Report

Ballyfasy Wind Farm

Irish Rail Telecommunications Impact Assessment Report

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Executive Summary

During Telecom Operator Consultations in October 2024, Irish Rail (IR) were contacted by TOBIN Consultancy to determine if they had any concerns in relation to the proposed wind farm at Ballyfasy, Co Kilkenny. In the respond received from Irish Rail, it was stated that they operate a GSM-R Train Radio communications system in the vicinity of Ballyfasy. Irish Rail also requested a 5 km Exclusion Zone around their transmitting radio antennas.

Ai Bridges Ltd were subsequently commissioned to evaluate the Irish Rail communications network and to assess the possible impacts that the proposed wind farm at Ballyfasy could have on the Irish Rail radio network. Field and desktop surveys of the Irish Rail network in the vicinity of Ballyfasy were carried for the telecommunications assessment.

GSM-R Train Radio is an international standard used by rail operators and operates in the UHF band of frequencies. Obstacles generally do not interfere with radio signals in this band of frequencies unless the obstacle (e.g. wind turbine) is very near to the transmitting antenna (e.g. less than 500m) when it can inhibit the radio signals ability to “launch” correctly.

Results from the field survey found that there are GSM-R radio basestations at three mast locations (in the vicinity of Ballyfasy) along the rail line between Waterford City and Thomastown. GSM-R radio antennas are aligned in the direction of the rail lines to provide targeted signal coverage along the rail network. The nearest of the GSM-R basestations to the proposed wind farm is in the townland of Ballylusky. This basestation is 4.0 km from the nearest point of the proposed wind farm development. At this distance, there would be no impact to the Irish Rail GSM-R radio network.

The results of the desktop surveys indicate that the 5 km Exclusion Zone requested by Irish Rail is excessive. Other state operators (Emergency Services, Garda Síochána, etc) and commercial operators (Vodafone, Three Ireland and Eir), only raise concerns when proposed turbines are very close to their transmitters (i.e. less than 500m).

It should also be noted that there are existing wind farms throughout Ireland (including Ballymartin wind farm, which is adjacent to Ballyfasy) with turbines that are less than 5 km from Irish rail tracks. These existing wind farms have no detrimental impact on the Irish Rail telecommunications network.

For the reasons outlined above, the proposed wind farm development at Ballyfasy is expected to have no impacts on the Irish Rail communications network.

Network Description	Comments	Wind Farm Impacts
GSM-R Train Radio	The nearest IR GSM-R basestation to the proposed wind farm is in the townland of Ballylusky. This basestation is 4.0 km from the nearest point of the proposed development. At this distance, it is highly unlikely that there would be any impacts on the Irish Rail communications network, due to turbines at the proposed development. It should also be noted that there are existing wind farms throughout Ireland with turbines that are less than 5 km from Irish Rail tracks (including the turbines at Ballymartin wind farm, which is adjacent to Ballyfasy). These wind farms appear to have had no detrimental impact to the Irish Rail communications network.	No impacts

Table 1. Irish Rail Network Impact Summary.

Sections

Appendix

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 proposed wind turbine dimensions are presented.

1.1 Wind Farm Site Information

The proposed wind farm development is located in County Kilkenny and is approximately 8 km west of New Ross, Co Wexford. The development is in the pre-planning stage and exact details regarding the quantity, location and turbine dimensions have yet to be finalized.

Wind Farm	Number of Turbines	Turbine Hub Height (max)	Blade Length (max)
Ballyfasy	10 (TBC)	TBC	TBC

Table 2. Wind Farm Turbine Details

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

Figure 1. Location of proposed wind farm.

Section 2 - Irish Rail Communications Network

2. Introduction

Irish Rail operate a communications network along their rail tracks to facilitate communications between drivers and signallers. This communications network is used to increase safety, reduce delays and improve the general performance of the rail network. For their communications network Irish Rail use the following technologies:

- Analogue Train Radio
- GSM-R Train Radio

A description of each of these technologies is provided below in Section 2.1 and Section 2.2.

2.1 Analogue Train Radio

Analogue Train Radio operates in the UHF band of radio frequencies and is the older of the two technologies currently used by Irish Rail. Radio antennas, installed adjacent to the tracks, are used provide targeted radio coverage along the rail network.

Figure 2 below shows an example of a UHF antenna installed at an Irish Rail control building.

