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CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED CROAGHAUN WIND FARM, CO. CARLOW

VOLUME 2 – MAIN EIAR

CHAPTER 13 – TRAFFIC AND TRANSPORTATION

Prepared for: Coillte

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GROW · TRANSFORM · SUSTAIN

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13. TRAFFIC AND TRANSPORTATION

13.1 Introduction

This section of the EIAR evaluates the proposed project in the context of the traffic and transportation within the study area. The assessment examines potential impacts and identifies mitigations for construction, operation and decommissioning of the project.

The proposed project will primarily consist of a wind farm of up to 7no. wind turbine generators (WTG's), 2 no. substation compounds (one of which is an off-site substation compound at Kellistown) along with ancillary civil and electrical infrastructure. The associated grid connection will consist entirely of underground cable and will connect the on-site substations to an existing 110/220kV substation at Kellistown, Co. Carlow. The assessed project also includes temporary accommodation works associated with the Turbine Delivery Route (TDR) and replanting lands as well as infrastructure for community use in the form of a walking trail and recreational enhancements. Further details on the proposed project are contained in Section 13.4 and Chapter 3.

13.1.1 Study Area

The study area for the traffic and transportation chapter includes the main wind farm site along with the surrounding road network leading to and from the main wind farm site. The site entrance is also assessed.

The roads associated with the grid connection are assessed as is the turbine delivery route which runs from the M11-N30 junction to the site entrance.

Replant lands are also assessed cumulatively with respect to traffic and transportation..

The site location and surrounding road network comprising the study area is identified in Figure 13-1.

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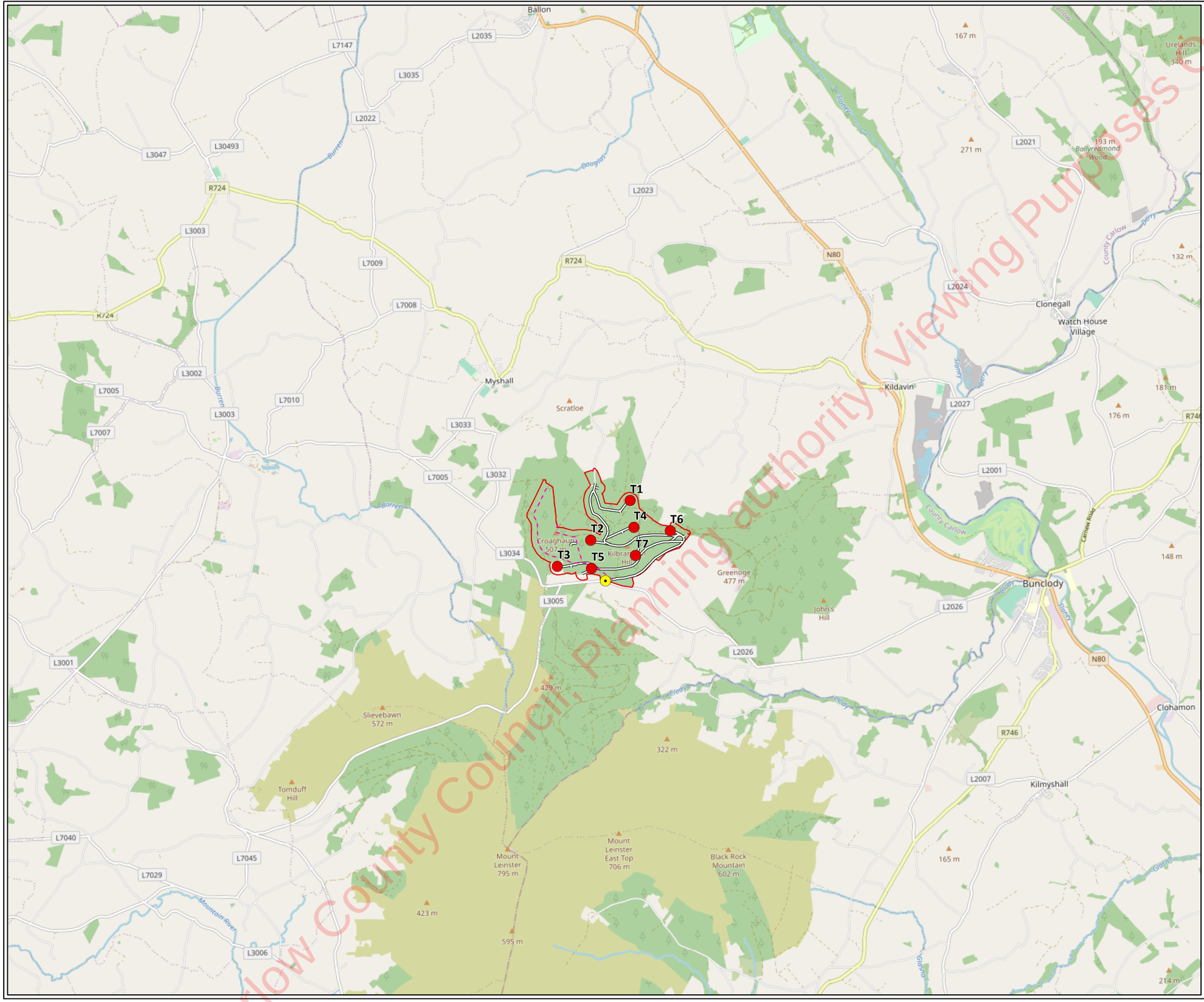

