	Procedure: 001	Rev: 1.0
Title: Inchamore Telecommunications Impact Study	Approved: KH	Date: 23/12/20

# Report

## *Inchamore Wind Farm Telecommunications Impact Study*

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## Executive Summary

Ai Bridges was commissioned to evaluate the possible impacts that the proposed wind farm development at Inchamore, Co. Cork could have on a number of telecom links which have been identified in the vicinity of the proposed development.

Based on consultations made prior to the commencement of this report, there are two microwave radio links in the vicinity of the proposed windfarm:

- Mullaghanish to Kenmare      Vodafone Ireland\*
- Mullaghanish to Inchee      Vodafone Ireland

To assess the possible impacts of the proposed turbines on these radio links, a detailed network analysis was undertaken. The results of the network analysis indicate that the Mullaghanish to Kenmare radio link will not be impacted, as the nearest of the proposed turbines would be over 185m from the radio link.

The Mullaghanish to Inchee radio link passes through the proposed wind farm; however, 3D network analysis indicates that the blade-tips of the nearest turbines (T02 and T05) are sufficiently far from the radio link Fresnel Zone that there will be no impacts to its operation. 3D network analysis findings were presented to Vodafone Ireland on the 22<sup>nd</sup> December 2020 and the clearance distance were accepted by Vodafone.

A summary of the network analysis findings is provided below in Table 1.

Operator	Link Description	Impact of wind farm
Vodafone Ireland	Microwave radio transmission link from Mullaghanish to Kenmare.	No impacts. Network analysis indicates that this link is sufficiently far from the nearest turbine that the operation of the link will not be impacted.
Vodafone Ireland	Microwave radio transmission link from Mullaghanish to Inchee.	No impacts. 3D network analysis indicates that this link is sufficiently far from the nearest turbines that the operation of the link will not be impacted.

**Table 1. Impact on Microwave radio links crossing through/near the proposed wind farm.**

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## Section 1 - Wind Farm Site Information

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# 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.

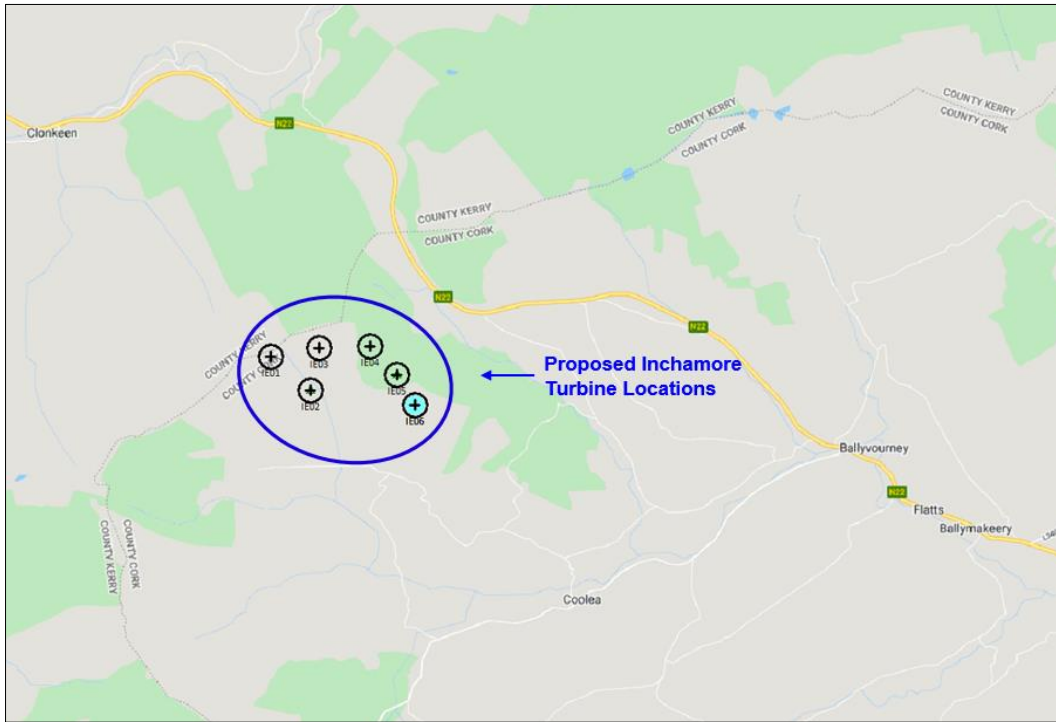
## 1.1 Wind Farm Site Information

The proposed wind farm development is located in County Cork approximately 5km west of Ballyvourney. The proposed hub heights and rotor diameters of the turbines are shown below in Table 1. The proposed turbine co-ordinates are listed in Appendix A.


