road network;
- The traffic impact associated with the construction, operation and decommissioning stage, as these stages have the largest associated traffic volumes; and
- The proposed mitigation measures.

16.1.2 Methodology

The TII Publication PE-PDV-02045 sets out the methodology to be followed in any given TTA. The methodology that will be used in this assessment follows the guidelines set in this document and can be outlined as follows:

- Temporary Automatic Traffic Counters (ATC tube counters) were employed. These devices enabled the collection of data on vehicle classification and traffic speeds, providing a detailed understanding of traffic patterns and behaviours.
- Annual Average Daily Traffic (AADT) volumes that the Proposed Development will generate during the construction stage, have been estimated on the basis of the above mentioned ATCs and TII automatic traffic counter data.
- Traffic counts were factored up using appropriate TII growth rates for Co. Kilkenny for the current year (2024), the assumed commencement year 2025 and the assumed commencement year 2035 as a worst-case scenario.
- The predicted traffic generated by the Proposed Development was provided by the client based on the expected number of staff on site during peak construction stage and the anticipated daily peak number of HGV movements for delivery of materials.
- Traffic arriving to/leaving the development was assumed to coincide with the morning and evening peak hour. However, it is likely that HGV traffic will be distributed through the working day and therefore the analysis is considered conservative.
- The impact of the Proposed Development on the road network was carefully evaluated based on the TII threshold. It was determined that certain local roads exhibited a percentage increase exceeding the 10% TII Threshold. However, it is important to note that these findings are influenced by the extremely low existing traffic flow in the area.
- The 3 No. junctions were modelled using the Transport Research Laboratory (TRL) software *Junctions10* (PICADY) for future design years using Central Sensitivity Growth Factors for Co. Kilkenny to obtain the existing and proposed traffic profiles at the junctions analysed for the assumed commencement years.
- The potential impact that the Proposed Development will have on the road network was reviewed. Due to the rural location and nature of the development, trips by bicycle are not expected. There are no bicycle lanes on the local access roads.

16.1.3 ORS

Angeliki Kalatha – Senior Transportation Engineer

Angeliki holds an MSc in Civil Engineering from Aristotle University of Thessaloniki (A.U.Th.), 2014, and an MSc in Engineering Project Management from A.U.Th., 2016. She is a member of Engineers Ireland and the Technical Chamber of Greece.

Angeliki is a Senior Transportation Engineer with ORS, bringing eight years of professional experience in transportation and infrastructure development. She has contributed to various transportation projects, including traffic analysis, Traffic and Transport Assessments, and initiatives promoting active travel and sustainable mobility. She is skilled in using TRL Junctions 10 and TRANSYT software for modelling and analysing roundabouts, priority junctions and signalised junctions. Drawing upon a solid foundation in civil engineering and project management, Angeliki has played integral roles in numerous infrastructure projects across Greece and Ireland.

Adam Price – Infrastructure Lead

Adam Price holds a BEng (Hons) in Civil Engineering from DIT, 2012 and BEng Construction and Civils Works (2009) and is a qualified TII Road Safety Auditor (2015) (Auditor No AP275695).

Adam is a Chartered Engineer with over 12 years' post graduate experience in consulting engineering. Adam's experience also includes carrying out Road Safety Audits and Traffic and Transport Assessments on various schemes on the national road network in Ireland, including the design review and assessment of a wide range of proposed developments including housing schemes, industrial business parks, windfarms, hospitals, and schools.

16.1.4 Liaison with Kilkenny County Council

ORS attempted to arrange a scoping meeting with Kilkenny County Council to discuss the assessment requirements but did not receive a response. As a result, ORS proceeded with the assessment based on their expertise and understanding of the project. The preparation of this TTA also considered the Kilkenny City and County Development Plan (2021-2027) which indicates that the planning authority, when evaluating an application for wind energy development, should consider several factors, including the adequacy of the local access road network to facilitate construction and transportation of large machinery and turbine parts to the site. This assessment may also encompass the implementation of a traffic management plan.

16.2 The Proposed Development

16.2.1 Proposed Ballynalacken Windfarm Project

The Proposed Development involves various elements to support the installation and operation of the 12 No. Ballynalacken turbines. These elements include:

- 12 No. wind turbines along with associated works such as hardstanding areas, windfarm roads, and underground cabling.
- Electrical Control Building at the windfarm site
- Electrical Substation (Tinnalintan Substation) located in the valley to the west of the windfarm site;
- Internal Cable Link - underground electrical cabling connecting the Windfarm Control Building to the Windfarm Substation.
- Ballynalacken Grid Connection comprising underground 110kV cabling which will connect Tinnalintan Substation to the national electrical system at the EirGrid Ballyragget Substation; and
- Haul Route Works & Activities along the public roads, necessary works, temporary modifications and activities will be carried out to facilitate turbine delivery and provide access to the turbine sites.

Subject to obtaining planning permission, the commencement of work at the site is anticipated upon securing the necessary permits. The construction phase is estimated to last approximately 12 to 18 months, with peak construction activity expected to occur over a 12-month period, as indicated in the provided construction programme in **Section 16.6**. The construction start date is currently estimated to fall between 2025 and 2035.

For more info regarding the development see EIAR **Chapter 5 - Description of the Development.**

16.2.2 Development Site Location

The proposed Ballynalacken Windfarm site is strategically situated within County Kilkenny, approximately equidistant between the towns of Ballyragget (4.3km) and Castlecomer (4.2km), while also being 3.2km away from the village of Ballinakill in County Laois. Figure 3 below shows location of the site.

16.2.3 Site Access

It is proposed that the Project works locations will be accessed from the public road network from 11 No. specific site entrances, as shown in Figure 3. The entrances are strategically located, with 8 of the 11 entrances through already existing field/forestry entrances. The entrances will facilitate the transportation of wind turbine components, personnel, equipment, and materials to the respective construction compounds, turbine locations, windfarm control building, Tinnalintan substation and other works locations. These entrances will have varying widths to accommodate the passage of turbine components during the construction phase of the windfarm.

To ensure safe access and visibility, the entrances will be setback 2.4m from the road. In some cases, existing trees and hedgerows will be pruned or removed as necessary to provide clear sightlines in both directions. This proactive approach aims to enhance visibility and ensure the smooth and efficient movement of construction vehicles and equipment during the windfarm development.

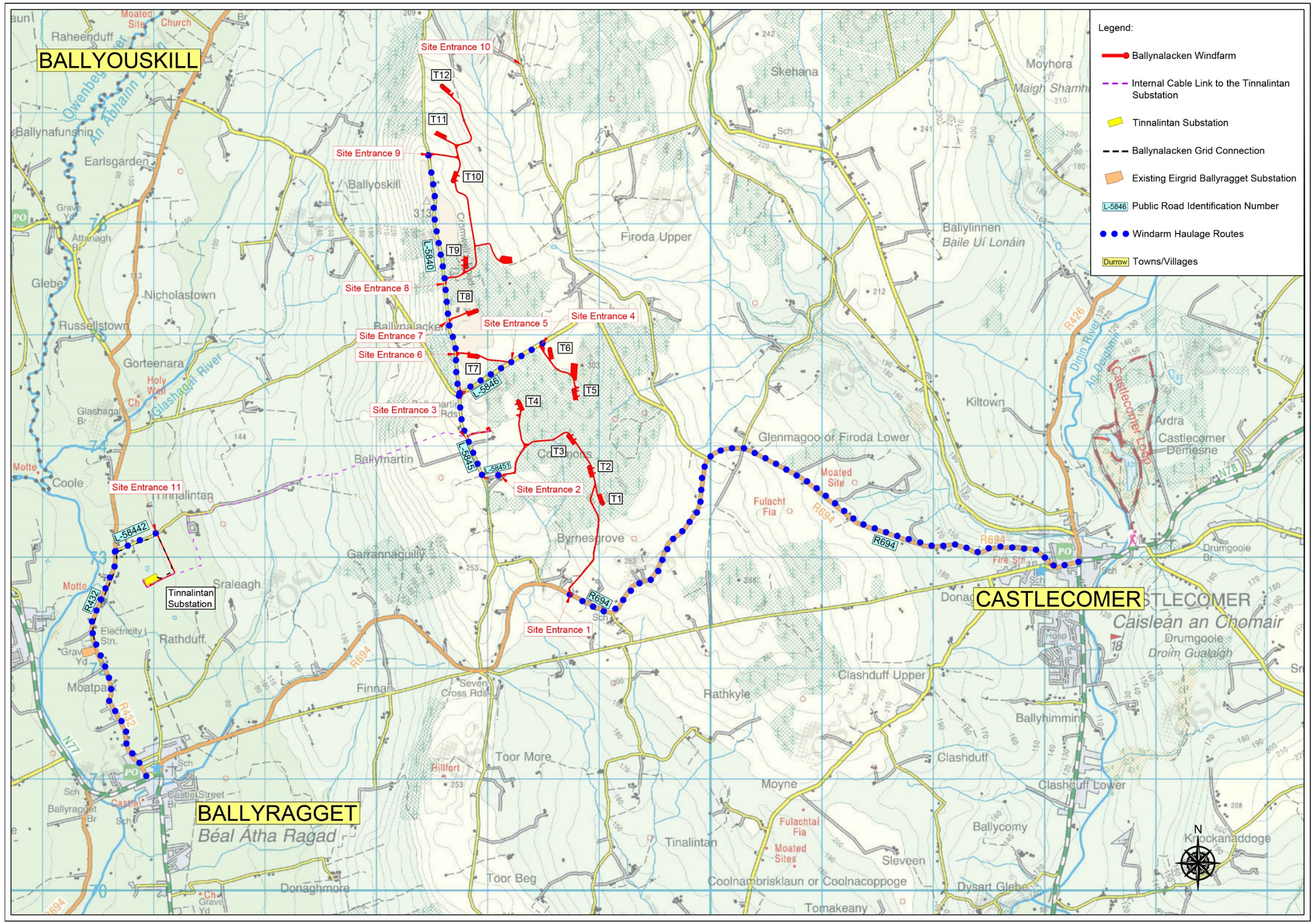

Figure 3: Windfarm site entrances

Table 1 below presents the site entrances for the Ballynalacken Windfarm project.

Table 1 – Site entrance locations

Entrance	Location and Access	Facilities/Access Points
1	New entrance from R694	Windfarm Main Entrance - Access all parts of Windfarm
2	Existing entrance from L-58451	Access all parts of Windfarm
3	Existing entrance from L-5845	Control Building
4	Existing entrance from L-5846	T5, T6, Borrow Pit No.1, Construction Compound No.1
5	New entrance from L-5846	Temporary access for turbine components
6	New entrance from L-5840	T7, Construction Compound No.2, Overburden Storage Area
7	Existing entrance from L-5840	T8, Telecom Relay Pole
8	Existing entrance from L-5840	T9, Borrow Pit No.2
9	Existing entrance from L-5840	T10, T11, T12, Borrow Pit No.2
10	Existing entrance from L-5838	Met Mast
11	Existing entrance from L-58442	Tinnalintan Substation, Construction Compound No.3

16.2.4 Proposed Construction Material Delivery Route

In accordance with the project requirements, a range of construction materials will be delivered to the site throughout the construction program. These deliveries will be facilitated by a variety of heavy goods vehicles (HGVs), each serving a specific purpose.

Aggregate, Concrete and Road Surface Dressing: during the construction phase, various materials such as aggregate, concrete, and road surface dressing will be transported to the works areas from nearby quarries that offer suitable products.

There are three quarries in the area that can provide the necessary materials:

1. Wholesale Suppliers Limited, located in Coolbawn, Castlecomer, is approximately 4.5km from the Windfarm site and supplies sand and gravel;
2. Cemex Dunmore, situated in Kilkenny, is about 20km from the Windfarm site and offers a wide range of quarry products, including concrete; and
3. Roadstone Bennettsbridge, which is roughly 27km from the Windfarm site, provides concrete and gravel products.

The delivery vehicles will follow designated routes:

- Route 1: N78 (Kilkenny – Castlecomer Road) as far as Castlecomer, the R694 (Castlecomer to Ballyragget Road) as far as Entrance no. 1, and then site roads and Local Roads (L58451, L5845, L5846, L5840) in the vicinity of the windfarm site;
- Route 2: N77, as far as Ballyragget, the R432 (Ballyragget – Ballinakill Road) as far as Tinnalintan and then the local road L58442 for Internal Cable Link, Tinnalintan Substation and Grid Connection deliveries.

In assessing the traffic volumes, it is considered that most of the traffic will travel to the windfarm site via Route 1 and a smaller amount of traffic travelling to the Tinnalintan Substation. Therefore, it is considered a realistic scenario where 95% of traffic will travel along Route 1 to the windfarm site, and the remaining 5% will travel along

Route 2 to the Tinnalintan Substation.

16.2.5 Proposed Haul Route for Turbine Equipment (Abnormal Load Route)

As part of the traffic and transport assessment, the transportation logistics for turbine components to the windfarm site have been carefully planned. Specialised extendable flatbed semi-trailers and blade lift trailers will be utilised to transport the turbine components from the port to the site via the public road network.

The transportation vehicles carrying the turbine components will utilise the motorway and national road network, starting from the port (most likely at Waterford) and joining the M9. They will take Exit 8 (Kilkenny) and continue on the N10. From there, the vehicles will follow Route 1 to the windfarm site, i.e. along the N77 and then take a right onto the N78 (Kilkenny - Castlecomer Road), upon reaching Castlecomer, they will make a left turn onto the R694 (Castlecomer – Ballyragget Road, Junction 1) and access the windfarm site at Site Entrance no. 1 and using designated Site Entrances (as mentioned in **Section 16.2.3**) located along the Local Roads, namely the L58451, L5845, L5846 and L5840 (Cromwell's Road).

To facilitate the left turn onto the Ballyragget Road in Castlecomer, especially considering the length of the blade trailers, a blade transfer area will be established on the N78, on the Kilkenny side of Castlecomer. The Blade Transfer (HR8) area is located adjacent to the N78. Construction access to the Blade Transfer area will be from an existing field gate on the Local Road L1844. Movement of blades to and from the Blade Transfer Area during turbine haulage will also utilise this entrance. This will negate the requirement for a new entrance off the National Road. In this area, a crane will be used to lift the blades onto specialised blade-lifter trailers. This transfer process allows for smoother navigation of the acute turn-offs closer to the site and avoids any potential conflicts with nearby buildings during the left turn from the N78 onto the R694 in Castlecomer.

Figure 4 overleaf shows the proposed Haul Route for the transportation of the Turbine components and associated Haul Route works and activities (HR1 to HR13).

A total of 13 No. Haul Route Work & Activity sites (HR1 to HR13) will be established on the public road. It is important to emphasise that these works and activities, intended to accommodate turbine component deliveries, will be of minimal scale and short duration. They include the following:

- Street furniture removal: Street furniture will be removed at specific locations, namely HR1, HR3, HR4, HR5, HR6, HR7, HR9, HR10, HR12;
- Construction of temporary hardcore area on roundabouts and on verges at HR2, HR4, HR5, HR7, and HR10;
- Temporary widening of junctions into agricultural lands, namely at HR12 (Ballymartin Crossroads), and HR13 (Ballymartin);
- Provision of hardcore area to facilitate transfer of blades onto specialised blade-lift trailer – at HR8; and
- Tree trimming along the R694 (HR11).

Following the transport of the turbines, the hardcore areas at the roundabouts, verges and at junctions will be reinstated by covering the hardcore with the topsoil removed during the initial works, the areas will be landscape and sown/planted with the plant species which prevailed prior to the works, and any fencing, kerbing or street furniture will be reinstated. During the operational phase and during decommissioning works, it may be necessary to carry out some or all of the above haul route works and activities in order to transport large components to/from the windfarm site.

See EIAR **Chapter 5 Description of the Development** and **Chapter 5 Figure 5.17.1 – Figure 5.17.13** for detailed mapping of HR1 to HR13.

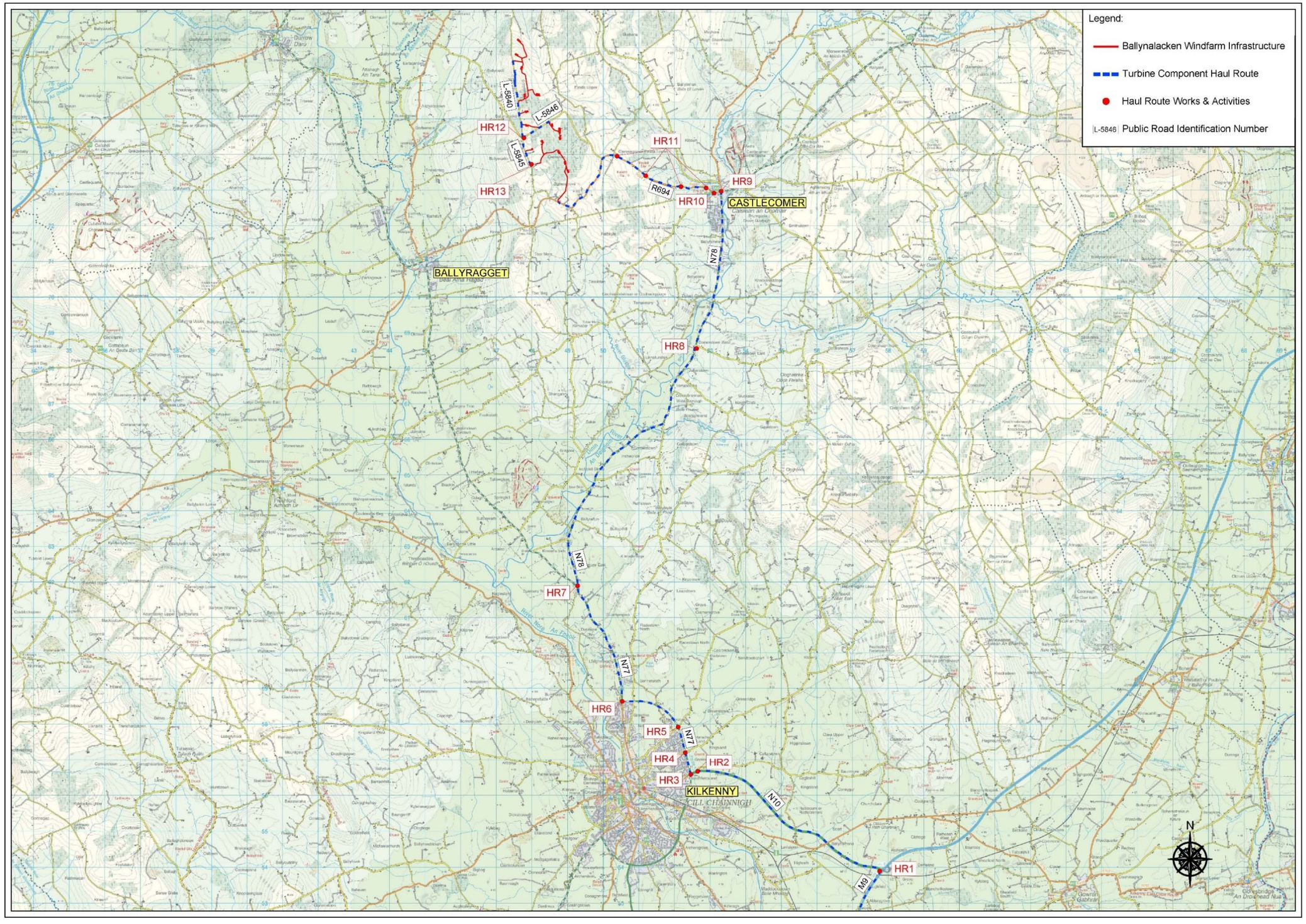

Figure 4: Haul Route Works & Activities

16.3 Existing Traffic Conditions

16.3.1 Existing Road network

The traffic generated by the Ballynalacken Windfarm will access the windfarm site through Site Entrance No. 1 on the R694 and then via the local roads L-58451, L-5845, L-5846 and L-5840, while the Tinnalintan substation, grid connection and the western end of the Internal Cable Link route will be access via the regional road R432, and then the local road L-58442 as shown in Figure 5 and 6.

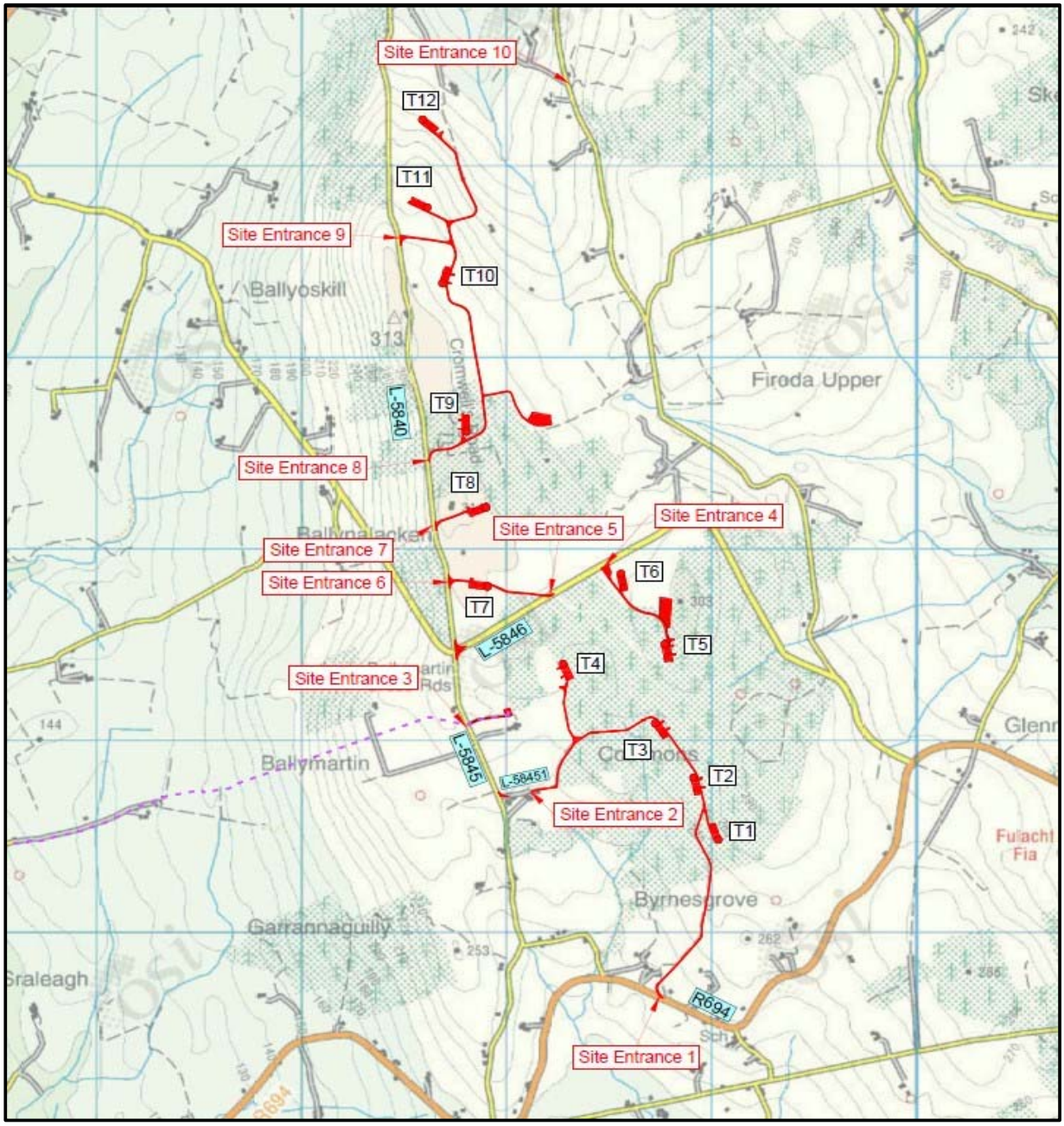

Figure 5: Windfarm Site Entrances and local road network

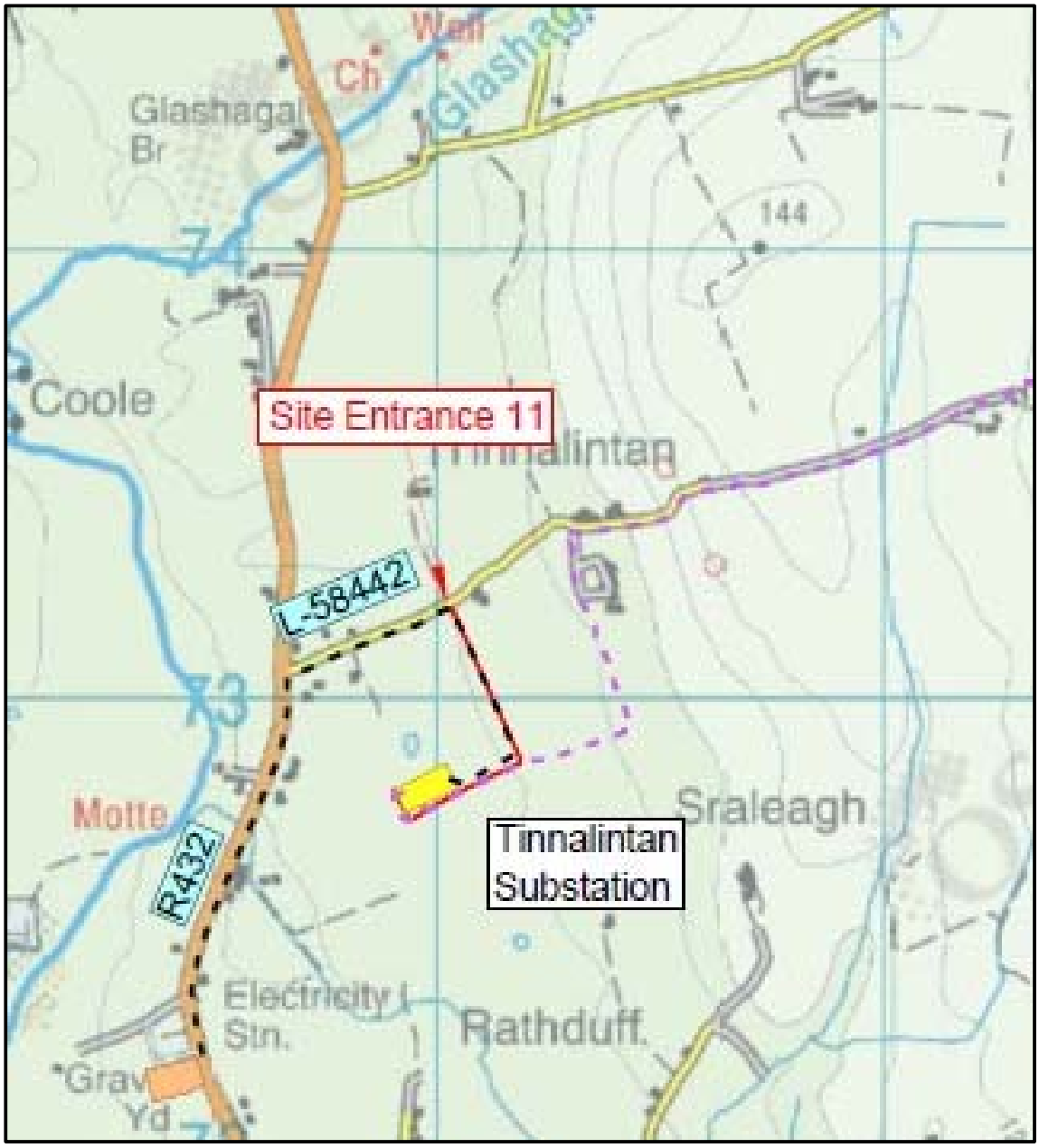

Figure 6: Windfarm Site Entrances and local road network

The local roads are generally rural in nature and experience light traffic. The following paragraphs provide a summary of the local road network, and which parts of the proposed development will be accessed from each road.

16.3.1.1 Regional Road R694

The R694 road is an 80 km/hr which provides a connection between Castlecomer and Ballyragget to the west. The R694 in the vicinity of the proposed development site has a road carriageway width of approximately 6-7 metres with centreline and road edge markings, with a reduced speed within the town of Castlecomer of 50km/hr. Site Entrance 1 is located along this road.

16.3.1.2 Local Road L-58451

L-58451 is a local tertiary road with a carriageway width of approximately 2.40 metres, providing access to existing premises and to farm and forestry lands. Along this road, there is an existing forestry entrance, which will be used as Site Entrance No.2 to access T1, T2, T3 and T4, T5 and T6 and the northern part of the Windfarm. It is important to note that there are currently no road markings, signage or street lighting in the vicinity of the entrance**.**

16.3.1.3 Local Road L-5845

L-5845 road is a local secondary road characterised by a carriageway width of approximately 3.0 metres, flanked by agricultural land on both sides. Along this road, there is an existing entrance that leads to a farm lane, which will be used as Site Entrance No.3 and will provide access to the Windfarm Control Building. A short section of earthen bank will be removed to provide sightlines at this entrance. The speed limit in this area is set at 60 km/h. It is important to note that there are no properties located in close proximity to the entrance and no road markings present in the vicinity of the existing access point. Additionally, the L-5845 road serves as a gateway to the local road L-58451.

16.3.1.4 Local Road L-5846

L-5846 is a local secondary road characterised by a carriageway width of approximately 3.50 metres, with agricultural lands on both sides. The speed limit on this road is 80 km/h. Along the L-5846, there is an existing field entrance on the southern side of the L-5846 that will be widened as Site Entrance No.4 to access to T6, T5, and to Temporary Borrow Pit No. 1. In addition, a new entrance (Site Entrance No.5) will be constructed along the northern side of the L-5846 road. This new entrance will grant access to T7. Hedgerows will be removed to offer a clear sightlines of 90 metres at each of these entrances. It is important to note that there are no street lighting or road markings present in the vicinity of either access point or domestic properties and sheds.

16.3.1.5 Local Road L-5840 (Cromwell's Road)

L-5840 road is classified as a local secondary road and features a carriageway width of approximately 3 metres. Along this road, there is one new entrance to provide access to various locations such as T7 and temporary Construction Compound (Site Entrance No.6), and three existing entrances that provide access to T8 (Site Entrance No.7), and T9, T10, T11, T12, and Borrow Pit No. 2 (Site Entrance No.8 and Site Entrance No.9). The speed limit within this area is set at 60 km/h. Sightlines will be provided at all 4 No. Site Entrances along this road.

It is important to note that there are no properties in close proximity to these entrances. Furthermore, there are currently no road markings present in the vicinity of the existing access point.

16.3.1.6 Regional Road R432

The R432 road is an 80 km/hr regional road, which runs north–south from the R430 in Abbeyleix, County Laois to the N77 in Ballyragget, County Kilkenny. The R432 in the vicinity of the proposed development site has a typical rural road carriageway width of 6.0 metres, with centreline and road edge markings.

16.3.1.7 Local Road L-58442

L-58442 is a local road with a carriageway width of approximately 3.50 meters. A new entrance will be constructed to provide access to the Windfarm Substation and temporary Construction Compound No.3. It is worth noting that there are no road markings, signage or street lighting present in the vicinity of the entrance.

16.3.1.8 Local Road L5838

Traffic on Local Road L5838 (Site Entrance No.10), which will be used only for the construction and access to the met mast, is scoped out for consideration due to the very low traffic volumes associated with the construction and operation of the met mast.

16.3.2 Pedestrian and Cyclist Connectivity

In order to gain deeper insights into the current transportation modes and traffic patterns in the Ballynalacken area, an analysis of the Census 2022 data was conducted. The findings from the 2022 Census for the Electoral Districts of Castlecomer (Figure 7) and Ballyragget (Figure 8) as well as the Small Areas data of Ballynalacken, outlined in Figure 9, indicate a significant reliance on cars as the primary mode of transportation, while bicycles were not reported as a means of travel.

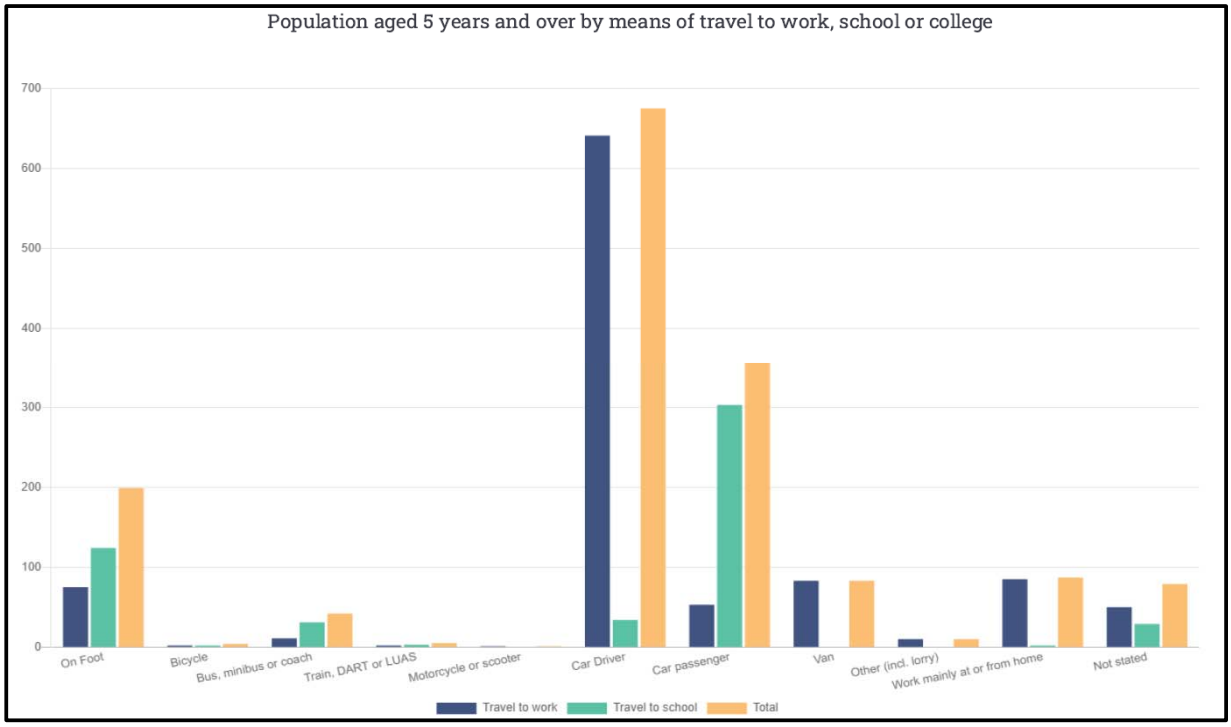

Figure 7: Means of travel to work, school or college for the Electoral District of Castlecomer (Source: CSO.ie)

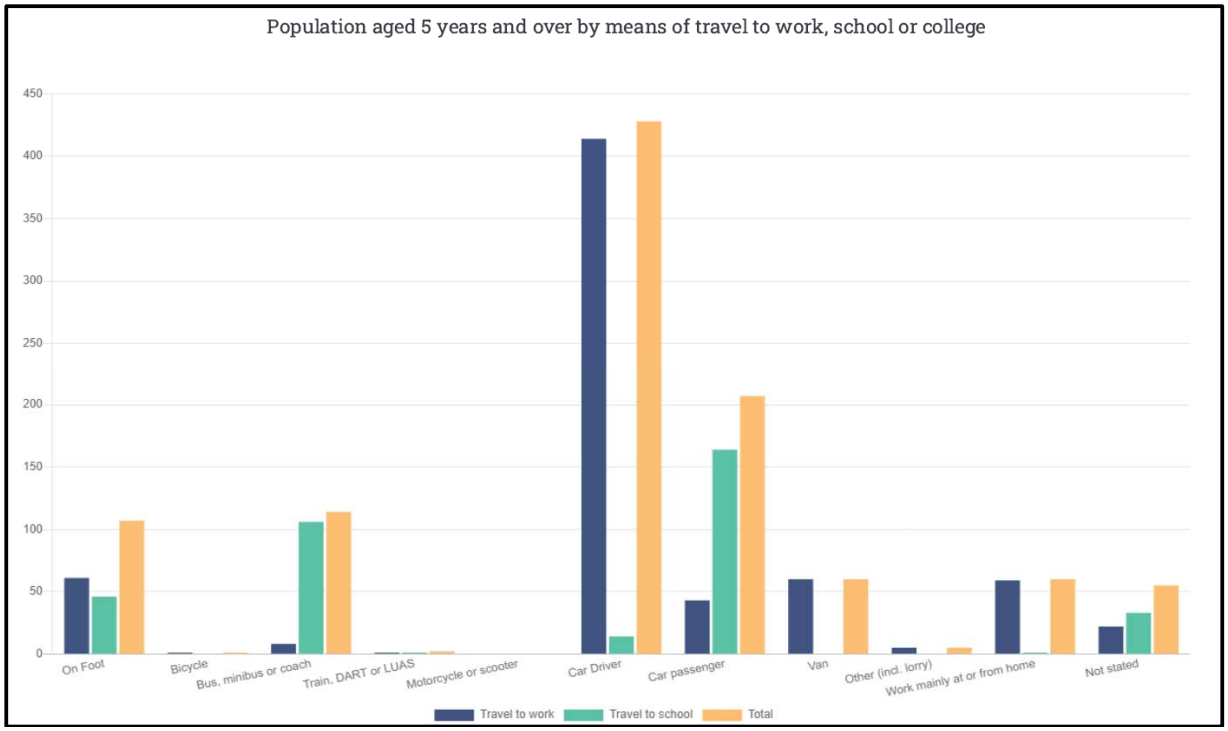

Figure 8: Means of travel to work, school or college for the Electoral District of Ballyragget (Source: CSO.ie)

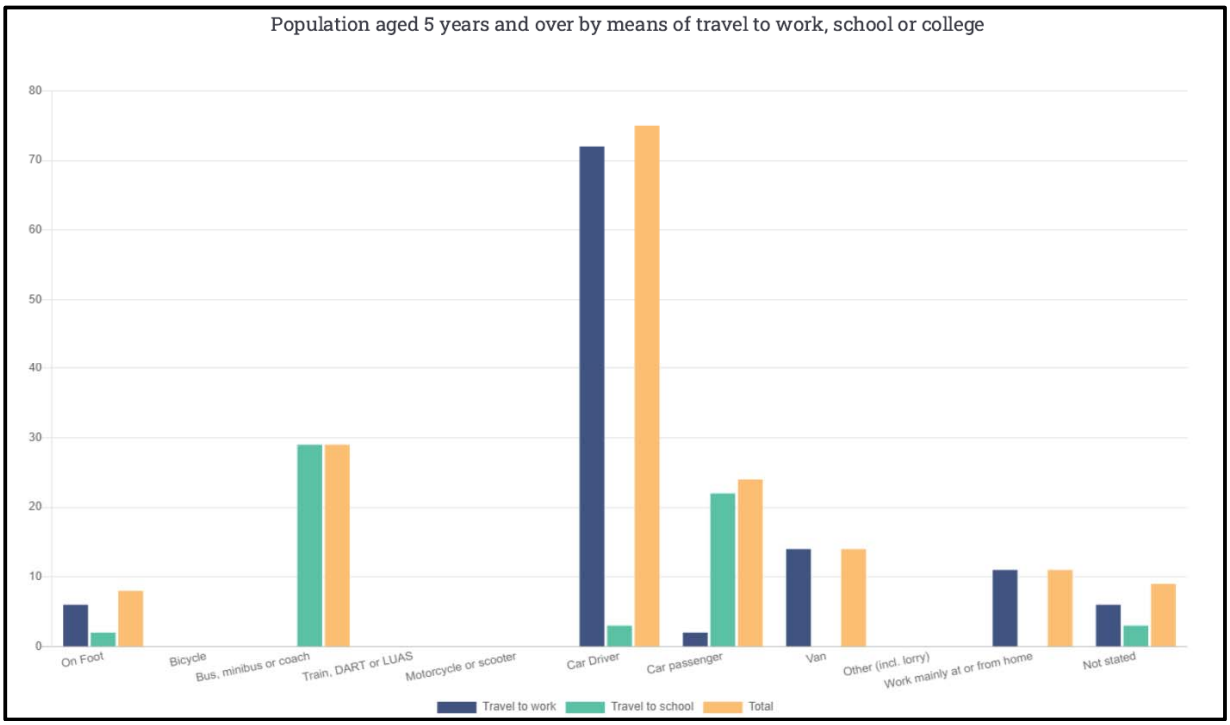

Figure 9: Means of travel to work, school or college for the Smal Area of Ballynalacken (Source: CSO.ie)

Specifically, private vehicles are the preferred means of transport for 68.2% of the Castlecomer population, either as drivers or passengers. This percentage is slightly lower in Ballyragget, with 67.4% opting for private vehicles, and in the Small Area of Ballynalacken, the percentage is 66.5%. Additionally, approximately 13% of individuals in Castlecomer chose walking as their mode of commuting to work, school, or college, compared to 10.3% in Ballyragget. In the rural area of Ballynalacken, this percentage drops to 4.7%.