TITLE:	Proposed Main Wind Farm Site Location and Surrounding Road Network
PROJECT:	Croaghaun Wind Farm
FIGURE NO:	13.1
CLIENT:	Coillte
SCALE: 1:60000	**REVISION:** 0
DATE: 19/11/2020	**PAGE SIZE:** A3

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13.2 Assessment Methodology

The details of the proposed project are considered in relation to the construction, operation and decommissioning phases of the project.

The likely traffic that will be generated by each phase of the project is estimated to identify potential disruptions to existing road users within the study area. Based on the project construction methodologies described in Chapter 3, an estimate of the number of vehicles generated as a result of the project is calculated. These estimates are used to assess the impact on the road network in numerical terms.

The potential for soiling or damage to public road infrastructure through poor construction practices as well as potential health and safety hazards through poor traffic management are also identified where applicable.

The effects of the project on the existing road network are then considered and described in terms of quality, duration and significance. Mitigation measures are then proposed followed by identification of residual impacts.
The potential for cumulative impacts from other developments are assessed in Section 13.9.

A 12-month construction programme was assumed for construction traffic generation movement calculations as part of this assessment in order to assess for worst case.

The assessment uses a combination of field surveys, data counters, desktop studies and consultation.

The following guidance was used during the assessment of traffic and transport in this EIAR:

- TII Publication: Traffic and Transport Assessment Guidelines, NRA, 2014;
- TII Project Appraisal Guidelines for National Roads Unit 5.3 - Travel Demand Projections, 2019;;
- EPA Guidelines on The Information to Be Contained In Environmental Impact Assessment Reports (DRAFT), 2017;
- Carlow County Council – County Development Plan 2015 – 2021;
- TII Project Appraisal Guidelines for National Roads: Estimating AADT on National Roads, October 2016;
- Guidance on the preparation of the Environmental Impact Assessment Report, European Commission, 2017;
- TII Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade separated, and compact grade separated junctions) DN-GEO-03060 April 2017.

Traffic count data was obtained from open-source TII traffic counter information, consultation with Carlow County Council Roads Department and private traffic count data carried out for historical impact assessments.

Other key sources of information used to assess traffic impacts include the following;

- Ordinance survey and aerial mapping;
- Project construction methodologies;
- Site Layout Plans;
- Route Survey Report for the Turbine Delivery Route carried out by Pell Frischmann, May 2020;
-

- Survey Report for Bridges/Culverts on local road L-2026-0 from Bunclody to the proposed site access in response to a request for further information by Carlow County Council for Planning Reference PL 15/87, by Jennings O'Donovan, July 2015.

The above sources of information have been used to identify the study area and transport routes to be assessed.

13.2.1 Consultation

Transport Infrastructure Ireland (TII) were consulted through the EIAR scoping process. A copy of the correspondence from TII is included in Appendix 13-3.