Wind Farm	Number of Turbines	Turbine Hub Height	Turbine Rotor Diameter
Inchamore	6	107.5 m	155 m

**Table 2. Inchamore Wind Farm - Proposed Turbine Details**

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



**Figure 1. Location of Inchamore Wind Farm, County Cork.**

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## Section 2 - Methodology

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## 2. Introduction

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

### 2.1 Methodology

There are four primary stages in preparing and compiling a communication impact study:

- Telecom Operator Consultations
- Field Surveys
- Desktop Survey Network Modeling 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

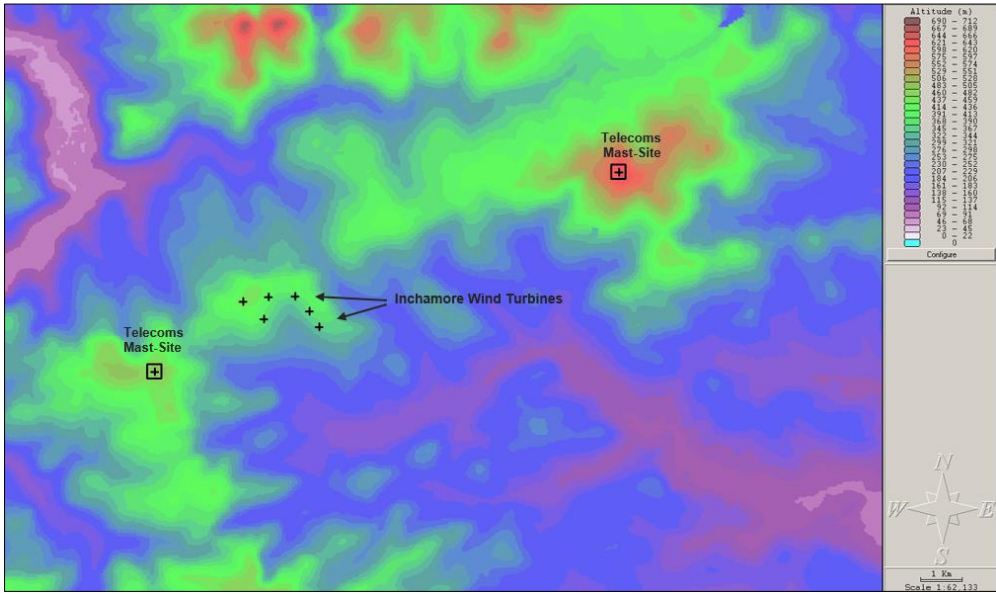
When required, field surveys are undertaken and the co-ordinates of communication masts are recorded. During the field surveys of the communication sites, approximations of antenna size, bearing and height are made for the antennas installed on each of the masts surveyed.

#### 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. Relevant mast-site coordinates are then obtained 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 Inchamore. Where additional technical analysis is required, cross-sectional analysis of the potential impacts is carried out. 3D software tools are employed to provide accurate visualisations for operators to finalise operator consultation outcomes.

