14. MATERIAL ASSETS

Material Assets are defined in the 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports' (EPA, 2022) *"*as '*built services and infrastructure. Traffic is included because in effect traffic consumes transport infrastructure'.*

Material assets may be either of human or natural origin. This chapter of the EIAR addresses the likely significant effects of the Proposed Development on transportation infrastructure (Section 14.1 Traffic and Transport), and Other Material Assets (Telecommunications & Aviation and Utilities) (Section 14.2), which are economic material assets of human origin. A Telecommunications Impact Study was undertaken to determine the potential for impacts from the proposed 26 turbine wind farm on telecommunication assets in the area. This Study can be found in Appendix 14-3 and should be read in conjunction with section 14-2 of this chapter.

Waste Management is considered within the EPA 2022 Guidelines as part of Material Assets. EPA Waste Management pertaining to the construction, operation and decommissioning of the Proposed Development is summarised in Chapter 4 of the EIAR. A Waste Management Plan (WMP) is included in the Construction and Environmental Management Plan which is included as Appendix 4-3 of this EIAR. Traffic volumes generated by the removal of waste from the site of the Proposed Development to fully authorised waste facilities, is considered in Section 14.1 below.

The cultural assets of Archaeology and Cultural Heritage are addressed in Chapter 12 of this Environmental Impact Assessment Report (EIAR). Economic assets of natural heritage include non-renewable resources such as minerals or soils, and renewable resources such as wind and water. These assets are addressed in Chapter 8: Land, Soils and Geology, Chapter 9: Hydrology and Hydrogeology, and Chapter 10: Air and Climate. Tourism and amenity resources, which are also considered material assets, are addressed in Chapter 5: Population and Human Health. Tourism and amenity resources, which are also considered material assets, are addressed in Chapter 5: Population and Human Health. The Population and Human Health chapter also addresses existing land-uses (economic assets). Waste Management in the context of the Proposed Development is included in Chapter 4: Description of the Proposed Development.

This chapter of the EIAR has been prepared in accordance with the requirements of the EIA legislation and guidance detailed in Chapter 1: Introduction.

14.1 Traffic and Transport

14.1.1 Introduction

14.1.1.1 Background and Objectives

This chapter of the EIAR addresses the likely significant effects of the proposed development on transportation infrastructure (Section 14.1 Traffic and Transport) and on Telecommunications and Aviation (Section 14.2), which are economic assets of human origin. This chapter of the EIAR has been prepared in accordance with the requirements of the EIA legislation and guidance outlined in Chapter 1: Introduction.

For developments of this nature, the construction phase is the critical period with respect to the traffic effects experienced on the surrounding road network in terms of both the additional traffic volumes that will be generated on the road network, and the geometric requirements of the abnormally large loads associated with the wind turbine plant. The requirements of the additional traffic and abnormal sized

loads generated during the construction stage were assessed on both the external highway network and at the proposed junctions that will provide access to the site.

It should be noted that abnormal weight loads are not a feature of the turbine delivery vehicles, they are abnormal in size only. All construction and delivery vehicles for the proposed development will be subject to the standard axle weight requirements set out under Road Traffic Regulations and therefore the loadings from construction traffic will not exceed the relevant standards. Notwithstanding the need to use some specialist vehicles to facilitate turbine delivery, it should be noted that the number of load-bearing axles for any specialist vehicles carrying large loads are designed to ensure that the load on any one axle does not exceed acceptable load bearing statutory limits.

The magnitude of the increase in traffic volumes experienced on the surrounding network is identified during the various construction stages of the proposed development. Preliminary traffic management measures are also provided in Sections 14.1.7 and 14.1.9.6 aimed at minimising the traffic impact on the local highway network.

14.1.1.2 Statement of Authority

This section of the EIAR has been prepared by Alan Lipscombe of Alan Lipscombe Traffic and Transport Consultants Ltd. Alan is a competent expert in traffic and transport assessments. In 2007 Alan set up a traffic and transportation consultancy providing advice for a range of clients in the private and public sectors. Prior to this Alan was a founding member of Colin Buchanan's Galway office having moved there as the senior transportation engineer for the Galway Land Use and Transportation Study. Since the completion of that study in 1999, Alan has worked throughout the West of Ireland on a range of projects including: major development schemes, the Galway City Outer Bypass, Limerick Planning Land-Use and Transportation Study, Limerick Southern Ring Road Phase II, cost benefit analyses (COBA) and various studies for the NUI Galway. Before moving to Galway in 1997, Alan was involved in a wide variety of traffic and transport studies for CBP throughout the UK, Malta and Indonesia. He has particular expertise in the assessment of development related traffic, including many wind farm developments including the following; Ardderoo, Derryadd, Knocknamork, Shehy More, Cloncreen, Derrykillew, Coole, Ballyhorgan, Cahermurphy, Lettergull, Barnadivane, Cleanrath and Knocknalough .

Alan has a BEng (hons) Degree in Transportation Engineering (Napier University, Edinburgh, 1989), is a member of Engineers Ireland and of the Institute of Highways and Transportation and is a TII accredited Road Safety Audit Team Member.

14.1.1.3 Guidance and Legislation

This section of the EIAR has been completed in accordance with the guidance set out in Chapter 1. The assessment uses terminology to describe the likely significant effects associated with the proposed development as detailed in Table 3.4 of the EPA *Guidelines on the Information to be contained in Environmental Impact Assessment Reports 2022*. Further information on the classification of effects used in this assessment is presented in Section 1.8 of this EIAR.

14.1.1.4 Scoping and Consultation

The scope for this assessment has been informed by the traffic related feedback arising from consultation with statutory consultees, bodies with environmental responsibility and other interested parties as detailed in Chapter 2 of the EIAR and summarised below.

Transport Infrastructure Ireland

Transport Infrastructure Ireland (TII) responded to Scoping on the 8th May 2020 in which it provided a list of recommendations to be followed when preparing the EIAR. A follow up request for comments on the design was issued to TII on the 7th May 2021 to which TII responded on the 17th May 2021 stating they had no further comments to make. All relevant TII guidelines and policies have been taken into account in the preparation of this assessment, including the following:

- PE-PDV-02045, Transport Assessment Guidelines, Transport Infrastructure Ireland, May 2014
- PE-PAG-02017, Project Appraisal Guidelines, Unit 5.3, Travel Demand Projections, Transport Infrastructure Ireland, May 2019
- DN-GEO-03060, Geometric Design of junctions, Transport Infrastructure Ireland, April 2017
- TII Automatic Traffic Count Data (on the M3, M4 and N52)

Department of Transport, Tourism and Sport

A scoping request was posted to The Department of Transport Tourism and Sport on the 8th May 2020. No response was received. A follow up scoping request was issued via email on May 2021 to which a response was received on May 27th 2021. The response pertained to the potential impact for cables in the road network and that all intrusive works should comply with Guidelines for Managing Openings in Public Roads, 2017.

County Westmeath County Council

A pre planning meeting was held with Westmeath Co. Council on the 23rd of July 2020 at which representatives from MKO, Bord na Móna Powergen Ltd and the Council Planning Department were in attendance. A follow up meeting was held on the 22nd of October 2020 at which representatives from the MKO, Bord na Móna Powergen Ltd, the Council Planning Department, the District Engineer and the Senior Engineer- Environment Section were present.

At the meetings, the proposed haul route, and main site entrances were outlined by MKO and Bord na Móna. Issues raised by Westmeath County Council in respect to the proposals were considered in the design of the Proposed Development.

County Meath County Council

A pre planning meeting was held with Meath Co. Council Planning Department on the 28rd of July 2020 at which representatives from MKO, Bord na Móna Powergen Ltd and the Council Planning Department, Conservation Department, Flood Department and Environment Department were in attendance. At the meetings, the proposed haul route, a separate application for intrusive works on Scarriff Bridge and main site entrances were outlined by MKO and Bord na Móna.

A follow up meeting was held on the 13th of October 2020 at which representatives from the MKO, Bord na Móna Powergen Ltd, the Council Planning Department, were present. Updates to the proposed haul routes and investigative works undertaken on Scarriff Bridge were discussed.

Issues raised by Meath County Council in respect to the proposals were considered in the design of the proposed development.

14.1.1.5 Methodology and Section Structure

The traffic and transport assessment takes cognisance of guidance for such assessments set out by Transport Infrastructure Ireland (TII), in the document PE-PDV-02045 '*Traffic and Transport Assessment Guidelines'*, (TII, 2014). The geometric requirements of the turbine delivery vehicles were assessed using Autocad and Autotrack with the assessment undertaken by Collett & Sons Ltd which is included as Appendix 14.1. Colletts employs over 150 people across four depots and run a diverse fleet of trucks and trailers. They provide all the expertise and equipment associated with abnormal load heavy transport, general haulage, heavy lift, marine services and transport consulting on a worldwide basis for the renewable energy, aerospace & aviation, power generation, environmental systems, heavy engineering, oil & gas processes and civil & infrastructure industries. The preliminary design and geometric assessments for the Proposed Development access junctions were prepared by Alan Lipscombe Traffic and Transport Ltd.

The Traffic and Transport Section of this chapter is set out as follows:

- Sections 14.1.2 - Receiving Environment and 14.1.3 – Existing Traffic Volumes - A review of the existing and future transport infrastructure in the vicinity of the proposed development, including an assessment of 2019 (pre-Covid 19) traffic flows, 2021 observed traffic flows and traffic forecasts during an assumed construction year of 2026.
- Section 14.1.4 – Proposed Development and Traffic Generation - A description of the proposed development and the traffic volumes that it will generate during the different construction stages and when it is operational.
- Section 14.1.5 –Turbine component delivery vehicles - A description of the abnormally sized large loads and vehicles that will require access to the site.
- Section 14.1.6 –Traffic effects during construction and during operation - A review of the effects of development generated traffic on links and junctions during construction and when the facility is operational.
- Section 14.1.7 – Traffic Management for Large Deliveries - Identification of traffic management for large deliveries during construction.
- Section 14.1.8 – Route Assessment - A geometric assessment of the route and its capacity to accommodate the abnormal-sized loads associated with the development.
- Section 14.1.9 – Provision for Sustainable Modes of Travel - An assessment of the provision for sustainable modes of travel (in this case primarily with respect to the transport of construction staff).

The description of likely significant effects is provided in Section 14.1.10.

14.1.2 Receiving Environment

14.1.2.1 Site Location

The proposed development, known as Ballivor Wind Farm, will be located on Ballivor, Carranstown, Lisclogher and Bracklyn Bogs which are located in lands within both Counties Westmeath and Meath.

The closest settlements to the site are Ballivor which is located approximately 2.2km to the east and Raharney which is located approximately 3.7km to the west. Other settlements and towns in the area include Athboy (c. 9km north), Mullingar (c. 13km west) and Trim (c. 16km east). The site location is shown on Figure 1-1.

14.1.2.2 Proposed Abnormal Size Load Delivery Route

A detailed assessment of the turbine delivery route (TDR) for the transport of abnormal loads was made from a point at which the route turns off the M3 Motorway to the west of Dunshaughlin. The route is shown in Figure 14-1 and is discussed in detail in Section 14.1.8.

A number of major ports can be accessed from the M3 motorway. The alternatives considered for the port of entry of wind turbine components into Ireland for the Proposed Development include Shannon-Foynes Port, County Limerick and the Port of Galway. Shannon Foynes Port is the principal deepwater facility on the Shannon Estuary and caters for dry bulk, break bulk, liquid, and project cargoes. The Port of Galway also offers a roll-on roll-off procedure to facilitate import of wind turbine components. Both ports and indeed others in the state (including Cork and Dublin), have been used for the importing of turbine components. The final selection of the port of entry will made prior to the commencement of construction. As stated, all four ports have a proven track record in the handling and subsequent transport of large turbine components. The final selection will be driven by commercial, availability and scheduling considerations. There are clear access routes for all four ports utilising the motorway network to the proposed haul route to the site.

The assessment is confined to the access route comprising the turn off from the M3 onto the R125 at Dunshaughlin, before heading west on the R125 for approximately 2.5km towards the roundabout junction with the R154. The route then heads northwest on the R154 for 14 kms towards the town of Trim, where the route negotiates the town using Patrick's street to access the R161 ring road. The route then travels southwest on the R161 for 7.6 kms before turning right onto the R156. From this point the route travels northwest for 11.2 kms on the R156, negotiating the bridge over the River Boyne, the 90-degree bend at Moyfeigher and the village of Ballivor, before reaching the proposed site access junctions on the R156 4.5 kms west of Ballivor. The main access junctions are located at the existing access to the bogs to the north and south of the R156 at a location in County Westmeath, approximately 0.4 kms west of the boundary with County Meath, as shown in Figure 14.1 and Figure 14.2a.

14.1.2.3 Proposed Construction Traffic Haul Route

The delivery route for general HGV construction traffic may vary depending on the location of quarries and the suppliers used for stone and other materials required to construct the proposed development. Based on the location of quarries in the vicinity of the proposed development and the fact that deliveries of stone comprise the majority of deliveries to and from the site, it is possible that stone, concrete and general construction traffic may travel to the site via the TDR, or via the M4 / N4 and the R156 from the west, or the N52 from the north.

For the purpose of this assessment, it is assumed that deliveries of smaller component parts for the wind turbines transported as general HGV traffic, will travel to the site the same route as the larger turbine components, via the M3, the R125, R154 and R161 via Trim, followed by the R156 towards the site. In practice the delivery route for these component parts could change but as the associated traffic volumes are low, as established in Section 14.1.4 of this EIAR, the impacts will be minimal regardless of the route selected.

The assessment presented in this section of the EIAR is based on these assumptions.

14.1.2.4 Site Entrances

Two entrances are proposed for the construction stage of the proposed development in order to transport turbine components, materials and equipment to the site. Both are in the vicinity of existing Bord na Móna entrances which have been in use to provide access for the machinery involved in peat harvesting activities. The entrance locations are depicted on Figure 4.1 of this EIAR and can be described as follows:

- Access Junction A - entrance off the R156 providing access to the northern part of the site during construction and to Carranstown Bog Car park once operational, and;
- Access Junction B - entrance off the R156 providing access to the southern part of the site during construction and the Ballivor Bog Car Park once constructed, and,.
- Access junction C – this junction is located on a local road which separates Bracklin Bog from Lisclogher Bog Road and will provide for construction traffic crossing the Bracklin Road during construction and for amenity trips accessing the Bracklin Car Park once operational.

These proposed access junctions will provide for both the construction phase, the operational phase and for any subsequent maintenance or decommissioning works and will be designed to facilitate both materials delivery to the site (stone, steel and concrete) as well as large oversize components such as turbine blades and tower sections. Upgrade works will be required to these entrance locations in order to accommodate access and egress of turbine delivery and construction vehicles. Following the construction phase of the proposed development, the oversized component traversing area at these entrances will be closed by erecting fencing, however they may need to be used during the lifetime of the development should replacement blades or other abnormal loads be required to access the site.

14.1.3 Existing Traffic Volumes

It should be noted that traffic volumes are discussed in terms of heavy goods vehicles (HGVs) and passenger car units (PCU's), where each vehicle is expressed in terms of its demand on the network relative to the equivalent number of cars. For example, an articulated HGV was given a factor of 2.4 passenger car units (as per TII Project Appraisal Guidelines for National Roads Unit 5.2), while one of the extended loaders required to transport the wind turbine components was assigned a factor of 10.

14.1.3.1 Background Traffic Flows

The link count locations included in the assessment are shown in Figure 14-2b and set out in Table 14.1.

Continuous traffic counters are maintained by TII on the M3, M4 and N52 (Locations 1, 6, 7, 8 and 9). This information; together with peak period classified turning counts, undertaken by Traffinomics Ltd, at the junctions between the R125 and R154 (locations 2 and 3), and the R161 and R156 (locations 4 and 5) were used to provide background traffic volumes on the local study road network.

The date that the classified traffic counts were undertaken at the junction between the R125 and R154 was Tuesday 14th September 2021, which was during a period of Covid-19 related government travel restrictions. In order to determine the scale of the likely reduction in traffic demand on the day of the survey daily traffic volumes observed at the TII count sites on the M3 were compared for the survey date, and a comparable day in 2019, Tuesday 10th September, prior to the Covid-19 related government travel restrictions, as shown in Table 14.2. A total combined daily 2-way volume at both sites on the M3 of 47,271 vehicles was observed on Thursday 14th September in 2019, compared to 43,064 in 2021, indicating a Covid-19 related reduction in traffic demand on the M3 of 9.8%. The 2021 flows observed at these classified count sites are factored to 2019 pre-Covid-19 flows in Table 14.2 using a factor of 1.098 (+9.8%)..

The classified turning count at the junction between the R161 and the R156 (locations 5 and 6) were undertaken on 7th March 2023, during a period when there were no Covid-19 travel restrictions and therefore did not require adjustment.

Table 14-1 Count locations and data source

Link	Data source
1 M3 south of Dunshaughlin	TII ATC site
2 R125	Classified count (year 2021)
3 R154 (east of Trim)	Classified count (year 2021)
4 R161 (between Trim and Doolistown)	Classified count (year 2023)
5 R156 (between Doolistown and Ballivor)	Classified count (year 2023)
6 M3 north of Dunshaughlin	TII ATC site
7 M4 east of Kinnegad	TII ATC site
8 M4 Mullingar	TII ATC site
9 N52	TII ATC site

Table 14-2 Observed flows at TII ATC sites, September 2019 and 2021, Covid 19 adjustment factor

Link	Data source	2019 data (Tuesday 10th September)	2021 data (Tuesday 14th September)	Covid 19 factor
1 M3 south of Dunshaughlin	TII ATC site	24,063	22,019	1.093
6 M3 north of Dunshaughlin	TII ATC site	23,208	21,045	1.103
Total		47,271	43,064	1.098

Table 14-3 Classified count site, observed 2021 traffic flows and 2019 covid-19 adjusted 2019 flows

Link	Data source	2021 observed	2019 covid-19 adjusted
2 R125	Classified count	5,719	6,279
3 R154 (east of Trim)	Classified count	9,108	10,001

14.1.3.2 Future Background Traffic Volumes

This section describes the process adopted to produce background traffic forecasts for an assumed construction year of 2026.

Revised guidelines for forecasting annual growth in traffic volumes were produced by TII in May 2019, as set out by county in the 'Project Appraisal Guidelines for National Roads (Unit 5.3)'. The annual growth rates for light vehicles (car and lgvs) for the County, and factors for the years relevant to this study, are shown in Table 14.4 and Table 14.5. Traffic volumes are forecast to increase during the period from 2019 and 2023 base year traffic flows to 2026 (the assumed construction year) by 12.8%, between the years 2019 to 2026, and by 5.3% between the years 2023 and 2026 assuming a medium growth scenario. All day traffic flows, for the years 2019, 2023 and 2026 are comparted on the study area network in Table 14.6.

It should be noted that while the assumed construction year of 2026 may vary slightly, this will not alter the forecast outcomes and effects presented in this section of the EIAR. This is due to the annual growth rate for background traffic being just 1.73% (as shown in Table 14.4) and the traffic volumes generated by the Proposed Development will remain unchanged regardless of construction year, as presented subsequently in Section 14.1.4.

Table 14-4 TII Traffic Growth Annual Factors and Indices for County Meath

Year	Lights (cars and lgvs) – Annual Factor			Lights (cars and lgvs) – Cumulative Index		
	Low	Medium	High	Low	Medium	High
2019	1.0145	1.0173	1.0205	1.000	1.000	1.000
2020	1.0145	1.0173	1.0205	1.015	1.017	1.021
2021	1.0145	1.0173	1.0205	1.029	1.035	1.041
2022	1.0145	1.0173	1.0205	1.044	1.053	1.063
2023	1.0145	1.0173	1.0205	1.059	1.071	1.085
2024	1.0145	1.0173	1.0205	1.075	1.090	1.107
2025	1.0145	1.0173	1.0205	1.090	1.108	1.129
2026	1.0145	1.0173	1.0205	1.106	1.128	1.153

Source: TII Project Appraisal Guidelines – Unit 5.3, May 2019

Table 14-5 TII traffic growth rates by growth scenario

Period	New Factors		
	Low	Medium	High
2019 – 2026	1.106	1.128	1.153
2023 – 2026	1.044	1.053	1.063

Table 14-6 Average all day flows by location and year (2-way vehicles)

Link	2019	2023	2026
1 M3 south of Dunshaughlin	24,063	NA	27,143
2 R125	6,279	NA	7,083
3 R154 (east of Trim)	10,001	NA	11,281
4 R161 (between Trim and Doolistown)	NA	679	715
5 R156 (between Doolistown and Ballivor)	NA	4,179	4,400
6 M3 north of Dunshaughlin	23,208	NA	26,179
7 M4 east of Kinnegad	27,420	NA	30,930
8 M4 Mullingar	21,412	NA	24,153
9 N52	5,918	NA	6,676

The TII ATC traffic count data and the classified turning counts were also used to determine the existing percentage of HGVs on the study area network. The observed percentage of HGVs was observed to vary from 7.0% on the R156, to 12.0% on the M4 to the east of Kinnegad. Traffic volumes forecast on the study network for the year 2026 are shown by vehicle type in Table 14.7.