Carlow County Council Roads Department were also consulted during the EIAR scoping phase and through subsequent email correspondence. A consultation meeting was held between FT and a Senior Executive Engineer from Carlow County Council Roads Department at the Civic Offices, in Tullow, County Carlow on the third of September 2020.

Details of the above and further consultations are contained in Chapter 5 of this EIAR.

13.3 Existing Environment

13.3.1 Existing Road Network

Roads in the Republic of Ireland are classified as motorways, national (primary and secondary), regional and local roads. Transport Infrastructure Ireland (TII) has overall responsibility for the planning and supervision of the construction and maintenance of motorways, national primary and secondary roads. The local authorities have responsibility for all non-national roads. The hierarchy of roads throughout Ireland is outlined in Table 13.1:

Table 13-1: Road Categories

Road Category	Description
Motorways	These are high quality multiple lane roads with limited grade separated junctions. They are high speed (120kmph) road predominantly provided to facilitate strategic traffic with reduced journey times.
National Primary Roads	These are predominantly single carriageway, with some that are dual carriageway. Generally high speed (100kmph) roads that facilitate strategic traffic, with reduced journey times.
National Secondary Roads	These are medium distance through-routes connecting towns, serving medium to large geographical areas and link to primary routes to form a homogeneous arterial network.
Regional Roads	Predominantly single carriageway roads of regional and local importance. These roads generally receive more frequent maintenance criteria than Local Roads and therefore tend to be structurally sound.
Local Roads (Primary, Secondary and Tertiary)	The local road system is operated in three tiers defining local importance, usage and maintenance priorities. They form a network of single carriageway roads of varying quality.

Motorways

The nearest motorway to the site is the M9 which connects Waterford City to the M7 between Naas and Newbridge. The road is the arterial route for traffic connecting Waterford to Dublin. The M9 is located approximately 18km to the west of the windfarm site. The AADT for the M9 in 2019 according to TII automatic traffic counter data was approximately 21,000 with approximately 7% of this total comprised of HGV traffic.

The M11 is the next closest motorway to the proposed site. The M11 connects Wexford to Dublin and is approximately 22km to the east of the site boundary. As part of the turbine delivery route it is proposed to utilize the M11 motorway to connect the M50 with the N30. The AADT for the M11 in 2019 according to TII automatic traffic counter data was approximately 32,000 with approximately 5.9% of this total comprised of HGV traffic.

There are no other motorways located within 50km of the site.

National Primary Routes

To the south-east, the closest national primary route is the N30 which connects the N25 at New Ross to the M11 near Enniscorthy. The N30 will connect the M11 to the N80 along the proposed turbine delivery route.

National Secondary Routes

The closest national secondary route to the west of the site is the N80 . The N80 connecting Tullamore to the N30 north of Enniscorthy is located approximately 4km from the site boundary. The AADT for the N80 in 2019 according to TII automatic traffic counter data was 6976 with 7.9% of this total comprised of HGV traffic.

It is proposed that the N80 will for the most significant part of the turbine delivery route connect the M11 with the local roads network surrounding the site.

Regional Roads

The closest regional road is the R724 which is located approximately 4km to the north of the proposed site. The R724 connects the R448 at Royal Oak to the N80 at Kildavin.

Local Roads

There are several local roads in the vicinity of the proposed project. The proposed delivery route proposes the use of one of the local roads to the south of the site, the local road which connects the proposed site entrance to the N80 at Bunclody (L-2026) known locally as Barkers road.

Local roads associated with the grid connection are located between Kellistown substation and the proposed on-site substation compound to the north of the site boundary. The grid connection utilizes unnamed roads for approximately 4km before turning left onto (L-3033) for approximately 1.3km. It then turns right and travels along a second unnamed road for approximately 2.4km. The route continues right along the (L-7008) for 180m and turns left onto R724 for approximately 1.6km.
It then travels right along the (L-2022) for approximately 2.2km. The grid route proceeds towards the N80 via the (L-7110) for 4km, it crosses the N80 onto the (L7111) for a further 2km. The grid route turns left onto the (L-7112) for approximately 1.5km before turning right onto the (L-3046) where it enters Kellistown 220kV substation after a further 1.5km.

The site location and existing road network is shown on Figure 13-1.

