14. MATERIAL ASSETS

Material Assets are defined in the '*Advice Notes for Preparing Environmental Impact Statements'* (EPA, Draft 2015) as "*resources that are valued and that are intrinsic to specific places" and in the* 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports' (EPA, Draft 2017) as "*built services and infrastructure. Traffic is included because in effect traffic consumes roads infrastructure*." They may be either of human or natural origin. The cultural assets of Archaeology and Cultural Heritage are addressed in Chapter 13 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. Waste management which is also considered under the heading of material assets by the above EPA documents, is summarised in Section 4.3.11.7 of Chapter 4 of the EIAR and considered in Section 14.3 below. 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.

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 Section 1.7 of Chapter 1 of this EIAR.

14.1 Traffic and Transport

14.1.1 Introduction

14.1.1.1 Background and Objectives

The purpose of this section is to assess the effects, on roads and traffic, of the traffic movements that will be generated during the construction, operational and decommissioning phases of the proposed Glenard Wind Farm development.

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 delivery of wind turbine components. The requirements of the additional traffic and abnormal sized loads generated during the construction stage were assessed on both the external road network and at the junctions of the proposed road 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 of 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 (Construction and Use of Vehicles) Regulations 2003 (S.I. No. 5 of 2003) 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. Therefore, the structural integrity of the national and regional road network used during the construction of the proposed development is adequate to provide for these accepted loads.

The magnitude of the increase in traffic volumes experienced on the surrounding network is identified during the various construction stages of the proposed development. Traffic management measures are also provided in Sections 14.1.5 and 14.1.8.6 aimed at minimising the traffic impact on the local highway network. Refer also to Appendix 14-2 for the Traffic Management Plan (TMP).

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.

Traffic counts were undertaken by Traffinomics Ltd, a specialist travel survey company based in Ireland regularly commissioned by various local authorities.

14.1.1.3 Guidance and Legislation

This section has been completed in accordance with the guidance set out in Chapter 1 of this EIAR. The assessment uses standard terminology (refer to Table 1-2 of Chapter 1 of the EIAR) to describe the likely significant effects associated with the proposed development. Further information on the classification of effects used in this assessment is presented in Section 1.8 of this EIAR. See also Section 14.1.1.5 below for additional guidance that has been adhered to.

14.1.1.4 Scoping and Consultation

The scope for this assessment has been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties as outlined in Sections 2.6 and 2.7of Chapter 2 of the EIAR and summarised below.

Transport Infrastructure Ireland

Transport Infrastructure Ireland (TII) responded to Scoping on the 21st August 2019 in which it provided a list of recommendations to be followed when preparing the EIAR. 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, N13, year 2019.

Department for Infrastructure

The Department for Infrastructure (Dfi NI) responded to Scoping on the 30th September 2019 in which it also provided a list of recommendations to be followed when preparing the EIAR, including thresholds above which the traffic impacts of the proposed development should be assessed. The Dfi also requested details of all materials to be delivered through Northern Ireland to be provided, to be consulted with respect to the Traffic Management Plan prior to delivery, and to agree with the Applicant an inspection scheme to monitor and repair any damage to the road network that may occur during the construction 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.

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

- A review of the existing and future transport infrastructure in the vicinity of the proposed development, including an assessment of 2020 traffic flows and traffic forecasts during an assumed construction year of 2025 (Sections 14.1.2 - Receiving Environment and 14.1.3 – Existing Traffic Volumes).
- A description of the nature of the proposed development and the traffic volumes that it will generate during the different construction stages and when it is operational (Section 14.1.4 – Proposed Development and Traffic Generation).
- A description of the abnormally sized loads and vehicles that will require access to the site (Section 14.1.5 – Construction Traffic Design Vehicles).
- A review of the increases in traffic volumes due to development generated traffic on links and junctions (Section 14.1.6 – Expected Traffic During Construction, During Operation) and during Decommissioning.
- Identification of traffic management for large deliveries during construction (Section 14.1.7 – Traffic Management for Large Deliveries).
- A geometric assessment of the route and its capacity to accommodate the abnormal-sized loads associated with the development (Section 14.1.8 – Abnormal Load Route Assessment).
- An assessment of the provision for sustainable modes of travel (in this case primarily with respect to the transport of construction staff) (Section 14.1.9 – Provision for Sustainable Modes of Travel).
- An assessment of the effects of the Proposed Development (Section 14.1.10 – Likely and Significant Effects and Associated Mitigation Measures, including Traffic Management Plan)

14.1.2 Receiving Environment

14.1.2.1 Site Location

The Proposed Development, known as Glenard Wind Farm, is located in Co. Donegal, in the townlands listed in Table 1-1 of Chapter 1: Introduction.

The proposed development site entrance on the L-7131-1 Crockaheeny Road is located approximately 6.2km west of Quigley's Point, Co. Donegal and 13.1km north of Derry City. The site location is shown on Figure 1-1 of the EIAR.

14.1.2.2 Proposed Abnormal Size Load Delivery Route

A detailed assessment of the transport route for the abnormally large vehicles was made from the proposed port of arrival in Derry, with the route shown in Figure 14-1a and discussed in detail in Section 14.1.8.

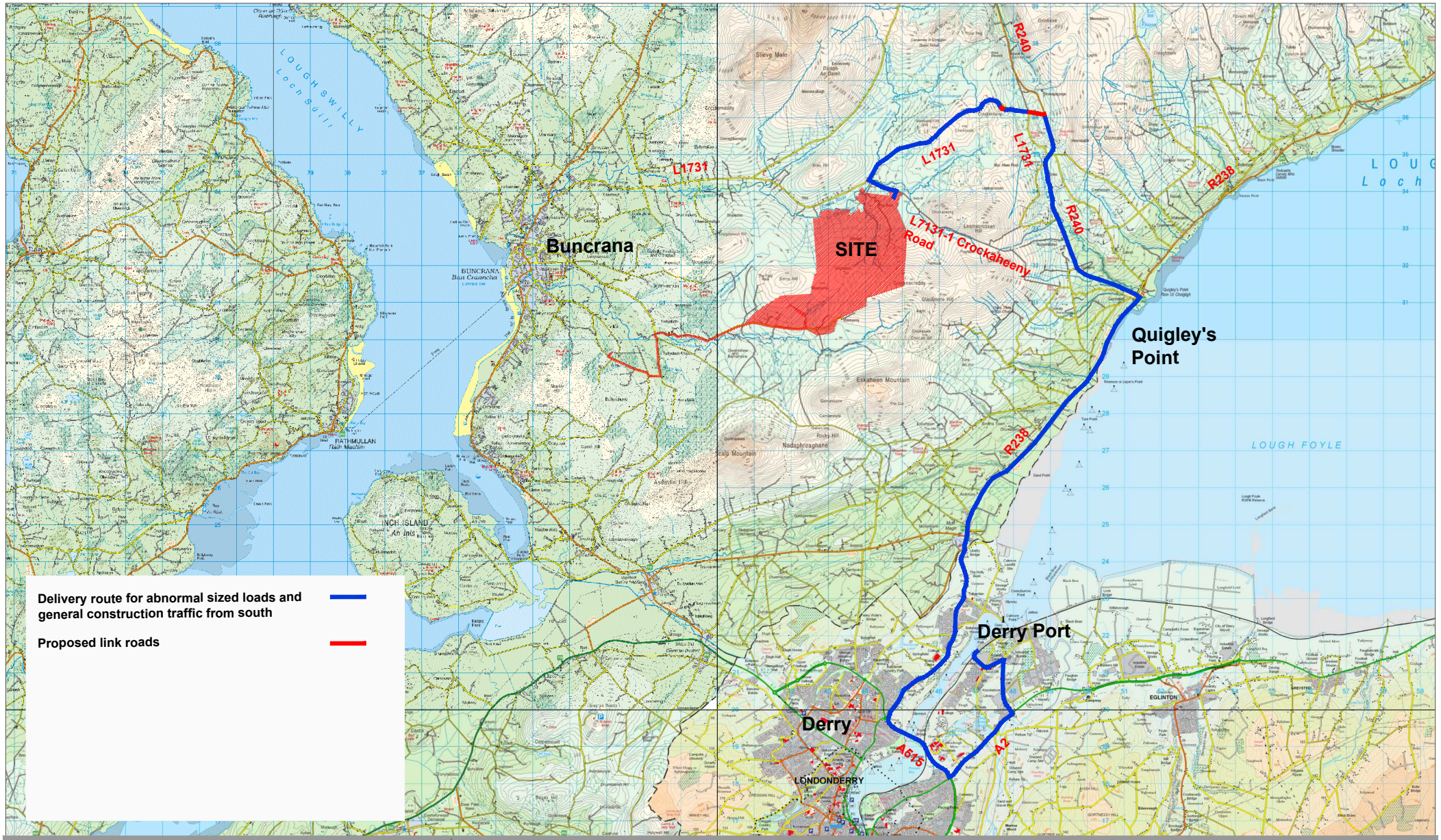
The route assessment includes 15 no. locations on the abnormal size load delivery route as shown on Figure 14-2a, including the right turn from Haw Road onto the Maydown Road (Location 1) just to the east of the Port of Derry, followed by the right turn at the Maydown Road / A2 Road roundabout (Location 2). The abnormally sized loads will then travel south west towards Derry City passing through the Gransha Roundabout (Location 3), before turning right at the roundabout with the A515 (Location 4) heading in a northwestern direction over the River Foyle. On the approach to the signalised junction with the A2 Cuilmore Road (Location 5) the delivery vehicles will turn right travelling north out of the city on the west bank of the river / lough on the A2 / R238 for approximately 14 kms. On reaching the village of Quigley's Point the vehicles will turns left onto the R240 (Location 6) heading in a northern direction for approximately 7 kms. At this point the abnormally sized turbine loads will turn left onto a new temporary link road approximately 0.4 kms long that will link the R240 at its eastern end (Location 7) with the L1731 at the western end (Location 8). The vehicles will then travel west on the L1731 for approximately 6 kms (Location 9, which is also a new link road, and locations 10 to 13) before turning left onto the local L-7131-1 Crockaheeny Road where a new steel bridge crosses the River Crana (Location 14). The abnormal loads will then travel east on the L-7131-1 Crockaheeny Road for approximately 0.8 kms to the location of a proposed new access junction where they will turn right into the site (Location 15). The proposed link road linking the R240 and the L1731 (Locations 7 to 8) will be used for the purpose of all deliveries (abnormally sized loads and standard HGVs) to the site, while the second link road at location 9 will be used solely for the purpose of the delivery of abnormally sized loads to the site. All of deliveries of abnormally sized loads will be made using Garda Siochana / Police Service of Northern Ireland escorts and local transient traffic management measures put in place by the haulage company.

14.1.2.3 Proposed Construction Traffic Haul Route

The delivery route for general construction traffic including site staff and heavy goods vehicles (HGVs) may vary depending on the location of the suppliers used for concrete and other materials required to construct the proposed development. Based on the location of suppliers in the vicinity of the Proposed Development (as described below), it is estimated that concrete and general construction traffic will all travel on one of the following routes as shown in Figures 14.1b and 14.2a, in order to test the worst case scenario;

Concrete / Rock / Stone

- It is not confirmed at this stage where the concrete required for the turbine foundations or the finer crushed stone required during the construction phase will be transported from. There are 4 quarries identified that may be used to provide concrete, rock and stone. These quarries are located in Carndonagh, situated to the north of the site, Gransha and Burnfoot located local to the south of site and, and in Letterkenny to the southwest. The locations of these quarries are shown in Figure 4-10. While it is proposed that quarries situated closest to the site will be used in order to minimise the traffic effects of the proposed development, in order to test a worst case scenario it is assumed that all concrete, rock and stone may be delivered from any one of the 4 quarries.