Table 14-7 All day flows, percentage HGVs and flows by vehicle type, year 2026

Link	All day flow (vehs)	% HGV's	Vehicles		PCU's		
			HGVs	Cars / lgvs	HGVs	Cars / lgvs	Total
1 M3 south of Dunshaughlin	27,143	9.4%	2,551	24,592	6,123	24,592	30,715
2 R125	7,083	11.5%	815	6,268	1,955	6,268	8,223
3 R154 (east of Trim)	11,281	11.5%	1,297	9,984	3,114	9,984	13,097
4 R161 (between Trim and Doolistown)	715	3.0%	21	694	51	694	745

Link	All day flow (vehs)	% HGV's	Vehicles		PCU's		
			HGVs	Cars / lgvs	HGVs	Cars / lgvs	Total
5 R156 (between Doolistown and Ballivor)	4,400	7.0%	308	4,092	739	4,092	4,832
6 M3 north of Dunshaughlin	26,179	9.4%	2,461	23,718	5,906	23,718	29,624
7 M4 east of Kinnegad	30,930	12.0%	3,712	27,218	8,908	27,218	36,126
8 M4 Mullingar	24,153	8.8%	2,125	22,027	5,101	22,027	27,128
9 N52	6,676	8.7%	581	6,095	1,394	6,095	7,489

14.1.4 Proposed Development and Traffic Generation

14.1.4.1 Development Trip Generation – During Construction

The assessment of the effects of traffic generated during the construction of the proposed development is considered in two stages.

- Stage 1 – Site preparation and groundworks, turbine foundation development and,
- Stage 2 – Turbine component delivery.

For the purpose of the traffic impact assessment, assumptions based on typical wind farm construction projects regarding the length of the construction phases must be made to inform the assessment. These assumptions are detailed in the following sections and allow for a scenario based on a conservative set of circumstances but should not be inferred as prescriptive limitations to the construction phase. There are numerous variables which can affect a construction project programme such as weather for example. The construction phase of the proposed development will be carried out in accordance with the CEMP, which is submitted as Appendix 4.3 of this EIAR. The CEMP will be updated based on any relevant conditions imposed as part of the planning consent and the input of the Local Authority prior to construction commencing.

14.1.4.1.1 *Stage 1 – Site Preparation and Ground Works*

The construction phase of the proposed development is expected to last approximately 24 months (2 years). While this could increase to 30 months, 24 months is assumed for the purpose of this assessment in order to test the worst-case scenario. For assessment purposes a standard 255 working days per annum was adopted, with 510 working days assumed for the site preparation and ground works stage with the total numbers of deliveries made to the site during that period shown in Table 14.8. During this construction phase, there will be two distinct types of days with respect to trip generation. A total of 26 days will be used to pour the 26 concrete wind turbine foundations. Foundations will likely be poured one per day, with an estimated 75 concrete loads required for each turbine foundation delivered to the site over a 12-hour period. This will result in just over 6 HGV trips to and from the site per hour. On the remaining 484 working days for this stage, other general materials will be delivered to the site.

During Stage 1 construction phase, based on trip rates typical of wind farm projects, it is estimated that a total of 89,789 loads will require to be delivered to the site by trucks and large articulated HGVs as set out in Table 14.8, with the daily effects on the local road network shown in Table 14.9 and 14.10. It is noted that a significant proportion of these loads (86,075 loads) are for the transportation of rock and stone to the site. This estimate is based on the scenario that no materials from the in-site borrow pits are suitable for construction, and therefore represents a worst case scenario.

The figures show that on the 26 days that concrete will be delivered to the site an additional 360 two-way PCU's will be added to the network (comprising 75 two-way HGV trips or 150 movements, with 2.4 PCU's per movement), as shown in Table 14.9. Similarly, on the 484 days when other materials will be delivered to the site, traffic volumes on the local network are forecast to increase by an average of 871 PCU's, as set out in Table 14.10.

Table 14-8 Stage 1 – Site preparation and groundworks – total movements

Material	Total no. Truck Loads	Type of HGV
Concrete (turbine foundations)	1,950	Concrete mixers
Concrete (mast foundations)	441	Concrete mixers
Concrete blinding and steel	285	Large artic
Plant / fencing / compound set-up	62	Large artic
Crushed rock and sand	86,075	Trucks
Ducting / cabling	765	Large artic
Grid cable laying	65	Large artic
Cranes	11	Large artic
Substation components	79	Large artic
Refuelling / maintenance / misc	56	Large artic
Total	**89,789**	

Table 14-9 Stage 1 – Concrete Turbine foundation pouring – total movements and volumes per delivery day

Material	Total Truck Loads	Truck type	PCU Value	Total PCU's	PCU Movements /day*	2- way PCU's/day
Concrete	1,950	Truck	2.4	4,680	180.0	360.0
* Estimation based on 26 concrete pouring days						

Table 14-10 Stage 1 – Site preparation and groundworks – total movements and volumes per delivery day

Material	Total Truck Loads	Truck type	PCU Value	Total PCU's	PCU Movements /day*	2- way PCU's/day
Concrete (mast foundations)	441	Concrete mixer	2.4	1,058	2.2	4.4
Concrete blinding and steel	285	Large artic	2.4	684	1.4	2.8
Plant / fencing / compound set-up	62	Large artic	2.4	149	0.3	0.6
Crushed rock and sand	86,075	trucks	2.4	206,580	426.8	853.6
Ducting / cabling	765	Large artic	2.4	1,836	3.8	7.6
Grid cable laying	65	Large artic	2.4	156	0.3	0.6
Cranes	11	Large artic	2.4	26	0.1	0.1
Substation components	79	Large artic	2.4	190	0.4	0.8
Refuelling / maintenance / misc	56	Large artic	2.4	134	0.3	0.6
Total	87,839			210,814	435.6	871.1
* Estimation based on ground work period of 484 working days						

14.1.4.1.2 *Stage 2 – Turbine Construction*

During the turbine construction stage, including delivery and assembly, some deliveries to the site will be made by abnormally sized vehicles, referred to in this section as extended articulated HGVs, transporting the large component parts of the turbines (nacelles, 76m blade sections and towers). There will also be deliveries made by standard large HGVs, transporting cables, tools and smaller component parts, including the shorter 9m blade sections. The types of load and associated numbers of trips made to the site during the turbine construction period are shown in Table 14.11, which summarises that a total of 234 trips will be made to and from the site by extended artics, with a further 182 trips made by conventional large articulated HGVs.

Table 14-11 Stage 2 – Wind turbine plant – total movements

Material	Units	Quantity per Unit	Total Quantity	Quantity per Truck	Total Truck Loads	Truck type
Nacelle	26	1	26	1	26	Extended Artic
Blades	26	3	78	1	78	Extended Artic
Towers	26	5	130	1	130	Extended Artic
Sub total					***234***	
Short blade sections	26	3	78	1	78	Large Artic
Transformer	26	1	26	1	26	Large Artic
Drive train and blade hub	26	1	26	1	26	Large Artic
Base and other deliveries	26	2	52	1	52	Large Artic
Sub total					***182***	
Total					**416**	

For the purpose of this assessment an assumed delivery period is provided although this may be subject to change. It is assumed that the turbine delivery element will progress at the rate of 5 extended articulated HGV trips made by convoy to the site on 2 days per week, resulting in this stage taking approximately 47 days/nights spread over an assumed 24 week period. On a further two days per week, lasting for approximately 13 weeks, the remaining equipment required during this phase, including the short sections of the blades (3 per turbine), will be delivered to the site. The additional traffic movements for these 2 types of days are summarised in Table 14.12 and Table 14.13. In Table 14.12, a PCU equivalent value of 10 was allocated to each extended artic movement, resulting in an additional 100 PCU's on the study network on these 2 days per week, while an additional 29 PCU's are forecast to be on the network on two other days per week during the turbine construction phase, as shown in Table 14.13.

Table 14-12 Stage 2 – Wind turbine plant, extended artics – total movements and volumes per delivery day

Material	Units	Truck Type	pcu Value	Total PCU's	2-way PCU's/ day
Nacelle	1	Extended Artic	10	10.0	20.0
Blades	3	Extended Artic	10	30.0	60.0

Material	Units	Truck Type	pcu Value	Total PCU's	2-way PCU's/ day
Towers	5	Extended Artic	10	50.0	100.0
Total per turbine	9			90.0	180.0
Total per delivery day	5			50.0	100.0
*Estimation based on 5 abnormal sized loads being delivered per day on 2 days per week (total 234 loads will take 47 nights spread over 24 weeks)					

Table 14-13 Stage 2 - Wind turbine plant, standard artic HGVs - total movements and volumes per delivery day

Material	Quantity per Unit	PCU Value	2-way PCU's / day
Short sections of blade	3	7.2	14.4
Transformer	1	2.4	4.8
Drive train and blade hub	1	2.4	4.8
Base & other deliveries	1	2.4	4.8
Total	6		28.8
*Estimation based on equipment for 2 turbines being moved per week spread over 2 days			

14.1.4.1.3 *Construction Employee Traffic*

It is estimated that a maximum of 100-120 staff members will be employed on the site at any one time during the site preparation and groundworks stage of construction, reducing to a maximum of 80 staff at any one time during the turbine construction stage. If a worst case is assumed that all staff will travel to / from the site by car, at an average of 2 persons per car, then a total of 120 PCU movements (each trip is two way) will be added to the network during the groundworks stage of the development, reducing to 80 PCU trips during the turbine construction stage.

14.1.4.2 Development Trip Generation – During Operation

It is assumed that the wind farm will be unmanned once operational and will be remotely monitored. Traffic associated with the operational phase of the wind farm will be from the maintenance (Eirgrid, ESB Networks, and developer) personnel visiting the substation, and maintenance personnel who will visit individual turbines.

It is estimated that the traffic volumes that will be generated by the development once it is operational will be minimal. The site will be unmanned but will generate maintenance trips, with approximately two

maintenance staff travelling to site at any one time. The impact on the network of these trips during the operational stage is discussed in Section 14.1.6.

Once operational the site will also attract visitors for amenity purposes, with those travelling by car using the carparks provided via the access off the R156 and off a local road at Bracklin Bog. The locations of the proposed carparks are shown in Appendix 4-4, and include; the Bracklin Car Park (15 spaces), Carranstown Car Park (15 spaces) and Ballivor Car Park (50 spaces). Based on existing Bord na Móna sites it is forecast that on a typical day 30 to 40 car trips will be generated by this use.

14.1.4.3 Turbine Component Delivery Vehicles Construction Traffic Vehicle Types

The delivery of turbine components including blades, tower sections and nacelles is a specialist operation due to the oversized loads involved. The blades are the longest turbine component and in the case of the Proposed Development blade components 76m long have been considered for the purpose of this assessment. The blade length has been fixed at 85m. This will require the use of split blade technology to transport the required blades to the site. Each blade movement will equate to two large component movements.

The actual turbine to be installed on the site will be the subject of a competitive tender process and could include turbines not amongst those originally considered as part of this assessment because they are not yet available on the market. The worst-case scenario of a blade component length of 76m has been assessed and is the maximum regardless of the make or model of the turbine eventually selected for installation on site. A confirmatory delivery assessment and program will be carried out by the turbine delivery company.

The key dimensions are as follows:

Transport of Blades – Super Wing Carrier with blade

Total vehicle and load length	81.4 m
Length of maximum blade component	76.0 m
Inner turning radius	28.0 m

Transport of longest Tower Section – Using low-bed or drop deck trailers

Total vehicle and load length	49.6 m
Length of load	30.0 m
Inner turning radius	25.0 m

The critical vehicles in terms of size and turning swept path requirements and used in the detailed route assessment discussed in Section 14.1.8 and included as Appendix 14.1 are the blade and longest tower section transporters. The geometry of the delivery vehicles are included as Figures 14.4 and 14.5.

The vehicles used to transport the nacelles will be shorter in length compared to the blade and tower transporters.

All other vehicles requiring access to the site will be standard HGVs and will be significantly smaller than the abnormal sized load vehicles.

14.1.5 Traffic Effects During Construction and During Operation

14.1.5.1 Traffic Effect During Construction and During Operation

As detailed below, transportation of large turbine components will be carried out at night when traffic is at its lightest and in consultation with the relevant Roads Authority and An Garda Síochána with deliveries likely accompanied by Garda escort.

Effect on Link Flows – During Construction

Background traffic volumes and development generated traffic volumes are shown for the typical construction day scenarios in Table 14.14 to 14.17, with the traffic effects in Table 14.18 to 14.21. The actual figures presented in the tables will be subject to change, however they are considered to represent a robust estimation of the likely effects.

In terms of daily traffic flows the potential effects are detailed as additional PCU's to the background traffic volumes in the following sections.

It is noted that for the delivery of the turbine related components, the potential impacts are assessed on the turbine delivery route only, Links 1 to 5, as shown in Figure 14-2b, as these deliveries will be restricted to that route. For all other deliveries the impacts are assessed over all potential delivery routes, as shown in Links 1 to 9 as shown in Figure 14-2b.

During Stage 1 – Concrete Pouring

For these 26 days an additional 480 PCU's will travel on the delivery route roads., The percentage increase in traffic volumes experienced on the study network roads will be between 1.3% on the M4 east of Kinnegad, and 64.4% on the R161 between Trim and Doolistown.

During Stage 1 - Site Preparation and Groundworks

On average an additional 991 PCU's will travel on the study network roads during this stage. On these 484 days, the percentage increase in traffic volumes experienced on the study network roads will be between 2.7% on the M4 east of Kinnegad, and 133.0% on the R161 between Trim and Doolistown.

During Stage 2 - Turbine Delivery Stage – Delivery of large equipment using extended articulated vehicles

The additional 180 PCU's (made up of cars and large extended artics) will appear on the delivery route roads for 47 days. On the days this impact occurs, volumes will increase between 0.6% on the M3 south of Dunshaughlin, and 24.2% on the R161 between Trim and Doolistown.

The most significant traffic impact may be experienced during these days primarily due to the slow speeds, size and geometric requirements of these vehicles. The provision of traffic management measures, including ensuring that these deliveries are made at night (as set out in Sections 14.1.7 and 14.1.10.6 and the Traffic Management Plan included as Appendix 14-2 of this EIAR, will be required to minimise the impact of development traffic on the study network on these days.

During Stage 2 - Turbine Construction Stage – Other deliveries using conventional articulated HGVs

For 26 days on the delivery route 109 additional PCU's (made up of cars and standard articulated HGV movements to the site and back) will travel on the study network roads. On the days this impact occurs, volumes will increase between 0.4% on the M3 south of Dunshaughlin, and 14.6% on the R161 between Trim and Doolistown.

Table 14-14 Effects of development traffic during concrete pouring

Link	Background PCU's			Development PCU's			Total PCU's (Background plus Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 M3 south of Dunshaughlin	24,592	6,123	30,715	120	360	480	24,712	6,483	31,195
2 R125	6,268	1,955	8,223	120	360	480	6,388	2,315	8,703
3 R154 (east of Trim)	9,984	3,114	13,097	120	360	480	10,104	3,474	13,577
4 R161 (between Trim and Doolistown)	694	51	745	120	360	480	814	411	1,225
5 R156 (between Doolistown and Ballivor)	4,092	739	4,832	120	360	480	4,212	1,099	5,312
6 M3 north of Dunshaughlin	23,718	5,906	29,624	120	360	480	23,838	6,266	30,104
7 M4 east of Kinnegad	27,218	8,908	36,126	120	360	480	27,338	9,268	36,606
8 M4 Mullingar	22,027	5,101	27,128	120	360	480	22,147	5,461	27,608
9 N52	6,095	1,394	7,489	120	360	480	6,215	1,754	7,969

Table 14-15 Development traffic during site preparation and groundworks

Link	Background PCU's			Development PCU's			Total PCU's (Background plus Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 M3 south of Dunshaughlin	24,592	6,123	30,715	120	871	991	24,712	6,994	31,706
2 R125	6,268	1,955	8,223	120	871	991	6,388	2,826	9,214
3 R154 (east of Trim)	9,984	3,114	13,097	120	871	991	10,104	3,985	14,088

4 R161 (between Trim and Doolistown)	694	51	745	120	871	991	814	922	1,736
5 R156 (between Doolistown and Ballivor)	4,092	739	4,832	120	871	991	4,212	1,610	5,823
6 M3 north of Dunshaughlin	23,718	5,906	29,624	120	871	991	23,838	6,777	30,615
7 M4 east of Kinnegad	27,218	8,908	36,126	120	871	991	27,338	9,779	37,117
8 M4 Mullingar	22,027	5,101	27,128	120	871	991	22,147	5,972	28,119
9 N52	6,095	1,394	7,489	120	871	991	6,215	2,265	8,480

Table 14-16 Development traffic during turbine construction - extended artics (large turbine components)

Link	Background PCU's			Development PCU's			Total PCU's (Background plus Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 M3 south of Dunshaughlin	24,592	6,123	30,715	80	100	180	24,672	6,223	30,895
2 R125	6,268	1,955	8,223	80	100	180	6,348	2,055	8,403
3 R154 (east of Trim)	9,984	3,114	13,097	80	100	180	10,064	3,214	13,277
4 R161 (between Trim and Doolistown)	694	51	745	80	100	180	774	151	925
5 R156 (between Doolistown and Ballivor)	4,092	739	4,832	80	100	180	4,172	839	5,012

Table 14-17 Effect of development traffic during turbine construction – other deliveries (small turbine components)

Link	Background PCU's			Development PCU's			Total PCU's (Background plus Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 M3 south of Dunshaughlin	24,592	6,123	30,715	80	29	109	24,672	6,152	30,824
2 R125	6,268	1,955	8,223	80	29	109	6,348	1,984	8,332

Link	Background PCU's			Development PCU's			Total PCU's (Background plus Development)		
3 R154 (east of Trim)	9,984	3,114	13,097	80	29	109	10,064	3,143	13,206
4 R161 (between Trim and Doolistown)	694	51	745	80	29	109	774	80	854
5 R156 (between Doolistown and Ballivor)	4,092	739	4,832	80	29	109	4,172	768	4,941

Table 14-18 Summary effect of development traffic during concrete pouring

Link	Background	Development	Total	Percentage increase	Estimated No. of days
1 M3 south of Dunshaughlin	30,715	480	31,195	1.6%	26
2 R125	8,223	480	8,703	5.8%	26
3 R154 (east of Trim)	13,097	480	13,577	3.7%	26
4 R161 (between Trim and Doolistown)	745	480	925	24.2%	26
5 R156 (between Doolistown and Ballivor)	4,832	480	5,012	3.7%	26
6 M3 north of Dunshaughlin	29,624	480	30,104	1.6%	26
7 M4 east of Kinnegad	36,126	480	36,606	1.3%	26
8 M4 Mullingar	27,128	480	27,608	1.8%	26
9 N52	7,489	480	7,969	6.4%	26

Table 14-19 Summary effect of development traffic during site preparation and ground works

Link	Background	Development	Total	Percentage increase	Estimated No. of days
1 M3 south of Dunshaughlin	30,715	991	31,706	3.2%	484
2 R125	8,223	991	9,214	12.1%	484

3 R154 (east of Trim)	13,097	991	14,088	7.6%	484
4 R161 (between Trim and Doolistown)	745	991	1,736	133.0%	484
5 R156 (between Doolistown and Ballivor)	4,832	991	5,823	20.5%	484
6 M3 north of Dunshaughlin	29,624	991	30,615	3.3%	484
7 M4 east of Kinnegad	36,126	991	37,117	2.7%	484
8 M4 Mullingar	27,128	991	28,119	3.7%	484
9 N52	7,489	991	8,480	13.2%	484

Table 14-20 Summary effect of development traffic during turbine construction – extended artics (large turbine components)

Link	Background	Development	Total	Percentage increase	Estimated No. of days
1 M3 south of Dunshaughlin	30,715	180	30,895	0.6%	47
2 R125	8,223	180	8,403	2.2%	47
3 R154 (east of Trim)	13,097	180	13,277	1.4%	47
4 R161 (between Trim and Doolistown)	745	180	925	24.2%	47
5 R156 (between Doolistown and Ballivor)	4,832	180	5,012	3.7%	47

Table 14-21 Summary effect of development traffic during turbine construction – other deliveries (small turbine components)

Link	Background	Development	Total	Percentage increase	Estimated No. of days
1 M3 south of Dunshaughlin	30,715	109	30,824	0.4%	26
2 R125	8,223	109	8,332	1.3%	26

3 R154 (east of Trim)	13,097	109	13,206	0.8%	26
4 R161 (between Trim and Doolistown)	745	109	854	14.6%	26
5 R156 (between Doolistown and Ballivor)	4,832	109	4,941	2.3%	26

Assessment of links flows During Construction compared to Link Capacity

An assessment of the impact on link capacities in the study area was undertaken for the various construction stages as set out in Table 14.22, Table 14.23, and Table 14.24. The capacity for each link in the study area is shown in Table 14-22. The capacities range from a daily flow of 52,000 vehicles on the M3 down to 5,000 on the R161 and R156 and are based on road widths and capacities set out in the TII Standards document DN-GEO-03031 Road Link Design, Table 6/1.

It is noted that the link capacities adopted from the TII guidelines correspond to a Level of Service D, which the guidelines describe as being the level where

"Speeds begin to decline slightly with a slight increase of flows and density begins to increase somewhat more quickly. Freedom to manoeuvre within the traffic streams is more noticeably limited, and the driver experiences reduced comfort levels".