Existing commercial operations of note within the study area:

- Ballon Meats, Ballon Hill, Co. Carlow. Meat Processing Plant. Located on L3035 just off the L2022 which forms part of the proposed grid connection.
- FLI Carlow (Carlow Precast), Ardbearn, Kilnock, Co. Carlow. Concrete Factory. Located on N80 with access from the L7111 which forms part of the proposed grid connection.
- Ryland Business Park, Bunclody, Clohamon, Co. Wexford contains several businesses including Millstream Recycling Limited, Slaney Foods International. It is located just off the N80 to the south of Bunclody which forms part of the turbine delivery route.

13.3.2 Existing Environment Traffic Volumes

Existing traffic volumes on roads in the study area are shown in Table 13-2 below:

Table 13-2: Baseline Traffic Volumes

Road	Projected Baseline AADT		
	HGV	LGV	AADT
M11 - TMU M11 085.0 S: M11 Between Jn23 Courtown and Clogh Roundabout, Gorey South, Co. Wexford[1]	1,133	9,463	10,596
M11 - TMU M11 070.0 N: M11 Between Jn21 Arklow South and Jn22 Tinnock, Arklow South, Co. Wicklow[1]	1,064	20,022	21,086
N80 - TMU N80 090.0 S: N80 Between Ballon and Kildavin , Ballyhealy, Co, Wexford[1]	702	7,157	7,859
N30 - TMU N30 003.0 E: N30 Between Scarawalsh Roundabout (N30/N80) and M11 Jn25 Enniscorthy, Co. Wexford[1]	513	4,850	5,364
L3046[2]	33	992	1,025
L7111[2]	29	270	299
R724[3]	909	8,532	9,441

AADT figures were projected to a proposed construction commencement year of 2023 from 2018 and 2019 source data in accordance with NRA Project Appraisal Guidelines for National Roads: Unit 5.5 Link-Based Traffic Growth Forecasting, 2011.

[1] Source: TII

[2] Source: Carlow County Council Roads Department

[3] Source: EIAR for Proposed Industrial Units on behalf of Firtree Developments Ltd. (Planning Ref. 19313)

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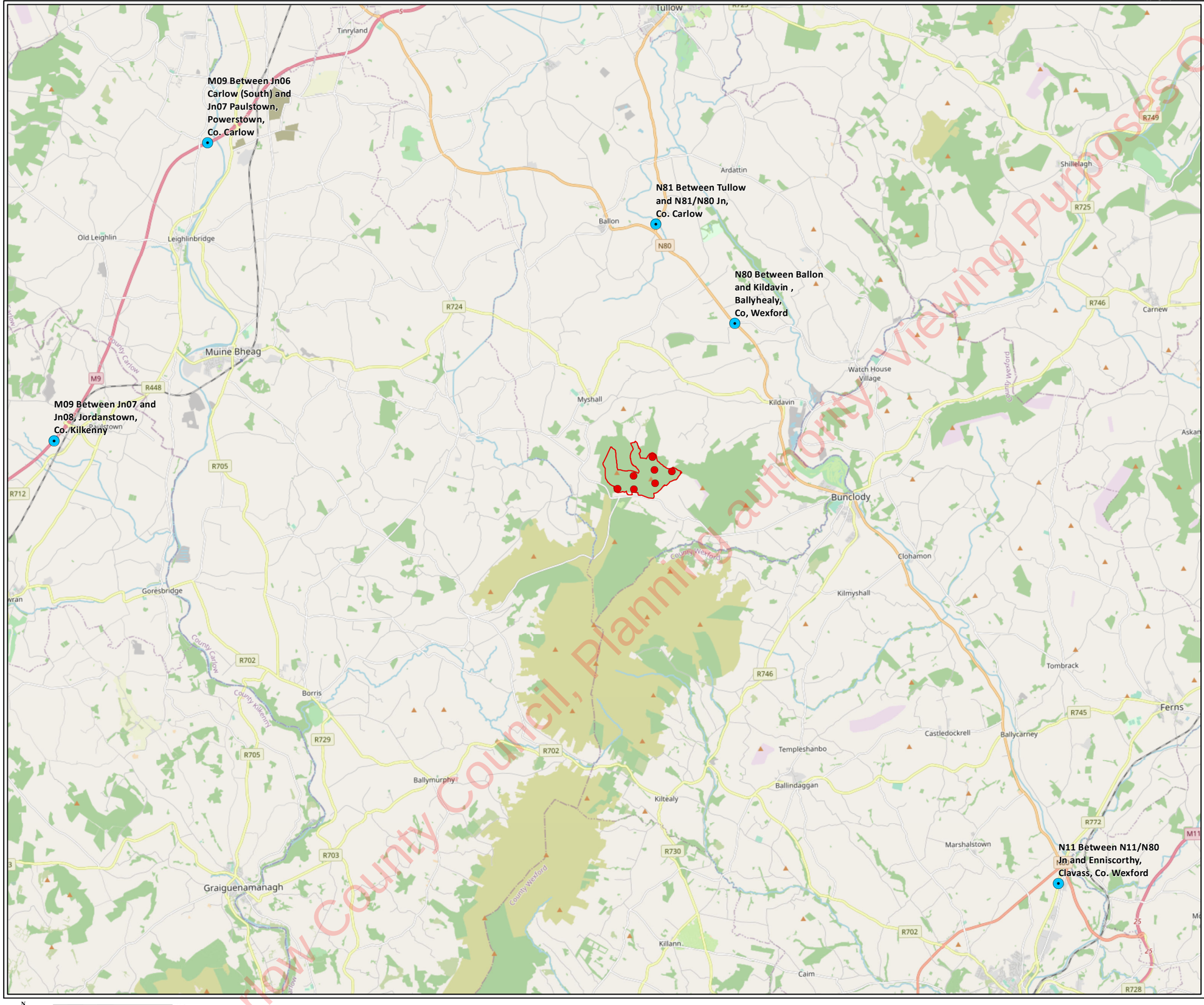