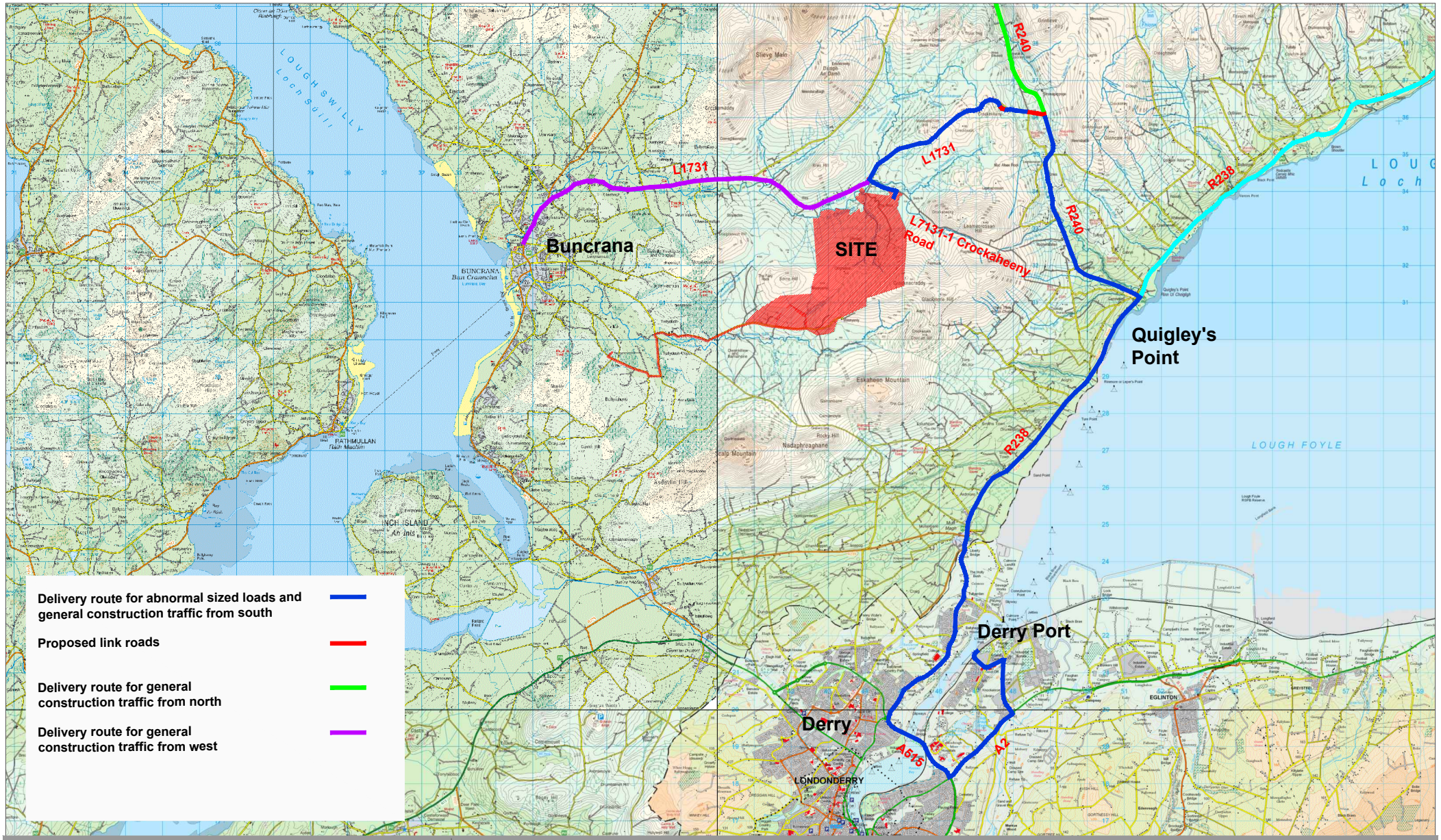
NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSE

Figure 14.1a Site location and delivery route for abnormal sized loads

PROJECT:	Glenard Wind Farm		
CLIENT:	FuturEnergy Ireland	SCALE:	NTS
PROJECT NO: 7790	DATE: 26.11.21	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



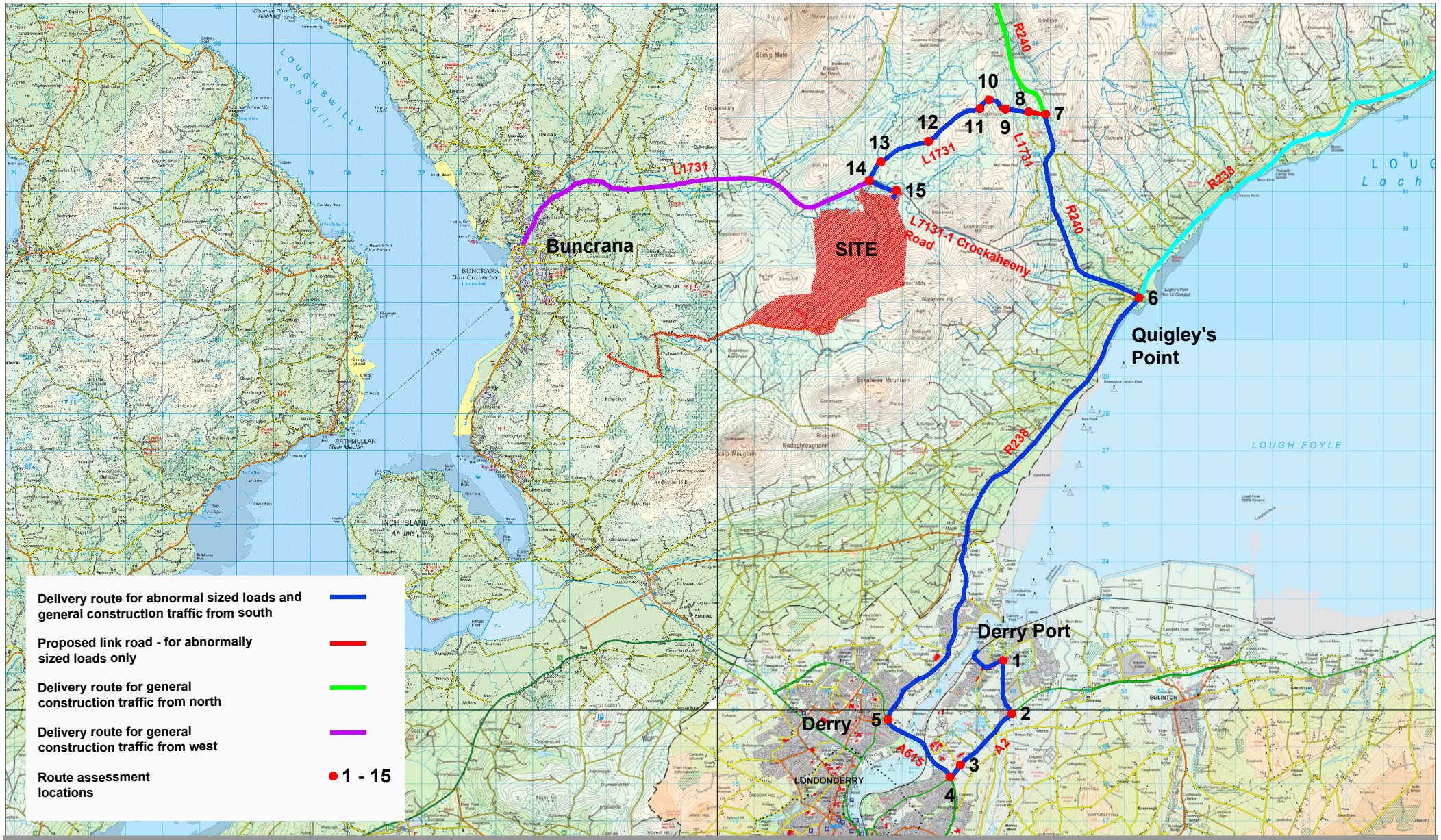
NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSE

Figure 14.1b Site location and delivery route for general construction traffic

PROJECT:	Glenard Wind Farm		
CLIENT:	FuturEnergy Ireland	SCALE:	NTS
PROJECT NO: 7790	DATE: 26.11.21	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



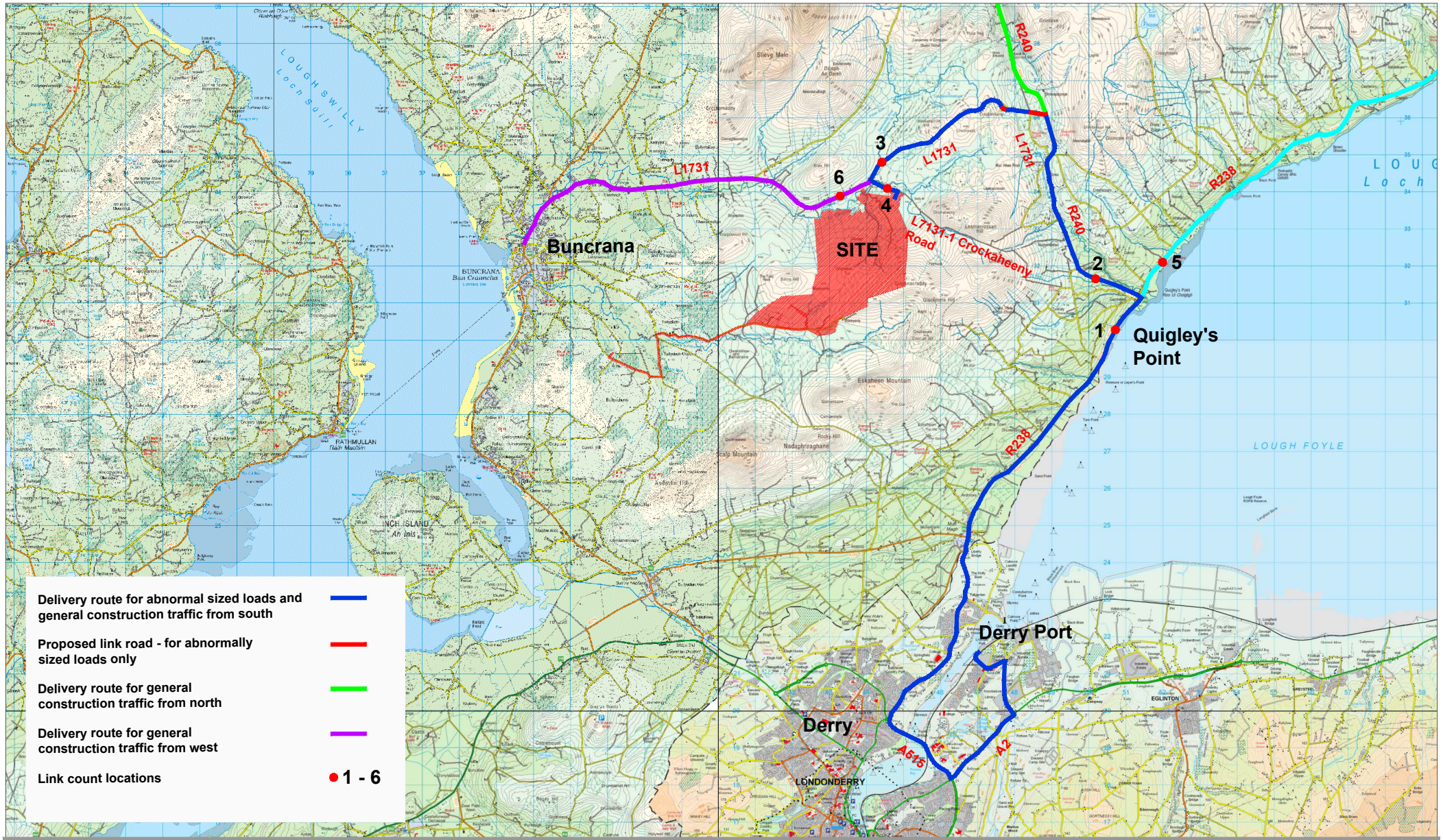
NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSE

Figure 14.2a Route assessment location plan

PROJECT:	Glenard Wind Farm		
CLIENT:	FuturEnergy Ireland	SCALE:	NTS
PROJECT NO: 7790	DATE: 26.11.21	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSE

Figure 14.2b Link count locations

PROJECT:	Glenard Wind Farm		
CLIENT:	FuturEnergy Ireland	SCALE:	NTS
PROJECT NO: 7790	DATE: 26.11.21	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

General construction materials, felled timber, other miscellaneous items and waste

- Similarly, it is not confirmed at this stage where general construction materials, felled timber, miscellaneous items and waste will be transported from or to. Again, in order therefore to test a worst case scenario it was assumed that all general construction traffic may be delivered from or to the direction of Quigley's point, or may be delivered from the direction of Moville in the north, or Derry in the south, which will be the most likely delivery route, or from Buncrana in the west, as shown in Figure 14-1b.

Other wind turbine component deliveries (components delivered using standard HGVs)

- All other wind turbine components delivered by standard HGVs will arrive at the Port of Derry and will be delivered by via the same haul route as for the abnormally sized loads as set out in 14.1.2.2 above and will occur on the same occasions as the abnormal sized loads.

It is noted that the proposed link road linking the R240 and the L1731 (Locations 7 to 8) will also be used for the purpose of the delivery of general deliveries to the site, but will not be used by construction staff cars or Light Goods Vehicles (LGVs). The link road will be closed by means of gates at the junctions on the R240 and the L1731 at all other times. The second link road at location 9 will be closed at all times other than when the abnormal loads are delivered to the site.

The impacts of additional traffic generated due to the construction of the grid connection are also assessed, including the potential impacts on existing traffic that will require to undertake local detours for short periods during the construction of a new bridge on the L1781-3 over the Owenkillew River at Tullydush Upper.

The assessment presented in this chapter of the EIAR is based on these conservative scenarios.

14.1.2.4 Site Entrance

There is one site entrance proposed for the construction stage of the development in order to transport everything (turbine components, materials and equipment to the site, and staff), and it is via the proposed access junction on the L-7131-1 Crockaheeny Road located in the townland of Glenard as shown in Figure 14-2a as Location 15.

In addition to the proposed new link road between the R240 and L1731 (Locations 7 to 8), the proposed link road for abnormal loads on the L1731 (Location 9) and the proposed access junction on the L-7131-1 Crockaheeny Road (Location 15), local road widening works will be required along the existing L-1731 in order to accommodate the abnormally sized loads associated with the turbine components. Following the construction phase of the proposed development, the boundary between the proposed link road and the R240 to the east and the L1731 to the west (Locations 7 to 8) will be reinstated by erecting steel barriers. The same will apply to the second link road at Location 9. It is noted, however, that they may need to be reopened temporarily during the lifetime of the development should replacement blades or other abnormal loads be required to be delivered to the site.

During the operational stage, limited parking for the purpose of amenity use will be provided at the proposed access junction on the L-7131-1 Crockaheeny Road. Further information on the proposed amenity elements associated with the proposed development is outlined in Chapter 4 of this EIAR.