Currently, the site lacks direct access for pedestrians or cyclists. The local roads in the area have speed limits of either 60 km/h or 80 km/h and are characterised by tall hedging, narrow sections, and winding narrow roads. Moreover, there are no dedicated cycle lanes or pedestrian footpaths on either side of any of the local road, or on the regional roads where they occur outside of Castlecomer and Ballyragget urban areas. Given these conditions, it is not feasible to anticipate pedestrian or cyclist access to the site without substantial investment in active travel infrastructure in the area.

Considering that the primary purpose of this development site is renewable wind energy production, and that the surrounding lands are either farmed or commercial forestry plots, it is unlikely that this area will attract a significant number of on-site employees. Consequently, it is improbable that the local authorities will prioritise the implementation of active travel measures in this rural setting in the short to medium term.

16.3.3 Public Transport Provision

Given the nature and location of the development, it is not anticipated that trips will be made via walking, cycling or public transport and there are limited public transport options at present. To the south there are local bus stops through the towns of Ballyragget and Castlecomer, approximately 4km from the development site. Table 2 summarises the routes and the weekday services available for these areas.

Table 2 – Bus Services Available

Route No.	Bus Operator	Direction	Weekday Services
897	TFI Local Link Carlow Kilkenny Wicklow	Kilkenny – Castlecomer – Carlow Town – Athy	4 services each way, Monday to Sunday
838	Slieve Bloom Coach Tours	Kilkenny – Ballyragget – Castlecomer – Clogh – Timahoe - Portlaoise - Mountmellick	1 service each way, Monday to Saturday

Figure 10 delineates in red the public transport corridors in the vicinity of the site (Routes 838 and 897), indicated by the colour red. This visual representation offers valuable insight into the existing public transport routes and their close proximity to the project site.

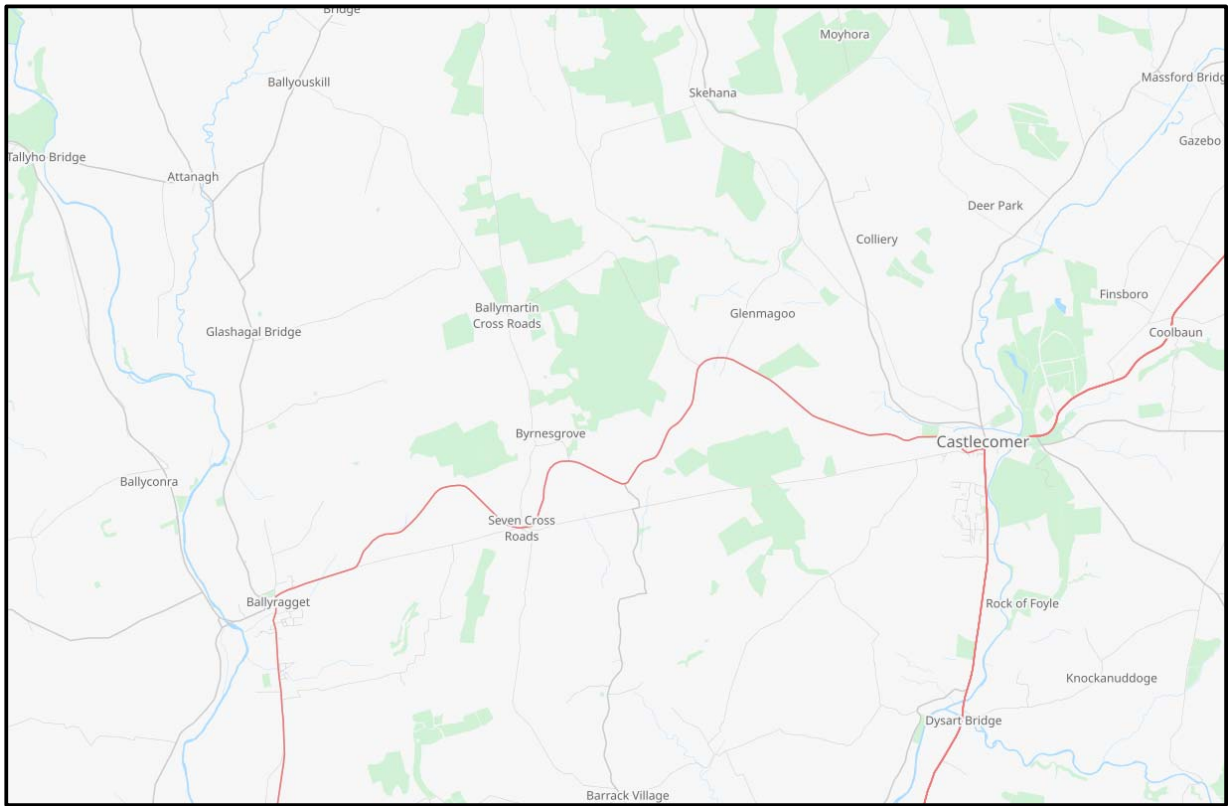

Figure 10: Public transport corridors in the vicinity of the site

16.3.4 Traffic Collisions Data in the Vicinity of the Site

Recent traffic data on collisions in the vicinity of the Windfarm Project could not be obtained as the Road Safety Authority website is currently in process of reviewing its road traffic collision data.

16.4 Existing Traffic flows

To determine the existing traffic conditions in terms of volume and ambient speed on the regional and local rural road network, Automatic Traffic Counters 'ATC Tube Counts' surveys were conducted on each of the affected roads and were undertaken during the years 2022, 2023 and 2024.

Figure 11 overleaf shows the precise locations where the traffic counters were installed.

The recorded data was factored up using TII's growth factors. This adjustment allowed for the estimation of typical peak hour and Annual Average Daily Traffic (AADT) volumes for the latest year, 2024. The resulting 2024 typical baseline traffic volumes are provided in Table 3. These are total two-way vehicles at the road locations identified. Furthermore, the AADT volumes specifically pertaining to Heavy Goods Vehicles (HGVs) and their respective proportions (%) of the overall AADT are also provided.

16.4.1 Local Roads

In summary, it is clear from Table 3 below, that the local roads in the area are generally very lightly trafficked, reflecting the rural nature of the study area.

Table 3 – Existing Traffic Volumes in Local Roads

Road Number	Relevant Automatic Traffic Counters (ATC)	Total Vehicles			
		24Hr 2-way Average Annual Daily Traffic (2024 baseline)	AM Peak 2-way	PM Peak 2-way	2024 AADT HGV (%)
L-5846	ATC1, ATC2	134	11	16	23 (17%)
L-5840	ATC3, ATC4, ATC7, ATC8	31	2	4	3 (10%)
L-5845	ATC14,	61	4	6	5 (8%)
L-5838	ATC21	77	8	10	10 (13%)
L-58442	ATC19	73	7	8	3 (4%)

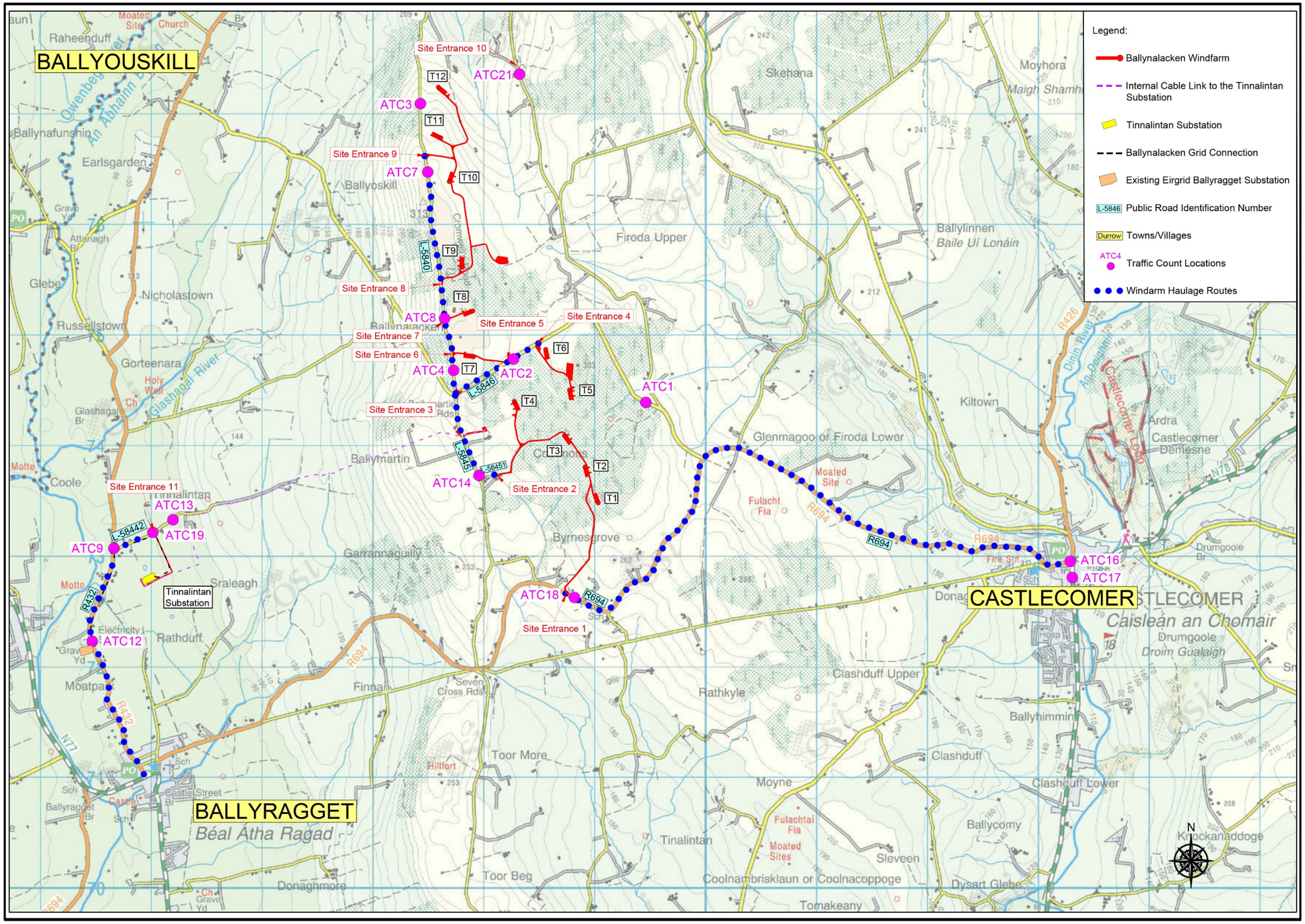

Figure 11: Mapping showing Traffic Count Locations

16.4.2 Regional Roads

The existing rural road link AADT volume/capacity ratio for the R694 and the R432 Regional Road, in the vicinity of the proposed development site, is provided in Table 4, on the basis of the TII DN-GEO-03031 June 2017, for the year 2024. These values are generally in line results of Automatic Tube Counters ATC18 on the R694 and ATC9 and ATC12 on the R432.

Estimation of the Annual Average Daily Traffic (AADT) was carried out based on the TII Project Appraisal Guidelines for National Roads Unit 16.1 - Expansion Factors for Short Period Traffic Counts PE-PAG-02039, October 2016. Estimation of rural road link capacity for the R694 and the R432 Regional Road was conducted using the TII Rural Road Link Design DN-GEO-03031, June 2017 (updated in May 2023), taking into account their typical road carriageway widths. The resulting capacity values are provided in Table 4. The TII rural road link capacity is an AADT capacity.

Table 4 – Existing Traffic Volumes in Regional Roads and Estimated Capacity

Road Location	Relevant Automatic Traffic Counters (ATC)	Total Vehicles			
		Carriageway width (m)	Average Annual Daily Traffic Capacity (vehicle) For a Level of Service D	2024 Average Annual Daily Traffic	AADT Volume/Capacity Ratio
R694	ATC18	6,0	5,000	1,236	24.7%
R432	ATC9, ATC12	6,0	5,000	1,015	20.3%

16.4.3 Junctions

ATC counters were installed at Junction 1 in Castlecomer on the N78 and R694, and at Junctions 2 and 3 in Ballyragget on the N77, R432 and An Chearnog Road. The counters were left in place for approximately 48 hours, starting from midday on Wednesday, June 14th, and concluding at midday on Friday, June 16th, 2023. Additionally, manual counts were also conducted at Junctions 1, 2 and 3 during the AM peak and PM periods, each lasting for 2 hours. These comprehensive data collection efforts aimed to provide accurate and detailed information on the existing traffic conditions at the targeted locations.

The results for the AM and PM peak are shown in Table 5 overleaf.

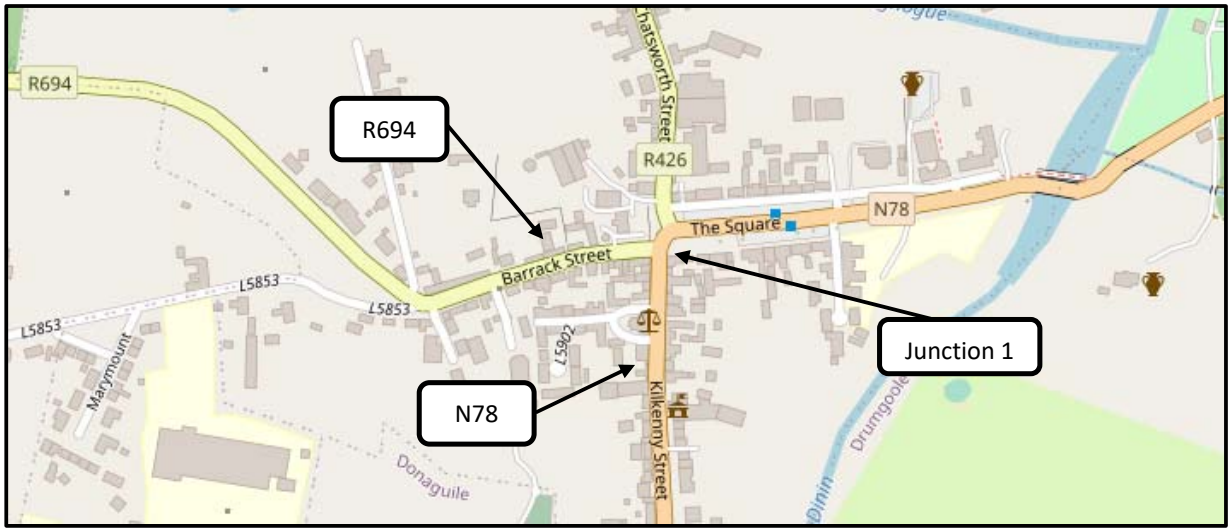

Figure 12: Junction 1 between R694 and N77

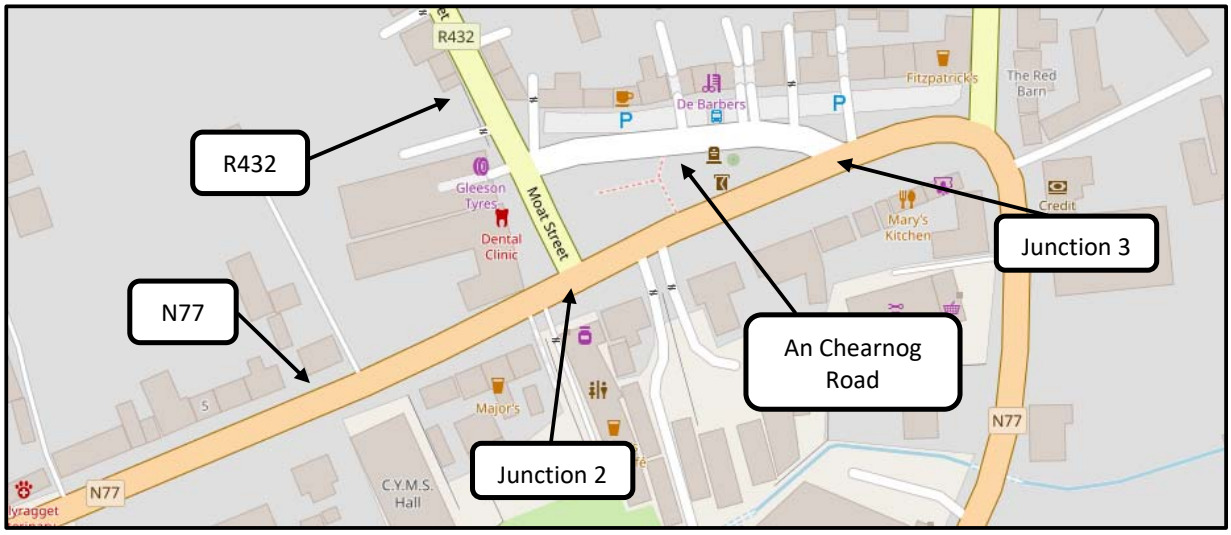

Figure 13: Junction 2 between R432 and N77 and Junction 3 between An Chearnog and N77

Table 5 – AM and PM Traffic in Castlecomer and Ballyragget (June 2023)

Location	Road ID	AM Peak (PCUs)	%HGV	PM Peak (PCUs)	%HGV
J1	R694/N78	1170	6.6%	1050.4	2.2%
J2	R432/N77	883.3	8.3%	961.1	6.4%
J3	An Chearnog/N77	891.4	3%	946.7	2.7%

16.5 Future Years Traffic Growth

16.5.1 Traffic and Transport Assessment Guidelines

The Kilkenny Development Plan 2021 – 2027, requires a Traffic Assessment to be provided for all significant development proposals in accordance with the TII publication *Traffic and Transport Assessment Guidelines*.

The TII Publication PE-PDV-02045 Traffic and Transport Assessment Guidelines, published in May 2014, recommends that junction modelling should be carried out where new traffic exceeds 5% of existing flows if congestion already exists and if traffic generated by the development exceeds 10% where no traffic congestion is present**.**

Table 6 – Traffic Management Guidelines Thresholds for Transport Assessments (TII)

TII Thresholds	
YES	**Traffic to and from the development exceeds 10% of the traffic flow on the adjoining road.**
N/A	Traffic to and from the development exceeds 5% of the traffic flow on the adjoining road where congestion exists, or the location is sensitive
N/A	Residential development in excess of 200 dwellings
N/A	Retail and leisure development in excess of 100m2
N/A	Office, education and hospital development in excess of 2,500m2
N/A	Industrial development in excess of 5,000m2
N/A	Distribution and warehousing in excess of 10,000m2

As indicated in Table 6 above, the construction-related traffic on some of the local roads will meet the first listed threshold, therefore the production of a Traffic and Transport Assessment is recommended. This Traffic and Transport Assessment has been prepared to address the construction-related traffic associated with the Windfarm Project, particularly on the local roads. To ensure a comprehensive evaluation of the transport impact, a thorough analysis was conducted, considering the existing volumes, future projections, and quantified road link capacity based on the pavement width and conditions.

16.5.2 Traffic Forecasting

Transport Infrastructure Ireland (TII) issues a range of forecasts: low growth, central growth, and high growth. The implementation of policies relating to the National Sustainable Mobility Policy will act as a deterrent to high growth in car-based travel. Low growth factors are however likely to be equally unrealistic at present, therefore, this assessment has used central growth factors, which was extracted from the TII Publication PE-PAG-02017 Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projections, published in October 2021, outlined in Table 7 and Table 8 below.

Assuming planning permission is obtained in 2025 for a 10-year planning duration, the construction is estimated to commence between 2025 and 2035. ORS evaluated two potential construction years for the Project – 2025 and 2035. As a result, traffic counts were adjusted using growth factors corresponding to the years 2025 and 2035. This approach ensures that the assessment takes into account the projected changes in traffic volumes and patterns during the construction phase.

Table 7 – TII Annual Growth Rates (Central Growth) for Co. Kilkenny

Year	LGV	HGV
2016 – 2030	1.0124	1.0268
2030 – 2040	1.0037	1.0129
2040 – 2050	1.0027	1.0166

Table 8 – Growth Factors for Future Design Years for Co. Kilkenny

	Counts	Base Year	Construction Phase	
	2023	2024	2025	2035
LGV	1.000	1.012	1.025	1.110
HGV	1.000	1.027	1.054	1.203

16.6 Trip Generation & Distribution of Traffic Associated with Project

16.6.1 Construction Programme

The Windfarm construction programme can be broken down into 4No. main phases as follows:

- Phase 1 Pre-Construction (6 months);
- Phase 2 Haul route works/activities (30 days);
- Phase 3 Main Civil and Electrical Construction Activities, Internal Cable Link, Grid Connection (12-16 months); and
- Phase 4 Commissioning (2 months).

During the construction phase, it is expected that the majority of aggregate will be sourced from two on-site borrow pits which will provide most of the material for internal road construction & hardstands. Some aggregate for the hardwearing capping layer will be imported, along with concrete requirements and aggregate for backfilling trenches and for road widening, these materials will be sourced from 3 No. local quarries. These quarry locations represent maximum distances that construction materials could potentially travel to reach the proposed development. It should be noted that there may be smaller local suppliers available during the construction phase, which could significantly reduce the distance travelled on public roads.

It is assumed that 95% of the delivery vehicles will use the N78 (Kilkenny - Castlecomer Road) and the R694 (Castlecomer to Ballyragget Road) and then Local Roads in the vicinity of the site, while the remaining 5% will use the N77 (Kilkenny - Ballyragget Road), the R432 and then the Local Roads.

Construction Hours

Construction activities for the project are scheduled to take place during the following hours: 7:00 a.m. to 7:00 p.m. from Monday to Friday, and 8:00 a.m. to 4:30 p.m. on Saturdays. These working hours are subject to confirmation at the beginning of the project, and any potential changes to the hours will be discussed and agreed upon with the Local Authority.

Construction Staff

During different phases of the construction activities, the number of construction staff involved will vary. At the peak construction period of the Wind Farm site, an estimated maximum of approximately 107 personnel will be present. This includes:

- 35 No. civil contracting personnel responsible for the construction of temporary facilities, roads, turbine foundations, and cabling infrastructure.
- 12 No. personnel dedicated to turbine manufacturing, delivery, and erection.
- 30 No. electrical and civil contractor personnel involved in the construction of the Windfarm Control Building, Windfarm Substation, and associated equipment installation.
- 20 No. civil and electrical contracting personnel engaged in cabling activities, connecting the Windfarm Control Building to the Windfarm Substation and from the Substation to the EirGrid Ballyragget Substation. Additionally, 4 No. electrical contractors will be responsible for cable pulling and jointing along the cabling routes.
- Approximately 6 No. personnel providing security and canteen services.

Site personnel will arrive at the site prior to 7:00 a.m. and depart after 7:00 p.m. on weekdays, avoiding peak traffic hours. Assuming an average vehicle occupancy rate of 1.25 personnel per vehicle (representing a conservative scenario), the estimated peak staff of 107 will generate approximately 86 No. car and van trips to and from the site each working day. Since on-site canteen facilities will be provided, there will be no need for staff to leave the site during working hours.

The proposed trip generations by the Windfarm Project construction are summarised in Table 9 overleaf. Notes:

* The largest traffic volumes are associated with the concrete pours for the turbine foundations. No other deliveries to the windfarm will be scheduled to occur on the same days as the concrete pours, hence, they have not been added to the daily traffic volumes in this table. These values have been highlighted in red colour.

** The turbine deliveries will occur during night-time with traffic management and garda escort. As this traffic will be isolated from other daily traffic movements, it has not been added into the daily traffic volumes in this table. These values have been highlighted in green colour.

*** This construction traffic table is a simplified traffic volume table against staff programme. As mentioned before staff will arrive at the site prior to 7:00 a.m. and depart after 7:00 p.m. on weekdays, avoiding network's peak traffic hours.

Table 9 – Typical Construction Traffic Volumes (Week 1 - 26)

			Loads per Week																									
Task Name	Duration (weeks)	Loads	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Construction (overall)	52	2550																										
Construct roads & hardstands	24	323			15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	8		
Construct turbine foundations*	22	972										81		81		81		81		81		81		81		81		81
Construct met mast, telecom pole	2	4													4													
Install internal windfarm collector circuit	16	443							27	27	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26		
Haul route works	10	100																	10	10	10	10	10	10	10	10	10	10
Internal cable link construction	10	310																					21	28	28	29	29	29
Substation - Civil works	26	226	20	20	20	20	20	20	20	20	20	5	5	5	5	5	5	5	5	5	1							
Substation - Fit out	19	6																										
Grid - Cable trench & joint bay construction	5	56																									16	10
Reinstatement Works	6	2																									1	
Turbine delivery**	12	108																										
Turbine erection & testing	20	0																										

Staff (LV) ***			86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86
Total HGV Per Day (1-way route)			20	20	35	35	35	35	62	62	61	46	46	46	50	46	46	46	56	56	52	51	72	79	79	47	56	49	

Table 9 cont. – Typical Construction Traffic Volumes (Week 27 - 52)

			Loads per Week																										
Task Name	Duration (weeks)	Loads	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	
Construction (overall)	52	2550																											
Construct roads & hardstands	24	323																											
Construct turbine foundations*	22	972		81		81		81																					
Construct met mast, telecom pole	2	4																											
Install internal windfarm collector circuit	16	443																											
Haul route works	10	100																											
Internal cable link construction	10	310	29	29	29	29	29																						
Substation - Civil works	26	226																											
Substation - Fit out	19	6	6																										
Grid - Cable trench & joint bay construction	5	56	10	10	10																								
Reinstatement Works	6	2							1																				

Turbine delivery**	12	108					9	9	9	9	9	9	9	9	9	9	9	9										
Turbine erection & testing	20	0	45	39	39	29	29	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Staff (LV) ***			86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86
Total HGV Per Day (1-way route)			45	39	39	29	29	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

16.6.2 Development Traffic Generation

Traffic Generation During Construction Stage

The construction stage of the project will have the most significant traffic impact. Peak construction deliveries are assumed to occur during the initial eight months of the maximum sixteen months construction period. This section outlines the potential impact of the construction stage on the existing road infrastructure and the existing traffic capacity.

Turbine Delivery Vehicle Volumes

Delivery of the wind turbine loads will be carefully coordinated with Kilkenny County Council and An Garda Síochána. A total of 108 No. delivery vehicles will be required for the transportation of the 12No. turbines (turbines, nacelles and blades). The turbine deliveries will occur during night-time with traffic management and Garda escort. As this traffic will be isolated from other daily traffic movements, it has not been added into the daily traffic volumes. It is important to note that during the off-peak traffic delivery periods, there may be temporary delays for other traffic in the vicinity.

The trip generations associated with the delivery of the Turbine components are summarised in Table 10. Based on the construction programme 9 No. deliveries will take place per week in a convoy and the delivery will last twelve weeks.

As stated above the turbine deliveries will occur during night-time with traffic management and garda escort. As this traffic will be isolated from other daily traffic movements, it has not been added into the daily traffic volumes previously in Table 9.

Table 10 – Turbine Delivery Traffic Volumes

Elements	Parts	Components per element	Total Components	Trips (Per week)	Weeks
Nacelle	1	12 turbines X 2 = 24	108	9	12
Blade	3	12 turbines X 3 = 36			
Tower	4	12 turbines X 4 = 48			

Construction Material Delivery Vehicle Volumes

The construction programme, spanning 12 months, will necessitate the importation of approximately 2,550 loads of construction materials. This includes the delivery vehicles for the 12No. wind turbines, including their abnormal loads. All other construction materials will be transported using standard heavy vehicle delivery trucks with capacities of around 14 m^3. For the importation of concrete, trucks with an 8 m^3 capacity will be utilised.

Table 11 below, provides an overview of the Average Annual Daily Traffic (AADT) volumes and Heavy Goods Vehicle (HGV) traffic volumes that are anticipated as a result of the construction activities associated with the proposed development during peak construction time. These traffic volumes are distributed across the local road network, taking into consideration the assumption that the majority of deliveries (95%) and staff will utilise Route 1 as the primary route to access the construction site. Also, as discussed above the site personnel will travel to/from the site out of the network's peak times.

Table 11 uses the maximum weekly value (Week 22) outlined in Table 9 above, which includes 79 one-way HGV movements and 86 LGV movements created by staff, totalling 165 vehicle movements. This figure represents the worst-case scenario and was used to assess the previously mentioned junctions. Of the 165 vehicle movements, 95% (157 movements) will travel via Route 1 through the N77, N78, R694, L58451, L5845, L5846 and L5840, while 5% (8 movements) will travel via Route 2 through the N77, R432 and L58442.

Table 11 – Proposed Construction Works Traffic Volumes

Route ID (% construction traffic)	Road ID	Total Vehicles		
		24Hr 1-way Average Annual Daily Traffic (of which are staff vehicles)	24Hr 2-way Average Annual Daily Traffic	HGV only Traffic 2-way
Route 1 (95%)	N77	157 (82)	314	150
	N78	157 (82)	314	150
	R694	157 (82)	314	150
	L58451	157 (82)	314	150
	L5845	157 (82)	314	150
	L5846	63 (33)	126	60
	L5840	94 (49)	188	90
Route 2 (5%)	N77	8 (4)	16	8
	R432	8 (4)	16	8
	L58442	8 (4)	16	8

16.6.2.1 Traffic Generation During Operational Stage

During this phase, the day-to-day operations of the Windfarm will be primarily managed and monitored from an off-site location. As a result, there will be minimal traffic generated for operational and maintenance purposes. The volume of vehicles involved, including occasional heavy vehicles, will be relatively low. The existing construction site entrances will continue to serve as the operational entrances. Operational staff will utilise service vans or four-wheel drive vehicles and will visit the site frequently, averaging about three times per week. During the operational phase of the Windfarm, existing forestry and agricultural traffic volumes are expected to remain similar to the existing levels. The Windfarm itself will not contribute to an increase in forestry or agricultural traffic, resulting in a neutral in terms of quality, long-term in duration and imperceptible in significance effect on the traffic flow within the existing road network.

16.6.2.2 Traffic Generation During Decommissioning Stage

The decommissioning process is estimated to take approximately four months and will involve multiple specialist crews working simultaneously. A total of 20No. personnel will be present on-site during this phase. The dismantling of the turbines will be carried out using cranes and will require the same number of personnel and time as the initial erection of the turbines.

It is anticipated that the volume of traffic associated with the decommissioning stage will be significantly less than during the construction stage. This is due to the retention of turbine foundations, internal access roads, and other existing elements. As a result, the overall traffic impact during the decommissioning stage is temporary and will not have a significant adverse effect.

16.7 Impact on the Road Network

16.7.1 Traffic Impact Assessment

Based on the traffic counts obtained in June 2023 for the roads assessed, the travel distribution was established. Only a small percentage of traffic diverts towards the local roads L5840, L5846 and L5845. From Ballyragget, it has been observed that the majority of traffic travels along the R432 towards Ballyouskill and vice versa. Only a small percentage, approximately 7% of the traffic, diverts towards the local road L58442.

With the exception of the wind turbine component deliveries which are 100% incoming/outgoing through N77/N78/R694, the development traffic has been split accordingly. Given the construction activities, it is anticipated that the majority of the works will be concentrated on local roads L5840 and L5845. Consequently, Route 1 (N78/R694 through Castlecomer) is expected to bear the brunt of the traffic excluding the turbine components, with an estimated 95% of the generated construction traffic utilising this route. Route 2 (N77/R432 through Ballyragget) is projected to account for approximately 5% of the construction traffic. These estimations have been made for assessment purposes, taking into account the realistic scenario.

As the proposed development is expected to commence construction phase between 2025 and 2035, the projected 2024 traffic flows could be calculated using TII's Central Growth Factor for Co. Kilkenny. Based on the traffic levels expected from the proposed development, the impact on the road network can be determined, as shown in Table 12**.** This considers figures for anticipated traffic from the scheme during the public network peak, in conjunction with peak hour traffic counts. At this point it should be again highlighted that the site personnel will travel to/from the site out of the network's peak times, therefore these figures will not be included in Table 12 which assess the impact on traffic during peak times.

As part of the proposed works, the local roads will undergo widening to 4.5m to accommodate the new Windfarm works. It is worth noting that the TII guidance does not provide specific rural road link capacities for road carriageway widths less than 6.0 metres. To assess the capacity of the local roads, an evaluation was conducted, taking into consideration a worst-case scenario with a proposed width of 4.5m. The evaluation utilised *Junctions 10* software, which indicated a minimum capacity of 514 Vehicles per hour for this road category. Therefore, the comparison for the public roads will be presented in terms of vehicles, providing a comprehensive assessment of their capacity.

Table 12 – Traffic Impact on Assessed Roads

Road ID	AADT Road Capacity (vehicle) for Level of Service D	2025 Projected Traffic (vehicles)			Traffic from Developments (Table 11)			Increase in Traffic during peak times		TII Threshold of 10%		% Estimated Road Capacity used (Resid.)
		24Hr 2-way AADT	AM Peak	PM Peak	24Hr 2-way Traffic	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	
R694	5,000	1,353	120	127	314	75	75	62.5%	59%	Above	Above	33% (67%)
R432	5,000	1,027	99	87	16	4	4	4%	4.6%	Below	Below	21% (79%)
L5845	514	62	4	6	314	173	173	4325%	2883%	Above	Above	73.2% (26.8%)
L5846	514	136	11	16	126	63	63	573%	394%	Above	Above	50.9% (49.1%)
L5840	514	31	2	4	188	94	94	4,700%	2,350%	Above	Above	43% (57%)
L58442	514	74	7	8	16	8	8	114%	100%	Above	Above	17.5% (82.5%)

Note: The Local Road L58451, as listed in Table 11, is not considered in Table 12 above as this Local road is a cul de sac that only services 2 farm complexes and forestry access and as such existing traffic volumes are negligible.

According to Table 12, the anticipated traffic from these works during peak construction phase is expected to increase passing traffic by up to 62.5% during the AM period and 59% during the PM period on R694 and 4% during the AM period and 4.6% during the PM period on R432. As mentioned before in **Section 16.4.2,** the rural road link AADT capacities for the R694 and the R432 Regional Roads, in the vicinity of the proposed development site are indicative and estimated at 5,000 vehicles for a Level of Service D, on the basis of the TII Rural Road Link Design DN-GEO-03031 June 2017. The R694 and R432 would continue to operate within their TII rural road link AADT capacities, for the predicted peak construction year 2025 peak daily volumes, with peak construction and the TII central growth scenario, with highest 2025 volume/capacity ratios of 33% and 21%, respectively. Based on the above, the negative or adverse effects on the regional roads R694 and R432 associated with the construction works at the wind farm site are considered to be short-term in duration and moderate in significance without the inclusion of any mitigation measures. Specifically, for the R432 regional road, the impact is considered short-term and slight in significance. Therefore, the regional road network will continue to operate well within its carrying capacity even with the additional construction traffic.