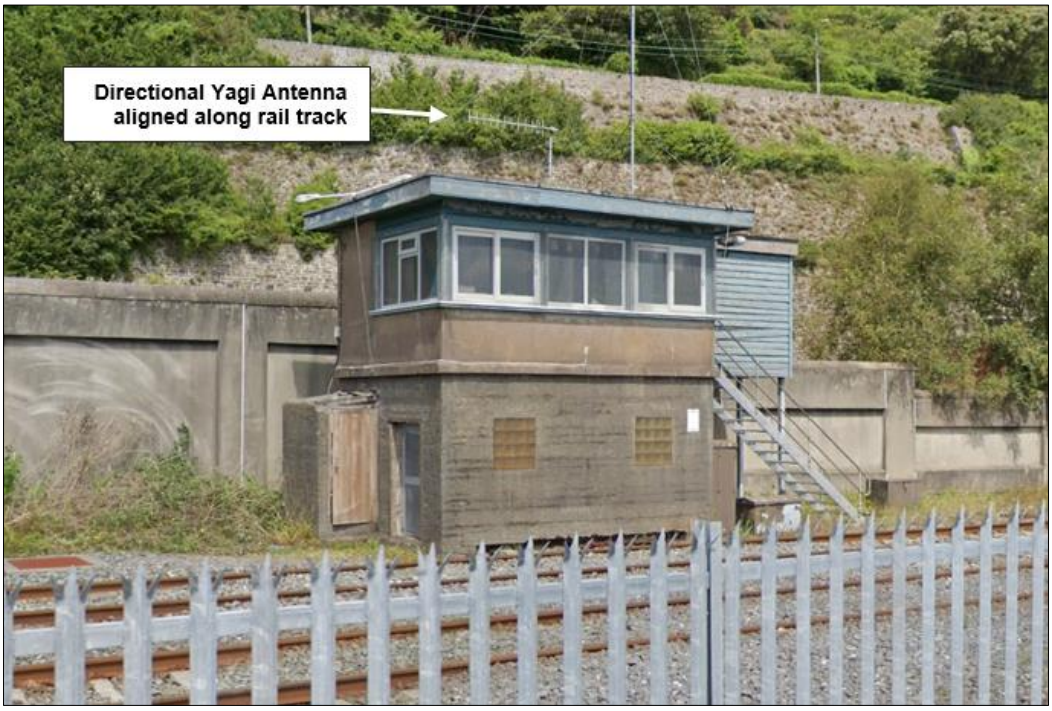


Figure 2. Example of Analogue Train Radio installation using a Yagi Directional Antenna

These analogue radio networks have limited functionality and had become increasingly expensive to maintain. As with other telecommunication networks, in recent years, there has been a move away from analogue systems in favour of digital systems which provide increased functionality and reliability. Irish Rail are currently phasing out their Analogue Train Radio system and migrating to the newer GSM-R radio technology.

2.2 GSM-R Train Radio

GSM-R is an international standard used by rail operators for communication between trains, signallers and rail control centres. As previously mentioned, Irish Rail are currently migrating their communications network away from the older Analogue Train Radio system to this newer GSM-R Train Radio system. The benefits of GSM-R include:

- Digitally enabled.
- Increased safety features
- Improved performance
- Voice and data services over circuit switching
- Based on GSM technology
- Can roam onto public GSM networks

Figure 3 below shows an example of a GSM-R Train Radio installation in which directional sector antennas are used. The antennas are aligned in the direction of the rail line to provide targeted coverage and range along the rail line.

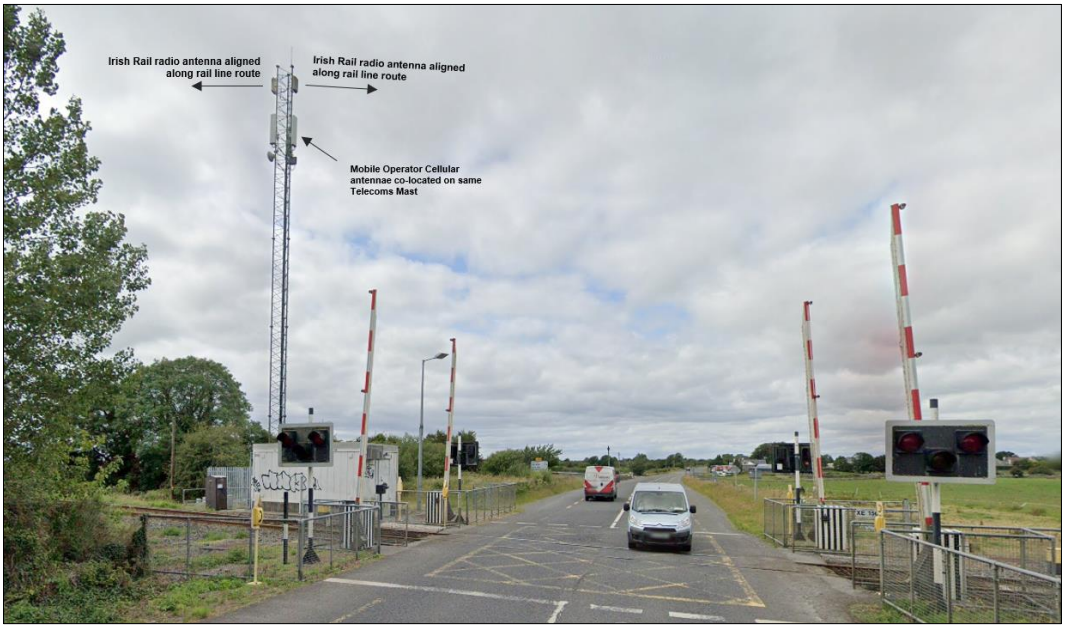


Figure 3. Example of GSM-R Train Radio installation using Directional Sector Antennas

Section 3 - Irish Rail Consultations

3. Introduction

Consultations beginning in October 2024 were undertaken by TOBIN, with telecom network operators to assist in identifying telecommunication infrastructure that could be impacted by proposed wind farm. The operators were requested to raise any concerns they may have regarding impacts to their networks due to the proposed wind farm development.