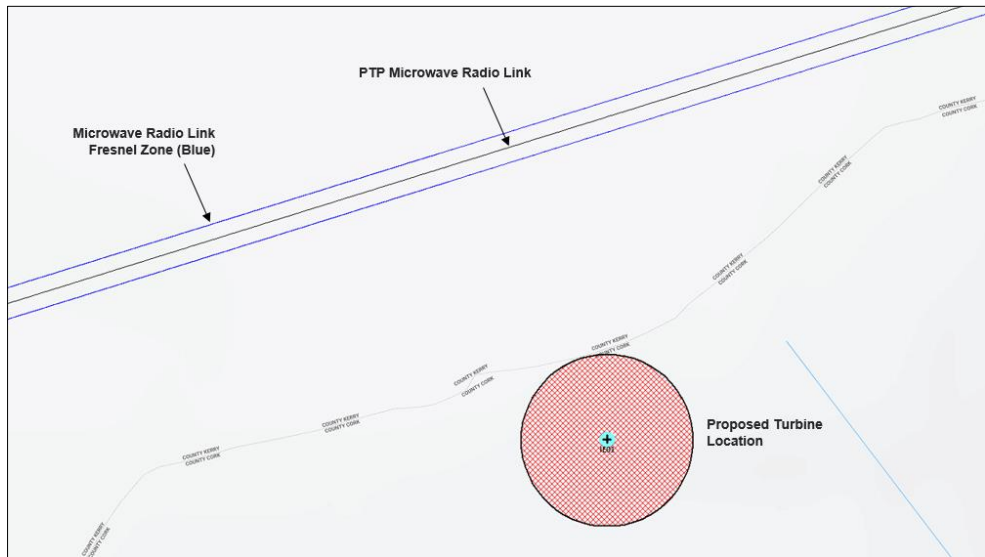
Figure 2 below shows the proposed wind turbines plotted in the radio planning tool. There are two telecommunication mast-sites within 8km of the proposed wind farm. The mast-sites have been plotted relative to the proposed wind and are also shown in Figure 2.

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**Figure 2. Proposed Inchamore Wind turbines plotted in Radio Planning Software**


The findings from the consultations and desktop surveys are collated and the communications networks requiring further analysis are identified. 3D network modeling is used to assess the possible impact of the proposed 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 the proposed wind farm modelled in radio planning software.



**Figure 3. Example of a microwave radio link near the proposed wind farm modelled in radio planning software.**

### Report Generation

The final stage of the communications impact study process is to collate the data and present the findings & analysis into a report for submission.

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## Section 3 - Telecom Operator Consultations

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### 3. Introduction

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

#### 3.1 Telecom Operator Consultations

Consultations beginning in December 2020 were undertaken with relevant telecom network operators to assist in assessing the 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. 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 Section 3.1.1.

ID	Operator	Response Received (Yes/No)	Issues raised by Operator \ Observations.
1	Vodafone Ireland	Yes	Vodafone stated that that they have one microwave radio link that passes through the proposed wind farm.

Table 3. Telecom Operators Consulted

##### 3.1.1 Vodafone Ireland Consultations

The consultations between Vodafone Ireland and Ai Bridges Ltd are provided below.

##### 17/12/20 – Consultation Request sent by Ai Bridges to Vodafone Ireland

Hello Gavin,

We are contacting you in relation to your recent correspondence with Jennings O Donovan & Partners Ltd who are preparing an Environmental Impact Assessment Report for a proposed wind farm development at Inchamore in County Cork.

As you have indicated that Vodafone Ireland have a microwave link in the vicinity of the development, we have been asked to undertake a detailed telecommunications network analysis and to model the Vodafone link relative to the proposed turbines.


LinkID	Link Deployment Type	Radio Config Status	BW + Ref Mod	Freq Band	Max Ethernet Capacity (Mbps)	B-End IDU	B-End HW IDU Type	B-End Latitude	B-End Longitude	B-End Bearing	A-End IDU	A-End HW IDU Type	A-End Latitude	A-End Longitude	A-End Bearing	RAH Site Application	Access RAH Site Dependents	Wp Distance (km)
KYIHECMGH_50		radio XPIC single pipe	bw56MHz-16QAM	18GHz	682	KYIHE702	ALCpu2e	51.9405622	-9.3058566	246.82	CKMGH700	ALCpu2e	51.98320518	-9.143697278	66.95			12.118

We have plotted the 18GHz radio link relative to the proposed turbines and analysis shows that turbines T02 and T05 are the closest turbines to the Vodafone Link.