As observed in Table 12 there is a significant increase in traffic volume on the local roads. However, it is important to note that the percentage changes in traffic conditions may appear substantial due to the extremely low existing traffic levels. The negative or adverse effects on the local roads, namely L58451, L5845, L5840, L5846, and L58442, associated with the construction works at the wind farm site are considered to be short-term in duration and substantial in significance without the inclusion of any mitigation measures. It should be emphasised that despite the increase, the Average Annual Daily Traffic (AADT) volumes on the Local Roads would remain relatively low. The local road network will continue to operate within its carrying capacity even with the additional construction traffic, providing adequate capacity to accommodate the projected traffic volumes. By ensuring the necessary widening of the local road carriageways and aligning with the estimated capacities, the anticipated traffic conditions on these roads can be effectively managed. This approach will contribute to maintaining smooth traffic flow, accommodating the increased traffic resulting from the construction activities, and ensuring the continued functionality of the local road network.

In conclusion, the comprehensive traffic assessment conducted for the proposed Windfarm Project has provided valuable insights into the potential impact on the existing road network. The peak construction traffic during construction weeks 22-23 is the worst-case scenario the Proposed Development is envisaged to generate with regards to traffic. Overall, the findings indicate that that during peak construction traffic, the impact will be of short duration, resulting in a **temporary moderate negative** effect on the road network.

While this assessment has addressed the overall traffic conditions and capacity considerations, it is important to note that further evaluation will be carried out to assess the specific junctions mentioned in **Section 16.4.3**. Junction modelling will provide a more detailed analysis of these areas, allowing for a thorough understanding of the traffic flow and any potential improvements that may be required.

The results from the 3No. junction modelling will further contribute to the comprehensive assessment of the project's impact on the road network and are presented in **Section 16.8**.

16.8 Capacity Analysis

16.8.1 Capacity Analysis Introduction

A capacity assessment was conducted at the specific junctions mentioned earlier in the report. The purpose of this assessment was to provide evidence that the implementation of the Proposed Windfarm Project would not have a significant impact on the operational efficiency of the existing junctions and the broader road network. By evaluating the capacity of these junctions, the assessment aimed to examine if the proposed changes would cause congestion, delays, or any other adverse effects on the overall functionality of the junctions.

The performance of the junction during the AM and PM peak hours was assessed using PICADY transport modelling software for the design years:

- 2024, present scenario;
- 2025, 1st construction phase scenario; and
- 2035, 2nd construction phase scenario.

The Ratio of Flow to Capacity (RFC) values, displayed in the following sections, describe the capacity of each approach to the junction and determines if the junction will cater for the predicted level of traffic. An RFC below 0.85 (85%) implies that an approach road is operating satisfactorily well within capacity; between 0.85 to 1.0 RFC means the approach operates well within capacity but at less optimal efficiency; and an RFC above 1.0 means that demand and capacity are equal and no further traffic can progress through the junction. The queue levels are presented in Passenger Car Unit (PCU) and quantify the total number of vehicles queueing on each arm.

16.8.2 Traffic Impacts of the Proposed Development on the Local Road Network

For the purpose of this traffic assessment, it has been considered that during the peak construction phase, the majority of the generated traffic, approximately 95%, will utilise the B-arm at Junction 1. This arm leads to Site Entrance No. 1 which provides direct access to the main Windfarm access points and primary construction sites. The traffic volumes along the three junctions have been calculated using data from Junctions' ATC counters and manned traffic counts. Furthermore, it has been assumed that 100% of the construction traffic to and from the site will be generated by heavy goods vehicles (HGVs). These assumptions provided a comprehensive basis for evaluating the traffic impact of the proposed Windfarm Project on the surrounding road network.

The results presented in Table 13, Table 14 and Table 15 reflect the consideration of all relevant factors and provide a comprehensive assessment of the performance of three key junctions within the study area.

Traffic counts were undertaken at the aforementioned junctions, from Wednesday the 14th of June to Monday the 19th of June 2023 for Junction 1 and from Wednesday the 14th of June to Friday the 16th of June 2023 for Junctions 2 and 3. Manual traffic counts were also carried out at the aforementioned junctions, to cover all traffic movements for two hours in the morning (8:00-10:00) and two hours in the evening (16:00-18:00). Central traffic growth rates for Co. Kilkenny, specified in the TII's Publication PE-PAG-02017 of October 2021, were applied to existing background traffic only and were not applied to the generated traffic by the proposed Windfarm development, since they are limited by development size.

The capacity assessment was conducted by modelling three different scenarios to evaluate the traffic impacts. These scenarios include:

- Base-year: Traffic flows in the year 2024 were modelled based on the traffic counts obtained in June 2023 for the three specified junctions.
- Scenario 1: The additional traffic generated during the peak construction phase was added to the traffic counts obtained in June 2023 for the three junctions. This analysis allows for a comparison with the "Do-nothing" scenario. The traffic counts were factored up using TII's Growth Factor for the construction year 2025.
- Scenario 2: Similar to the Scenario 1, the impact of the traffic generated during the peak construction phase was added to the traffic counts obtained in June 2023 for the three junctions. The traffic counts were factored

up using TII's Growth Factor for the construction year 2035.

16.8.3 Junction Modelling – Junction 1 (J1)

In the following analysis of the Junction 1, the junction was assessed for the AM and PM peak period using PICADY. The peak time periods taken based on the counts are 8:15 to 09:15 in the AM and 17:30 to 18:30 in the PM peak. The arms were labelled as follows (Figure 14):

- Arm A: N78 - South
- Arm B: R694
- Arm C: N78 - East

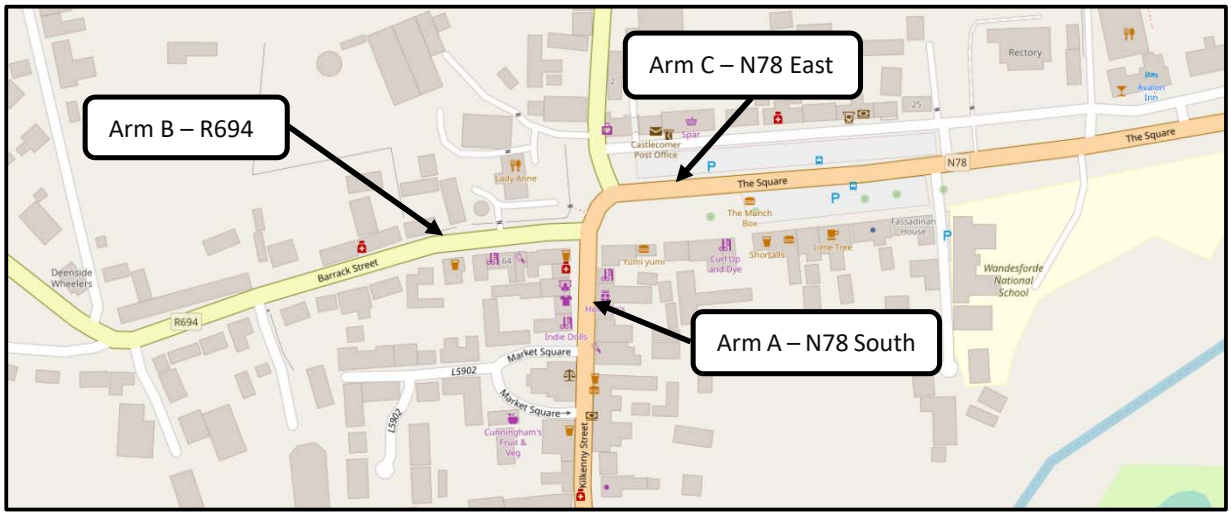

Figure 14: Junction 1 - arm names on Junctions

Figure 15 shows the traffic obtained at J1 on the days of the counts during peak hours.

Figure 15: AM and PM June 2023 traffic counts in PCUs at Junction 1

Figure 16 shows the HGV percentages obtained at J1 on the days of the counts during peak hours.

Figure 16: AM and PM June 2023 HGV % at Junction 1

The traffic model includes a controlled pedestrian crossing on Arm A. This pedestrian crossing has been carefully incorporated into the analysis to assess its impact on traffic flow.

Table 13 presents the analysis results for Junction 1, obtained using PICADY software, for the current year 2024 as well as the construction years 2025 and 2035, taking into account the peak construction traffic activity. The table provides a comprehensive overview of the anticipated traffic at Junction 1, considering two different construction scenarios.

Table 13 – PICADY Results for Junction 1

Scenario	Stream	AM		PM	
		Queue (PCU)	RFC	Queue (PCU)	RFC
1 – 2024, base year	A-BC	0.4	0.26	0.5	0.32
	B-AC	0.7	0.41	0.4	0.3
	C-AB	0.5	0.19	0.3	0.16
2 – 2025	A-BC	0.7	0.37	0.5	0.33
	B-AC	0.8	0.44	6.4	0.85
	C-AB	0.6	0.21	0.3	0.16
3 – 2035	A-BC	0.8	0.39	0.6	0.35
	B-AC	1.1	0.50	9.5	0.92
	C-AB	0.7	0.25	0.4	0.18

16.8.3.1 Results - Junction 1

Based on the results obtained from the PICADY software analysis for Junction 1, the performance of each arm during different scenarios was evaluated. In the base year scenario of 2024, Arm A exhibited a queue of 0.4 PCU (Passenger Car Units) during the AM peak period and 0.5 PCU during the PM peak period. Arm B had a queue of 0.7 PCU in the AM and 0.4 PCU in the PM, while Arm C had a queue of 0.5 PCU in the AM and 0.3 PCU in the PM.

In Scenario 1 for the year 2025, which considered the impact of additional traffic generated during peak construction, the queues at Junction 1 showed an increase compared to the base year scenario. Arm A had a queue of 0.7 PCU in the AM and 0.5 PCU in the PM, Arm B had a queue of 0.8 PCU in the AM and 6.4 PCU in the PM (corresponding to 37m), and Arm C had a queue of 0.6 PCU in the AM and 0.3 PCU in the PM.

Looking ahead to Scenario 2 for the year 2035, the queues at Junction 1 were further increased compared to the previous scenarios. Arm A had a queue of 0.8 PCU in the AM and 0.6 PCU in the PM, Arm B had a queue of 1.1 PCU in the AM and 9.5 PCU in the PM (corresponding to 55m), and Arm C had a queue of 0.7 PCU in the AM and 0.4 PCU in the PM.

It should be noted that in Scenario 1 and 2, Arm B on Stream B-AC (R694 towards the N78) exhibits a notably high (Ratio of Flow Capacity) RFC value of 0.85 and 0.92 during the PM peak period for the year 2025 and 2035, respectively. These high RFC values for Arm B indicate a possible capacity constraint and the potential for traffic congestion. It is important to note that these effects on traffic flow are temporary and expected only during the peak construction period. Once the construction activities are completed, traffic conditions are anticipated to return back to normal levels, alleviating the congestion concerns at Arm B. Despite the temporary high RFC levels the junction will continue to operate within capacity.

16.8.4 Junction Modelling – Junction 2 (J2)

In the following analysis Junction 2 was assessed for the AM and PM peak period using PICADY software. The peak time periods taken based on the counts are 8:00 to 09:00 in the AM and 16:30 to 17:30 in the PM peak. The arms were labelled as follows (see Figure 17):

- Arm A: N77 - West
- Arm B: R432
- Arm C: N77 - East

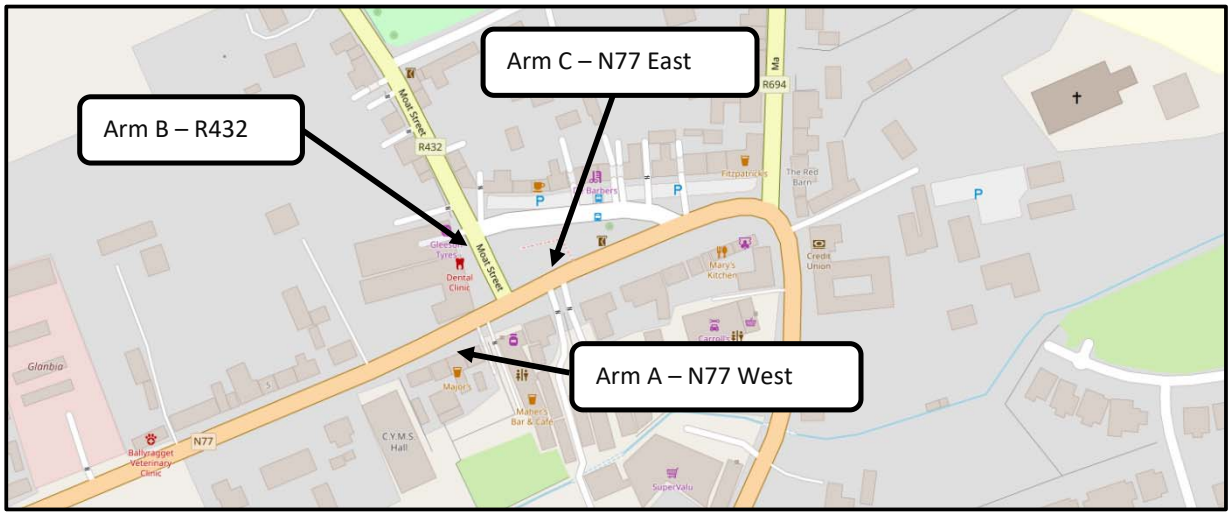

Figure 17: Junction 2 - arm names on Junctions

Figure 18 shows the traffic obtained at J2 on the days of the counts during peak hours.

Figure 18: AM and PM June 2023 traffic counts in PCUs at Junction 2

Figure 19 shows the HGV percentages obtained at J2 on the days of the counts during peak hours.

Figure 19: AM and PM June 2023 HGV % at Junction 2

Table 14 presents the analysis results for Junction 2, obtained using PICADY software, for the current year 2024 as well as the construction years 2025 and 2035, taking into account the peak construction traffic activity. The table provides a comprehensive overview of the anticipated traffic at Junction 2, considering two different construction scenarios.

Table 14 – PICADY Results for Junction 2

Scenario	Stream	AM		PM	
		Queue (PCU)	RFC	Queue (PCU)	RFC
1 – 2024, base year	A-BC	0.0	0.00	0.0	0.00
	B-AC	0.2	0.14	0.1	0.11
	C-AB	0.3	0.14	0.6	0.23
2 – 2025	A-BC	0.0	0.00	0.0	0.00
	B-AC	0.2	0.15	0.2	0.13
	C-AB	0.4	0.17	0.6	0.24
3 – 2035	A-BC	0.0	0.00	0.0	0.00
	B-AC	0.2	0.16	0.2	0.14
	C-AB	0.5	0.19	0.7	0.27

16.8.4.1 Results - Junction 2

Based on the results obtained from the PICADY software analysis for Junction 2, the performance of each arm during different scenarios was evaluated. In the base year scenario of 2024, all arms of the junction exhibited minimal queuing, with Arm A showing no queues during both the AM and PM peak periods. Arm B had a queue of 0.2 PCU in the AM and a queue of 0.1 PCU in the PM, while Arm C had a queue of 0.3 PCU in the AM and 0.6 PCU in the PM.

In Scenario 1 for the construction year 2025, which considered the impact of additional traffic generated during peak construction, the queues remained similar to the base year scenario. Arm B had a slightly increased queue of 0.2 PCU in the AM and 0.2 PCU in the PM, while Arm C had a queue of 0.4 PCU in the AM and 0.6 PCU in the PM.

Looking ahead to Scenario 2 for the construction year 2035, the queues at Junction 2 remained relatively low. Arm B had a queue of 0.2 PCU in both the AM and PM, while Arm C had a queue of 0.5 PCU in the AM and 0.7 PCU in the PM. The maximum RFC value observed is at 0.27 (27%) in Arm C during the PM peak.

Overall, the results indicate that Junction 2 performs well below its theoretical capacity, with minimal queuing observed across all scenarios and arms. These findings demonstrate the efficient traffic flow and capacity of the junction, contributing to smooth and uninterrupted movement for vehicles passing through the N77 West, R432, and N77 East arms.

16.8.5 Junction Modelling – Junction 3 (J3)

In the following analysis Junction 3 was assessed for the AM and PM peak period using PICADY software. The peak time periods taken based on the counts are 8:00 to 09:00 in the AM and 16:30 to 17:30 in the PM peak. The arms were labelled as follows (see Figure 20):

- Arm A: N77 - West
- Arm B: An Chearnog
- Arm C: N77 - East

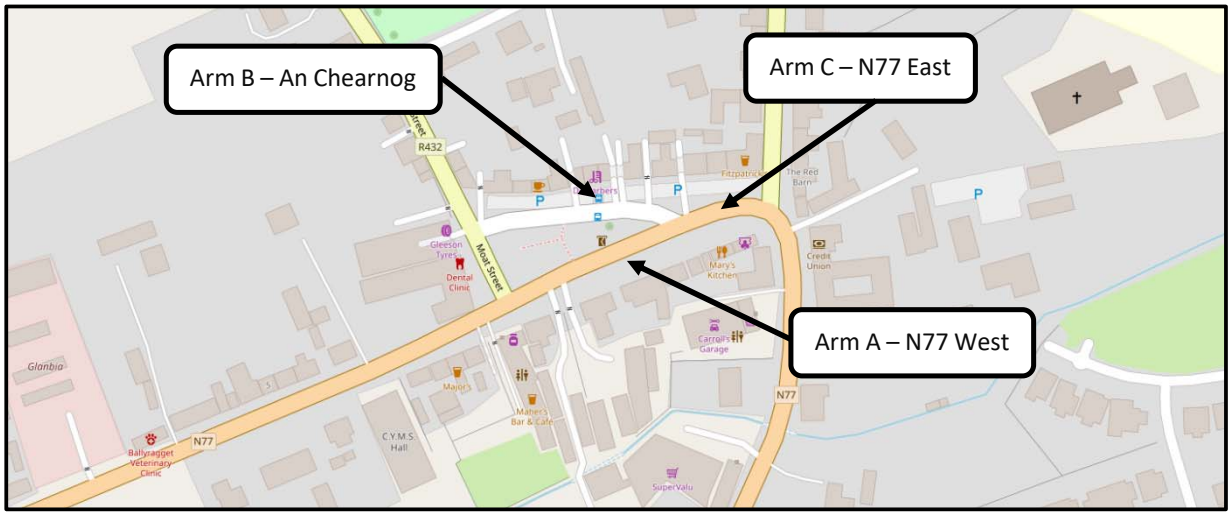

Figure 20: Junction 3 - arm names on Junctions

Figure 21 shows the traffic obtained at J3 on the days of the counts during peak hours.

Figure 21: AM and PM June 2023 traffic counts in PCUs at Junction 3

Figure 22 shows the HGV percentages obtained at J3 on the days of the counts during peak hours.

Figure 22: AM and PM June 2023 HGV % at Junction 3

The traffic model includes a controlled pedestrian crossing on Arm A. This pedestrian crossing has been carefully incorporated into the analysis to assess its impact on traffic flow.

Table 15 presents the analysis results for Junction 3, obtained using PICADY software, for the current year 2024 as well as the construction years 2025 and 2035, taking into account the peak construction traffic activity. The table provides a comprehensive overview of the anticipated traffic at Junction 3, considering two different construction scenarios.

Table 15 – PICADY Results for Junction 3

Scenario	Arm	AM		PM	
		Queue (PCU)	RFC	Queue (PCU)	RFC
1 – 2024, base year	A-BC	0.4	0.26	0.3	0.25
	B-AC	0.1	0.06	0.1	0.08
	C-AB	0.0	0.02	0.1	0.04
2 – 2025	A-BC	0.4	0.27	0.4	0.25
	B-AC	0.1	0.07	0.1	0.10
	C-AB	0.1	0.04	0.1	0.04
3 – 2035	A-BC	0.4	0.29	0.4	0.27
	B-AC	0.1	0.07	0.1	0.11
	C-AB	0.1	0.05	0.1	0.04

16.8.5.1 Results - Junction 3

Based on the results obtained from the PICADY software analysis for Junction 3, the performance of each arm during different scenarios was evaluated. In the base year scenario of 2024, the queues at Junction 3 were relatively low. Arm A had a queue of 0.4 PCU in the AM and 0.3 PCU in the PM, while Arm B had a queue of 0.1 PCU in the AM and PM. Arm C showed minimal queuing, with a queue of 0.0 PCU in the AM and 0.1 PCU in the

PM.

In Scenario 1 for the construction year 2025, which considered the impact of additional traffic during peak construction, the queues at Junction 3 remained similar to the base year scenario. Arm A had a queue of 0.4 PCU in the AM and PM, Arm B had a queue of 0.1 PCU in the AM and PM, and Arm C had a queue of 0.1 PCU in the AM and PM.

Looking ahead to Scenario 2 for the year 2035, the queues at Junction 3 remained relatively stable. Arm A had a queue of 0.4 PCU in the AM and PM, Arm B had a queue of 0.1 PCU in the AM and PM, and Arm C had a queue of 0.1 PCU in the AM and PM. The maximum RFC value observed is at 0.27 (27%) in Arm B during the PM peak.

Overall, the results indicate that Junction 3 performs well below its theoretical capacity, with low queues observed across all scenarios and arms. This demonstrates the efficient traffic flow and capacity of the junction, ensuring smooth movement for vehicles traveling through the N77 - West, An Chearnog, and N77 - East arms.

16.9 Mitigation Measures

16.9.1 Mitigation Measures During Construction Stage

The construction phase of the project includes various mitigation measures, which have been incorporated into the design and assessment outlined in the preceding sections. These measures aim to address potential impacts and ensure the smooth implementation of the construction activities.

One of the mitigation measures is the utilisation of existing forestry accesses available on the local road network surrounding the Windfarm. By selecting the site access location on the local network, traffic will be diverted from the regional road network, reducing congestion and minimising disruption. In most cases, the site accesses provide adequate visibility onto the local roads, adhering to the required standards. Maintenance of hedgerows within the visibility splays will be undertaken to ensure proper visibility and mitigate any potential risks (MM59).

The construction phase also involves the construction and upgrading of roads to accommodate large vehicles. The new Windfarm Site Roads will have a width of 4.5m, and existing farm roads and forestry tracks will be widened and improved. These measures will ensure safe and efficient traffic flow during the construction period.

A comprehensive Traffic Management Plan for Ballynalacken Windfarm has been developed as a key construction contract document. This plan will outline specific measures and procedures to be implemented to minimise the effects of additional traffic generated by the proposed development. It will be an essential tool for coordinating and managing traffic during the construction phase (MM62).

During the construction phase, due to the increased construction traffic and potential changes in traffic patterns, there may be a temporary impact on road safety. However, mitigation measures, such as proper traffic management planning, adherence to safety protocols, and coordination with local authorities, are designed to minimise these potential risks.

To minimise the impact of construction traffic, the Windfarm will make use of available resources within the site, reducing the need for material importation. Stone material will be excavated from 2 No. borrow pits within the Windfarm site to provide construction materials, effectively reducing HGV volumes. Additionally, concrete pours for turbine foundations, which generate the largest traffic volumes, will be carefully scheduled to avoid simultaneous deliveries with other windfarm shipments (MM65).

To ensure that local roads are kept clean and site roadways are clear of mud, a road sweeper and dry wheel washes will be used. The dry wheel washes will be installed near the entrance to the public road at Site Entrance No 4, 5, and 9. All HGVs and other delivery vehicles, will drive over the wheel wash before leaving the site (MM46).

Confirmatory condition surveys involving pre-construction and post-construction inspections, high definition video surveys and FWD surveys will be undertaken along the routes of concentrated construction traffic between the R694 and the windfarm Site Entrances and along the route of the Ballynalacken Grid Connection route. (SM09)

Any damage to structures or road pavements along cable routes and along concentrated construction haul routes, as a result of the construction works and deliveries to the works areas, will be repaired to at least as good a condition as pre-works (MM61).

No additional mitigation measures are proposed, as no significant adverse impacts are anticipated.

Overall, the successful completion of this project will rely on thorough coordination, planning, and the implementation of comprehensive mitigation measures to minimise the effects of construction traffic on the surrounding road network.

16.9.2 Mitigation Measures During Operational Stage

Considering the relatively low volume of operational traffic expected, no specific mitigation measures are proposed for the operation and maintenance of the Windfarm.

16.9.3 Mitigation Measures During Decommissioning Stage

Given the nature of the decommissioning activities, which are similar but much less than the construction activities, the impact on the traffic is anticipated to be slight and temporary. Mitigation measures implemented during the construction phase will also be applicable during the decommissioning phase.

Considering the existing measures and the expected minimal adverse impacts, no additional mitigation measures are proposed for the decommissioning phase of the Windfarm. The overall decommissioning process will be managed efficiently, with careful consideration given to minimising any potential adverse effects on the traffic and road infrastructure.

16.10 Residual Impacts

16.10.1 Residual Impacts During Construction Stage

The residual average construction traffic impact is expected to align with the potential impact outlined earlier, resulting in a **short-term slight negative effect** on the national road network and a **short-term slight negative effect** specifically on the R694 following mitigation. The residual construction traffic impact on the R694 will mirror the peak potential impact, leading to a **moderate adverse effect** during the period associated with the turbine foundation concrete pours (1 day per turbine foundation). However, it's important to note that this effect will be brief in duration. Negative or adverse effects on the local road network associated with the construction works on the Windfarm site are considered to be **short-term** in duration and **moderate** in significance following mitigation.

Regarding the turbine components delivery route, there will be a **not significant residual effect** as a result of the temporary works undertaken to accommodate the delivery of turbine components. All street furniture that was demounted will be re-erected, ensuring minimal impact. For locations requiring temporary removal of topsoil during construction, the areas will be reinstated to their original conditions, resulting in a **not significant** effect on the surrounding environment.

The presence of road works and the increase in traffic volumes resulting from construction traffic are anticipated to have an **imperceptible effect** on the safety and passage of pedestrians along the affected roads. This expectation is based on several factors, including the low usage of the roads by walkers, as indicated by CSO data and observations during site visits. Furthermore, it should be noted that the area has negligible presence of cyclists. The limited presence of cyclists in the vicinity contributes to the assessment that the construction activities and associated traffic will have an **imperceptible** effect on cyclist safety.

It is anticipated that there may be **slight to moderate negative effects** on accidents and road safety during the construction phase. The mitigation measures identified above, such as enhanced signage and traffic management plans, as well as the provision of an abnormal loads escort and delivery schedule, will reduce the magnitude of impact on accidents and road safety. Consequently, the rating for the residual effect will improve from moderate negative to slight negative. It is important to note that these negative effects are temporary in nature, as they primarily arise during the construction period. Once construction is complete, and the windfarm enters the operational phase, the traffic impact and associated road safety concerns are anticipated to return to the existing baseline conditions.

16.10.2 Residual Impacts During Operational Stage

During the operational stage of the proposed Ballynalacken Windfarm, the impact on traffic is projected to be negligible and will not have any long-term negative effects. The operational phase will primarily involve the automatic operation of the wind turbines, which allows for smooth and continuous functioning without substantial traffic implications. Any traffic generated for operational and maintenance purposes will be at a low volume, with occasional heavy vehicles required for specific tasks.

Considering these factors, it can be confidently stated that the traffic impact of the proposed Ballynalacken Windfarm during the operational stage will be **imperceptible** and will not result in any significant residual effects. As such, there will be no significant residual impacts on the traffic during this stage of the development.

16.10.3 Residual Impacts During Decommissioning Stage

The decommissioning process of a windfarm involves the straightforward dismantling of structures and the restoration of the land. As highlighted in **Section 16.9**, similar to the construction phase, the decommissioning phase will implement mitigation measures to minimise any potential impacts.

During the decommissioning phase, special consideration is given to the removal of turbine blades. These blades are cut into smaller, more manageable sizes, reducing their overall impact during transportation off-site. This ensures that the transportation of turbine components and materials remains efficient and poses minimal disruption to the surrounding road infrastructure.

The mitigation measures implemented during the construction phase, such as proper coordination, planning, and

adherence to transportation schedules, will be continued during decommissioning to ensure minimal disruption. Therefore, it is anticipated that the residual impact on traffic will be **slight** and **temporary**.

16.11 Conclusions

The main conclusions of this study are summarised as follows:

- During the construction phase of the project, there will be a temporary increase in traffic caused by site personnel trips and material deliveries. This traffic, which will primarily travel along regional and local access roads as detailed in this report, is short-term in nature. It is important to note that staff traffic will be scheduled outside of peak traffic hours, minimising any potential impact on the existing road network. Once the construction phase is completed, the operation and maintenance phase of the Windfarm development is anticipated to have negligible traffic effects. This means that there will be minimal additional traffic generated during the ongoing operation and maintenance activities of the Windfarm.
- During the peak daily construction stage (week 22-23), it is anticipated that there will be a total of 158No. HGV movements, with 79No. vehicles traveling to the site in the morning and 79No. vehicles leaving the site in the evening. In addition, there will be trips associated with the 107No. full-time staff, with 86No. vehicles traveling to the site and 86No. vehicles leaving the site. It is estimated that the average car occupancy for these staff trips will be 1.25 persons per vehicle.
- Considering the significance of traffic flow during the peak construction period, this Traffic and Transport Assessment has prioritised the examination of key junctions. The focus has been placed on the existing priority T-junction between the R694 and the N78 in Castlecomer, as well as the junctions between the R432 and the N77, and between An Chearnog and the N77 in Ballyragget. These junctions were identified as critical points through which traffic will pass, making them essential for comprehensive evaluation and effective management of the construction-related traffic impacts.
- Traffic data for the Traffic and Transport Assessment was collected using temporary Automatic Traffic Counters (ATC tube counters). These counters were strategically installed in selected locations to gather valuable information on traffic volume, vehicle class (such as motorcycles, cars, and goods vehicles distinguished by the number of axles), and traffic speeds. The data collection period spanned from 2022 to 2024, allowing for a comprehensive understanding of the traffic patterns in the area. To further enhance the evaluation of traffic patterns at the specific junctions under examination, manual traffic turning counts were conducted in June 2023. This additional data collection was initiated at the request of ORS to gather more detailed information on the movement of vehicles at these junctions. The turning counts offered valuable insights into the flow and distribution of traffic, enabling a more accurate assessment of the existing conditions and the potential impact of the peak construction activities on the road network.
- Ecopower conducted extensive research for planning applications within a 25km radius of the Ballynalacken Windfarm Project. There are 5 no. projects that overlap the study area along the Regional Road R432. 2 no. of these projects, namely Laois-Kilkenny Grid Reinforcement Project and Moatpark-Loan 38kV OHL, are either already completed or under construction and will be finished before the commencement of the Ballynalacken Windfarm Project. The remaining 3 projects, namely Farranrory Wind Farm Grid Connection, Battery Energy Storage Developments in Moatpark and Ballyragget & Parksgrove Solar Farms Grid Connection, are unlikely to be built at the same time. Therefore, cumulative effects are unlikely to occur.
- This assessment calculated the traffic impact which the proposed development will have on the relevant road network, and it was found that the construction stage traffic associated with the project would fall within the 10% increase threshold for non-congested roads, specifically for certain local roads. The changes in traffic volume during the construction phase are illustrated in Table 12, and while these percentages may appear significant at first glance, it is important to consider the context of the existing low traffic levels in the area. To ensure a comprehensive evaluation, the capacity of the local roads was analysed using *Junctions10* software. On the basis of the predicted total two-way 2025 and 2035 peak hour traffic volumes, the findings indicate that during the construction phase, the estimated highest peak hour traffic volumes per direction would remain within their hourly urban road link capacities per direction on the R694 and R432 urban roads and the local roads L5846, L5840, L5845 and L58442 in Ballynalacken and on other routes in the vicinity. This implies that the existing road infrastructure can effectively accommodate the expected increase in traffic without significant congestion or operational issues.

- The assessment of the selected 3No. junctions in Castlecomer and Ballyragget involved a comprehensive analysis using *Junctions10* software, specifically the PICADY module, to simulate the peak conditions during the morning (AM) and afternoon (PM) periods. This analysis took into account conservative future projections, considering various factors such as the availability of limited public transport and the Central Traffic Growth specific to Co. Kilkenny. The assessment focused on three key timeframes: the current year (2024), as well as two potential construction years, namely 2025 and 2035. These construction years were selected based on the estimated start date falling within the range of 2025 and 2035.
- The junctions were examined for peak conditions, and it was assumed that all additional traffic associated with the development will arrive and depart during the peak hour of the public network, in order to provide a robust worst-case scenario.
- The peak hours at the junctions were recorded to be between 08:15 to 09:15 period and 17:30 to 18:30 in Junction 1 (Castlecomer) and 08:00 to 09:00 and 16:30 to 17:30 in Junction 2 and Junction 3 (Ballyragget). The peak flows for June 2023 were 1170 PCUs in the AM peak and 1050.5 PCUs in the PM peak in Junction 1, 883.3 PCUs in the AM peak and 961.1 PCUs in the PM peak in Junction 2, 891.4 PCUs in the AM peak and 946.7 PCUs in the PM peak in Junction 3.
- From a transportation planning perspective, it is evident that the proposed development will not serve as a significant traffic generator, and it will not have any adverse impacts on the future operational capacity of the existing road network. While there will be a slight increase in traffic loading during the peak construction phase, the available capacity on the roads will be able to accommodate this additional traffic. The junction that will experience the greatest impact is Junction 1 in Castlecomer, as it will be the primary route for construction and material delivery traffic to travel to and from the site. However, it is important to note that the impact on journey times and road users' convenience will be at acceptable levels, and there will be a short-term inconvenience associated with the construction phase.
- Furthermore, when considering the long-term effects of the development on the local road network during the operational and decommissioning stages, they are deemed negligible. The proposed wind farm development will not significantly disrupt the normal functioning of the local roads, and any potential impacts will be effectively managed to ensure the continued convenience and safety of road users.

Overall, the transportation planning analysis concludes that the proposed development will have acceptable and temporary adverse effects on the road network in the locality, during the construction phase. It is crucial to highlight that the long-term effects of the proposed development on the local road network during the operational and decommissioning stages are considered negligible. This means that once the construction phase is completed and the windfarm is operational, the traffic impact on the roads in the locality will return to normal levels. Adequate measures will be implemented to mitigate any potential impacts and ensure smooth traffic flow and convenience for road users.

Taking into consideration the low number of cyclists using the affected roads, the modest increase in traffic volumes, the existing road capacity, and the enforcement of speed limits for construction vehicles, the impact on the safety of pedestrians and cyclists is anticipated to be minimal. Measures will be in place to ensure the safe progression and passage of these vulnerable road users.

Furthermore, although there may be a slight to moderate negative effect on accidents and road safety during the construction phase, the implementation of appropriate mitigation measures will help alleviate these risks. Proactive steps will be taken to minimise potential hazards and ensure the safety of all road users. Once the construction phase concludes and the wind farm transitions into the operational phase, the impact on road safety is considered to be not significant.

In conclusion, the transportation assessment affirms that the proposed development will have acceptable adverse effects on the road network in the locality. These impacts be temporary, only occurring during the construction phase. The planning and design of the project have been carried out in such way to minimise any potential disruptions to the existing road infrastructure. As a result, the long-term effects on traffic are projected to be negligible. Adequate measures will be implemented to mitigate any potential impacts and ensure smooth traffic flow and convenience for road users.

Appendix 16.2: Telecommunications Impact Assessment Report

Appendix to Chapter 16: Material Assets

Appendix 16.2: Telecommunications Impact Assessment Report

Report

Appendix 16.2 - Ballynalacken Wind Farm Telecommunications Impact Assessment Report

Document Number:

Author: DMG/PT

Approved for Release: Rev 5.0 KH **Date:** 20/01/2025

Document Filename: *Ballynalacken Wind Farm Telecommunications Impact Assessment.*

Executive Summary

Ai Bridges was commissioned to evaluate the possible impacts that the proposed wind farm development at Ballynalacken, Co. Kilkenny 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 wind farm development were identified and field surveys of these mast-sites were 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, fifteen telecom operators were contacted. At the time of writing this report, eleven of these operators have responded to the consultation request. The responses received from each of the telecom operators can be found in Section A16.2.3 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 fifteen radio links and one Tetra Basestation on the vicinity of the proposed wind farm development. These radio links are listed below in Table 1.

Operator	Network Description	Impact of wind farm	Mitigation Measures	Residual Impact
Eir	Licenced PTP microwave radio link from Ballyouskilll to Upper Coolbawn.	No impacts (Clearance distance of over 50 m between T08 and the 2nd Fresnel Zone of the radio link).	None	None
Eir	Licenced PTP microwave radio link from Ballyouskilll to Ardra.	No impacts.(Clearance distance of over 50 m between T08 and the 2nd Fresnel Zone of the radio link).	None	None
Eir	Licenced PTP microwave radio link from Ballyouskilll to Kilmadum.	Likely to be Impacted. (The radio path of this radio link would be obstructed by the proposed turbine layout.)	Re-route via alternative Telecoms Mast site.	None
ESB	Licenced PTP microwave radio link from Ballyouskilll to Slieve Bloom.	No impacts. (Clearance distance of over 50 m between T09 and the 2nd Fresnel Zone of the radio link).	None	None
ESB	Licenced PTP microwave radio link from Ballyouskilll to Carbury.	No impacts.(Clearance distance of 49.64 m between T11 and the 2nd Fresnel Zone of the radio link).	None	None
ESB	Licenced PTP microwave radio link from Ballyouskilll to Monavea 38kV.	No impacts.(Clearance distance of over 50 m between T09 and the 2nd Fresnel Zone of the radio link).	None	None
ESB	Licenced PTP microwave radio link from Ballyouskilll to Glencoumwood.	Potentially Impacted. (The blade-tip of T02 would be less than 10 m from the radio path of this radio link. At this distance, it poses a risk to the operation of the radio link.)	Re-route via optional relay mast.	None
ESB	PMP radio link from Ballyouskilll to Ballyhale 38kV.	None (No Fresnel Zone obstruction. Allow for mitigation measure options)	None	None
ESB	PMP radio link from Ballyouskilll to Castlecomer 38kV.	None (No Fresnel Zone obstruction. Allow for mitigation measure options)	None	None
ESB	PMP radio link from Ballyouskilll to Rosehill	None (No Fresnel Zone obstruction. Allow for mitigation measure options)	None	None
ESB	PMP radio link from Ballyouskilll to Talbots Inch	None (No Fresnel Zone obstruction. Allow for mitigation measure options)	None	None
Imagine Broadband	Licenced PTP microwave radio link from Ballyouskilll to ESB_Portlaoise. (Link #1)	No impacts. (Clearance distance of 33.7 m between T12 and the 2nd Fresnel Zone of the radio link).	None	None
Imagine Broadband	Licenced PTP microwave radio link from Ballyouskilll to ESB_Portlaoise. (Link #2)	No impacts.(Clearance distance of 33.7 m between T12 and the 2nd Fresnel Zone of the radio link).	None	None
Three Ireland	Licenced PTP microwave radio link from Ballyouskilll to Ardra.	No impacts.(Clearance distance of over 50 m between T08 and the 2nd Fresnel Zone of the radio link).	None	None
Three Ireland	Licenced PTP microwave radio link from Ballyouskilll to Portlaoise. (Radio Link scheduled to be decommissioned).	No impacts.(Clearance distance of 39.65 m between T12 and the 2nd Fresnel Zone of the radio link).	None	None
Tetra Ireland	Tetra Basestation at Ballyouskill Mast-Site	Unlikely to be significantly impacted. (Results from the Tetra Impact Study (May 2022) indicate that any degradation in TETRA service coverage due to Turbine T10 would be offset by coverage from neighbouring TETRA basestations.)	None	None

Table 1. Microwave radio links radio links potentially impacted by proposed wind farm.