Background, or 'do nothing' traffic flows, are compared to flow forecasts for the various construction delivery stages in Table 14.23 with the percentage capacity reached for each link and stage shown in Table 14.24. Based on this assessment the following points are noted;

- On the M3 Motorway the link capacity is forecast to operate at 59% for the do-nothing scenario, increasing to a maximum of 61% during the construction of the proposed development.
- On the regional road network, the R154 is forecast to operate over capacity for the do-nothing scenario at 152%, increasing short term to a maximum of 164% for the 484 days on which general site works and construction is undertaken.
- For the R161 between Trim and Doolistown, background traffic flows are low with forecasts showing that this road will operate at 15% of capacity, increasing short term to a maximum of 35% during the 484 days for general site works and construction.
- Similarly, the R156 is forecast to operate at 92% capacity for the do-nothing scenario, increasing to 112% short term for the 484 days on which general site works and construction is undertaken.

While the background link flows on sections of the regional road network on the delivery route are high, it is noted that the forecast increases due to the construction of the proposed development are manageable and are short term. In terms of the actual effects on the road network more details are provided in the junction capacity assessment discussed below.

Table 14-22 Carriageway widths, road link type and road capacity

Link	Carriageway width (m)	Road type	Road capacity
1 M3 south of Dunshaughlin	2 x 7.0	Motorway 2+2	52,000
2 R125	7.3	Type 1 single (with 2.5m hard shoulders)	11,600
3 R154 (east of Trim)	7.0	Type 2 single (with 0.5m hard strip)	8,600
4 R161 (between Trim and Doolistown)	6.0	Type 3 single(with 0.5m hard strip)	5,000
5 R156 (between Doolistown and Ballivor)	6.0	Type 3 single (with 0.5m hard strip)	5,000
6 M3 north of Dunshaughlin	2 x 7.0	Motorway 2+2	52,000
7 M4 east of Kinnegad	2 x 7.0	Motorway 2+2	52,000
8 M4 Mullingar	2 x 7.0	Motorway 2+2	52,000
9 N52	7.0	Type 1 single	11,600

Table 14-23 Link capacity and summary of link flows by construction material delivery stage

Road	Road capacity	Construction material delivery stage				
		Background traffic (do-nothing)	Concrete pour	Site preparation and groundworks	Turbine plant	Turbine equipment
1 M3 south of Dunshaughlin	52,000	30,715	31,195	31,706	30,895	30,824
2 R125	11,600	8,223	8,703	9,214	8,403	8,332
3 R154 (east of Trim)	8,600	13,097	13,577	14,088	13,277	13,206
4 R161 (between Trim and Doolistown)	5,000	745	1,225	1,736	925	854

Road	Road capacity	Construction material delivery stage				
5 R156 (between Doolistown and Ballivor)	5,000	4,832	5,312	5,823	5,012	4,941
6 M3 north of Dunshaughlin	52,000	29,624	30,104	30,615	NA	NA
7 M4 east of Kinnegad	52,000	36,126	36,606	37,117	NA	NA
8 M4 Mullingar	52,000	27,128	27,608	28,119	NA	NA
9 N52	11,600	7,489	7,969	8,480	NA	NA

Table 14-24 Link capacity and percentage of link capacity by construction material delivery stage

Link	Link capacity	Construction material delivery stage				
		Background traffic (do nothing)	Concrete pour	Site preparation and groundworks	Turbine plant	Turbine equipment
1 M3 south of Dunshaughlin	52,000	59%	60%	61%	59%	59%
2 R125	11,600	71%	75%	79%	72%	72%
3 R154 (east of Trim)	8,600	152%	158%	164%	154%	154%
4 R161 (between Trim and Doolistown)	5,000	15%	25%	35%	19%	17%
5 R156 (between Doolistown and Ballivor)	5,000	97%	106%	116%	100%	99%
6 M3 north of Dunshaughlin	52,000	57%	58%	59%	NA	NA
7 M4 east of Kinnegad	52,000	69%	70%	71%	NA	NA
8 M4 Mullingar	52,000	52%	53%	54%	NA	NA

Link	Link capacity	Construction material delivery stage				
9 N52	11,600	65%	69%	73%	NA	NA

Effect on Link Flows – During Operation

Once the wind farm is operational it is estimated that approximately two maintenance staff will access the site at any particular time, to carry out operational maintenance, with a similar number of vehicle trips. It is considered that the traffic impact during this phase will be negative and long term but will be imperceptible.

Effect on Junctions – During Construction

The capacity of the study area junction most affected, the R161 / R156 junction, was assessed using the industry standard junction simulation software PICADY, which permits the capacity of any junction to be assessed with respect to existing or forecast traffic movements and volumes for a given period. The capacity for each movement possible at the junction being assessed is determined from geometric data input into the program with the output used in the assessment as follows:

- Queue – This is the average queue forecast for each movement used to assess impacts on adjacent junctions.
- Degree of Saturation or Ratio of Flow to Capacity (% Sat or RFC) –This offers a measure of the amount of available capacity being utilised for each movement. Ideally each movement should operate at a level of no greater than 85% of capacity.
- Delay – Output in minutes, this gives an indication of the forecast average delay during the time period modelled for each movement.

Scenarios Modelled

While other junctions and links on the network will experience an increase in traffic volumes passing through them, as discussed previously and as set out in Table 14.18 to 14.22 above, the worst-case effect will be experienced during peak hours when, during peak construction periods, up to 120 workers (60 cars) will pass through it. It is noted that deliveries of materials to the site will take place during the day after the workers have arrived on site, and before they leave at the end of the day, and will therefore not occur at the same time.

R161 / R156 junction Capacity Test Results

The AM and PM peak hour traffic flows through the R161 / R156 junction are shown for the year 2026 in Figure 14.3a, with background traffic flows for the assumed construction year of 2026 shown in Figure 14.3b. Traffic flows generated by the proposed development during the AM and PM peak hours are shown in Figure 14.3c while the year 2026 traffic flows with development generated traffic are shown in Figure 14.3d.

The results of the capacity assessment, as set out in Table 14.25, show that additional trips passing through the junction will have a slight effect, increasing the maximum ratio of flow to capacity (RFC) at the junction for the traffic movements impacted from 4.5% to 12.3% in the AM peak hour (for traffic accessing the R156 from the R161), and from 9.0% to 17.1% during the PM peak hour (for the same movement). For the year 2026 scenario including construction traffic generated by the proposed development, the maximum RFCs for the AM and PM peak hours are 12.3% and 17.1% respectively, which are within the acceptable limit provided by TII of 85%.

Table 14-25 Junction capacity test results, R161 / R156 junction, AM and PM peak hours, without and with construction staff, year 2026

Period	Movement	Without construction traffic			With construction traffic		
AM		RFC	Queue (vehicles)	Delay (minutes)	RFC	Queue (vehicles)	Delay (minutes)
	From R161	4.5%	0.05	0.15	12.3%	0.14	0.17
	Right turn from R156	0.7%	0.01	0.13	0.7%	0.01	0.14
PM		RFC	Queue (vehicles)	Delay (minutes)	RFC	Queue (vehicles)	Delay (minutes)
	From R161	9.0%	0.10	0.15	17.1%	0.20	0.18
	Right turn from R156	0.9%	0.01	0.12	0.9%	0.01	0.13

Effect on Junctions – During Operation

As discussed in Section 14.1.6 it is forecast that once operational, the development will generate approximately 2 trips per day for maintenance purposes. It is therefore concluded that the development will not have a significant effect on the local network once constructed.

14.1.6 Traffic Management of Large Deliveries

Traffic management measures for the abnormally sized vehicles are included in Section 14.1.10.6 and include the following:

- Identification of a delivery schedule,
- Details of the alterations required to the infrastructure identified in Section 13.1.8 of this report and any other minor alteration identified (hedge rows etc),
- A dry run of the route using vehicles with similar dimensions.

The transport of large components is challenging and can only be done following extensive route selection, route proofing and consultation with An Garda Síochána and the various local authorities. Turbine components are usually transported at night when traffic is lightest and this is done in consultation with the roads authorities / An Garda Síochána and special permits are generally required.

In some cases, temporary accommodation works are required along the turbine delivery route (TDR) such as hedge or tree cutting, temporary relocation of powerlines/poles, telegraph lines/poles, lampposts, signage and minor road verge works. Any updates to the road will be carried out in advance of turbine deliveries and following consultation and agreement with the appropriate local authorities and service providers.

It is not anticipated that any sections of the local road network will be closed, although there may be delays to local traffic at various locations if the deliveries are made during daylight hours. During these

periods, it may be appropriate to operate local diversions for through traffic. The effect of this stage may be minimised by the deliveries of the abnormally sized large loads taking place during the night. It is noted that it is proposed that all deliveries of abnormally sized loads will be made during night time hours, as is normal for such deliveries.

14.1.7 Route Assessment

A route assessment was undertaken covering the proposed delivery route for the abnormal loads, with the route and assessment locations shown in Figure 14.2a. The preliminary route assessment discussed in this section, which was undertaken by Collett & Sons Ltd and is included as Appendix 14-1, indicates that the optimum route to the site would be via the M3, the R125 and R154 to Trim, followed by the R161 and R156 towards the site. This route was therefore selected as the transport route for the abnormal loads. All locations along the route referred to in this section are highlighted in Figure 14.2a. An assessment of the turning requirements (swept path analysis) of the abnormally sized loads was then undertaken at each location identified using Autotrack, in order to establish the locations where the wind turbine transport vehicles will be accommodated, and the locations where some form of remedial measure may be required. The autotrack assessments undertaken by Collett & Sons Ltd are included for each location in Appendix 14.1.

The assessment also presents the preliminary design of the proposed site access junctions (access junction A serving the site to the north of the R156, access junction B, serving the site to the south of the R156 and access junction C, the crossing point between the Bracklin and Lisclogher bogs), and the swept path analysis for the appropriate vehicle types relevant to each access.

The locations discussed are as follows;

- Location 1 – M3 Junction 6 / R125 Roundabout,
- Location 2 – R125 / R154 Roundabout,
- Location 3 – R154 Roundabout approaching Trim,
- Location 4 – R154 / R160 Roundabout Bypass, Trim,
- Location 5 – Double bend on Patrick Street, Trim,
- Location 6 – R161 / R156 priority Junction,
- Location 7 – Bridge over River Boyne, R156,
- Location 8 – Left hand bend on R156,
- Location 9 – Right hand bend on R156,
- Location 10 – Access junction A and B on R156.
- Location 11 – Access junction C on local unnamed road

14.1.7.1 Access to the Wind Farm site via M3, R125, R154, R161 and R156

The following text summarises the findings of the swept path analysis for Locations 1 to 9 undertaken by Collett & Sons Ltd and included as Appendix 14-1. The preliminary design and swept path analysis for Site Access Junctions A and B, situated at location 10, were prepared by Alan Lipscombe Traffic and Transport Ltd.

Location 1 – M3 Junction 6 / R125 Roundabout

See Drawing No 333697-10B1.1

The swept path analysis undertaken for this location indicates that an area of the centre island of the roundabout together with a small area on the southeast approach to the roundabout will be required to be levelled and surfaced in order to accommodate the 76m blade transporter. The temporary removal

of some road signs will also be required while the deliveries of the abnormally long loads are being made to the site.

Location 2 – R125 / R154 Roundabout

See Drawing No 333697-20B1.1

Similarly, the swept path analysis undertaken for this location also shows that an area of the centre island of the roundabout, together with the traffic island located at the north western exit onto the R154 arm of the roundabout, will require to be levelled and surfaced in order to accommodate the 76m blade transporter. The temporary removal of some road signs will also be required.

Location 3 – R154 Roundabout approaching Trim

See Drawing No 333697-30B1.1

A strip of the centre island will be required to facilitate the delivery of the abnormal loads and the temporary removal of some road signs will also be required at this location.

Location 4 – R154 / R160 Roundabout Bypass, Trim

See Drawing No 333697-410B1.1

The abnormally sized loads will require to use the bricked area on the approach to this road. The street furniture, planters and road signs will require to be temporarily removed at this location. Moving west a telegraph pole and a road sign on the north side of the road will require to be moved, and bollards on the southern side, will also require to be removed temporarily during the delivery stage.

Location 5 – Double Bend on Patrick Street

See Drawing No 333697-420B1.1

The swept path analysis undertaken for this location indicates that temporary road widening will required on the northern side of the first (eastern) bend. A lamp post at the same location, and vegetation on the northern side of the road, will require to be relocated during the delivery of the abnormal loads. At the western bend on Patrick Street a lamp post on the northern side of the road and zebra crossing lights and poles will also require to be temporarily removed.

Location 6– R161 / R156 Junction

See Drawing No 333697-430B1.1

An area of third party land on the southern side of the R156 is required in order for the abnormally sized loads to negotiate this location. It is proposed that the vehicles transporting the abnormally sized loads will travel south on the R161 and over-run the R161 into this area that will require to be surfaced. The vehicles will then reverse back onto the R158 before driving west forward in a north western direction on the R161. At this location 2 telegraph poles, one sign post, one road sign, a section of fence and section of hedgerow will also require to be temporarily removed during the transportation of the large turbine components to the site.

Location 7 – Bridge over River Boyne on R156

See Drawing No 333697-130B1.1,

In the horizontal plane various trees will require to be pruned and the blade will require to oversail the bridge parapets.

Location 8 – Left hand bend on R156

See Drawing No 333697-140B1.1

An area of third party land on the north west corner of this sharp bend on the R156 is required in order for the abnormally sized loads to negotiate this location. The figure also shows that road widening (at the same location) and the temporary removal of a telegraph poles, trees, vegetation and traffic signs will also be required during the delivery stage.

Location 9 – Right hand bend on R156

See Drawing No 333697-150B1.1

A narrow strip of road widening on the north side of the R156 is required for the delivery stage. The figure also shows that the temporary removal of a gate, telegraph poles, trees, vegetation and traffic signs will also be required.

Locations 10 – Site Access Junctions A and B on the R156

Information relating to the proposed Ballivor Wind Farm Access junctions A and B are set out in the following figures;

- *Figure 14.6 Access junctions A and B on the R156, proposed junction layouts,*
- *Figure 14.7 Access junctions A and B on the R156, proposed junction layouts and visibility splays (horizontal - 3m x 160m),*
- *Figure 14.8 Access junctions A and B on the R156, proposed junction layouts and visibility splays (vertical - 3m x 160m, taken from driver height of 1.05m to object height of 1.05m),*
- *Figure 14.9 Access junctions A and B on the R156, proposed junction layouts, autotrack assessment for blade transporter (75m blade)*
- *Figure 14.10 Access junctions A and B on the R156, proposed junction layouts, autotrack assessment for tower transporter*
- *Figure 14.11 Access junctions A and B on the R156, proposed junction layouts, autotrack assessment for standard large articulated HGV*

The following principles were adopted during the design of the access junctions;

- The junctions would require to provide access to the northern and southern sites for all vehicle types and for all development phases, including construction, operational, plant replacement and decommissioning,
- The delivery of the abnormal loads associated with the transportation of the turbine blades, towers and nacelles will be done accompanied by a Garda escort,
- All other trips gaining access to the site will do so unaccompanied and will require junction designs to be fully compliant with TII design standards.
- Based on an existing designated speed limit of 80 km/h, visibility splays in the horizontal plane taken from a setback of 3m to 160 meters along the nearside carriageway edge are required (Refer to DN-GEO-03060 – Geometric Design of Junctions, TII, April 2017, Table 5.5),
- For the extent of the above, visibility splays in the vertical plane should be available for a driver height of 1.05m to an object height of 1.05m (Refer to DN-GEO- 03031),

- The access to the northern and southern parts of the site should not form a crossroads type layout with the R156 (Refer to DN-GEO-03060 – Geometric Design of Junctions, TII, April 2017, Section 5.3.4) and should form a staggered layout with traffic travelling between the 2 sites making right out, followed by left in movements, as opposed to left out followed by right in movements (Refer to DN-GEO-03060 – Geometric Design of Junctions, TII, April 2017, Figure 5.6).
- The location of Access junction B serving the southern site is determined by the existing 3rd party boundary fence / hedge located to the east of the site (as highlighted in Figures 14.6 and 14.7), and the requirement for the 3m x 160m visibility splay to clear the boundary.
- The location of Access junction A that serves the northern site is staggered from Junction B, with a separation of 65m.

The junction geometry provided for general construction traffic and for when the wind farm is operational is shown in Figure 14.6 and is in accordance with (refer to DN-GEO-03060 – Geometric Design of Junctions, TII, April 2017), Figure 5.19 with 13m junction radii and 1:10 tapers over a length of 25m provided for left in and left out movements. The figure also shows the temporary over-run areas required during the turbine delivery stage.

The visibility splays required in the vertical plane, taken form a driver height of 1.05m to an object height of 1.05m, are shown in Figure 14.8. The forward visibility for general traffic on the R156 is also indicated. As was observed on site, visibility in the vertical plane is currently impacted by a trough and rise in the road located between the proposed Access Junctions A and B. The assessment of the vertical alignment shown in Figure 3 indicates that a 44m section of the R156 impacts on required sightlines with a maximum reduction in level of 0.47m required. The vertical alignment will be designed and agreed with County Westmeath prior to the construction phase of the Proposed Development.

Figures 14.9 to 14.11 demonstrate that the proposed Access Junctions A and B will accommodate the swept path requirements of the 76m blade transporter and the tower transporter using the temporary over-run areas, and within the boundary of the permanent junction alignments with respect to standard articulated HGVs.

Locations 11 – Site Access Junction C on local unnamed Road

This junctions will be used for construction traffic crossing the unnamed local road during the construction if the Proposed Development. The movement of traffic road during the construction phase will be managed by site staff at all times. There will be no construction traffic accessing the site via the unnamed local road.

Once operational members of the public wishing to access the site for recreational purposes will access the proposed Bracklin Carpark from this junction. The proposed junction layout and visibility splays (3m x 90m) are shown in Figure 14-12.

14.1.8 Provision for Sustainable Modes of Travel

14.1.8.1 Walking and Cycling

The lack of continuous footpaths linking the site with neighbouring urban centres results in walking to the site not being a feasible mode of travel for construction staff to the site. While there are no cycle lanes on the surrounding network, travel by bicycle will be a feasible mode of transport for members of staff living close to the site. Bike racks will be provided in the amenity carparks for any staff and members of the public (once operational), wishing to cycle to the site.

14.1.8.2 Public Transport

There are no public transport services that currently pass the site. Mini-buses provided by the contractor may be considered for transporting construction staff to and from the site in order to minimise traffic generation and parking demand on site.

14.1.9 Likely and Significant Effects and Associated Mitigation Measures

14.1.9.1 "Do Nothing" Scenario

If the proposed wind farm does not proceed, there will be no additional traffic generated or accommodation works carried out on the local road network and therefore no direct effects on roads and traffic.

14.1.9.2 Construction Phase

During the 26 days of Construction Stage 1 when the concrete foundations are poured the effect on the surrounding road network will be negative, resulting in an increase in traffic levels ranging from 1.6% on the M3 to an increase of 64.4% on the R161 between Trim and Doolistown. The effect will be negative, will be temporary and will be slight.

During the remaining 484 days of Construction Stage 1 for the site preparation and ground works when deliveries to the site will take place, the effect on the surrounding road network will be negative, resulting in an increase in traffic levels ranging from 3.2% on the M3, to an increase of 133.0% on the R161 between Trim and Doolistown. While the percentage increase at this location is high, it is accentuated by the relatively low background traffic volume. On these days, the effect will be negative, will be short term and will be slight.

During the 47 days of Construction Stage 2 when the abnormally sized component parts of the wind turbine plant are delivered to the site using extended articulated HGVs, the effect of the additional traffic on these days will be moderate due to the size of vehicles involved, resulting in increased traffic volumes of between 0.6% on the M3 to 24.2% on the R161 between Trim and Doolistown, but will be temporary. The effect may be reduced to slight if the delivery of the large plant is done at night, as is proposed. The impacts will be negative and temporary lasting for 47 days.

During the 26 days of the Construction Stage 2 when the smaller sections of the blades and other smaller components for the turbines are delivered to the site by means of standard HGVs, the additional traffic generated will result in a negative impact on the surrounding road network, increasing traffic levels, ranging from 0.4% on the M3, to an increase of 14.6% on the R161 between Trim and Doolistown. The effect during this period will be negative will be temporary lasting for 26 days, and will be slight.

14.1.9.3 Operational Phase

During the operational phase the direct effect on the surrounding local road network will be neutral and long term given that there will be approximately two maintenance staff travelling to site at any one time, resulting in typically two visits to the site on any one day made by a car or light goods vehicle.

Should the proposed wind farm be consented and developed, the recreational and amenity proposals set out in Chapter 4 will be implemented which means that there will be some levels of traffic accessing the site for amenity use during the operational stage. This traffic will access the site via the R156 where there are amenity car parks proposed north (Carranstown Car Park) and south (Ballivor Car Park) of the R156, and via the unnamed local road (Bracklin Car Park). The location of the car parks are shown in Appendix

4-4. The volumes are likely to be small (up to 40 car trips on a typical day and potentially 70 on weekends) based on information from other similar Bord na Móna facilities. It is noted that the peak weekend trip generation estimate is based on recreational events that currently take place. Given the capacity of the local road network there is no significant effects anticipated on roads and traffic.

14.1.9.4 Decommissioning Phase

The design life of the wind farm is 30 years. If the site is decommissioned, cranes will disassemble each turbine tower and all equipment.

All turbine infrastructure including turbine components will be separated and removed off-site for re-use, recycling and waste disposal.

It is proposed that turbine foundations and hardstanding areas will be left in place and covered with soil/topsoil. It is proposed to leave the access roads in situ at the decommissioning stage as these are likely to continue to be used for amenity purposes. It is considered that leaving the turbine foundations, access tracks and hardstanding areas in situ will cause less environmental damage than removing and recycling them. However, if removal is deemed to be required all infrastructure will be removed with mitigation measures similar to those during construction being employed.