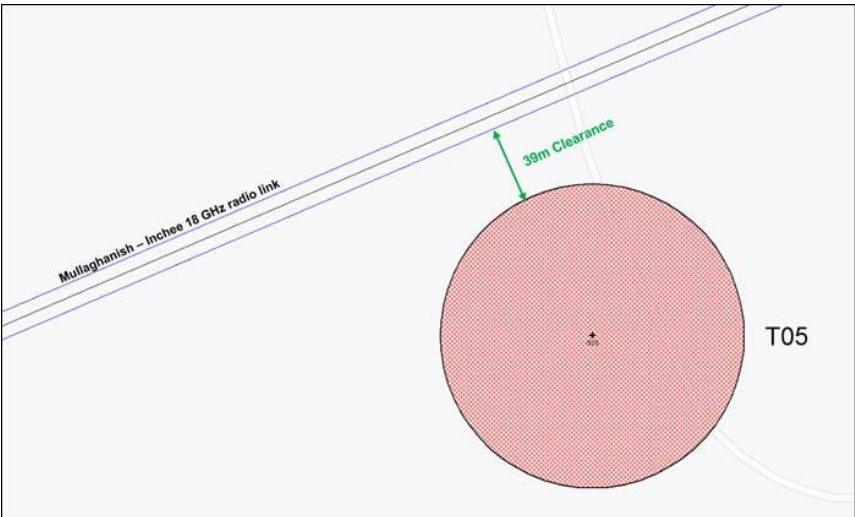
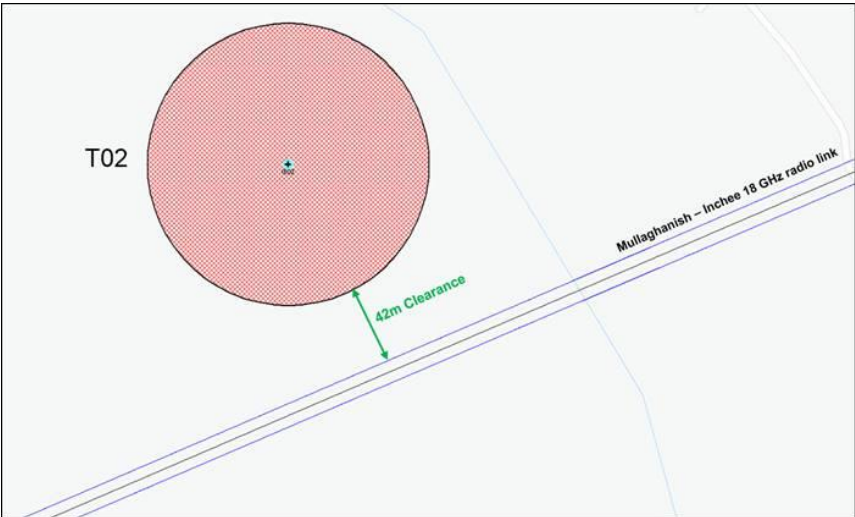
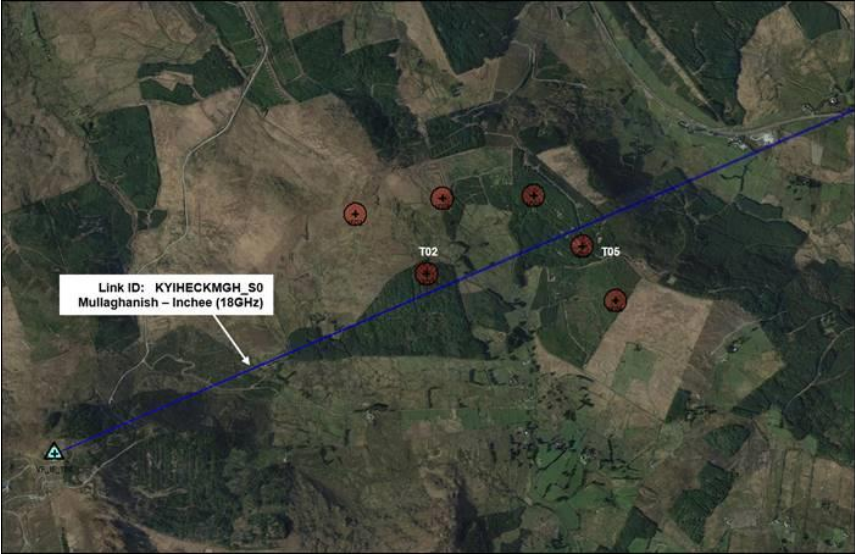
The (Plan View) distances between the turbines and the 1st Fresnel of the radio link are:

T02: 42m Clearance  
T05: 39m Clearance

Note : All clearances are based on the 1st Fresnel Zone, All links clear the specified 30m buffer required, Mullaghanish Tower selected as the 2RN main Transmission Tower.

