15. 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"*.

Material assets may be of either human or natural origin. The cultural assets of Archaeological, Architectural and Cultural Heritage are addressed in Chapter 14 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 9: Land, Soils and Geology, Chapter 10: Water, and Chapter 11: Air and Climate. Tourism and amenity resources, which are also considered material assets, are addressed in Chapter 5: Population and Human Health.

This chapter of the EIAR addresses the likely significant effects of the proposed development on transportation infrastructure (Section 15.1 Traffic and Transport) and on Telecommunications and Aviation (Section 15.2), which are economic assets of human origin. Waste management is addressed in Section 4.3.11.7 in Chapter 4 of this EIAR and in the Construction and Environmental Management Plan (CEMP) in Appendix 4-4.

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

15.1 Traffic and Transport

15.1.1 Introduction

15.1.1.1 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 Lyrenacarriga 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 wind turbine plant. The requirements of the additional traffic and abnormal sized loads generated during the construction stage were assessed on both the external highway network and at the proposed junctions that will provide access to the site.

It should be noted that abnormal *weight* loads are not a feature of the turbine delivery vehicles, they are abnormal in *size* only. All construction and delivery vehicles for the proposed development will be subject to the standard axle weight requirements set out under Road Traffic (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.

The magnitude of the increase in traffic volumes experienced on the surrounding network is identified in this assessment during the various construction stages of the proposed development. Traffic

management measures are also provided in Sections 15.1.7 and 15.1.10.6 aimed at minimising the traffic impact on the local highway network.

15.1.1.2 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 throughout Ireland 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.

15.1.1.3 Guidance and Legislation

This section of the EIAR has been completed in accordance with the guidance set out in Section 1.5 of Chapter 1. The assessment uses standard terminology 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 1.7 of this EIAR.

15.1.1.4 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 described in Section 2.6 of Chapter 2 of the EIAR and summarised below. Copies of all scoping replies are provided in Appendix 2-2 of this EIAR.

Transport Infrastructure Ireland

Transport Infrastructure Ireland (TII) responded to a Scoping request on the 7th June 2018 in which it provided a list of recommendations to be followed when preparing the EIAR. All recommendations and 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, N25, 2019.

Waterford and Cork County Councils

Cork County Council's response to Scoping dated 13th June 2018 stated that their main concern was the potential impact of traffic generated during the construction stage of the development, and that all locations where measures are required to accommodate the turning requirements of the abnormal sized loads should be identified. Other issues raised related to the potential requirement for strengthening of sections of the local road network on the haul routes and also driver safety on the R634 when the proposed development is operational.

A written scoping response was not received from Waterford County Council, however two pre-planning meetings were held in order to discuss all elements of the assessment in relation to the proposed development. Details of all pre-planning meetings are set out in Section 2.6 of Chapter 2 of this EIAR.

15.1.1.5 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 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 2019 traffic flows and traffic forecasts during an assumed construction year of 2024 (Sections 15.1.2 - Receiving Environment and 15.1.3 – 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 15.1.4 – Proposed Development and Traffic Generation).
- A description of the abnormally sized large loads and vehicles that will require access to the site (Section 15.1.5 – Construction Traffic Design Vehicles).
- A review of the effects of development generated traffic on links and junctions during construction and when the facility is operational (Section 15.1.6 –Traffic effects during construction and during operation).
- Identification of traffic management for large deliveries during construction (Section 15.1.7 – 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 15.1.8 – 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 15.1.9 – Provision for Sustainable Modes of Travel).
- The description of likely significant effects is provided in Section 15.1.10.

15.1.2 Receiving Environment

15.1.2.1 Site Location

The proposed development comprises of 17 wind turbines, substation and grid connection, and all associated infrastructure, and is located at Lyrenacarriga and other townlands, as listed in Section 1.1 in Chapter 1 of this EIAR. The proposed development is located in Co. Waterford (11 turbines) and Co. Cork (6 turbines). The two clusters of proposed turbines are referred to as the eastern cluster (Waterford) and the western cluster (Cork) in this section of the EIAR.

The closest towns to the site are Tallow which is located approximately 5kms to the northwest and Youghal which is located approximately 9kms to the southeast. The site location is shown on Figure 15.1.

15.1.2.2 Site Entrances

Three entrances are proposed for the construction stage of the proposed development in order to transport turbine components, materials and equipment to the site. The locations of the access junctions are shown in Figures 15.2a and 15.2b of this EIAR and can be described as follows:

- **Access A** on the R634 regional road, into eastern cluster of turbines
- **Access B** on the L7806 local road, into western cluster of turbines, and
- **Access C** located on the L2003 local road into eastern cluster (non-turbine construction traffic).

Access junction A is on the east side of the R634 and is at the location of an existing forestry access which will be upgraded as part of the proposed wind farm development. It is proposed that this junction will provide access and egress to the eastern cluster for the abnormal sized loads only. All of these movements will be made with the assistance of escort vehicles, including members of An Garda Siochána and traffic management staff. This junction will be closed at all other times. Following the construction phase of the Proposed Development, the upgraded area of this entrance will be closed by erecting fencing, however this may be reopened during the lifetime of the development should replacement blades or other abnormal loads be required to access the site.

Access junction B located on the L7806 will be the sole access to the western cluster and will provide for the delivery of abnormal loads, the delivery of general construction traffic, and all construction staff traffic during the construction of the Proposed Development. It will also provide access for maintenance staff to the western cluster once the wind farm is operational. Two potential design options (Options 1 and 2) are included for this entrance location.

Access junction C located on the L2003 is also an existing forestry access that will be upgraded, and will provide for all general construction traffic, including construction staff, requiring access to the eastern cluster. It will also provide for maintenance staff to the eastern cluster when operational.

Works will be required at these access locations in order to accommodate access and egress of turbine vehicles and general construction traffic, with the proposed layouts discussed in Section 15.1.8.

15.1.2.3 Proposed Abnormal Size Load Delivery Route

An assessment of the haul route was made from the proposed port of entry for the large turbine components in Waterford. The route is shown in Figure 15.1 and is discussed in detail in Section 15.1.8.

The route assessment is confined to the haul route commencing with the 3kms on the R448 from the port in Waterford onto the N25, before heading west on the N25 for approximately 30 kms to a roundabout just north of Youghal. The route then travels northwest on the R634 to the proposed access to the eastern site (Access A), situated on the eastern side of the R634. Approximately 3 kms to the south on the R634 there is a fork in the road, with the road heading northwest on the L7806. This road provides access to the western site approximately 6 kms to the northwest of the junction with the R634 (Access B). The locations of the proposed access junctions are shown in Figures 15.2b.

NOTES:

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Figure 15.1 Site location and delivery route

PROJECT:	Lyrenacarriga Wind Farm		
CLIENT:	Innogy		SCALE: NTS
PROJECT NO: 6310	DATE: 10.10.20		DRAWN BY: AL

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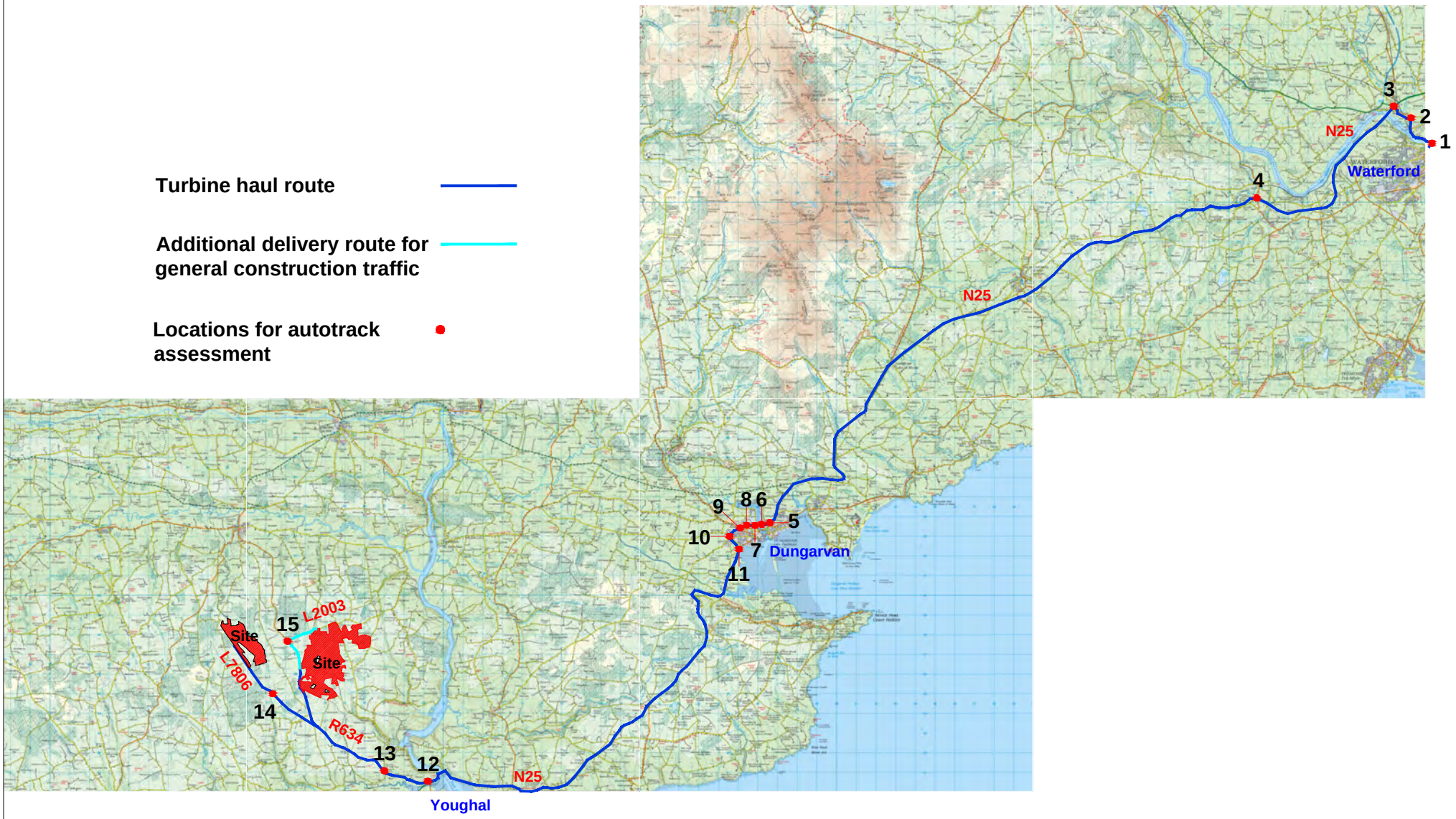

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 15.2a Route assessment location plan (national road network)

PROJECT:	Lyrenacarriga Wind Farm		
CLIENT:	Innogy		SCALE: NTS
PROJECT NO: 6310	DATE: 10.12.20		DRAWN BY: AL

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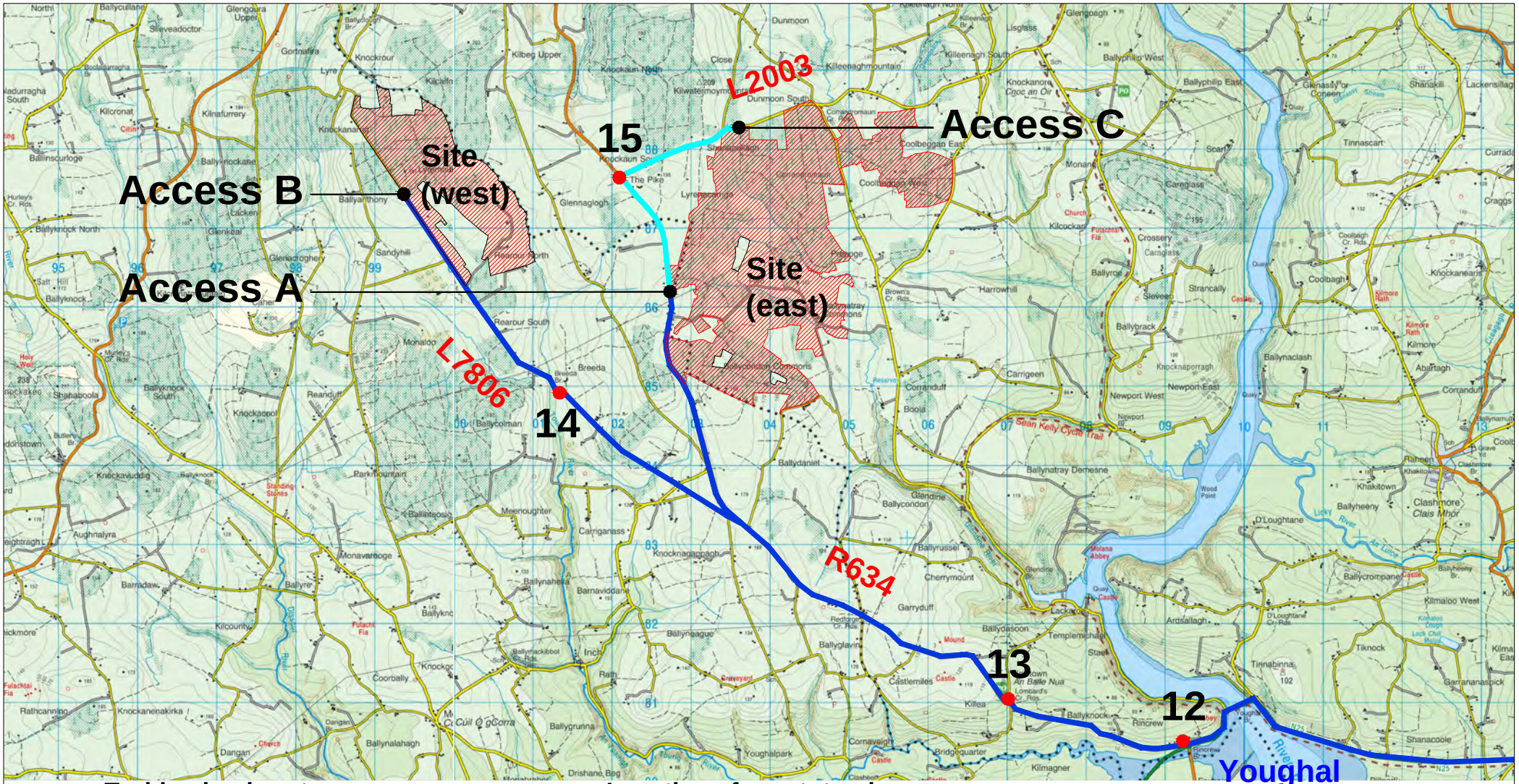
TRAFFIC & TRANSPORT CONSULTANTS



Turbine haul route

Additional delivery route for general construction traffic

Locations for autotrack assessment

NOTES:

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Figure 15.2b Route assessment location plan (local road network)

PROJECT:	Lyrenacarriga Wind Farm		
CLIENT:	Innogy	SCALE:	NTS
PROJECT NO: 6310	DATE: 10.12.20	DRAWN BY:	AL

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TRAFFIC & TRANSPORT CONSULTANTS

15.1.2.4 Proposed Construction Traffic Haul Route

The delivery route for general HGV construction traffic may vary depending on the location of the suppliers of concrete and other general construction materials required to construct the proposed development.

For the purpose of assessing the worst-case scenario it is estimated that the following proportion of concrete, aggregate and general construction traffic will travel on the following links;

- N25 Waterford – up to 100%,
- R634 – up to 100%,
- L7806 towards Access B – all abnormal loads, general construction traffic and construction staff trips for 7 turbines (36% of total),
- L2003 towards Access C– all general construction traffic and construction staff trips for 11 turbines (64% of total).

For the purpose of this assessment it is assumed that deliveries of smaller component parts for the wind turbines will travel to the site via the port at Waterford and the N25 followed by the R634 and, in the case of the western site, the L7806, and for the eastern site, the L2003. In practice the delivery route for these component parts could change but as the associated traffic volumes are low, as established in Section 15.1.4 of this EIAR, the impacts will be minimal regardless of the route selected.

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

15.1.3 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. 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.