Mitigation measures for the telecom networks that are potentially impacted by the proposed turbines are provided in Section A16.2.6 of this report.

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A16.2.1. Introduction

A16.2.1.1 Statement Of Authority

Ai Bridges has been supplying telecommunications and aviation assessment solutions to the wind farm industry throughout the Republic of Ireland, Northern Ireland and the UK since 2007. The Ai Bridges Engineering Department has in excess of 200 plus years of experience in the delivery of Aviation, Telecommunications\EMI, Broadcast & EMF\EMC projects.

Kevin Hayes is the Engineering Director at Ai Bridges and takes the role of Client Relationship Manager responsible for overseeing project progress and deliverables for the Telecommunications and Aviation Impact Assessments. This also includes responsibility, along with other team members, for day-to-day running of the projects including co-ordination of project teams and achieving agreed milestones.
Kevin is a qualified engineer and B.Eng Hons. in Electronic & Communications Engineer, M. Eng. Hons in Communications & Software Engineering. Kevin has gained extensive experience in the areas of Telecommunications network design, deployment and implementation roles of telecommunications systems over a 32-year period. He has extensive working knowledge of software modelling and radio planning of telecommunications and aviation networks and systems. This includes taking the lead R&D role in developing the Ai Bridges 3D modelling software techniques used to predict wind farm and solar park interference impacts on telecommunications, broadcast and aviation infrastructure networks.

A16.2.1.2 Wind Farm Site Information

The wind farm development is located approximately 5 km northwest of Castlecomer in County Kilkenny. The proposed turbines dimensions are shown below in Table 2 and the proposed turbine coordinates are provided in Appendix A.

Turbine ID	Hub Height	Rotor Diameter	Tip Height
T01	96.5	117	155
T02	96.5	117	155
T03	96.5	117	155
T04	84	117	142.5
T05	96.5	117	155
T06	96.5	117	155
T07	96.5	117	155
T08	96.5	117	155
T09	96.5	117	155
T10	96.5	117	155
T11	96.5	117	155
T12	96.5	117	155

Table 2. Wind Farm Turbine Details

The location of the proposed wind farm development is shown below in Figure 1.

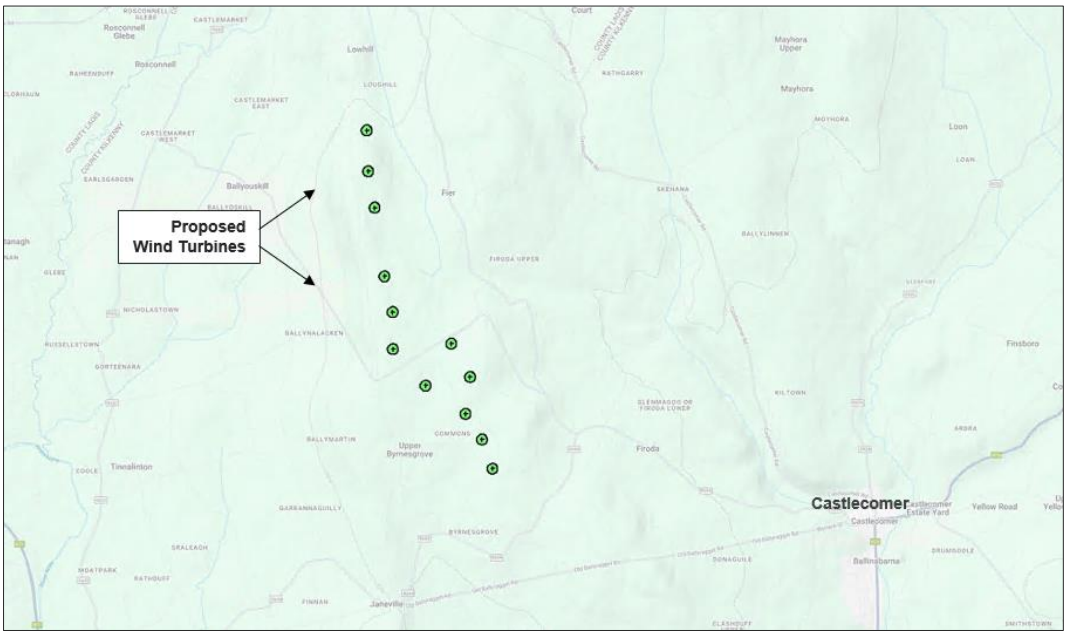

Figure 1. Location of Ballynalacken Wind Farm, County Kilkenny.

A16.2.2. Methodology

Introduction

In this section a brief summary of the Telecommunication Impact Study Methodology is provided.

A16.2.2.1 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 at Ballynalacken. Figure 2 below shows the proposed wind turbines plotted in the radio planning tool.

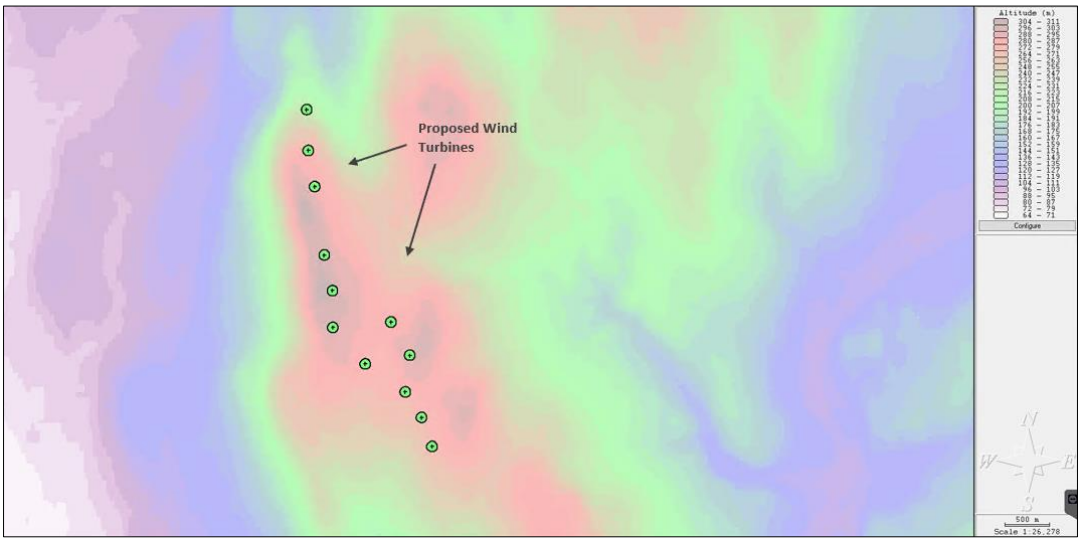

Figure 2. Wind Turbines plotted in Radio Planning Software

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 passes near one of the proposed turbines modelled in radio planning software.

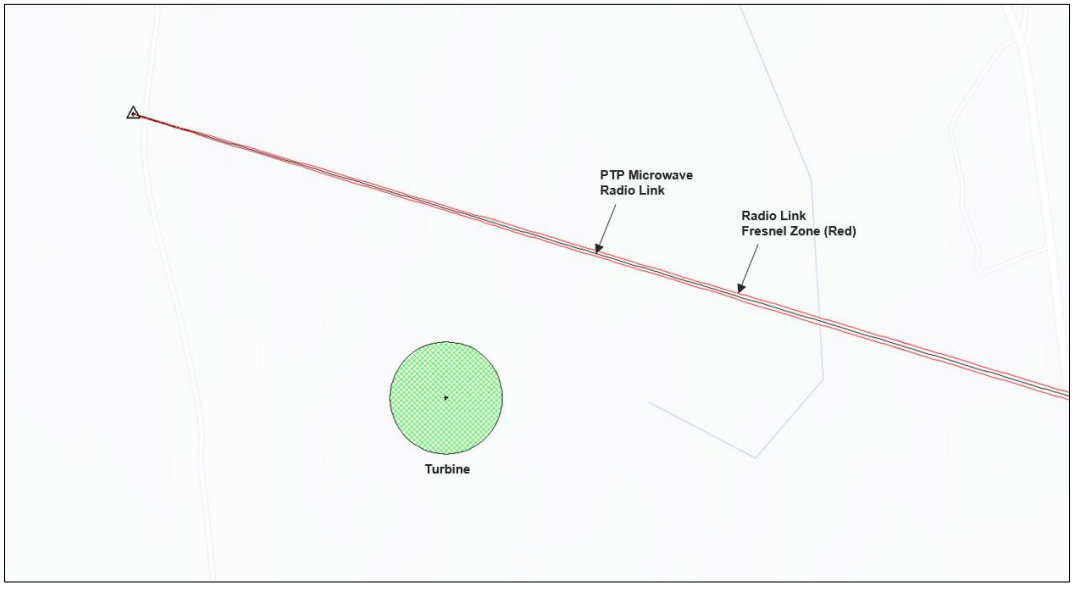

Figure 3. Example of microwave radio link passing near a proposed wind turbine modelled in radio planning software.

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.

A16.2.3. Telecom Operator Consultations

Introduction

In this section the consultation process undertaken with telecom operators is described. The response received from each operator is also provided.

A16.2.3.1 Telecom Operator Consultations

Consultations beginning in May 2021 were undertaken with telecom network operators to assist in identifying telecommunication infrastructure that could be impacted by proposed wind farm. During the consultation process in 2021, 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 A16.2.3.1.1 to A16.2.3.1.15.

ID	Operator	Response Received (Yes/No)	Issues raised by Operator \ Observations.
1	2RN	Yes	No issues regarding transmission links; however, 2RN have requested that a protocol document be signed should the wind farm go ahead (regarding the TV broadcast service in the area).
2	Broadcast Authority of Ireland (BAI)	Yes	No issues
3	BT Ireland	Yes	No issues
4	Eir	Yes	Eir have raised a concern regarding three Licensed PTP microwave radio links.
5	Enet	Yes	No issues.
6	ESB Networks	Yes	ESB have stated that the proposed wind turbines “may cause significant impact to ESB’s various radio networks”.
7	Imagine Broadband	Yes	Imagine Broadband have raise a concern regarding two Licensed PTP microwave radio links.
8	Irish Aviation Authority (IAA)	No	No response. (No response expected.)
9	Kilkenny County Council	No	No response. (No response expected.)
10	Tetra Ireland (TI)	Yes	Tetra Ireland have raise a concern regarding the proximity of the turbines to their basestation at Ballyouskill.
11	Three Ireland	Yes	Three Ireland have raised a concern regarding two Licensed PTP microwave radio links.
12	Viatel	No	No response.
13	Virgin Media	Yes	No issues.
14	Vodafone Ireland	Yes	No issues.
15	ComReg	No	No response received.

Table 3. Telecom Operators Consulted

Note: The proposed turbine layout for the Ballynalacken development has been revised since May 2021. The Telecom Operator responses that follow refer to the original May 2021 turbine layout. The revised turbine layout is not significantly different to the original layout provided to the Telecoms Operators in 2021. The new layout would have no discernible impact on the consultation responses received from the Telecom Operators. During the 2021 consultation engagement.

A16.2.3.1.1 2RN Response to Consultations

2RN provided the following email response to consultations:

> *"The proposed windfarm will not impact any of 2RNs fixed linking.*
> *There is a risk of interference to the reception of broadcast signals in the area to the north west of the site. We would therefore ask that a protocol be signed between the developer and 2RN should the site go ahead."*

A16.2.3.1.2 Broadcast Authority of Ireland (BAI)

The BAI provided the following email response to consultations:

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

A16.2.3.1.3 BT Ireland Response to Consultations

BT provided the following email response to consultations:

> *"We only have a network presence in Louth and Waterford."*

A16.2.3.1.4 Eir Response to Consultations

Eir provided the following email response to consultations:

> *"We have a number of links within the proposed area, three in particular are too close that are at risk with the current plots, the end points of the transmission link are below, for wind farm developments we would keep a buffer of 100meters radius from the turbine's blade tip away from this transmission path. Can you replot turbines outside the buffer zone."*

LS_3019	52°50'2.03"N	52°50'2.03"N	↔	KK_4474	52°49'26.07"N	7° 9'23.50"W
LS_3019	52°50'2.03"N	52°50'2.03"N	↔	KK_4477	52°48'56.02"N	7°11'44.70"W
LS_3019	52°50'2.03"N	52°50'2.03"N	↔	KK_4816	52°44'22.65"N	7°13'27.20"W

A16.2.3.1.5 Enet Response to Consultations

Enet provided the following email response to consultations:

> *"This won't affect our current network:"*

A16.2.3.1.6 ESB Services Response to Consultations

ESB provided the following email response to consultations:

> *"Please find attached the list of 4 point to point radio links and 4 point to multipoint radio links that I suspect will be impacted by the planned windfarm.*
>
> ***Point to Point Radio links***
> *There are 5 radio links that are crossing or near the site boundary, 4 of which are likely to be impacted by the turbines, the first, Ballyoskill to Slieve Bloom is just for information but isn't expected to be impacted.*
>
> *Link 1: Ballyoskill to Slieve Bloom*
> *Site A: Ballyoskill Hillsite / 13m AGL / 52.835216 -7.295671 / TX 6740 MHz*
> *Site B: Slieve Bloom / 15m AGL / 53.095832, -7.591216 / TX 7080 MHz*
>
> *Link 2: Carbury to Ballyoskill*
> *Site A: Carbury Hill site / 8m AGL / 53.355842 -6.970762 / TX 7000MHz*
> *Site B: Ballyoskill Hillsite / 10m AGL / 52.835216 -7.295671 / TX 6660MHz*
>
> *Link 3: Ballyoskill to Portlaoise*
> *Site A: Ballyoskill Hillsite / 13m AGL / 52.835216 -7.295671 / TX 8118.32MHz*
> *Site B: Portlaoise AO / 21m AGL / 53.030155, -7.301508/ TX 7807 MHz*
>
> *Link 4: Ballyoskill to Monavea 38kV*
> *Site A: Ballyoskill Hillsite / 25m AGL / 52.835216 -7.295671 / TX 1370 MHz*
> *Site B: Monavea 38kV / 6m AGL / 52.823481, -7.058772 / TX 1512 MHz*
>
> *Link 5: Ballyoskill to Glencoumbwood*
> *Site A: Ballyoskill Hillsite / 13m AGL / 52.835216 -7.295671 / TX 6460 MHz*
> *Site B: Glencoumbwood / 17m AGL / 52.557597, -7.023101 / TX 6800 MHz*
>
> ***Point to Multipoint Radio links***
> *There are 4 point to multipoint radio link that are expected to be impacted by the planned development:*
> *Ballyoskill Hillsite: Ballyoskill Hillsite / 30m AGL / 52.835216 -7.295671 / TX 458 MHz*
>
> *Site 1: Ballyhale 38kV / 12m AGL / 52.470371, -7.195317 / TX 458MHz*
> *Site 2: Castlecomber 38kV / 15m AGL / 52.838114, -7.192179/ TX 458MHz*
> *Site 3: Rosehill / 8m AGL / 52.642930, -7.263555/ TX 458MHz*
> *Site 4: Talbots Inch / 8m AGL / 52.673112, -7.269974/ TX 458MHz"*

A16.2.3.1.7 Imagine Broadband Response to Consultations

Imagine provided the following email response to consultations:

> *"We have two MW links running over the same Path you need to make allowance for.*
>
> *Details below:*
>
> ***Site A - ESB Ballyouskill**.*
> *ITM :*
> *E 647442*

N 676264
Link 1 is at 11m
Link 2 is at 11.5m

***Site B – ESB Portlaoise**.*
ITM :
E 647078
N 697076
Link 1 is at 30.5m
Link 2 is at 31.5m

A clearance zone of at least 50m is required from our path.
The proposed position of T1 is within 100m of our MW path & will interfere with our links.
Depending on the Radius of the Blades T2 may also be of concern."

A16.2.3.1.8 IAA Response to Consultations

To date no response has been received.

A16.2.3.1.9 Kilkenny County Council Response to Consultations

To date no response has been received.

A16.2.3.1.10 Tetra Ireland (TI) Response to Consultations

Tetra Ireland provided the following email response to consultations.

"We have equipment at E247530 / N176223, we specify a minimum exclusion zone of 500m and in this case it appears that turbine 3 is approximately 400m from where we are located.

Given the increasing size of turbines any additional distance over 500m that might be available is useful."

A16.2.3.1.11 Three Ireland Response to Consultations

Three Ireland provided the following email response to consultations:

> *"I have reviewed the Turbine locations for the proposed Ballyoskill WF and 3Ireland have 2 microwave links that could potentially be affected by T1 and T4. I have attached a visual showing the 2 links and also a spreadsheet with the details for these 2 links.*
>
> *Please contact me if any more information is required."*

Link no.	Link Ref	Freq.	Length	Site A	X	Y	Dish Height	Site B	X	Y	Dish Height	Comments
1	ML050241	26GHz	7km	KK0125	247502	176072	26m	KK0096	254281	174105	24m	Link Staying
2	ML051749	13GHz	21km	LX0094	247149	197042	30m	KK0125	247502	176072	30m	Link to be Decomm - potentially within 6 months

A16.2.3.1.12 Viatel Response to Consultations

To date no response has been received.

A16.2.3.1.13 Virgin Media Response to Consultations

Virgin Media provided the following email response to consultations:

> *"Thank you for the notification. Virgin Media do not have any microwave links in that would be effected by the proposed wind farm development at Ballyoskill in Co. Kilkenny."*

A16.2.3.1.14 Vodafone Ireland Response to Consultations

Vodafone provided the following email response to consultations:

> *"There are no M/W Links affected by this development."*

A16.2.3.1.15 Comreg Response to Consultations

To date no response has been received.

A16.2.4. Field Surveys

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 and Mast-Site B) 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.

A16.2.5. Desktop Survey Analysis

Introduction

Based on the findings of the consultation process, there are five Telecom Operators with networks in the vicinity of the proposed wind farm that require a detailed technical analysis:

- Eir Network
- ESB Network
- Imagine Network
- Three Ireland Network
- Tetra Ireland Network

Sections A16.2.5.1 to A16.2.5.5 below outline the desktop survey analysis findings* for each of the Telecom Operator networks listed above.

A16.2.5.1 Eir Network Analysis

Eir have seven radio links in the vicinity of the proposed wind farm. However, only three of these radio links are in the aligned in the direction of the proposed wind farm. Each of these three radio links are listed in Table 4 and a Plan View of the radio link network is shown in Figure 5.

Link No.	Operator	Link Description
1	Eir	Ballyouskilll to Upper Coolbawn (PTP Microwave Radio Link)
2	Eir	Ballyouskilll to Ardra (PTP Microwave Radio Link)
3	Eir	Ballyouskilll to Kilmadum (PTP Microwave Radio Link)

Table 4. Eir Radio Links requiring Analysis

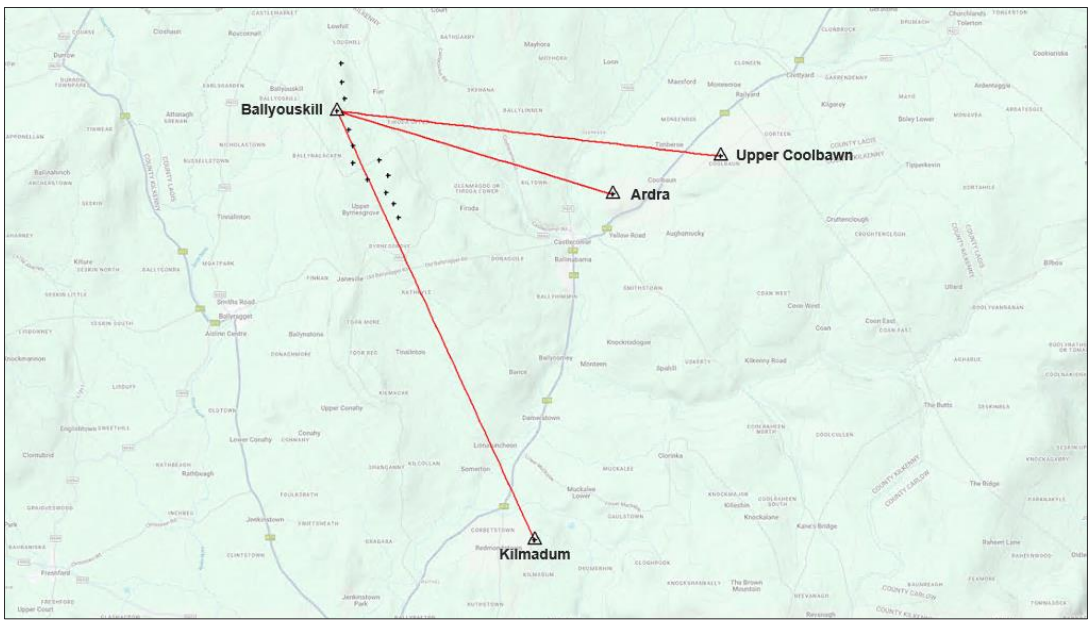

Figure 5. Eir Radio Network – Plan View

** The Desktop Survey Analysis findings are subject to accuracy of the information (GPS co-ordinates, turbine dimensions, etc.) provided to Ai Bridges.*

Figure 6 below shows a Close-up Plan View of the Eir microwave radio link network relative to the proposed wind farm.

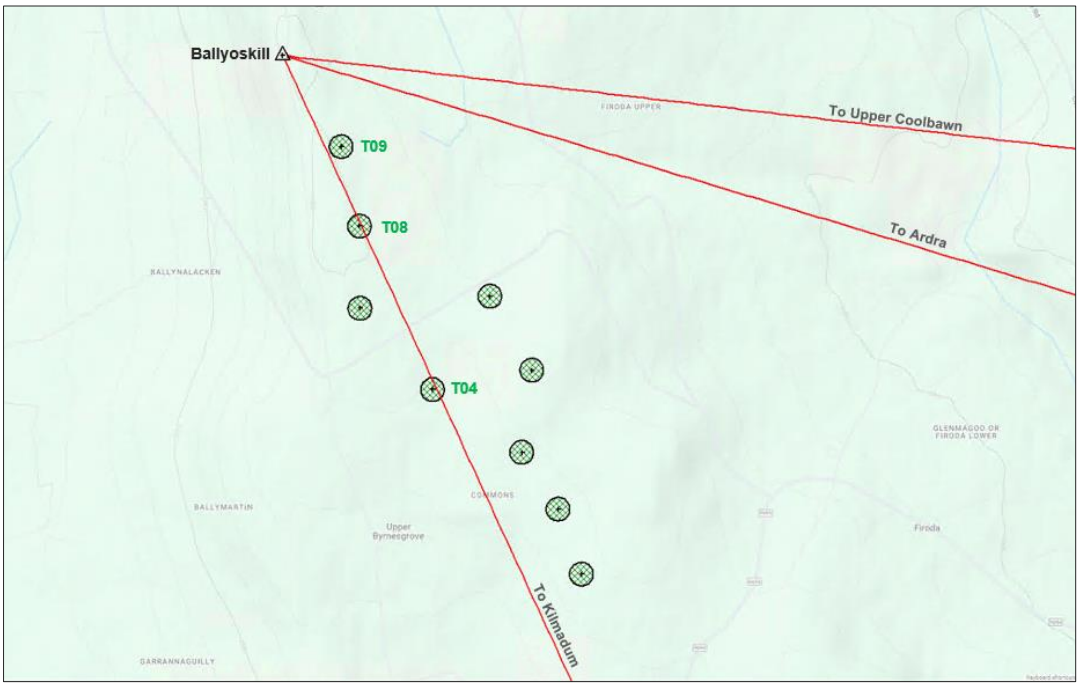

Figure 6. Eir Network – Close-up Plan View.

To further assess the potential impact of the turbines on the Eir network, the microwave radio links have been modelled in 3D and the Clearance Distances between the 2nd Fresnel Zone of the radio links and the blade-tip of the nearest turbine have been calculated. A 3D view of the radio links relative to the proposed turbines is shown below in Figure 7

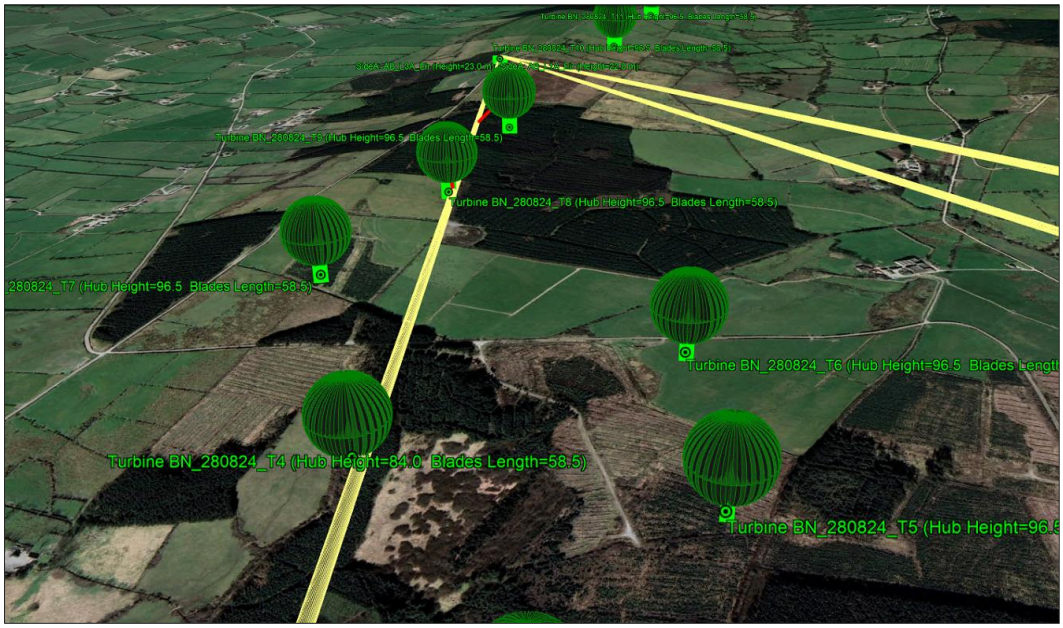

Figure 7. Eir Network – 3D View.

The 3D analysis indicates that radio link between Ballyouskill and Kilmadum would be obstructed by the proposed turbine layout and mitigation measures would be required for this radio link.

Table 5 below provides a brief summary of the network analysis for the Eir network in the vicinity of the proposed wind farm.

Eir Radio Link ID	Radio Link Description	Nearest Turbine	Fresnel Zone (F2) Clearance Condition to Blade-Tip of nearest Turbine	Mitigation Measures Required
Link 1	Ballyouskill - Upper Coolbawn	T10	> 50m (No Impacts)	None
Link 2	Ballyouskill - Ardra	T09	> 50m (No Impacts)	None
Link 3	Ballyouskill - Kilmadum	T04	-11.63 m (Interference Impact)	Mitigation Required.

Table 5. Eir Network Analysis Summary

A16.2.5.2 ESB Network Analysis

ESB have nine radio links in the vicinity of the proposed wind farm. Five of these radio links are PTP and 4 are PMP. Each of the ESB radio links are listed in Table 6 and a Plan View of the radio link network is shown in Figure 8.

Link No.	Operator	Description	Link Type (PTP or PMP)
1	ESB	Ballyouskill - Slieve Bloom	PTP
2	ESB	Ballyouskill - Carbury	PTP
3	ESB	Ballyouskill - Portlaosie	PTP
4	ESB	Ballyouskill - Monavea 38kV	PTP
5	ESB	Ballyouskill - Glencoumwood	PTP
6	ESB	Ballyouskill - Ballyhale 38kV	PMP
7	ESB	Ballyouskill - Castlecomber 38kV	PMP
8	ESB	Ballyouskill - Rosehill	PMP
9	ESB	Ballyouskill - Talbots Inch	PMP

Table 6. ESB Radio Links requiring Analysis

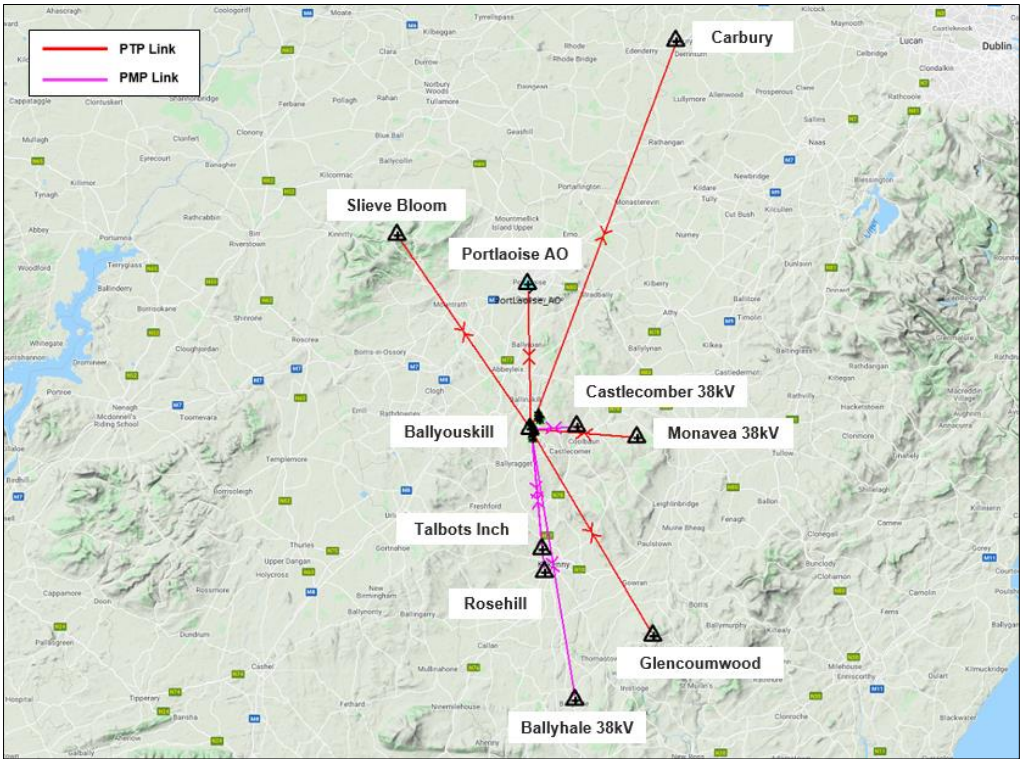

Figure 8. ESB Radio Network – Plan View

Figure 9 below shows a Close-up Plan View of the ESB radio link network relative to the proposed wind farm.

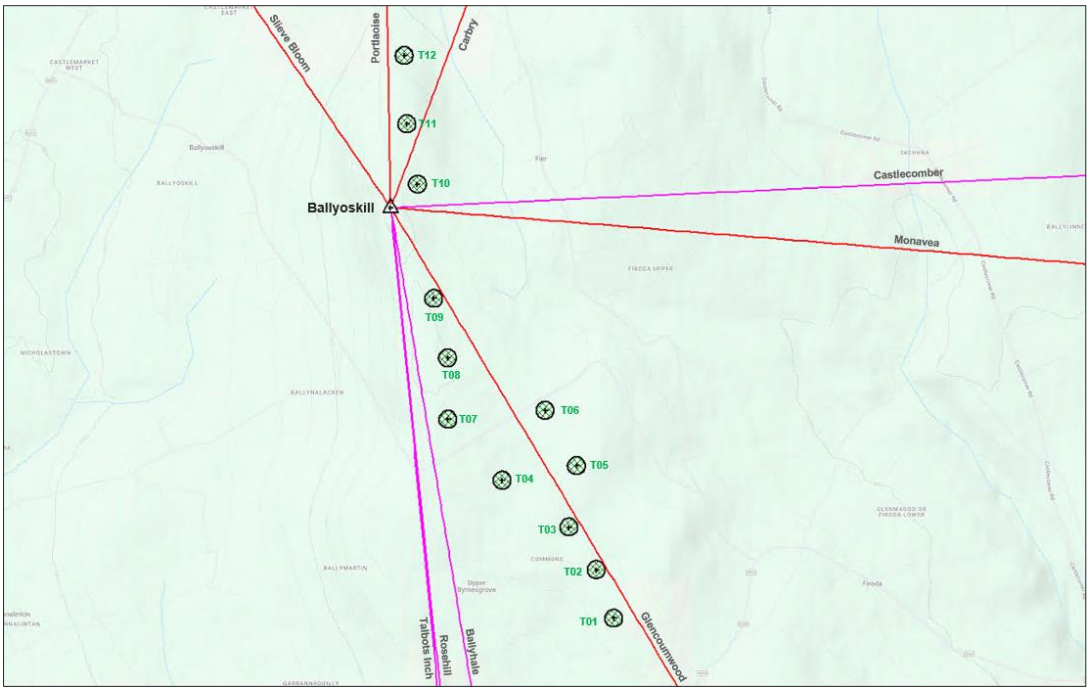

Figure 9. ESB Network – Close-up Plan View.

To further assess the potential impact of the turbines on the ESB network, the radio links have been modelled in 3D and the Clearance Distances between the 2nd Fresnel Zone of the radio links and the blade-tip of the nearest turbine have been calculated. A 3D view of the radio links relative to the proposed turbines is shown below in Figure 10.

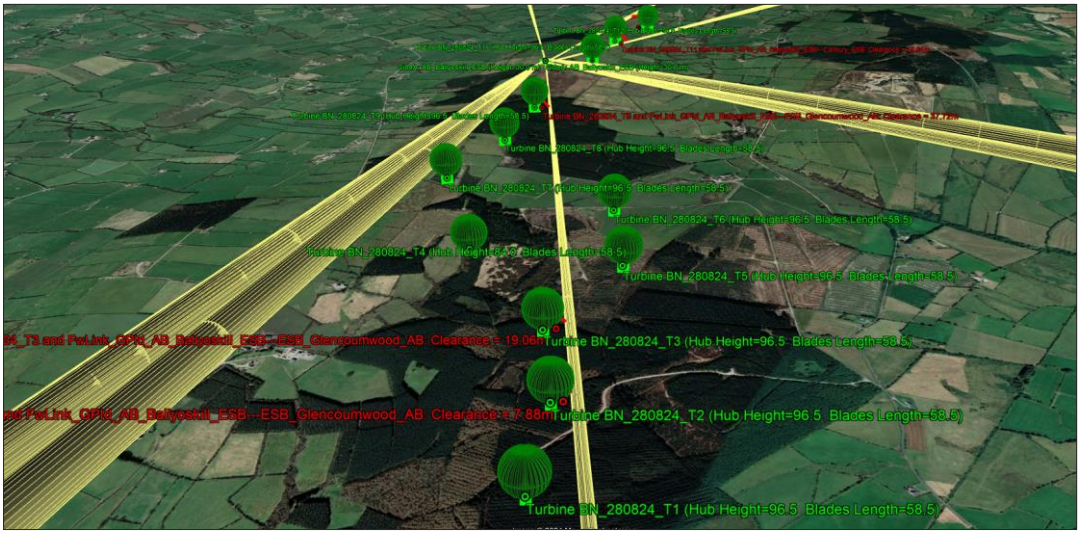

Figure 10. ESB Network – 3D View.

The 3D analysis indicates that the Clearance Distance between the blade-tip of T02 and the Fresnel Zone of the point-to-point (PTP) microwave radio link between Ballyouskill and Glencoumwood would be less than 10m. As this distance is relatively small, it poses a risk to the operation of the link and mitigation measures may be required for this link.

The 3D analysis also indicates that the Fresnel Zones of the point-to-multipoint (PMP) radio links are not obstructed by the proposed turbine layout. However, ESB may raise concerns regarding the impact of the turbines on their PMP network however there are existing precedents showing that there are operational wind farms in ROI that maintain Fresnel Zone Clearance and ESB Networks continue to operate their telemetry links with no impacts from signal “reflections”. There is no empirical data that has been provided to-date in relation to the signal “reflections” impacts. A theoretical model, developed in 1997 using manual calculations, is being used by ESB Networks that has not been verified to-date using empirical field data to substantiate these interference claims.

Table 7 below provides a brief summary of the network analysis for the ESB network in the vicinity of the proposed wind farm.