14.1.3 Existing Traffic Volumes

It should be noted that traffic volumes are discussed in terms of vehicles and passenger car units, or PCUs, where each vehicle is expressed in terms of its demand on the network relative to the equivalent

number of cars or light goods vehicles (LGV). 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 equipment was assigned a value of 10 PCUs.

14.1.3.1 Background Traffic Flows

The link count locations included in the assessment are shown in Figure 14-2b.

A continuous traffic counter is maintained by TII on the N13 between Bridgend and Burnfoot, Co Donegal. This information, together with peak period classified turning counts, undertaken by Traffinomics Ltd, at the junctions between the R238 and R240 at Quigley's Point and the L1731 and the L-7131-1 Crockaheeny Road approaching the proposed site, ie. locations 1 to 6 shown in Figure 14-2b. The counts, which were undertaken on Thursday 12th March 2020, were used to provide background traffic volumes on the local study road network.

The date that the traffic counts were undertaken, Thursday 12th March 2020, was just prior to 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 site on the N13 were compared for the survey date, and the comparable Thursday in 2019 (14th March 2019), prior to the Covid-19 pandemic. A total daily 2-way volume of 8,836 vehicles was observed on the Thursday in 2019, compared to 8,123 in 2020, indicating a Covid related reduction in traffic demand on the N13 of 8.7%. As it is likely that the effects of the pandemic would be less marked on the local and regional road network, where there are less long distance trips, and the fact that it is the impact of the additional traffic generated by the proposed development that is being assessed in this EIAR, it is concluded that the traffic count data is valid for the purpose of this assessment.

For the peak period count locations daily flow profiles were applied to the short period traffic counts using the data from the continuous traffic counter site on the N13 which shows that the average annual daily traffic flow, or AADT, is 11.5 times the flow observed during the evening peak hour period, as set out in Table 14-1.

Data from the continuous traffic counter maintained by TII on the N13 was used to determine the seasonal variation in traffic volumes in the proximity of the proposed delivery route. Traffic count data from 2019 reveals that average monthly flows are 4.8% higher than those observed in March. Seasonal variations were not based on 2020 data as traffic volumes were not typical in this year. All daily traffic flows on the delivery route were therefore seasonally adjusted and factored by 1.048 as shown in Table 14-1. The seasonally adjusted traffic flows were then adopted as the base year 2020 traffic flows for the purpose of this EIAR. Daily traffic flows on the route vary from a maximum of 9,389 vehicles per day observed on the R238 to the south of Quigley's Point, to 205 vehicles per day on the L1731 approaching the junction with the L-7131-1 Crockaheeny Road, with just 24 vehicles per day on the L-7131-1 Crockaheeny Road approaching the site.

Table 14-1 Observed flow in PM peak hour, all day factor, Average all day flows, year 2020 (2-way vehicles)

Link	2-way flow	hour	All day factor	Month	All day flow	Seasonally adjusted All day flow
1 R238 (south of Quigley's Point)	779	17:00 – 18:00	11.5	March	8,959	9,389
2 R240 (west of Quigley's Point)	409	17:00 – 18:00	11.5	March	4,704	4,929

Link	2-way flow	hour	All day factor	Month	All day flow	Seasonally adjusted All day flow
3 L1731 (Quigley's Point)	17	17:00 – 18:00	11.5	March	196	205
4 L-7131-1 Crockaheeny Road to site	2	17:00 – 18:00	11.5	March	23	24
5 R238 (north of Quigley's Point)	462	17:00 – 18:00	11.5	March	5,313	5,568
6 L171 (Buncrana)	18	17:00 – 18:00	11.5	March	207	1217

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 2025.

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 for Co. Donegal, and factors for the years relevant to this study, are shown in Table 14-2 and Table 14-3. Traffic volumes are forecast to increase during the period from 2020 (the observed traffic count year) to 2025 (the assumed construction year) by 5.7%, assuming a medium growth scenario. All day traffic flows, for the years 2020 and 2025, on the study area network are compared in Table 14-4.

It should be noted that while the assumed construction year of 2025 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 1.1% (as shown in Table 14-2) 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 14-2 TII Traffic Growth Annual Factors and Indices for County Donegal

Year	Lights – Annual Factor			Lights (Cars and LGVs) – Cumulative Index		
	Low	Medium	High	Low	Medium	High
2020	1.0097	1.0111	1.0139	1.000	1.000	1.000
2021	1.0097	1.0111	1.0139	1.010	1.011	1.014
2022	1.0097	1.0111	1.0139	1.019	1.022	1.028
2023	1.0097	1.0111	1.0139	1.029	1.034	1.042
2024	1.0097	1.0111	1.0139	1.039	1.045	1.057
2025	1.0097	1.0111	1.0139	1.049	1.057	1.071

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

Table 14-3 TII traffic growth rates by growth scenario

Period	New Factors		
	Low	Medium	High
2020 – 2025	1.05	1.06	1.07

Table 14-4 Observed all day flows by year (2-way vehicles)

Link	2020	2025
1 R238 (south of Quigley's Point)	9,389	9,952
2 R240 (west of Quigley's Point)	4,929	5,225
3 L1731 (from R240 towards site)	205	217
4 L-7131-1 Crockaheeny Road to site	24	26
5 R238 (north of Quigley's Point)	5,568	5,902
6 L171 (from Buncrana)	1217	230

The classified counts undertaken on the delivery route were used to determine the existing percentage of HGVs on the study area network. The observed percentage of HGVs was observed to vary on the turbine delivery route from 2.7% on the R238 south of Quigley's Point, to 2.9% on the R240 to 1.0% on the local L1731 and L-7131-1 Crockaheeny Roads approaching the site. Traffic volumes forecast on the study network for the year 2025 are shown by vehicle type in Table 14-5.

Table 14-5 All day flows, percentage HGVs and flows by vehicle type, year 2025

Link	All day flow (vehs)	% HGV's	Vehicles		PCUs		
			HGVs	Cars / LGVs	HGVs	Cars / LGVs	Total
1 R238 (south of Quigley's Point)	9,952	2.7%	269	9,683	645	9,683	10,328
2 R240 (west of Quigley's Point)	5,225	2.9%	152	5,073	364	5,073	5,437
3 L1731 (from R240 towards site)	217	1.0%	2	215	5	215	220
4 L-7131-1 Crockaheeny Road to site	26	1.0%	0	25	1	25	26
5 R238 (north of Quigley's Point)	5,902	1.0%	59	5,843	142	5,843	5,985

Link	All day flow (vehs)	% HGV's	Vehicles		PCUs		
			HGVs	Cars / LGVs	HGVs	Cars / LGVs	Total
6 L171 (from Buncrana)	230	3.6%	8	222	20	222	242

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, construction of turbine foundations, cabling, met mast foundations, substation construction, construction of compound and tree felling, and,
- Stage 2 – Turbine component delivery and construction.

For the purpose of the traffic impact assessment, projections based on trip generation data collected from other wind farm construction projects regarding the numbers of trips per quantum of material, the number of turbine component parts based on 15 turbines, the length of the construction phase and work periods etc. were made to inform the assessment. These projections allow for a worst-case scenario assessment 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 Chapter 4 and the CEMP, which is submitted as Appendix 4-3 of this EIAR.

The construction phase of the proposed development is expected to last approximately 18 months (1.5 years). While this could increase to 24 months, 18 months was assumed for the purpose of this assessment in order to test the worst-case scenario. The shortest construction period will give rise to higher volumes of construction traffic using the public road network at any one time.

14.1.4.1.1 *Stage 1 – Site Preparation and Ground Works*

For assessment purposes a standard 255 working days per annum was adopted for a 12 month period, equating to 383 days for an 18 month construction period for the site preparation and ground works stage (stage 1) with the total numbers of deliveries made to the site during that period shown in Table 14-6.

During this construction phase, there will be two distinct types of days with respect to trip generation. A total of 15 days will be used to pour the 15 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 368 working days for this stage, other general materials will be delivered to the site.

During all of Stage 1, it is estimated that 5,476 two-way HGV trips will be made to the site by trucks and large articulated HGVs, as set out in Table 14-6, with the daily effect on the local road network shown in Table 14-7 and 14-8.

The figures in Table 14-6 show that on the 16 days that concrete will be delivered to the site an additional 360 two-way PCUs will be added to the network (comprising 75 two-way HGV trips or 150

movements, with 2.4 PCUs per movement), as shown in Table 14-7. Similarly, on the 368 days when other materials will be delivered to the site, traffic volumes on the local network are forecast to increase by an average 84 two-way PCUs, as set out in Table 14-8.

Table 14-6 Stage 1 – Site preparation and groundworks – total movements

Material	Total no. Truck Loads	Truck type
Concrete	1,125	Trucks
Concrete blinding and steel	175	Large artic
Plant / fencing / compound set-up	38	Large artic
Forestry felling	805	Large artic
Crushed rock and stone	3,682	Large artic
Ducting / cabling	471	Large artic
Grid cable laying	40	Large artic
Cranes	11	Large artic
Substation components	79	Large artic
Refuelling / maintenance / misc (incl. waste)	35	Large artic
Total	**6,461**	

Table 14-7 Stage 1 – Concrete foundation pouring – total movements and volumes per delivery day

Material	Total Truck Loads	Truck type	PCU Value	Total PCUs	PCU Movements /day*	2- way PCUs/day
Concrete	1,125	Truck	2.4	2,880	180.0	360.0
* Estimation based on 15 concrete pouring days						

Table 14-8 Stage 1 – Site preparation and groundworks – total movements and volumes per delivery day

Material	Total Truck Loads	Truck type	PCU Value	Total PCUs	PCU Movements /day*	2- way PCUs/day
Concrete blinding and steel	175	Large artic	2.4	420.8	1.7	3.4
Plant / fencing / compound set-up	38	Large artic	2.4	91.2	0.4	0.7

Material	Total Truck Loads	Truck type	PCU Value	Total PCUs	PCU Movements /day*	2- way PCUs/day
Forestry felling	805	Large artic	2.4	1,932.0	5.3	10.5
Crushed rock and stone	3,682	Large artic	2.4	8,836.8	24.026.7	48.0
Ducting / cabling	471	Large artic	2.4	1,129.6	4.6	9.2
Grid cable laying	40	Large artic	2.4	96.0	0.4	0.8
Cranes	11	Large artic	2.4	26.4	0.1	0.2
Substation components	79	Large artic	2.4	189.6	0.8	1.5
Refuelling / maintenance / waste collection / misc.	35	Large artic	2.4	83.2	0.3	0.7
Total	5,336			12,806	34.8	69.6
* Estimation based on ground work period of 368 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 large vehicles, referred to in this section as extended artics, transporting the component parts of the turbines (nacelles, blades and towers). There will also be deliveries made by normal large HGVs, transporting cables, tools and smaller component parts The types of load and associated numbers of trips made to the site during the turbine construction period are shown in Table 14-9, which summarises that a total of 144 trips will be made to and from the site by extended artics, with a further 64 trips made by conventional large articulated HGVs.

Table 14-9 Stage 2 – Wind turbine plant – total movements

Material	Units	Quantity per Unit	Total Quantity	Quantity per Truck	Total Truck Loads	Truck type
Nacelle	15	1	15	1	15	Extended Artic

Material	Units	Quantity per Unit	Total Quantity	Quantity per Truck	Total Truck Loads	Truck type
Blades	15	3	45	1	45	Extended Artic
Towers	15	5	75	1	75	Extended Artic
Sub total					***135***	
Transformer	15	1	15	1	15	Large Artic
Drive train and blade hub	15	1	15	1	15	Large Artic
Base and other deliveries	15	2	30	1	30	Large Artic
Sub total					***60***	
Total					**195**	

For the purpose of this assessment a delivery period based on previously constructed wind farm sites already constructed, 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 artic trips made by convoy to the site on 2 days per week, resulting in this stage taking approximately 29 days/nights spread over a 15-week period. On a further 16 days at 2 days per week, lasting for approximately 8 weeks, the remaining equipment required during this phase will be delivered to the site. The additional traffic movements for these 2 types of days are summarised in Table 14-10 and Table 14-11. In Table 14-10, a PCU equivalent value of 10 was allocated to each extended artic movement, resulting in an additional 100 PCUs on the study network on these 2 days per week, while an additional 14.4 PCUs are forecast to be on the network on two other days per week, as shown in Table 14-11, during the turbine construction phase.

Table 14-10 Stage 2 – Wind turbine plant, extended artics – total movements and volumes per delivery day

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

Material	Units	Truck Type	PCU Value	Total PCUs	2-way PCUs/ day
* Based on 5 abnormal sized loads being delivered per day on 2 days per week (total 135 loads will take 27 nights spread over 15 weeks)					

Table 14-11 Stage 2 - Wind turbine plant, normal artic HGVs - total movements and volumes per delivery day

Material	Quantity per Unit	PCU Value	2-way PCUs / day
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	3		14.4
* 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 80 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 40 staff at any one time during the turbine construction stage. If a worst case is assumed then all staff will travel to / from the site by car, at an average of 2 persons per car, then a total of 80 PCU movements (each trip is two way). This is added to the network during the groundworks stage of the development, reducing to 40 pcu trips during the turbine construction stage. This has been included in the figures used in this assessment.

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 wind farm developers, Eirgrid 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 to three maintenance staff trips per week. The impact on the network of these trips during the operational stage is discussed in Section 14.1.4.

Once operational the site will also be open to visitors for amenity purposes, with those travelling by car using the carpark provided and accessed via the site access junction. Based on visitors to existing wind farm sites it is forecast that up to 20 car trips per day will be generated by this use.