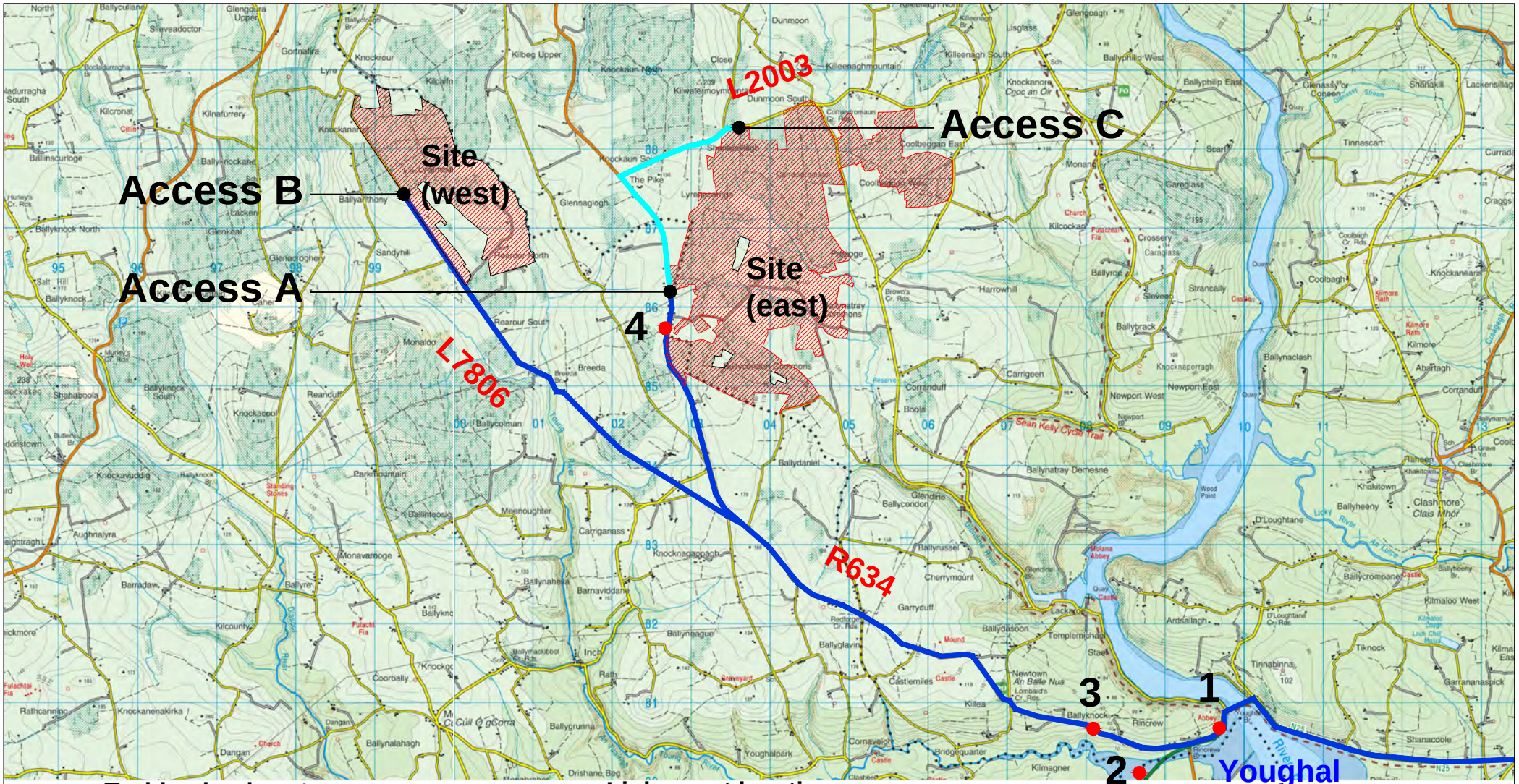
15.1.3.1 Background Traffic Flows

The link count locations included in the assessment are shown in Figure 15.2c.

A continuous traffic counter is maintained by TII on the N25 to the north east of Dungarvan. Traffic data from this site together with a peak period classified turning count undertaken at the N25 / R634 roundabout located to the north of Youghal, and an all-day count undertaken the R634 adjacent to Access junction A, as shown in Figure 15.2c on Wednesday 25th September 2019, were used to provide background traffic volumes on the local public road network.

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 N25. This data shows that the average annual daily traffic flow (AADT) is 12.1 times the flow observed during the evening peak hour period, which at the roundabout was observed to be 16:00 to 17:00, as set out in Table 15.1 below. Base year 2019 traffic volumes for the link locations 1 to 3 shown in Figure 15.2b range from 11,785 vehicles per day on the N25 from Waterford to 2,263 on the R634 just to the north of Youghal.

In Table 15.2, the all-day link flows for all locations shown in Figure 15.2b are shown. The observed all day flow determined from the traffic count undertaken on Wednesday 25th September 2019 was 1,425 vehicles. While classified counts were not undertaken at the local L7806 and L2003 adjacent to Access junctions B and C, short period 1 hour observations made on an initial site visit undertaken on Tuesday 11th September 2018 indicated that traffic flows on these roads were low. For the purpose of assessing link capacity a background flow of 1,000 vehicles per day was allocated to each of these roads.



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 15.2c Link count locations

PROJECT:	Lyrenacarriga Wind Farm		
CLIENT:	Innogy	SCALE:	NTS
PROJECT NO: 6310	DATE: 10.12.20	DRAWN BY:	AL

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TRAFFIC & TRANSPORT CONSULTANTS

Table 15-1 Observed flow in PM peak hour, all day factor, Average all day flows, year 2019 (2-way vehicles)

Link	2-way flow	hour	All day factor	All day flow
1 N25 – Waterford	459	16:00 – 17:00	12.1	11,785
2 N25 – Midleton	701	16:00 – 17:00	12.1	8,422
3 R634 – Youghal	253	16:00 – 17:00	12.1	2,263

Table 15-2 Average all day flows by location, 2019 (2-way vehicles)

Link	2019
1 N25 – Waterford	11,785
2 N25 – Midleton	8,422
3 R634 – Youghal	2,263
4 R634 – Site access	1,425
5 L7806 – Site access	1,000
6 L2003 – Site access	1,000

15.1.3.2 Future Background Traffic Volumes

This section describes the process adopted to produce background traffic forecasts for an assumed construction year of 2024.

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 the County, and factors for the years relevant to this study, are shown in Table 15.3 and Table 15.4. Traffic volumes are forecast to increase during the period from 2019 (the observed traffic count year) to 2024 (the assumed construction year) by 5.2%, assuming a medium growth scenario. All day traffic flows, for the years 2019 and 2024, on the study area network are compared in Table 15.5. It is noted that growth factors for County Waterford were adopted for the assessment, while it is acknowledged that the proposed delivery routes traverse counties Waterford and Cork. It was concluded that as the forecast growth in background traffic up to the construction year of 2024 is similar for both counties (5.2% for Waterford compared to 5.8% for Cork), that either could be used, with no material impact on the assessment presented in the EIAR. As the majority of the haul route is in County Waterford, the growth rates for this county were adopted.

It should also be noted that while the assumed construction year of 2024 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 1.17% (as shown in Table 15.3) and the traffic volumes generated by the Proposed Development will remain unchanged regardless of construction year, as presented subsequently in Section 15.1.4.

Table 15-3 TII Traffic Growth Annual Factors and Indices for County Waterford

Year	Lights – Annual Factor			Lights – Cumulative Index		
	Low	Medium	High	Low	Medium	High
2019	1.0154	1.0171	1.0205	1.000	1.000	1.000
2020	1.0154	1.0171	1.0205	1.015	1.017	1.021
2021	1.0154	1.0171	1.0205	1.031	1.034	1.041
2022	1.0154	1.0171	1.0205	1.047	1.052	1.063
2023	1.0154	1.0171	1.0205	1.063	1.070	1.085
2024	1.0154	1.0171	1.0205	1.079	1.088	1.107

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

Table 15-4 TII traffic growth rates by growth scenario

Period	New Factors		
	Low	Medium	High
2019 – 2024	1.047	1.052	1.063

Table 15-5 Average all day flows by location and year (2-way vehicles)

Link	2019	2024
1 N25 – Waterford	11,785	12,823
2 N25 – Midleton	8,422	9,163
3 R634 – Youghal	2,263	2,462
4 R634 – Site access	1,425	1,550
5 L7806 – Site access	1,000	1,088
6 L2003 – Site access	1,000	1,088

The TII traffic count data recorded from the ATC data on the N25 and observed during the traffic count survey on the R634 were also used to determine the existing percentage of HGVs on the study area network. The observed percentage of HGVs was observed to vary from 6.3% on the N25, to 4.1% on the R634 adjacent to Access junction A. Traffic volumes forecast on the study network for the year 2024 are shown by vehicle type in Table 15.6.

Table 15-6 All day flows, percentage HGVs and flows by vehicle type, year 2024

Link	All day flow (vehs)	% HGV's	Vehicles		PCUs		
			HGVs	Cars / LGVs	HGVs	Cars / LGV	Total
1 N25 – Waterford	12,823	6.3%	808	12,015	1,939	12,015	13,953
2 N25 – Midleton	9,163	6.3%	577	8,585	1,385	8,585	9,971
3 R634 – Youghal	2,462	4.1%	101	2,361	242	2,361	2,603
4 R634 – Site access	1,550	4.1%	64	1,487	153	1,487	1,639
5 L7806 – Site access	1,088	4.1%	45	1,043	107	1,043	1,150
6 L2003 – Site access	1,088	4.1%	45	1,043	107	1,043	1,150

15.1.4 Proposed Development and Traffic Generation

15.1.4.1 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, groundworks and concrete pours and,
- Stage 2 – Turbine component delivery.

For the purpose of the traffic impact assessment, projections based on typical wind farm construction projects regarding the length of the construction phases and work periods etc. must be made to inform the assessment. These assumptions 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 the CEMP, which is submitted as Appendix 4-4 of this EIAR. The CEMP will be agreed with the Local Authority prior to construction commencing.

The construction phase of the proposed development is expected to last approximately 18 to 24 months (1.5 to 2 years). While works could take up to to 24 months, 18 months was assumed for the purpose of this assessment in order to test the worst-case scenario. For assessment purposes a standard 255 working days per annum was adopted, with 382 working days assumed for the entire construction stage of the Proposed Development. As discussed in the following paragraphs there will be 4 typical days during the 382 working day construction period for which the traffic effects of the Proposed Development are assessed. Given the nature of construction projects, these days will be intertwined and will not happen in one batch and may not happen in the order described. However, the purpose of this section is to set out the traffic impacts on typical days during the construction process, so the order in which they occur is less relevant. The types of typical day assessed are as follows;

- General site preparation, ground works, turbine construction commissioning (317 days).
- Delivery of concrete for the construction of foundations (17 days),
- Delivery of abnormal sized turbine components to site (31 days),
- Delivery of other turbine equipment using standard HGVs (17 days),

15.1.4.1.1 *Stage 1 – Site Preparation , Ground Works and Concrete Pours (334 days)*

The total number of deliveries made to the site during Stage 1 - Site Preparation and Construction phase are shown in Table 15.6.

During this construction phase, there will be two distinct types of days with respect to trip generation. A total of 17 days will be used to pour the 17 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 317 working days for this stage, other general construction materials will be delivered to the site.

During all of Stage 1, based on trip rates typical of wind farm projects, it is estimated that 5,591 two-way trips will be made to the sites by trucks and large articulated HGVs, as set out in Table 15.7, with the daily effect on the local road network shown in Tables 15.8 and 15.9. The figures show that on the 17 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 15.8. Similarly, on the 317 days when other materials will be delivered to the site, traffic volumes on the local network are forecast to increase by an average of 65 PCUs, as set out in Table 15.9.

Table 15-7 Stage 1 – Site preparation groundworks and concrete pours– total movements

Material	Total no. Truck Loads	Truck type
Concrete	1,275	Large artic
Concrete blinding and steel	186	Large artic
Plant / fencing / compound set-up	40	Large artic
Forestry felling	657	Large artic
Crushed rock and sand	2,763*	Large artic
Ducting / cabling	500	Large artic
Grid cable laying	43	Large artic
Cranes	11	Large artic
Substation components	79	Large artic
Refuelling / maintenance / misc	37	Large artic
Total	5,591	

* Note: it is proposed that the majority of crushed rock will be won on site, however the above estimation includes a worst case whereby a proportion of this will be imported.

Table 15-8 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	1,275	Large artic	2.4	3,060	180.0	360.0
* Estimation based on 17 concrete pouring days						

Table 15-9 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	186	Large artic	2.4	446	1.4	2.8
Plant / fencing / compound set-up	40	Large artic	2.4	96	0.3	0.6
Forestry felling	657	Large artic	2.4	1,577	5.0	9.9
Crushed rock and sand	2,763	Large artic	2.4	6,631	20.9	41.8
Ducting / cabling	500	Large artic	2.4	1,200	3.8	7.6
Grid cable laying	43	Large artic	2.4	103	0.3	0.7
Cranes	11	Large artic	2.4	26	0.1	0.2
Substation components	79	Large artic	2.4	190	0.6	1.2
Refuelling / maintenance / misc	37	Large artic	2.4	89	0.3	0.6
Total	4,316			10,358	32.7	65.4
* Estimation based on ground work period of 317 working days						

15.1.4.1.2 Stage 2 – Turbine Component Delivery and Turbine Construction (48 days)

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/conventional 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 15.10, which summarises that a total of 153 trips will be made to and from the site by extended artics, with a further 68 trips made by conventional large articulated HGVs.

Table 15-10 Stage 2 – Wind turbine plant – total movements

Material	Units	Quantity per Unit	Total Quantity	Quantity per Truck	Total Truck Loads	Truck type
Nacelle	17	1	17	1	17	Extended Artic
Blades	17	3	51	1	51	Extended Artic
Towers	17	5	85	1	85	Extended Artic
Sub total					***153***	
Transformer	17	1	17	1	17	Large Artic
Drive train and blade hub	17	1	17	1	17	Large Artic
Base and other deliveries	17	2	34	1	34	Large Artic
Sub total					***68***	
Total					221	

For the purposes of this assessment an assumed delivery period is provided, although this may be subject to change. It is assumed that the turbine delivery element will progress at the rate of 5 extended artic trips made by convoy to the site on 2 days per week, resulting in this stage taking approximately 31 days/nights spread over an assumed 16-week period. On a further two days per week, lasting for approximately 9 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 Tables 15.11 and Table 15.12. In Table 15.11, a PCU equivalent value of 10 was allocated to each extended artic movement to the site with 2.4 PCUS allocated for the reduced sized HGV leaving the site, resulting in an additional 62 PCUs on the study network on these 2 days per week, while an additional 15 PCUs are forecast to be on the network on two other days per week, as shown in Table 15.12, during the turbine construction phase.

Table 15-11 Stage 2 – Wind turbine plant, extended artics – total movements and volumes per delivery day

Material	Units	Truck Type	PCU Value to site	PCU Value from site	2-way PCUs
Nacelle	1	Extended Artic	10	2.4	12.4
Blades	3	Extended Artic	10	2.4	12.4
Towers	5	Extended Artic	10	2.4	12.4
Total per turbine	9				111.6
Total per delivery day	5				62.0
*Estimation based on 5 abnormal sized loads being delivered per day on 2 days per week (total 153 loads will take 31 nights spread over 16 weeks)					

Table 15-12 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
*Estimation based on equipment for 2 turbines being moved per week spread over 2 days			

15.1.4.1.3 *Construction Employee Traffic*

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

15.1.4.2 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 operator,

Eirgrid personnel visiting the substation, and operation / maintenance personnel who will visit individual turbines.

It is estimated that the traffic volumes that will be generated by the development once it is operational will be minimal. The site will be unmanned but will generate maintenance trips, with approximately two maintenance staff regularly travelling to site for routine periodic site visits. The impact on the network of these trips during the operational stage is discussed in Section 15.1.6.

15.1.5 Construction Traffic Design Vehicles

15.1.5.1 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 66.5m 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. 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 and a similar methodology will be adopted as set out here to ensure the findings of this assessment remain valid for whatever model of turbine is selected. Any references to the turbine dimensions in the text below must be considered in the context of the above and should not be construed as meaning it predetermines the dimensions of any wind turbine that could be used on the site.

The key dimensions are as follows:

Transport of Blades – Super Wing Carrier with blade

- Total length 71.9 m
- Length of blade 66.5 m
- Inner radius 28.0 m

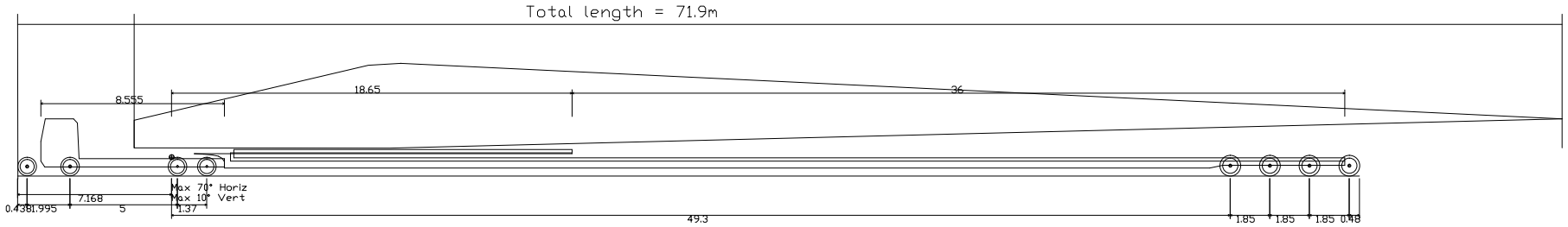
Transport of Tower – Using low-bed or drop deck trailers

- Total length (with load) 46.7 m
- Length of load 30.0 m
- Inner radius 25.0 m

The critical vehicles, in terms of size and turning geometry requirements, used in the detailed route assessment discussed in Section 15.1.8 and included in the swept path analysis drawings (please see Appendix 15-1), are the blade and tower transporters. The geometry of the design vehicles are included as Figures 15.4 and 15.5.