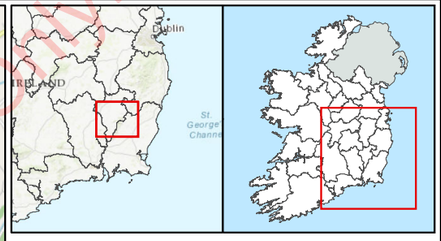

- Proposed Turbine Layout
- Proposed Development Boundary
- TII Traffic Counter Locations

TITLE:	Traffic Counter Locations		
PROJECT:	Croaghaun Wind Farm		
FIGURE NO:	13.2		
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13.4 Proposed Project

The proposed project will consist of a wind farm of up to 7 no. wind turbine generators (WTG's), 1 no. onsite substation compound and an offsite substation compound at Kellistown, along with ancillary civil and electrical infrastructure.

A detailed description of the project assessed in this EIAR is provided in Chapter 3 and is comprised of three main elements:

- The wind farm (hereinafter referred to as the **'main wind farm site'**);
- Turbine delivery route (hereinafter referred to as the **'turbine delivery route'** or **'TDR'**);
- Grid connection (hereinafter referred to as the **'grid connection'**.

The main wind farm site includes the wind turbines, internal access tracks, hard standings, the permanent meteorological mast, recreational amenity trail and associated signage, onsite substation, internal electrical and communications cabling, temporary construction compound, drainage infrastructure and all associated works related to the construction of the wind farm. The grid connection includes the buried grid connection cable route from the on-site substation to the existing grid substation at Kellistown, Co. Carlow and the proposed off-site substation, also at Kellistown. The turbine delivery route includes all aspects of the route from the M11/N30 junction to the site entrance including proposed temporary accommodation works to facilitate the delivery of wind turbine components. Replanting lands at Sroove Co. Sligo and Crag Co. Limerick have also been assessed for cumulative impacts. Reports detailing environmental assessments carried out on these sites are contained in Appendix 3.3 and 4.4 of this EIAR.

The associated grid connection will consist entirely of underground cable and will connect the on-site substation to the existing 110/220kV substation at Kellistown. The GCR will be ca.22km in length, with ca. 20km to be constructed within the existing public road corridor.

13.4.1 Construction Programme

The construction of the project in its entirety is expected to take between 12 – 18 months.