14.1.4.3 Development Trip Generation – During Decommissioning

Traffic generation during decommissioning will be similar but significantly less than the trip generation estimates presented for the construction phase presented in 14.14.1.

14.1.5 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 blades up to 68.5m long have been considered for the purpose of this assessment..

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 length of 68.5m 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..

For the purpose of this assessment set out in this EIAR, it is assumed that the blades, which are the largest turbine components, will be transported using a standard extended arctic. As this method involves transporting the blade in a horizontal position it represents the worst case in terms of the geometric requirements on the road network. It is noted, however, that during the delivery phase consideration will be given to using alternative transportation technologies, including the use of scissor lift adaptors which raise the rear of the blade over existing obstructions, and in extreme cases, the use of blade lift adaptors that can transport blades at an angle to both lift the rear of the blade and shorten the wheelbase of the transporter.

The critical vehicles in terms of size and turning geometry requirements and used in the detailed route assessment discussed in Section 14.1.8 are the blade and tower transporters. The geometry of the design vehicles are included as Figures 14-4 and 14-5.

The key dimensions of the vehicles tested are as follows:

Transport of Blades – Super Wing Carrier with blade

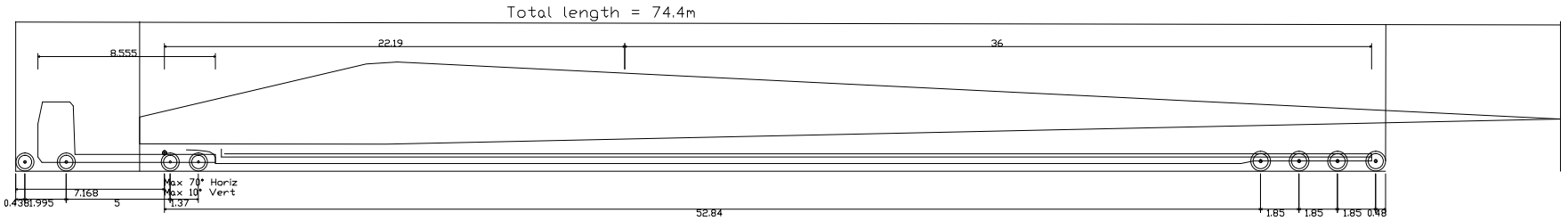
Total length	74.4 m
Length of blade	68.5 m
Inner radius	28.0 m

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

Total length (with load)	49.6 m
Length of load	30.0 m
Inner radius	25.0 m

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 design test vehicles.



68.5 m blade	
Overall Length	74.4m
Overall Width	2.550m
Overall Body Height	4.800m
Min Body Ground Clearance	0.375m
Track Width	2.500m
Lock to Lock Time	6.00s
Wall to Wall Turning Radius	9.800m

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14.4 Design blade extended artic profile (68.5m blade)

PROJECT:	Glenard Wind Farm		
CLIENT:	FuturEnergy Ireland	SCALE:	NTS
PROJECT NO: 7790	DATE: 28.10.20	DRAWN BY:	AL

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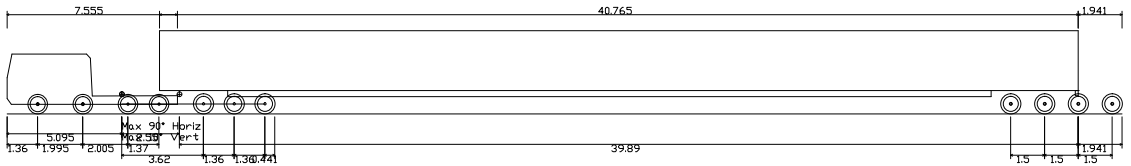

Tower (Final)

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:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14.5 Design tower extended artic profile

PROJECT:	Glenard Wind Farm		
CLIENT:	FuturEnergy Ireland		SCALE: NTS
PROJECT NO: 7790	DATE: 28.10.20		DRAWN BY: AL

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14.1.6 Expected Traffic During Construction, During Operation and During Decommissioning

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 Authorities and An Garda Síochána / Police Service of Northern Ireland with deliveries accompanied by Garda / Police escort.

14.1.6.1 Expected Traffic on Link Flows – During Construction

Background traffic volumes, as established previously and set out in Table 14-5, and development generated traffic volumes are shown for the typical construction day scenarios discussed in Section 14.1.4 are set out in Table 14-12 to 14-15, with the traffic effects summarised in Table 14-16 to 14-19. The actual figures presented in the tables, may vary slightly, however they are considered to represent a robust worst case assessment of the likely increases in traffic volumes. For the purposed of assessing the worst case increases in traffic volumes on links during Stage 1 of construction, it is assumed that all traffic may travel from each of the traffic routes identified in Figure 14-1b.

In terms of daily traffic flows the potential increase may be summarised as follows:

During Stage 1 – Concrete Pouring

For these 16 days an additional 440 PCUs will travel on the study network.

If solely delivered from the south in the direction of Derry the percentage increase in traffic volumes experienced on the study network will be between +4.3% on the R238 south of Quigley's Point, to +8.1% on the R240 west of Quigley's Point. On the local road network approaching the proposed site where existing traffic volumes are very low it is forecast that traffic flows on the L1731 will double, +100% while on the L-7131-1 Crockaheeny Road leading to the site flows are forecast to increase by a factor of 18, or +1,698%.

During Stage 1 - Site Preparation and Groundworks

For these 367 days an additional 164 PCUs will travel on the study network.

If solely delivered from the south in the direction of Derry, the percentage increase in traffic volumes experienced on the study network will be between +1.6% on the R238 south of Quigley's Point, to +3.0% on the R240 west of Quigley's Point. On the local road network approaching the proposed site where existing traffic volumes are very low it is forecast that traffic flows on the L1731 will increase by +75% while on the L-7131-1 Crockaheeny Road leading to the site flows are forecast to increase by a factor of 7, or +633%.

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

As stated previously, all of the deliveries for this stage will approach the site from the direction of Derry on the R238 from the south and will utilise the proposed short link road connecting the R240 and the L1731 between locations 7 and 8 as shown in Figure 14-2a.

The additional 140 PCUs (made up of cars and large extended artics) will travel on the study network for 29 days. On the days this impact occurs, volumes will increase by between +1.4% on the R238 south of Quigley's Point, to +2.6% on the R240 west of Quigley's Point. On the local road network approaching the proposed site where existing traffic volumes are very low it is forecast that traffic flows

on the L1731 will increase by +64% while on the L-7131-1 Crockaheeny Road leading to the site flows are forecast to increase by a factor of 6, or +540%.

The most significant traffic impact may be experienced during these delivery periods 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 is proposed, (as set out in Sections 14.1.7 and 14.1.10.6 and included in the CEMP), 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 16 days on the delivery route 55 additional PCUs (made up of cars and standard articulated HGV movements to the site and back) will travel on the study network. On these days, the percentage increase on the study network will be between +0.5% on the R238, to 1.0% on the R240 on the route from Quigley's Point, +25% on the L1731 and +212% on the L-7131-1 Crockaheeny Road approaching the site.

Table 14-12 Effects of development traffic during turbine 15 days concrete pouring – Stage 1

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 R238 (south of Quigley's Point)	9,683	645	10,328	80	360	440	9,763	1,005	10,768
2 R240 (west of Quigley's Point)	5,073	364	5,437	80	360	440	5,153	724	5,877
3 L1731	215	5	220	80	360	440	295	365	660
4 L-7131-1 Crockaheeny Road to site	25	1	26	80	360	440	105	361	466
5 R238 (north of Quigley's Point)	5,843	142	5,985	80	360	440	5,923	502	6,425
6 L1731 (Buncrana)	222	20	242	80	360	440	302	380	682

Table 14-13 Development traffic during site preparation and groundworks 367 days – Stage 1

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 R238 (south of Quigley's Point)	9,683	645	10,328	80	70	150	9,763	715	10,478

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
2 R240 (west of Quigley's Point)	5,073	364	5,437	80	70	150	5,153	434	5,587
3 L1731	215	5	220	80	70	150	295	75	370
4 L-7131-1 Crockaheeny Road to site	25	1	26	80	70	150	105	71	176
5 R238 (north of Quigley's Point)	5,843	142	5,985	80	70	150	5,923	212	6,135
6 L1731 (Buncrana)	222	20	242	80	70	150	302	90	302

Table 14-14 Development traffic during turbine construction - extended artics (large turbine components) – Stage 2

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 R238 (south of Quigley's Point)	9,683	645	10,328	40	100	140	9,723	745	10,468
2 R240 (west of Quigley's Point)	5,073	364	5,437	40	100	140	5,113	464	5,577
3 L1731	215	5	220	40	100	140	255	105	360
4 L-7131-1 Crockaheeny Road to site	25	1	26	40	100	140	65	101	166
5 R238 (north of Quigley's Point)	5,843	142	5,985	40	0	40	5,883	142	6,025
6 L1731 (Buncrana)	222	20	242	40	0	40	262	20	282

Table 14-15 Effect of development traffic during turbine construction – other deliveries (small turbine components) – Stage 2

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 R238 (south of Quigley's Point)	9,683	645	10,328	40	15	55	9,723	660	10,383
2 R240 (west of Quigley's Point)	5,073	364	5,437	40	15	55	5,113	379	5,492

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
3 L1731	215	5	220	40	15	55	255	20	275
4 L-7131-1 Crockaheeny Road to site	25	1	26	40	15	55	65	16	81
5 R238 (north of Quigley's Point)	5,843	142	5,985	40	0	40	5,883	142	6,025
6 L1731 (Buncrana)	222	20	242	40	0	40	262	20	282

Table 14-16 Summary effect of development traffic during turbine concrete pouring – Stage 1

Link	Background	Development	Total	% increase	Estimated No. of days
1 R238 (south of Quigley's Point)	10,328	440	10,768	4.3%	15
2 R240 (west of Quigley's Point)	5,437	440	5,877	8.1%	15
3 L1731	220	440	660	199.8%	15
4 L-7131-1 Crockaheeny Road to site	26	440	466	1698.3%	15
5 R238 (north of Quigley's Point)	5,985	440	6,425	7.4%	15
6 L1731 (Buncrana)	242	440	682	182.2%	15

Table 14-17 Summary effect of development traffic during site preparation and ground works

Link	Background	Development	Total	% increase	Estimated No. of days
1 R238 (south of Quigley's Point)	10,328	150	10,478	1.5%	368
2 R240 (west of Quigley's Point)	5,437	150	5,587	2.8%	368
3 L1731	220	150	370	68.1%	368
4 L-7131-1 Crockaheeny Road to site	26	150	176	579.0%	368

Link	Background	Development	Total	% increase	Estimated No. of days
5 R238 (north of Quigley's Point)	5,985	150	6,135	2.5%	368
6 L1731 (Buncrana)	242	150	392	62.1%	368

Table 14-18 Summary effect of development traffic during turbine construction – extended artics (large turbine components)

Link	Background	Development	Total	% increase	Estimated No. of days
1 R238 (south of Quigley's Point)	10,328	140	10,468	1.4%	27
2 R240 (west of Quigley's Point)	5,437	140	5,577	2.6%	27
3 L1731	220	140	360	63.6%	27
4 L-7131-1 Crockaheeny Road to site	26	140	166	540.4%	27
5 R238 (north of Quigley's Point)	5,985	40	6,025	0.7%	27
6 L1731 (Buncrana)	242	40	282	16.6%	27

Table 14-19 Summary effect of development traffic during turbine construction – other deliveries (small turbine components)

Link	Background	Development	Total	% increase	Estimated No. of days
1 R238 (south of Quigley's Point)	10,328	55	10,383	0.5%	15
2 R240 (west of Quigley's Point)	5,437	55	5,492	1.0%	15
3 L1731	220	55	275	25.0%	15
4 L-7131-1 Crockaheeny Road to site	26	55	81	212.3%	15
5 R238 (north of Quigley's Point)	5,985	40	6,025	0.7%	15
6 L1731 (Buncrana)	242	40	282	16.6%	15

An assessment of the impact on link capacities in the study area was undertaken for the various construction stages as set out in Table 14-20, Table 14-21, and Table 14-22. The capacity for each link in the study area is shown in Table 14-20. The capacities range from a daily flow of 11,600 vehicles on the R238 down to 2,200 on the L1731 and local L-7131-1 Crockaheeny Road leading to the site, and are based on road widths and capacities set out in the TII Standards document DN-GEO-03031 Road Link Design, Table 6/1.

Background, or do nothing traffic flows, are compared to flows forecast for the various construction delivery stages in Table 14-21 with the percentage capacity reached for each link and stage shown in Table 14-22. Based on this assessment the following points are noted;

- On the external network the R238 to the south of Quigley's Point is the busiest road with the link capacity forecast to operate at 89% for the do-nothing scenario, increasing to a maximum of 93% during the 16 days that the concrete foundations will be poured.
- All other roads leading to the site are forecast to operate well within link capacity for all scenarios.