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

All other vehicles requiring access to the site will be standard HGVs and will be significantly smaller than the design test vehicles.



66.5m blade

Overall Length	71.9m
Overall Width	2.550m
Overall Body Height	2.661m
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 15.4 Design blade extended artic profile

PROJECT:	Lyrenacarriga Wind Farm		
CLIENT:	Innogg	SCALE:	NTS
PROJECT NO:	6310	DATE: 10.12.20	DRAWN BY: AL

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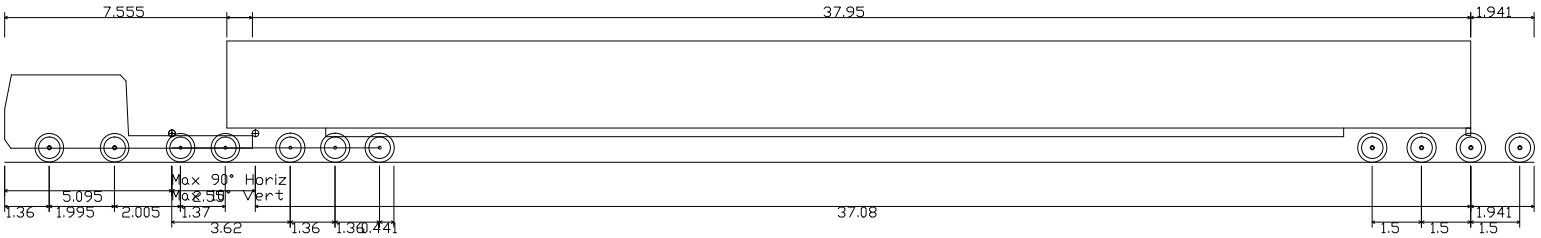

Tower	
Overall Length	46.666m
Overall Width	2.550m
Overall Body Height	3.695m
Min Body Ground Clearance	0.427m
Max Track Width	2.520m
Lock to Lock Time	6.00s
Wall to Wall Turning Radius	9.800m

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

FIGURE 15.5 Design tower extended artic profile

PROJECT:	Lyrenacarriga Wind Farm		
CLIENT:	Innogy	SCALE:	NTS
PROJECT NO: 6310	DATE: 10.12.20	DRAWN BY:	AL

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15.1.6 Traffic Effects During Construction and During Operation

15.1.6.1 Traffic Effect During Construction and During Operation

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

15.1.6.1.1 *Effect on Link Flows – During Construction*

Background traffic volumes, as established previously and set out in Table 15.5, and development generated traffic volumes are shown for the typical construction day scenarios discussed in Section 15.1.4 are set out in Table 15.13 to 15.16, with the traffic effects summarised in Table 15.17 to 15.20. The figures presented in the tables will be subject to change in practice, however these figures are considered to represent a robust worst-case estimation of the likely effects.

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

During Stage 1 - Site Preparation and Groundworks

On average an additional 186 PCUs will travel on the local highway network resulting in a percentage increase in traffic volumes on the study network ranging from +1.3% on the N25 to + 11.3% on the R634 to + 16.2% on the 2 local roads (L7806 and L2003) providing access to the site.

During Stage 1 – Concrete Pouring

For these 17 days an additional 480 PCUs will travel on the study network. On these days, the percentage increase in traffic volumes experienced on the study network will be between +3.4% on the N25 in the direction of Waterford, to +29.3% on the R634 leading to the site, to +41.7% on the local L7806 & L2003 roads providing access the western and eastern sites respectively

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

The additional 142 PCUs (made up of cars and large extended artics) will travel on the study network for 31 days. On the days this impact occurs, volumes will increase by between +1.0% on the N25 to 8.7% on the R634 approaching Access Junction A serving the eastern cluster, to +12.3% on the L7806 leading towards Access junction B for the western cluster. The L2003 approaching Access Junction C will be impacted less (+7.0%) as it will provide for construction staff trips only on these days.

The most significant traffic impact may be experienced during these days primarily due to the slow speeds, size and geometric requirements of these vehicles. The provision of traffic management measures, including ensuring that these deliveries are made at night (as set out in Sections 15.1.7 and 15.1.10.6 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 17 days on the delivery route 95 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 +0.7% on the N25, to +5.8% on the R634, to +8.3% on the local L7806 and L2003 providing access to the western and eastern sites respectively.

Table 15-13 Development traffic during site preparation and groundworks

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 N25 – Waterford	12,015	1,939	13,953	120	66	186	12,135	2,005	14,139
2 N25 – Midleton	8,585	1,385	9,971	120	66	186	8,705	1,451	10,157
3 R634 – Youghal	2,361	242	2,603	120	66	186	2,481	308	2,789
4 R634 – Site access	1,487	153	1,639	120	66	186	1,607	219	1,825
5 L7806 – Site access	1,043	107	1,150	120	66	186	1,163	173	1,336
6 L2003 – Site access	1,043	107	1,150	120	66	186	1,163	173	1,336

Table 15-14 Effects of development traffic during concrete pouring

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 N25 – Waterford	12,015	1,939	13,953	120	360	480	12,135	2,299	14,433
2 N25 – Midleton	8,585	1,385	9,971	120	360	480	8,705	1,745	10,451
3 R634 – Youghal	2,361	242	2,603	120	360	480	2,481	602	3,083
4 R634 – Site access	1,487	153	1,639	120	360	480	1,607	513	2,119
5 L7806 – Site access	1,043	107	1,150	120	360	480	1,163	467	1,630
6 L2003 – Site access	1,043	107	1,150	120	360	480	1,163	467	1,630

Table 15-15 Development traffic during turbine construction - extended artics (large turbine components)

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 N25 – Waterford	12,015	1,939	13,953	80	62	142	12,095	2,0001	14,095
2 N25 – Midleton	8,585	1,385	9,971	80	62	142	8,665	1,447	10,113
3 R634 – Youghal	2,361	242	2,603	80	62	142	2,441	304	2,745
4 R634 – Site access	1,487	153	1,639	80	62	142	1,567	215	1,781
5 L7806 – Site access	1,043	107	1,150	80	62	142	1,123	169	1,292
6 L2003 – Site access	1,043	107	1,150	80	62	142	1,123	169	1,292

Table 15-16 Effect of development traffic during turbine construction – other deliveries (small turbine components)

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 N25 – Waterford	12,015	1,939	13,953	80	15	95	12,095	1,954	14,048
2 N25 – Midleton	8,585	1,385	9,971	80	15	95	8,665	1,400	10,066
3 R634 – Youghal	2,361	242	2,603	80	15	95	2,441	257	2,698
4 R634 – Site access	1,487	153	1,639	80	15	95	1,567	168	1,734
5 L7806 – Site access	1,043	107	1,150	80	15	95	1,123	122	1,245
6 L2003 – Site access	1,043	107	1,150	80	15	95	1,123	122	1,245

Table 15-17 Summary effect of development traffic during site preparation and ground works

Link	Background PCUs	Development PCUs	Total PCUs	% increase	Estimated No. of days
1 N25 – Waterford	13,953	186	14,139	1.3%	317
2 N25 – Midleton	9,971	186	10,157	1.9%	317
3 R634 – Youghal	2,603	186	2,789	7.1%	317
4 R634 – Site access	1,639	186	1,825	11.3%	206
5 L7806 – Site access	1,150	186	1,336	16.2%	111
6 L2003 – Site access	1,150	186	1,336	16.2%	206

Table 15-18 Summary effect of development traffic during concrete pouring

Link	Background PCUs	Development PCUs	Total PCUs	% increase	Estimated No. of days
1 N25 – Waterford	13,953	480	14,433	3.4%	17
2 N25 – Midleton	9,971	480	10,451	4.8%	17
3 R634 – Youghal	2,603	480	3,083	18.4%	17
4 R634 – Site access	1,639	480	2,119	29.3%	17
5 L7806 – Site access	1,150	480	1,630	41.7%	17
6 L2003 – Site access	1,150	480	1,630	41.7%	17

Table 15-19 Summary effect of development traffic during turbine construction – extended artics (large turbine components)

Link	Background PCUs	Development PCUs	Total PCUs	% increase	Estimated No. of days
1 N25 – Waterford	13,953	142	14,095	1.0%	31
2 N25 – Midleton	9,971	NA	NA	NA	NA
3 R634 – Youghal	2,603	142	2,745	5.5%	31
4 R634 – Site access	1,639	142	1,781	8.7%	20
5 L7806 – Site access	1,150	142	1,292	12.3%	11
6 L2003 – Site access	1,150	80	1,230	7.0%	20

Table 15-20 Summary effect of development traffic during turbine construction – other deliveries (small turbine components)

Link	Background PCUs	Development PCUs	Total PCUs	% increase	Estimated No. of days
1 N25 – Waterford	13,953	95	14,048	0.7%	17
2 N25 – Midleton	9,971	NA	NA	NA	NA
3 R634 – Youghal	2,603	95	2,698	3.6%	17
4 R634 – Site access	1,639	95	1,734	5.8%	11
5 L7806 – Site access	1,150	95	1,245	8.3%	6
6 L2003 – Site access	1,150	95	1,245	8.3%	11

An assessment of the impact on link capacities in the study area was undertaken for the various construction stages as set out in Table 15.21, Table 15.22, and Table 15.23. The capacity for each link in the study area is shown in

Table 15-2121. The capacities range from a daily flow of 11,600 vehicles on the N25 in the direction of Midleton down to 5,000 on the R634 and are based on road widths and capacities set out in the TII Standards document DN-GEO-03031 Road Link Design, Table 6/1. On sections of the L7086 leading towards the western site Access junction B, sections of the road are less than 5 metres wide with sections providing one-way traffic flow with passing opportunities only. The capacity for this section is estimated to be 2,200 vehicles per day based on local road guidelines.

Background, or do-nothing, traffic flows are compared to flows forecast for the various construction delivery stages in Table 15.22 with the percentage capacity reached for each link and stage shown in Table 15.23. Based on this assessment the following points are noted;

- On the external network the N25 in the direction of Waterford is the busiest road with the link capacity forecast to operate over capacity 120% for the do-nothing scenario, increasing to a maximum of 124% during the 17 days that the concrete foundations will be poured.
- The R634 N62 leading to the site is forecast to operate well within capacity for all scenarios, increasing from 33% for the do-nothing scenario to a maximum of 42% on the 17 days that the foundations will be poured.
- For the Local L7806 leading to Access junction B serving the western cluster, this narrow local road is forecast to operate at 52% capacity for the do-nothing scenario, increasing to a maximum of 74% on the days that the concrete foundations are poured. A corresponding increase from 23% for the do-nothing scenario to 33% for the busiest delivery day is forecast for the local L2003 leading to Access junction C serving the eastern site.

Table 15-21 Carriageway widths, link type and link capacity

Link	Width (m)	Link type	Link capacity
1 N25 – Waterford	7.0	Type 1 single	11,600
2 N25 – Midleton	7.0	Type 1 single	11,600
3 R634 – Youghal	7.0	Type 2 single	8,600
4 R634 – Site access	6.0	Type 3 single	5,000
5 L7806 – Site access	< 5.0	Local road	2,200
6 L2003 – Site access	5.0 to 6.0	Local road	5,000

Table 15-22 Link capacity and summary of link flows by construction delivery stage

Link	Link capacity	Construction delivery stage				
		Background traffic	Concrete pour	Other site works	Abnormally sized turbine plant	Turbine equipment
1 N25 – Waterford	11,600	13,953	14,433	14,139	14,095	14,048
2 N25 – Midleton	11,600	9,971	10,451	10,157	NA	NA
3 R634 – Youghal	8,600	2,603	3,083	2,789	2,745	2,698
4 R634 – Site access	5,000	1,639	2,119	1,825	1,781	1,734
5 L7806 – Site access	2,200	1,150	1,630	1,336	1,292	1,245
6 L2003 – Site access	5,000	1,150	1,630	1,336	1,292	1,245

Table 15-23 Link capacity and % of link capacity by construction delivery stage

Link	Link capacity	Construction delivery stage				
		Background traffic	Concrete pour	Other site works	Abnormally sized turbine plant	Turbine equipment
1 N25 – Waterford	11,600	120%	124%	122%	122%	121%
2 N25 – Midleton	11,600	86%	90%	88%	NA	NA
3 R634 – Youghal	8,600	30%	36%	32%	32%	31%
4 R634 – Site access	5,000	33%	42%	37%	36%	35%
5 L7806 – Site access	2,200	52%	74%	61%	59%	57%
6 L2003 – Site access	5,000	23%	33%	27%	25%	25%

Substation Construction

It is estimated that an additional 400 HGV trips will be generated to and from the site during the construction of the substation, associated compound and grid connection works. It is assumed that the construction of the substation will take place at the same time as the site preparation and groundworks stage, as set out in Table 15.7, with traffic effects included in the assessment for that construction period.

Effect on Link Flows – During Operation

Once the wind farm is operational it is estimated that approximately two maintenance staff on average will regularly access the site for routine periodic site inspections and to carry out operational site maintenance work, with a similar number of vehicle trips. It is considered that the traffic impact during this phase will be imperceptible.

Effect on Junctions – During Construction

The capacity of the study area junction most affected, the R634 / L7806 junction, was assessed using the industry standard junction simulation software PICADY, which permits the capacity of any junction to be assessed with respect to existing or forecast traffic movements and volumes for a given period. The capacity for each movement possible at the junction being assessed is determined from geometric data input into the program with the output used in the assessment as follows:

- Queue – This is the average queue forecast for each movement 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.

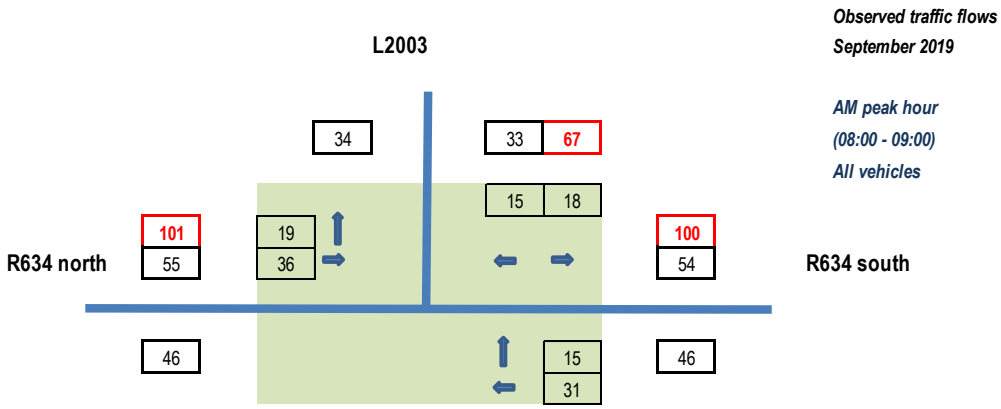
Scenarios Modelled

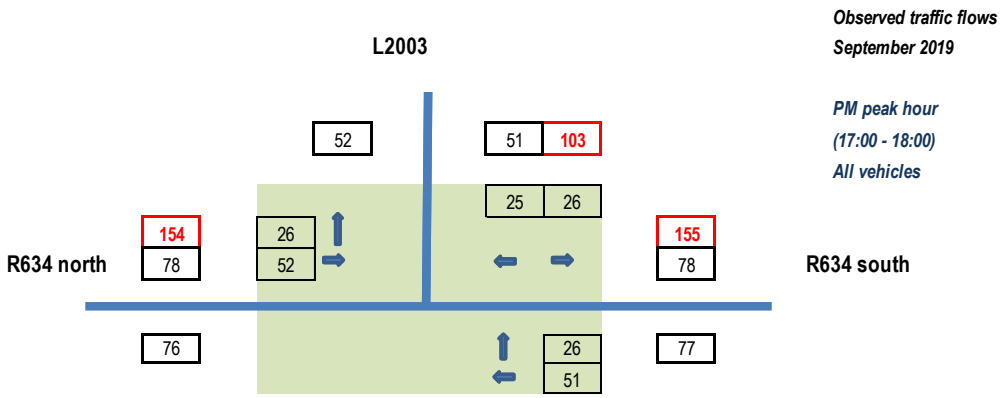
While other junctions and links on the network will experience an increase in traffic volumes passing through them, as discussed previously and as set out in Table 15.16 to 15.20 above, the worst-case effect will be experienced during peak hours when, during peak construction periods, up to 120 workers (60 cars) will pass through it. It is noted that deliveries of materials to the site will take place during the day after the workers have arrived on site, and before they leave at the end of the day, and will therefore not occur at the same time.