Irish Rail responded to their consultation request stating that they operate a GSM-R Train Radio network in the Ballyfasy area. The Irish Rail response to consultations is presented below in Section 3.1 .

3.1 Irish Rail Response to Consultations

The correspondences between Irish Rail and TOBIN Consultancy are provided below:

15.10.24 - Email sent by Irish Rail (CIE) to TOBIN

"The proposed site lies within the GSM-R (Mobile Network for Railways) exclusion zone and therefore is not permitted. Please see below.

From a study carried out by the ANFR (Agence Nationale des Frequences in France), the output calls for 2 main recommendations by defining 2 main zones as follows:

***1 - Exclusion zone:** wind farm not less than 5 Km from antenna*

***2 - Coordination zone:** : 5 Km < wind farm < 30 Km: this area, between operators is required to fix any issue and impact on the signal propagation*

The Orange Line indicates ≈ 5km distance from the edge of the proposed Windfarm, with the SET sites along the railway indicated on the extract for reference"

Section 4 - Field Surveys

4. Introduction

To assess the Irish Rail communication network in the Ballyfasy area, field surveys were undertaken at locations along the rail track adjacent to the proposed wind farm. The field survey map and survey results are presented in Section 4.1 that follows.

4.1 Field Survey

Figure 4 below shows the proposed wind farm site relative to the Irish Rail track which runs between Waterford City and Thomastown. The rail line was surveyed for the presence of telecommunications equipment (i.e. telecoms mast and/or radio antenna).

During the field survey of the rail line in the vicinity of Ballyfasy, Irish Rail GSM-R basestations were identified at three locations: Knockmoylan, Ballylusky (Mullinavat Train Radio Tower), and Rossinan.

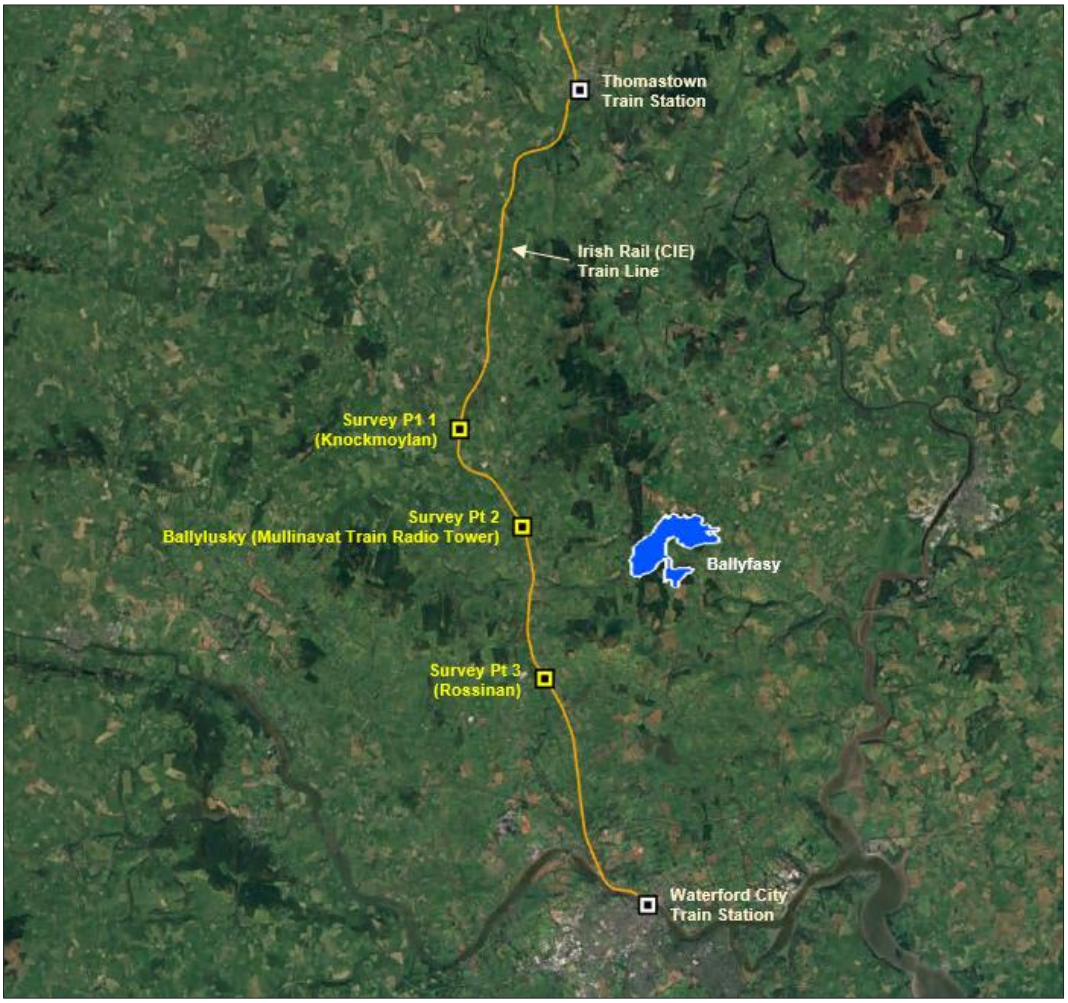


Figure 4. Irish Rail Network - Field Survey Map.