Table 14-20 Carriageway widths, link type and link capacity

Link	Width (m)	Link type	Link capacity
1 R238 (south of Quigley's Point)	7.5	Type 1 single	11,600
2 R240 (west of Quigley's Point)	7.0	Type 2 single	8,600
3 L1731 (Quigley's Point)	<5	Type 3 single	2,200
4 L-7131-1 Crockaheeny Road to site	<5	Type 3 single	2,200
5 R238 (north of Quigley's Point)	7.5	Type 1 single	11,600
6 L1731 (Buncrana)	<5	Type 3 single	2,200

Table 14-21 Link capacity and summary of link flows by construction delivery stage

Link	Link capacity	Construction delivery stage				
		Background traffic	Concrete pour	Other site works	Turbine plant	Turbine equipment
1 R238 (south of Quigley's Point)	11,600	10,328	10,768	10,478	10,468	10,383
2 R240 (west of Quigley's Point)	8,600	5,437	5,877	5,587	5,577	5,492

Link	Link capacity	Construction delivery stage				
3 L1731 (Quigley's Point)	2,200	220	660	370	360	275
4 L-7131-1 Crockaheeny Road to site	2,200	26	466	176	166	81
5 R238 (north of Quigley's Point)	11,600	5,985	6,425	6,135	6,025	6,025
6 L1731 (Buncrana)	2,200	242	682	392	282	282

Table 14-22 Link capacity and % of link capacity by construction delivery stage

Link	Link capacity	Construction delivery stage				
		Background traffic	Concrete pour	Other site works	Turbine plant	Turbine equipment
1 R238 (south of Quigley's Point)	11,600	89%	93%	90%	90%	90%
2 R240 (west of Quigley's Point)	8,600	63%	68%	65%	65%	64%
3 L1731 (Quigley's Point)	2,200	10%	30%	17%	16%	13%
4 L-7131-1 Crockaheeny Road to site	2,200	1%	21%	9%	8%	4%
5 R238 (north of Quigley's Point)	11,600	52%	55%	53%	52%	52%
6 L1731 (Buncrana)	2,200	11%	31%	18%	13%	13%

14.1.6.2 Expected Traffic on Link Flows – During Operation

Once the wind farm is operational it is estimated that approximately two operation and maintenance staff will access the site at any particular time in order to carry out operational maintenance, with a

similar number of vehicle trips. It is considered that the traffic impact during this phase will be imperceptible.

14.1.6.3 Junction Capacity Assessment – During Construction

Guidance relating to the requirement to undertake a detailed junction capacity assessment at junctions in the proximity of a proposed development is set out in Document PE-PDV-02045 Traffic and Transport Assessment Guidelines, TII, May 2014. The guidance states that a capacity assessment should be undertaken where the proposed development results in an increase in traffic volumes of 10% or greater, in situations where the network is not currently congested. As the traffic volumes on the R240 are forecast to increase by greater than this threshold during the construction of the Proposed Development, a detailed capacity assessment was undertaken for the existing R238 / R240 junction at Quigley's' Point. As the impact on the R238 is below this threshold it is considered that no further junctions were required to be the subject of a detailed capacity assessment.

While the percentage impact through the L1731 / L-7131-1 Crockaheeny Road junction is greater than the 10% threshold as the traffic flows are so low a junction capacity assessment at this location is not required.

The capacity of the R238 / R240 junction was assessed using the industry standard junction simulation software PICADY, which permits the capacity of a priority 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 and is useful to ensure that queues will not interfere with adjacent junctions.
- Degree of Saturation or Ratio of Flow to Capacity (% Sat or RFC) – As suggested, 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.

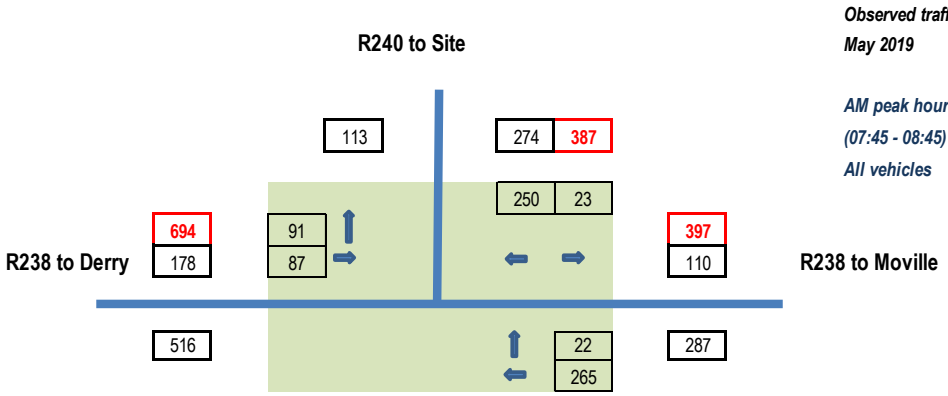
Scenarios Modelled

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 14-16 to 14-19 above, the worst-case effect will be experienced during peak hours when, during peak construction periods, up to 80 workers (40 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.

R238 / R240 Junction Capacity Test Results

The AM and PM peak hour traffic flows through the R238 / L-4282 junction were established from the classified turning counts and are shown for the year 2025 in Figure 14-3a, with background traffic flows for the assumed construction year of 2025 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 2025 traffic flows with development generated traffic are shown in Figure 14-3d.

The results of the capacity assessment, as set out in Tables 14-23 and 14-24, show that additional car trips passing through the junction will be accommodated by the existing junction with a maximum ratio of flow to capacity (RFC) forecast to increase from 68.9% from the do nothing scenario to 69.9% with the Proposed Development construction traffic in place during the AM peak hour, with an increase from



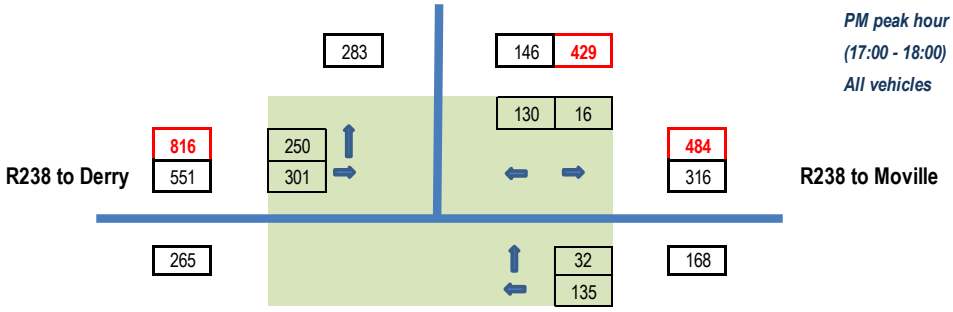


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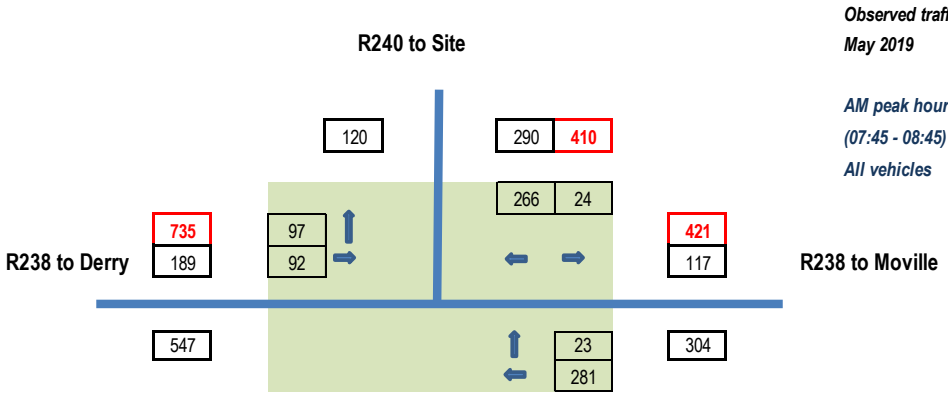
Figure 14.3a Observed traffic flows, AM & PM peak hours (seasonally adjusted)
R238 / R240 junction, yesr 2020 - All vehicles



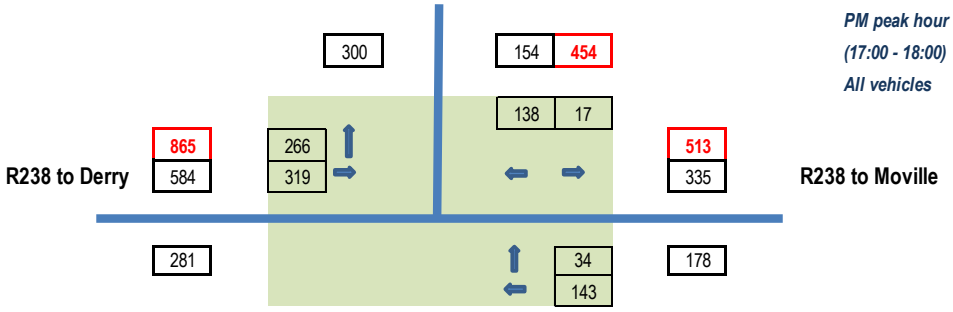


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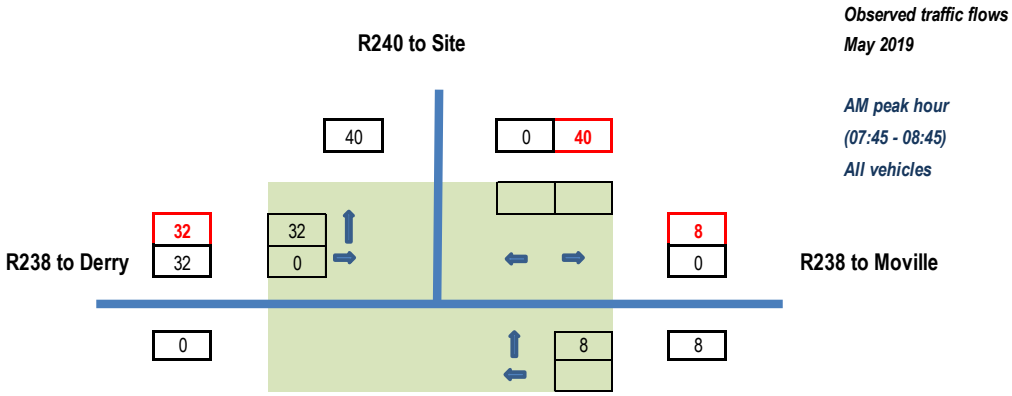
Figure 14.3b Forecast background traffic flows, AM & PM peak hours R238 / R240 junction, yesr 2025 - All vehicles



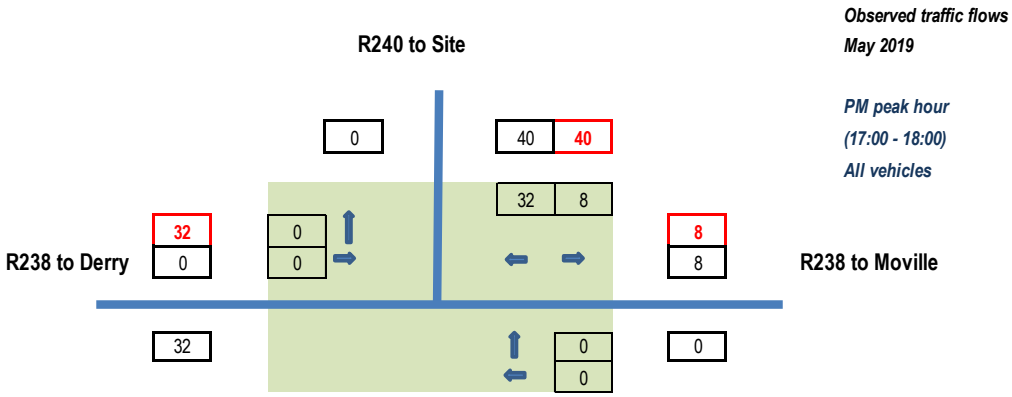


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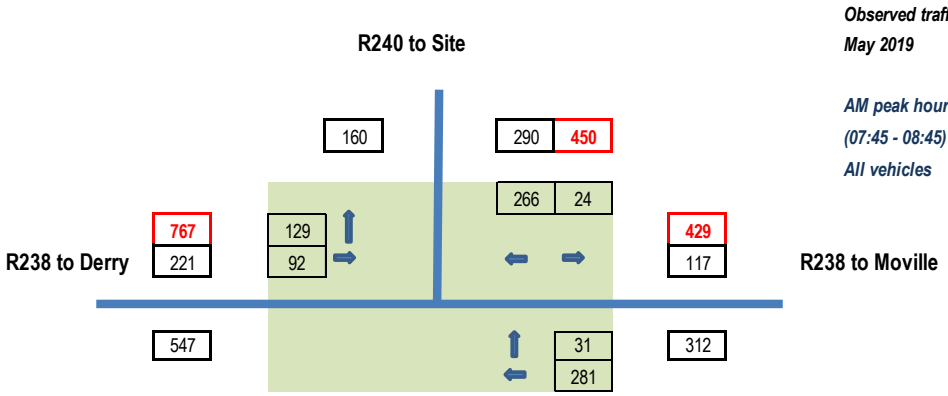
Figure 14.3c Development generated traffic flows, AM & PM peak hours, R238 / R240 junction, yesr 2025 - All vehicles



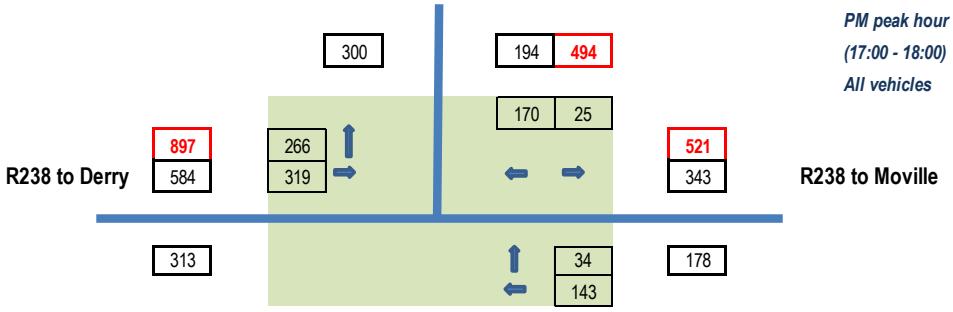


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Figure 14.3d With development traffic flows, AM & PM peak hours, R238 / R240 junction, yesr 2025 - All vehicles

41.0% to 50.5% during the PM peak hour. Of the movements affected the most by the Proposed Development, the right turn from the R238 onto the R240 is forecast to increase from 4.6% to 6.2% during the AM peak hour and the right turn from the R240 onto the R238 from 41.0% to 50.5% during the PM peak hour, as stated above. All of these movements are forecast to operate well within the acceptable limit of 85%.