R634 / L2003 junction Capacity Test Results

The AM and PM peak hour traffic flows through the R634 / L2003 junction are shown for the year 2019 in Figure 15.3a, with background traffic flows for the assumed construction year of 2024 shown in Figure 15.3b. Traffic flows generated by the proposed development during the AM and PM peak hours are shown in Figure 15.3c while the year 2024 traffic flows with development generated traffic are shown in Figure 15.3d.

The results of the capacity assessment, as set out in Table 15.24, show that additional car trips passing through the junction will have a slight effect, increasing the maximum ratio of flow to capacity (RFC) at the junction for the traffic movements impacted from 3.5% to 10.4% in the AM peak hour, and from 12.7% to 27.1% during the PM peak hour, which is within the acceptable limit of 85%.





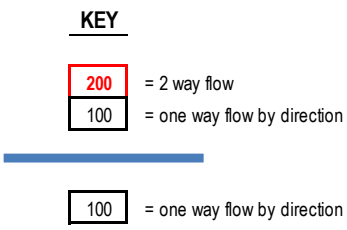


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Figure 15.3a Observed traffic flows, AM & PM peak hours, R634 / L2003 junction, September 2019 - All vehicles

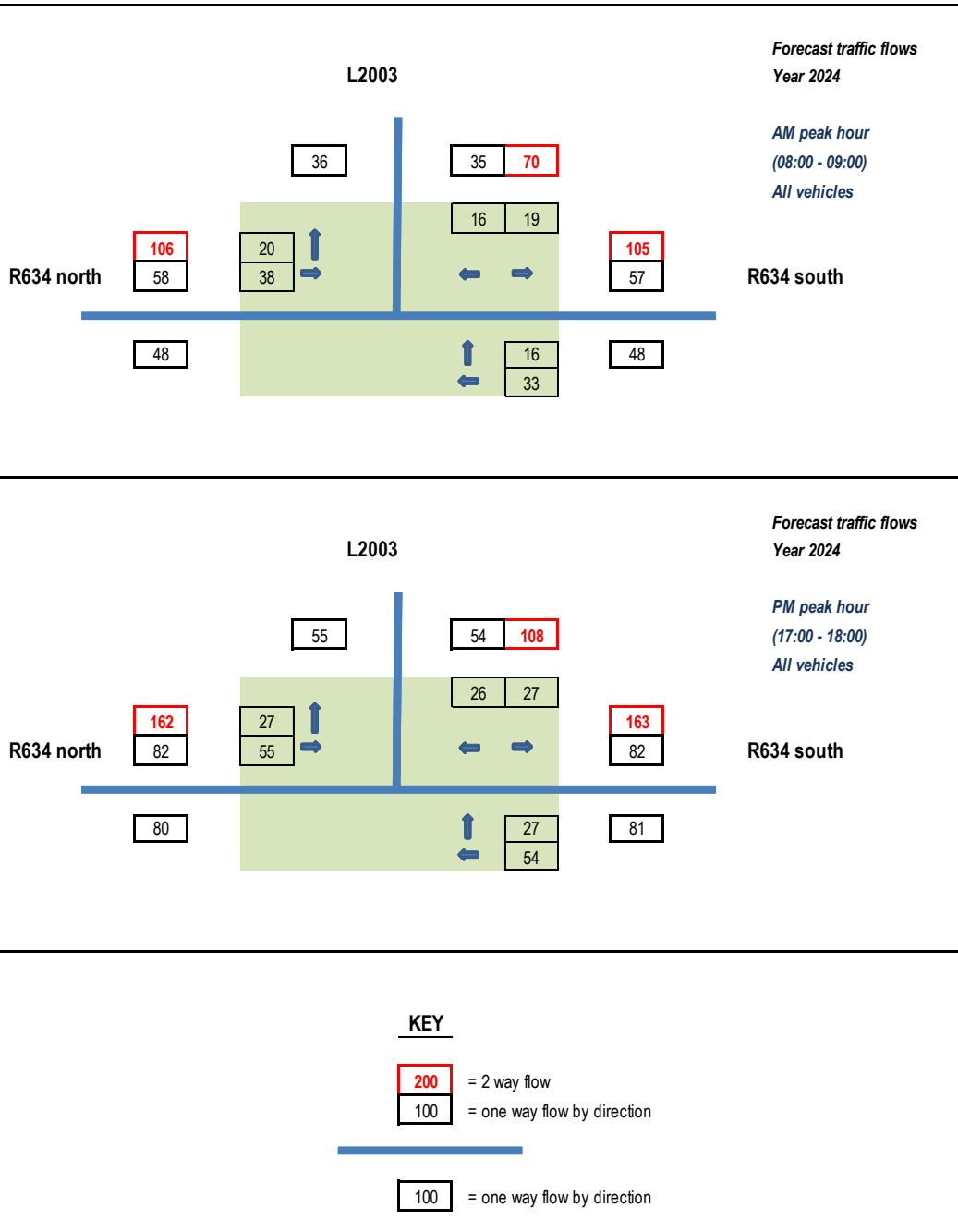

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Figure 15.3b Forecast background traffic flows, AM & PM peak hours, R634 / L2003 junction, September 2024 - All vehicles

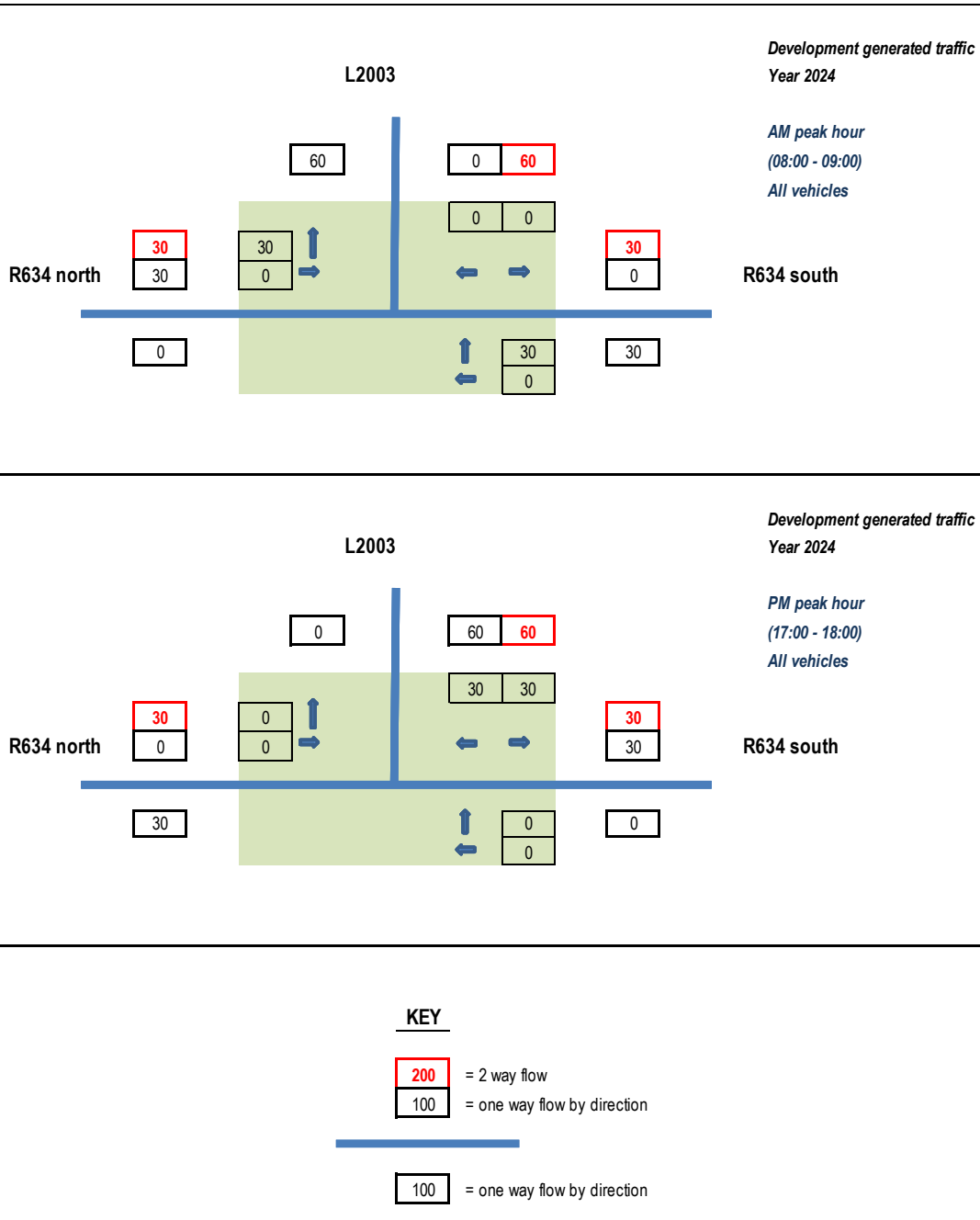

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Figure 15.3c Development generated traffic flows, AM & PM peak hours, R634 / L2003 junction, September 2024 - All vehicles

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Figure 15.3d With development traffic flows, AM & PM peak hours, R634 / L2003 junction, September 2024 - All vehicles

Table 15-24 Junction capacity test results, R634 /L2003 junction, AM and PM peak hours, without and with construction staff, year 2024

Period	Location	Without construction traffic			With construction traffic		
AM		RFC	Queue (vehicles)	Delay (minutes)	RFC	Queue (vehicles)	Delay (minutes)
	From L2003	8.1%	0.09	0.14	8.3%	0.09	0.49
	Right turn from R634	3.5%	0.04	0.12	10.4%	0.12	0.13
PM		RFC	Queue (vehicles)	Delay (minutes)	RFC	Queue (vehicles)	Delay (minutes)
	From L2003	12.7%	0.14	0.15	27.1%	0.37	0.18
	Right turn from R634	6.1%	0.08	0.12	6.1%	0.08	0.12

Effect on Junctions – During Operation

As discussed under 'Effect on Link Flows' above, it is forecast that once operational, the development will generate approximately 2 trips on a regular basis by maintenance staff for routine site inspections. Given the low number of traffic movements, it is considered that the traffic impact during this phase will be imperceptible.

15.1.7 Traffic Management of Large Deliveries

The greatest effect on the road network will likely be experienced on the approximately 31 days during which the 5 large loads per day comprising the tower sections, the blades and the nacelles are delivered to the site.

Traffic management measures are included in Section 15.1.10.6 and include the following:

- Identification of a delivery schedule,
- Details of the alterations required to the infrastructure identified in Section 15.1.8 of this report and any other minor alteration identified (hedge rows etc). Please note the proposed works locations on the turbine delivery route (i.e. proposed widening at Lombard's Cross Roads and construction of new link road near Breeda Bridge, as described in Section 4.4.3 of Chapter 4, have been assessed in this EIAR as part of the proposed project).
- A dry run of the route using vehicles with similar dimensions.

The transport of large components such as the transport of turbines to wind farms requires extensive route selection, route proofing and consultation with An Garda Síochána and the various local

authorities as is proposed for the Lyrenacarriga Development. Turbine components are proposed to be primarily transported at night when traffic is lightest and this is done in consultation with the roads authorities / An Garda Síochána and special permits are generally required.

Works are proposed at two locations on the turbine delivery route as part of the proposed development. The locations of these works are described in Section 4.4.3 in Chapter 4 of this EIAR and are addressed under 'Location 13' and 'Location 14' below. Other works on the route will be minor only, for example the temporary removal of some street signs or furniture, or the temporary levelling of the centre island of some roundabouts.

It is not anticipated that any sections of the local road network will be closed, although there may be delays to local traffic at various locations if the deliveries are made during daylight hours. During these periods, it may be appropriate to operate local diversions for through traffic. The effect of this stage may be minimised by the deliveries of the abnormally sized large loads taking place during the night. It is noted that it is proposed that all deliveries of abnormally sized loads will be made during night time hours, as is the norm for such deliveries.

15.1.8 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 15.2a. The preliminary route assessment discussed in this section, indicates that the optimum route to the site from the port of entry at Waterford is via the N25 to Youghal, followed by the R634 towards the site, with additional access junctions located on the local road network. This route was therefore selected as the transport route for the abnormal loads.

All locations along the route referred to in this section are highlighted in Figures 15.2a and 15.2b. For these locations, preliminary road and junction alignments, based on site surveys, were supplied by the project team. A preliminary 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 may be required.

The assessment also presents the preliminary design of the proposed site access junctions A, B and C as described in Section 15.1.2.2 for the delivery of abnormally sized loads and general construction traffic, and the autotrack assessments for the appropriate vehicle types relevant to each access.

The locations discussed are as follows;

- Location 1 – R711 / R448 Dock Road roundabout,
- Location 2 – R448 / R861 roundabout,
- Location 3 – R861 / N25 roundabout,
- Location 4 – N25 / R680 roundabout,
- Location 5 – N25 / R675 roundabout,
- Location 6 – N25 Strandside roundabout,
- Location 7 – N25 Shandon roundabout,
- Location 8 – N25 Fairline roundabout,
- Location 9 – N25 Kilrush roundabout,
- Location 10 – N25 Spring roundabout,
- Location 11 – N25 Youghal roundabout,
- Location 12 – N25 / R634 roundabout,
- Location 13 – Bend on R634 at Lackarde Post Office,
- Location 14 – L7806 Breeda Bridge
- Location 15 – R634 / L2003 junction
- Access junction A – R634,
- Access junction B – L7806,
- Access junction C – L2003

15.1.8.1 Access to the Wind Farm site from the Port in Waterford via N25 and R634

The following text summarises the findings of the swept path analysis for Locations 1 to 15, all Figures for which are included as Appendix 15-1 of this EIAR.

Location 1 – R711 / R448 Dock Road roundabout

See Figures A15.1.1 and A15.1.2

The swept path analysis undertaken for this location indicates that if the large turbine vehicles negotiate the roundabout contra-flow, as is proposed to be completed by means of Garda escort, the vehicles will negotiate this location with only minor temporary alterations required to the central reserve and the temporary removal of some road signs. It is noted that road signs can be temporarily sleeved for removal and reinstatement during the delivery process. Likewise, roundabouts and traffic islands can be defined with bolt anchored rubber strips to demark the roundabout or island. These allow the delivery vehicles to travel over while still demarking the road feature. This will apply to all locations where existing traffic signs are impacted or where temporary over-run areas are required.

Location 2 – **R448 / R861 roundabout**

See Figures A15.1.3 and A15.1.4

The swept path analysis undertaken for this location shows that an area of the centre island of the roundabout will require to be levelled and surfaced in order to accommodate the 66.5m blade transporter. The temporary removal of some road signs will also be required (per the process described for location 1).

Location 3 – **R861 / N25 roundabout**

See Figures A15.1.5 and A15.1.6

Similarly, the swept path analysis undertaken for this location shows that an area of the centre island of the roundabout will require to be levelled and surfaced in order to accommodate the 66.5m blade transporter. The temporary removal of some road signs will also be required (per the process described for location 1).

Location 4 – **N25 / R680 roundabout**

See Figures A15.1.7 and A15.1.8

The swept path analysis undertaken for this location shows that an area of the centre island of the roundabout will require to be levelled and surfaced in order to accommodate the 66.5m blade transporter. The temporary removal of some road signs will also be required (per the process described for location 1).

Location 5 – **N25 / R675 roundabout**

See Figures A14.1.9 and A14.1.10

The swept path analysis undertaken for this location indicates that by negotiating the roundabout contra-flow, as is proposed, the large turbine vehicles will negotiate the roundabout requiring a narrow strip of local widening on the north side of the carriageway within the curtilage of the public road

network. The temporary removal of some road signs will be required at this location (per the process described for location 1).

Location 6– **N25 Strandside roundabout**

See Figures A15.1.11 and A15.1.12

An area of the centre island of the roundabout will require to be levelled and surfaced in order to accommodate the turbine transport vehicles. The temporary removal of some road signs will also be required (per the process described for location 1).