ESB Link ID	Radio Link Description	Nearest Turbine	Fresnel Zone (F2) Clearance Condition to Blade-Tip of nearest Turbine	Mitigation Measures Required
Link 1	Ballyouskilll - Slieve Bloom	T10	> 50 m (No Impacts)	None
Link 2	Ballyouskilll - Carbury	T11	49.64 m (No Impacts)	None
Link 3	Ballyouskilll – Portlaosie AO	T12	42.10 m (No impacts)	None
Link 4	Ballyouskilll - Monavea 38kV	T10	> 50 m (No Impacts)	None
Link 5	Ballyouskilll - Glencoumwood	T02	<10 m (7.88m) (Potential Interference Impact – subject to further technical analysis)	Option - Relay Pole Mitigation
Link 6	Ballyouskilll - Ballyhale 38kV (PMP Link)	T07	> 50 m (No Impacts)	None (No Fresnel Zone obstruction. Allow for mitigation measure options)
Link 7	Ballyouskilll - Castlecomber 38kV (PMP Link)	T10	> 50 m	None (No Fresnel Zone obstruction. Allow for mitigation measure options)
Link 8	Ballyouskilll - Rosehill (PMP Link)	T07	> 50 m	None (No Fresnel Zone obstruction. Allow for mitigation measure options)
Link 9	Ballyouskilll - Talbots Inch (PMP Link)	T07	> 50 m	None (No Fresnel Zone obstruction. Allow for mitigation measure options)

Table 7. ESB Network Analysis Summary

A16.2.5.3 Imagine Broadband Network Analysis

Imagine Broadband have two radio links in the vicinity of the proposed wind farm. These radio links are listed in Table 8 below and a Plan View of the radio link network is shown in Figure 11.

Link No.	Operator	Link Description
1	Imagine	Ballyouskilll to ESB Portlaoise (PTP Microwave Radio Link)
2	Imagine	Ballyouskilll to ESB Portlaoise (PTP Microwave Radio Link)

Table 8. Imagine Broadband Radio Links requiring Analysis

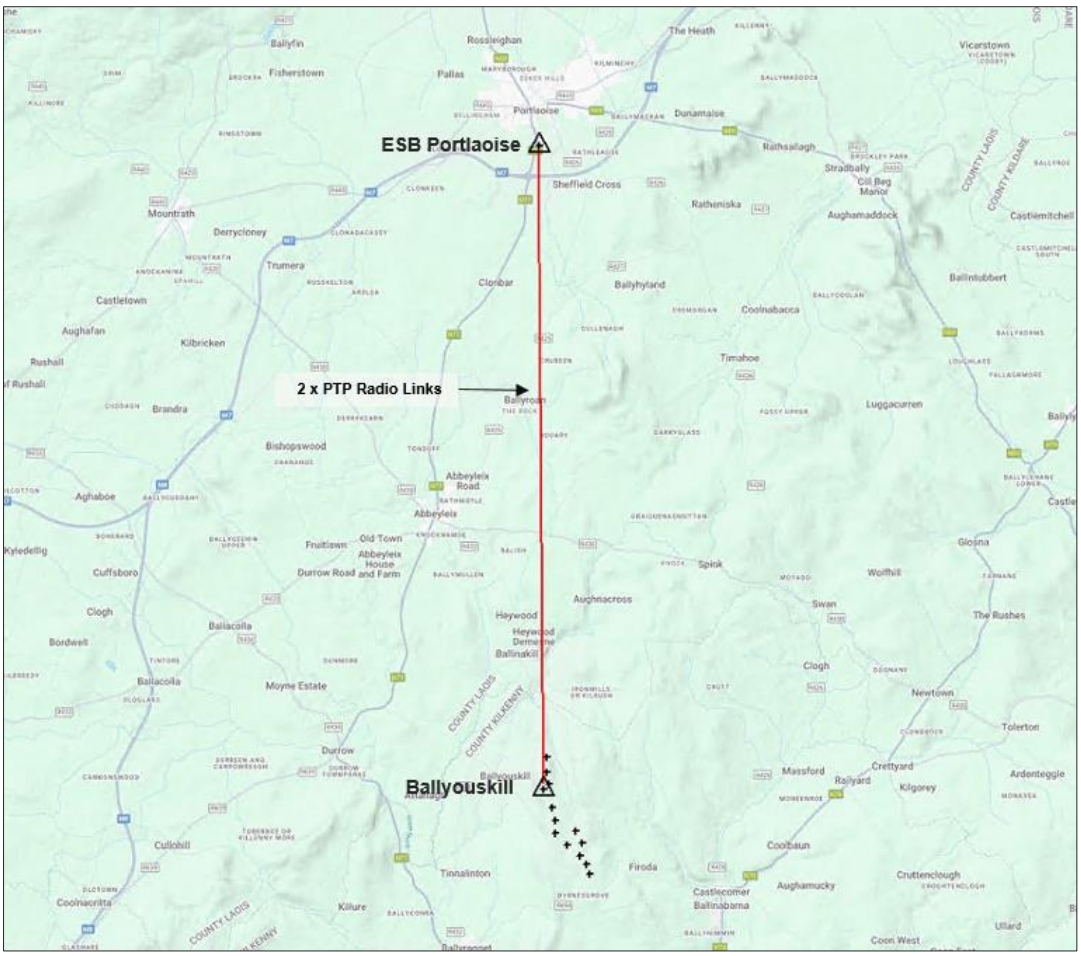

Figure 11. Imagine Broadband Radio Network – Plan View

Figure 12 below shows a Close-up Plan View of the Imagine Broadband microwave radio link network relative to the proposed wind farm.

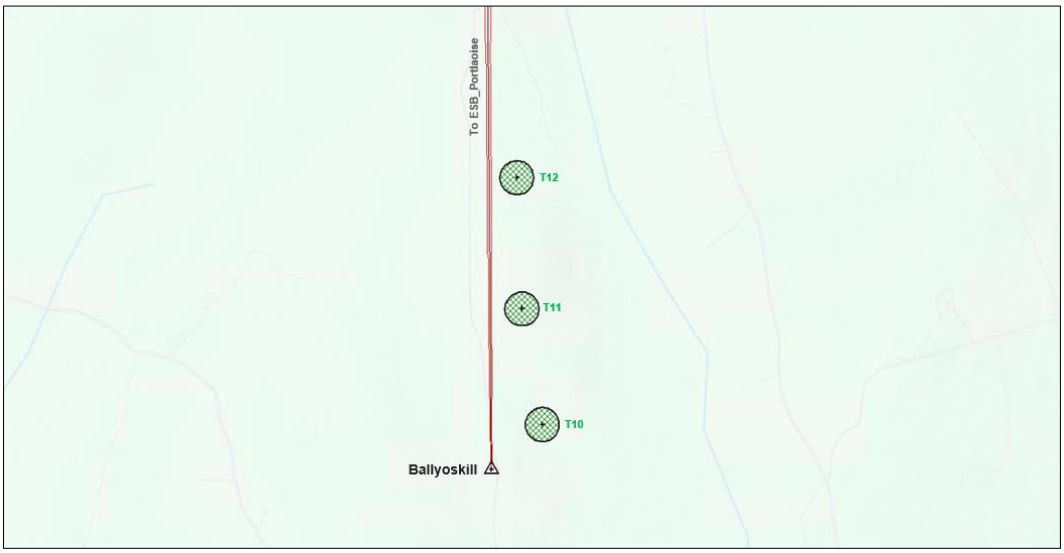

Figure 12. Imagine Broadband Radio Network – Close-up Plan View

To further assess the potential impact of the turbines on the Imagine Broadband network, the radio links have been modelled in 3D and the Clearance Distances between the 2nd Fresnel Zone of the radio links and the blade-tip of the nearest turbine have been calculated. A 3D view of the radio links relative to the proposed turbines is shown below in Figure 13.

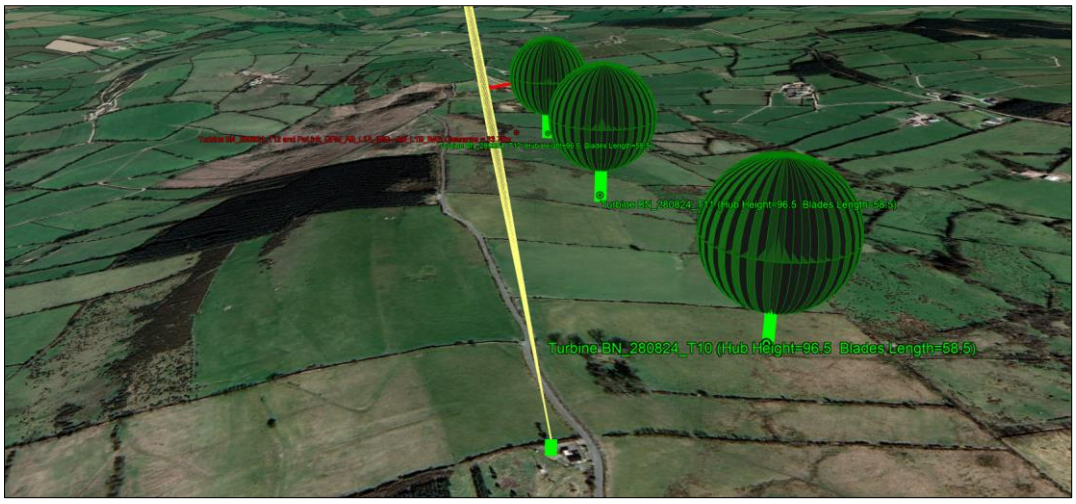

Figure 13. Imagine Broadband Radio Network – 3D View

The 3D analysis indicates that the turbine blades do not obstruct any of the Imagine radio links. Table 9 below provides a brief summary of the network analysis for the Imagine Broadband network in the vicinity of the proposed wind farm.

Imagine Link ID	Radio Link Description	Nearest Turbine	Fresnel Zone (F2) Clearance Condition to Blade-Tip of nearest Turbine	Mitigation Required
Link 1	BallyouskillI – ESB Portlaoise	T12	33.7 m (No Impacts)	None
Link 2	BallyouskillI – ESB Portlaoise	T12	33.7 m (No Impacts)	None

Table 9. ESB Network Analysis Summary

A16.2.5.4 Three Ireland Network Analysis

The Three Ireland network in the vicinity of the proposed wind farm consists of two Point-to-Point (PTP) microwave radio links. The radio links are listed in Table 10 below and a Plan View of the Three Ireland network is shown in Figure 14.

Link No.	Operator	Link Description
1	Three Ireland	PTP microwave radio link from Ballyouskill to Ardra
2	Three Ireland	PTP microwave radio link from Ballyouskill to Portlaoise (Scheduled to be decommissioned)

Table 10. Three Ireland Radio Links requiring Analysis

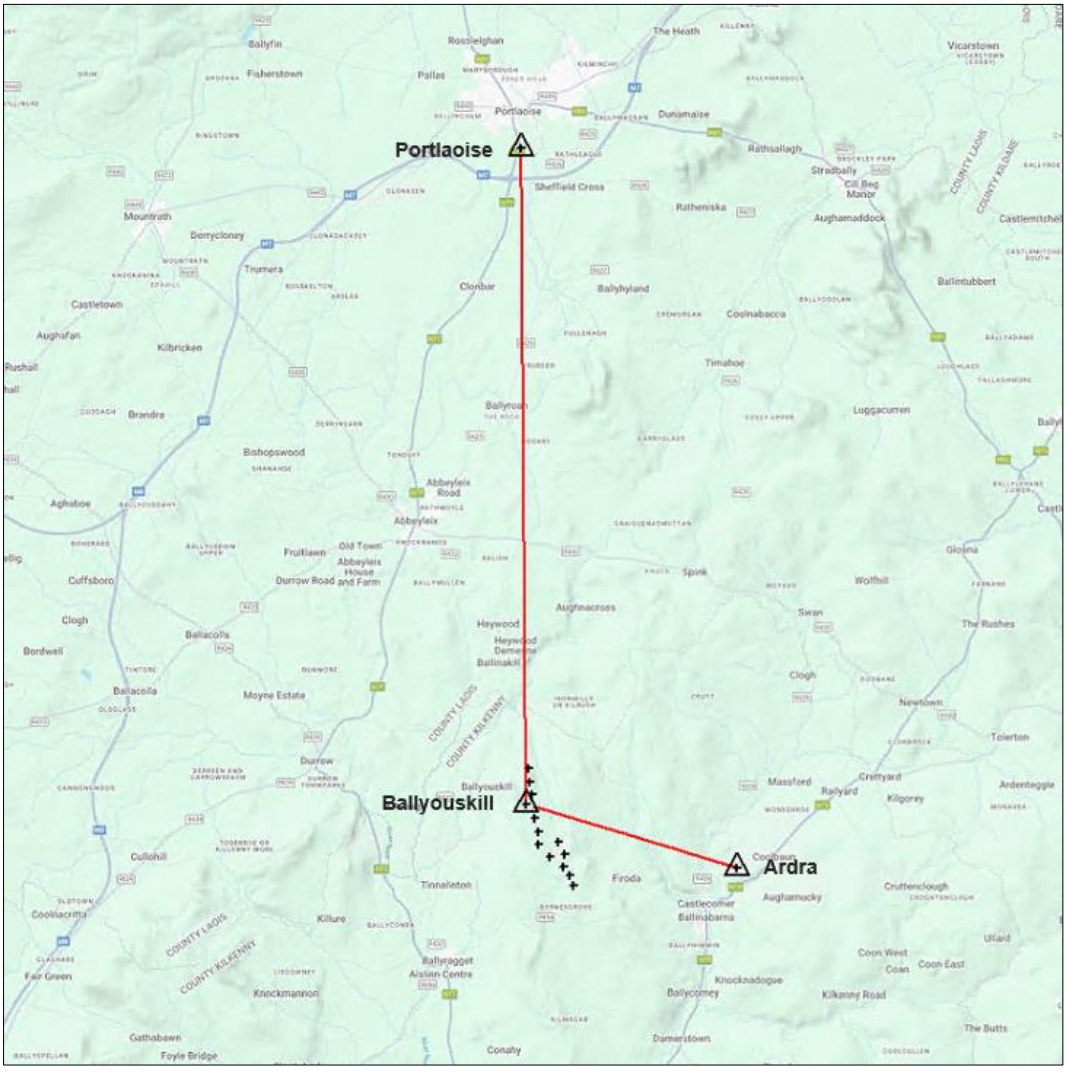

Figure 14. Three Ireland Radio Network – Plan View

Figure 15 below shows a Close-up Plan View of the Three Ireland microwave radio link network relative to the proposed wind farm.

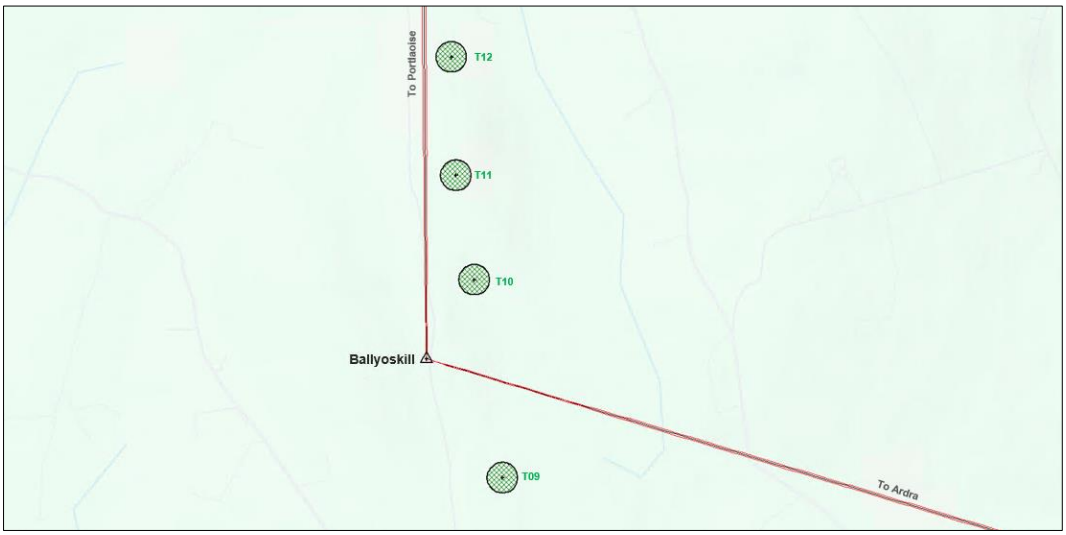

Figure 15. Three Ireland Network – Close-up Plan View.

To further assess the potential impact of the turbines on the ESB network, the radio links have been modelled in 3D and the Clearance Distances between the 2nd Fresnel Zone of the radio links and the blade-tip of the nearest turbine have been calculated. A 3D view of the radio links relative to the proposed turbines is shown below in Figure 16.

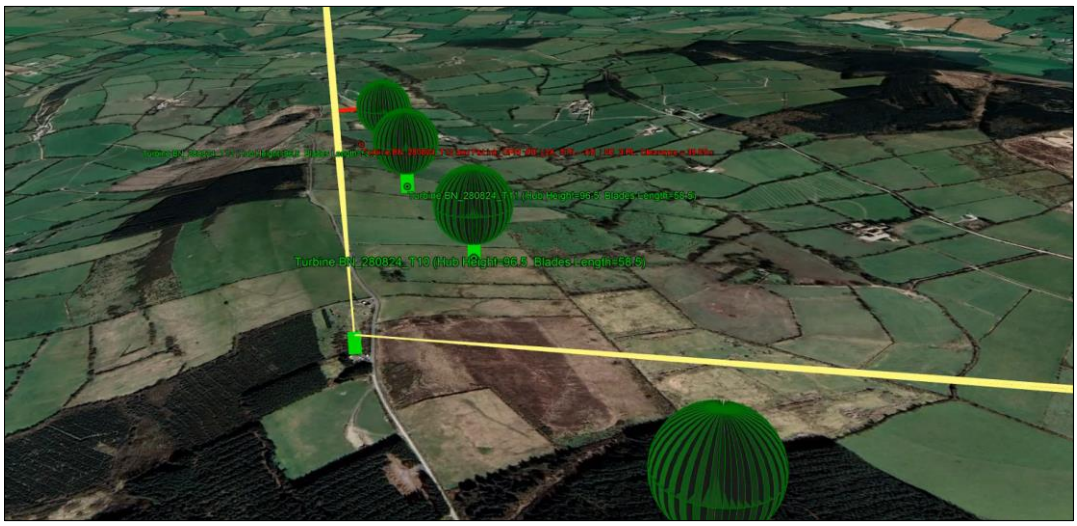

Figure 16. Three Ireland Radio Network – 3D View

The 3D analysis indicates that the turbine blades do not obstruct any of the Three Ireland radio links. Table 11 below provides a brief summary of the network analysis for the Three Ireland radio network in the vicinity of the proposed wind farm.

Imagine Link ID	Radio Link Description	Nearest Turbine	Fresnel Zone (F2) Clearance Condition to Blade-Tip of nearest Turbine	Mitigation Required
Link 1	Ballyouskilll – Ardra	T09	> 50 m (No Impacts)	None
Link 2	Ballyouskilll – Portlaoise (Link Scheduled to be decommissioned)	T12	39.65 m (No Impacts)	None

Table 11. Three Ireland Network Analysis Summary

A16.2.5.5 Tetra Ireland Network Analysis

Figure 17 below shows a close-up view of the 500m Tetra Exclusion Zone (as specified by Tetra Ireland), relative to the proposed wind turbines. One of the proposed turbines; T10, would be located within the 500m Tetra Exclusion Zone.

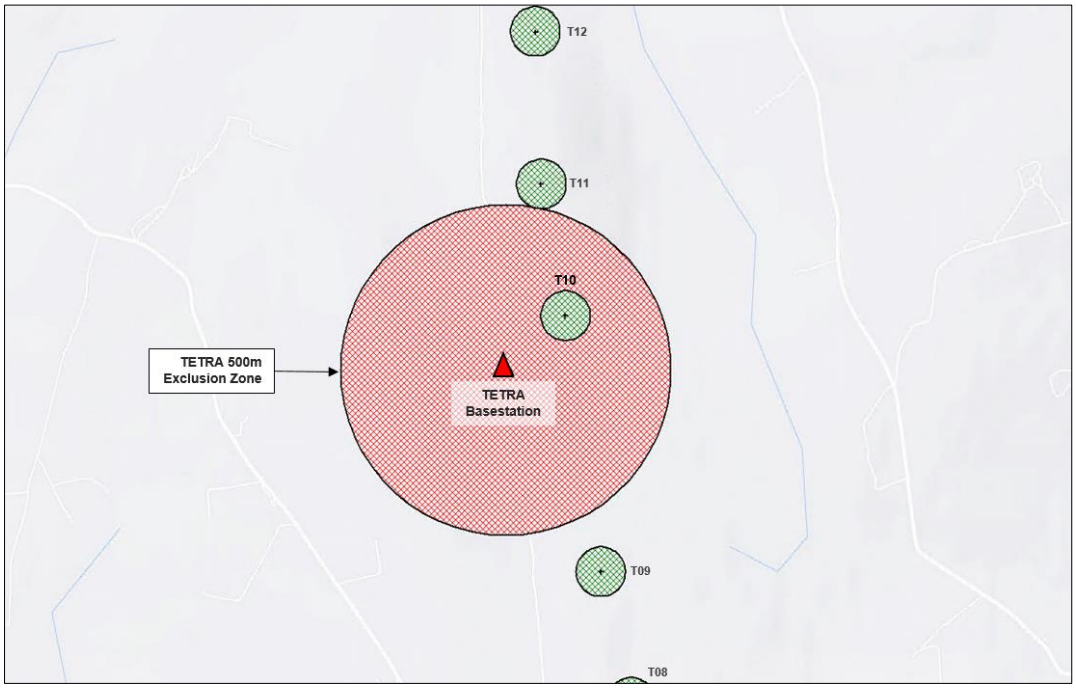

Figure 17. Tetra Ireland Network – Plan View.

A Tetra Impact Study carried out in May 2022 (Appendix C) indicates that, in a worse-case scenario, a turbine at this location could cause degradation in signal levels (i.e. a "shadowing" impact) to the northeast of Ballyouskill. This shadowing impact is illustrated below in Figure 18.

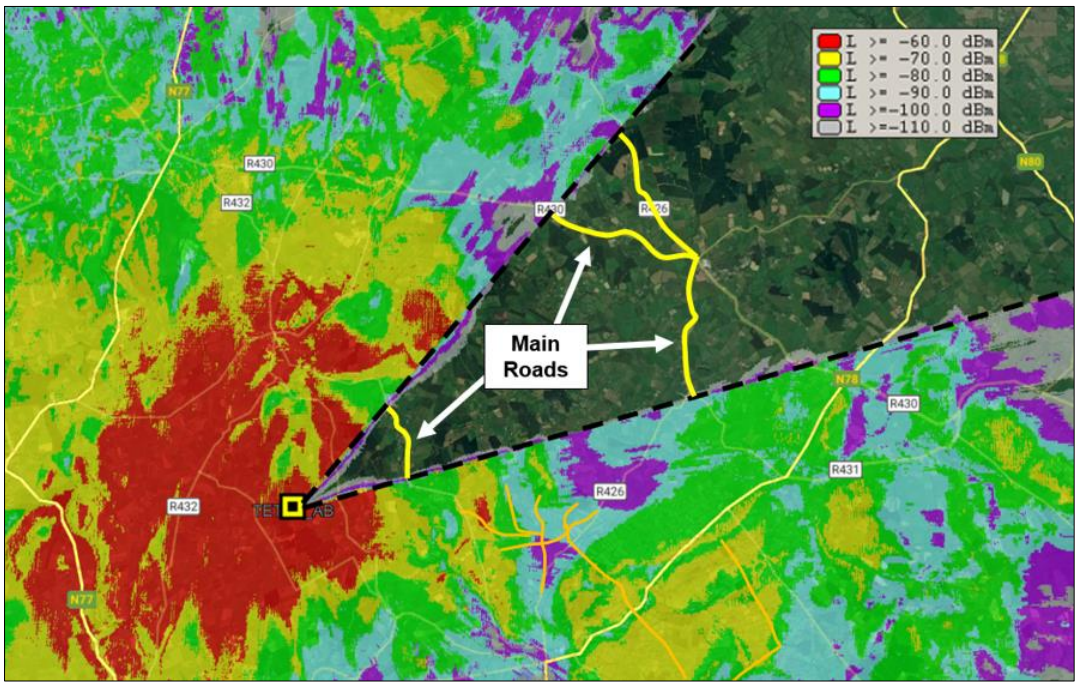

Figure 18. Illustration of potential shadow area to northeast of basestation due to turbine.

Tetra Field Surveys were also carried out for the Impact Study, the results of which found that there are other Tetra basestations (LACs) in the locality providing additional coverage in the area to the northeast of Ballyouskill.

Figure 19 shows field survey data, with the exclusion of the received TETRA signals from the Ballyouskill Mast (LAC 4401). As shown in the coverage map there is relatively good TETRA coverage in the area, even when service from Ballyouskill is excluded. This indicates that there is adequate signal from the other 21 neighboring cells even if T10 causes a degradation of service from the Ballyouskill basestation.

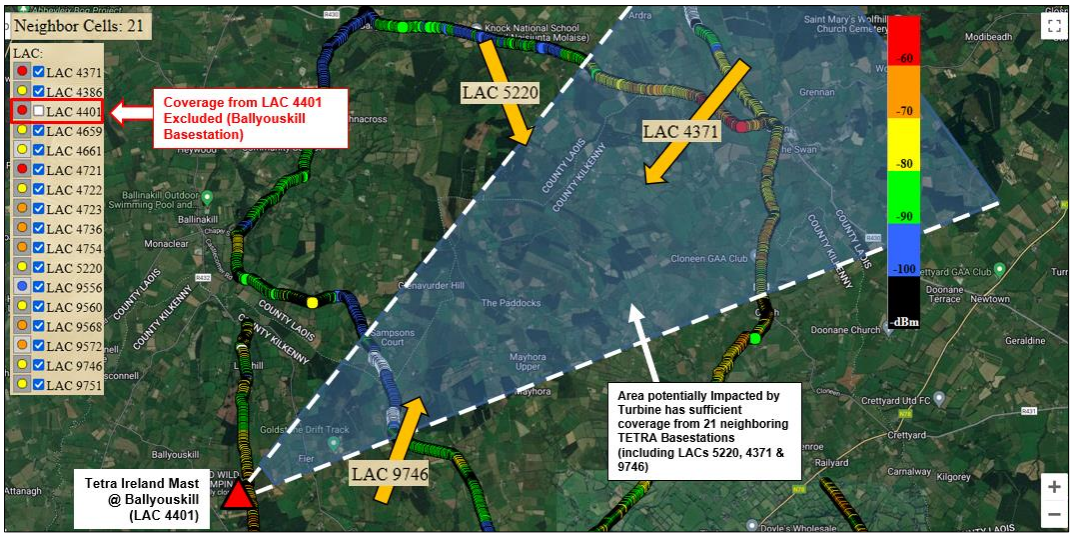

Figure 19. TETRA Service Coverage from neighbouring cells excluding Ballyouskill basestation coverage (i.e. adequate signal coverage from the other 21 neighboring cells)

Table 12 below provides a brief summary of the network analysis for the Tetra Ireland network in the vicinity of the proposed wind farm.

Link ID	Link Description	Link Type	Tetra Exclusion Zone	Wind Farm Impacts
Tetra BS1	Ballyouskill Basestation	Tetra	500m	Unlikely to be significantly impacted. Results from the Tetra Impact Study indicate that any degradation in TETRA service coverage due to Turbine T10 would be offset by coverage from neighboring TETRA basestations.

Table 12. Tetra Ireland Network – Analysis Summary

A16.2.6. Mitigation Measures

Mitigation Measures

Sections A16.2.6.1 and A16.2.6.2 that follow, describe the mitigation measures available to the wind farm developer to offset the potential impact of the proposed turbines on the Eir and ESB Networks.

A16.2.6.1 Mitigation Measure Solutions – Eir Network

To offset the impact of the turbines on the Eir radio link from Ballyouskill to Kilmadum the following mitigation solution is available:

Re-route Eir service into Kilmadum from alternative mast-site.

This mitigation measure is described in more detail in Section A16.2.6.1.1 that follows.

A16.2.6.1.1 Re-route Eir service into Kilmadum from alternative mast-site.

An option of offset the impact of the proposed turbine layout on the Eir radio link between Ballyouskill and Kilmadum would re-route the Eir service into Kilmadum from alternative Eir POP site.

The mast site at Ardra could be used as a relay site to re-route the Eir service between Ballyouskill and Kilmadum, as illustrated in Figure 20 below.

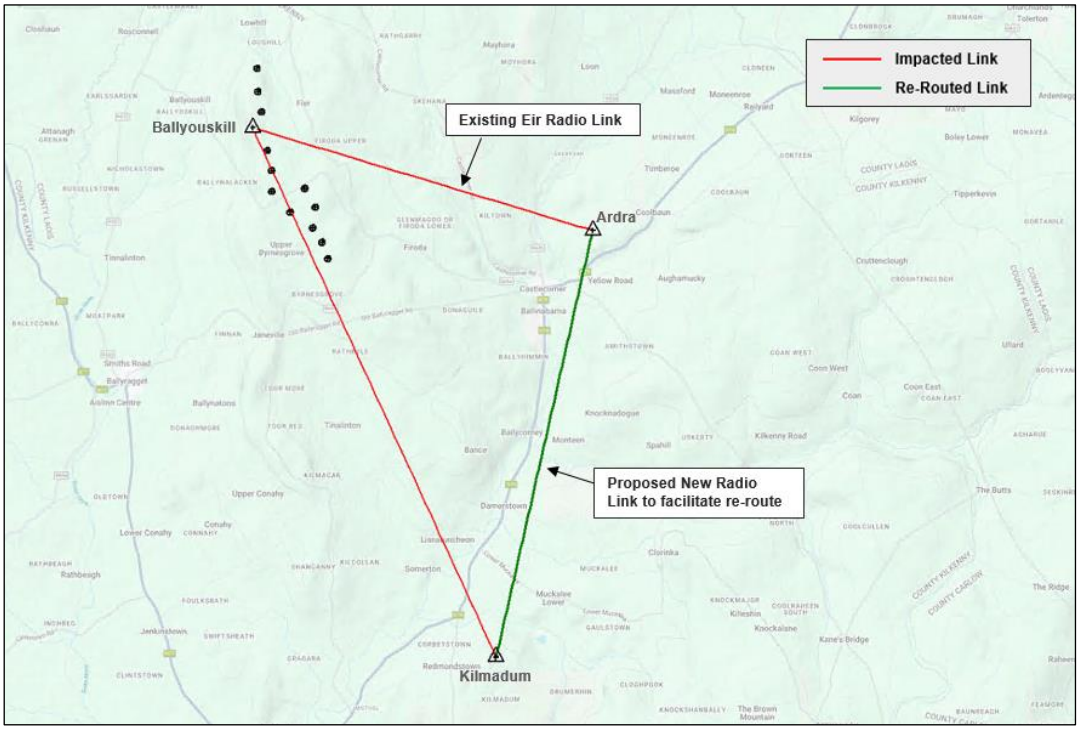

Figure 20. Re-routing via Ardra Mast

For this mitigation measure, a new radio link between Ardra and Kilmadum would be required. To determine if the proposed radio link would meet the Radio Link Availability Criteria required by ComReg for radio licensing, a Radio Path Profile and a Radio Link Budget analysis was

carried out. The results are presented in Figure 21 below and show that the ComReg Availability Criteria would be met.

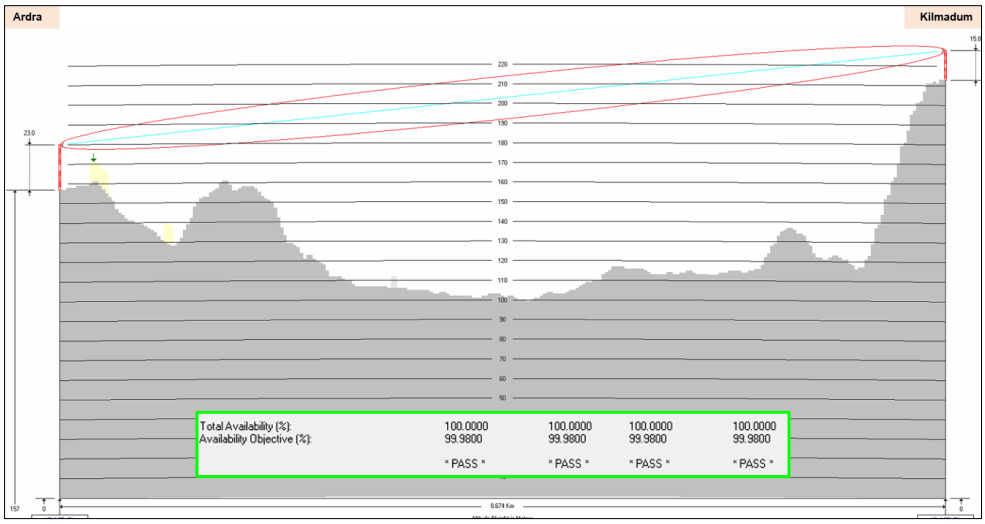

Figure 21. Ardra - Kilmadum Path Profile and Link Budget

A16.2.6.2 Mitigation Measure Solutions – ESB Network

Network analysis indicates that mitigation measures are likely to be required for ESB's PTP radio link between Ballyouskilll and Glencoumwood. Mitigation measures may also be required for ESB's PMP radio network operating from the telecoms mast at Ballyouskill. Sections A16.2.6.2.1 and A16.2.6.2.2 below outline the mitigation measures available to offset the impact of the proposed turbine layout on the ESB networks.

A16.2.6.2.1 PTP Radio Network (ESB Link 5: Ballyouskilll - Glencoumwood)

To offset the impact of the proposed turbine layout on the PTP radio link the following mitigation solution is available:

> Re-route the ESB service to/from Glencoumwood via a relay mast located within the proposed wind farm development.

This mitigation measure is described in more detail in Section A16.2.6.2.1.1 that follows.

A16.2.6.2.1.1 Re-route the ESB service to/from Glencoumwood via a relay mast.

An option of offset the impact of the proposed turbine layout on the ESB radio link between Ballyouskill and Glencoumwood would re-route the ESB service to/from Glencoumwood via a relay mast located within the proposed wind farm development.

A relay mast at the location illustrated in Figure 22 below could be used to facilitate a link between Ballyouskill and Glencoumwood.

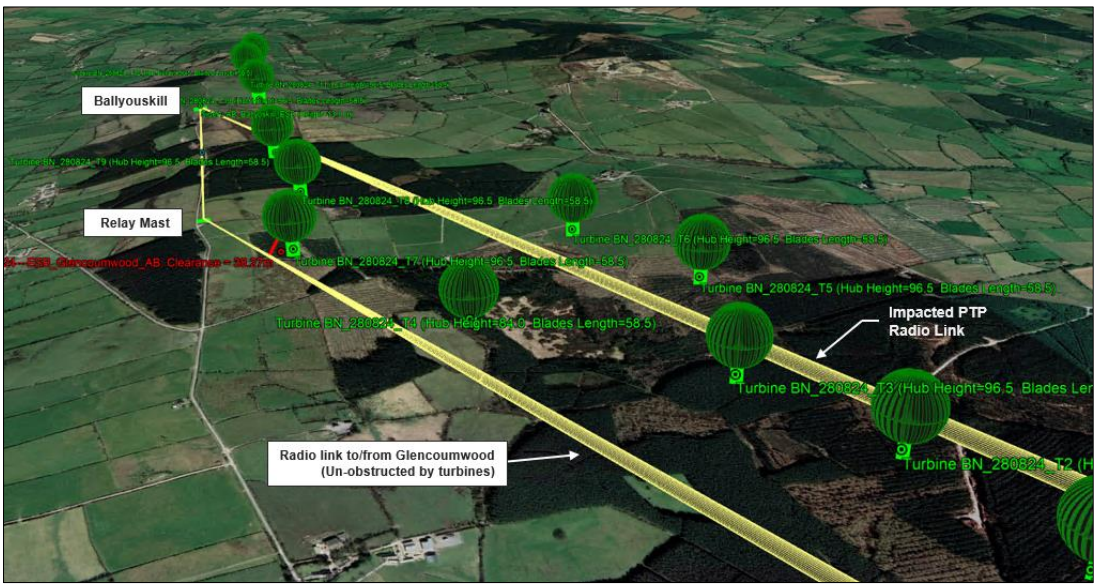

Figure 22. Re-routing via Ardra Mast

For this mitigation measure, new radio links to/from the relay mast would be required. To determine if the proposed radio links would meet the Radio Link Availability Criteria required by ComReg for radio licensing, a Radio Path Profile and a Radio Link Budget analysis was carried

out. The results are presented in Figures 23 and 24 below and show that the ComReg Availability Criteria would be met by both radio links.