After decommissioning, the areas around the turbine bases and other disturbed areas will be encouraged to revegetate naturally and will be backfilled with peat and spoil similar to that removed during excavation so as to allow natural recolonisation.

14.1.9.5 Cumulative Effects

A detailed assessment of all developments at varying stages in the planning process (from pre-planning to operational), is set out in Section 2.6 of this EIAR, with an assessment of the potential cumulative traffic effects with the proposed subject wind farm assessed on the following criteria;

- Project status (proposed to operational)
- Degree of overlap with the Proposed Development delivery highway network (low to high)
- Traffic volumes (low to high)

The development or activities that were considered to have potential cumulative impacts with the proposed wind farm development in terms of traffic impacts are in Table 14.26.

All other wind farm developments located within a 20km radius and shown in Figure 2-3 are also listed in Table 14.26. It is noted that the proposed turbine delivery route for the neighbouring Bracklyn Wind Farm development which comprises of 9 turbines, is from the west via the N52, rather than from the M3 and the east for the proposed Ballivor Wind Farm. It is likely that the routes used for general materials, including sand and stone, will overlap. In the event that the proposed Ballivor Wind Farm Development is constructed at the same time as the Bracklyn Wind Farm it is forecast that there will be a temporary and moderate level of cumulative impact. This will be avoided by engaging with 3rd party project developer to ensure that there is not a significant overlap during the construction phases for these 2 developments through careful scheduling of deliveries to each site and with agreement of the relevant county councils.

Reference was also made in the preparation of this assessment to other planning applications as set out in Chapter 2.

Table 14.26 Summary of projects considered in cumulative assessment and potential for cumulative traffic effects with proposed Ballivor Wind Farm

Project	Status	Degree of overlap of highway network (low / medium / high)	Traffic volumes (low / medium / high)	Potential cumulative traffic effects
1. Bracklyn Wind Farm, 9 turbines (Pre application)	Granted	Medium	Medium	Moderate
Yellow river Wind Farm, 25 turbines	Granted	Low	Medium	Slight

14.1.9.6 Mitigation Measures

This section summarises the mitigation measures to minimise the effects of the Proposed Development during both the construction and operational stages.

Mitigation by Design

Mitigation by design measures includes the following;

- Selection of the most appropriate delivery route to transport the wind turbine components, requiring the minimum remedial works to accommodate the vehicles as set out in Section 14.1.8.
- Construction of temporary improvements to the local highway network at locations identified in Section 14.1.8.

Mitigation Measures During the Construction Stage

The successful completion of this development will require significant coordination and planning and it is therefore recommended that the following comprehensive set of mitigation measures will be put in place before and during the construction stage of the project in order to minimise the effects of the additional traffic generated by the proposed wind farm.

Scheduling of construction program

There will be a commitment from the Applicant to ensure that there is no significant overlap of the construction phase of the Proposed Development with any of the developments where it considered that there is the potential for cumulative impacts.

Use of material from borrow pits

The traffic impact assessment presented in the section of the EIAR is based on the conservative assumption that all stone and aggregate required during the construction of the Proposed Development will be delivered to the site from external quarries. In practice it is proposed that as much material that is suitable will be won from the on-site borrow pits. This will significantly reduce the number of HGV trips generated during the construction phase.

Delivery of abnormal sized loads

The following are the main points to note for these deliveries which will take place after peak evening traffic:

- The delivery of turbine components is a specialist transport operation with the transportation of components carried out at night when traffic is at its lightest and the impact minimised.
- The turbine component deliveries will be made in consultation with the Local Authority and An Garda Síochána.
- It is estimated that 234 abnormal sized loads will be delivered to the site, comprising 47 convoys of 5 abnormal vehicles and loads, undertaken over 47 separate nights.
- These nights will be spread out over an approximate period of 24 weeks and will be agreed in advance with the relevant authorities.
- In order to manage each of the travelling convoys, for each convoy there will be two police escort vehicles that will stop traffic at the front and rear of the convoy of 5 vehicles.
- There will also be two escort vehicles provided by the haulage company for each convoy.

Other traffic management measures

A **Traffic Management Plan (TMP** is included as Appendix 14-2, which provides details relating to traffic management measures during the construction of the Proposed Development. A Detailed Traffic Management Plan will be included in the CEMP prior to the commencement of the construction phase of the proposed development. The detailed TMP will be agreed with the local authority and An Garda Síochána prior to construction works commencing on site. The detailed TMP will include the following:

- **Traffic Management Coordinator** – a competent Traffic Management Co-ordinator will be appointed for the duration of the project and this person will be the main point of contact for all matters relating to traffic management.
- **Delivery Programme** – a programme of deliveries will be submitted to the County Council in advance of deliveries of turbine components to site. Liaison with the relevant local authorities and Transport Infrastructure Ireland (TII) will be carried out where required regarding requirements such as delivery timetabling. The programme will ensure that deliveries are scheduled in order to minimise the demand on the local network and minimise the pressure on the access to the site.
- **Information to locals** – Locals in the area will be informed of any upcoming traffic related matters e.g. temporary lane/road closures (where required) or delivery of turbine components at night, via letter drops and posters in public places. Information will include the contact details of the Project Co-ordinator, who will be the main point of contact for all queries from the public or local authority during normal working hours. An "out of hours" emergency number will also be provided.
- **A Pre and Post Construction Road Condition Survey –** Where required by the local authority, a visual pre-condition survey of roads associated with the proposed development can be carried out immediately prior to construction commencement to record an accurate condition of the road at the time. A visual post construction survey will be carried out after works are completed. These surveys will involve capturing georeferenced imagery of the road surface. The pre- and post- condition images will be compared, and the required remediation or re-instatement works agreed with the local authority. Images of the post-remediation works will be provided to the local authority to confirm the work has been carried out to the satisfaction of their engineers. The timing of these surveys will be agreed with the local authority.
- All road surfaces and boundaries will be re-instated to pre-development condition, as agreed with the local authority engineers.

- **Liaison with the relevant local authority** - Liaison with the County Council and An Garda Síochána, will be carried out during the delivery phase of the large turbine vehicles, when an escort for all convoys will be required. Once the surveys have been carried out and "prior to commencement" status of the relevant roads established, (in compliance with the provisions of the CEMP), the Roads section will be informed of the relevant names and contact numbers for the Project Developer/Contractor Site Manager as well as the Site Environmental Manager.
- **Implementation of temporary alterations to road network at critical junctions** – at locations highlighted in section 14.1.8. In addition, in order to minimise the impact on the existing environment during turbine component deliveries the option of blade adaptor trailers will also be used where deemed practicable.
- **Identification of delivery routes** – These routes will be agreed with the County Council and adhered to by all contractors.
- **Delivery times of large turbine components** - The management plan will include the option to deliver the large wind turbine plant components at night in order to minimise disruption to general traffic during the construction stage.
- **Travel plan for construction workers** – While the assessment above has assumed the worst case in that construction workers will drive to the site, the construction company will be required to provide a travel plan for construction staff, which will include the identification of routes to / from the site and identification of an area for parking.
- **Improvements to the R156** – Proposed improvements to the vertical alignment of the R156 adjacent to the access junctions A and B.
- **Additional measures** - Various additional measures will be put in place in order to minimise the effects of the development traffic on the surrounding road network including wheel washing facilities on site and sweeping / cleaning of local roads as required. These are set out in the CEMP which is contained in Appendix 4.3.
- **Re-instatement works** - All road surfaces and boundaries will be re-instated to pre-development condition, as agreed with the local authority engineers.

Mitigation Measures During Operational Stage

Due to the very low volumes of traffic forecast to be generated during this stage no mitigation measures are required. However, the improvements to the R156, the junctions on the R156 and on the unnamed local road and the 3 amenity carparks, will remain in place for the benefit of general traffic on the R156 and for those visiting the site for amenity purposes.

Mitigation Measures During Decommissioning Stage

In the event that the Proposed Development is decommissioned after the 30 years of operation, a decommissioning plan, including material recycling / disposal and traffic management plan will be prepared for agreement with the local authority. This plan will contain similar mitigation measures to those implemented during the construction phase.

14.1.9.7 Residual Impacts

Construction Stage

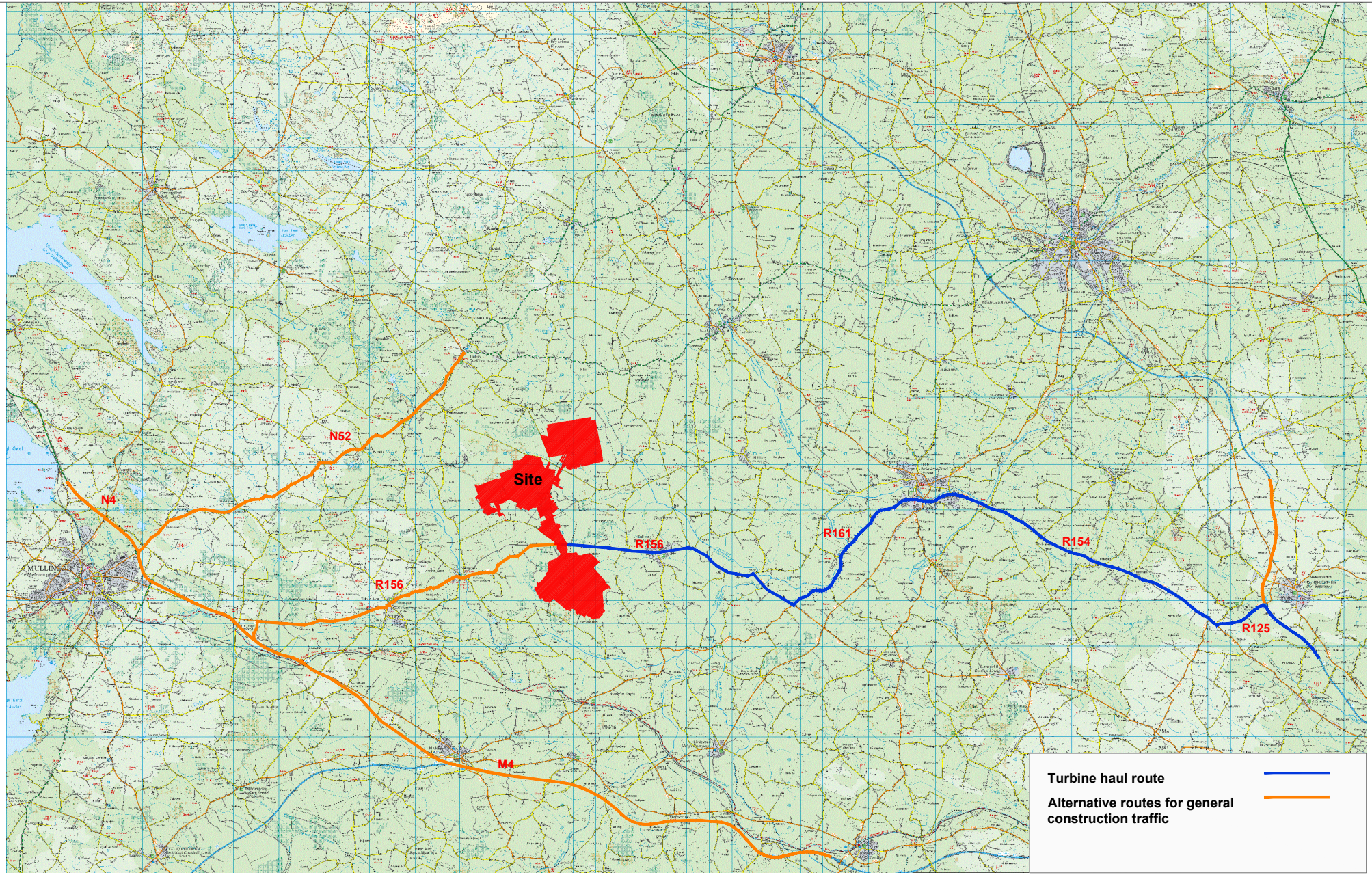
During the 24-month construction stage of the Proposed Development, it is forecast that the additional traffic that will appear on the delivery route indicated in Figure 14.2a will have a slight, negative and temporary impact on existing road users, which will be minimised with the implementation of the mitigation measures included in the proposed traffic management plan.

Operational Stage

While there will be recreational trips to and from the site, they are relatively low in volume, and many trips already take place at present As the traffic impact of the optimised development will be imperceptible during the operational stage, there will be no residual impacts during this stage.

Decommissioning Stage

As stated above, in the event that the wind farm is decommissioned a decommissioning plan will be prepared and implemented in order to minimise the residual impacts during this stage.



NOTES:

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Figure 14-1 Site location and delivery routes

PROJECT:	Ballivor Wind Farm, Counties Meath & Westmeath		
CLIENT:	Bord na Mona	SCALE:	NTS
PROJECT NO: 8560	DATE: 22.03.23	DRAWN BY:	AL

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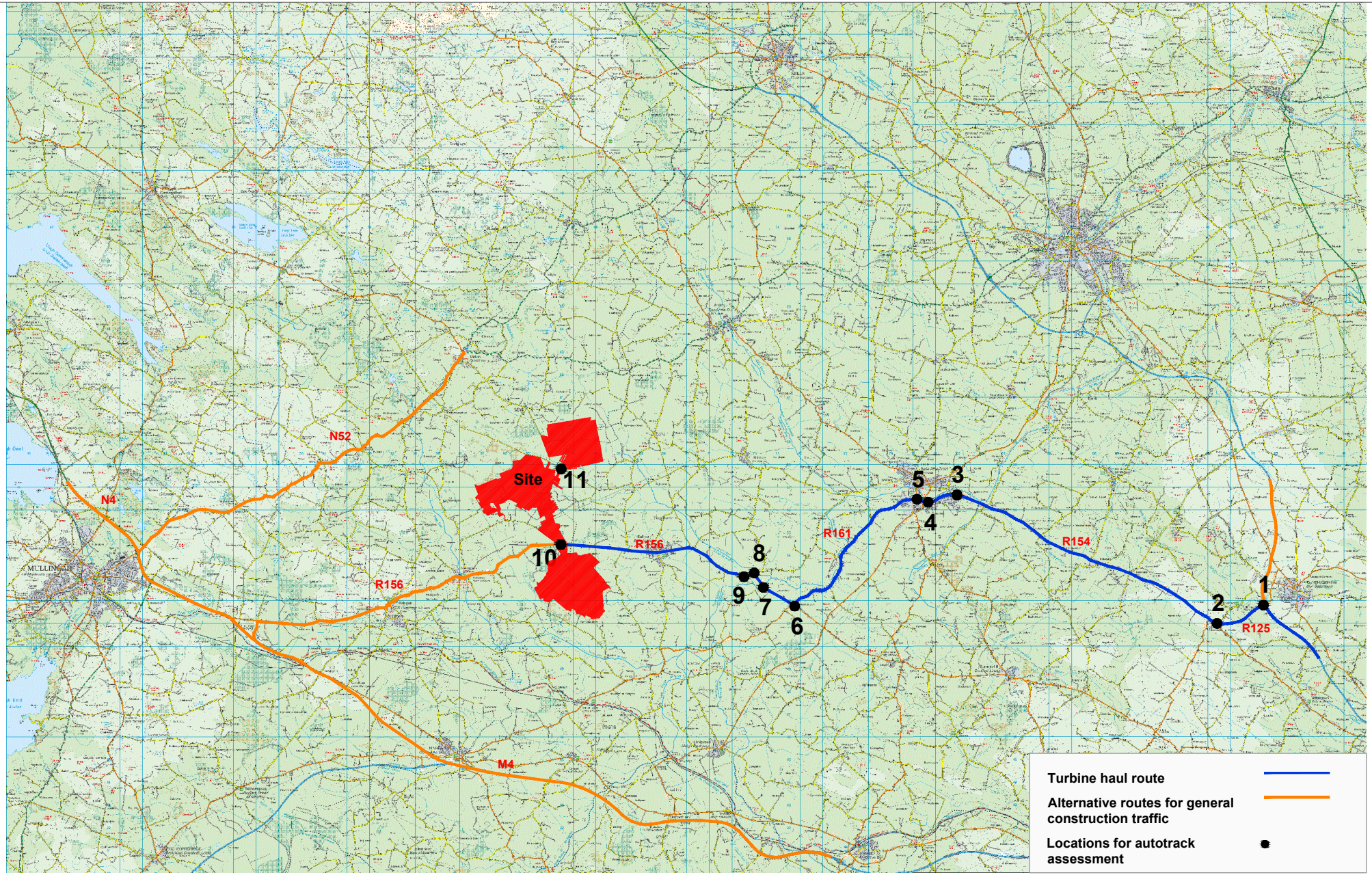

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Figure 14-2a Route assessment location map

PROJECT:	Ballivor Wind Farm, Counties Meath & Westmeath		
CLIENT:	Bord na Mona	SCALE:	NTS
PROJECT NO: 8560	DATE: 22.03.23	DRAWN BY:	AL

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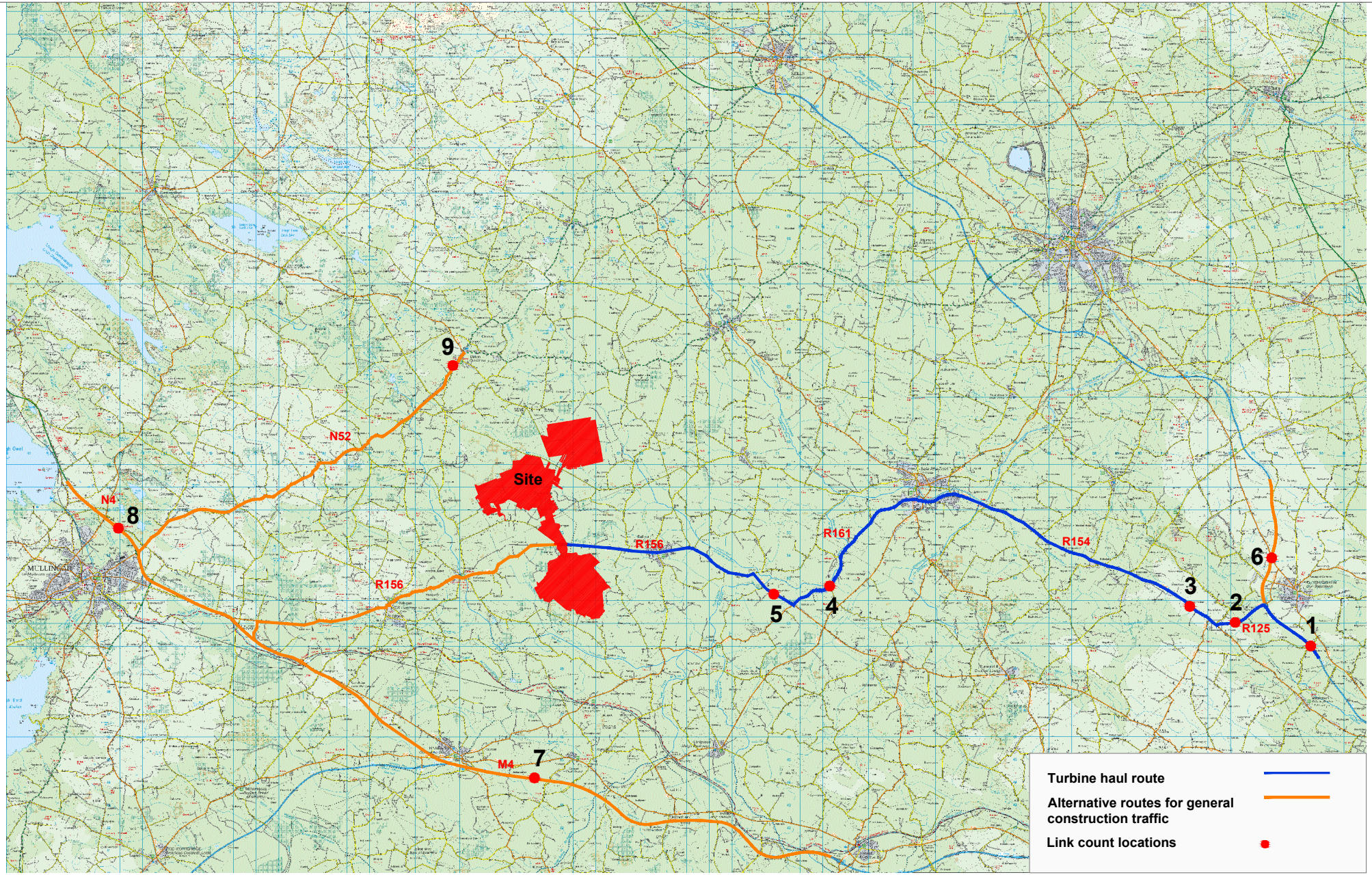

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Figure 14-2b Link count locations

PROJECT:	Ballivor Wind Farm, Counties Meath & Westmeath		
CLIENT:	Bord na Mona	SCALE:	NTS
PROJECT NO: 8560	DATE: 22.03.23	DRAWN BY:	AL