Location 7 – **N25 Shandon roundabout**

See Figures A15.1.13 and A15.1.14

An area of the centre island of the roundabout will require to be levelled and surfaced in order to accommodate the turbine transport vehicles. The temporary removal of some road signs will also be required (per the process described for location 1).

Location 8 – **N25 Fairline roundabout**

See Figures A15.1.15 and A15.1.16

An area of the centre island of the roundabout will require to be levelled and surfaced in order to accommodate the turbine transport vehicles. The temporary removal of some road signs will also be required (per the process described for location 1).

Location 9 – **N25 Kilrush roundabout**

See Figures A15.1.17 and A15.1.18

An area of the centre island of the roundabout will require to be levelled and surfaced in order to accommodate the turbine transport vehicles. The temporary removal of some road signs will also be required (per the process described for location 1).

Location 10 – **N25 Spring roundabout**

See Figures A15.1.19 and A15.1.20

An area of the centre island of the roundabout will require to be levelled and surfaced in order to accommodate the turbine transport vehicles. The temporary removal of some road signs will also be required (per the process described for location 1).

Location 11 – **N25 Youghal roundabout**

See Figures A15.1.21 and A15.1.22

The swept path analysis undertaken for this location indicates that by negotiating the roundabout contra-flow, as is proposed to be completed using An Garda Siochana escort, the vehicles will negotiate this location with only minor temporary alterations required to the central reserve and the temporary removal of some road signs.

Location 12 – **N25 / R634 roundabout**

See Figures A15.1.23 and A15.1.24

The swept path analysis undertaken for this location indicates that by negotiating the roundabout contra-flow, as will be done using An Garda Siochana escort, the vehicles will negotiate this location with only minor temporary alterations required to the central reserve and the temporary removal of some road signs.

Location 13 – **Bend on R634 at Lackarde Post Office**

See Figures A15.1.25 and A15.1.26

The swept path analyses undertaken at this location indicates that the blade transporter will require an area of local widening into the southwest corner of the road verge / field in order to accommodate this location opposite the post office located on the R634. The area impacted will be restored to its original state post construction.

Location 14 – **L7806 Breeda Bridge**

See Figures A15.1.27 and A15.1.28

A new local access track 5 metres wide and 300 metres long will be laid on agricultural land on the northern side of the existing L7806 in order that the abnormally sized turbine vehicles are able to negotiate this location. This temporary access road will be constructed using geogrid / geotextile with the area proposed to be re-instated to its original state post construction. It is noted that this local link road will be used for the delivery of the large turbine vehicles only, which will be accompanied by An Garda Siochána escort. The road will be closed by means of fencing all other times during the construction period and will be closed off post construction.

Location 15 – **R634 / L2003 junction**

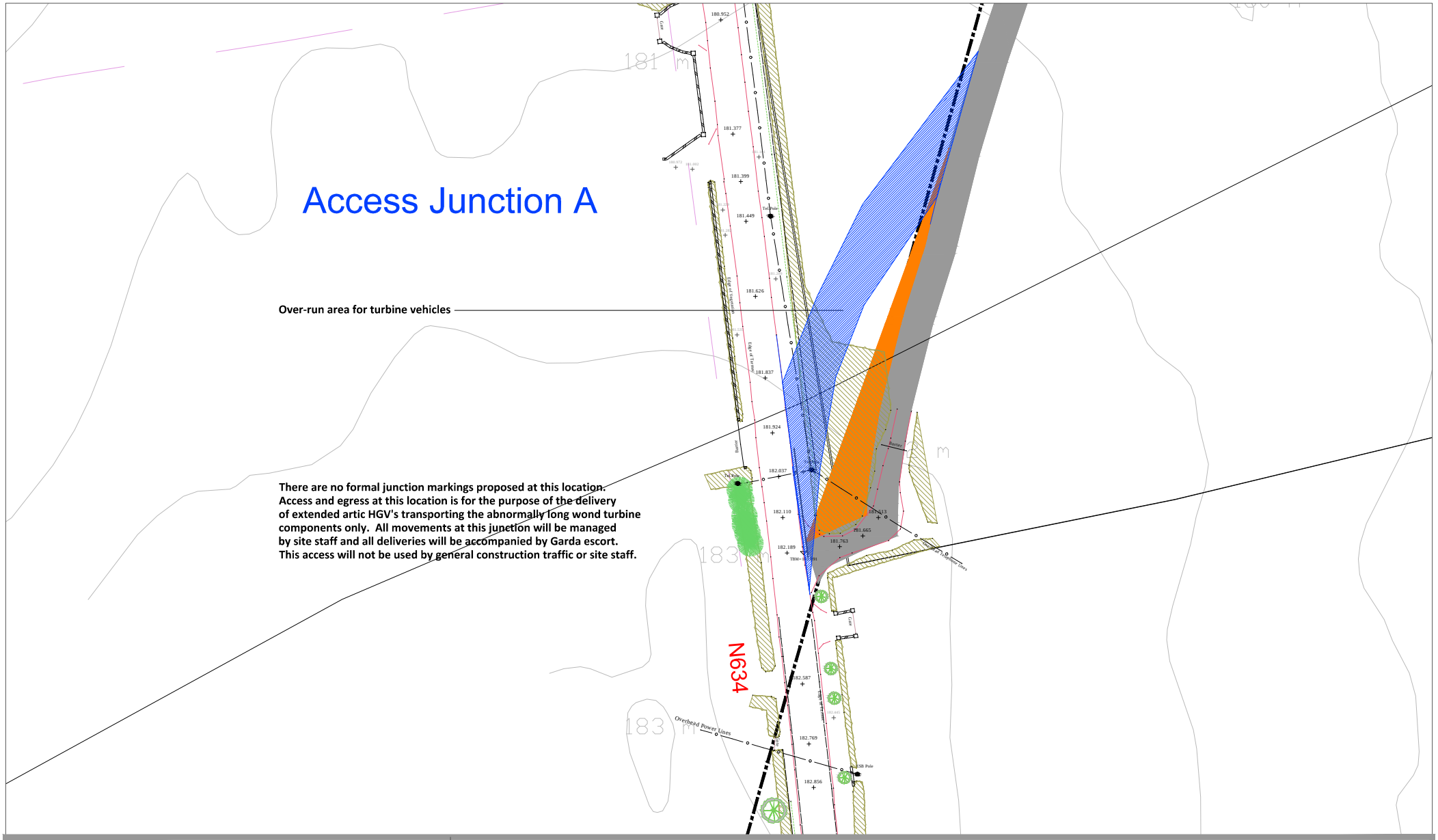
See Figures A15.1.29 and A15.1.30

As abnormal turbine transporters will not be required to negotiate this junction a swept path analysis was undertaken for a standard large HGV. The assessment shows that the junction will accommodate the turning requirements of these vehicles.

15.1.8.2 Proposed Access Junctions on R634, L7806 and L2003

Access Junction A – R634, for extended artic access only

The proposed junction layout and auto-track assessment for abnormal load deliveries approaching from the south and accessing the eastern site are shown for the proposed access in Figures 15.6 to 15.8. The figures confirm that the junction layout proposed for the delivery stage will accommodate all vehicles requiring access to the site at this location. It is noted that all movements of abnormal loads undertaken through this junction will require to be managed on location, including the provision of Garda escort vehicles to control traffic. This location will not be used for any other traffic accessing the site and will be closed at all other times during the construction phase and once the Proposed Development is operational.



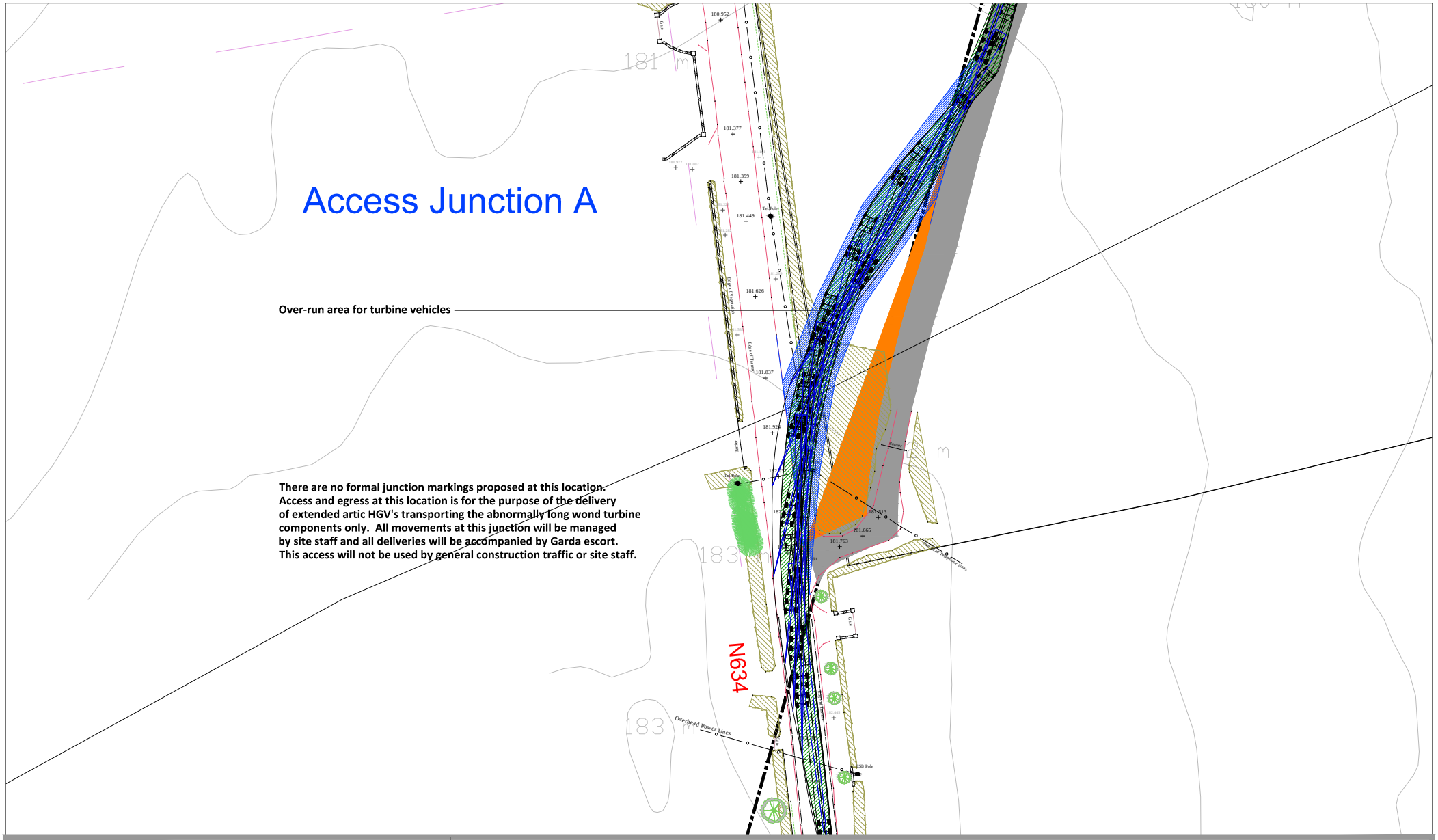
NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 15.6 Access A - R634 junction, junction layout - for extended artic access only

PROJECT:	Lyrenacarriga Wind Farm		
CLIENT:	Innogy	SCALE:	1:1000
PROJECT NO: 6310	DATE: 10.12.20	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



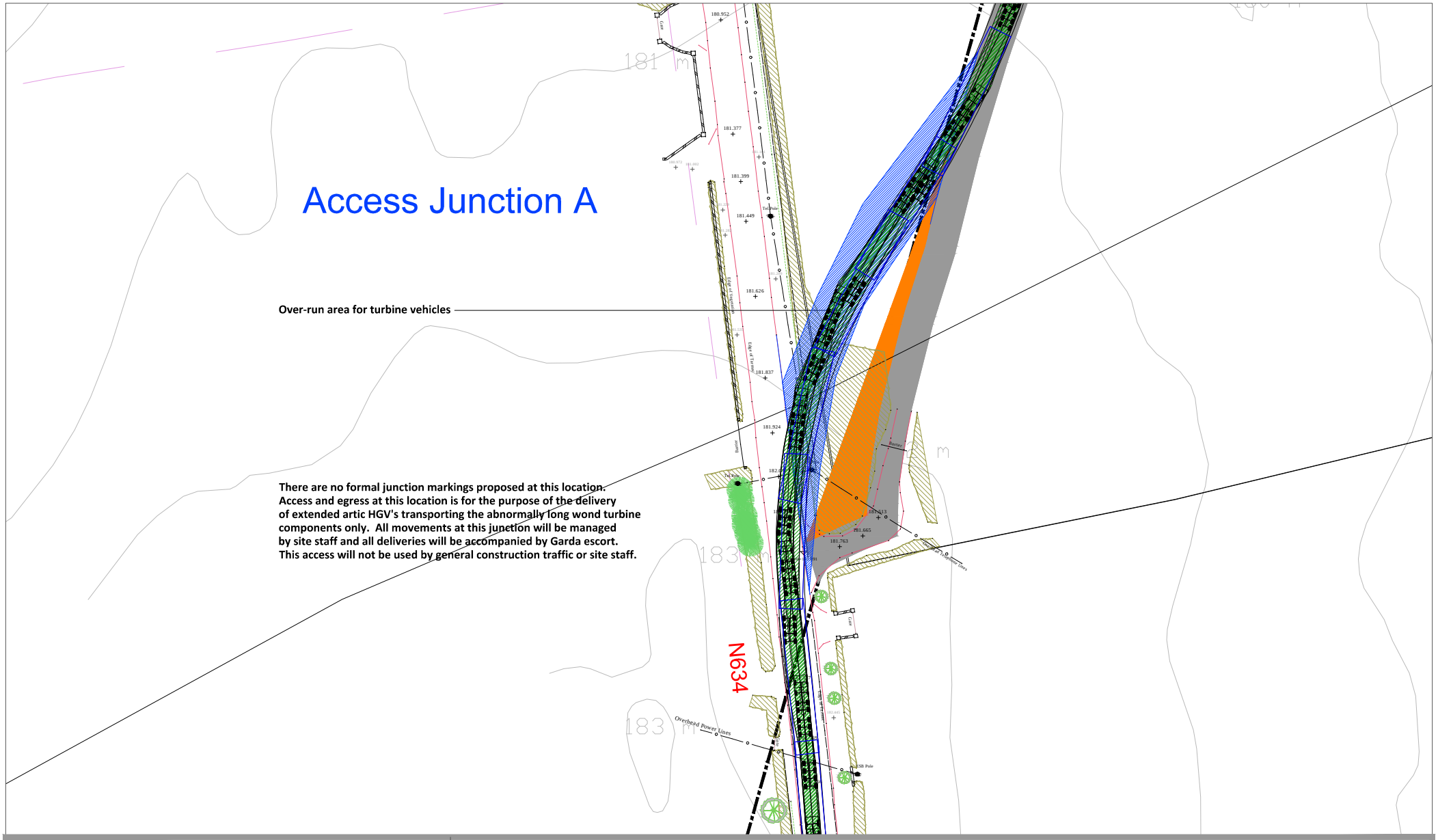
NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 15.7 Access A - R634 junction, junction layout - blade extended artic (66.5m blade)

PROJECT:	Lyrenacarriga Wind Farm		
CLIENT:	Innogy	SCALE:	1:1000
PROJECT NO: 6310	DATE: 10.12.20	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 15.8 Access A - R634 junction, junction layout - tower extended artic

PROJECT:	Lyrenacarriga Wind Farm		
CLIENT:	Innogy	SCALE:	1:1000
PROJECT NO: 6310	DATE: 10.12.20	DRAWN BY:	AL

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Access junction B – L7806 - for extended artic access and general construction traffic

There are 2 design options proposed for the abnormally sized turbine vehicles to negotiate this junction: Option 1, which utilises the land to the west and north of the proposed access road, and Option 2, which cuts across the south east corner of the junction. The proposed junction layout and autotrack assessment for abnormal load deliveries and general construction traffic approaching from the south, and accessing the western site, are shown for the proposed access Option 1 in Figures 15.9 to 15.11, and for Option 2 in Figures 15.12 to 15.14. The figures confirm that the junction layouts proposed for the delivery stage will accommodate all vehicles requiring access to the site at this location. It is noted that all movements of abnormal loads passing through this junction will require to be managed on location, including the provision of Garda escort vehicles to control traffic.

The junction layout proposed for the general site clearance and construction stages is also shown on Figure 15.9 and 15.12, including visibility splays of 2.4m x 90m, which will require to be kept clear of all obstructions above 1.05m at all times. The junction layout is in accordance with junction design guidelines for HGVs as set out in DN-GEO-03060, TII and includes 13m radii, with junction markings as recommended in the Traffic Signs Manual.