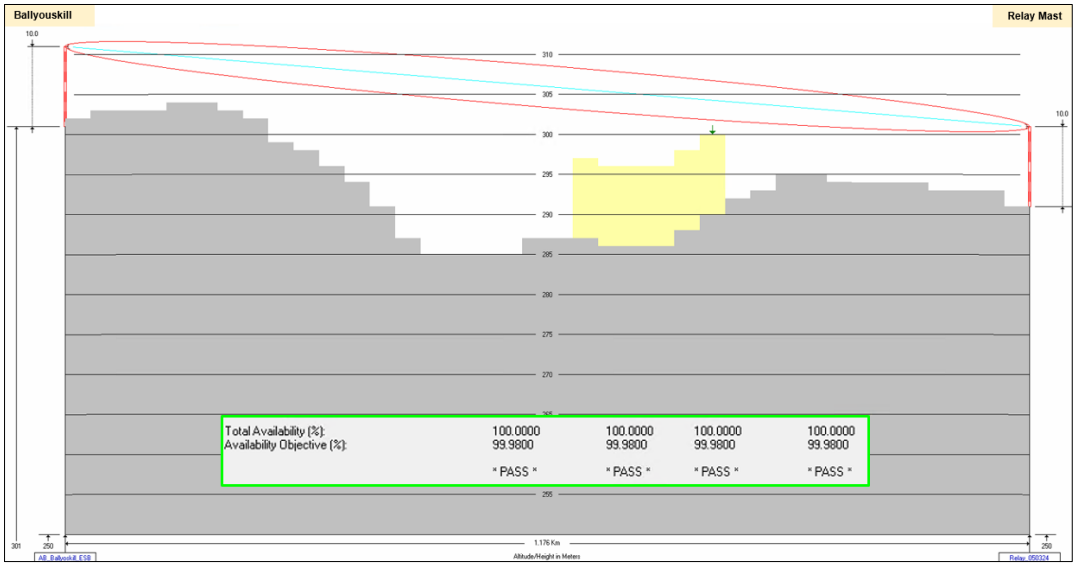

Figure 23. Ballyouskill – Relay Mast Path Profile and Link Budget

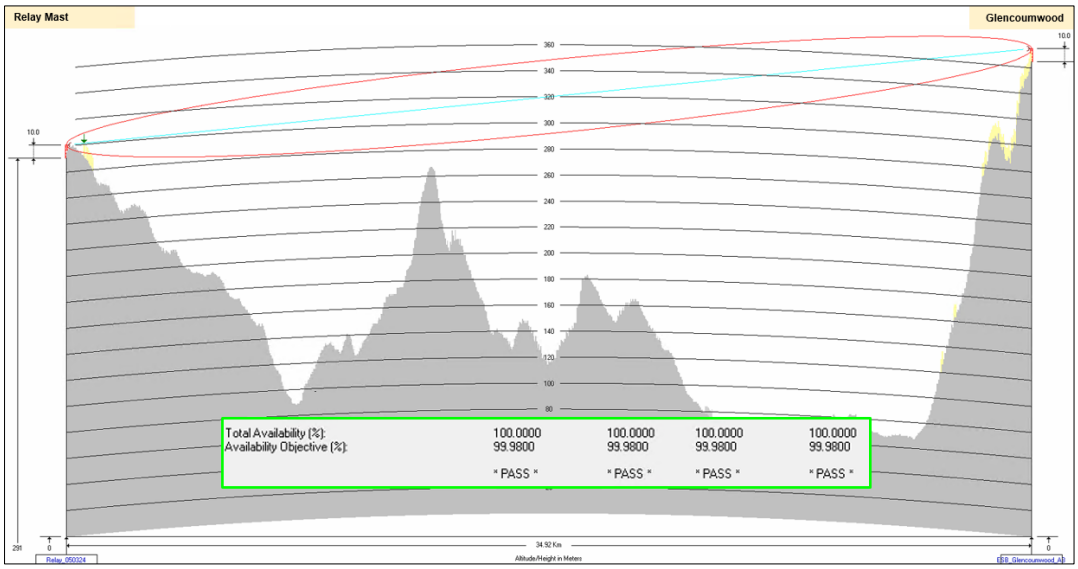

Figure 24. Relay Mast – Glencoumwood Path Profile and Link Budget

A16.2.6.2.2 PMP Radio Network

To offset the impact of the turbines on the ESB PMP Network the following mitigation solutions are available:

Option 1 – Replace Omni-directional Antennas at Ballyouskill Mast with Directional Antennas (if required to reduce interference impacts)

Option 2 – Provision of Relay Mast.

These mitigation measures are described in more detail in Sections A16.2.6.2.2.1 to A16.2.6.2.2.2 that follow.

A16.2.6.2.2.1 Option 1 – Replace Omni-directional Antennas at Ballyouskill Mast with Directional Yagi Antennas

The preferred option of offset the potential impact of reflections on the ESB PMP radio links would be to replace the Omni-directional Antennas at Ballyouskill Mast with Directional Antennas. Figure 25 below shows the existing omni-directional antennas at Ballyouskill mast and an example of a Yagi Antenna that could be used to eliminate the impact of the turbines due to reflections.

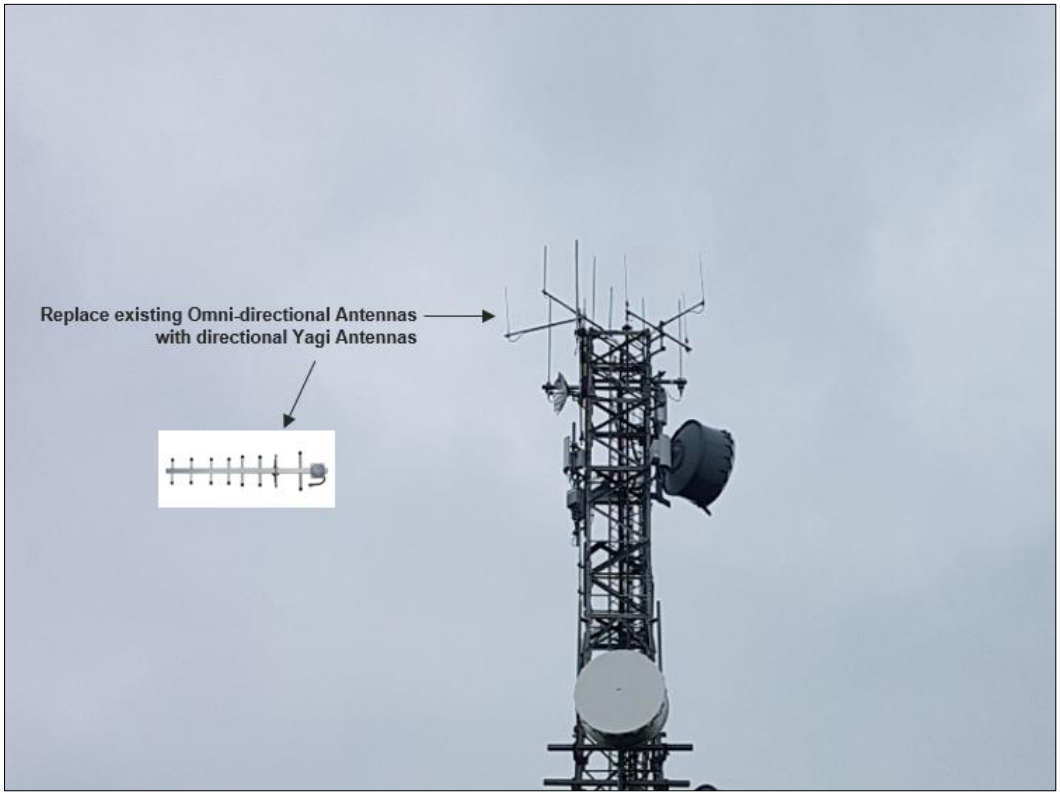

Figure 25. Replace Omni-directional Antenna at Ballyouskill mast with directional Yagi Antenna

A16.2.6.2.2.2 Option 2 – Provision of Relay Mast.

An alternative option to offset any potential impacts to the ESB PMPs links would be to provision a relay mast-structure. This would require a telecoms mast or mono-pole structure to be erected, which would provide an alternative telecommunication site to ESB, so that the turbines would not interference with the PMP radio signals. An outdoor cabinet would also be required to house the radio indoor equipment and electrical power supply. Figure 26 below an example structure that could be used at a relay mast-site.

Note: It is unlikely that this mitigation measure would be required as replacing the Omni-antennas at the Ballyouskill mast with Yagi Antennas (Option 1) should be sufficient to prevent interference to the PMP radio links.

Figure 26. Example of Monopole mast-structure

A16.2.7. Conclusions

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 fifteen radio links and one Tetra Basestation in the vicinity of the proposed development.
- The telecoms networks which could potentially be impacted by the proposed wind farm development are listed below in Table 13.

Operator	Network Description	Impacts of Wind Farm	Possible Mitigation Measure(s)
Eir	Licenced PTP microwave radio link from Ballyouskilll to Upper Coolbawn.	None	N.A
Eir	Licenced PTP microwave radio link from Ballyouskilll to Ardra.	None	N.A
Eir	Licenced PTP microwave radio link from Ballyouskilll to Kilmadum.	Likely to be impacted by proposed turbine layout.	Re-route via alternative Telecoms Mast site.
ESB	Licenced PTP microwave radio link from Ballyouskilll to Slieve Bloom.	None	N.A
ESB	Licenced PTP microwave radio link from Ballyouskilll to Carbury.	None	N.A
ESB	Licenced PTP microwave radio link from Ballyouskilll to Monavea 38kV.	None	N.A
ESB	Licenced PTP microwave radio link from Ballyouskilll to Glencoumwood.	Potentially impacted by proposed turbine layout.	Re-route via optional relay mast.
ESB	PMP radio link from Ballyouskilll to Ballyhale 38kV. (PMP radio link)	None	**Mitigation options if required** **Option 1:** Replace Omni-directional Antennas with Yagi Antennas **Option 2:** Relay Mast
ESB	PMP radio link from Ballyouskilll to Castlecomer 38kV. (PMP radio link)	None	**Mitigation options if required** **Option 1:** Replace Omni-directional Antennas with Yagi Antennas **Option 2:** Relay Mast
ESB	PMP radio link from Ballyouskilll to Rosehill. (PMP radio link)	None	**Mitigation options if required** **Option 1:** Replace Omni-directional Antennas with Yagi Antennas **Option 2:** Relay Mast
ESB	PMP radio link from Ballyouskilll to Talbots Inch. (PMP radio link)	None s.	**Mitigation options if required** **Option 1:** Replace Omni-directional Antennas with Yagi Antennas **Option 2:** Relay Mast

Imagine Broadband	Licenced PTP microwave radio link from Ballyouskilll to ESB_Portlaoise. (Link #1)	None	N.A
Imagine Broadband	Licenced PTP microwave radio link from Ballyouskilll to ESB_Portlaoise. (Link #2)	None	N.A
Three Ireland	Licenced PTP microwave radio link from Ballyouskilll to Ardra.	None	N.A
Three Ireland	Licenced PTP microwave radio link from Ballyouskilll to Portlaoise. (Radio Link scheduled to be decommissioned).	None	N.A
Tetra Ireland	Tetra Basestation at Ballyouskill Mast-Site	Unlikely to be significantly impacted.	N.A

Table 13. Radio Links in vicinity of proposed Ballynalacken Wind Farm development.

- The indicative costs associated with the proposed mitigation solutions are provided below in Table 14.

Operator	Impacted network	Mitigation Proposal	Indicative Cost
Eir	PTP microwave radio link from Ballyouskilll to Kilmadum.	Re-route service to/from Kilmadum via Alternative Eir POP site.	Installation of 2 No. Microwave Radio Links. Link #1: (Ballyouskill - Ardra) - Design, Hardware & Installation : € 15,000 Link #2: (Ardra - Kilmadum) - Design, Hardware & Installation : € 15,000
ESB	PTP microwave radio link from Ballyouskilll to Glencoumwood.	Re-route service to/from Glencoumwood via relay mast.	Installation of 2 No. Microwave Radio Links. Link #1: (Ballyouskill – Relay Mast) - Design, Hardware & Installation : € 15,000 Link #2: (Relay Mast - Glencoumwood) - Design, Hardware & Installation : € 15,000
ESB	PMP radio link network at Ballyouskill	Option 1: Replace Omni-directional Antennas at Ballyouskill Mast with directional Yagi Antenna	Installation of 4 No. Yagi antennas and commissioning of PMP links. - Design, Hardware & Installation : € 7,500

		Option 2: Relay Mast (Impacts not anticipated however mitigation options include herin) - Installation of UHF PMP telemetry link equipment to be installed and maintained for duration of operation of the wind farm. - Civil Construction by the wind farm developer of a concrete plinth, outdoor street side telecommunication cabinet, palisade fencing and a 6m monopole	Once-off Civil Construction costs including concrete plinth palisade construction and monopole construction to be covered by the wind farm developer. Once-off Hardware & Installation Costs : - Street side Telecoms Cabinet : € 2,641 - Electrical & Battery Pack Supply : € 1,675 - 4 no UHF Links including radio and antenna equipment : € 11,000 - Design & Installation Costs : € 10,000

Table 14. Mitigation Costs

APPENDIX A – Wind Farm Turbine Coordinates

Appendix A – Wind Farm Turbine Co-ordinates

The co-ordinates of the proposed wind turbines studied in this report are shown below in Table 15.

ID	Co-ordinates (ITM)	
	X	Y
T1	648966	673528
T2	648846	673851
T3	648660	674134
T4	648208	674445
T5	648706	674547
T6	648492	674915
T7	647840	674849
T8	647833	675261
T9	647737	675658
T10	647620	676423
T11	647545	676826
T12	647523	677284

Table 15. Proposed Turbine Co-ordinates - Ballynalacken Wind Farm (Turbine Layout 280824).

APPENDIX B – Field Survey Findings

Appendix B – Field Survey Findings

The telecom mast-sites surveyed for this Telecoms Impact Study are shown relative to the proposed turbines in Figure 27 below.

Figure 27. Telecom Mast-Sites shown relative to proposed Wind Farm

The findings from the field surveys of each of the mast-sites are presented below.

Mast-Site A (Ballyouskill)

Telecommunications Mast-Site A is situated in the townland of Ballyouskill and is adjacent to the proposed wind farm development site. 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 16.

Figure 28. Mast A1

Mast ID	Telecom operators with radio links in direction of proposed wind farm
Mast A1	Eir

Table 16. Field Survey Summary – Mast A1

Mast-Site B (Kilmadum)

Telecommunications Mast-Site A is situated in the townland of Kilmadum, Co Kilkenny and is approximately 9km southeast of the proposed wind farm development site. 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 17.

Figure 29. Mast B1

Mast ID	Telecom operators with radio links in direction of proposed wind farm
Mast B1	Eir

Table 17. Field Survey Summary – Mast B1

APPENDIX C – Tetra Impact Study Report (May 2022 Turbine Layout)

Report

Ballynalacken Wind Farm

TETRA Impact Study

Document Number:

Author: D.McG.

Approved for Release: Rev 1.0 David McGrath **Date:** 16/05/22

Document Filename: *Ballynalacken Wind Farm TETRA Impact Study Report*

Executive Summary

During consultations as part of the Ballyouskill Wind Farm (now known as Ballynalacken Wind Farm) Telecommunications Impact Study in 2021, TETRA Ireland raised concerns in relation to the proximity of the proposed turbines to their TETRA Basestation at the telecoms mast-site adjacent to the wind farm. Their concern was that the proposed wind farm development could negatively impact TETRA service coverage in the region.

EcoPower commissioned Ai Bridges to carry out this TETRA Impact Study based on a revised turbine layout in May 2022 to evaluate the potential impacts of turbine T08 which is proposed to be located within a 500m Exclusion Zone around the TETRA Ireland basestation.

The requirement of this study was conduct field and desktop surveys in the Ballynalacken area to compare TETRA service coverage at both pre-construction and post-construction phases of the wind farm development. The signal levels recorded during the field surveys could then be used to assess the potential impacts of Turbine T08 on TETRA service coverage in the area.

Analysis of the field and desktop survey findings are presented in Section 4 of this report and show that Turbines T08 will not adversely affect TETRA service coverage in the Ballynalacken area. The results show that there is sufficient TETRA coverage from neighboring basestations to provide good coverage in the area.

As the findings of this report indicate that the Ballynalacken wind farm will not adversely impact TETRA service coverage in the area, it is deemed that no mitigation measures are required.

It should also be noted that TETRA Ireland have not responded to the consultation requests previously sent to them in relation to the proposed development. An analysis has been prepared indicating that there would be no significant impact to TETRA coverage in the area due to turbine T08.

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Section 1 - Wind Farm Site Information

1. Introduction

In this section a brief summary of the wind farm site is provided. Details regarding the site's geographic location and the turbine dimensions are presented.

1.1 Wind Farm Site Information

The proposed wind farm development is located approximately 4 km northwest of Castlecomer in County Kilkenny. The proposed turbines dimensions are shown below in Table 2 and the proposed turbine coordinates are provided in Appendix A.

Wind Farm	Number of Turbines	Turbine Hub Height	Turbine Rotor Diameter
Ballynalacken	10	105 m	150m

Table 1. Ballynalacken Wind Farm Turbine Details

The location of the proposed Ballynalacken wind farm development is shown below in Figure 1.

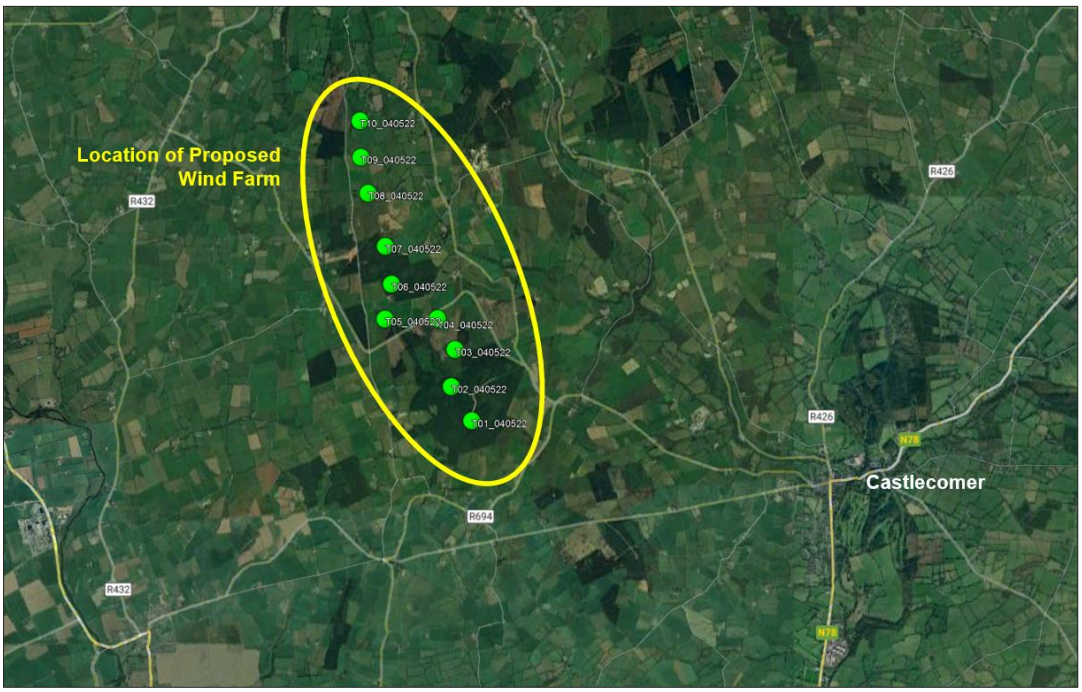

Figure 1. Location of Ballynalacken Wind Farm, Co Kilkenny.

Section 2 - Desktop Survey

2. Introduction

A desktop survey was undertaken to predict TETRA service coverage in the Ballynalacken area for both the pre-construction and post-construction wind farm development phases. The predictions could then be used to assess the possible impacts on TETRA service coverage due to turbine T08.

2.1 Turbine T08 relative to Ballynalacken Basestation

Wind Turbine T08 has been plotted using radio planning software and is shown relative to the TETRA Ireland Basestation in Figure 2 below.

The distance separating T08 from the TETRA Ireland Basestation is less than 250 meters. Turbine T08 has been modelled as an obstruction to TETRA radio signals and has been mapped onto the morphology layer of the radio planning software GIS database.

Figure 2. Turbine T08 relative to the TETRA Basestation at Ballyoskill

2.2 Pre-Construction TETRA Service Coverage Prediction – Ballynalacken Transmitter

The pre-construction service coverage has been modelled for downlink transmission. The radio software model used transmit power settings of the TETRA basestation at 10 Watts on the basis of conversations with RF planners and from previous modelling of TETRA Impact Study Reports.

The Communications Regulator ("ComReg") specify that a transmit power of 40Watts (46 dBm) can be used for Emergency Services Digital Radio Licences (i.e. TETRA services); however in this report a transmit power of 10 Watts has been used for predictions as this will provide for a Worse-Case Scenario result.

The predicted pre-construction service coverage for the TETRA basestation at 10Watts at the Ballyouskill transmitter site is shown in Figure 3 below.

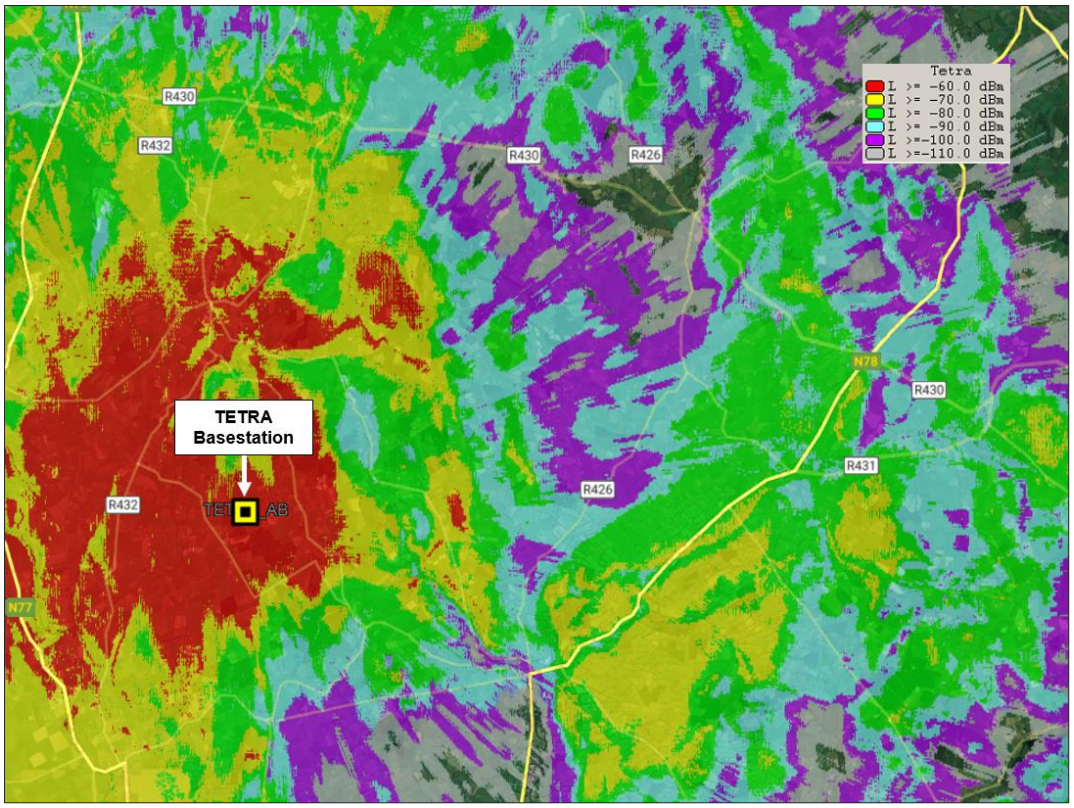

Figure 3. TETRA Coverage from Ballyouskill Transmitter – Pre-Construction @ 10 Watts

2.3 Post-Construction TETRA Service Coverage Prediction – Ballynalacken Transmitter

The post-construction service coverage for the TETRA basestation at 10Watts (worse-case-scenario) at the Ballyouskill transmitter is shown below in Figure 4.

The TETRA service coverage shows that in the worse-case scenario there is a degradation in signal levels ("shadowing" impact) caused by the impact of turbine T08 when modelled as an obstruction. It should be noted that the service coverage prediction does not show any service coverage from any of the neighboring TETRA base-station as no information was available in relation to these neighboring cells.

The predicted post-construction service coverage* for the TETRA basestation at 10Watts at the Ballyouskill transmitter site is shown in Figure 4 below.

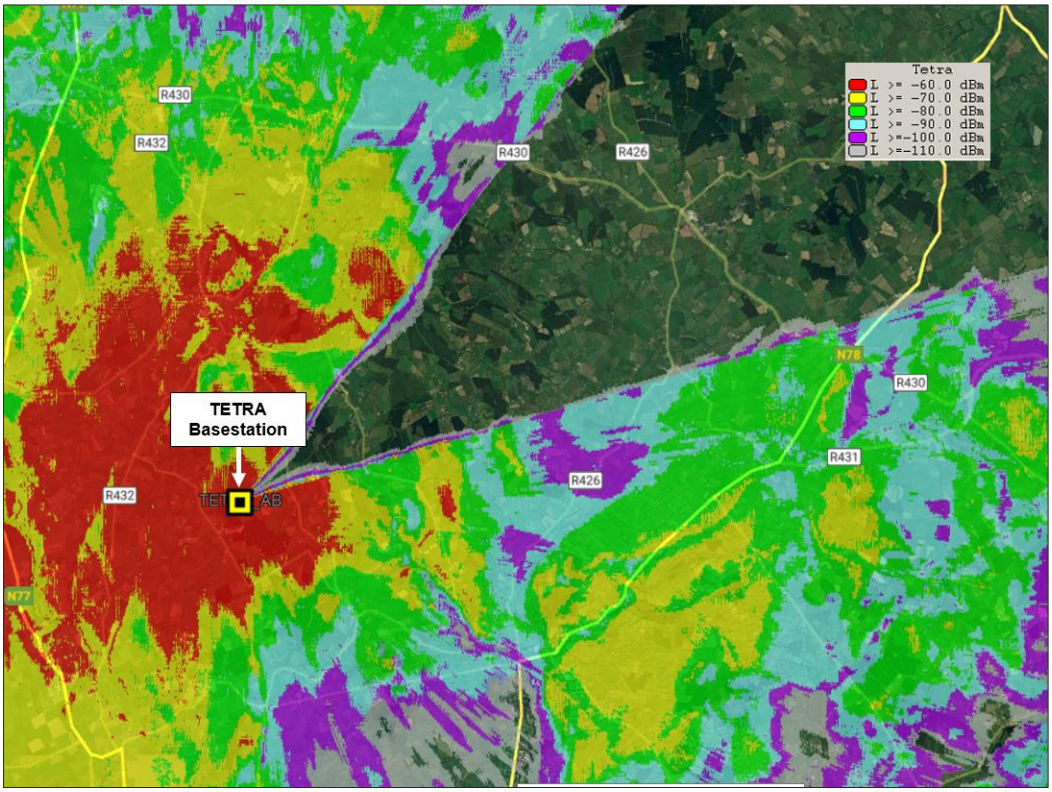

Figure 4. TETRA Coverage from Ballyouskill Transmitter – Post-Construction @ 10 Watts

Note: The Coverage Prediction Plot above is for a worse-case scenario where the turbine blade rotor span is considered as an obstacle that extends to ground level. In reality, there will be a distance of approximately 30m between the ground and the lowest point of the turbine rotor span and much of the TETRA signal will pass underneath the turbine blades un-obstructed.

Section 3 - TETRA Field Surveys

3. Introduction

Extensive field drive-thru surveys were conducted in the service coverage area of the Ballynalacken TETRA basestation. A TETRA spectrum analyzer was used to record all of the TETRA signals from the Ballynalacken basestation. TETRA signals from all other neighboring TETRA basestations were also recorded and potted based on GPS co-ordinates. The results from the pre-construction field surveys are presented below in sections 3.1 below.

3.1 Field Survey Results – Pre-Construction

Figure 5 shows that a selected GPS coordinate (within the predicted "shadow" areas of T08) reveals that there is coverage from 22 TETRA cells in the survey areas. The field survey data is visualized using a TETRA modelling software application and the neighboring cells are notated with a LAC (Local Area Code) ID with the associated received signal level. The results show relatively good TETRA coverage in the area with recorded signal strength readings of between –44dBm and -99dBm. No service coverage blackspot areas were recorded during the field surveys.

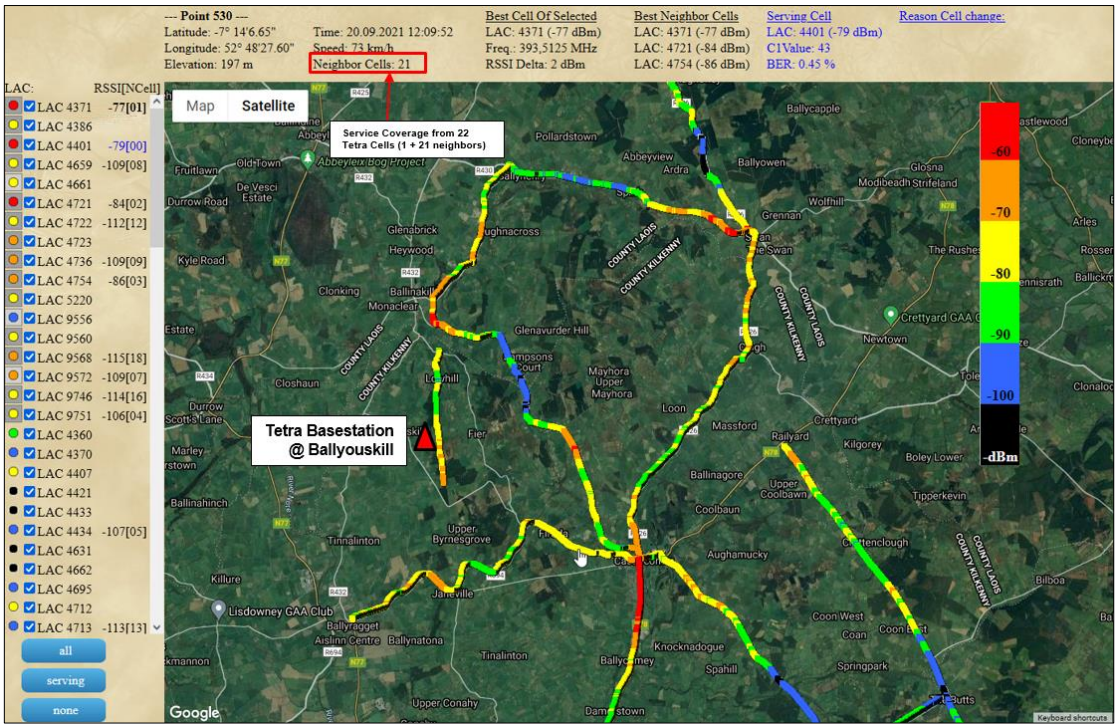

Figure 5. Pre-construction Field Survey Results - TETRA Service Coverage from Ballyouskill and neighbouring cell TETRA basestations

Figure 6 below shows the TETRA Basestation located at the Ballyouskill Mast Site. From the findings of the field and desktop surveys, it has been determined that the LAC associated with this basestation is LAC 4401.

Figure 6. TETRA Basestation (LAC 4401) at Ballyouskill Mast-Site

Section 4 - Desktop and Field Survey Analysis

4. Introduction

In this section an analysis of the Desktop and Field Survey findings are presented.

4.1 Analysis of Desktop and Field Survey Results

Figure 7 below shows a close-up view of the worse-case scenario of TETRA coverage from the Ballyouskill basestation (post-construction). The prediction shows that there is a shadow area to the northeast of the proposed wind farm development due to the impact of T08. The prediction shows a degradation in received signal levels down to less than -110dBm in some areas.

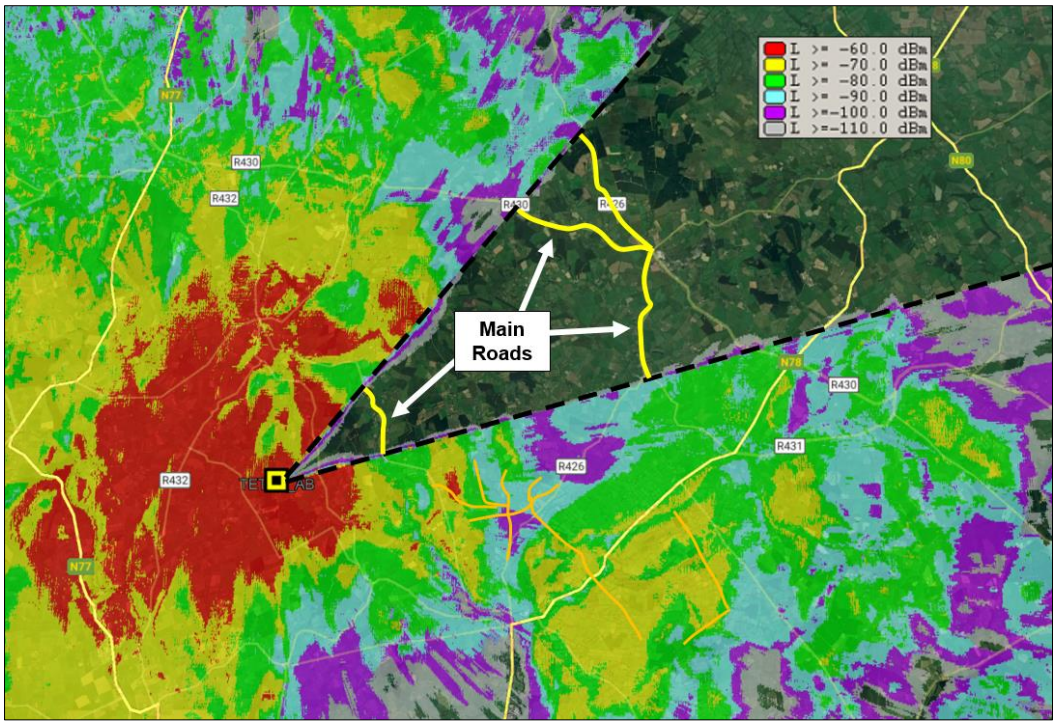

Figure 7. Worse-Case Scenario Prediction showing Shadow Area to northeast of the Tetra basestation at Ballyouskill.

Figure 8 shows field survey data to the northeast, with the exclusion of the received TETRA signals from the Ballynalacken Mast (LAC 4401). As shown in the coverage map there is relatively good TETRA coverage in the area, even when service from Ballynalacken is excluded. This indicates that there is adequate signal from the other 21 neighboring cells even if T08 causes a degradation of service from the Ballynalacken basestation.

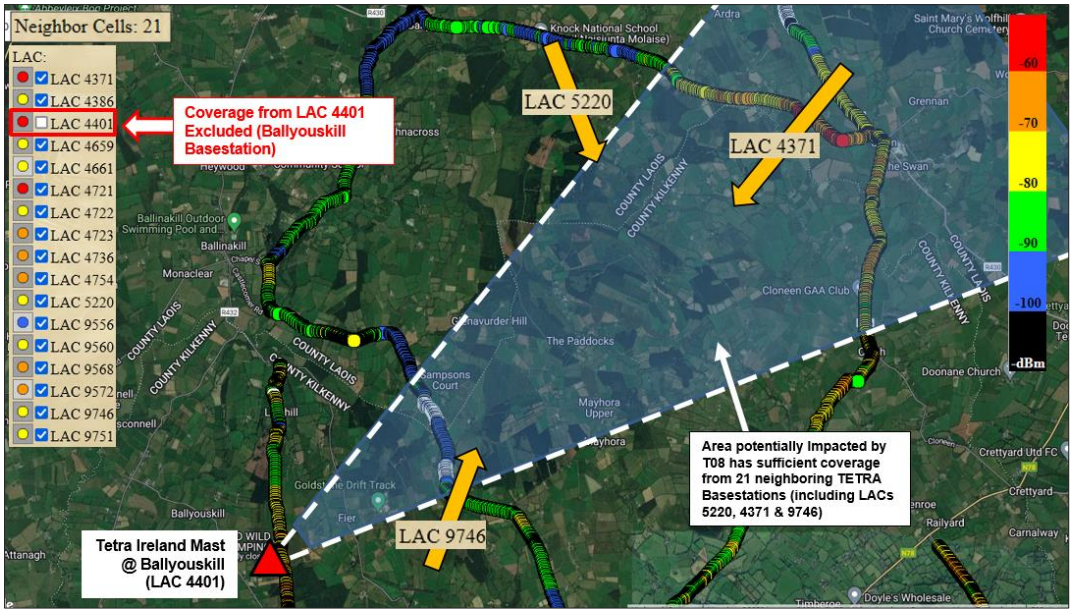

Figure 8. TETRA Service Coverage from neighbouring cells excluding Ballyouskill basestation coverage – Shadow Area to Northeast due to Turbine T08

4.2 Analysis Summary

A brief summary of the analysis findings are provided below:

- In a worse-case scenario, turbines T08 may cause some degradation to service coverage from the Ballyouskill TETRA Ireland Basestation (LAC 4401).
- Any degradation will be limited to an area to the northeast of the proposed development which is relatively unpopulated.
- Field Survey findings show that there other LACs (21 neighbouring LACs) in area providing additional coverage in the area to the northeast of the Tetra basestation.
- When signal reception from the Ballyouskill Basestation is excluded, there is still adequate TETRA coverage from the neighbouring basestations (LACs).
- There would be no blackspot areas in TETRA coverage due to the proposed wind farm development.

Section 5 - Conclusions

5. Conclusions

From the findings made in this report the following conclusions have been made:

- Worst Case Scenario TETRA services coverage predictions indicated that there may be some degradation in TETRA signals from the basestation at Ballynalacken in an areas to the northeast of the proposed wind farm development.

- Field survey results show that even if Turbine T08 did impact TETRA signal reception from the Ballynalacken basestation, there are 21 other TETRA basestations providing coverage in the Ballynalacken area.

- Results from the Field and Desktop Surveys indicate that any degradation in TETRA coverage due to Turbine T08 would be offset by coverage from neighboring TETRA basestations.

- The Ballynalacken wind farm development is unlikely to have any significant impact to TETRA service coverage in the area and no mitigation measures are required.

APPENDIX

APPENDIX A – Ballynalacken Turbine Co-ordinates

The co-ordinates of the turbines studied in this report (May 2022 Turbine Layout) are shown below in Table A-1.

Turbine ID	Latitude	Longitude
T01	52° 48' 43.344"N	7° 16' 27.995"W
T02	52° 48' 56.561"N	7° 16' 41.073"W
T03	52° 49' 10.880"N	7° 16' 38.646"W
T04	52° 49' 22.855"N	7° 16' 49.878"W
T05	52° 49' 22.636"N	7° 17' 23.319"W
T06	52° 49' 36.137"N	7° 17' 19.252"W
T07	52° 49' 50.753"N	7° 17' 23.181"W
T08	52° 50' 11.301"N	7° 17' 34.333"W
T09	52° 50' 25.307"N	7° 17' 39.129"W
T10	52° 50' 39.680"N	7° 17' 40.178"W

Table A-1 Ballynalacken Turbine Co-ordinates

Appendix 16.3: Aviation Review Statement

Appendix to Chapter 16: Material Assets

Appendix 16.3: Aviation Review Statement

Report

Ballynalacken Wind Farm

Aviation Review Statement

Document Number:	001/BN/0125			
Author:	PT\DMG			
Approved for Release:	Rev 4.0	KH	**Date:**	20/01/25

Document Filename: *Ballynalacken Wind Farm - Aviation Review Statement*

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 Ballynalacken. 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 and Navigation Systems
- Radar Surveillance Sensors
- Flight Inspection and Calibration
- Aeronautical Obstacle Warning Light Scheme
- Private Airfield / Helipads (VFR Flying)
- 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 Waterford Airport 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 Waterford 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 Waterford 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 Waterford 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.