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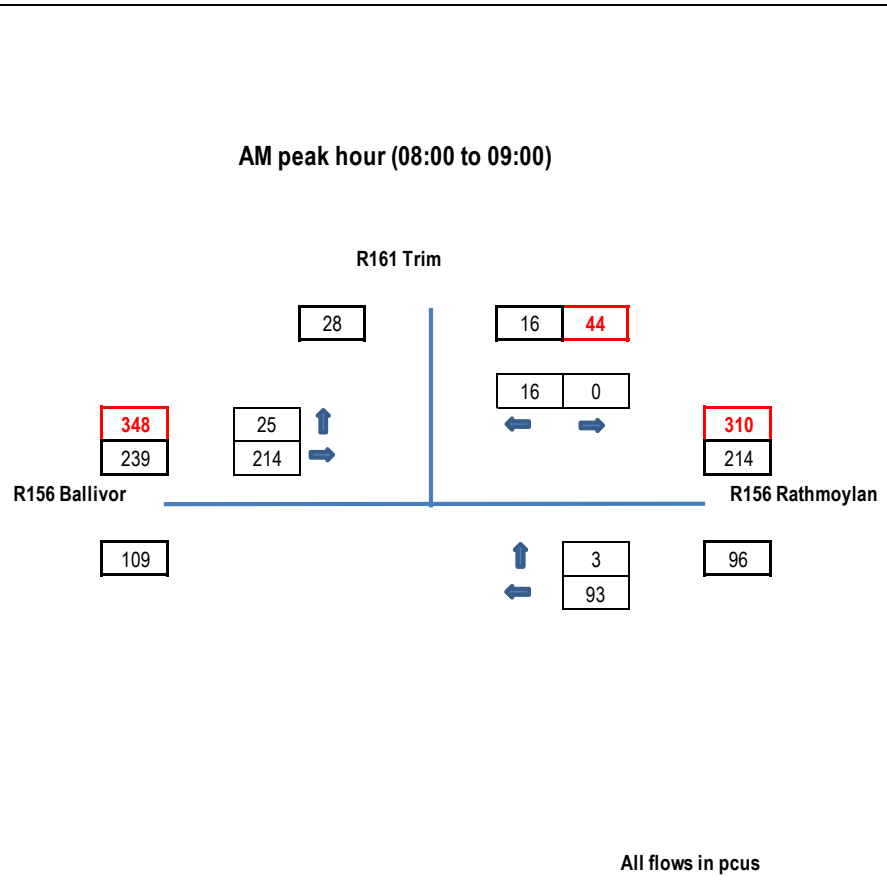

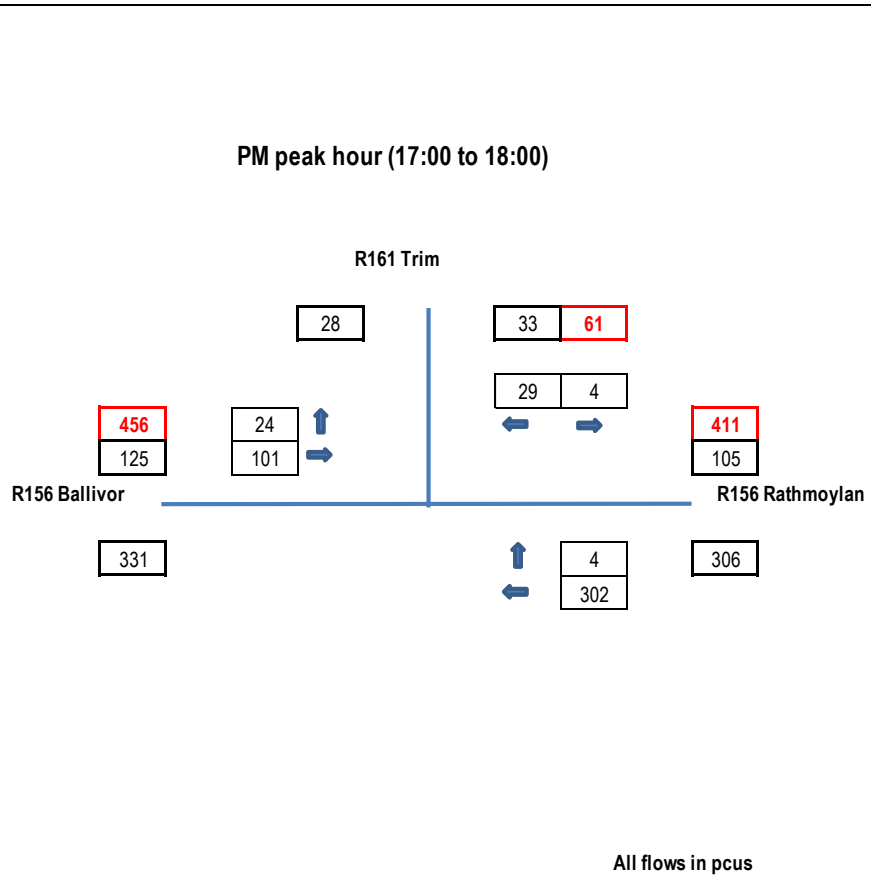

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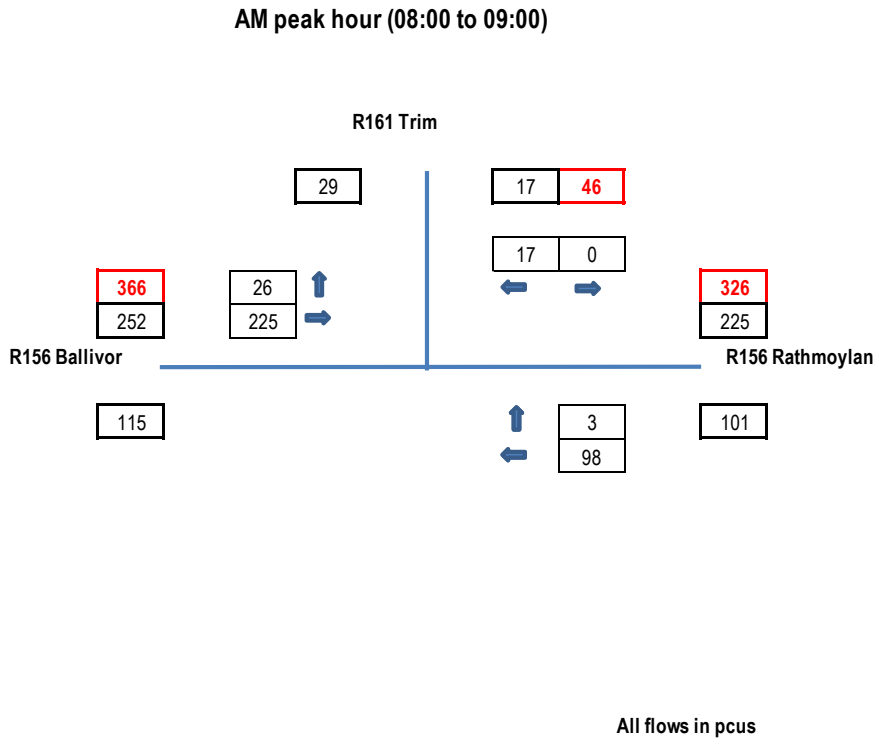
Figure 14-3a Observed traffic flows, AM and PM peak hours, R161 / R156 junction Tuesday 7th March 2023



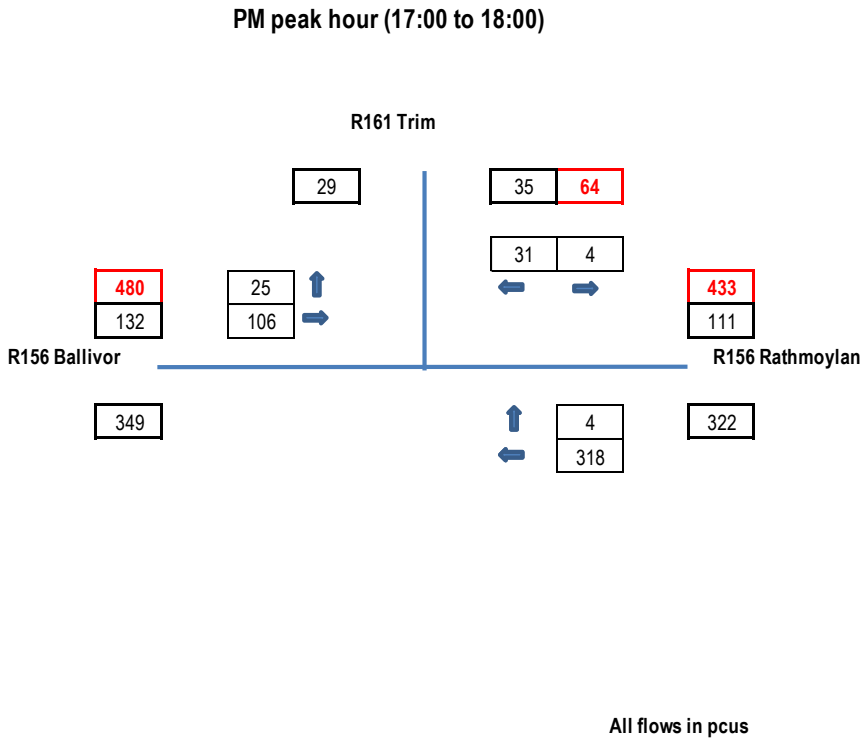


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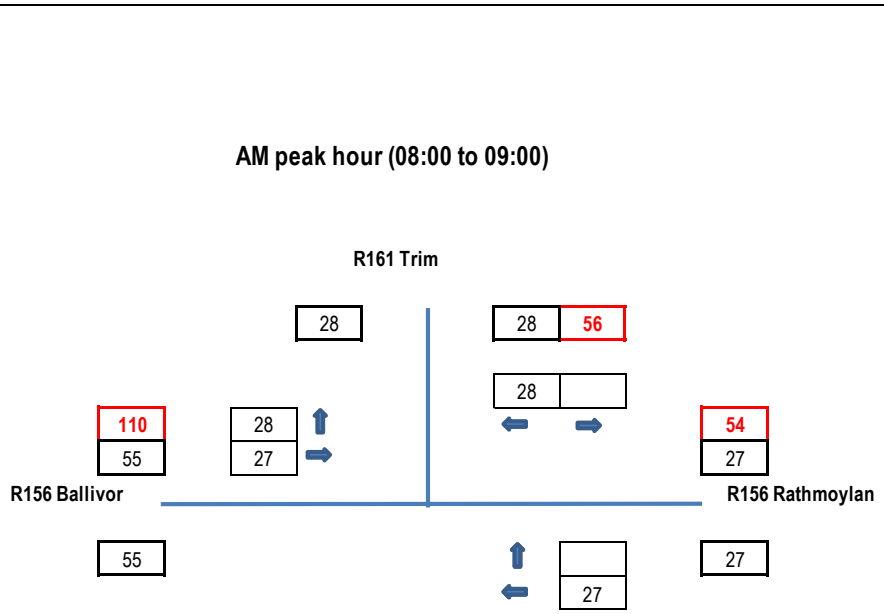
Figure 14-3b Forecast traffic flows, AM and PM peak hours, R161 / R156 junction, factored to 2026



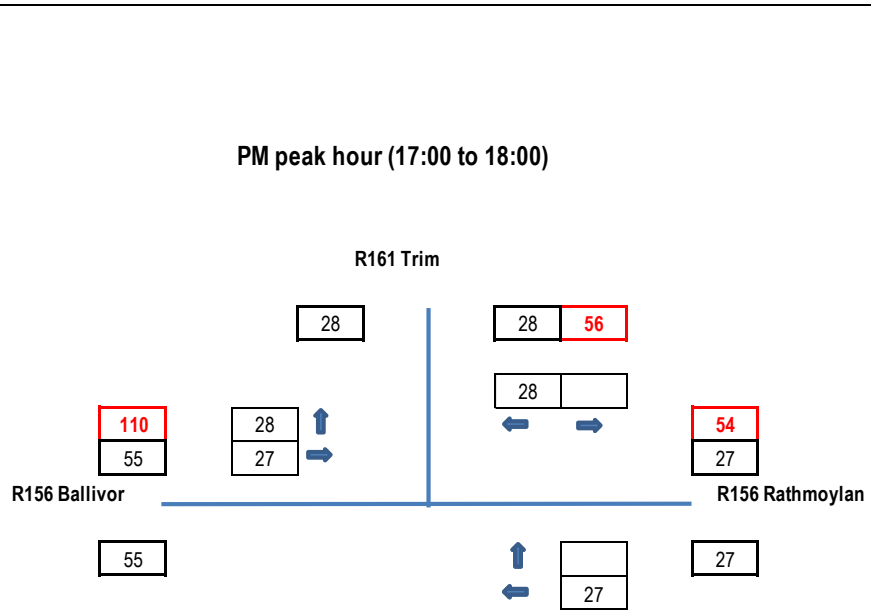


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Figure 14-3c Construction traffic generation, AM and PM peak hours, R161 / R156 junction

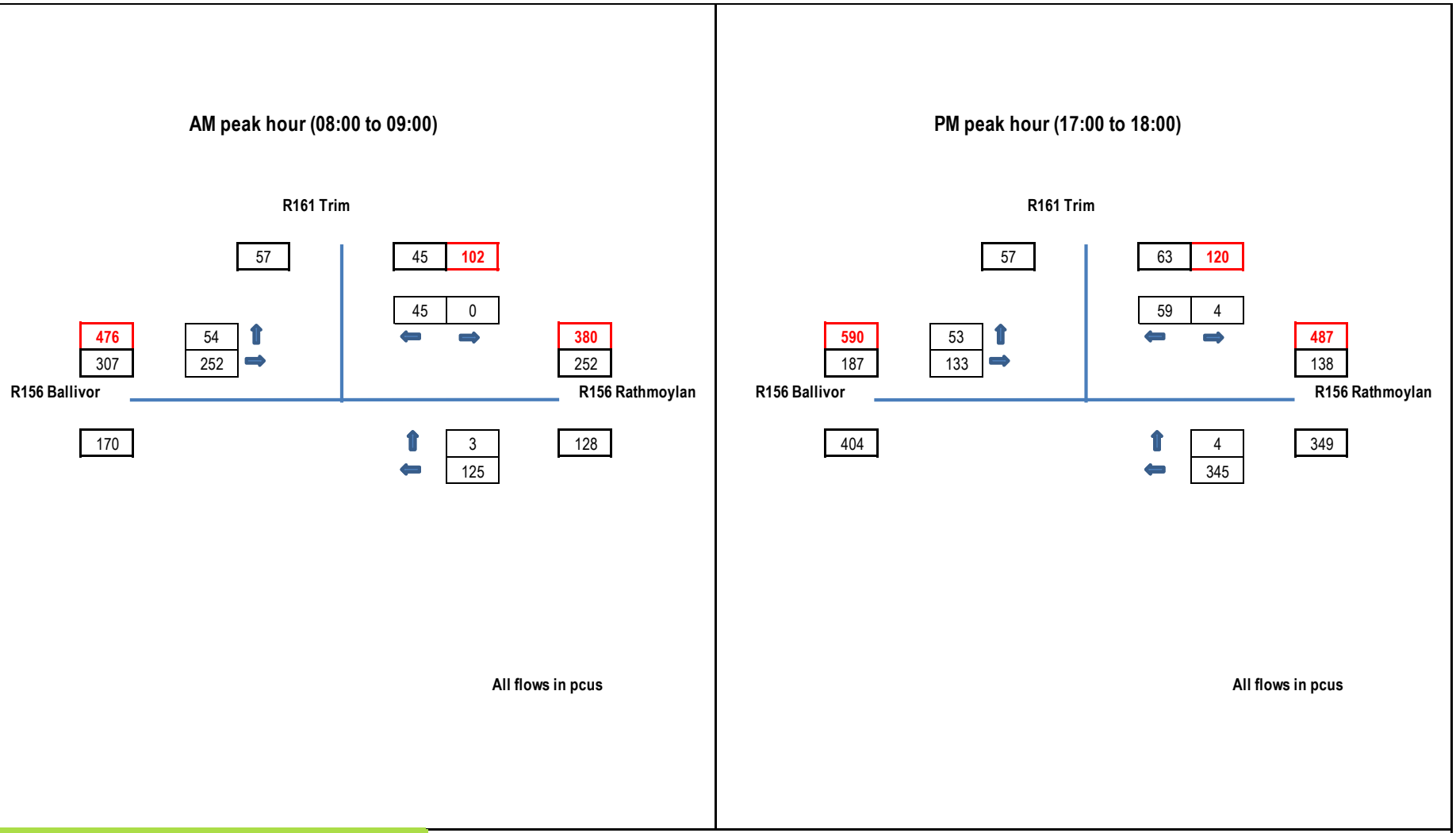

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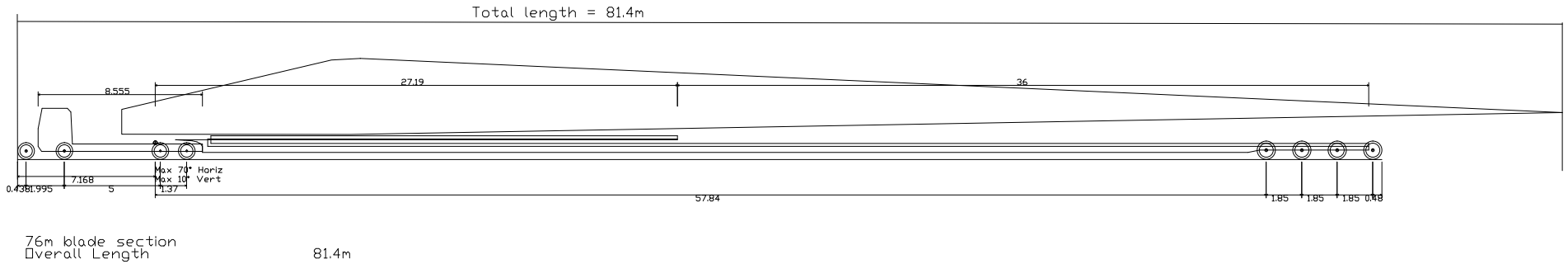
Figure 14-3d With construction traffic flows, AM and PM peak hours, R161 / R156 junction, year 2026



76m blade section
Overall Length 81.4m

NOTES:

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Figure 14-4 Design blade extended artic profile (76m section)

PROJECT:	Ballivor Wind Farm, Counties Meath and Westmeath		
CLIENT:	Bord na Mona	SCALE:	NTS
PROJECT NO: 8560	DATE: 22.03.23	DRAWN BY:	AL

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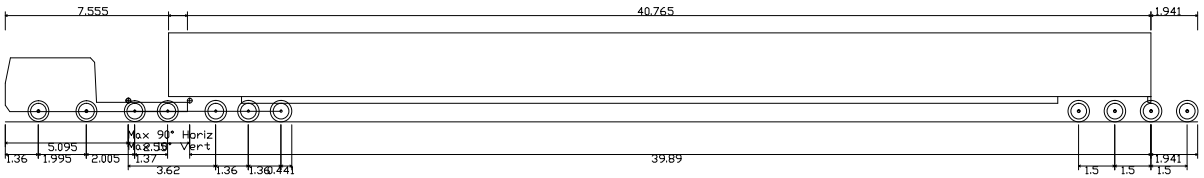

Tower	
Overall Length	49.476m
Overall Width	2.550m
Overall Body Height	3.695m
Min Body Ground Clearance	0.427m
Max Track Width	2.520m
Lock to Lock Time	6.00s
Wall to Wall Turning Radius	9.800m

NOTES:

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Figure 14-5 Design tower extended artic profile

PROJECT:	Ballivor Wind Farm, Counties Meath and Westmeath		
CLIENT:	Bord na Mona		SCALE: NTS
PROJECT NO: 8560	DATE: 10.12.23		DRAWN BY: AL

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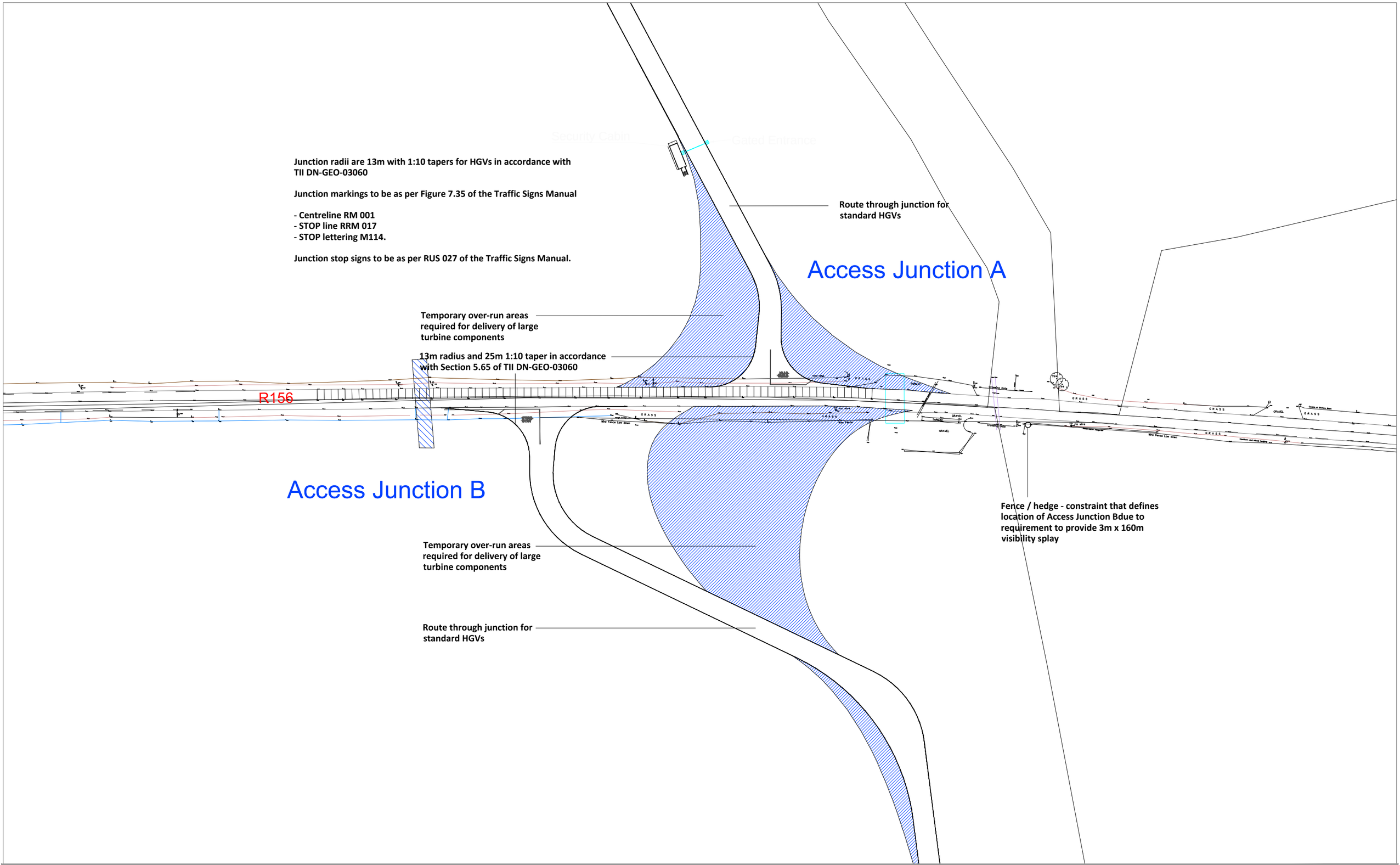