Access junction C – L2003 - for general construction traffic

The improved layout proposed for this location is shown in Figure 15.15, including visibility splays of 2.4m x 90m, which will require to be kept clear of all obstructions above 1.05m at all times. The junction layout and markings are in accordance with the guidelines referred to above.

Figure 15.16 shows that the proposed access junction will accommodate a large standard articulated HGV. It is proposed that this junction will be retained for the use of maintenance staff during the operational phase of the Proposed Development

15.1.9 Provision for Sustainable Modes of Travel

15.1.9.1 Walking and Cycling

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

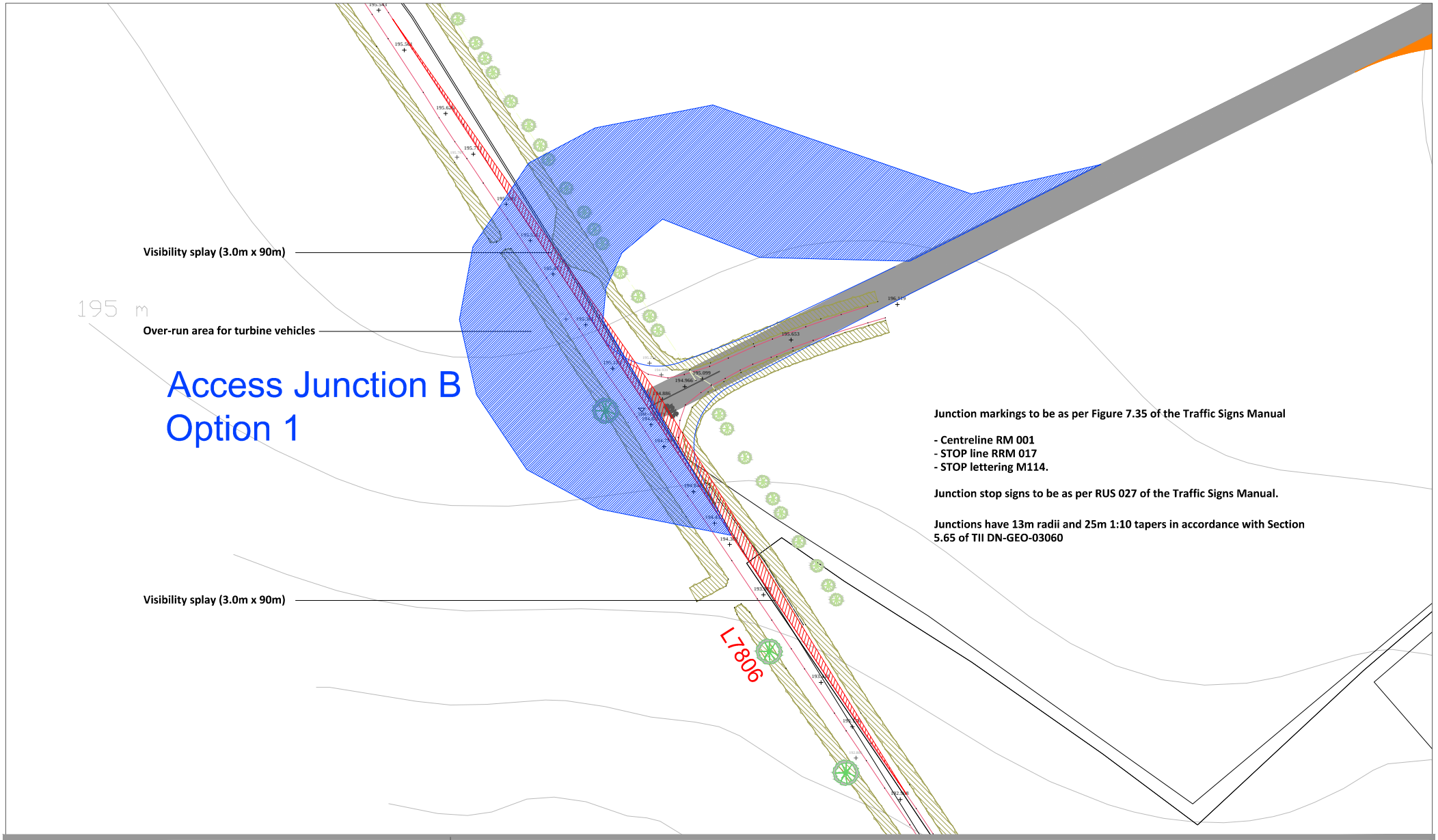
15.1.9.2 Public Transport

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

15.1.10 Likely and Significant Effects and Associated Mitigation Measures

15.1.10.1 "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.



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 15.9 Access B, Option 1 - L7806 junction, junction layout - for extended artic access and for general construction traffic

PROJECT:	Lyrenacarriga Wind Farm		
CLIENT:	Innogy	SCALE:	1:1000
PROJECT NO: 6310	DATE: 10.12.20	DRAWN BY:	AL

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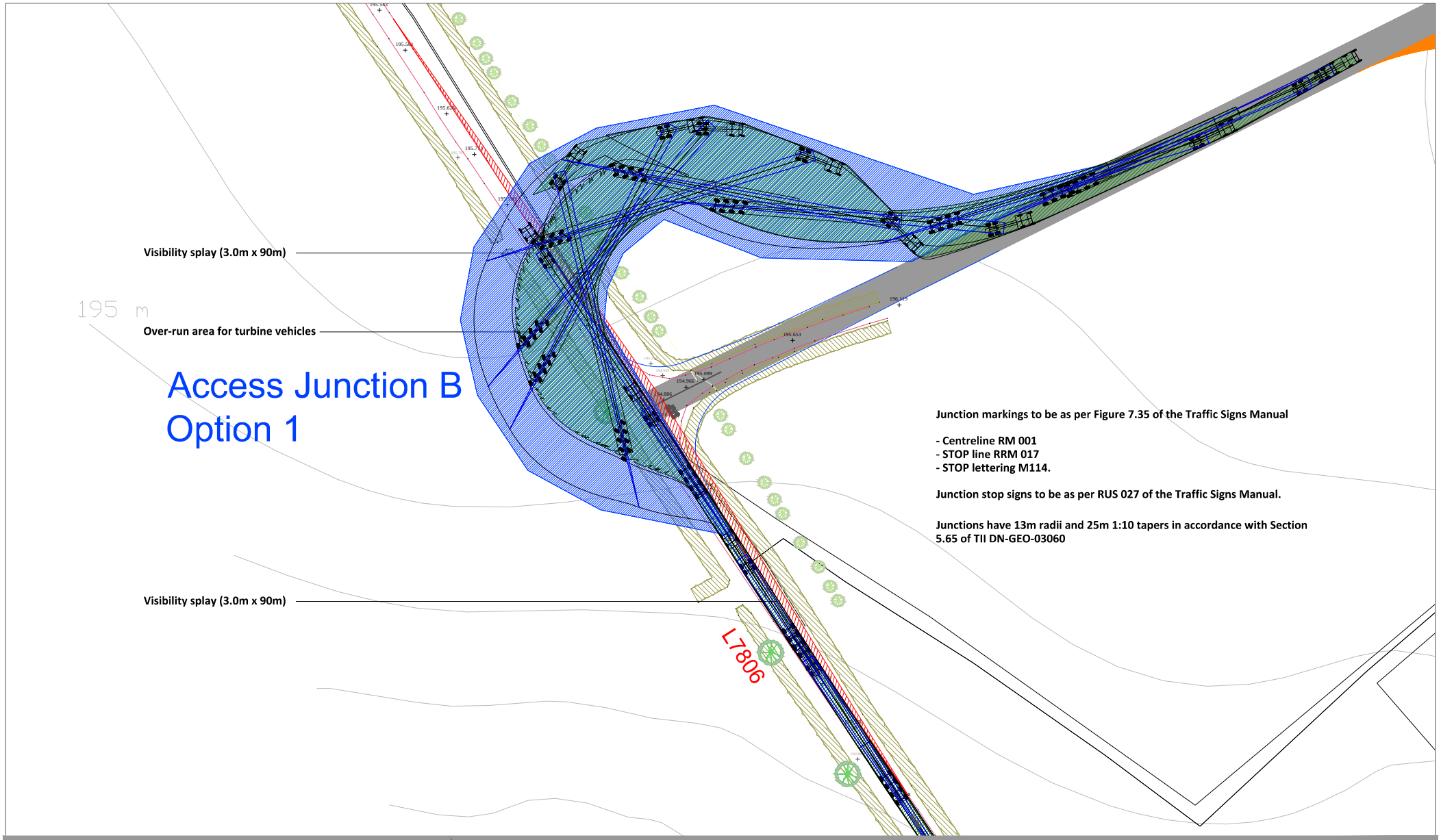

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 15.10 Access B, Option 1 - L7806 junction, junction layout - blade extended artic (66.5m blade)

PROJECT:	Lyrenacarriga Wind Farm		
CLIENT:	Innogy	SCALE:	1:1000
PROJECT NO: 6310	DATE: 10.12.20	DRAWN BY:	AL

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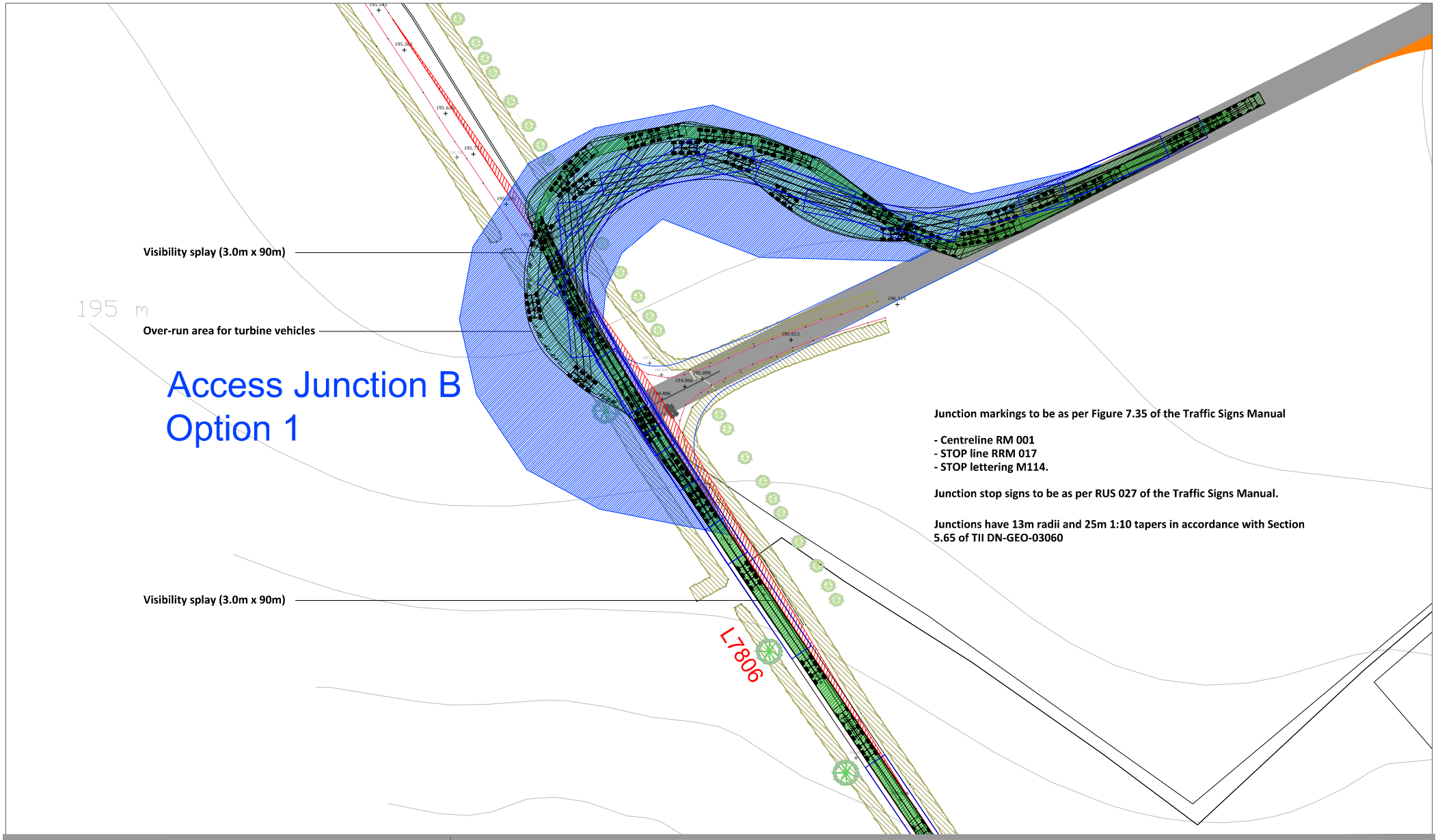

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 15.11 Access B, Option 1 - L7806 junction, junction layout - tower extended artic

PROJECT:	Lyrenacarriga Wind Farm		
CLIENT:	Innogy	SCALE:	1:1000
PROJECT NO:	6310	DATE: 10.12.20	DRAWN BY: AL

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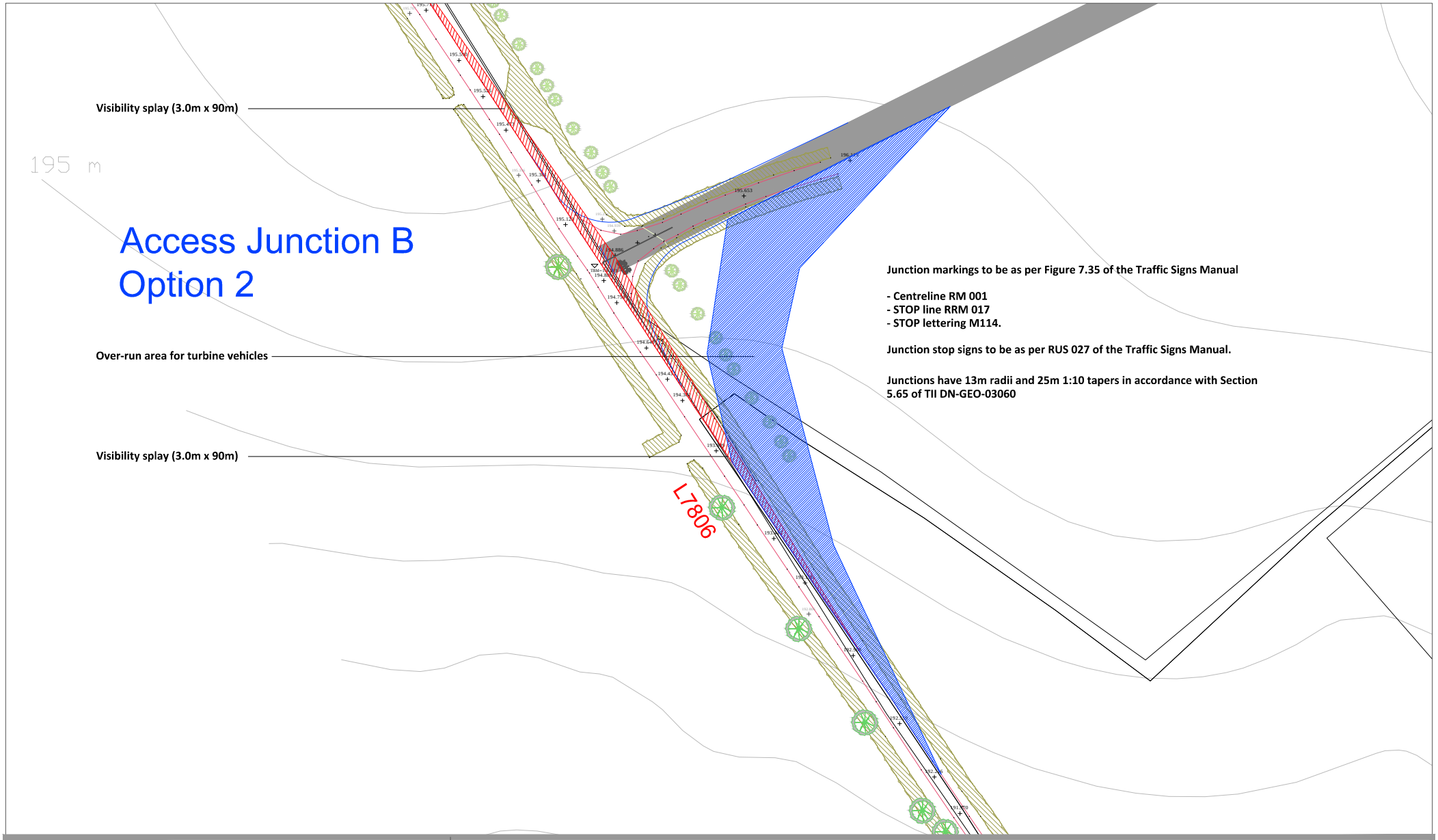