Table 14-23 Junction capacity test results, R238/R240 junction, without and with construction staff, year 2025, AM peak

Period	Location	Without construction traffic			With construction traffic		
AM		RFC	Queue (vehicles)	Delay (minutes)	RFC	Queue (vehicles)	Delay (minutes)
	Right turn from R240	68.9%	2.12	0.45	69.9%	2.21	0.47
	Left turn from R240	8.2%	0.09	0.20	8.4%	0.09	0.21
	Right turn into R240	4.6%	0.05	0.11	6.2%	0.07	0.12

Table 14-24 Junction capacity test results, R238/R240 junction, without and with construction staff, year 2025, PM peak

Period	Location	Without construction traffic			With construction traffic		
PM		RFC	Queue (vehicles)	Delay (minutes)	RFC	Queue (vehicles)	Delay (minutes)
	Right turn from R240	41.0%	0.68	0.27	50.5%	1.00	0.33
	Left turn from R240	4.4%	0.05	0.15	7.0%	0.08	0.17
	Right turn into R240	8.2%	0.09	0.14	8.2%	0.09	0.14

14.1.6.4 Junctions Capacity Assessment – 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. Given the nature and usage of the road network in the area it is therefore concluded that the development will not have a significant effect on the local network once constructed.

14.1.6.5 Expected Traffic on Link Flows – During Decommissioning

The traffic volumes that will be generated during decommissioning will be less compared to those generated during the construction of the Proposed Development as set out in Section 14.1.6.1.

14.1.6.6 Traffic on Network due to Grid Connection

The planning application includes 1 No. substation and an associated grid connection. It is proposed to construct a 110kv substation at the site and to connect from here to the existing 110 KV Trillick substation, located approximately 6.2 kilometres to the west of the proposed on-site substation.

The proposed grid connection route is shown in Figure 4-1a of Chapter 4 of this EIAR with the construction methodology set out on Appendix 4-5 of this EIAR.

The construction methodology of providing a cable route under and along local road networks is well established and accepted nationwide. There are in excess of 300 wind farms currently operational in Ireland and the majority of these are connected to the national grid via underground cable connections predominantly along the public road networks.

The grid connection will be a total of 8 km in length with 7.3km being along the public road, with the remainder (0.7km) being along forestry roads within the Glenard Wind Farm Site, or along and ESB track linking into the Trillick substation.

The connection will be installed by 2 teams, with each team laying approximately 150 metres of cable per day, equating to a total of 300 metres per day. Temporary road closure will be required as local roads are not wide enough to accommodate both the construction works and one live lane of traffic. With 7.3 kms of road affected, localised road closures lasting a total of 25 days will be required.

It is estimated that the L1781-3 will be closed for up to a further 12 weeks or 84 days while the existing bridge deck crossing the Owenkillew River at Tullydish Upper is replaced, resulting in a total of 109 days where a local road closure will be in place along the route of the grid connection. Potential local diversion routes are identified for the local road network where alternative routes exist in Figure 14-6. The most common trip that will be impacted during the closures on the route of the grid connection are those between the town of Buncrana, indicated as location A, and a point to the south of the bridge over the Owenkillew River on the L7261-1, indicated as Location B. During times when works are being undertaken on the either of Route 1 or Route 2 indicated, then the other route will provide an alternative with no impact on trip length, as both routes are approximately 5.4 km. For the rare occasion that a road user will need to travel the long way round both routes travel to locations either side of the bridge-deck replacement works, a maximum diversion for any trip will be 10.8kms.

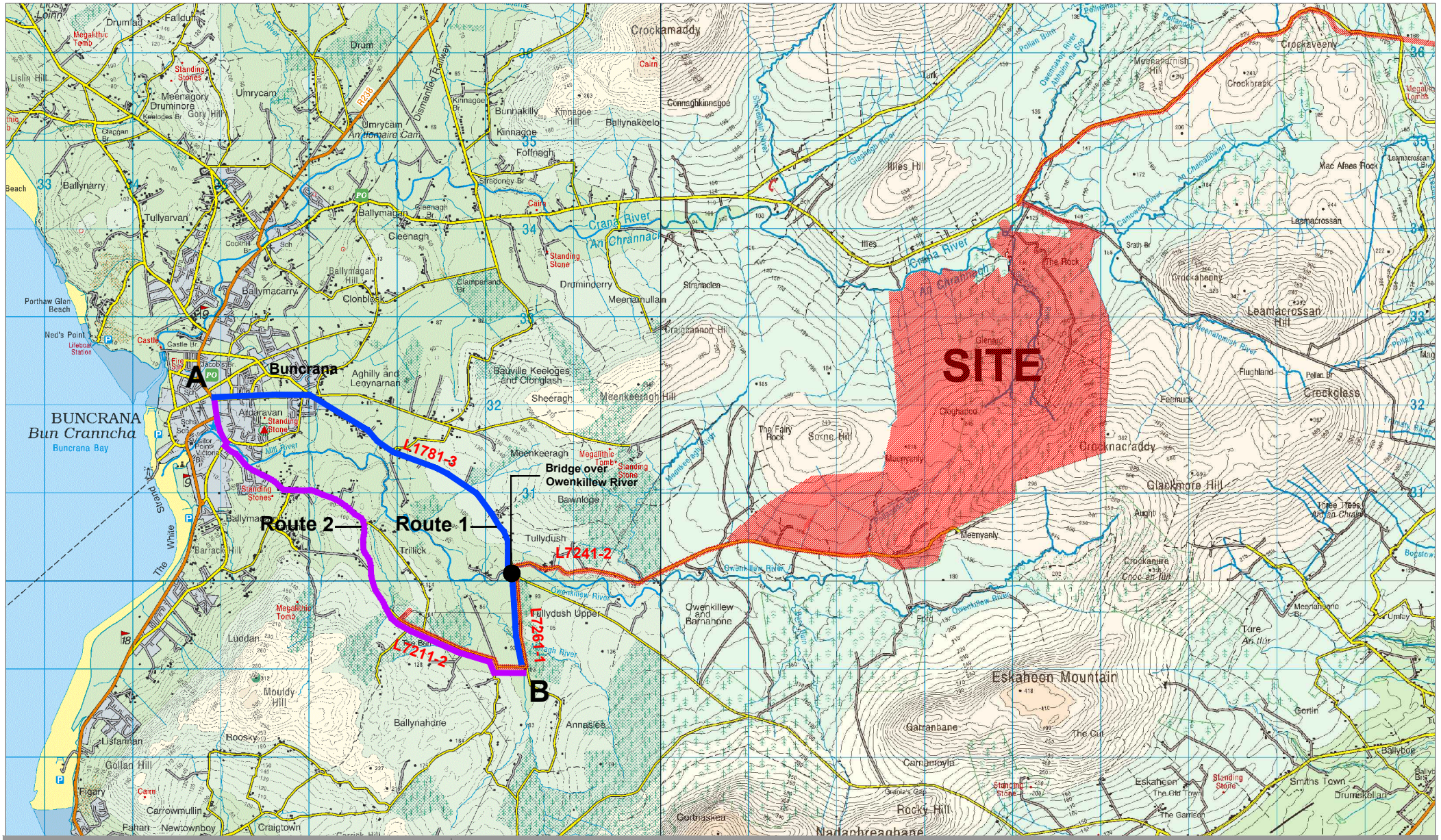
For the very small number of trips that will be impacted on the eastern section of the grid connection route along the L-7241-2 where no alternative route exists, these trips may be re-routed on a temporary basis through the Glenard Wind Farm site and onto the public road network via the main development access junction. The additional traffic volumes that are forecast to be generated during the construction of the grid connection cable route are included in the assessment presented in Section 14.1.4. This is based on materials travelling to the site via the delivery routes previously discussed (Figure 14-2a) and accessing the site via the main access junction, it is possible that some loads will travel to the site via the local road network from the direction of Buncrana. Based on an estimate of 25% of the traffic generated by the construction of the grid connection coming from the direction of Buncrana, this would result in approximately 20 additional 2-way HGV trips on the local road network for approximately 8 days.

14.1.7 Traffic Management of Large Deliveries

The greatest effect on the road network will likely be experienced on the approximately 27 days during which the 5 large loads comprising the tower sections, the blades and the nacelles are delivered to the site

Traffic management measures are included in Section 14.1.8.6 and include the following:

- Identification of a delivery schedule,



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSE

Figure 14.6 Potential diversion routes during bridge closure

PROJECT:	Glenard Wind Farm		
CLIENT:	FuturEnergy Ireland	SCALE:	NTS
PROJECT NO: 7790	DATE: 29.11.21	DRAWN BY:	AL

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- Details of the alterations required to the infrastructure identified in Section 14.1.6 of this report and any other minor alteration identified,
- 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 Police Service of Northern Ireland and the various local authorities. Turbine components are often transported at night when traffic is lightest and this is done in consultation with the roads authorities / An Garda Síochána / Police Service of Northern Ireland, and special permits are generally required.

In some cases, hedge or tree cutting, temporary relocation of services, removal of lampposts and signage will be required and will be agreed with the appropriate local authorities prior to the delivery of turbine components. 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 as assessed in Section 14.1.4 above. During these periods, it may be appropriate to operate local diversions for through traffic as described in the Traffic Management Plan in Appendix 12-2. It is noted that it is proposed that all deliveries of abnormally sized loads will be made during night time hours, as is the norm for such deliveries. A dry run using a vehicle with the dimensions as per the blade delivery vehicle will be undertaken by the haulage company prior to the construction phase.

14.1.8 Abnormal Load 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 route assessment discussed in this section includes all locations on the proposed delivery route from the Port of Derry in Northern Ireland (NI) to the proposed access junction on the local L-7131-1 Crockaheeny Road, as shown in Figure 14-2a. A combination of OS mapping and site surveys were used to prepare background mapping. A swept path analysis was then undertaken 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, such as local widening, may be required.

The assessment presents the preliminary design of the proposed junctions at the eastern and western ends of the proposed link road (Locations 7 and between the R240 and L1731), and the proposed access junction on the L-7131-1 Crockaheeny Road (Location 15) and the autotrack assessments for the design blade and tower extended artic vehicles described in Section 14.1.5.

The locations discussed are as follows;

- Location 1 – Haw Road / Maydown Road priority junction (NI),
- Location 2 – Maydown Road / A2 roundabout (NI),
- Location 3 – A2 Gransha Roundabout (NI),
- Location 4 – A2 / A515 Foyle Bridge Roundabout (NI),
- Location 5 – A515 Foyle Bridge / A2 Culmore Road signalised junction (NI),
- Location 6 – R238 / R240 priority junction,
- Locations 7 and 8 – Proposed junctions for abnormally sized load on R240 and L1731,
- Locations 9, 10, 11, 12, 13 and 14 – Locations on the L1731,
- Location 15 – L1731 / L-7131-1 Crockaheeny Road junction, and,
- Location 16 – Proposed access junction on L-7131-1 Crockaheeny Road

The following text summarises the findings of the swept path analysis for Locations 1 to 16. All figures referred to in this section are included as Appendix 14-1.

Location 1 – Haw Road / Maydown Road priority junction (NI)

Figures 14-7 and 14-8

The autotrack assessment based on a surveyed base which includes the local road improvements that have been implemented on the northern side of Haw Road and the south western side of Maydown Road indicates that geometry of the junction will accommodate the geometric requirements of the tower and blade transporters, with a strip of the grass verge on the eastern side of Maydown Road required as a temporary over-run area. The assessment indicates that the blade tip will require to over-sail into the third-party lands to the north of Haw Road by up to 7m.

Location 2 – Maydown Road / A2 roundabout (NI)

Figures 14-9 and 14-10

The autotrack assessment indicates that temporary over run areas, temporary re-location of traffic signs and blade over-sail will be required at this location. All temporary impacts are within the curtilage of the existing road.

Location 3 – A2 Gransha roundabout (NI)

Figures 14-11 and 14-12

The autotrack assessment indicates that a temporary over run area through the roundabout centre-island and the temporary re-location of traffic signs will be required at this location. All temporary impacts are within the curtilage of the existing road.

Location 4 – A2 / A515 Foyle Bridge roundabout (NI)

Figures 14-13 and 14-14

The autotrack assessment indicates that the blade and tower transporters will be accommodated at this location. The temporary removal of signs may be required. All temporary impacts are within the curtilage of the existing road.

Location 5 – A515 Foyle Bridge / A2 Culmore Road signalised junction (NI)

Figures 14-15 and 14-16

The autotrack assessment shows that the blade and tower transporters will be accommodated at this location with the provision of a Police Service of Northern Ireland escort in order to travel contra-flow through the junction as the vehicles turn right onto the A2 Culmore Road. The temporary removal of signal heads and signs will be required.