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Base mapping provided by MKO

Figure 14-6 Access junctions A and B on the R156, proposed junction layouts

PROJECT:	Bollivor Wind Farm, County Meath		
CLIENT:	Bord na Mona	SCALE:	1:1000
PROJECT NO: 8560	DATE: 22.03.23	DRAWN BY:	AL

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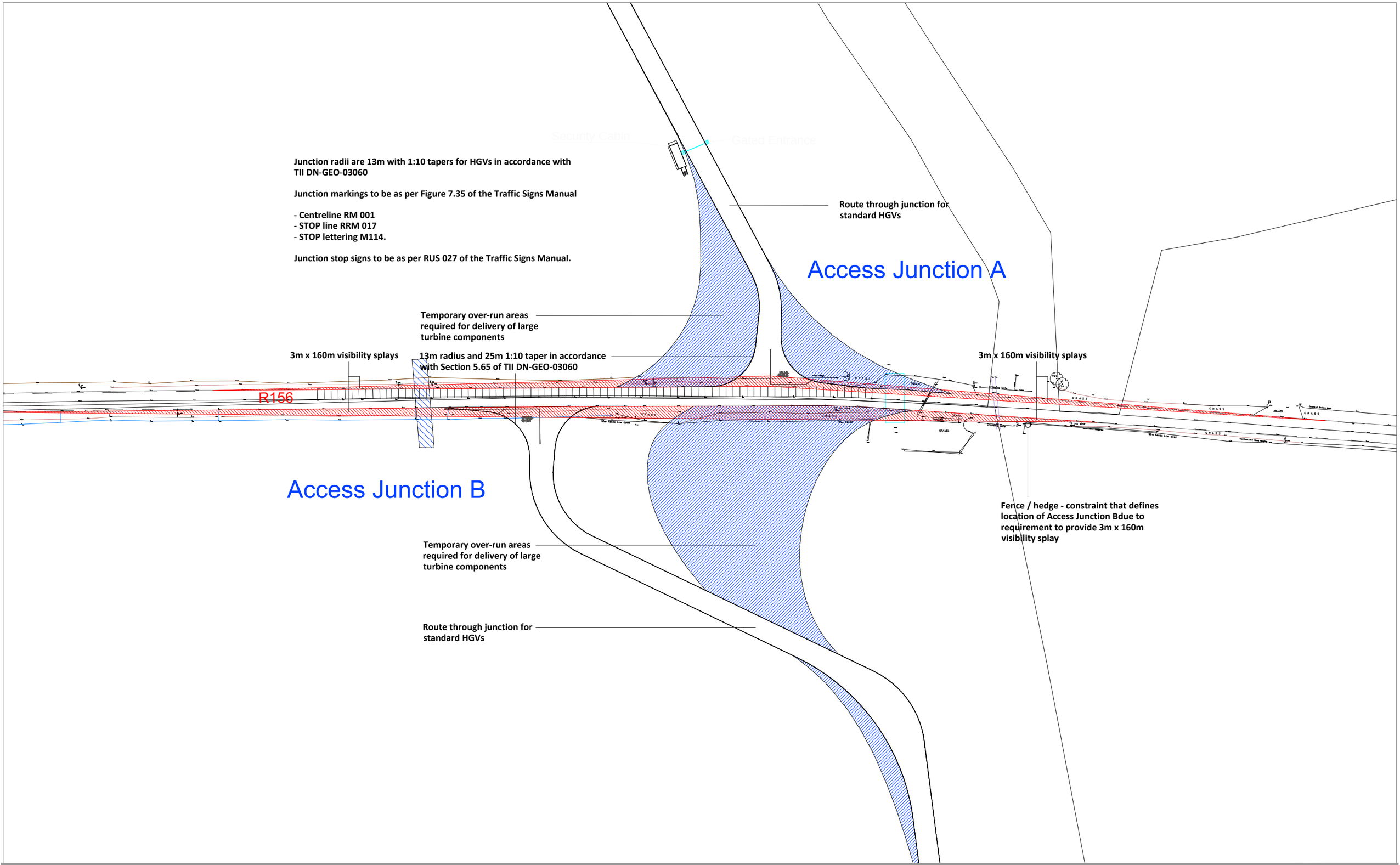

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PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-7 Access junctions A and B on the R156, proposed junction layouts and visibility splays (horizontal - 3m x 160m)

PROJECT:	Bollivor Wind Farm, County Meath		
CLIENT:	Bord na Mona	SCALE:	1:1000
PROJECT NO: 8560	DATE: 22.03.23	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

Access Junction A

Temporary over-run areas required for delivery of large turbine components

3m x 160m visibility splays

13m radius and 25m 1:10 taper in accordance with Section 5.65 of TII DN-GEO-03060

3m x 160m visibility splays

R156

Access Junction B

Fence / hedge - constraint that defines location of Access Junction Bdue to requirement to provide 3m x 160m visibility splay

Temporary over-run areas required for delivery of large turbine components

Route through junction for standard HGVs

length required to be lowered (44m by 0.47m max)

GROUND LEVEL

GROUND LEVEL

GROUND LEVEL

GROUND LEVEL

GROUND LEVEL

GROUND LEVEL

GROUND LEVEL

Visibility west of Junction B (1.05 above ground level)

Visibility west of Junction A (1.05 above ground level)

Forward visibility (1.05 above ground level)

Site Access Junction B (1.05 above ground level)

Site Access Junction A (1.05 above ground level)

Forward visibility (1.05 above ground level)

Visibility east of Junction B (1.05 above ground level)

Visibility east of Junction A (1.05 above ground level)

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-8 Access junctions A and B on the R156, proposed junction layouts and vertical visibility (3m x 160m) taken from a driver height of 1.05m to an object height of 1.05m

PROJECT:	Ballivor Wind Farm, Counties Meath and Westmeath		
CLIENT:	Bord na Mona	SCALE:	1:1000
PROJECT NO: 8560	DATE: 22.03.23	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

Junction radii are 13m with 1:10 tapers for HGVs in accordance with TII DN-GEO-03060

Junction markings to be as per Figure 7.35 of the Traffic Signs Manual

- Centreline RM 001
- STOP line RRM 017
- STOP lettering M114.

Junction stop signs to be as per RUS 027 of the Traffic Signs Manual.

Route through junction for standard HGVs

Access Junction A

Temporary over-run areas required for delivery of large turbine components

Blade tip

3m x 160m visibility splays

13m radius and 25m 1:10 taper in accordance with Section 5.65 of TII DN-GEO-03060

3m x 160m visibility splays

R156

Access Junction B

Fence / hedge - constraint that defines location of Access Junction Bdue to requirement to provide 3m x 160m visibility splay

Temporary over-run areas required for delivery of large turbine components

Route through junction for standard HGVs

NOTES:

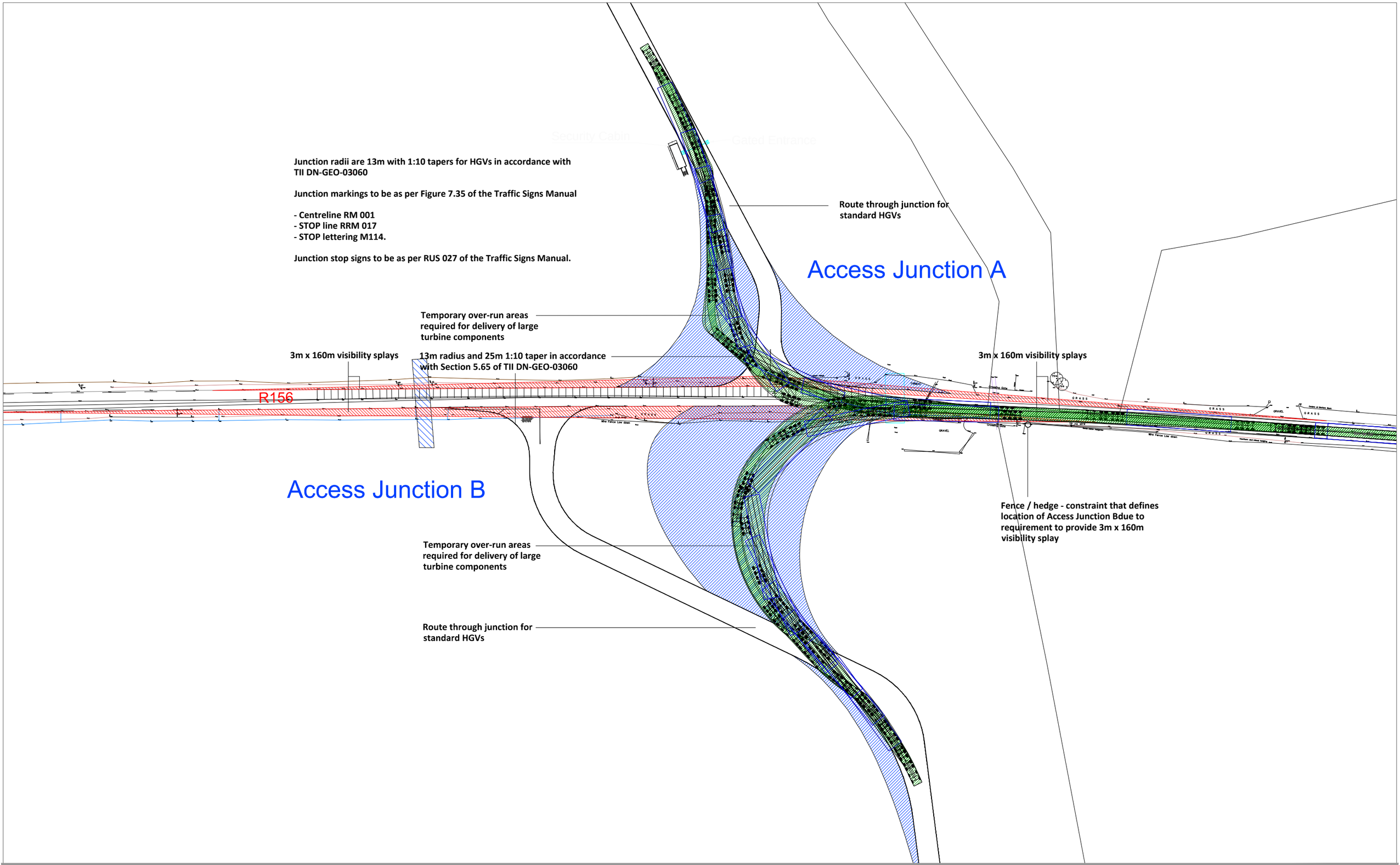
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-9 Access junctions A and B on the R156, proposed junction layouts autotrack accessment for blade transporter (76m blade section)

PROJECT:	Bollivor Wind Farm, County Meath		
CLIENT:	Bord na Mona	SCALE:	1:1000
PROJECT NO: 8560	DATE: 22.03.23	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

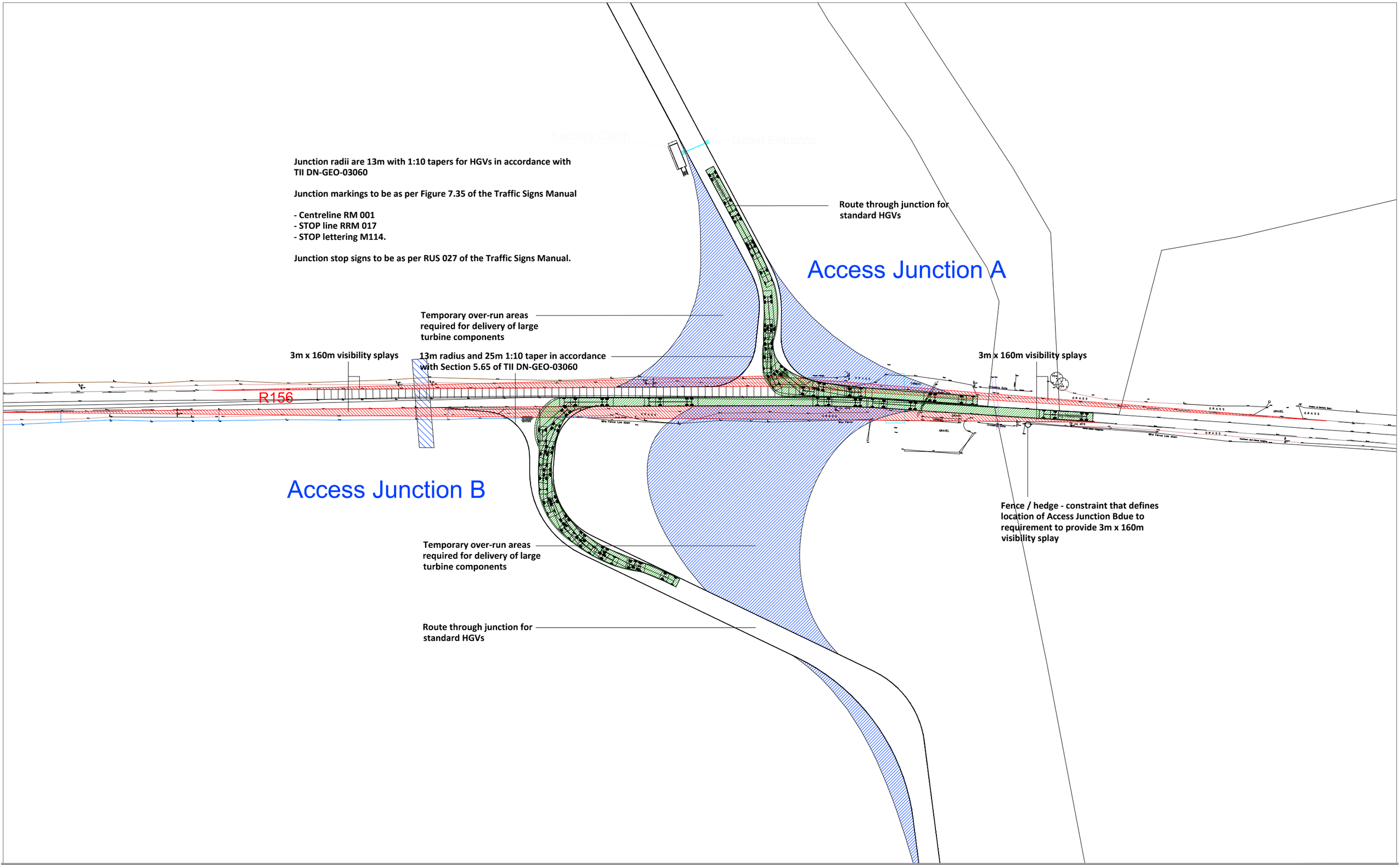
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-10 Access junctions A and B on the R156, proposed junction layouts autotrack accessment for tower transporter

PROJECT:	Bollivor Wind Farm, County Meath		
CLIENT:	Bord na Mona	SCALE:	1:1000
PROJECT NO: 8560	DATE: 22.03.23	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

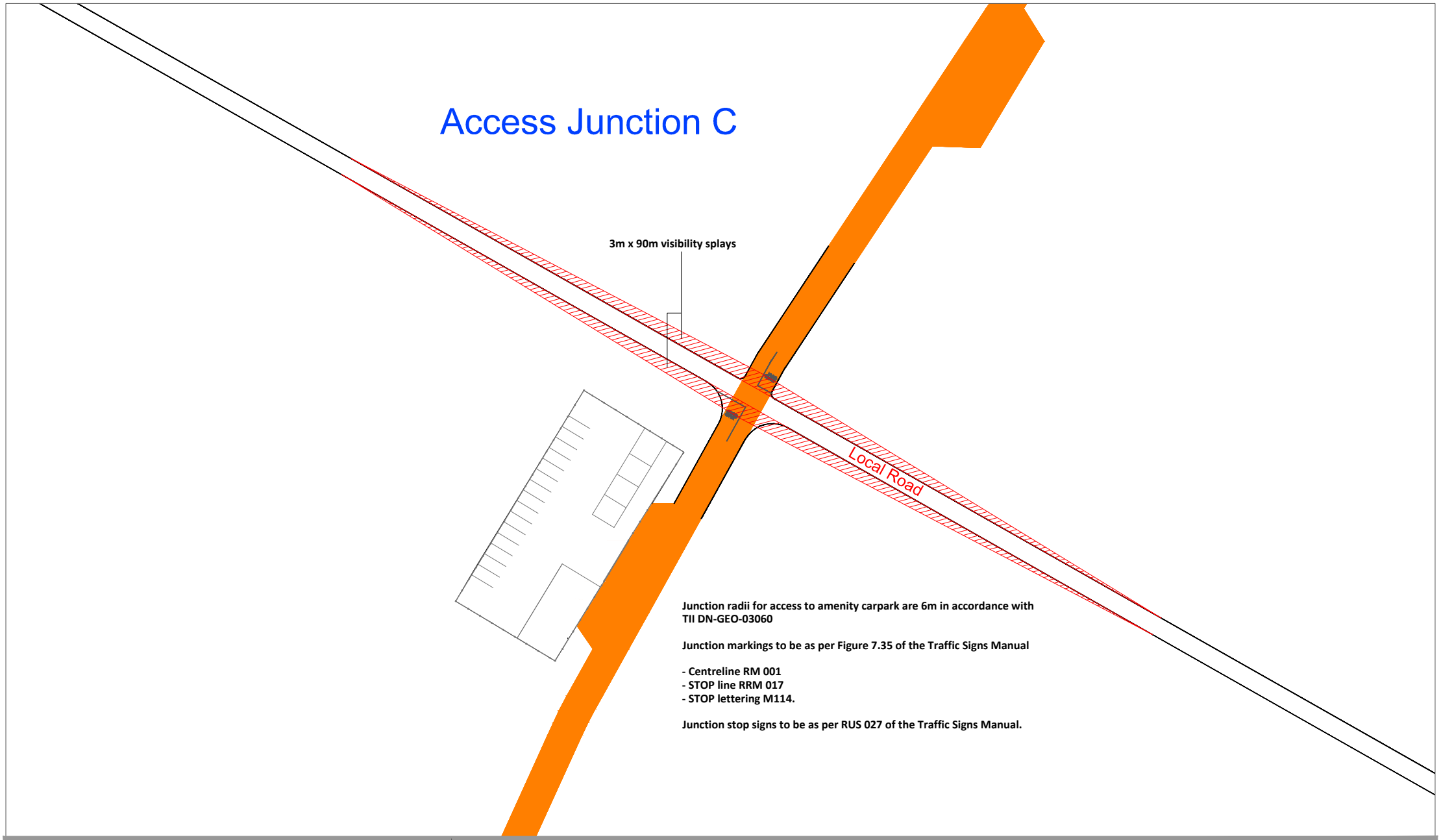
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-11 Access junctions A and B on the R156, proposed junction layouts autotrack accessment for standard large articulated HGV

PROJECT:	Bollivor Wind Farm, County Meath		
CLIENT:	Bord na Mona	SCALE:	1:1000
PROJECT NO: 8560	DATE: 22.03.23	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-12 Access Junction C on local road, proposed junction layouts and visibility splays

PROJECT:	Bollivor Wind Farm, County Meath		
CLIENT:	Bord na Mona	SCALE:	1:1000
PROJECT NO: 8560	DATE: 22.03.23	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

14.2 Other Material Assets

This section of the EIAR assesses the likely significant effects of the Proposed Development on other material assets such as utilities, telecommunications and aviation assets. This section should be read in conjunction with Appendix 14-3 Telecommunications Impact Study.