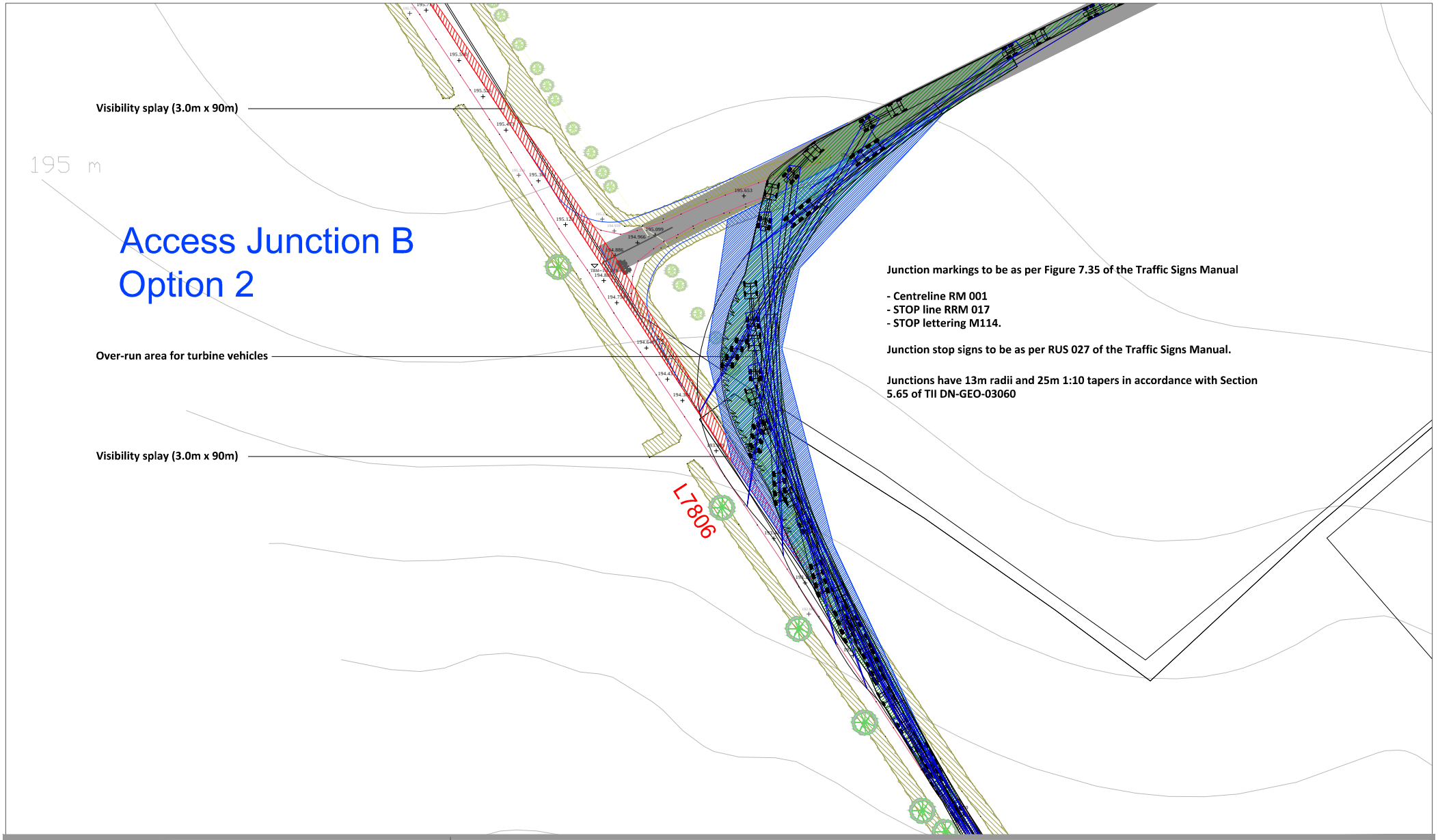
NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 15.12 Access B, Option 2 - L7806 junction, junction layout - for extended artic access and for general construction traffic

PROJECT:	Lyrenacarriga Wind Farm		
CLIENT:	Innogy	SCALE:	1:1000
PROJECT NO: 6310	DATE: 10.12.20	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 15.13 Access B, Option 2 - L7806 junction, junction layout - blade extended artic (66.5m blade)

PROJECT:	Lyrenacarriga Wind Farm		
CLIENT:	Innogy	SCALE:	1:1000
PROJECT NO: 6310	DATE: 10.12.20	DRAWN BY:	AL

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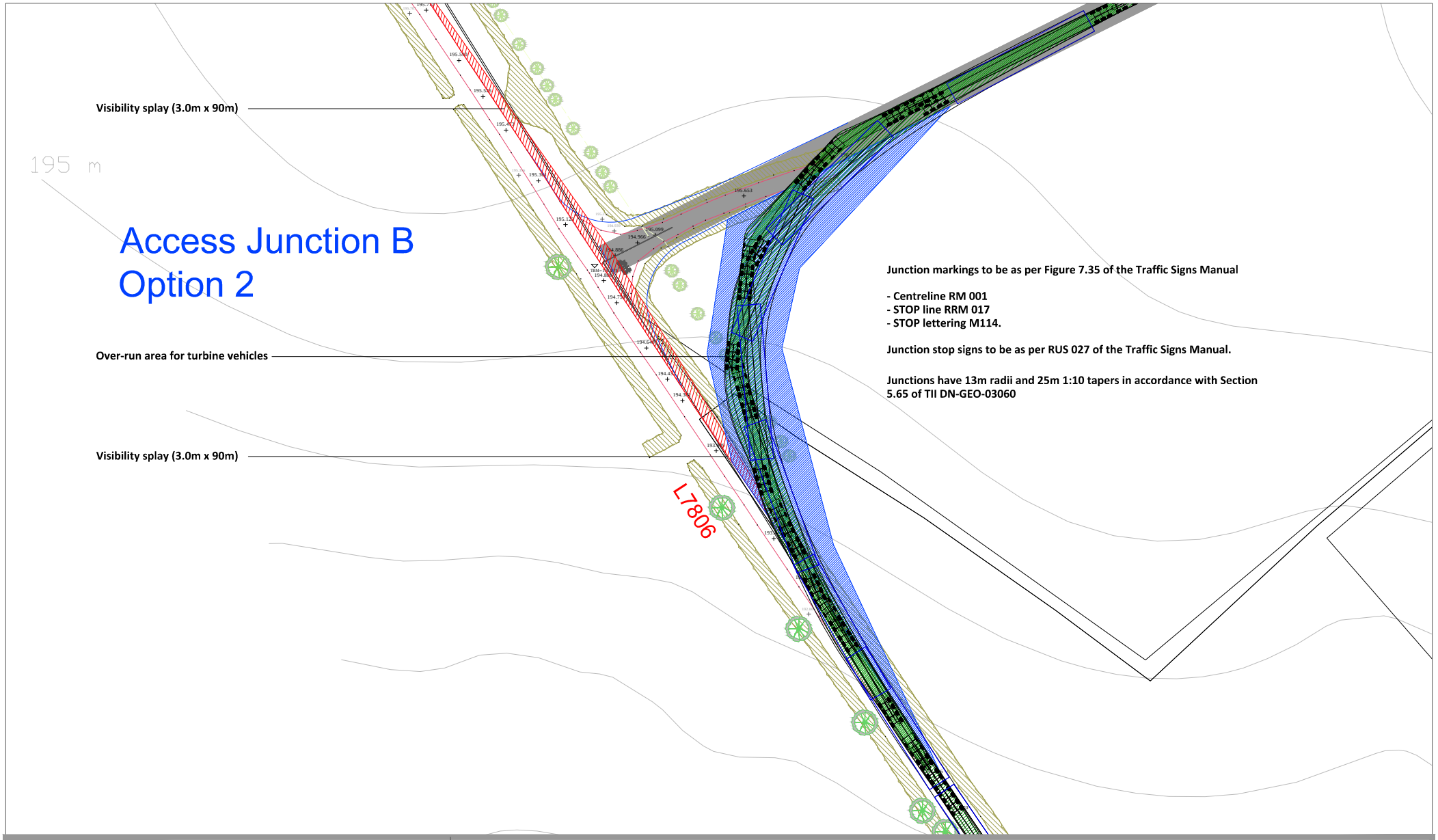
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 15.14 Access B, Option 2 - L7806 junction, junction layout - tower extended artic

PROJECT:	Lyrenacarriga Wind Farm		
CLIENT:	Innogy	SCALE:	1:1000
PROJECT NO: 6310	DATE: 10.12.20	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

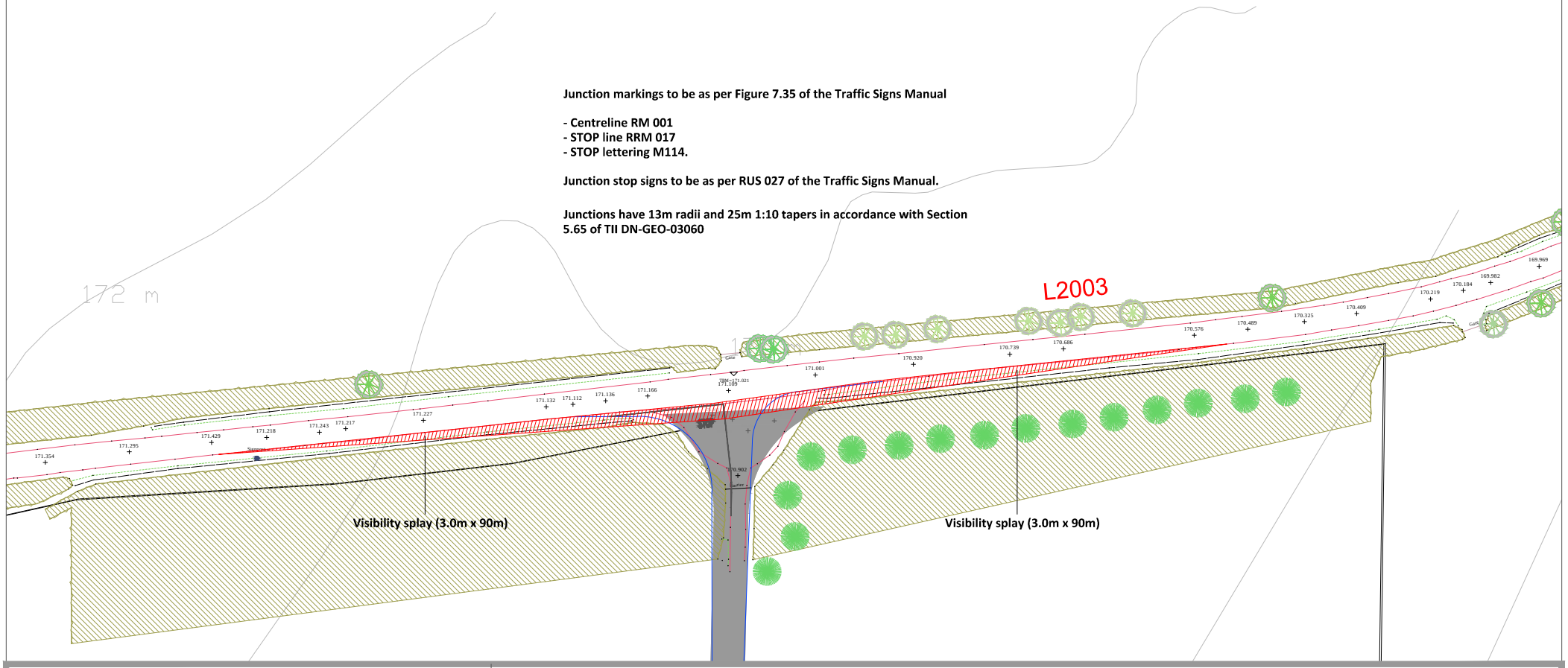
Access Junction C

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

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

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

Junctions have 13m radii and 25m 1:10 tapers in accordance with Section 5.65 of TII DN-GEO-03060



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 15.15 Access C - L2003 junction, junction layout - for general construction traffic

PROJECT:	Lyrenacarriga Wind Farm		
CLIENT:	Innogy	SCALE:	1:1000
PROJECT NO:	6310	DATE: 10.12.20	DRAWN BY: AL

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TRAFFIC & TRANSPORT CONSULTANTS

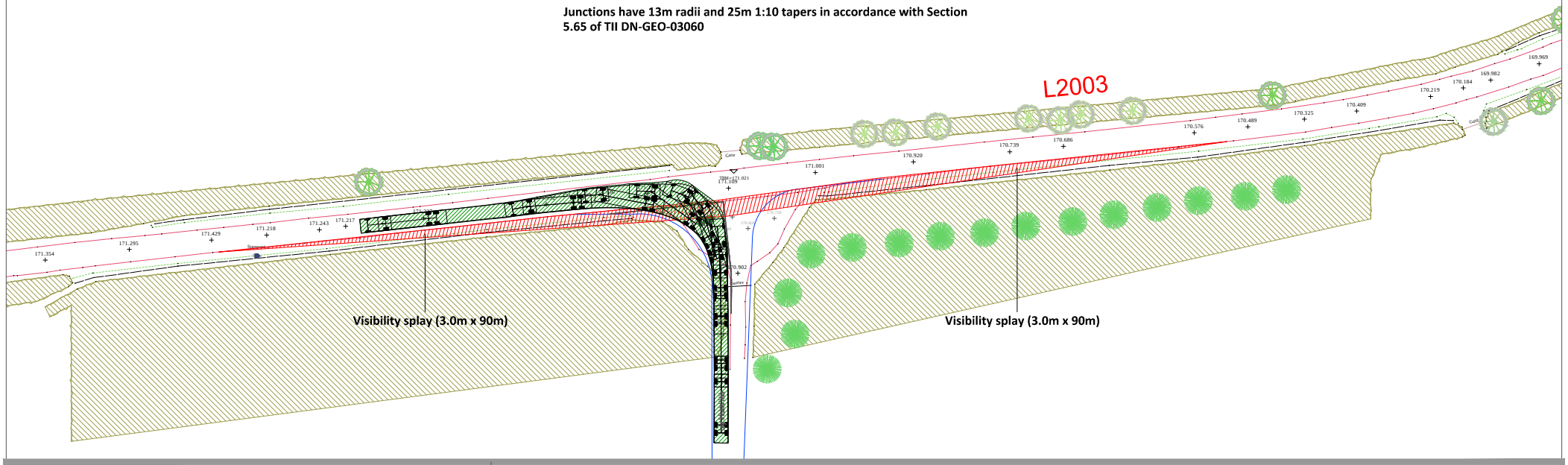
Access Junction C

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

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

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

Junctions have 13m radii and 25m 1:10 tapers in accordance with Section 5.65 of TII DN-GEO-03060



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 15.16 Access C - L2003 junction, junction layout - large artic HGV

PROJECT:	Lyrenacarriga Wind Farm		
CLIENT:	Innogy	SCALE:	1:1000
PROJECT NO:	6310	DATE: 10.12.20	DRAWN BY: AL

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15.1.10.2 Construction Phase

During the 317 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 1.3% on the N25, to an increase of 11.3% on the R634 and 16.2% on the local roads approaching the site. On these days, the direct effect will be temporary and will be slight.

During the 17 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 3.4% on the N25 to an increase of 29.3% on the R634, 41.7% on the local roads leading to the site access junctions. The direct effect will be temporary, and will be slight

During the 17 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 0.7% on the N25, to an increase of 5.8% on the R634 to 8.3% on the local roads leading to the site access junctions. The direct effect during this period will be temporary and will be slight.

During the 31 days 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 1.0% on the N25 to 8.7% on the R634 to 12.3% on the local road network. The direct effect will be reduced to slight if the delivery of the large plant is done at night, as is proposed.

15.1.10.3 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 on average regularly travelling to site for routine inspections and maintenance work, resulting in typically two visits to the site regularly made by a car or light goods vehicle.

15.1.10.4 Decommissioning Phase

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

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

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

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

15.1.10.5 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 2.7 of this EIAR, with an assessment of the potential cumulative traffic effects with the proposed subject wind farm assessed on the following criteria;

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

The developments located within a 20km radius and shown in Figure 2.2 that were considered to have potential cumulative impacts with the proposed wind farm development in terms of traffic impacts are summarised in Table 15.25.