There are a number of items which will be conducted in parallel, but the basis of the construction programme will involve site establishment, site access road and drainage construction, hardstanding construction and substation works. The grid connection works are likely to be done in parallel with the site works and the turbine installation works will be completed before commissioning, reinstatement and landscaping. However it is also possible that the grid route could commence prior to the on-site infrastructure or subsequent to the construction of the on-site infrastructure. Carrying out the grid connection works in parallel with the site works represents the worst-case scenario.

An indicative construction programme upon which vehicle trip distribution calculations are based is shown in Figure 13-3.

Activity	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Mobilisation and site setup												
Site clearance and felling												
Internal access tracks												
Turbine hard standings												
Turbine foundations												
Turbine Installation												
Onsite substation												
Offsite substation												
Grid connection cable works												
Private electrical network												
Landscaping, reinstatement, demob												

Figure 13-3: Proposed Construction Programme

13.4.2 Main Wind Farm Site

As described above, the main wind farm site includes the wind turbines, internal access tracks, hard standings, the permanent meteorological mast, recreational amenity trail and associated signage, onsite substation, internal electrical and communications cabling, temporary construction compound, drainage infrastructure and all associated works related to the construction of the wind farm.

13.4.2.1 Site Access

Croaghaun Wind Farm shall have one site entrance which will be used for both construction and operation. Access to the site shall be via an existing Coillte forestry entrance on the L2026. The location of the site entrance is shown on Figure 13-1.

This site entrance shall be upgraded in accordance with TII design guidelines DN-GEO-03060 and is capable of achieving sightlines of 160m in both directions at a setback distance of X=3m. Refer to drawing number P1913 – 0103-0001.

Plate 13-1: Existing Forestry Access and Proposed Site Entrance

Plate 13-2: Existing Visibility to Left from Existing Site Entrance at X=3m

Plate 13-3: Existing Visibility to Right from Proposed Site Entrance at X=3m

13.4.2.2 Felling

Felling of approximately 25.7 ha of coniferous forestry is required within and around the wind farm infrastructure to accommodate the construction of turbines, hardstands, crane pads, temporary compounds, borrow pits, access tracks and the proposed onsite substation.

13.4.2.3 Permanent Met Mast

1 no. permanent meteorological (Met) mast shall be erected on site.

The permanent met mast shall consist of an up to 100m high lattice steel mast with a shallow concrete foundation, fixed to ground anchors by 3no. guy-wires.

13.4.2.4 Recreational Amenity Trail

The project includes the upgrade existing forest tracks and paths that shall be re-purposed as recreational amenity trails for community use and shall include trail signage and way-markers.

The location and alignment of the proposed amenity trail is shown in Figure 3-1.

The development of the recreational trail will generate construction traffic related to the importation of aggregates and other materials for its construction.

13.4.2.5 Construction Haul Routes

In constructing the wind farm, materials and plant will need to be delivered to the site. The material haul routes will include some of the surrounding road network which will need to cater for the additional traffic associated with the project.

Traffic associated with the construction phase include:

- HGVs carrying aggregates, pipes and other materials associated with construction of the internal access tracks, hard standings and drainage infrastructure;
- HGVs (Concrete wagons) carrying concrete for turbine foundations and substation foundations;
- HGVs carrying building materials for the substations as well as electrical equipment and cabling;
- HGVs carrying plant and fuel;
- HGVs exporting site waste;
- Cranes and associated elements for the main crane for erecting the turbines;
- Private cars and vans for the commuting workforce.

The surrounding quarries currently in operation and indicative haul routes to the site have been identified. The nearest suppliers of quarry stone (TII Class 6 products):

- Clonmelsh, Co. Carlow. Located 24km from Croaghaun. (Dan Morrissey & Co.)
- Millford, Co Carlow. Located 25km from Croaghaun. (Kilcarrig Quarries).

Indicative haul routes are shown in Figure 13-5.

13.4.3 Grid Connection

13.4.3.1 Grid Connection Cable Works

As described in Chapter 3, Electricity generated from wind turbines shall be collected at medium voltage (20/33 kV) by an internal circuit of buried cables which primarily will follow on-site access tracks. This circuit shall be terminated at a proposed onsite substation and exported to the grid via a 38 kV buried cable to the existing Kellistown substation.