14.2.1 Introduction

The Proposed Development will be located on Ballivor, Carranstown, Bracklin and Lisclogher Bog, which form part of the Ballivor Bog Group, and a small portion of third party lands. The Bogs underwent peat extraction from the 1940's to June 2020. The Wind Farm Site covers a total area of approximately 1,770 hectares and measures approximately 9 kilometres (km) in length from north to south and approximately 6.km from east to west, at its widest point. The Wind Farm Site is long established as an industrial peat site (extraction ceased in June 2020) within the rural Midlands Ireland, stretching Co. Meath and Westmeath border. The purpose of this section is to determine the potential for impact on built services such as gas networks, water supply, electricity, telecommunication and aviation by the Proposed Development during the construction, operation and decommissioning phase and to determine the residual effects once mitigation, where required, has been implemented.

14.2.2 Statement of Authority

Kevin Hayes served as the main engineering lead within AI Bridges organisation to deal with the delivery of the Telecommunications Assessment Study. Kevin has a B.Eng Hons Electronic Engineering– Telecommunications & Industrial Automation, a M.Eng Hons Electronic Engineering– Telecommunications Engineering, a Harris Radio Design Certification, a WiMAX Certified Engineer Redline Communications Certified Engineer and is a PM Certified Professional. Kevin has managed contracts for various wind farm wireless signal interference field survey projects. He holds the responsibility for software prediction modelling for various wind farms and has developed the software prediction modelling on contract for UK, NI & Scotland Aviation and MET Radar Interference Analysis for wind farms.

This section of the EIAR, including a summary of the Telecoms Impact Study produced by AI Bridges, has been prepared by Karen Mulryan and reviewed by Michael Watson, of MKO. Karen is a Project Environmental Scientist with MKO with over 6 years' experience in the consultancy sector. Karen holds a BA International in Archaeology from NUI Galway and a MSc in Archaeology from the University of Edinburgh. Karen's key strengths and areas of expertise are in project management, environmental impact assessment, wind energy site selection and feasibility assessment. Since joining MKO, Karen has experience managing wind farm Environmental Impact Assessment Report applications of various scales including SID applications across Ireland. Karen has experience in report writing, including EIAR Population and Health chapters, feasibility studies and EIA screening reports. Karen holds memberships with the Chartered Institute for Archaeologists (ACIfA) and the Institute of Archaeologists of Ireland (IAI)

14.2.3 Methodology

The methodology for this assessment includes:

- Legislation and guidance review;
- Scoping exercise with stakeholders
- Desk study, including review of available maps and published information , followed by mapping of constraints.
- Independent Telecommunications Impact Study review and summary
- Impact Assessment

Consultation with all statutory consultees, bodies with environmental responsibility and other interested parties is detailed in Chapter 2 of the rEIAR. Scoping was undertaken in line with section 3.3 'Scoping' of the EPA 2022 Guidelines on the information to be contained in Environmental Impact Assessment Reports.

14.2.4 Legislation and Guidance

This section has been carried out in accordance with the 'EIA Directive' as mended by Directive 2014/52/EU and having regard, where relevant, to guidance and policy documents listed below:

- The Westmeath County Council Development Plan 2021-2027
- The Meath County Development Plan 2021 – 2027
- Guidelines on the Information to be contained in Environmental Impact Assessment Reports' (EPA, 2022)
- Draft Air Corps Wind Farm/Tall Structures Position Paper (August 2014)
- Department of Environment, Heritage and Local Government (2006) Wind Energy Development Guidelines for Planning Authorities
- Department of the Environment, Heritage and Local Government (2019)
- Draft Revised Wind Energy Development Guidelines for Planning Authorities
- ESB Networks (2019) Code of Practice for Avoiding Danger from Overhead Electricity Lines.

14.2.5 Telecommunications and Aviation

A Telecommunications Impact Study (Appendix 14-3) was undertaken by AI Bridges for the Ballivor Bog Group within which the Wind Farm Site is located. This section should be read in conjunction with this Study.

14.2.5.1 Background

14.2.5.1.1 *Broadcast Communications*

Wind turbines, like all large structures, have the potential to interfere with broadcast signals, by acting as a physical barrier or causing a degree of scattering to microwave links. The most significant effect at a domestic level relates to a possible flicker effect caused by the moving rotor, affecting, for example, radio signals. The most significant potential effect occurs where the wind farm is directly in line with the transmitter radio path.

14.2.5.1.2 *Domestic Receivers*

Depending on local topography, a domestic receiver may receive broadcast signals from more than one location. The strength of the signals varies with distance from the transmitter, and the receiver's antenna is generally always directed towards the most local, and usually strongest, broadcasting station.

There are two types of potential electromagnetic interference to domestic receivers, depending on the location of the receiver in relation to a wind farm. 'Shadowed' houses are located directly behind a wind farm, relative to the location from where the signal is being received. In this case, the main signal passes through the wind farm and the rotating blades can create a degree of signal scattering. In the case of viewers located beside the wind farm (relative to the broadcast signal direction), the effects are likely to be due to periodic reflections from the rotating blades, giving rise to a delayed signal.

In both cases, i.e., shadowed houses located behind the wind farm and those located to the side of it, the effects of electromagnetic interference may depend to some degree on the wind direction, since the plane

of rotation of the rotor will affect both the line-of-sight blockage to viewers located behind the wind farm and the degree of reflection to receivers located to the side.

14.2.5.1.3 Other Signal Types

Wind turbines have the potential to affect other signal types used for communication and navigational systems, for example telecommunication tower-to-tower microwave communication links, and airborne and ground radar systems. Interference with radar systems occurs when wind turbines are located close to an airport or directly in line with the instrument landing approach. These effects can be avoided through design or dealt with by detailed micro-siting of turbines in order to avoid alignment with signal paths or by the use of repeater relay links out of line with the wind farm.

14.2.5.2 Preventing Electromagnetic Interference

14.2.5.2.1 National Guidelines

Both the adopted 2006 and the Draft Revised 2019 '*Wind Energy Development Guidelines for Planning Authorities'* produced by the Department of the Environment, Heritage and Local Government (DOEHLG) state that interference with broadcast communications can be overcome by the installation of deflectors or repeaters where required.

The guidelines advise Developers to contact individual local and national broadcasters and mobile phone operators to inform them of proposals to develop wind farms. This consultation has been carried out by MKO as part of the assessment of the Proposed Development as summarised below; full details are provided in Chapter 2 of this EIAR. The layout and design of the Proposed Development has taken into account nearby telecommunications links.

14.2.6 Scoping Exercise

14.2.6.1 Utilities

Irish Water

A scoping request was sent to Irish Water the 2nd of December 2021. A response was received 9th June flagging a sewer network and water distribution area within the Wind Farm Site. Further correspondence form Irish Water in January 2022 clarified that this was an error in Irish Water mapping.

Waterways Ireland

A scoping request was sent to Waterways Ireland on the 8th May 2020 and a response was received on the 14th May stating the Proposed Development is not located on lands under their jurisdiction.

Department of the Environment, Climate and Communications

A scoping request was sent to the Department of the Environment, Climate and Communications the 8th May 2020. A response was received from the DECC via the EPA on the 18th of May 2020. The response comprised a list of relevant data sources and websites relating to geological mapping, geohazards, groundwater and thermal data for the country. This data was reviewed and considered in Chapter 8 Lands, Soil and Geology and Chapter 8 Hydrology and Hydrogeology Please see Appendix 2-1 for scoping correspondences with consultees in relation to this application.

ESB

A scoping request was sent to the ESB on the 27th of June 2022. No response was received to date. A response was received on the 14th May stating no impacts on their assets are anticipated from a wind farm at the Wind Farm Site.

Eirgrid

A scoping request was sent to Eirgrid on the 12th February 2021 and again on the 7th May 2021. No response has been received to date.

Gas Networks Ireland (GNI)

GNI were contacted in April 2022 and again in Jan 2022 regarding gas network assets within the Wind Farm Site and surrounding landscape. No gas infrastructure is sited within 4km of the Wind Farm Site.

14.2.6.2 Telecommunications & Aviation

As part of the EIAR scoping and consultation exercise, MKO contacted the relevant national and regional broadcasters, fixed and mobile telephone operators, aviation authorities and other relevant consultees. Consultation was also carried out with ComReg (Commission for Communications Regulation) in order to identify any other additional licensed operators in the vicinity of the Ballivor Bog Group (Ballivor, Bracklin, Carranstown, Lisclogher and Lisclogher West Bogs, as the earlier design iterations included all five bogs, see Chapter 3 Consideration of Alternatives for details) to be contacted. The responses received by MKO from the telecommunications and aviation consultees are summarised below in Table 14-27.

A Telecommunications Impact Study was undertaken by AI Bridges in September 2021 which involved further consultation with the same operators to confirm communication assets and refine setbacks if and were required. Please see Appendix 14-3. Any refinements to turbine locations brought about by the AI Bridges study were incorporated into the fourth and final Proposed Development design.

Table 14-26 Telecommunications and Aviation Scoping Responses

Consultee	Initial Scoping Response	Potential for Interference Following Consultation Exercise	Action Required	Final Scoping Response on Final Design	Potential for Interference Following Final Consultation Exercise- Action Required
ComReg (Commission for Communications Regulation)	Received 22.06.2020	List of operators with potential links in area provided	All operators contacted	N/A	N/A
Broadcasting Authority of Ireland	Received 11.05.2020	No	N/A	Received 10.05.2021	No
BT Communications Ireland	Received 08.05.2020	No	N/A	Received 07.05.2021	No

Consultee	Initial Scoping Response	Potential for Interference Following Consultation Exercise	Action Required	Final Scoping Response on Final Design	Potential for Interference Following Final Consultation Exercise- Action Required
Department of Defence	No Response	N/A	N/A	Received 25.05.2021	No- conditions requested. Please see section 14.2.6.3 below
Eir (Formerly Meteor)	Received 15.05.2020	Buffers requested. Please see section 14.2.6.2 below	Implement buffers at design stage	Received 14.05.2021	No
EMR Solutions	Received 15.05.2020	No	N/A	Received 07.05.2021	No
ENET	Received 23.06.2020	Buffers requested. Please see section 14.2.6.2 below	Implement buffers at design stage	Received 11.05.2021	No
ESB Telecoms	Received 10.07.2020	No	N/A	Received 10.05.2021	No
Imagine Group	Received 11.05.2020	Buffers requested. Please see section 14.2.6.2 below	Implement buffers at design stage.	Received 18.05.2021, 12.07.2021, 02.09.2021.	No Please see section 14.2.6.3 below
Openeir (Radio)	Received 30.09.2020	Buffer requested. Please see section 14.2.6.2 below	Implement buffers at design stage.	No Response	N/A as required buffers were implemented
Ripplecom	Received 09.07.2020	No- No links through the site	N/A	N/A	N/A

Consultee	Initial Scoping Response	Potential for Interference Following Consultation Exercise	Action Required	Final Scoping Response on Final Design	Potential for Interference Following Final Consultation Exercise- Action Required
RTE Transmission Network (2rn)	Received 08.05.2020	Buffers requested to ensure no impacts, agreement to be signed with developer. Please see section 14.2.6.2 below	Implement buffers at design stage.	Received 07.05.2021	No - Please see section 14.2.6.2 below
Tetra Ireland Communications (emergency services)	Received 15.05.2020	Buffer Requested. Please see Section 14.2.6.2 below	Implement buffers at design stage.	Received 19.05.2021	No
Three Ireland	Received 08.05.2020	Buffers requested. Please see section 14.2.6.2 below	Implement buffers at design stage.	Received 11.05.2021	No
Virgin Media	No Response	N/A	N/A	Received 08.05.2021 No Links through the site	No
Viatel Ireland Ltd	Received 22.05.2020	No	N/A	Received 18.05.2021 No Links through the site	No

Consultee	Initial Scoping Response	Potential for Interference Following Consultation Exercise	Action Required	Final Scoping Response on Final Design	Potential for Interference Following Final Consultation Exercise- Action Required
Vodafone Ireland	Received 08.05.2020	Buffers requested. Please see section 14.2.6.2 below	Implement buffers at design stage and sent to operator for confirmation. Confirmation received Feb 2021 that no impacts are anticipated.	Received 12.05.2021	No

14.2.7 Scoping Responses

The scoping responses from the telecommunications and aviation consultees are described below. The full scoping responses received are provided in Appendix 2-1. All operator links and set back are illustrated in Appendix 14-3 Telecommunication Impact Study.

14.2.7.1 Broadcasters

RTÉ Transmission Network (operating as 2rn):

- replied on the 8th of May 2020 to a scoping request from MKO.
  - provided information on a link running through the site and requested a setback distance. Requested a protocol agreement be signed between 2rn and the wind farm developer.
- replied on 12th February 2021 to a follow up scoping request confirming there is no potential for impact on updated design and again requested that a protocol agreement be signed between 2rn and the wind farm developer.
- Replied 7th of May 2021 to a follow up scoping request stating there are no impacts with the final and Proposed Development design.

Virgin Media were not listed by ComReg as having links in the area. However, the operator was sent a scoping request on the 8th of May 2020. No response was received. The fourth and final design iteration (which incorporated any turbine recommendations in the AI Bridges Telecommunications Study) was sent to the broadcaster and a response was received 8th of May 2021 confirming they have no links at the Wind Farm Site.

14.2.7.2 Other Operators

Of the scoping responses received from telephone, broadband and other telecommunications operators, those who highlighted an initial potential interference risk with preliminary designs are addressed below. The final proposed turbine layout (which incorporated any turbine recommendations in the AI Bridges Telecommunications Study) does not overlap with any of the telecom links or clearance zones requested

by operators. The remaining consultees who responded to scoping, operate links either outside the Ballivor Bog Group, and therefore are not subject to any interference risk from the proposed turbines, or do not operate any links in the area.

Vodafone Ireland

Vodafone Ireland replied on the 8th of May 2020 to a scoping request from MKO, noting four links running through the development site boundary and included minimum set back requirements. The operator specific buffers were implemented, and the third design iteration sent to Vodafone for approval on 12th of February 2021. A response was received on 26th of February 2021 stating no impacts anticipated. The fourth and final design iteration (which incorporated any turbine recommendations in the AI Bridges Telecommunications Study) was sent to the operator and a response was received 8th of May 2021 stating no impacts anticipated.

Eir

Eir replied on the 15th of May 2020 to a scoping request from MKO noting three links in the area of the Proposed Development and requested a setbacks to be incorporated into the design. A 100m buffer zone was implemented and the third design iteration was sent to Eir for approval on the 12th of February 2021 with setbacks implemented. Confirmation was received from Eir on the same day that the design would not impact the Eir mobile network. The fourth and final design iteration(which incorporated any turbine recommendations in the AI Bridges Telecommunications Study) was sent to the operator and a response was received 14th of May 2021 stating again no impacts anticipated.

Openeir (radio)

Openeir replied on the 29th of September 2020 to a scoping request from MKO, noting one radio link running thought the development site boundary. Openeir requested a minimum set back distance and added it is "*likely that this radio will be removed in the next year or two*". The operator contacted MKO on the 30th of September 2020 stating that "*it looks extremely likely that this radio link will be ceased*". The third design iteration which incorporated the operators request setbacks was issued to the operator and a response was received 18th of February 2021 stating no impacts are anticipated. The fourth and final design iteration (which incorporated any turbine recommendations in the AI Bridges Telecommunications Study) was sent to the operator however no response was received.

Three Ireland

Three Ireland replied on the 12th of May 2020 to a scoping request from MKO stating there are three links through the Ballivor Bog Group which are currently being optimised; three existing links are to be decommissioned and four new links are be installed with three of the new links having potential to be impacted by the wind farm design. The operator requested a setback for each link. The third design iteration incorporating setbacks was issued to Three Ireland for approval on 12th of February 2021 to which the operator confirmed no impacts on their network are anticipated. The fourth and final design iteration (which incorporated any turbine recommendations in the AI Bridges Telecommunications Study) was sent to the operator and a response was received on the 8th of May 2021 confirming no impacts anticipated.

Tetra Ireland

Tetra Ireland replied on the 15th of May 2020 to a scoping request from MKO stating they operated a mast adjacent Carranstown East and requested a 500m buffer to be applied to prevent potential interference. The buffer was applied to the third design iteration which was sent to Tetra Ireland for approval on the 12th of February 2021. Tetra responded on 5th of March 2021 stating no impacts are

anticipated. The fourth and final design iteration (which incorporated any turbine recommendations in the AI Bridges Telecommunications Study) was sent to the operator and a response was received 19th of May 2021 stating no impacts anticipated. The mast is approximately 1.7km from the Wind Farm Site Boundary and over 2km from any turbine location.

Imagine Group

Imagine Group replied on the 11th of May 2020 to a scoping requests from MKO noting one link running through the Ballivor Bog Group and requested a setback to be implemented. The third design iteration incorporating a setback was issued to Imagine Group for their approval on 12th of February 2021. No Response was received. The fourth and final design iteration was issued to the operator and a response was received 18th of May 2021 requesting a further setback. Further consultation between AI Bridges and Imagine Group was undertaken, in which a reduced setback was agreed for the Proposed Development on 1st of July 2021. A detailed 3D software link analysis was also sent to Imagine for their review illustrating the sufficient setback between the turbine locations and the Imagine Group Link. Please see Appendix 14-3 for further details. A follow up confirmation email was issued to Imagine Group in September 2021 to ensure all parties were satisfied that no impacts are anticipated with the fourth and final design iteration (which incorporated any turbine recommendations in the AI Bridges Telecommunications Study). Imagine Group responded on the 2nd of September 2021 in agreement with the setbacks incorporated into the design and with the outcome of the AI Bridges Assessment. Please see section 14.2.7 and Appendix 14.3 for details.

Enet

Enet replied on the 23rd of June 2020 to a scoping request from MKO noting two links running through the Ballivor Bog Group and requested setbacks. Setbacks were incorporated into the third design iteration and sent to Enet for their approval on 12th of February 2021 but no response was received. The fourth and final design iteration (which incorporated any turbine recommendations in the AI Bridges Telecommunications Study) was sent to the operator and a response was received 11th of May 2021 stating no impacts anticipated.

Irish Rail

As part of the scoping exercise, ComReg recommended Irish Rail were consulted for potential telecommunication interference due to a proposed wind farm development at this location. Irish Rail replied on the 23rd of September 2020 with a list of UHF train radio system base stations along the Sligo line from Enfield to Mullingar and a link outside of the development site area. The operator was not aware of any set back distances required for the base stations; the nearest station located approximately 7.3km south of the nearest turbine. Irish Rail replied 23rd October 2020 stating they were satisfied that there will be no impacts on their rail assets from a wind farm development at this location.

14.2.7.3 Aviation

Department of Defence

The Department of Defence was contacted by MKO on the 7th of May 2020. No response was received. The Department of Defence were provided with the third turbine design on the 12th of February 2021 and replied on the 19th of February and requested the following conditions should the development be consented:

1. *All turbines or tall structures, should be illuminated by high intensity obstacle lights that will allow the hazard be identified and avoided by aircraft in flight.*
2. *Obstruction lights used should be incandescent or of a type visible to Night Vision Equipment. Obstruction lighting fitted to obstacles must emit light at the near Infra-Red (IR) range of the electromagnetic spectrum specifically at or near 850 nanometres (nm) of wavelength. Light intensity to be of similar value to that emitted in the visible spectrum of light.*
3. *Due to the nature of flight operations by the Irish Air Corps the above mentioned are separate to any ICAO and IAA lighting requirements.*

The revised final design layout (which incorporated any turbine recommendations in the AI Bridges Telecommunications Study) was sent to the Department of Defence on the 7 May 2021 and a response was received on the 25th May 2021 requesting the same three items as noted above.

In response to the lighting requirements requested by the Department of Defence, the turbines will be included on mapping, fitted with obstruction lighting and entered into aircraft navigation databases to ensure they will be avoided during flight.

Irish Aviation Authority

The Irish Aviation Authority (IAA) replied on the 5th of May 2020 requesting information of turbine locations and dimensions. On the 12th of February, the IAA were provided with the turbine locations and proposed dimensions. The IAA responded on the 15th of February 2021 stating no impacts are anticipated on nearby aviation assets and recommend the following conditions should the project be granted a consent:

1. *agree an aeronautical obstacle warning light scheme for the wind farm development,*
2. *provide as-constructed coordinates in WGS84 format together with ground and tip height elevations at each wind turbine location and*
3. *notify the Authority of intention to commence crane operations with at least 30 days prior notification of their erection.*

In response to the final turbine layout (which incorporated any turbine recommendations in the AI Bridges Telecommunications Study), the IAA stated the following: "*the turbines continue to appear to be positioned in excess of 10km radius from Athboy Aerodrome, the Authority has no specific requirements for integration into the Environmental Impact Assessment Report"* and requested the same three items as above.

14.2.8 Baseline Environment

14.2.8.1 Utilities

14.2.8.1.1 *Electricity*

Grid Infrastructure

The 110kV Mullingar to Corduff overhead 110kV transmission line traverses the site in an east to west orientation at Carranstown Bog.

Rural Supply

A 10/20kV substation is located at the Ballivor Works (planning reference 05/2348, adjacent to the Wind Farm Site) and provides power to the Works buildings.

14.2.8.1.2 *Gas*

A data request was sent to Gas Networks Ireland in February 2023. The data return concluded there are no gas pipelines within the Wind Farm Site.

14.2.8.1.3 *Water*

There are no underground water or sewerage networks within the Wind Farm Site.

14.2.8.2 Waste Management Services

There are no EPA-licensed or local authority-authorised waste facilities or activities located within the Wind Farm Site boundary. The closest, authorised municipal waste facility is located approximately 18km west of the in Mullingar, Co. Westmeath.