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We would be grateful if you could review our findings and let us know if you have any concerns in relation to the proposed turbine layout.



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**Turbine Coordinates and Dimensions**

Turbine No	POINT_X_ITM	POINT_Y_ITM
T01	512357.8	578940.1
T02	512852.25	578513.7
T03	512972.39	579040.5
T04	513613.13	579049.8
T05	513947.36	578689
T06	514175.06	578301.5

Hub Height: 107.5 m  
Rotor Diameter: 155.0 m

Best Regards,  
David McGrath.

Ai Bridges  
...Total Communications Solutions...

**21/12/20 – Consultation Request sent by Ai Bridges to Vodafone Ireland**

Hello Gavin,

I am just following up in relation to the email below. Would you be able to confirm that the clearances specified below are acceptable to Vodafone i.e. we have calculated the clearance buffers based on the 2nd Fresnel at the mid-point of the link and have extrapolated this diameter along the link for a worst-case scenario.

We are seeing that the closest turbines to the Vodafone link are Turbine 2 and Turbine 5.

T02: 42m Clearance  
T05: 39m Clearance

We would be grateful if you could provide a response by this week

Best Regards,  
Kevin Hayes,

Ai Bridges Ltd.,  
...Total Communications Solutions...

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**21/12/20 – Vodafone Ireland Response**

Hi Kevin,

The clearance is acceptable, subject to the usual conditions

- All co-ordinates are accurate
- Dish positions on towers are known and accounted for

If additional clearance can be achieved, it would reduce the risk significantly.  
In the event there is interference to Vodafone services, what mitigation is in place/can we expect?

**22/12/20 – Ai Bridges Response**

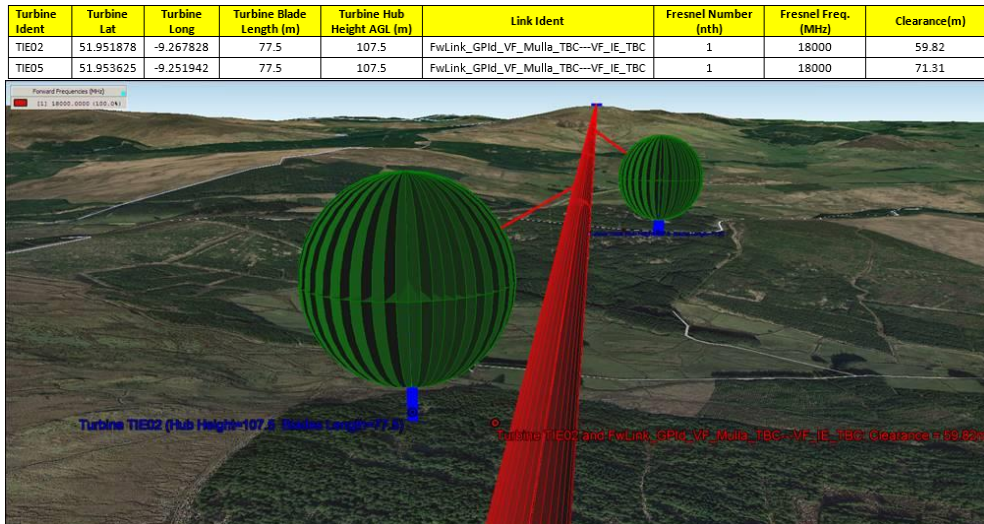
Hello Gavin,

We have been provided the turbine co-ordinates below by the wind farm developer and we have completed the 3D analysis based on these new co-ordinates. We are now seeing greater clearances. i.e. clearance of 59m and 71 mtr from T02 and T05 respectively.

Based on the analysis below I would be grateful if you could confirm that these clearances provide sufficient clearance.

**Vodafone (Mullaghanish – Inchee) :**

The nearest turbines to the Vodafone radio link are Turbines 02, & 05. The clearance distances from these turbines are listed in the table below. A 3D plot of the Vodafone link relative to these turbines is also shown below.



Best Regards,  
Kevin Hayes,


Ai Bridges Ltd.,  
...Total Communications Solutions...