Location 6 – R238 / R240 priority junction, Quigley's point

Figures 14-17 and 14-18

The autotrack assessment of the R238 / R240 junction indicates the following;

- An over-run area on the grass verge on the northern side of the R240 will be required to accommodate the blade transporter.
- The blade tip will require to over-sail into Donegal County Council owned land on the eastern side of the R238 by approximately 6 metres.

Location 7 – Proposed link road / R240 junction

Figures 14-19 to 14-22,

The junction between the proposed link road and the R240 will provide for the abnormally sized turbine vehicles, and general construction traffic. The proposed layout for the junction is shown in Figure 14-19 while the visibility splays (3.0m x 160m) that will be required to be kept clear of all obstruction during both the construction and operational stages of the proposed development are shown in Figure 14-20. The 160m visibility splay is in accordance with an 80 km/h speed limit as set out in Table 03 Appendix 3 of the County Donegal Development Plan, 2018 -2024. All abnormal loads accessing the link road from the R240 will be made with a Garda escort and temporary traffic management measures. The autotrack assessment shows the area that will require to be cleared, surfaced and made available for the duration of the delivery of the large turbine plant.

Location 8 – Proposed link road / L1731 junction

Figures 14-23 to 14-26

As for location 7, the junction between the proposed link road and the L1731 will provide for the abnormally sized turbine vehicles and general construction traffic.

The proposed layout for the junction is shown in Figure 14-23 while the visibility splays (3.0m x 70m), and the forward visibility (70m), that will be required to be kept clear of all obstruction during both the construction and operational stages of the proposed development are shown in Figure 14-24. The 70m visibility splay is in accordance with a 50 km/h speed, which is more than the maximum speed that would be possible at this 90 degree bend, as set out in Table 03 Appendix 3 of the County Donegal Development Plan, 2018 -2024.

The autotrack assessment shows the area that will require to be cleared, surfaced and made available for the duration of the delivery of the large turbine plant.

Location 9 – New link road at bends on L-1731

Figures 14-27 and 14-28

The autotrack assessment undertaken at this location indicates that the new link road will be required at this location in order to accommodate the abnormally large loads. This link road will be closed at all other times.

Location 10 – Bends on L-1731

Figures 14-29 And 14-30

The assessment shows that minor temporary widening will be required, within the public road corridor, at this location in order to accommodate the abnormally large loads.

Location 11 – Bends on L-1731

Figures 14-31 and 14-32

The assessment shows that minor temporary widening will be required, within the public road corridor, at this location in order to accommodate the abnormally large loads.

Location 12 – Bends on L-1731

Figures 14-33 and 14-34

The assessment shows that minor temporary widening will be required, within the public road corridor, at locations this location in order to accommodate the abnormally large loads.

Location 13 – Bends and bridge on L-1731

Figures 14-35 and 14-36

The assessment indicates that the temporary removal of the existing walls may be required in order to accommodate the abnormally sized loads. The autotrack assessment indicates that the bridge walls, which are 6.7m apart wall to wall, will accommodate the blade transporters as they negotiate the gentle left hand bend at this location. As is the case for the haul route in general, it is recommended that a delivery dry–run is undertaken at this location prior to the delivery stage.

Location 14 – L-1731 / L-7131-1 Crockaheeny Road junction

Figures 14-37 and 14-38

The autotrack assessment indicates that significant land take will be required on the western side of the L1731 in order that the turbine plant vehicles may approach the bridge over the River Crana at the optimum angle. A dry run will be essential prior to the delivery of the turbine components. The nature and extent of the proposed works at this location are described in Chapter 4.

Locations 15 – Proposed access junction on L-7131-1 Crockaheeny Road

Figures 14-39 to 14-42

A new junction will provide access to the site from the local L-7131-1 Crockaheeny Road for all vehicle types. The nature and extent of the proposed works at this location are described in Chapter 4.

The proposed layout for the junction in shown in Figure 14.39 while the visibility splays (3.0m x 90m) that will be required to be kept clear of all obstruction during both the construction and operational stages of the proposed development are shown in Figure 14.40. The 90m visibility splay is in accordance with a 60 km/h speed, which is more than the maximum speed that would be safe to drive at this location, as set out in Table 03 Appendix 3 of the County Donegal Development Plan, 2018 - 2024.

The autotrack assessments undertaken for the blade and turbine extended artics are shown in Figures 14-41 and 14-42 and demonstrate that the proposed junction geometry will accommodate all vehicle types requiring access to the site.

14.1.9 Provision for Sustainable Modes of Travel

14.1.9.1 Walking and Cycling

The provision for these modes is not relevant during the construction stage of the development as travel distances will likely exclude any employees walking or cycling to work.

14.1.9.2 Public Transport

There are no public transport services that currently pass the site.

14.1.10 Likely and Significant Effects and Associated Mitigation Measures

14.1.10.1 "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 or indirect effects on roads and traffic.

14.1.10.2 Construction Phase

During the 16 days 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 +4.3% on the R238 south of Quigley's Point, to +8.1% on the R240 west of Quigley's Point to an increase of 1000% on the L1731 and by a factor of 18 on the L-7131-1 Crockaheeny Road approaching the site. It is noted that the high percentage increases forecast for the L1731 and the L-7131-1 Crockaheeny Road are due to the low volume of background traffic. The direct effect on all these roads will be temporary, and will be slight.

During the remaining 367 days 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 +1.6% on the R238 south of Quigley's Point, to +3.0% on the R240 west of Quigley's Point to an increase of 75% on the L1731 and by a factor of 7 on the L-7131-1 Crockaheeny Road approaching the site. On these days, the direct effect will be temporary and will be slight.

During the 27days when the various 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 +1.4% on the R238 south of Quigley's Point, to +2.6% on the R240 west of Quigley's Point to an increase of 64% on the L1731 and by a factor of 6 on the L-7131-1 Crockaheeny Road approaching the site. These large turbine components being delivered during the day reflects the worst-case scenario. The direct effect will be reduced from moderate to slight as the delivery of the large plant will be done at night, as is proposed.

During the 16 days of the turbine construction stage when general materials are delivered to the site, the delivery of construction materials will result in a negative impact on the surrounding road network, increasing traffic levels ranging from +0.5% on the R238 south of Quigley's Point, to +1.0% on the R240 west of Quigley's Point to an increase of 25% on the L1731 and by a factor of 3 on the L-7131-1 Crockaheeny Road approaching the site. The direct effect during this period will be temporary and will be imperceptible to slight.

It was determined that all links in the study area and the junction between the R238 and the R240 will operate within operational capacity for all days within the construction period.

During the construction of the Grid Connection there will be closures along the route at up to 2 locations per day for a total of 109 days in the proximity of the Owenkillew River at Tullydush Upper. As traffic volumes are very low, and the resulting diversions will on average be short, the direct effect will be negative, temporary and slight.

14.1.10.3 Operational Phase

During the operational phase the direct effect on the surrounding local highway 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 traffic accessing the site for amenity use during the operational stage. This traffic will access the site via the proposed access junction on the L-7131-1 Crockaheeny Road and may drive to/from this point from any direction beyond that. The proposed amenity car park will be accessed via the proposed site access junction. The volumes are likely to be small (up to a maximum of 20 car trips per day, as a worst-case prediction) based on information from other similar wind farm developments. Given the capacity of the local highway network there is no significant effects anticipated on roads and traffic.

14.1.10.4 Decommissioning Phase

The design life of the wind farm is 35 years. When 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, visitor car park and walkways in situ at the decommissioning stage. 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.

The effects on the network during decommissioning will be less significant compared to those during the construction phase as presented in this section of the EIAR as the volume of materials transported to and from the site will be significantly less.

14.1.10.5 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 2.3 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)

From a review of all existing and approved projects in Section 2.3 it has been determined that the potential for cumulative impacts will only occur with other wind farms that have yet to be constructed as the traffic generation for existing operational wind farms is very low.

There are 3 permitted wind farm developments not yet constructed; Aught Wind Farm (14 turbines), Malkell Wind Farm (2 turbines) Colpey Wind Farm (1 turbine) and Carrowglen Wind Farm (6 turbines) all located within close proximity of the proposed Glenard Wind Farm and accessed off the L1731.

As the majority of delivery routes for the abnormally large turbine deliveries and for general construction traffic are common to the four developments described above and the Proposed Development, in the event that the construction of the Proposed Development coincides with any or all of these developments, then traffic related cumulative impacts would be negative, short-term and moderate. The construction phase of the Proposed Development will be scheduled to take account of

other wind farms under construction in the area. This will ensure that the potential for cumulative effects is minimised.

It is noted that all general forestry activity will be curtailed on the site during the construction of the proposed development.

14.1.10.6 Mitigation Measures

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

Mitigation by Design

Mitigation by design measures include 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 improvements to the local highway network at locations identified in Section 14.1.8.

Mitigation Measures During the Construction Stage

The construction of this development will require significant coordination 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.

Delivery of abnormal sized loads

The following are the main points to note for these deliveries. These 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 deliveries will be made in consultation with the Local Authority and An Garda Síochána / The Police Service of Northern Ireland.
- It is estimated that 144 abnormal sized loads will be delivered to the site, comprising 29 convoys of 5, undertaken over 29 separate nights.
- These nights will be spread out over an approximate period of 15 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 provided specifying details relating to traffic management and as Appendix 14-2 this EIAR. Prior to the commencement of the construction phase of the proposed development a detailed Traffic Management Plan will be prepared by the Contractor for agreement with the relevant local authorities and An Garda Síochána / Police Service of Northern Ireland. The TMP includes recommendations for 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 Condition Survey** – Where required by the local authority, a 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 post construction survey will be carried out after works are completed to ensure that any remediation works are carried out to a satisfactory standard. Where required 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 Councils and An Garda Síochána / Police Service of Northern Ireland, 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 locations** – 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 Councils 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..
- **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.

Mitigation Measures During Decommissioning Stage

When the proposed development is decommissioned after the 35 years of operation, a decommissioning plan will be prepared for agreement with the local authority, as described in Section 4.11 of Chapter 4. This plan will include a material recycling / disposal plan and traffic management plan and other similar mitigation measures to those implemented during the construction phase. In terms of traffic effects the decommissioning stage will generally mirror the constructions stage although the effects will be significantly reduced as the volumes of materials removed from the site will be less.

14.1.10.7 Residual Impacts

Construction Stage

During the 18-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 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. The effects will be slight to imperceptible during all of the construction stage, with the exception of the delivery of the abnormal loads, which will reduce from moderate to slight if these deliveries are undertaken during the night, as proposed.

Operational Stage

As the traffic impact of the proposed development will be imperceptible during the operational stage, no mitigation is required and the residual effects will also be imperceptible.

Decommissioning Stage

As stated above, a decommissioning plan will be prepared and implemented in order to minimise the residual impacts during this stage. The residual effect will be less than for the construction stage as set out above, and will be slight to imperceptible.

14.1.10.8 Transboundary Effects

The impacts of the Proposed Development on the road network in Northern Ireland will result from the deliveries made by abnormally sized vehicles delivering the turbine components from the proposed port of entry in Derry, through the Northern Irish road network between the Port of Derry, across the River Foyle to the A2 travelling north towards the site north of the City of Derry. It is proposed that these deliveries will be made during the night in order to minimise the impacts on existing road users. There will also be impacts on days when smaller turbine components are delivered from the port of Derry using standard HGV's.

During the 27days when the various large 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 negative, temporary and moderate due to the size of vehicles involved, if these deliveries take place during the day. The direct effect will be reduced from moderate to slight if these deliveries are made at night, as is proposed.

During the 16 days of the turbine construction stage when general materials are delivered to the site, the delivery of construction materials will result in a negative impact on the surrounding road network. The direct effect during this period will be temporary and will be imperceptible to slight.

The locations where temporary measures will be required within the curtilage of the existing highway to facilitate these deliveries are identified in Section 14.1.8.

There will be no transboundary impacts on road users in Northern Ireland during the operational phase of the proposed development as there will only be approximately two maintenance staff travelling to site at any one time, using the road network in the Republic of Ireland, resulting in typically two visits to the site on any one day made by a car or light goods vehicle.

14.2 Telecommunications and Aviation

14.2.1 Introduction

This section of the EIAR assesses the likely significant effects of the proposed wind farm on telecommunications and aviation. Section 14.2.3 describes the way in which wind turbines can potentially interfere with telecommunications signals or aviation activities. Section 14.2.4 presents details on how such effects will be avoided, with the likely significant effects assessed (and mitigation measures proposed) in Section 14.2.5.

14.2.1.1 Statement of Authority

This section of the EIAR has been prepared by Daire O'Shaugnessy (B.Sc. Env.) and reviewed by Eoin McCarthy (B.Sc. Env.). Daire is an Environmental Scientist with MKO and has over one year of professional experience. He has coordinated the scoping and consultation exercise with telecommunications operators and aviation authorities for numerous wind energy developments and prepared the corresponding relevant sections of the EIARs. Eoin is a Senior Environmental Scientist with MKO and has over 10 years' experience in the preparation of EIARs for wind energy developments, including the assessment of likely significant effects on material assets.

14.2.2 Methodology and Guidance

The assessment of likely significant effects on material assets telecommunications and aviation uses the standard methodology and classification of impacts as presented in Section 1.8.1 of Chapter 1 of this EIAR. The full project description, including proposed turbine locations and elevations, is provided in Chapter 4.