It is noted that 3 out of the 4 wind farms within the 20 km radius (Barranafaddock Wind Farm and Woodhouse 1 & 2 Wind Farms) are already constructed, and therefore have no potential for cumulative traffic related impacts with the proposed Lyrenacarriga Wind Farm.

The one remaining development within a 20km radius with permission granted and still to be constructed is the Knocknamona Wind Farm (8 turbines). The only section of the delivery route for the Knocknamona Wind Farm common with the proposed Lyrenacarriga Wind Farm is the N25 between Waterford and Dungarvan. In the event that the proposed development is constructed at the same time as the granted Knocknamona Wind Farm it is forecast that there will be a potential temporary and slight cumulative impact. It is proposed that overlap (if anticipated) will be avoided by ensuring careful scheduling of deliveries to each site in close consultation with the Planning Authority prior to commencement of construction, via the Traffic Management Plan.

Reference was also made in the preparation of this assessment to other planning applications as set out in Chapter 2: Section 2.7.

Table 15-25 Summary of projects considered in cumulative assessment and potential for cumulative traffic effects with proposed Lyrenacarriga Wind Farm

Project	Status	Degree of overlap of highway network (low / medium / high)	Traffic volumes (low / medium / high)	Potential cumulative traffic effects
1. Barranafaddock Wind Farm, Co Waterford 12 turbines (PL ref 04/1559)	Existing	Not relevant	Not relevant	Included in background traffic levels – no effects
2. Woodhouse Wind Farm (1), Co Waterford 5 turbines (PL ref 04/1788)	Existing	Not relevant	Not relevant	Included in background traffic levels – no effects
3. Woodhouse Wind Farm (2), Co Waterford 3 turbines (PL ref 04/1788)	Existing	Not relevant	Not relevant	Included in background traffic levels – no effects
4. Knocknamona Wind Farm, 8 turbines (PL ref 14/600109	Permission granted	Low	Medium	Slight

15.1.10.6 Mitigation Measures

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

Mitigation by Design

Mitigation by design measures includes the following;

- Selection of the most appropriate delivery route to transport the wind turbine components, requiring the minimum remedial works to accommodate the vehicles as set out in Section 15.1.8.
- Construction of temporary improvements to the local highway network at locations identified in Section 15.1.8.

Mitigation Measures During the Construction Stage

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

Delivery of abnormal sized loads

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

- The delivery of turbine components is a specialist transport operation with the transportation of components carried out at night when traffic is at its lightest and the impact minimised.
- The deliveries will be made in consultation with the Local Authority and An Garda Síochána.
- It is estimated that 153 abnormal sized loads will be delivered to the site, comprising 31 convoys of 5, undertaken over 31 separate nights.
- These nights will be spread out over an approximate period of 16 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.
- These vehicles will be reduced to the size of standard HGVs when leaving the site.

Other traffic management measures

An outline Traffic Management Plan is provided in the CEMP in Appendix 4-4 of this EIAR. A confirmatory / final **Traffic Management Plan (TMP)** will be provided specifying details relating to traffic management and included in the CEMP prior to the commencement of the construction phase of the proposed development. The TMP will be agreed with the local authority and An Garda Síochána prior to construction works commencing on site. The final TMP will include the following:

- **Traffic Management Coordinator** – a competent Traffic Management Co-ordinator will be appointed for the duration of the project and this person will be the main point of contact for all matters relating to traffic management.

- **Delivery Programme** – a programme of deliveries will be submitted to the County Councils 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, including avoiding the construction period for the Knocknamona Wind Farm development.
- **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, project website updates, communications to local community groups and if required, a text service. 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 required 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, will be carried out during the delivery phase of the large turbine vehicles, when an escort for all convoys will be required. Once the surveys have been carried out and "prior to commencement" status of the relevant roads established, (in compliance with the provisions of the CEMP), the Roads section will be informed of the relevant names and contact numbers for the Project Developer/Contractor Site Manager as well as the Site Environmental Manager.
- **Implementation of temporary alterations to road network at critical junctions** – at locations highlighted in Section 15.1.8. 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 and identification of an area for parking.
- **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 4-4.
- **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

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

15.1.10.7 Residual Impacts

Construction Stage

During the 18-24 month construction stage of the Proposed Development, it is forecast that the additional traffic that will appear on the delivery route indicated in Figure 15.2a will have a slight, negative and temporary impact on existing road users, which will be minimised with the implementation of the mitigation measures included in the proposed traffic management plan.

Operational Stage

As the traffic impact of the proposed development will be imperceptible during the operational stage, there will be no residual impacts during this stage.

Decommissioning Stage

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

15.2 Telecommunications and Aviation

15.2.1 Introduction

This section of the EIAR assesses the likely significant effects of the proposed wind farm on telecommunications and aviation. Section 15.2.3 describes the way in which wind turbines can potentially interfere with telecommunications signals or aviation activities. Section 15.2.4 presents details on how such effects will be avoided, with the likely significant effects assessed (and mitigation measures proposed) in Section 15.2.5.

15.2.1.1 Statement of Authority

This section of the EIAR has been prepared by Eoin O'Sullivan and reviewed by Michael Watson, both of MKO. Eoin is an experienced geo-environmental scientist and has over ten years' experience in the design, implementation and interpretation of all phases of geo-environmental and geotechnical site investigations. Eoin has also extensive experience in the preparation of material assets assessments and reports for EIAs, particularly relating to wind energy. Eoin has also experience in completing IPC Permit Applications and in the preparation of Environmental Impact Statements/Environmental Impact Assessment Reports for renewable energy projects, quarries and a number of non-hazardous landfill sites and anaerobic digesters for both public and private clients. Eoin is also proficient in undertaking detailed quantitative risk assessments for the protection of controlled waters and human health. Eoin holds an MSc in Environmental Engineering and is a Chartered Member of the Chartered Institute of Water and Environmental Management (CWEM) and Chartered Environmentalist (CEnv) with the Society of Environment.

Michael Watson has over seventeen years' experience in the environmental sector and had worked for the Geological Survey of Ireland and then a prominent private environmental & hydrogeological

consultancy prior to joining MKO in 2014. Michael completed an MA in Environmental Management at NUI, Maynooth in 1999. Michael is a professional geologist (PGeo) and full member of IEMA (MIEMA) as well as a Chartered Environmentalist (CEnv).

15.2.2 Methodology and Guidance

This section of the EIAR has been prepared in line with the guidance set out by:

- 'Guidelines on the Information to be contained in Environmental Impact Statements' (EPA, 2002).
- 'Advice Notes for Preparing Environmental Impact Statements – Draft September 2015' (EPA, 2015).
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements' (EPA, 2003).
- 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports DRAFT' (EPA, 2017).
- Environmental Impact Assessment of Projects Guidance on Scoping, Directive 2011/92/EU as amended by 2014/52/EU, (European Commission 2017).
- Environmental Impact Assessment of Projects: Guidance on Screening, Directive 2011/92/EU as amended by 2014/52/EU, (European Commission 2017).
- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report, Directive 2011/92/EU as amended by 2014/52/EU, (European Commission 2017).

This section of the assessment focuses particularly on the scoping and consultation exercise conducted with telecommunications operators and aviation authorities. Scoping was carried out in line with the above 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 2.6 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, Section 3.6 of this EIAR.

The assessment of likely significant effects on material assets uses the standard methodology and classification of impacts as presented in Section 1.7.2 of Chapter 1 of this EIAR. The full project description, including proposed turbine locations and elevations, is provided in Chapter 4.

15.2.3 Background

15.2.3.1 Broadcast Communications

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

15.2.3.2 Domestic Receivers

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

There are two types of potential electromagnetic interference to domestic receivers (Shadowed and Scattered), 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.

15.2.3.3 Other Signal Types

Wind turbines have the potential to affect other signal types used for communication and navigational systems, for examplie 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 International Civil Aviation Organisation (ICAO), reproduced in Irish Statutory Order 423 of 1999, defines 15 kilometres as a minimum setback distance between an airport and a wind farm. The nearest such operational airport to the Proposed Development site is Cork Airport, located approximately 40 kilometres southwest of the site, and therefore outside the range at which such issues would be expected.

15.2.4 Preventing Electromagnetic Interference

15.2.4.1 National Guidelines

The '*Wind Energy Development Guidelines for Planning Authorities'* (Department of the Environment, Heritage and Local Government, 2006) 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 as summarised below; full details are provided in Section 2.6 in Chapter 2 of this EIAR.

15.2.4.2 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 in May 2018. In August 2019, MKO conducted follow up consultation exercises with the telecoms providers that anticipated potential interference and who requested more information on the design once it was finalised. The coordinates of the proposed turbines were provided to enable these operators to determine if there were in fact any potential impacts from turbine(s). Consultation was also carried out with ComReg in order to identify any other additional licensed operators in the vicinity of the Proposed Development 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 15-26.

Table 15-26 Telecommunications and Aviation Scoping Responses

Consultee	First Response May 2018	Potential for Interference Identified During Consultation	Second Response August 2019	Potential for Interference Identified During Consultation
Airspeed	No response received to date	No	No response received to date	No
Airwave	No response received to date	No	No response received to date	No
Broadcasting Authority of Ireland	Response received 25th May 2018	No	N/A	N/A
BT Communications Ireland	Response received 17th January 2018	No	Response received 16th August 2019	No
ComReg (Commission for Communications Regulation)	Response received 17th January 2018	No	Response received 21st August 2019	No
Cork Community Broadband	N/A (contact provided on second scope)	N/A	Response received 17th August 2019	No
Cork Airport	No response received to date	No	No response received to date	No
Department of Defence	Response received 28th May 2018 and 4th September 2018	No	N/A	N/A
East Cork Broadband	Response received 9th February 2018	No	No response	N/A
Eir	Response received 20th February 2018	Potential	Response received 19th August 2019	No – see below
Enet	N/A (contact provided on second scope)	N/A	Response received 19th August 2019	No
ESB Telecoms	Response received 16th February 2018 & 4th May 2018	No- See below	N/A	N/A

Consultee	First Response May 2018	Potential for Interference Identified During Consultation	Second Response August 2019	Potential for Interference Identified During Consultation
Gas Networks Ireland Ltd	N/A (contact provided on second scope)	N/A	Response received 21st August 2019	No
Imagine Group	Response received 18th January 2018	No	Response received 16th August 2019	No
Irish Aviation Authority	Response received 13th June 2018	No	N/A	N/A
Irish Telecom	No response received to date	N/A	No response received to date	N/A
Ripplecom	No response received to date	N/A	No response received to date	N/A
RTE Transmission Network (2rn)	Response received 17th January 2018	No	Response received 19th August 2019	Yes – see below.
Tetra Ireland Communications (emergency services)	Response received 24th January 2018	No	Response received 23rd August 2019	No
Towercom	Response received 18th January 2018	No	No response received to date	N/A
Three Ireland Ltd	Response received 17th January 2018	Yes – see below	Response received 21st August 2019	No – see below
Viatel	Response received 22nd January 2018	No	No response received to date	N/A
Virgin Media	Response received 17th April 2018	Yes – see below	Response received 20th August 2019	No – see below
Vodafone Ireland	Response received 17th January 2018	No	No response received to date	N/A

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

15.2.4.2.1 Broadcasters

RTÉ Transmission Network (operating as 2rn), stated that they have no microwave links in the vicinity of the proposed wind farm site. However, to mitigate against potential interference to viewers in the area receiving from RTE sites at Dungarvan, Mullaganish and Ferrypoint (Youghal), RTÉ have recommended that a protocol agreement be put in place for the wind farm development. The Protocol Document ensures that in the event of any interference occurring to RTÉ television or radio reception due to operation of a wind farm, the required measures as set out in the document, will be carried out by the developer to rectify this. The Protocol Document ensures that the appropriate mitigation is carried out in the event of any unanticipated broadcast interference arising to RTÉ television or radio reception as a result of the proposed wind farm. Pending a grant of permission for the proposed wind farm, the applicant will sign and commit to the standard Protocol Document with RTÉ (2rn).

15.2.4.2.2 Other Operators

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 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 20th February 2018, noting that they had one link in the area of the proposed development and that a buffer of 100 metres be maintained between the turbines and the Eir link. The Eir buffer has been incorporated into the constraints mapping exercise at the start of the project. MKO conducted a further scoping exercise with Eir in August 2019. In their response, Eir confirmed that the proposed turbine locations were over 300m from the Eir link and therefore there is no potential for adverse impacts to arise.

ESB Telecoms

ESB Telecoms replied to a scoping request on the 16th February 2018, noting that the proposed development would have an impact on the ESB Networks Point to multi point telemetry system. Further analysis by ESB Telecoms indicated that the proposed heights of the turbines relative to the link would allow sufficient clearance and therefore there is sufficient head room for the link to function within the proposed development.

Three Ireland Ltd

Three Ireland Ltd replied to a scoping request from MKO on the 17th January 2018, noting that they had one link in the area of the proposed development. In a further response from Three, they noted that a clearance of 100 metres was to be maintained between the turbines and the Three link. This buffer has been incorporated into the constraints mapping exercise at the start of the project.

MKO conducted a further scoping exercise with Three Ireland Ltd in August 2019. In their respone Three Ireland Ltd confirmed that there was sufficient clearance between the proposed heights of the turbines and the Three link in the area. The regional engineers also confirmed that there are no additional links planned in the area, so the development will not impact upon the transmission network.

Virgin Media

Virgin Media replied to a scoping request from MKO on the 17th April 2018, noting that they had one link within 1 km of the proposed development site and that a separation distance of 150 metres be maintained between the turbine blade tip and the signal path of the Virgin Media link. The buffer has been incorporated into the constraints mapping exercise at the start of the project.

MKO conducted a further scoping exercise with Virgin Media in August 2019. In their response, Virgin Media noted that the proposed turbine locations would not interfere with Virgin Media Microwave Links.

15.2.4.2.3 *Aviation*

As noted above, scoping responses were received from the following aviation consultees:

- Department of Defence
- Irish Aviation Authority
-
- Pertinent information has been summarised below, however the scoping responses should be refered to for further detail:

Department of Defence

A scoping response was received from the Department of Defence (DoD) on the 4th September 2018 in which they indicated that they had no observations on the proposal.

Irish Aviation Authority

In June 2018, a scoping response was received from the Irish Aviation Authority (IAA). The requirements of the IAA include the following:

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

The nearest operational airport to the Proposed Development site is Cork Airport, located approximately 40 kilometres southwest of the site, and therefore outside the range at which such issues would be expected.

In response to the lighting requirements requested by the IAA the turbines will be marked on maps, lit at night and entered into aircraft navigation databases and therefore can be avoided during flight.

15.2.5 Likely Significant Effects and Associated Mitigation Measures

15.2.5.1 'Do-Nothing' Scenario

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

15.2.5.2 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.

15.2.5.3 Operational Phase

15.2.5.3.1 *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, which confirmed that no turbines are proposed within the areas requested to be left clear of turbines.

Mitigation Measures

In the event of interference occurring to telecommunications, the Department of the Environment, Heritage and Local Government *'Wind Farm Planning Guidelines'* (2006) acknowledge that '*electromagnetic interference can be overcome'* by the use of divertor relay links out of line with the wind farm.

The applicant will sign a Protocol Document with RTÉ Transmission Network (operating as 2rn), which is a standard requirement for all wind farm developers. This document will ensure that the developer is responsible for rectifying any unanticipated broadcast interference arising to RTÉ television or radio reception as a result of the proposed wind farm.

Residual Impact

The Proposed Development will have no residual impact on the telecommunications signals of any other 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.

15.2.5.3.2 *Aviation*

Pre-Mitigation Impact

The scoping response of the IAA has requested that standard lighting requirements be used at the proposed wind farm, in line with Air Corps policy on tall structures.

Mitigation Measures

The scoping response from the IAA set out lighting requirements for turbines as detailed above. These requirements will be complied with for the proposed development. The coordinates and elevations for built turbines will be supplied to the IAA, as is standard practice for wind farm developments.

Residual Impact

The Proposed Development will have no residual impact on aviation as 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 during the operational phase.

15.2.5.4 Decommissioning 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 decomissioning phase of the Proposed Development, and therefore no mitigation required.

15.2.5.5 Cumulative Effect

Chapter 2, Section 2.7 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 current status. Although there are three permitted wind farms within 20 kilometres of the proposed development (Knocknamona Wind Farm, BarranafaddockWind Farm and Woodhouse Wind Farm), there will be no cumulative impacts relating to the Proposed Development and surrounding projects in relation to Telecommunications or Aviation.

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 Aviation Authorities to ensure that the proposals 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 mitigation measures are in place. Therefore, as each project is designed and built to avoid impacts arising, a cumulative impact cannot arise.