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 BRA surfaces at Waterford Airport. At this distance there will be no impacts to the BRAs due to wind turbines at Ballynalacken.

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 NDB at Waterford Airport. As the proposed wind farm is located outside the MSA Sectors for Waterford Airport, there should be no impact on the published MSA altitudes.

Instrument Flight Procedures

There are 6 published Instrument Flight Procedures for flights to/from Waterford 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 71 km from the Localizer and transmitting antennas at Waterford 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 distance of over 90 km from the radar stations at 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 Flight Inspection Service Provider. The checks are carried out during annual inspections consisting of radial and orbital test flights around Waterford 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.

Private Airfields / Helipads (VFR Flying)

A due-diligence survey was carried out on the private airfields / helipads in the vicinity of Ballynalacken. It was found that there are three private airfields /helipads within 20 km of the proposed wind farm site; Kilkenny Airfield, Midlands Heliport and Abbeyleix Airfield. The proposed wind farm is sufficiently far from each aviation installation that there would be no impact due to the proposed wind turbines. Pilots flying to/from these aviation installations would also be required by law to fly by Visual Flight Rules (VFR) and in accordance with the IAA *Rules of The Air*. The Rules of the Air state, it is the pilot's legal responsibility to be aware of and avoid any obstacles in his/her flight path and therefore he/she would be required to be aware of wind turbines if flying to/from the airfield / helipad in question. This can achieved by prudent flight planning by the VFR pilot prior to flight.

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 proposed wind farm site is located outside the restricted areas. As the proposed wind farm is not located in a restricted area it should have no impacts on the Irish Air Corps activities.

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.

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
IAA	Irish Aviation Authority
IAC	Irish Aer Corps
ICAO	International Civil Aviation Organization
IFP	Instrument flight Procedure
ILS	Instrument Landing System
NATS	National Air Traffic Services (UK)
NDB	Non-directional beacon
NM	Nautical Miles
OLS	Obstacle Limitation Surface
PSR	Primary Surveillance Radar
RWY	Runway
SID	Standard Instrument Departure Route
STAR	Standard Arrival Route
SSR	Secondary Surveillance Radar
VFR	Visual Flight Rules
VOR	VHF Omni-directional Range Station

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A16.3.1 Introduction

This section provides a brief summary of the proposed wind farm development at Ballynalacken and of the nearest significant aviation installation at Waterford Airport.

A16.3.1.1 Wind Farm Site Information

The proposed wind farm development is located in County Kilkenny approximately 71 km north of Waterford Airport. Figure 1 shows the proposed wind farm site with respect to Waterford Airport and the IAA radar stations at Shannon, Woodcock Hill and Dublin Airport.

Figure 1. Location of proposed wind farm at Ballynalacken

A16.3.1.2 Waterford Airport

Table 2 below shows the co-ordinates of Waterford Airport and the distance from the Airport reference Point (ARP) to the proposed wind farm site. Waterford Airport operates in Class G 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
Kilowen, Co Waterford	International Airport	Single Asphalt Runway Airspace: Class G	52 11 14 N 07 05 13 W (Mid-point of Runway 03/21).	70.7 km

Table 1. Waterford Airport Details

The aeronautical navigation aids at the aerodrome include DME, NDB, ILS LOC and ILS GP.

Figure 2. Waterford International Airport

A16.3.2 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 and Navigation Systems
- Radar Surveillance Sensors
- Flight Inspection and Calibration
- Aeronautical Obstacle Warning Light Scheme
- Private Airfields (VFR Flying)
- Irish Air Corps / DoD Safeguarding
- Garda Air Support Unit (GASU) and Emergency Aeromedical Service (EAS)

A16.3.2.1 Annex 14 Obstacle Limitation Surfaces (OLS)

A review of the Annex 14 Obstacles Limitation Surfaces (OLS) was first was carried out by first plotting the proposed wind farm location and the airport obstacle surfaces. The obstacle limitation surfaces for Waterford 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 Ballynalacken wind farm. The distance from the ARP at Waterford Airport (i.e. the runway centre-point), to the nearest of the proposed turbines is 70.7 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 15 km from the Airport Reference Point (ARP) or runway centre-point.

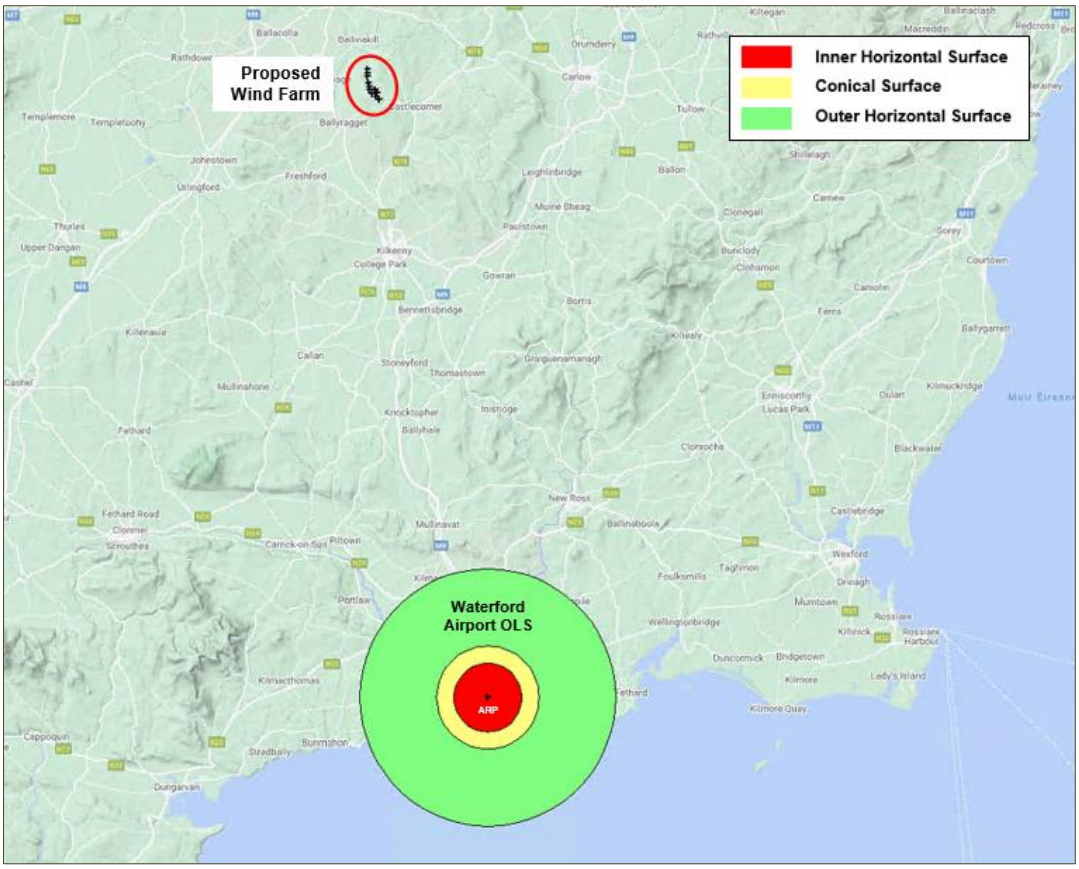


Figure 3. Ballynalacken Wind Farm in relation to Waterford Airport OLS.

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

A16.3.2.2 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 45 km 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 45 km from the ARP at Waterford Airport, there will be no penetration of the Annex 15 surface for the Waterford Aerodrome. All obstacles, if they are more than 100 meters above terrain for a distance of up to 45 km 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 used for en-route circling and maneuvering and is shown in Figure 4.

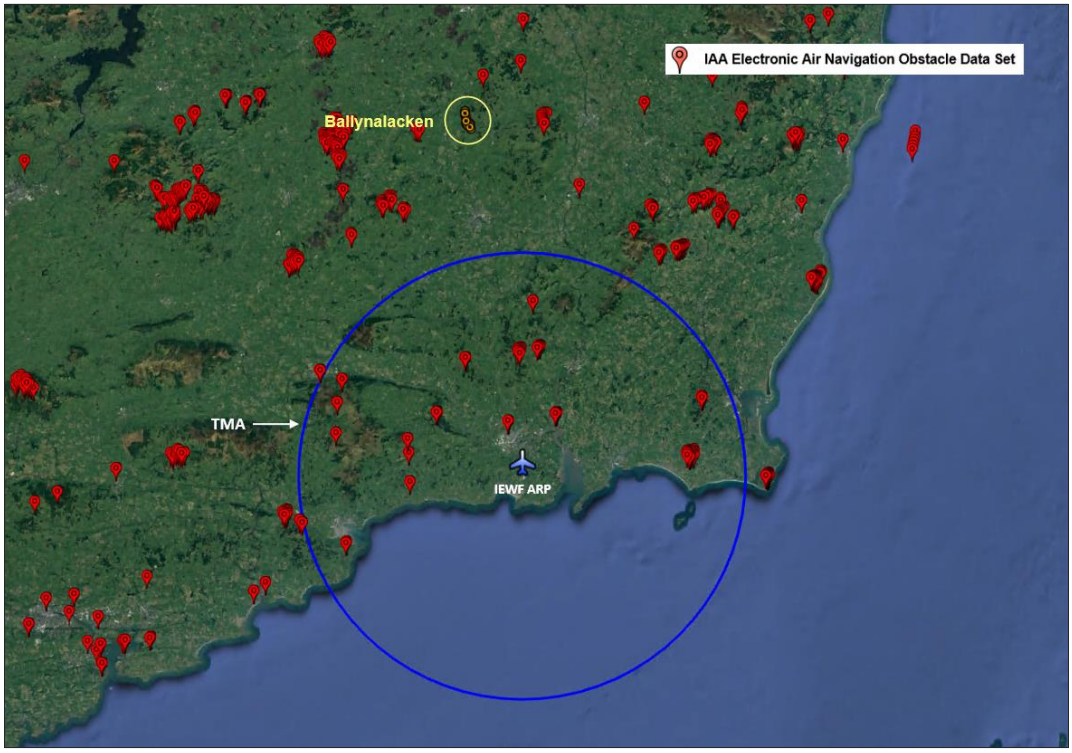


Figure 4. Annex 15 Aerodrome Surface and IAA Electronic Air Navigation Obstacle Data Set

It should also be noted that there are other existing tall structures (obstacles) nearer to the airport, e.g. the operational wind farms at Foyle, Ballybay, An Cnoc, Ballymartin and Rahora.

These existing obstacles would shield any potential impacts from the proposed wind farm at Ballynalacken. The IAA Electronic Air Navigation Obstacle Data Set permitted obstacles are shown relative to the proposed wind farm in Figure 5.

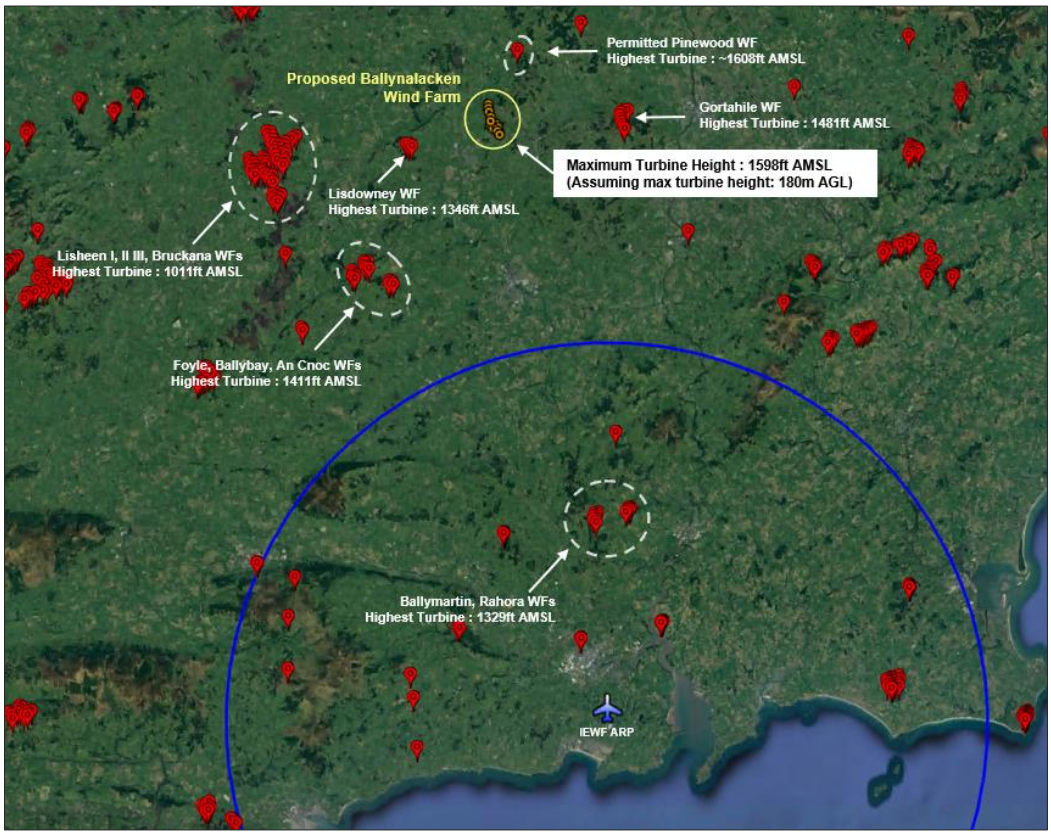


Figure 5. Operational and Permitted Obstacles in vicinity of Ballynalacken Wind Farm

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

A16.3.2.3 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 Waterford Airport are the ILS Localisers, Glidepaths and DMEs that provide guidance for aircraft landing on runways 03 and 21. 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 Ballynalacken is over 60 km from the Waterford BRA (safeguarded area for Runways 03 and 21). At this distance turbines at the proposed wind farm will have no impact on the navigation facilities associated with the Building Restricted Areas for Waterford Airport.

Figure 6. Proposed Wind Farm relative to Waterford Airport BRA (RWY 03 and 21)

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Building Restricted Areas	No action.	None

Table 4. Aviation Impact Review - Building Restricted Areas

A16.3.2.4 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 NDB at Waterford 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 Waterford Airport as shown in Figure 7. Therefore, there will be no impact on the published MSA altitude figures.

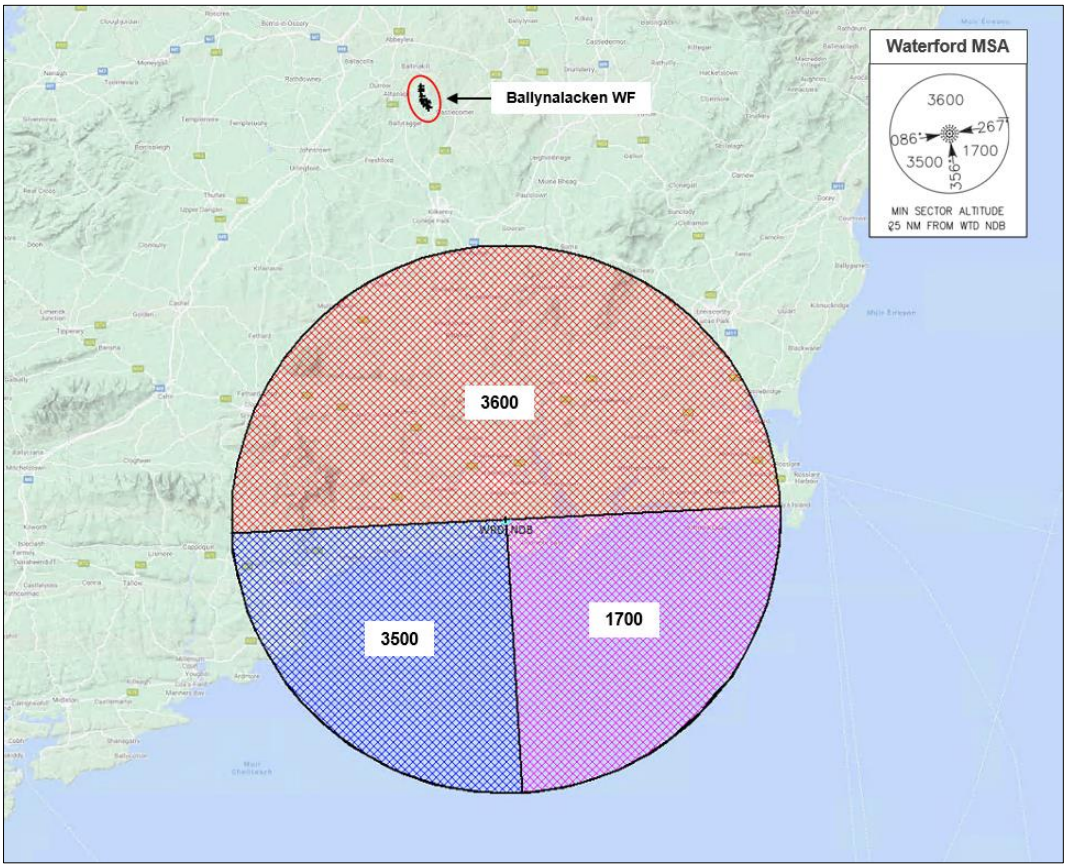


Figure 7. Waterford Airport (EIWF) Minimum Sector Altitudes

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Minimum Sector Altitudes	No action	None

Table 5. Aviation Impact Review - Minimum Sector Altitudes

A16.3.2.5 Instrument Flight Procedures

There are 6 published Instrument and Visual Flight Procedures for arrivals to and departures from Waterford 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 Waterford Airport. Table 6 below lists the Instrument Flight Procedures for Waterford Airport.

Aerodrome	Aerodrome Procedure	Chart ID	Likely WF Impacts
Waterford	Instrument Approach Chart ILS/NDB/DME RWY 21 – ICAO	EIWF AD 2.24-3.1	None.
Waterford	Instrument Approach Chart NDB/DME RWY 21 – ICAO	EIWF AD 2.24-5	None.
Waterford	Instrument Approach Chart NDB/DME RWY 03 – ICAO	EIWF AD 2.24-6.1	None.
Waterford	Visual Approach Chart – ICAO	EIWF AD 2.24-7	None.
Waterford	Instrument Approach Chart RNP RWY 02 – ICAO	EIWF AD 2.24-8	None.
Waterford	Instrument Approach Chart RNP RWY 20 – ICAO	EIWF AD 2.24-9	None.

Table 6. Instrument and Visual Flight Procedures – Waterford 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 it is unlikely that the Air Navigation Service Provider (ANSP) at Waterford Airport will require a detailed assessment on the possible impact of the proposed wind farm on the flight procedures.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Instrument Flight Procedures	No action	None.

Table 7. Aviation Impact Review - Instrument Flight Procedures

A16.3.2.6 Operational 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	Status
Lisdowney, Co. Kilkenny	12/172	Operational Wind Farm
Lisheen, Co. Tipperary	14/202	Operational Wind Farm
Bruckana, Co. Laois & Kilkenny	10/145	Operational Wind Farm
Foyle	12/378	Operational Wind Farm
Ballybay	12/533	Operational Wind Farm
An Cnoc, Co. Tipperary	09/781	Operational Wind Farm
Gortahile, Co. Laois	04/935	Operational Wind Farm
Rahora, Co. Kilkenny	03/1117	Operational Wind Farm
Ballymartin, Co. Kilkenny	07/2141	Operational Wind Farm
Pinewood, Co. Laois	16/260	Permitted Wind Farm

Table 8. Operational and Permitted Wind Farms in vicinity of Proposed Wind Farm

A16.3.2.7 Communications and Navigation Systems

The AIP document EIWD AD 2-18/19 provides the information for communication and navigation facilities for Waterford 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 fam
Waterford	121MHz -130MHz	110KHz – 331MHz	71 km	No impacts

Table 9. Impacts on Communications and Navigation Systems

As the proposed wind farm is approximately 71 km from the Localizer 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

A16.3.2.8 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 16km 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 Shannon Airport, Woodcock Hill and Dublin Airport. These radar sites are shown relative to the proposed wind farm in Figure 8 below.

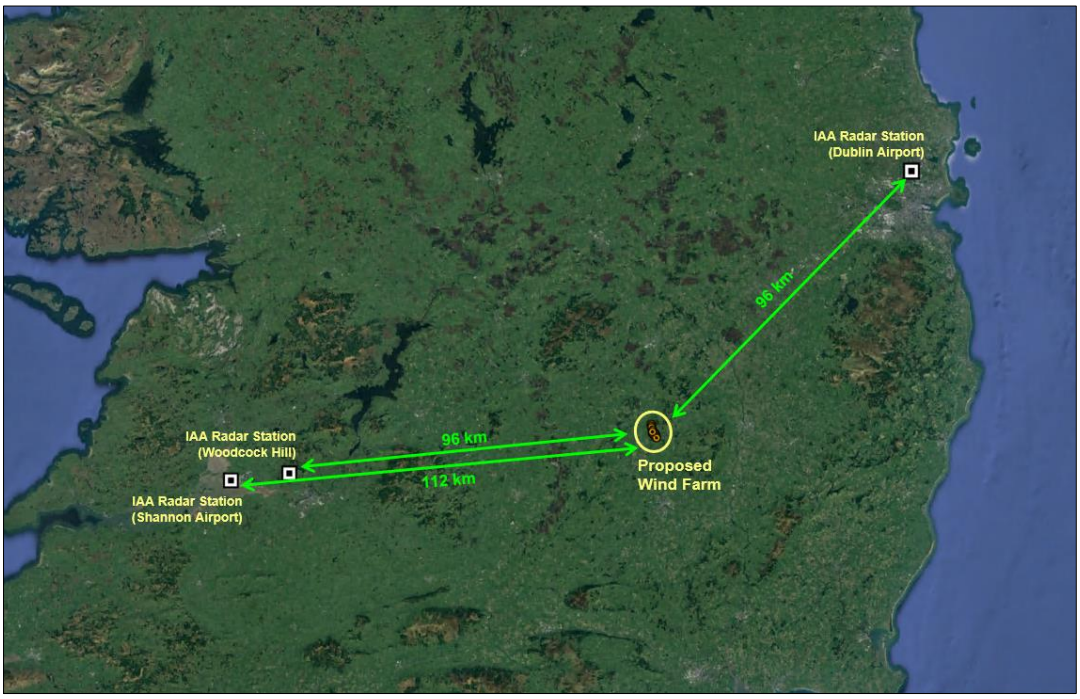


Figure 8. Radar Surveillance Sites relative to Ballynalacken Wind Farm.

A review of each radar station is provided in Sections A16.3.2.8.1 to A16.3.2.8.3 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

A16.3.2.8.1 Shannon Airport Radar Assessment

The radar surveillance site at Shannon Airport consists of a PSR and a SSR. The PSR and the SSR antennas are co-located on the same structure at Shannon Airport (Figure 9).

Figure 9. Shannon Airport 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)
Ballynalacken	112 km	Detailed Assessment Not Required	Detailed Assessment Not Required

Table 14. EuroControl / UK Safeguarding Guidelines – Shannon Airport Radar Station

As the table above show, 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.

A16.3.2.8.2 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 10.

Figure 10. Woodcock Hill 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)
Ballynalacken	96 km	Detailed Assessment Not Required	Detailed Assessment Not Required

Table 15. EuroControl / UK Safeguarding Guidelines – Woodcock Hill Radar Station

As the table above show, 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.

A16.3.2.8.3 Dublin Airport Radar Assessment

The radar surveillance site at Dublin Airport consists of two PSR/SSR (MSSR) radar stations as shown below in Figure 11 and Figure 12.

Figure 11. Dublin Airport MSSR Radar Station #1

Figure 12. Dublin Airport MSSR Radar Station #2

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)
Ballynalacken	96 km	Detailed Assessment Not Required	Detailed Assessment Not Required

Table 16. EuroControl / UK Safeguarding Guidelines – Dublin Airport Radar (Station #1 and #2)

As the table above show, 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.

A16.3.2.9 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 Waterford 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).

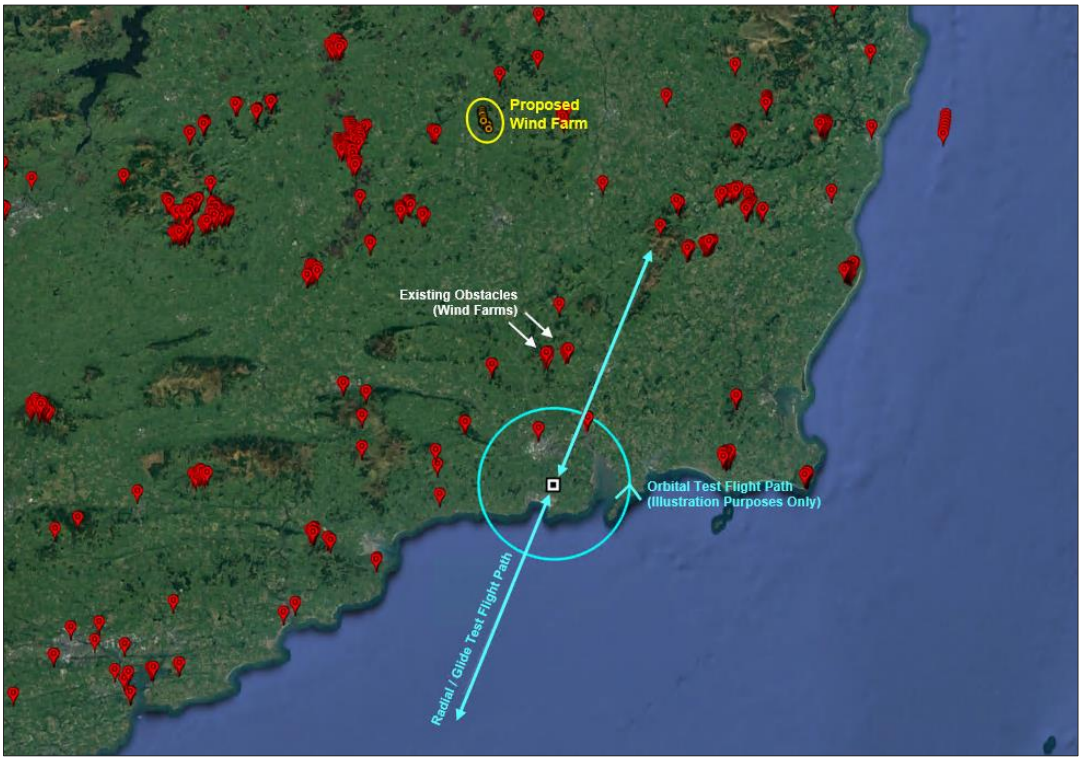


Figure 13. Flight Inspection and Calibration Test Procedures should account for existing obstacles (e.g. terrain and existing wind farms)

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Flight Inspection and Calibration	No action	None

Table 17. Aviation Impact Review - Flight Inspection and Calibration

A16.3.2.10 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 18. Aviation Impact Review - Aeronautical Obstacle Warning Light Scheme

A16.3.2.11 Private Airfields (VFR Flying)

For due diligence purposes, private airfields and heliports in the vicinity of Ballynalacken have been considered and it was found that there are three private airfields /helipads within 20 km of the proposed wind farm site: Kilkenny Airfield, Midlands Heliport and Abbeyleix Airfield.

These aviation installations operate in un-controlled Class G airspace and flights in and out of these airfields are required by law to fly by Visual Flight Rules (VFR) and in accordance with the IAA *Rules of The Air*.

ID	Location	Installation Type	Description
Kilkenny Airfield	Holdensrath, Co. Kilkenny.	Private Airfield.	Airfield with single grass-strip runway.
Midlands Heliport	Aghnacross, Co Laois.	Private Helipad.	Grass helipad located in private agricultural land.
Abbeyleix Airfield	Abbeyleix, Co Laois	Private Airfield.	Airfield with single grass-strip runway.

Table 19. Private Airfield / Heliport Details

A review of the possible impacts of the proposed wind farm on each Airfield/Heliport is provided in Sections A16.3.2.11.1 to A16.3.2.11.3 that follow. The findings of the review indicate that the proposed wind farm would have no impacts on these Airfields/Heliports.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Private Airfields (VFR Flying)	No action.	None

Table 20. Aviation Impact Review - Private Airfields (VFR Flying)

A16.3.2.11.1 Kilkenny Airfield

This airfield is located on the outskirts of Kilkenny City and is 18 km from the nearest of the proposed turbines at Ballynalacken. The location of the airfield relative to the proposed wind farm is shown below in Figure 14 and a close-up aerial view of the airfield is shown in Figure 15. The aerodrome is used for light aircraft only (i.e. small airplanes, helicopters microlights, etc.) and flights in and out of this airfield are required by law to fly by Visual Flight Rules (VFR) and in accordance with the *IAA Rules of The Air*.

The Rules of the Air state, it is the pilot's legal responsibility to be aware of and avoid any obstacles in his/her flight path and therefore he/she would be required to be aware of wind turbines if flying to/from the airfield in question. This can achieved by prudent flight planning by the VFR pilot prior to flight.

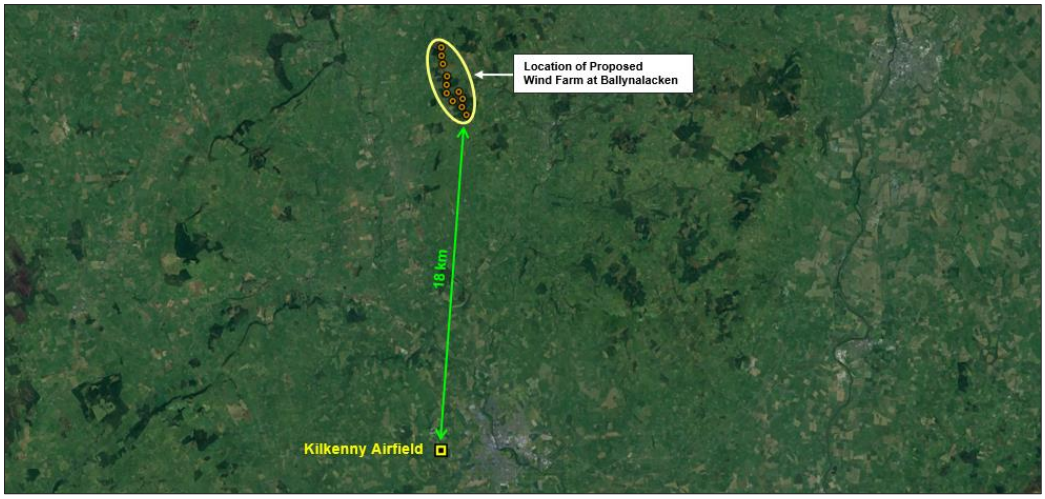


Figure 14. Location of Kilkenny Airfield

Figure 15. Close-up Aerial View – Kilkenny Airfield

As the proposed turbines are 18 km from the airfield and as pilots are required to fly by VFR rules and in accordance with the rules of the air, there would be no impact to Kilkenny Airfield due to the proposed development at Ballynalacken.

Airfield / Helipad	Description	Wind Farm Impacts
Kilkenny Airfield	Private grass-strip airfield, 18 km south of proposed wind farm.	No Impacts.

Table 21. Impacts of proposed wind farm on Kilkenny Airfield.

A16.3.2.11.2 Midlands Heliport

The Midlands Helipad is located in agricultural land and is 5.6 km north of the nearest of the proposed turbines at Ballnalacken. The location of the grass helipad relative to the proposed wind farm is shown below in Figure 16 and a close-up aerial view of the helipad is shown in Figure 17. The survey findings indicate that aviation activity at the helipad site is low. All helicopter flights to/from this helipad would be required by law to fly by Visual Flight Rules (VFR) and in accordance with the *IAA Rules of The Air*. It should also be noted that there is a permitted wind farm (i.e. Pinewood Wind Farm) that is located less than 2 km from the Midlands Helipad site.

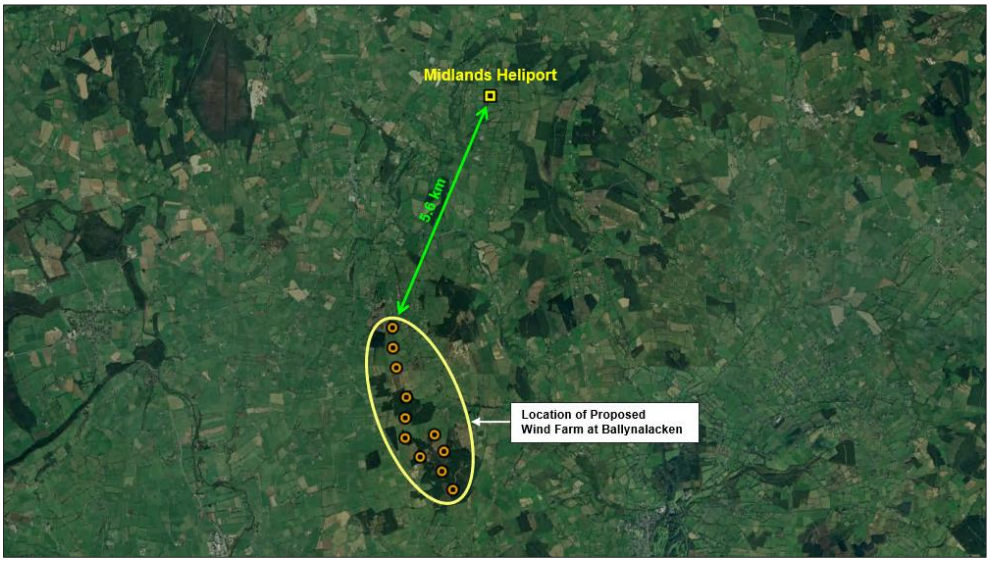


Figure 16. Location of Midlands Heliport

Figure 17. Close-up Aerial View – Midlands Heliport

As the proposed turbines are more than 5 km from the helipad site and as pilots are required to fly by VFR rules and in accordance with the rules of the air, there would be no impact to the Midlands Heliport due to the proposed development at Ballynalacken.

Airfield / Helipad	Description	Wind Farm Impacts
Midlands Heliport	Private grass helipad, 5km north of proposed wind farm.	No Impacts.

Table 22. Impacts of proposed wind farm on Midland Heliport.

A16.3.2.11.3 Abbeyleix Airfield

This airfield is located on the outskirts of Abbeyleix and is over 7 km from the nearest of the proposed turbines at Ballynalacken. The location of the airfield relative to the proposed wind farm is shown below in Figure 18 and a close-up aerial view of the airfield is shown in Figure 19. The aerodrome is used for light aircraft only (i.e. small airplanes, helicopters microlights, etc.) and flights in and out of this airfield are required by law to fly by Visual Flight Rules (VFR) and in accordance with the *IAA Rules of The Air*.

The Rules of the Air state, it is the pilot's legal responsibility to be aware of and avoid any obstacles in his/her flight path and therefore he/she would be required to be aware of wind turbines if flying to/from the airfield in question. This can achieved by prudent flight planning by the VFR pilot prior to flight.

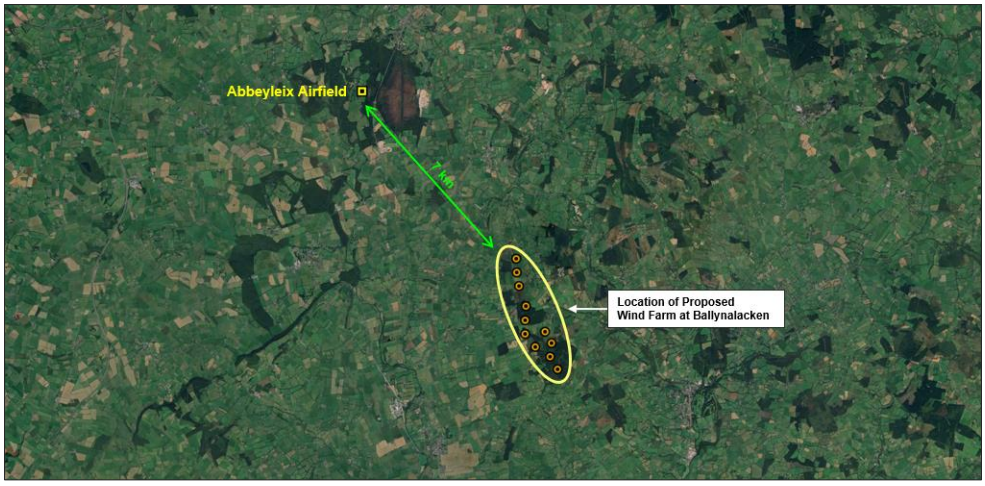


Figure 18. Location of Abbeyleix Airfield

Figure 19. Close-up Aerial View – Abbeyleix Airfield

As the proposed turbines are over 7 km from the airfield and as pilots are required to fly by VFR rules and in accordance with the rules of the air, there would be no impact to Abbeyleix Airfield due to the proposed development at Ballynalacken. .