A survey of all three GSM-R mast-sites (Survey Point 1, Survey Point 2, and Survey Point 3) was carried out, the results of which are presented below in Sections 4.1.1 to 4.1.3.

4.1.1 Survey Point 1 (Knockmoylan)

Survey Point 1 is located in the townland of Knockmoylan, Co Kilkenny. The IR (Irish Rail) basestation at this location is 30 m south of IR Level Crossing "WX143" and is shown in the aerial view below. A summary of the field survey findings at this location is provided in Table 3.

Figure 5. Survey Point 1 – Knockmoylan

Survey Point ID	IR Network Type	Observations
SP 1 – Knockmoylan	GSM-R	GSM-R Basestation 30 m south of LC XW143. Directional antennas aligned in direction of the rail lines.

Table 3. Field Survey Summary – SP1

4.1.2 Survey Point 2 (Ballylusky)

Survey Point 2 is located in the townland of Ballylusky, Co Kilkenny. The IR basestation at this location is situated adjacent to the rail track and is approximately 170 m west of the M9 motorway. A summary of the field survey findings at this location are provided in Table 4.

Note: In the consultation response received from IR (Section 3.1), the GSM-R basestation at this location is labelled "Mullinavat Train Radio Tower"

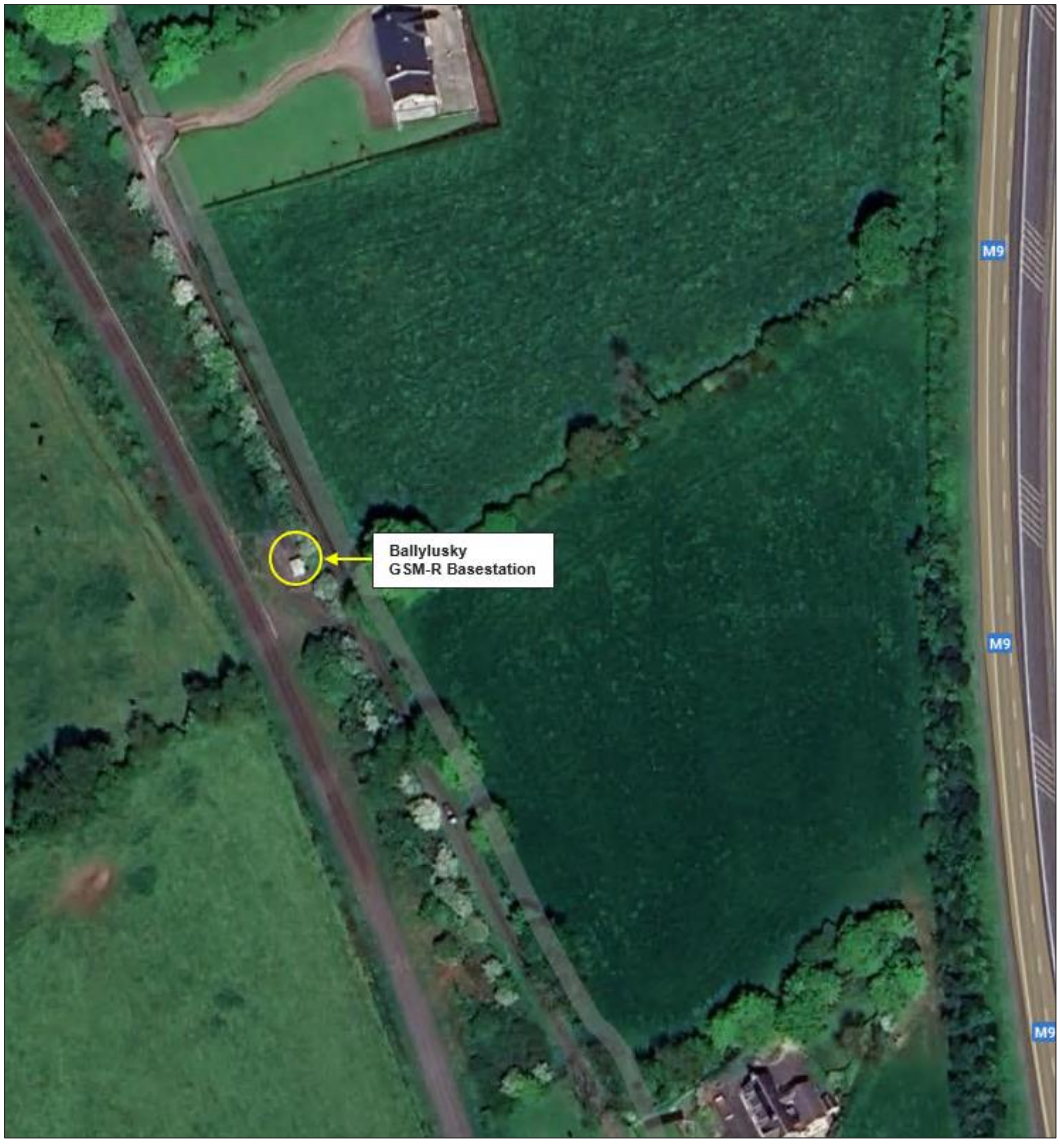


Figure 6. Survey Point 2 – Ballylusky

Survey Point ID	IR Network Type	Observations
SP 2 – Ballylusky	GSM-R	GSM-R Basestation is approximately 1.5 km north of Mullinavat village and is 170 m west of the M9 motorway. Directional antennas aligned in direction of the rail lines.

Table 4. Field Survey Summary – SP2

4.1.3 Survey Point 3 (Rossinan)

Survey Point 3 is located in the townland of Rossinan, Co Kilkenny. The IR basestation at this location is 200 m southeast of IR Level Crossing "WX169" and is shown in the aerial view below. A summary of the field survey findings at this location is provided in Table 3.

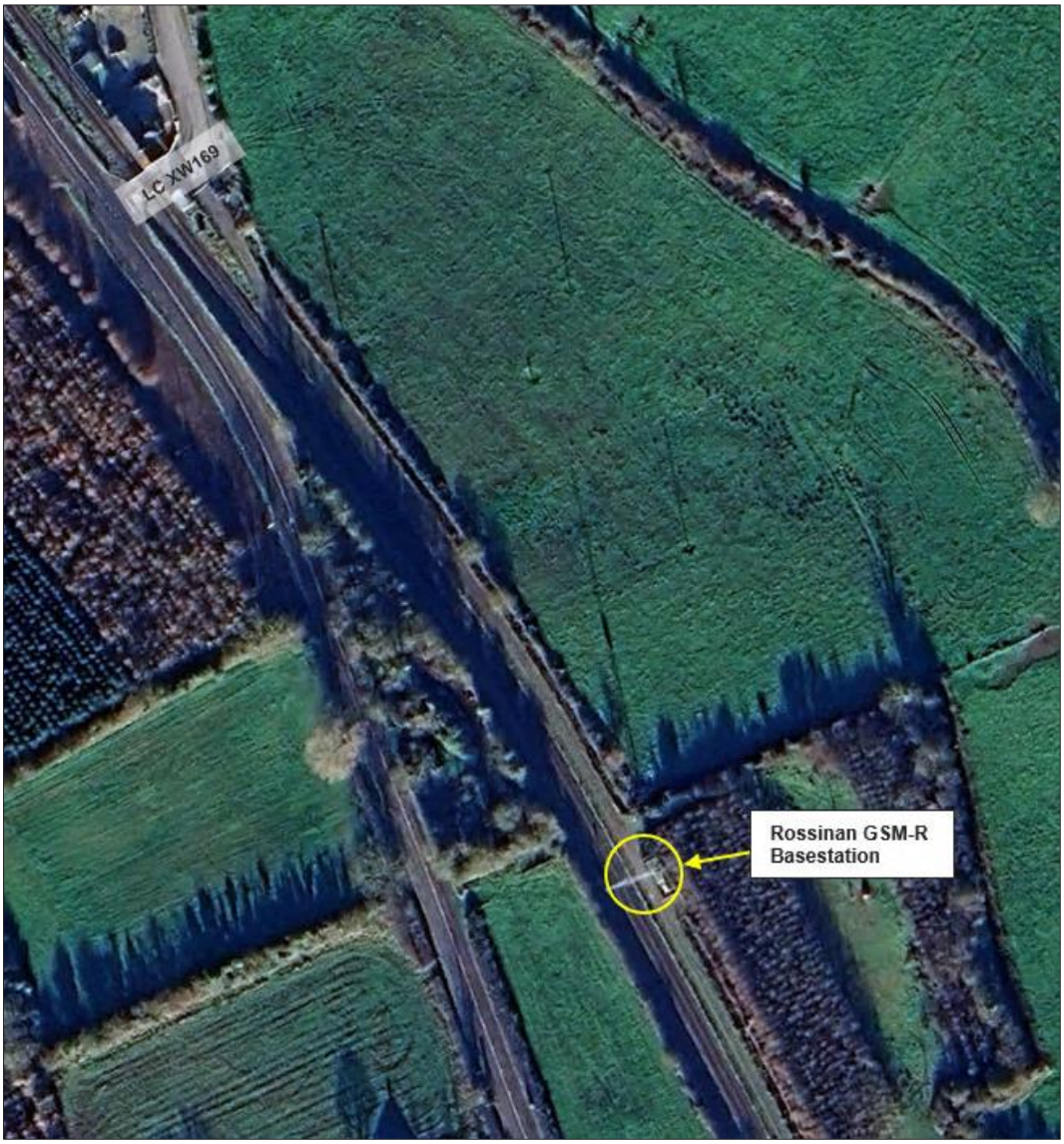


Figure 7. Survey Point 3 – Rossinan

Survey Point ID	IR Network Type	Observations
SP 3 – Rossinan	GSM-R	GSM-R Basestation 200 m southeast of LC XW169. Directional antennas aligned in direction of the rail lines.