The scoping and consultation exercise was conducted with telecommunications operators and aviation authorities, in line with EPA guidelines, and the '*Best Practice Guidelines for the Irish Wind Energy Industry'* (Irish Wind Energy Association, 2012), which provides a recommended list of telecommunications operators for consultation.

A full description of the scoping and consultation exercise is provided in Section 2.4 of Chapter 2 of this EIAR. Consultation with the telecommunications operators and aviation bodies informed the constraints mapping process, which in turn informed the layout of the proposed development, as described in Chapter 3 of the EIAR.

14.2.2.1.1 *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.

14.2.2.2 Background

14.2.2.3 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.

14.2.2.4 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 blade, 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.

14.2.2.5 Other Signal Types

Wind turbines have the potential to affect other signal types used for communication and navigational systems, for example 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. The nearest such operational airport to the Proposed Development site is City of Derry Airport, located approximately 13.5 kilometres southeast of the site. The airport is sited within the range at which issues would be expected. This is further discussed in Section 14.2.4.2.3 below.

Potential effects on other signal types are also generally easily 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.

14.2.2.6 Preventing Electromagnetic Interference

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.

Developers are advised 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 and is summarised below in Table 14-25; full details are provided in Section 2.4 in Chapter 2 of this EIAR.

The layout and design of the proposed development has taken into account all nearby telecommunications links.

14.2.3 Scoping and Consultation

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 in order to identify any other additional licensed operators in the vicinity of the proposed site to be contacted, who may not have been on the list of main operators.

The responses received from the telecommunications and aviation consultees are summarised below in Table 14-25.

Table 14-25 Telecommunications and Aviation Scoping Responses

Consultee	Response	Potential for Interference Following Consultation Exercise
Airspeed	Received 20th August 2019	No
Broadcasting Authority of Ireland	Received 8th October 2019	No
BT Communications	No Response Received	N/A
City of Derry Airport	Received 4th September 2019	Yes – See Section 14.2.4.2 below
ComReg (Commission for Communications Regulation)	Received 21st May 2019	No
Department of Defence	No Response Received	N/A
Eir	Received 19th August 2019	Yes – See Section 14.2.4.2 below
eNet	Received 20th August 2019	Yes – See Section 14.2.4.2 below
ESB Telecoms	Received 29th August 2019	Yes – See Section 14.2.4.2 below
Imagine Group	Received 16th August 2019	No
Irish Aviation Authority	No Response Received	N/A
Ripplecom	No Response Received	N/A
RTÉ Transmission Network (2rn)	Received 19th August 2019	No
Tetra Ireland Communications (Emergency Services)	Received 23rd August 2019	No
Three Ireland Ltd	Received 21st May 2019	Yes – See Section 14.2.4.2 below
Towercom Ltd.	No Response Received	N/A

Consultee	Response	Potential for Interference Following Consultation Exercise
Viatel	Received 21st May 2019	No
Virgin Media	Received 20th August 2019	No
Vodafone Ireland	Received 21st May 2019	No

The scoping responses from the telecommunications and aviation consultees are described below. Relevant copies of scoping responses are provided in Appendix 2-1.

14.2.3.1 Broadcasters

There are two broadcasters operating in Ireland RTÉ Transmission Network (operating as 2rn) and Virgin Media.

RTÉ Transmission Network, replied on the 19th of August 2019 to a scoping request from MKO stating that the operation of the proposed wind farm will not have any impact on RTÉ fixed links and stated that there is a low probability that it will cause any interference to digital terrestrial television services.

Virgin Media replied on the 20th of August 2019 to scoping requests from MKO stating that there was no potential for interference with their network.

14.2.3.2 Other Consultees

Of the scoping responses received from telephone, broadband and other telecommunications operators, those who highlighted an initial potential interference risk are addressed below. The final proposed turbine layout does not overlap with any of the telecoms links or clearance zones requested by these operators. The remaining consultees who responded to scoping, operate links either outside the proposed development site, and therefore are not subject to any interference risk, or do not operate any links in the area.

Eir

Eir replied to a scoping request from MKO on the 19th August 2019, noting that they had two links in the area of the proposed development and requested that a clearance of 100 metres was to be maintained between the turbines and the Eir link.

It should be noted that all turbine locations are located in excess of 500 metres from the Eir links and therefore no impact will occur.

eNET

eNET replied to a scoping request from MKO on the 20th August 2019, noting that they had a link in the area of the proposed development and requested a clearance of 250m metres was to be maintained between the turbines and the eNET link.

It should be noted that all turbine locations are located in excess of 500 metres from the eNET link and therefore no impact will occur.

ESB Telecoms

ESB Telecoms replied to a scoping request from MKO on the 29th of August 2019, with a basic initial analysis of the potential impact on their current operational telecommunications infrastructure. The analysis noted two services, including a microwave link and a point to multi point link, which may be affected within the EIAR Site Boundary and requested that an exclusion zone at either side of the link at least the width of the 2nd Fresnel zone be maintained. However, it is anticipated that this link will be decommissioned prior to the construction of the proposed development and therefore no impact will occur.

Three

Three replied to a scoping request from MKO on the 21st May 2019, noting that they had 10 links within a 10km area of the proposed development. One link was identified, which may be affected by the proposed development, however on 1st of July 2019, Three issued an updated response to MKO indicating that the link was to be decommissioned within the next 12 months and could be removed from the constraints mapping process.

It should also be noted that all turbine locations are located in excess of 500 metres from all other Three links and therefore no impact will occur.

14.2.3.3 Aviation

As noted in **Error! Reference source not found.**25 above, in terms of aviation consultees, a scoping responses was received from City of Derry Airport.

The City of Derry Airport (CoDA) replied to a scoping request from MKO Ireland on the 4th of September 2019 requesting dimensions of the proposed turbines along with the coordinates of each proposed turbine location. This information was provided to CoDA on the 2nd of October 2019. On the 21st of February 2020 MKO provided an update to the CoDA on the status of the proposed wind farm project along with an amended turbine layout.

The CoDA engaged Cyrrus Avation Consultancy to carry out a detailed safeguarding assessment of the potential impact of the proposed turbines on the Obstacle Limitation Services (OLS) as well as Instrument Flight Procedures (IFP) (a set of instructions regarding navigation around aerodromes) serving the airport, including the proposed approach IFPs to each runway end.

On the 23rd of April 2020, MKO received an IFP Technical Study Report outlining each assessed IFP and the OLS from Cyrrus. The Cyrrus report details that the proposed Glenard turbines will infringe on CoDA's existing instrument flight procedures. However, the report proposes required mitigation options. The required mitigation options presented within the Cyrrus report are all related to changes in the CoDA's procedures.

14.2.4 Likely Significant Effects and Associated Mitigation Measures

14.2.4.1 'Do-Nothing' Scenario

If the proposed development were not to proceed, there would be no impact on the telecommunications and aviation operations in the area.

14.2.4.2 Construction Phase

The potential for electromagnetic interference from wind turbines occurs only during the operational phase of the development. There are no electromagnetic interference impacts associated with the construction phase of the proposed development, and therefore no mitigation required.

14.2.4.3 Operational Phase

14.2.4.3.1 *Telecommunications*

Pre-Mitigation Impact

Consultation regarding the potential for electromagnetic interference from the proposed development was carried out with the relevant national and regional broadcasters, fixed line and mobile telephone operators and other operators. While a single telecommunications link currently traverses the site of the proposed development, this link will be decommissioned prior to the operation of the proposed development.

Mitigation Measures

In the event of interference occurring to telecommunications during operation, the Department of the Environment, Heritage and Local Government Wind Farm Planning Guidelines (2006) state that these effects can be dealt with by the use of divertor relay links out of line with the proposed wind turbines.

Residual Impact

The proposed development will have no residual impact on the telecommunications signals of any operator, due to distance from or absence of any links in the area.

Significance of Effects

There will be no significant effect on telecommunications from the proposed development.

14.2.4.3.2 *Aviation*

Pre-Mitigation Impact

The IFP Technical Study Report, outlined in Section 14.2.4.2.3, concludes that the proposed Glenard turbines will infringe on CoDA's existing instrument flight procedures. The required mitigation options presented within that report are all related to changes in the CoDA's procedures.

Mitigation Measures

An agreement has been reached between City of Derry Airport and the applicant for the implementation of mitigation measures outlined in the IFP Technical Study Report. This agreement is included in Appendix 14-3.

Other additional mitigation measures, generally requested by the Irish Aviation Authority and Department of Defence, that will be implemented to ensure that the proposed development has no adverse impacts on aviation include:

- Single turbines or turbines delineating corners of a wind farm will be illuminated by red, high intensity, obstacle strobe lights.

- Obstruction lighting elsewhere in the wind farm will be of a pattern that will allow the hazard be identified and avoided by aircraft in flight.
- Obstruction lights used will be incandescent or of a type visible to Night Vision Equipment. Obstruction lighting fitted to obstacles will emit light at the near Infra-Red (IR) range of the electromagnetic spectrum specifically at or near 850 nanometres (NM) of wavelength. Light intensity will be of similar value to that emitted in the visible spectrum of light.
- An aeronautical obstacle warning light scheme for the wind farm development will be agreed with Irish Aviation Authority prior to commissioning.
- As-constructed coordinates in WGS84 format together with ground and tip height elevations at each wind turbine location will be provided to the IAA upon commissioning of the wind farm.
- The Irish Aviation Authority will be notified of the intention to commence crane operations with a minimum of 30 days prior notification of their erection.

Residual Impact

The proposed development will have no residual impact on aviation as the IFP mitigation procedures will be implemented, as agreed with CoDA and all lighting requirements will be met by the applicant.

Significance of Effects

There will be no significant effect on aviation operations due to the proposed development.

14.2.4.4 Decommissioning Phase

As stated in Section 14.2.5.2 above, the potential for electromagnetic interference from wind turbines occurs only during the operational phase of the development. There are no electromagnetic interference impacts associated with the construction or decommissioning phases of the proposed development, and therefore no mitigation required.

14.2.4.5 Cumulative Effect

Chapter 2, Section 2.6 of this EIAR describes the methodology used in compiling the list of projects considered in the assessment of cumulative effects, and provides a description of each project, including its current status. There will be no cumulative impacts relating to the proposed development and surrounding projects in relation to Telecommunications or Aviation. This is because the proposed development will have no significant effects on Telecommunications and Aviation once mitigation measures are implemented. During the development of any large project that holds the potential to effect telecoms or aviation, the Developer is responsible for engaging with all relevant Telecoms Operators and the relevant Aviation Authorities to ensure that the proposal will not interfere with television or radio signals by acting as a physical barrier. In the event of any potential impact, the Developer for each individual project is responsible for ensuring that the necessary mitigatory measures are in place. Therefore, as each project is designed and built to avoid impacts arising, a cumulative impact cannot arise.

14.2.5 Transboundary Effects

There will be no transboundary effects relating to the proposed development in relation to telecommunications or aviation in Northern Ireland. As stated in Section 12.2.4.5 above, the proposed development will have no significant effects on telecommunications and aviation once mitigation measures are implemented. During the development of any large project that holds the potential to

effect telecoms or aviation, the Developer is responsible for engaging with all relevant Telecoms Operators and the relevant Aviation Authorities to ensure that the proposal will not interfere with television or radio signals by acting as a physical barrier. In the event of any potential impact, the Developer for each individual project is responsible for ensuring that the necessary mitigatory measures are in place. Therefore, as each project is designed and built to avoid impacts arising, a cumulative impact cannot arise.

14.3 Other Material Assets

This section of the Material Assets chapter considers other utilities or built services in the area such as electricity supply and transmission, water, gas and underground telecommunications. This section also considers waste management during the construction and operational phases of the proposed development.

In order to assess the potential for significant effects on built services and waste management in the vicinity of the proposed development, scoping requests were made to Eirgrid, Irish Water and numerous sections of Donegal County Council including Water Services and Environment. Refer to Section 2.4 of Chapter 2 of this EIAR for details in relation to the EIA scoping exercise.

A scoping response was received from Irish Water, however, it did not provide details in relation to specific water services within the EIAR Site Boundary. No response was received from Eirgrid or the local authority sections.

14.3.1 Existing Built Services and Utilities

There are numerous overhead and underground electricity transmission and supply cables within the vicinity of the EIAR Site Boundary. Two 38kV overhead lines traverse portions of the site. One overhead line traverses the site close to the proposed new site entrance and the second overhead line traverses the southern half of the site.

The existing Sorne Hill Wind Farm 110kV substation is located approximately 2.3km to the west of the site and the existing Trillick 110kV substation is located adjacent to the western extremities of the EIAR site boundary. It is proposed to connect the proposed development to the national grid via the Trillick substation (refer to Section 4.4.7 of Chapter 4 of this EIAR for further details).

There are no gas mains located within the EIAR Site Boundary. Given that no detailed information has been provided by Irish Water or the Water Services section of Donegal County Council in relation to water services within the EIAR Site Boundary, it has been assumed that there is the potential to encounter local water services within the site. However, it has been confirmed, following a site visit, that there are no water services located within the public road section of the proposed grid connection route. An underground telecommunications cable is located within the public road section of the proposed grid connection route.

14.3.2 Existing Waste Management Services

There are no EPA-licensed or local authority-authorised waste facilities or activities located within the EIAR Site Boundary. The closest, authorised municipal waste facility is located approximately 6km west of the site in the townland of Umrycam, Buncrana, Co. Donegal.