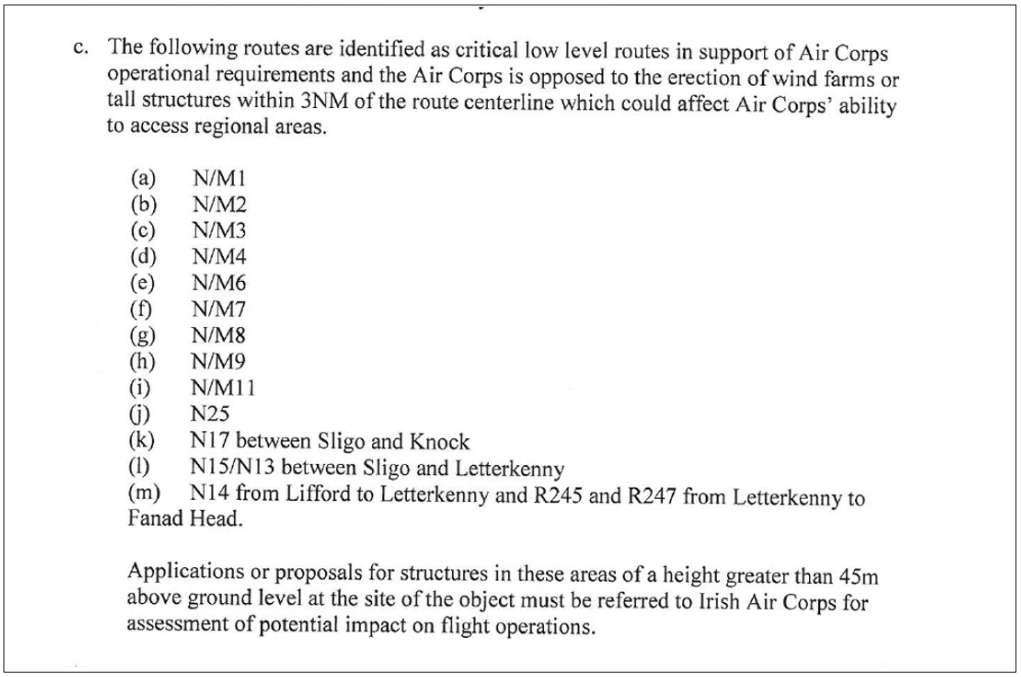
Airfield / Helipad	Description	Wind Farm Impacts
Abbeyleix Airfield	Private grass-strip airfield, 7 km northwest of proposed wind farm.	No Impacts.

Table 23. Impacts of proposed wind farm on Abbeyleix Airfield

A16.3.2.12 Irish Air Corps / DoD Safeguarding

The Irish Air Corps Position Paper "*Air Corps Wind Farm/ Tall Structures Position Paper*" published on 08th August 2014 (Appendix B), states that the Air Corps are likely to oppose any wind farm / tall structure in the following restricted areas:

- *Lands underlying military airspace for flying activity. (Areas contained in Danger Areas EI-D1, EI-D5, EI-D6, EI-D13, EI-D14, Restricted Areas EI-R15, EI-R16 within 20 NM of Baldonnel, MOAs 3 and 4 within 20 NM of Baldonnel.*
- *Low Flying Training Areas within MOA 4 in the areas of; Blessington, Edenderry/Allenwood/Rathangan, Kilmeague/Newbridge.*
- *Low Flying Training Area West – LFTA WEST.*
- *A distance of 5 NM or less from military installations.*
- *Critical low level flying routes in support of Air Corps operation requirements,* as described in Figure 20 below.



c. The following routes are identified as critical low level routes in support of Air Corps operational requirements and the Air Corps is opposed to the erection of wind farms or tall structures within 3NM of the route centerline which could affect Air Corps' ability to access regional areas.

(a) N/M1
(b) N/M2
(c) N/M3
(d) N/M4
(e) N/M6
(f) N/M7
(g) N/M8
(h) N/M9
(i) N/M11
(j) N25
(k) N17 between Sligo and Knock
(l) N15/N13 between Sligo and Letterkenny
(m) N14 from Lifford to Letterkenny and R245 and R247 from Letterkenny to Fanad Head.

Applications or proposals for structures in these areas of a height greater than 45m above ground level at the site of the object must be referred to Irish Air Corps for assessment of potential impact on flight operations.

Figure 20. Irish Air Corps – Critical Low-Level Routes

The nearest of the Air Corps restricted areas to the proposed wind farm is the 3 NM restricted area around the M8 Motorway, as shown in Figure 19 below. As the proposed wind farm is located outside the restricted areas, there should be no impacts on Irish Air Corps activities.

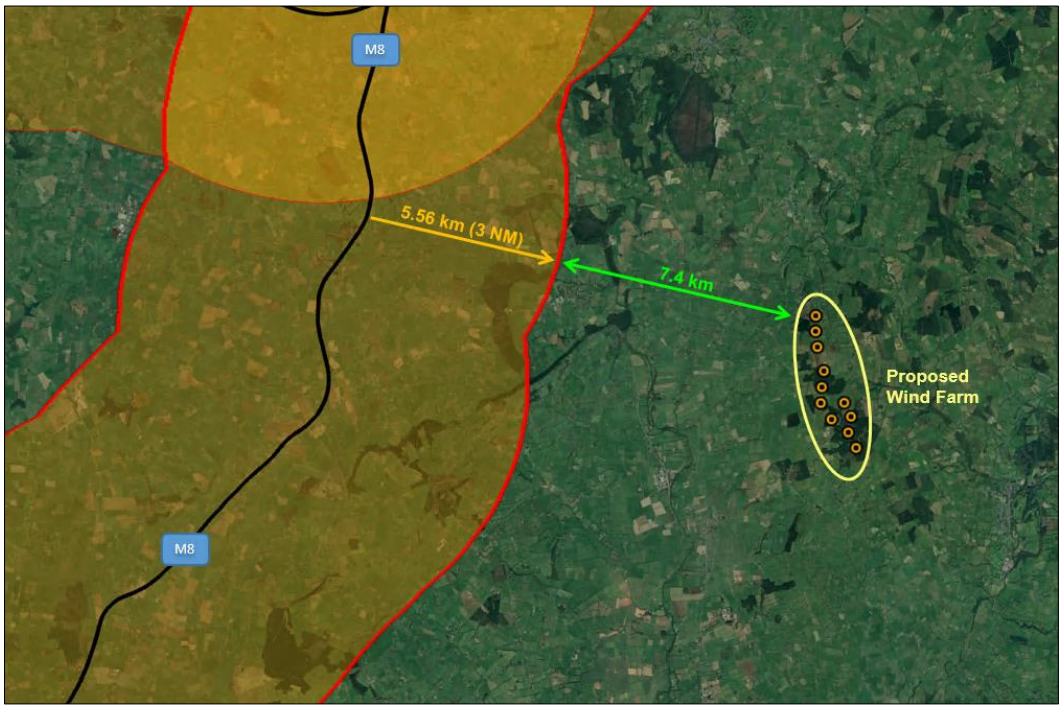


Figure 21. Proposed Wind Farm relative to IAC Critical Low Level Flight Route (M8)

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Irish Air Corps / DoD Safeguarding	No action	None

Table 24. Aviation Impact Review - Irish Air Corps / DoD Safeguarding

A16.3.2.13 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)"*

A review of the GASU and EAS services is provided in Sections A16.3.2.13.1 and A16.3.2.13.2 that follow. The findings of the review indicate that the proposed wind farm would have no impacts on these aviation services.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Garda Air Support Unit (GASU) and Emergency Aeromedical Service (EAS)	No action.	None

Table 25. Aviation Impact Review - GASU and EAS

A16.3.2.13.1 The Garda Air Support Unit (GASU)

The Garda Air Support Unit is based at Casement Aerodrome, Baldonnel 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 22. GASU - Pilatus Britten-Norman BN 2T-4S Defender 4000

Figure 23. GASU - Eurocopter EC135 T2

It is unlikely that a fixed-wing aircraft would be used in a low-level flight capacity over the Ballynalacken region. In the unlikely event that that a fixed-wing aircraft is flying in the Ballynalacken 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 Ballynalacken 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 Ballynalacken 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 Ballynalacken area, 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 also have good road access. A good example of a HLS would be a local football field. The proposed wind farm site is unlikely to be considered as suitable HLS, as the site largely consists largely of forestry / agricultural land.

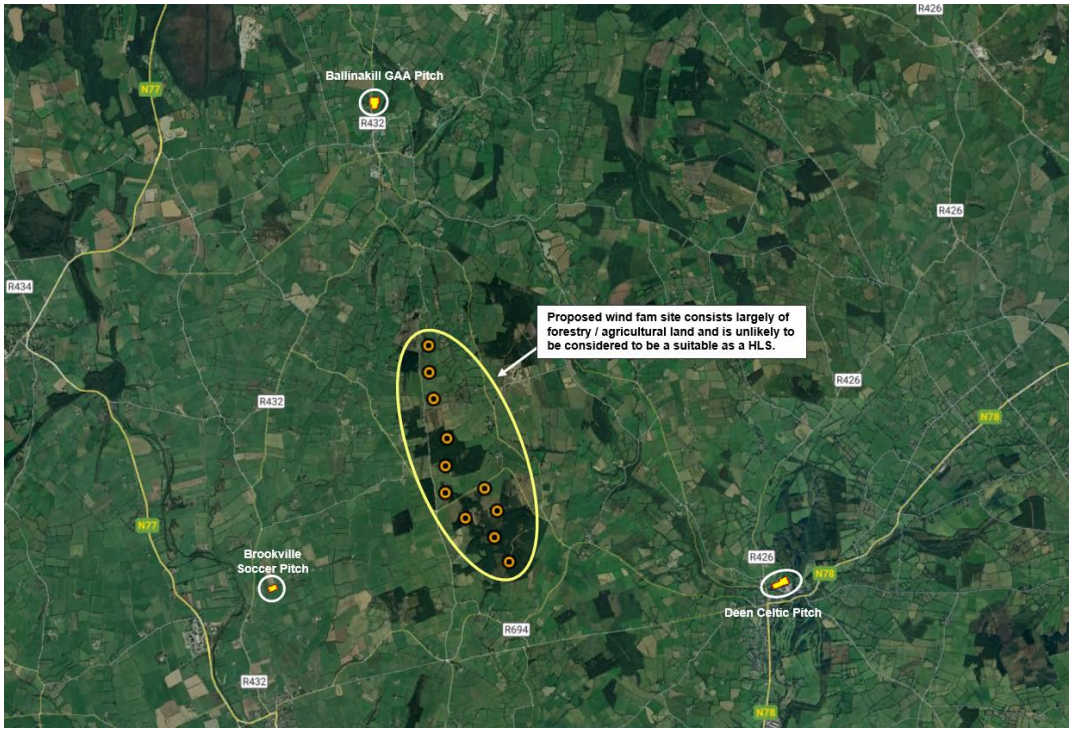


Figure 24. Ballynalacken Wind Farm Site largely consists of forested / agricultural land (i.e. unlikely to be suitable as a HLS for any GASU operations)

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 – GASU helicopters 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. In addition, the proposed wind farm site largely consists of forested / agricultural land and is highly unlikely to be suitable as a HLS for any GASU operations.

Table 26. Impact of proposed wind farm on GASU Operations

A16.3.2.13.2 The Emergency Aeromedical Service (EAS)

This Emergency Aeromedical Service is based in and operates from the Custume Barracks in Athlone. The aircraft utilised by the EAS is an Irish Air Corps Euro-copter 135 and is used for time-critical medical emergencies. Figure 25 below shows the flying times from the EAS base at Athlone.

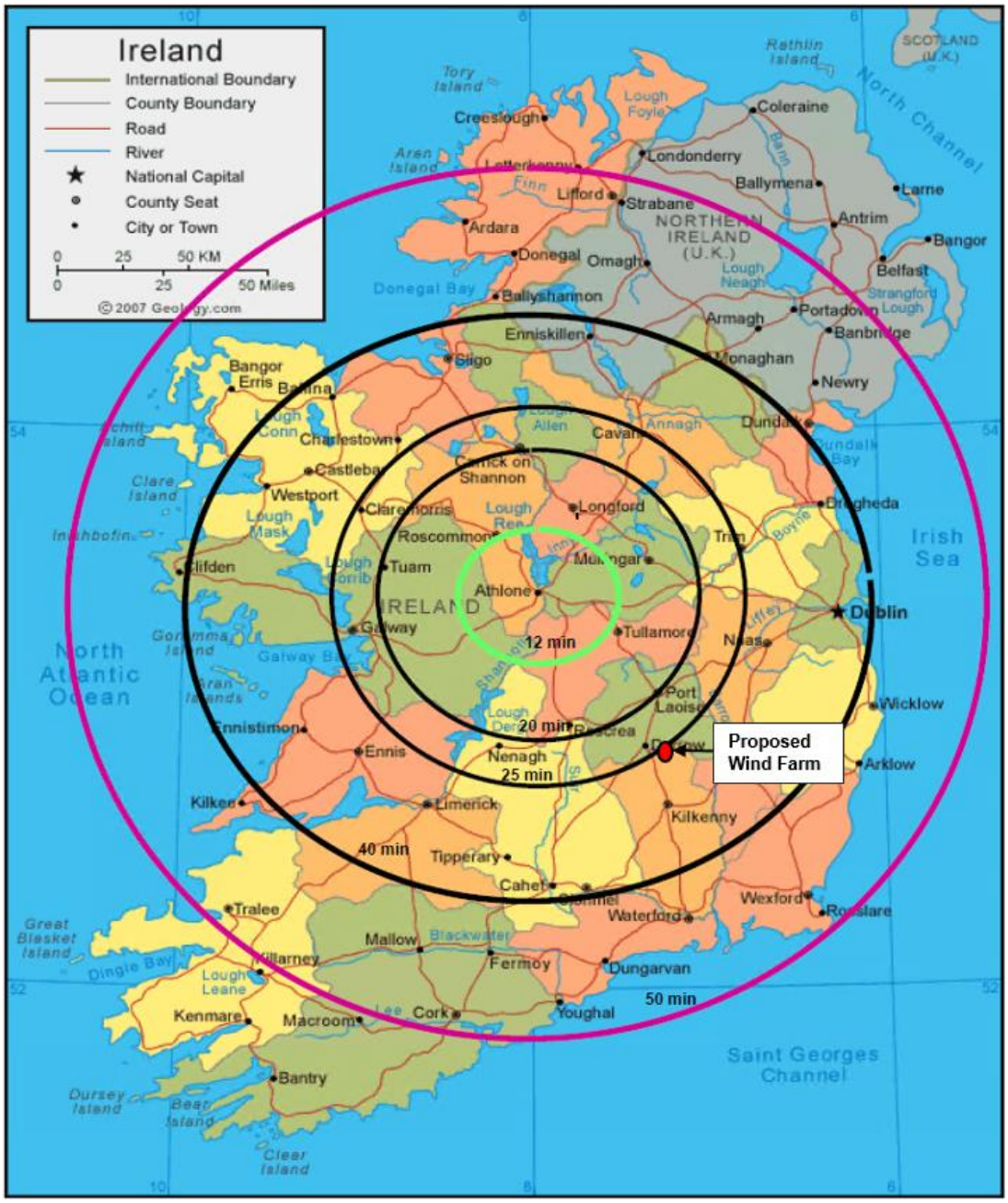


Figure 25. EAS – Flying Times from Athlone

The proposed wind farm is located approximately 5 km northwest of Castlecomer, Co Kilkenny and in an area that is relatively sparely populated. EAS helicopter landings are highly unlikely to occur at the proposed wind farm site as it consists of forested/ agricultural land, is largely rural and has relatively poor road access.

In the unlikely event of EAS operations in the general area, the pilot would seek a Helicopter Landing Site (HLS) that is clear of wires, loose objects and is relatively clear of obstacles (e.g. trees). The chosen HLS should also have good road access to link up with the local ambulance service. The sport field at Brookville, Ballinakill or Deen Celtic (Ref. Figure 18) would be a much more suitable HLS for any such emergency landings in the Ballynalacken area.

Also, should the proposed wind farm at Ballynalacken 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).

In addition, the footprint of the proposed wind farm development is relatively small and any flight diversions for EAS operations in the general area would have negligible time impacts. For these reasons, turbines at the proposed wind farm should have no impact on EAS flights from Athlone.

EAS Aircraft	Impact of proposed wind farm – Opinion
Helicopter (Eurocopter EC135)	Low – The helicopter 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 EAS emergency landing be required in the subject area, one of the sports fields at Brookville, Ballinakill or Deen Celtic are likely to be used as a HLS.

Table 27. Impact of proposed wind farm on EAS Operations

A16.3.3 Summary

A summary of the aviation review for the proposed wind farm at Ballynalacken is provided in Table 27 below.

Item	Impact	Summary
Annex 14 - Obstacle Limitation Surfaces (OLS)	None	**Outer Horizontal Surface:** Turbines at the proposed wind farm site would be located outside the Outer Horizontal Surface.
	None	**Take-off and Approach Surfaces:** Turbines at the proposed wind farm would be outside the take-off and approach surfaces.
Annex 15 - Aerodrome Surfaces	None	Turbines at the proposed wind farm would not penetrate the ICAO Annex 15 Aerodrome Surface for Waterford Airport. All obstacles, if more than 100 meters above terrain for a distance of 45km from center point of Waterford 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 Waterford Airport (e.g. existing turbines at Foyle, Ballybay, An Cnoc, Ballymartin and Rahora 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 Ballynalacken is over 60 km from the BRAs for Waterford 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 NDB at Waterford 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 03 and RWY 21 standard instrument departures are unlikely to be impacted for precision aircraft.
Communications and Navigation Systems	None	As the proposed wind farm is approximately 71 km from the Localizer and transmitting antenna at Waterford Airport, it is very unlikely that the proposed development will have any impact on these ATS communications and radio navigational aids.
Radar Surveillance Sensors	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 Waterford 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.
Private Airfields / Helipads	None	An assessment of private airfields / helipads in the vicinity of Ballynalacken indicate that there will be no impacts due to the proposed development.
Irish Air Corps / DoD Safeguarding	None	The proposed wind farm is located outside the Irish Air Corps Restricted Areas.
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 28. Ballynalacken Wind Farm – Aviation Review Summary

APPENDIX A - ICAO Annex 15 Area 1 and Area 2 Surfaces.

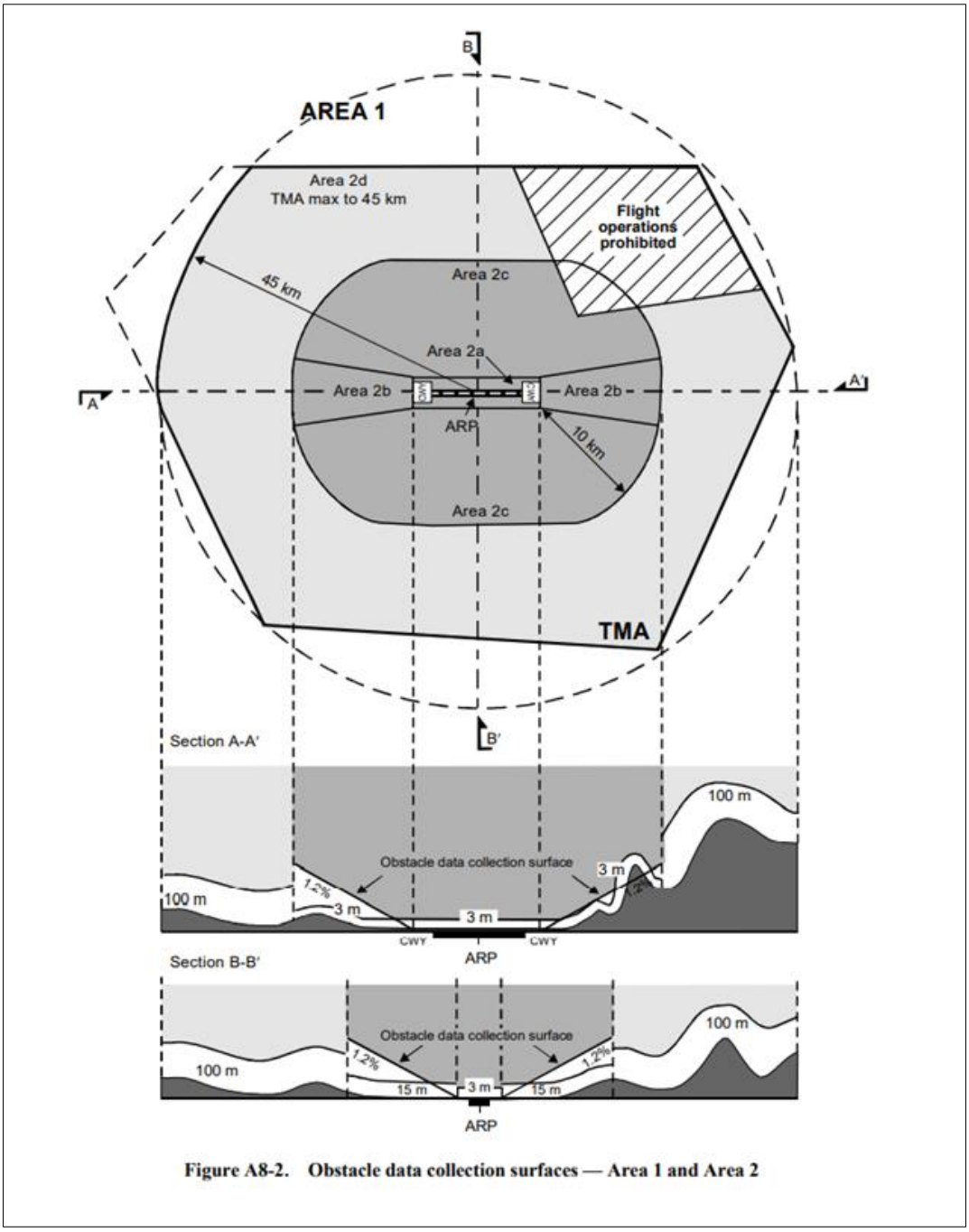


Figure A8-2. Obstacle data collection surfaces — Area 1 and Area 2

Figure A1 - ICAO Annex 15 Area 1 and Area 2 Surfaces.

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.

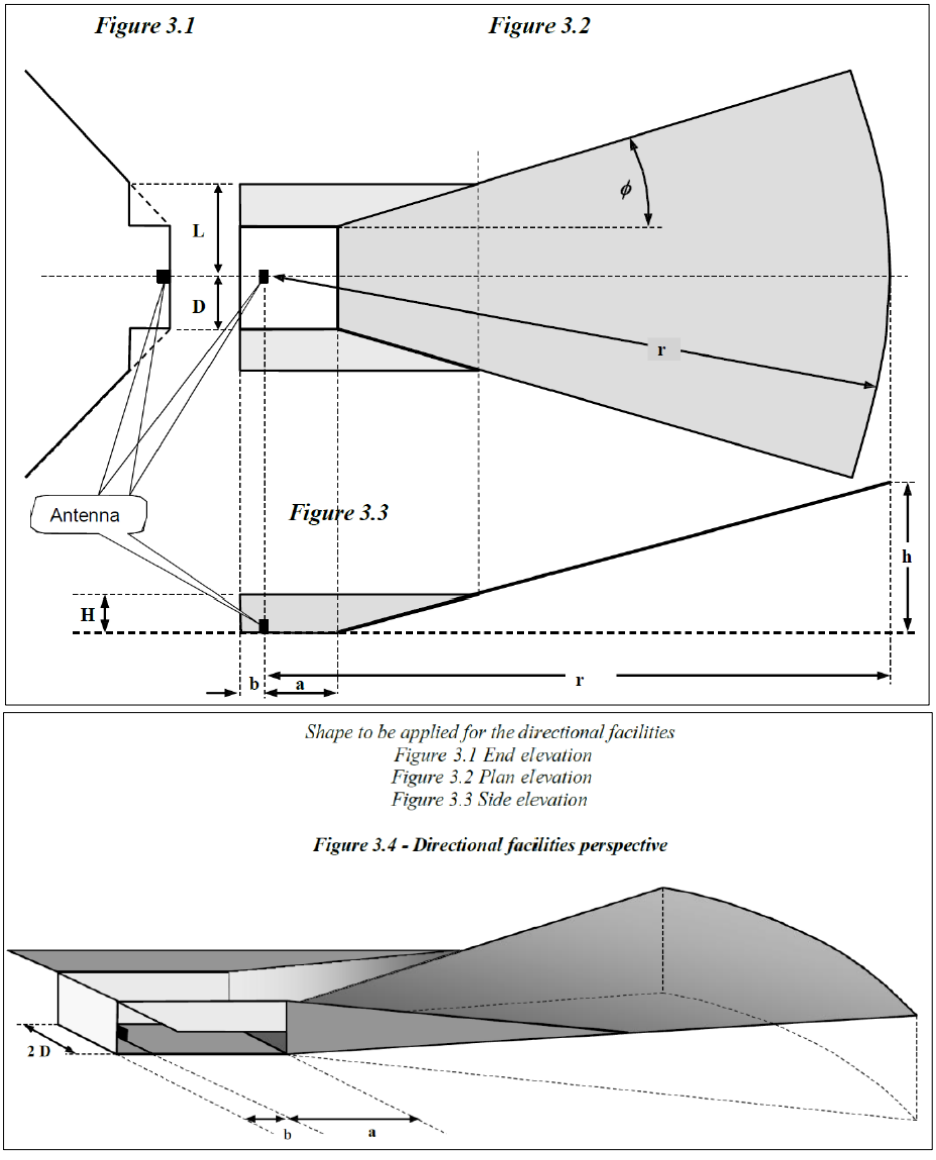


Figure B1 - Example BRA shape for directional facilities (ICAO EUR DOC 015 Figures 3.1-3.4)

*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)

Appendix 16.4: Methodology for the evaluation of Material Assets

Appendix to Chapter 16: Material Assets

Appendix 16.4: Methodology for the evaluation of Material Assets

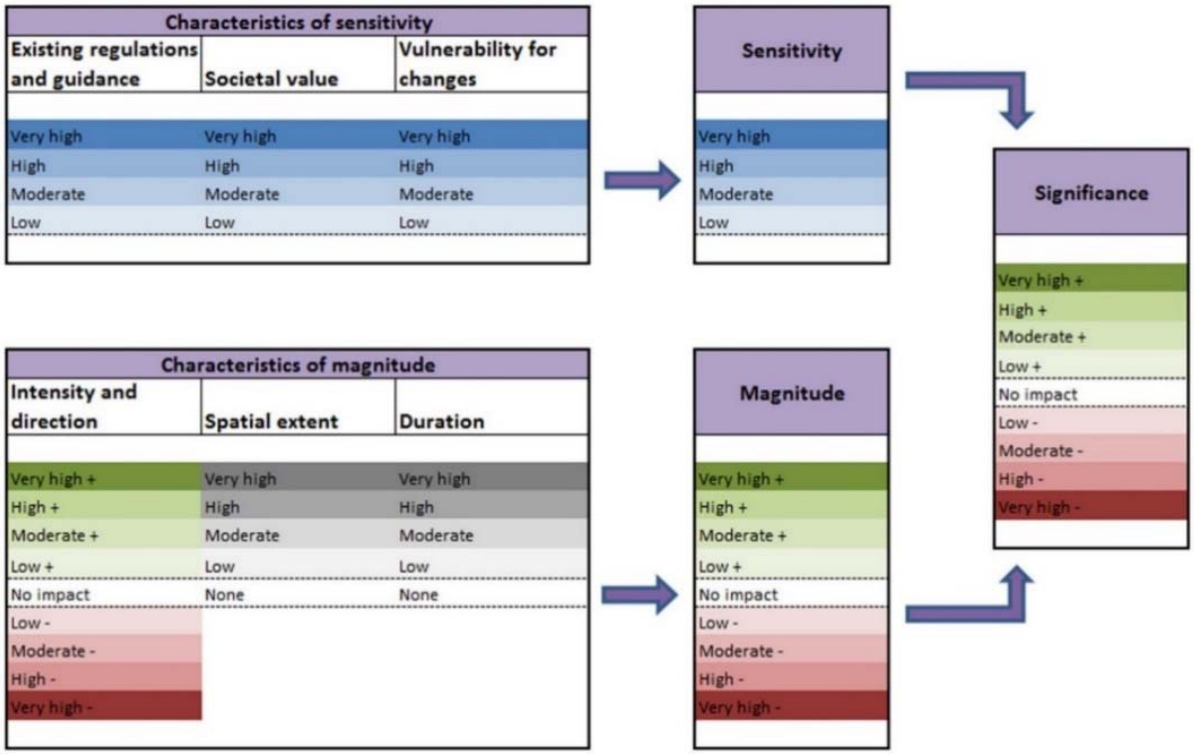
A16.4 Methodology Applied

In the absence of specific guidance on the evaluation of Material Assets for an EIA Report, in addition to the desktop surveys and fieldwork carried out for the Project as detailed in Section EIAR 16.1.3 of Chapter 16: Material Assets, the *Guidance on the information to be contained in EIA Reports* (EPA, 2022), along with the ARVI approach for impact significance assessment developed under the EC IMPERIA LIFE11 Project, are employed for this evaluation. The ARVI approach has been used to evaluate impact significance using a multi-criteria decision analysis, where the sensitivity of the receptor in the environment and the magnitude of the change caused by a particular project are rated, and then an overall significance can be determined.

The IMPERIA Project Report Guidelines for the systematic impact significance assessment – the ARVI approach (2015) is included in full as Appendix 2.1 of this EIAR, with the methods used for determining sensitivity, magnitude and significance reproduced below. The author's extensive experience with EIA preparation also informs this report.

A16.4.1 Overview of the IMPERIA Project ARVI approach

In the framework developed under the EC LIFE project - IMPERIA, the evaluation of impact significance uses a replicable, multi-criteria decision analysis, where the sensitivity of the receptor (i.e. the sensitivity of a Sensitive Aspect of the environment) and the magnitude of the change caused by a project are rated using sub-criteria or scales, and then the overall significance is evaluated using a matrix.



The criteria for determining the overall sensitivity of a receptor and magnitude of the change (effect) to the receptor, is provided in the tables below. The matrix for determining the significance of the effect to the receptor is provided after these tables.

A16.4.2 Criteria for Evaluating the Sensitivity of a Receptor

Sensitivity of the receptor is a description of the characteristics of the receptor or aspect of the environment which will be affected by the development. It is a measure of 1) existing regulations and guidance, 2) societal value and 3) vulnerability for the change. The sensitivity of a receptor is estimated in its current state prior to any change implied by the project.

Existing regulations and guidance describes whether there are any such objects in the impact area, which have some level of protection by law or other regulations (e.g. prohibition against polluting groundwater and Natura areas), or whose conservation value is increased by programs or recommendations (e.g. landscapes designated as nationally valuable).

Societal value describes the value of the receptor to the society and depending on the type of impact may be related to economic values (e.g. water supply), social values (e.g. landscape or recreation) or environmental values (e.g. natural habitat). Societal value measures general appreciation from the point of view of the society. When relevant, the number of people impacted is taken into account.

Vulnerability for the change describes how liable the receptor is to be influenced or harmed by changes to its environment.

Sensitivity	Criteria Existing regulations/guidance	Criteria Societal value	Criteria Vulnerability to change
Low	Few or no recommendations which add to the conservation value of the impact area, and no regulations restricting use of the area (e.g. zoning plans).	The receptor is of small value or uniqueness. The number of people impacted is small.	Even a large external change would not have substantial impact on the status of the receptor. There are only few or none vulnerable receptors in the area.
Moderate	Regulation sets recommendations or reference values for an object in the impact area, or the project may impact an area conserved by a national or an international program.	The receptor is valuable and locally significant but not very unique. The number of people impacted is moderate.	At least moderate changes are needed to substantially change the status of the receptor. There are some vulnerable receptors in the area.
High	The impact area includes an object that is protected by national law or an EU directive (e.g. Natura 2000 areas).	The receptor is unique and valuable to society. It may be deemed nationally significant and valuable. The number of people impacted is large.	Even a small external change could substantially change the status of the receptor. There are many vulnerable receptors in the area.
Very High	The impact area includes an object that is protected by national law or an EU directive (e.g. Natura 2000 areas).	The receptor is highly unique, very valuable to society and possibly irreplaceable. It may be deemed internationally significant and valuable. The number of people affected is very large.	Even a very small external change could substantially change the status of the receptor. There are very many vulnerable receptors in the area.

A16.4.2.1 Determining the Overall Sensitivity of a Receptor

The **overall sensitivity of a receptor** is assessed by the competent expert on the basis on his/her assessment of the components of sensitivity. A general guide for deriving the overall sensitivity is to pick the maximum of existing regulations and guidance and societal value and then adjust that value depending on the level of vulnerability.

Determining the Overall Sensitivity of a Receptor	
Low	The receptor has minor social value, low vulnerability for the change and no existing regulations and guidance. Even a receptor which has major or moderate social value may have low sensitivity if it's not liable to be influenced by the development.
Moderate	The receptor has moderate value to society, its vulnerability for the change is moderate, regulation may set reference values or recommendations, and it may be in a conservation program. Even a receptor which has major social value may have moderate sensitivity if it has low vulnerability, and vice versa.
High	Legislation strictly conserves the receptor, or it is very valuable to society, or very liable to be harmed by the development.
Very High	Legislation strictly conserves the receptor, or it is irreplaceable to society, or extremely liable to be harmed by the development. Even minor influence by the proposed development is likely to make the development unfeasible.

A16.4.3 Criteria for Evaluating the Magnitude of an Impact

Magnitude of the impact describes the characteristics of the changes or effects that the planned project is likely to cause. Magnitude is a combination of 1) intensity and direction, 2) spatial extent, and 3) duration. Assessment of magnitude evaluates the likely changes affecting the receptor *without* taking into account the receptors sensitivity to those changes.

Intensity describes the physical dimension of a development. The direction of the change/effect is either positive (green) or negative (red).

Magnitude	Criteria – Intensity & Direction
Very High	The proposal has an extremely beneficial effect on nature or environmental load. A social change benefits substantially people's daily lives.
High	The proposal has a large beneficial effect on nature or environmental load. A social change clearly benefits people's daily lives.
Moderate	The proposal has a clearly observable positive effect on nature or environmental load. A social change has an observable effect on people's daily lives.
Low	An effect is **positive** and observable, but the change to environmental conditions or on people is small.
No impact	An effect so small that it has no practical implication. Any benefit or harm is negligible.
Low	An effect is **negative** and observable, but the change to environmental conditions or on people is small.

Moderate	The proposal has a clearly observable negative effect on nature or environmental load. A social change has an observable effect on people's daily lives and may impact daily routines.
High	The proposal has a large detrimental effect on nature or environmental load. A social change clearly hinders people's daily lives.
Very High	The proposal has an extremely harmful effect on nature or environmental load. A social change substantially hinders people's daily lives.

Spatial extent describes the geographical reach of, or the range within which, an effect is observable.

Duration describes the length of time during which an impact is observable and it also takes other related issues such as timing and periodicity into account. These are relevant for impacts which aren't observable all the time such as periodic impacts.

Magnitude	Criteria Spatial Extent	Criteria Duration
Low	Impact extends only to the immediate vicinity of a source. Typical range is < 1 km.	An impact whose duration is at most one year, for instance during construction and not operation. A moderate-term impact may fall into this category if it's not constant and occurs only at periods causing the least possible disturbance.
Moderate	Impact extends over one municipality. Typical range is 1-10 km.	An impact lasts from one to a number of years. A long-term impact may fall into this category if it's not constant and occurs only at periods causing the least possible disturbance.
High	Impact extends over one region. Typical range is 10-100 km.	An impact lasts several years. The impact area will recover after the project is decommissioned.
Very High	Impact extends over several regions and may cross national borders. Typical range is > 100 km.	An impact is permanent. The impact area won't recover even after the project is decommissioned.

A16.4.3.1 Deriving the overall magnitude of the change from components of magnitude

Magnitude of the change is a comprehensive synthesis of its component factors. In a case, where intensity, spatial case and duration all get the same value, the magnitude would also be given this value. In other cases, intensity should be taken as a starting point, and the assessment should be adjusted based on spatial extent and duration to obtain an overall estimate. The aim is that the overall assessment should capture the characteristics of an effect. The table below describes some example descriptions of different categories for the magnitude of the change.

Determining the Overall Magnitude of the Change/Effect	
Very High	The proposal has beneficial effects of very high intensity and the extent and the duration of the effects are at least high.
High	The proposal has beneficial effects of high intensity and the extent and the duration of the effects are high.
Moderate	The proposal has clearly observable positive effects on nature or people's daily lives, and the extent and the duration of the effects are moderate.
Low	An effect is positive and observable, but the change to environmental conditions or on people is small.
No impact	No change is noticeable in practice. Any benefit or harm is negligible.
Low	An effect is negative and observable, but the change to environmental conditions or on people is small.
Moderate	The proposal has clearly observable negative effects on nature or people's daily lives, and the extent and the duration of the effects are moderate.
High	The proposal has harmful effects of high intensity and the extent and the duration of the effects are high.
Very High	The proposal has harmful effects of very high intensity and the extent and the duration of the effects are at least high.

A16.4.4 Assessing the significance of an impact

The **assessment of the overall significance uses the matrix below,** where positive impacts are in green and negative in red. The matrix is based on the **magnitude of the change** affecting a receptor and on the **sensitivity of the receptor** to those changes.

The values obtained from the table are indicative because the most relevant dimensions for characterising an impact are dependent on the type of impact. Thus, some discretion from the expert is required, in particular in cases, where the one component is low and the other one high or very high.

Determining the Overall Significance of an Impact

Impact Significance		Magnitude of change								
		Very High	**High**	**Moderate**	**Low**	**No Change**	**Low**	**Moderate**	**High**	**Very High**
Receptor Sensitivity	**Low**	Significant*	Moderate*	Slight	Imperceptible	Neutral	Imperceptible	Slight	Moderate*	Significant*
	Moderate	Significant	Significant	Moderate	Slight	Neutral	Slight	Moderate	Significant	Significant
	High	Profound	Significant	Significant	Moderate*	Neutral	Moderate*	Significant	Significant	Profound
	Very High	Profound	Profound	Significant	Significant*	Neutral	Significant*	Significant	Profound	Profound

* Especially in these cases, significance might get a lower estimate, if sensitivity or magnitude is near the lower bound of the classification

Note on Terms used in 'Determining the Overall Significance of an Impact' Table: The Significance rating ascribed in the Table above have been refined from the ARVI tool, to provide a more nuanced understanding of the significance and also to be compatible with the terms used throughout this EIA Report, which have been informed by the EPA Guidelines on Information to be contained in EIAR (2022) for description of effects.

In the above Table - Low has been refined as Slight or Imperceptible depending on context; High has been renamed as Significant; Very High has been renamed as Profound; No Impact is understood to also mean Neutral effect, which is defined in the EPA Guidelines as 'no effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error'.