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**22/12/20 – Vodafone Ireland Response**

*Thanks Kevin,*

*This is an acceptable clearance.*

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## Section 5 - Desktop Survey Analysis

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## 4. Introduction

Based on the information provided to Ai Bridges and on the findings from the consultation process, an analysis of the Vodafone links operating in the vicinity of the proposed wind farm at Inchamore was carried out. The findings of the Vodafone Network analysis is presented in Section 4.1 that follows.

### 4.1 Vodafone Licensed Transmission Networks

Table 4 below lists the licensed transmission radio links that required a desktop analysis. The results of the desktop analysis\* for these links are provided in Section 4.1.1 to Section 4.1.2.

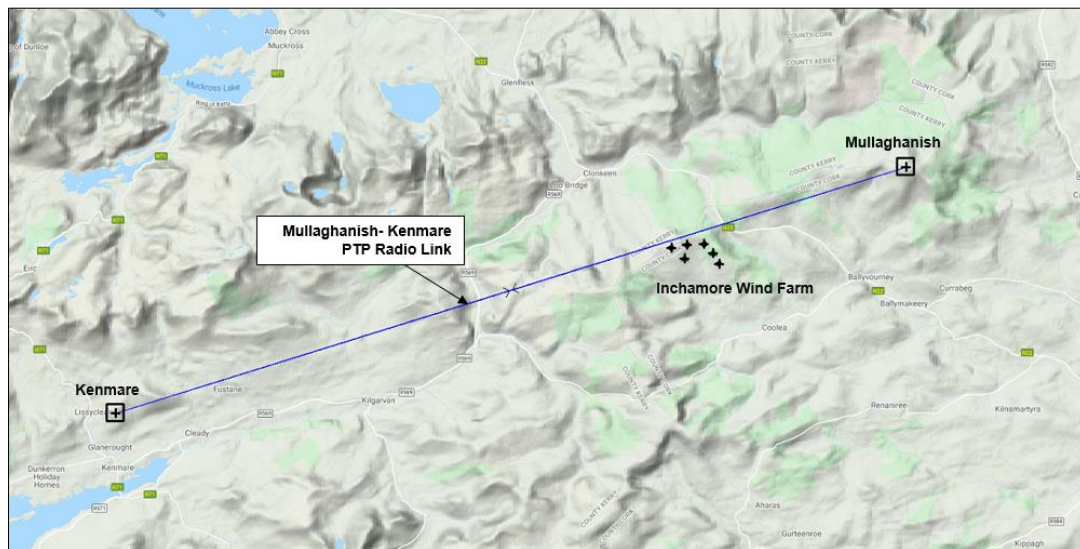
Link ID	Operator	Link Description
1	Vodafone Ireland*	PTP microwave radio link from Mullaghanish - Kenmare
2	Vodafone Ireland	PTP microwave radio link from Mullaghanish – Inchee

**Table 4. Licensed Radio Links requiring Analysis**

\* Shapefiles provided to Ai Bridges indicate that there is a radio link between Mullaghanish and a Telecoms mast-site north of Kenmare. The radio link has been assumed to operate at a frequency of 11GHz and Vodafone Ireland have been assumed as being the radio link operator.