Table 5. Field Survey Summary – SP3

Section 5 - Desktop Survey Analysis

5. Introduction

Based on the consultation responses received from Irish Rail, there is one communication network type that require a detailed technical analysis:

- GSM-R Train Radio

Section 5.1 below outlines the desktop survey analysis findings for the communication networks listed above.

5.1 GSM-R Train Radio Analysis

From the findings of field surveys, the antennas used by CIE for their GSM-R rail network are directional sector panel antennas which are aligned in the direction of the rail tracks. From a Freedom of Information (FOI) request which was made to CIE, the make and model of the antennas used for GSM-R in the Republic of Ireland have been determined to be a Kathrein K80010456V02. The antenna specification can be found in Appendix B.

Once the antenna characteristics were determined (make, model, bearing, etc.), Radio Planning software was used to plot the network service coverage from the GSM-R basestations at Knockmoylan, Ballylusky, and Rossinan.

The GSM-R network coverage plot is shown below in Figure 8. As the plot shows, targeted GSM-R radio coverage extends from each basestation along the rail tracks. The strength of any RF signals from the GSM-R basestations at Ballyfasy would be negligible, and it is highly unlikely that turbines at Ballyfasy would have any impact on the GSM-R network.

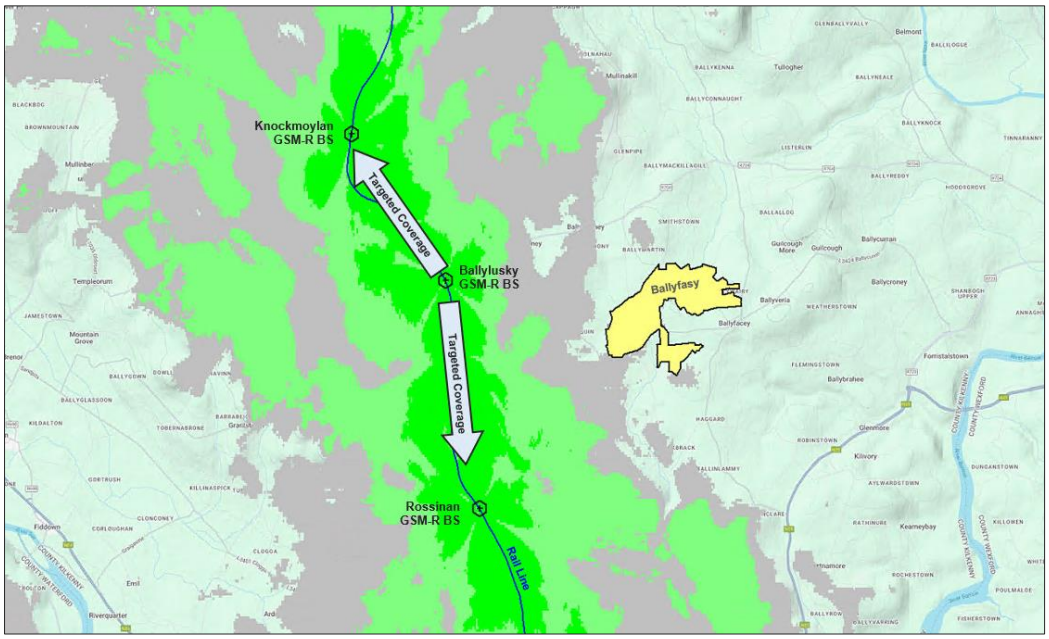


Figure 8. Irish Rail Network – Predicted Service Coverage from GSM-R Network

In their response to consultations CIE referenced recommendations from the ANFR, which is a government agency that manages radio frequencies in France. This agency (which has no authority in the Republic of Ireland), recommends an Exclusion Zone of 5 km from GSM-R antennas. However, wind turbines generally do not interference with GSM /GSM-R radio signals unless they are in close proximity to the transmitter.

Commercial service operators do not raise any concerns regarding GSM access networks unless proposed turbines are very near their transmitters (e.g. less than 500m). Figure 9 below shows that the proposed development is 4.0 km from the nearest IR GSM-R basestation. At this distance, it is highly unlikely that there would be any impact on the GSM-R radio network. It should also be noted that the turbines at the existing wind farm at Ballymartin (which is adjacent to Ballyfasy) are within 5.0 km of the GSM-R basestation and are operating without having any impact on the GSM-R network.