In 2000 the Derrygreenagh Bog Group, of which the Wind Farm Site is a subset, fell under IPC control. Condition 7 of the licence compels the Applicant to correctly dispose of waste to licenced facilities. As part of the licence compliance, the Applicant must dispose of waste appropriately to licenced waste facilities. Since peat extraction ceased at the Wind Farm Site in June 2020, onsite activities have reduced considerably. However, waste materials continue to be removed off site if recycling is not possible and disposed by licenced waste contractors. Waste currently produced at the Ballivor Bog Group is divided into hazardous and non-hazardous materials, weighed and reported in Annual Environmental Reports (AERs) which are submitted to the EPA each year. AERs from 2008 to 2021 are publicly available for viewing on the EPA licence permit portal[1].

14.2.8.3 Telecommunications

There are 8 no. telecommunication links traversing the Wind Farm Site. Please see Figure 14-13 for details.

[1] *IPC Licence PO501-01: https://epawebapp.epa.ie/licsearchdownload/CombinedFileView.aspx?regno=P0501-01&classification=Enforcement*

14.2.8.4 Aviation

The Draft Air Corps Wind Farm/Tall Structures Position Paper (August 2014) sets out the Air Corps position on the appropriate siting and management of wind farms and tall structures. The Position Paper details Air Corps assets within which tall structures such as wind farms are not recommended and/or require early engagement with the Department of Defence. The Wind Farm Site is not located within any off these assets.

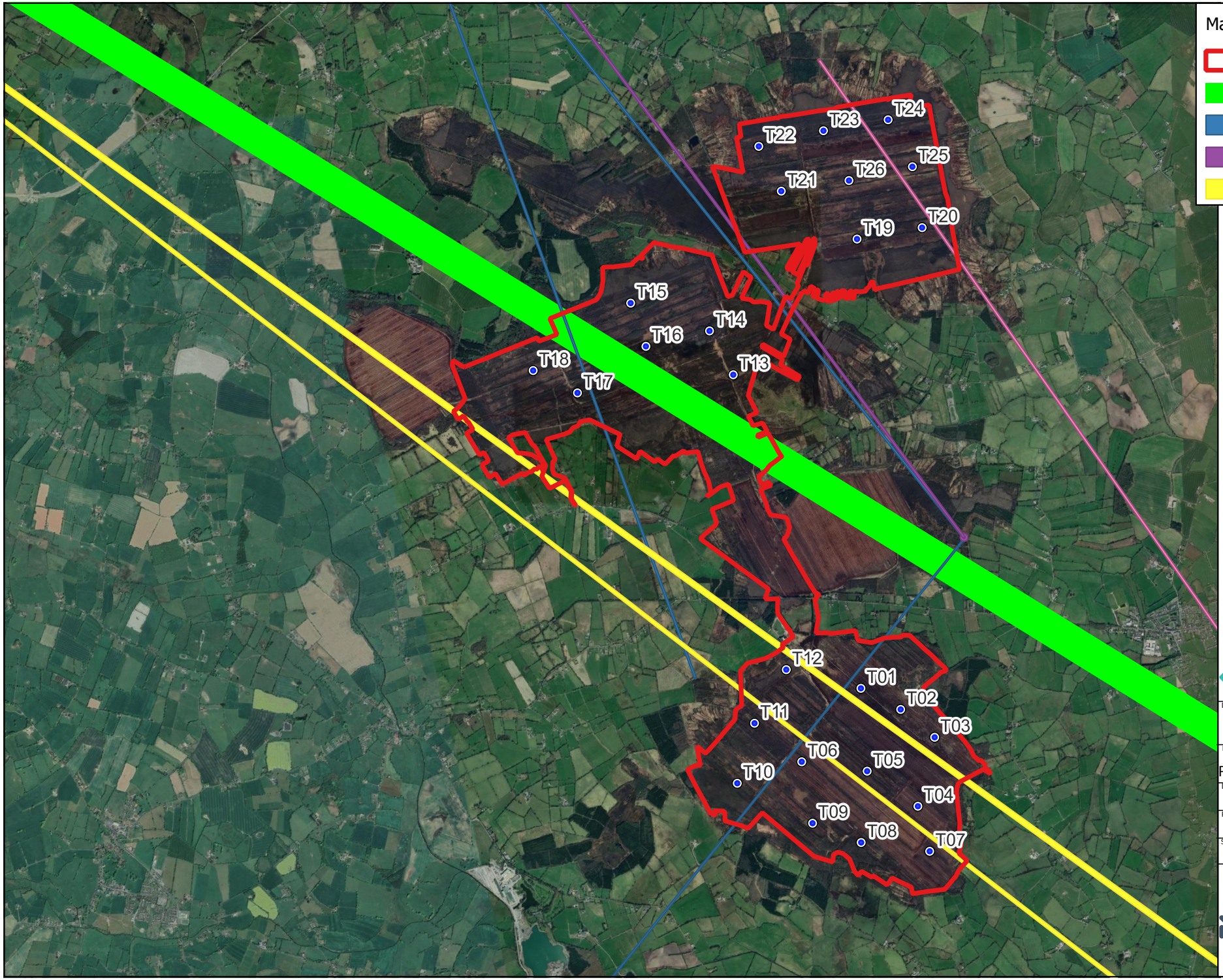
14.2.9 Telecommunications Impact Assessment Study

The assessment undertaken by AI Bridges included detailed technical desktop analysis as well consultation with the telecommunications operators for detailed technical information. Using the information obtained during the desktop 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. The modelling and analysis results allowed sufficient set back distances between fixed links and the wind farm design to prevent any potential for impacts.

None of the Telecommunication Operators contacted during the initial consultation process in November 2020 raised any concerns regarding telecommunications networks operating in the licence-exempt frequency bands. However, further consultations with Imagine Broadband were undertaken between July 2021 and September 2021 in light of a larger setback request in May 2021. A detailed 3D software link analysis was sent to Imagine Broadband for their review. Imagine Broadband accepted the results of the analysis and agreed the calculated set back distance provided. The fourth and final design iteration incorporating these buffers was issued to all operators for their review and confirmed that the final design did not impact any of their telecommunication links that traverse the final turbine locations.

Please see Figure 14-13 for the Telecommunication Constraints.

Please see Appendix 14-3 for the Telecommunications Impact Study.



Map Legend

- Application Site Boundary
- 2Rn (RTE) constraints
- '3' Three Constraints
- Eir Constraints
- Enet Constraints

N

Drawing Title: Telecommunication Links in Area

Project Title: Proposed Ballivor Wind Farm

Drawn By	Checked By
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Project No.	Drawing No.
191137	Figure 14-13
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14.2.10 Likely Significant Effects and Associated Mitigation Measures

The below assessment evaluates the impact (where there is the potential for an impact to occur) utilities, telecommunications and aviation during the construction, operation and decommissioning phases, as a result of the Proposed Development.

14.2.11 'Do-Nothing' Scenario

If the Proposed Development were not to proceed, the site would continue to be managed under the requirements of the relevant IPC licence and therefore the ongoing site management and environmental monitoring, peat stockpile removal (due to be completed by 2024), and wind measurement would continue. In addition, if the Proposed Development were not to proceed, the implementation of peatland rehabilitation plans as required under IPC License would occur. Likewise, the PCAS scheme in adjacent Bogs (where selected) would continue to be implemented. These land uses and activities will also continue if the Proposed Development does proceed.

In addition, if the Proposed Development were not to proceed, the potential to impact on utilities, telecommunications and aviation impacts would be removed.

However, if the Proposed Development were not to proceed, the opportunity to capture part of Meath and Westmeath's valuable renewable energy resource would be lost, as would the opportunity to contribute to meeting Government and EU targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions. The opportunity to generate local employment and investment and to diversify the local economy would also be lost.

14.2.12 Construction Phase: Utilities

14.2.12.1 Electricity

Identification of Impact

The 110kV Mullingar to Corduff overhead 110kV transmission line traverses the site in an east to west orientation at Carranstown Bog. It is the intention to connect the proposed onsite substation into this line. There is potential for this line to be impacted through interference or breakage during the construction phase. This would have an unlikely but temporary, moderate negative impact on electricity supply.

Mitigation Measures

- Goal posts will be established under the overhead line for the entirety of the construction phase. They will not exceed a height of 4.2 metres, unless specifically agreed with ESB Networks
- The suitability of machinery and equipment for use near power lines will be risk assessed.
- All staff will be trained on operating voltages of overhead electricity lines running the site. All staff will be trained to be aware of the risks associated with overhead lines. All contractors that may visit the sites are made aware of the location of lines before they come on to site.

- Barriers will run parallel to the overhead line at a minimum horizontal distance of 6 metres on plan from the nearest overhead line conductor wire.
- When activities must be carried out beneath overhead lines, e.g. component delivery or substation construction, a site-specific risk assessment will be undertaken prior to any works. The risk assessment must take into account the maximum potential height that can be reached by the plant or equipment that will be used prior to any works. Overhead line proximity detection equipment will be fitted to machinery when such works are required.
- Information on safe clearances will be provided to all staff and visitors.
- Signage indicating locations and health and safety measures regarding overhead lines will be erected in canteens and on site.
- All staff will be made aware of and adhere to the Health & Safety Authority's 'Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2021'. This will encompass the use of all necessary Personal Protective Equipment and adherence to the site Health and Safety Plan.
- All health and safety measures as detailed in the Construction Environment Management Plan and Chapter 5 Population and Human Health will be adhered to during the construction, operation and decommissioning phases.

Residual Impact

With the implementation of the above measures, the residual impact is considered to be a temporary, slight negative impact on local electricity supply.

Significance of Effects

There will be no significant direct or indirect effect on electricity supply from the proposed development during the construction phase.

14.2.12.2 Water Supply

Identification of Impact

There are no underground water or sewerage networks within the peat extraction areas. The nearest public water supply is located 3km away from the site and the source protection area for the scheme is 2km away site.

Mitigation Measures

Chapter 9 Hydrology and Hydrogeology assess the potential for impact on public water supply and private wells during the construction, operation and decommissioning phases. The chapter includes mitigation measures to minimise impacts on groundwater during the construction stage from the potential release of hydrocarbons, wastewater and cement based products.

Residual Impact

With the implementation of the proposed mitigation measures outlined in Chapter 9 combined with the (separation distances from wells, and prevailing geology, topography and groundwater flow directions), the residual impact is negative, imperceptible, indirect, long term, effect in terms of quality or quantity on local groundwater abstractions.

Significance of Effects

Based on the assessment above there was no significant effects on quality or quantity of water supply during the construction phase of the Proposed Development.

14.2.13 Construction Phase: Waste Management

The CEMP, Appendix 4-3 of this EIAR, includes a Waste Management Plan (WMP) which outlines the best practice procedures during the construction and decommissioning phases of the project. The WMP outlines the methods of waste prevention and minimisation by recycling, recovery and reuse at each stage of construction of the proposed development. Disposal of waste will be seen as a last resort. All hazardous wastes will be stored in bunded containers/areas before being collected by an authorised waste contractor and brought to an EPA licensed waste facility. Hazardous wastes will be kept separate from non-hazardous wastes that contamination does not occur. Please see the CEMP for best practise measures to prevent the creation of waste materials.

Mitigation Measures

- All waste generated on site will be contained in waste skips at a waste storage area on site. This waste storage area will be kept tidy with skips clearly labelled to indicate the allowable material to be disposed of therein.
- The expected waste volumes generated on site are unlikely to be large enough to warrant source segregation at the wind farm site. Therefore, all waste streams generated on site will be deposited into a single waste skip. This waste material will be transferred to a Materials Recovery Facility (MRF) by a fully licensed waste contractor where the waste will be sorted into individual waste streams for recycling, recovery or disposal.
- The waste generated from the turbine erection will be limited to the associated protective covers which are generally reusable. Considering the specialist nature of this packaging material the majority will be taken back by suppliers for their own reuse. Any other packaging waste generated from the turbine supply will be deposited into the on-site skips and subsequently transferred to the MRF.
- It is not envisaged that there will be any waste material arising from the materials used to construct the site roads as only the quantity of stone necessary will be sourced from local quarries and brought on site on an 'as needed' basis.
- Site personnel will be instructed at induction that under no circumstances can waste be brought to site for disposal in the on-site waste skip. It will also be made clear that the burning of waste material on site is forbidden.

Residual Impact

The residual effect of the construction phase activities on waste management services is considered to have had a short term slight negative effect.

Significance of Effects

There will be no significant effects on waste management services from the Proposed Development during the construction phase.

14.2.14 Construction Phase: Telecommunications and Aviation

Impacts on telecommunications and aviation can only during the operational phase of a wind energy development. There are therefore no potential impacts on telecommunications and aviation associated with the construction phase of the Proposed Development.

14.2.15 Operational Phase: Utilities

14.2.15.1 Electricity

14.2.15.1.1 *Electricity Infrastructure*

Pre-Mitigation Impact

In the unlikely event that a replacement of turbines components is required during this phase, the impacts described in section 14.2.13.1 will be the same.

Mitigation Measures

The measures listed in section 14.2.13.1 which relate to the delivery of turbine components through the site will be implemented.

Residual Impact

There will be no residual effect on electrical infrastructure during the operational phase.

Significance of Effects

There will be no significant effect on electrical infrastructure from the Proposed Development during the operational phase.

14.2.15.1.2 *Electricity Supply*

Pre-Mitigation Impact

It is the intention to connect the proposed onsite substation into the existing 110kV overhead line which crosses the Wind Farm Site. The Proposed Development will supply a 117MW to 169MW of electricity to the national grid during the operational phase, offsetting the use of fossil fuels within the electricity generating sector. The Proposed Development has the potential supply approximately 70,036 to 101,163 Irish households with clean electricity per year.

Mitigation Measures

None are proposed.

Residual Impact

There will be a long-term slight positive residual effect on electricity supply during the operational phase.

Significance of Effects

The Proposed Development will have a slight positive effect on national electricity supply.

14.2.16 Operational Phase Waste Management

During the operational phase, the wind farm site will include appropriate signage encouraging amenity users to leave the area waste free and bring waste materials home for proper disposal. The onsite 110kV substation will include welfare facilities for use by Eirgrid operational and maintenance staff. The wastewater holding tank will be emptied when required by a licenced contractor.

Mitigation Measures

None are proposed.

Residual Impact

There will be a long-term imperceptible negative effect on waste management during the operational phase.

Significance of Effects

There will be no significant effects on waste management services during the operational phase.

14.2.17 Operational Phase :Telecommunications and Aviation

14.2.17.1 Telecommunications

Pre-Mitigation Impact

As discussed in section 14.2.11, a Telecoms Impact Assessment was undertaken for the Proposed Development by AI Bridges, please see Appendix 14-3 for full report. The assessment involved a study of potential interference on electromagnetic links from the operational phase of the Proposed Development. The assessment included modelling of all telecommunication links to determine if any could be impacted by the turbine locations. Through further design iterations, the turbine locations were refined. The final and proposed design was issued to all operators who confirmed the final design has no impact on their links.

Mitigation Measures

It is standard practice of 2RN to produce a protocol document for wind farm developments, which will be signed by the developer. The protocol document ensures that in the event of any interference occurring to television or radio reception due to operation of the wind farm, the required measures, as set out in the document, will be carried out by the developer to rectify this. The Protocol Document ensures that the appropriate mitigation is carried out in the event of unanticipated broadcast interference arising to television or radio reception as a result of the proposed wind farm.

As all requested setbacks from all operators links were incorporated into the design, no further mitigation measures during the operational phase are required.

Residual Impact

The Proposed Development will have no residual impact on the telecommunications signals due to the achieved setbacks from links in the area.

Significance of Effects

There will be no significant effects on telecommunications from the Proposed Development during the operational phase.

14.2.17.2 Aviation

Pre-Mitigation Impact

There are no Air Corps assets within the Wind Farm Site or surrounding landscape as listed in the Department of Defence Tall Structures Position Paper 2014. There are no IAA assets within the Wind Farm Site or surrounds that may be impacted by the Proposed Development.

Mitigation Measures

The following DOD requests will be complied with should the Proposed Development be consented:

1. Turbines will be illuminated by high intensity obstacle lights that will allow the hazard to be identified and avoided by aircraft in flight (and in liaison with IAA requirement No.1 below)
2. Obstruction lights will be incandescent or of a type visible to Night Vision Equipment.
3. Obstruction lighting fitted to obstacles must emit light at the near Infra-Red (IR) range of the electromagnetic spectrum specifically at or near 850 nanometres (nm) of wavelength. Light intensity to be of similar value to that emitted in the visible spectrum of light.

The following IAA requests will be complied with should the Proposed Development be consented:

1. Agree an aeronautical obstacle warning light scheme for the wind farm development,
2. Provide as-constructed coordinates in WGS84 format together with ground and tip height elevations at each wind turbine location and
3. Notify the Authority of intention to commence crane operations with at least 30 days prior notification of their erection.

Residual Impact

With the implementation of the above, the residual impact is long-term imperceptible negative impact on aviation assets. .

Significance of Effects

There will be no significant effects on aviation assets from the Proposed Development during the operational phase.

14.3 Cumulative Assessment

14.3.1 Cumulative Effects

Potential cumulative effects on material assets between the Proposed Development and other projects in the vicinity were also considered as part of this assessment. The projects considered as part of the cumulative effect assessment including but not limited to the consented Bracklyn Wind Farm (Planning Reference: PC25M.306261), the Peatland Rehabilitation Plans and PCAS are described in **Chapter 2 Background to the Proposed Development** of this EIAR and considered below.

As part of the IPC licence rehabilitation requirements, the applicant is required to produce peatland rehabilitation plans. Please see Appendix 4-6 for details. These plans have considered the Proposed Development footprint and demonstrate that both peatland rehabilitation and renewable energy can coexist harmoniously onsite.

The Peatland Climate Action Scheme (PCAS) which comprises enhanced peatland rehabilitation (above and beyond IPC licence requirements), commenced and was completed at Carranstown East, adjacent to the Wind Farm Site. Bracklin West, also adjacent to the Wind Farm Site has been selected for PCAS and it is expected to commence in 2023. This accelerated form of peatland rehabilitation has been undertaken at the recently constructed Cloncreen wind farm. This scheme is in addition to the IPC licence requirements and therefore does not form part of the proposed Ballivor Wind Farm application.

14.3.1.1 Construction Phase

14.3.1.1.1 *Utilities*

Electricity

As demonstrated in section 14.2.12 above, there are no significant effects on electricity supply and infrastructure during the construction phase of the Proposed Development. Therefore, there will be no significant cumulative effects on electricity infrastructure or supply with other proposed or consented plans and projects (including the consented Bracklyn Wind Farm and peatland rehabilitation measures) within the surrounding landscape should they be constructed in parallel with the Proposed Development.

Water supply

As demonstrated in section 14.2.12 above, there are no significant effects on water infrastructure or supply during the construction phase of the Proposed Development. Therefore, there will be no significant cumulative effects on water infrastructure or supply with other proposed or consented plans and projects (including the consented Bracklyn Wind Farm and peatland rehabilitation measures) within the surrounding landscape should they be constructed in parallel with the Proposed Development.

14.3.1.1.2 *Waste Management*

As demonstrated in section 14.2.13 above, there are no significant effects on waste management during the construction phase of the Proposed Development. Therefore, there will be no significant cumulative effects on waste management with other proposed or consented plans and projects (including the consented Bracklyn Wind Farm and peatland rehabilitation measures) within the surrounding landscape should they be constructed in parallel with the Proposed Development.

14.3.1.1.3 Telecommunications and Aviation

There is no potential for impacts on telecommunications and aviation during the construction phase of the Proposed Development therefore cumulative effects are no considered.

14.3.1.2 Operational Phase

14.3.1.2.1 Utilities

As demonstrated in section 14.2.15 above, there are no significant effects on electricity infrastructure during the operational phase of the Proposed Development. However, the Proposed Development will supply a 117MW to 169MW of electricity to the national grid during the operational phase, offsetting the use of fossil fuels within the electricity generating sector. The Proposed Development has the potential supply approximately 70,036 to 101,163 Irish households with clean electricity per year which is a long term slight positive residual effect on electricity supply. This is considered to be a significant effect. In conjunction with the operational phase Bracklyn Wind Farm, there will be a positive significant cumulative effect on electricity supply. There is no cumulative effect with other non-energy producing developments within the surrounding landscape.

Water supply

As demonstrated in section 14.2.15 above, there are no significant effects on water infrastructure or supply during the operational phase of the Proposed Development. Therefore, there will be no significant cumulative effects on water infrastructure or supply with other proposed or consented plans and projects (including the consented Bracklyn Wind Farm and peatland rehabilitation measures) within the surrounding landscape should they be operational in parallel with the Proposed Development.

14.3.1.2.2 Waste Management

As demonstrated in section 14.2.16 above, there are no significant effects on waste management during the operational phase of the Proposed Development. Therefore, there will be no significant cumulative effects on waste management with other proposed or consented plans and projects (including the consented Bracklyn Wind Farm and peatland rehabilitation measures) within the surrounding landscape should they be operational in parallel with the Proposed Development.

14.3.1.2.3 Telecommunications and Aviation

As the Proposed Development will not have any significant effects on telecommunications or aviation, there will be no cumulative impacts relating to the Proposed Development and surrounding projects in relation to the same. Furthermore, the Bracklyn Wind Farm which located adjacent to the Proposed Development Wind Farm Site concluded in its corresponding Environmental Impact Assessment that there will be no significant effects on telecommunication links during the operational phase of the Bracklyn Wind Farm.