#### 4.1.1 Link 1 Analysis (Mullaghanish to Kenmare)

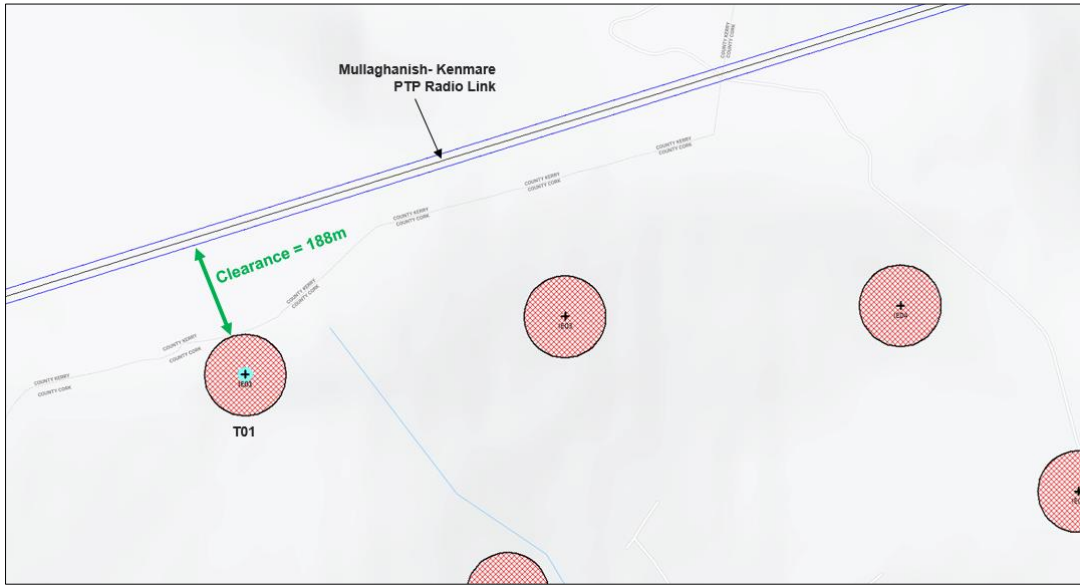
Figure 4 below shows a Plan View of the microwave radio link between Mullaghanish and Kenmare.



**Figure 4. Microwave radio link between Mullaghanish and Kenmare.**

Figure 5 below shows a close-up view of the radio link relative to the Inchamore wind turbines. Desktop analysis indicates that there is over 185m clearance between the blade-tip of the nearest turbine (T01) and the radio link. At this distance there will be no impacts to the operation of the radio link.

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**Figure 5. Close-up view of the radio link between Mullaghanish and Kenmare.**

Table 5 below provides a brief summary of the desktop survey analysis of Link 1.

<b>Operator</b>	Vodafone Ireland (TBC)
<b>Link Description</b>	Licensed PTP microwave radio link between Mullaghanish and Kenmare.
<b>Wind Farm Impacts</b>	No Impacts

**Table 5. Link 1 – Analysis Summary**

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### 4.1.2 Link 2 Analysis (Mullaghanish to Inchee)

Figure 6 below shows Vodafone’s microwave radio link between Mullaghanish and Inchee.

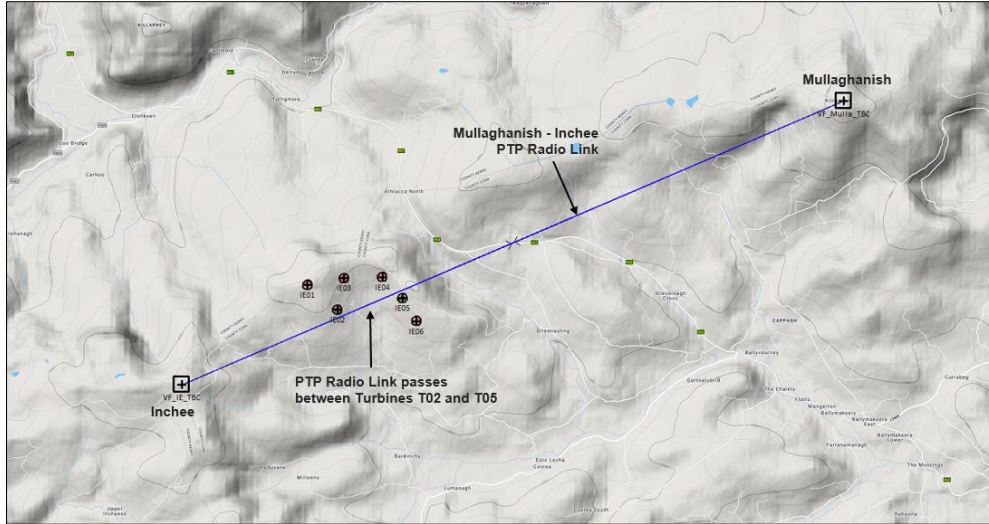
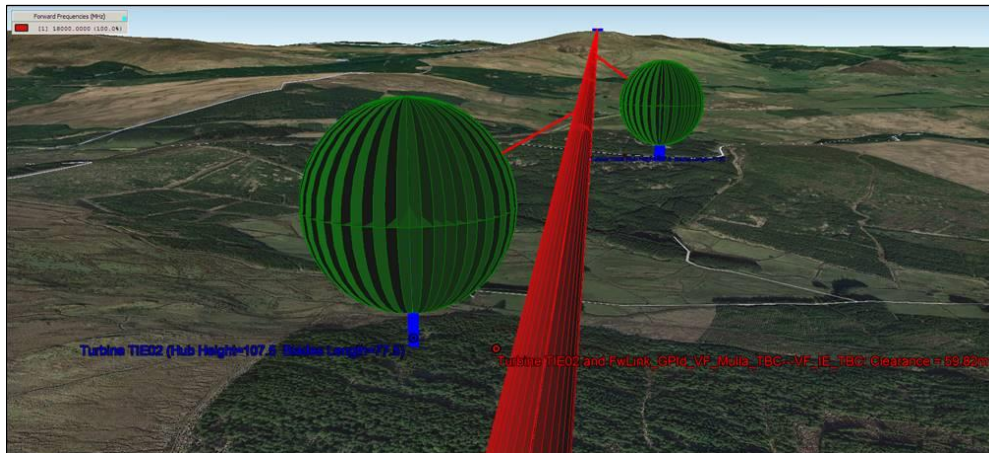