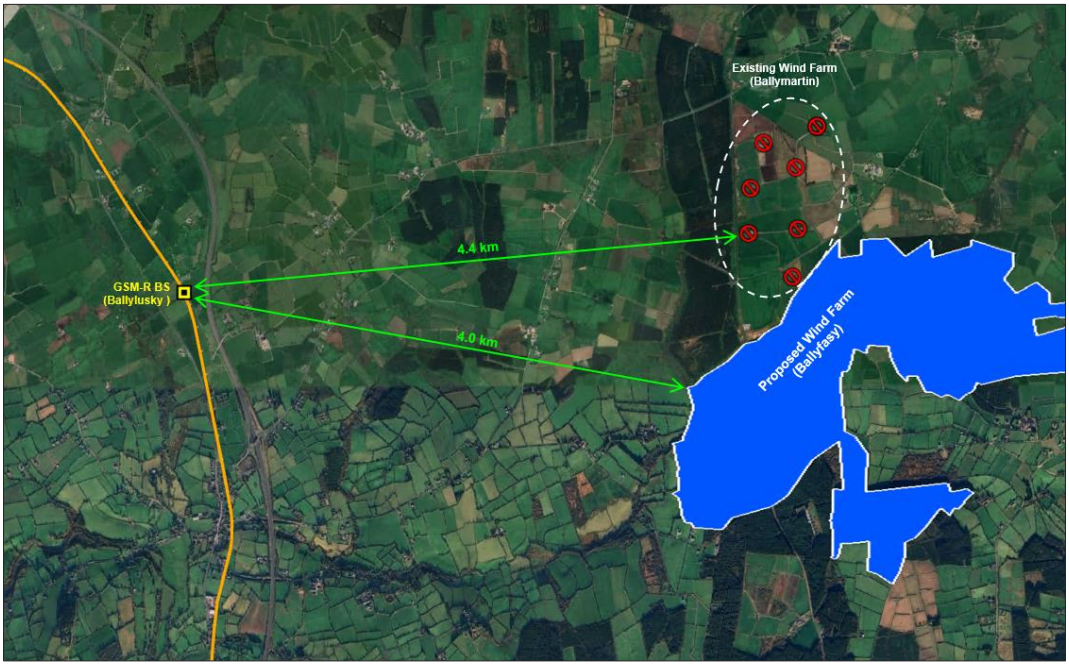


Figure 9. Nearest turbine to Irish Rail GSM-R Basestaion

In addition, a search of the online ANFR database of documents / studies found no reference to a 5 km Exclusion Zone for GSM-R networks. In France there are numerous wind farms that are located well within 5 km of rail lines. Figure 10 below shows an example of a wind turbine in northern France that is less than 200m from a rail line.

Figure 10. Example of a wind tubrine shown relative to a French rail track

In Ireland too, there are numerous examples of existing wind farms that are less than 5 km to Irish Rail lines. These operational wind farms in the Republic of Ireland (e.g. Ballymartin, Monaincha, Richfield, Cloontooa, etc.) appear to have had no detrimental impact to the Irish Rail communications network. Figure 11 below shows wind turbines at Cloontoa wind farm which are less than 1 km from the adjacent Irish Rail track.

Figure 11. Cloontooa wind turbines shown relative to Irish Rail track

Table 6 below provides a brief summary of the network analysis for the Irish Rail network in the vicinity of the proposed wind farm.

Network Type	Comments	Wind Farm Impacts
GSM-R Train Radio	Turbines at the proposed development would be at least 4.0 km from the nearest Irish Rail GSM-R basestation (located at Ballylusky). At this distance, it is highly unlikely that the proposed wind farm would have any impacts on the Irish Rail communications network. It should also be noted that there are existing wind farms throughout Ireland with turbines that are less than 5 km from Irish rail tracks. These wind farms appear to have had no detrimental impact to the Irish Rail communications network.	No impacts.

Table 6. GSM-R Train Radio – Analysis Summary

Section 6 - Conclusions

6. Conclusions

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

- Results from the field survey indicate that Irish Rail operate a GSM-R network along the rail line between the train stations at Waterford City and Thomastown.
- GSM-R Radio operates in the UHF band of frequencies. Wind turbines generally do not cause interference to radio signals in this band, unless they are in close proximity to the transmitter (e.g. less than 500m).
- The precedent that the Irish Rail refer to is that of the ANFR (Agence Nationale des Frequences) in France, which is not applicable within Irish an Irish legislative context under the Wireless Telegraphy Act. This Act is part of a broader framework of legislation, including the Broadcasting and Wireless Telegraphy Act, 1988, as noted on the Irish Statute Book. The statement by Irish Rail in their consultation response is not applicable on this legislative basis.

  The proposed site lies within the GSM-R (Mobile Network for Railways) exclusion zone and therefore is not permitted."

  From a study carried out by the ANFR (Agence Nationale des Frequences in France), the output calls for 2 main recommendations by defining 2 main zones as follows:

  ***1 - Exclusion zone:** wind farm not less than 5 Km from antenna*

  ***2 - Coordination zone:** : 5 Km < wind farm < 30 Km: this area, between operators is required to fix any issue and impact on the signal propagation*

- In addition, a search of the online ANFR database of documents / studies found no reference to a 5 km Exclusion Zone for GSM-R networks. In France there are wind farms that are located well within 5 km of rail lines. An example of a wind turbine in northern France that is less than 200m from a rail line has been cited.
- As turbines at the proposed development would be at least 4 km from the nearest Irish Rail GSM-R basestation (located at Ballylusky), it is highly unlikely that there would be any impacts on the Irish Rail communications network. A software prediction of the service coverage from the Irish Rail basestation has been generated and shows that there would be no impacts from the proposed wind farm
- It should also be noted that there are existing wind farms in Ireland with turbines that are located within 5 km of Irish Rail tracks (e.g. Ballymartin, Monaincha, Richfield, Cloontooa, etc.). These wind farms are operational for many years and there are no reports to\from the wind farm operators of any impact to the Irish Rail communications network.

Network Description	Comments	Wind Farm Impacts
GSM-R	GSM-R Train Radio operates in the UHF band of frequencies. Transmitters in this band are generally not impacted by obstacles (e.g. wind turbine) unless the obstacle is less than 500m from the transmitter. Turbines at the proposed development would be at least 4.0 km from the nearest Irish Rail GSM-R basestation (located at Ballylusky). At this distance, it is highly unlikely that the proposed wind farm would have any impacts on the Irish Rail communications network.	No impacts

Table 7. Irish Rail Network Impact Summary.

APPENDIX A – Wind Farm Turbine Coordinates

Appendix A – Wind Farm Turbine Co-ordinates

The development is in the pre-planning stage and the Final Turbine Layout is yet to be finalized.

APPENDIX B – GSM-R Antenna Specification

Appendix B – GSM-R Antenna Specification

The antenna used by CIE for GSM-R networks in the republic of Ireland is manufactured by Kathrein (Model K80010456V02). The antenna specification is shown below.

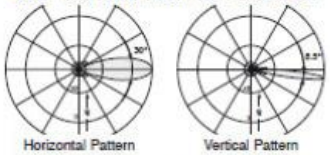
Panel 790–960
Dual Polarization X
Half-power Beam Width 30°
Adjust. Electrical Downtilt 0°–10°
set by hand or by optional RCU (Remote Control Unit)

KATHREIN
Antennen · Electronic

XPol Panel 790–960 30° 20.5dBi 0°–10°T

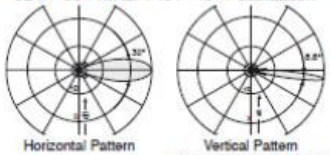
Type No.	80010456V02		
Frequency range	790 – 862 MHz	790–960 824 – 894 MHz	880 – 960 MHz
Polarization	+45°, –45°	+45°, –45°	+45°, –45°
Gain at 0° T	2 x 20.0 dBi	2 x 20.2 dBi	2 x 20.5 dBi
Horizontal Pattern:			
Half-power beam width	33°	32°	30°
Front-to-back ratio, copolar	> 28 dB	> 29 dB	> 30 dB
Cross polar ratio Maindirection 0°	Typically: 25 dB	Typically: 23 dB	Typically: 20 dB
Tracking, Avg.	2.5 dB		
Squint	±2.0°		
Vertical Pattern:			
Half-power beam width	9.1°	8.8°	8.5°
Electrical tilt	0.5°–10°, continuously adjustable		
Sidelobe suppression for first sidelobe above main beam	0° ... 5° ... 10° T > 16 ... 13 ... 13 dB	0° ... 5° ... 10° T > 18 ... 18 ... 17 dB	0° ... 5° ... 10° T > 18 ... 16 ... 15 dB
Impedance	50 Ω		
VSWR	< 1.5		
Isolation, between ports	> 30 dB		
Intermodulation IM3	< –150 dBc (2 x 43 dBm carrier)		
Max. power per input	500 W (at 50 °C ambient temperature)		

880 – 960 MHz: +45°/–45° Polarization



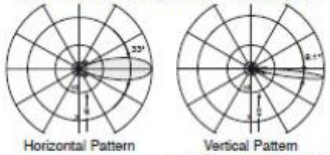
Horizontal Pattern | Vertical Pattern 0°–10° electrical downtilt

824 – 894 MHz: +45°/–45° Polarization

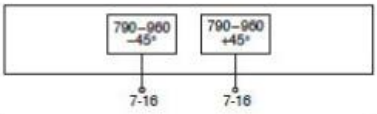


Horizontal Pattern | Vertical Pattern 0°–10° electrical downtilt

790 – 866 MHz: +45°/–45° Polarization



Horizontal Pattern | Vertical Pattern 0°–10° electrical downtilt



Mechanical specifications	
Input	2x 7-16 female
Connector position	Rearside
Adjustment mechanism	1x, Position bottom continuously adjustable
Wind load	Frontal: 1760 N (at 150 km/h) Lateral: 330 N (at 150 km/h) Rearside: 2040 N (at 150 km/h)
Max. wind velocity	200 km/h
Height/width/depth	2254 / 576 / 99 mm
Category of mounting hardware	H (Heavy)
Weight	22 kg / 24 kg (clamps incl.)
Packing size	2500 x 600 x 150 mm
Scope of supply	Panel and 2 units of clamps for 50 – 115 mm diameter

Subject to alteration.
906 39076

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