Figure 6. Vodafone’s microwave radio link between Mullaghanish and Inchee.

Figure 7 below shows a 3D view of the Vodafone link relative to the nearest of the proposed turbines (T02 & T05). Desktop analysis indicates that there is a clearance distance of more than 55m between the 1<sup>st</sup> Fresnel Zone of the microwave radio link and the blade-tip of the nearest turbine (T02). At this distance the operation of the radio link will not be impacted.




Turbine Ident	Turbine Lat	Turbine Long	Turbine Blade Length (m)	Turbine Hub Height AGL (m)	Link Ident	Fresnel Number (nth)	Fresnel Freq. (MHz)	Clearance (m)
TIE02	51.951878	-9.267828	77.5	107.5	FwLink_GPId_VF_Mulla_TBC--VF_IE_TBC	1	18000	59.82
TIE05	51.953625	-9.251942	77.5	107.5	FwLink_GPId_VF_Mulla_TBC--VF_IE_TBC	1	18000	71.31

Figure 7. 3D view of Vodafone’s radio link between Mullaghanish and Inchee.

Table 6 below provides a brief summary of the desktop survey analysis of Link 2.

<b>Operator</b>	Vodafone Ireland
<b>Link Description</b>	Licensed PTP microwave radio link between Mullaghanish and Inchee.
<b>Wind Farm Impacts</b>	No Impacts.

Table 6. Link 2 – Analysis Summary

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## Section 5 - Conclusions

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## 5. Conclusions


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

- Results from telecom operator consultations and desktop survey analysis indicate that there are two Licensed PTP microwave radio links crossing through/near the proposed wind farm. In the event that a wind turbine is erected in a location that would block a radio link path, the operation of the link could be impacted.
- The Licensed PTP radio links which could potentially be impacted by the Inchamore wind farm development are listed below in Table 7.

Operator	Licensed PTP Link Description	Impact of Wind Farm
Vodafone Ireland	Microwave radio transmission link from Mullaghanish to Kenmare.	No impacts. Network analysis indicates that this link is sufficiently far from the nearest turbine that the operation of the link will not be impacted.
Vodafone Ireland	Microwave radio transmission link from Mullaghanish to Inchee.	No impacts 3D network analysis indicates that this link is sufficiently far from the nearest turbines that the operation of the link will not be impacted.

**Table 7. Licensed PTP Links potentially impacted by Inchamore Wind Farm.**

- The 3D network analysis findings have been provided to Vodafone Ireland and they have stated the clearance distances are acceptable to them.

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# APPENDIX A – Inchamore Wind Farm Turbine Co-ordinates

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## Appendix A – Inchamore Wind Farm Turbine Co-ordinates

The turbine co-ordinates for the proposed Inchamore wind farm studied in this report are listed below in Table A1.

WTG No.	X	Y
1	512357.8	578940.1
2	512852.25	578513.7
3	512972.39	579040.5
4	513613.13	579049.8
5	513947.36	578689
6	514175.06	578301.5

**Table A1 – Proposed Turbine Coordinates**