Underground grid route connection works to Kellistown substation will involve the installation of ducting, joint bays, drainage and ancillary infrastructure and the subsequent running of cables predominantly along the existing road network. This will require delivery of plant and construction materials, followed by excavation, laying of cables and subsequent reinstatement of trenches.

It is expected that full road closures will be put in place to facilitate cabling works in combination with lane closures, partial road closures and stop/go systems. This will enable the works to be completed as quickly and as safely as possible, with minimal disruption time for residents of the area. These works shall be undertaken on a rolling basis with short sections closed for short periods before moving onto the next section.

As mentioned above, the grid connection for the project involves the construction of an offsite substation compound at Kellistown, along with ancillary civil and electrical infrastructure. A detailed description of this substation is contained in Chapter 3 of this EIAR. The proposed design for the offsite substation is a worst-case scenario in terms of footprint and scale of infrastructure. The final design will be carried out by the network operator subject to upgrade requirements and grid connection agreement and shall not exceed the design envelope assessed in this EIAR.

Watercourse Crossings Along the GCR

The following table summarises the proposed water crossing methods along the grid connection:

Table 13-3: Grid Connection Crossings

Feature ID	ITM_X	ITM_Y	Grid cable method crossing
GCR-WCC1	679096.96	670298.85	Standard trench crossing under existing culvert
GCR-WCC2	679110.52	670057.43	HDD in public road corridor
GCR-WCC3	679529.02	670126.05	HDD in public road corridor
GCR-WCC4	680262.95	665039.41	HDD in public road corridor
GCR-WCC5	680437.80	662507.73	HDD in public road corridor
GCR-WCC6	681594.32	659057.55	Ducts laid in flat profile within concrete bridge beam in road deck
GCR-WCC7	684252.84	659716.09	HDD in private field
GCR-WCC8	679645.23	670366.41	HDD in private field
GCR-WCC9	681641.77	660121.93	HDD in private field

For crossings where HDD has been identified as the preferred crossing method, open cut trenching methods shall be permitted in dry conditions where there is no-flow in the watercourse and there is no risk of in-stream works. In such instances, cable ducts will be laid under the stream bed which will then be fully reinstated to its pre-existing condition.

A description of construction methodologies for watercourse crossings is presented in in the CEMP and Chapter 3.

A careful approach will be taken to planning the works to ensure minimal impacts on road users and the general public. The cable trenching will be carried out with the aid of either a lane closure or road closure, which will ensure that the trenching works are completed as expeditiously as possible.

Due to the length of cabling within the road corridor (ca. 20km), these works are expected to be conducted over a 10-month period (ca. 40weeks). The road closures will be applied for by the appointed contractor and will outline local diversions whilst maintaining local access at all times for residents, farms and businesses.

Road closures will be subject to the applicable statutory processes as implemented by the roads authority. Road closures will be facilitated by the existing network of roads in the area. 'Rolling road closures' will be implemented, whereby the site will progress each day along a road, which will have the effect of reducing the impact for local residents.

Horizontal directional drilling operations will be required at a number of locations along the grid connection route between Croaghaun and Kellistown. These activities are isolated and carried out in under a day at each location, and with the exception of 1no. location, shall be carried out offline in private lands adjacent to the public road. 2no. crossings along the proposed grid connection route (GCR-WCC 4 & 5) will involve HDD within the public corridor. Temporary road closures will be required for HDD works within the public road corridor. Alternative route variants also assessed in the EIAR are shown in Figure 13-4 and include HDD crossings within the public road corridor at 3no. additional locations.

The locations of HDD operations are indicated in Figure 13-4.

Crossing of the N80 National Road

Where the grid connection crosses the N80 national route, horizontal directional drilling (HDD) will be used.

The launch pit for the HDD shall be in a field to the south of the N80. The alignment of the proposed HDD shall lead the bore to emerge in the verge of the local road on the north side of the national road.

There is sufficient room available to accommodate the necessary equipment. The locations of the launch and reception pits will be adequately spaced from the carriageway to ensure the bore is at such depth as not to conflict with the drainage, foundations or surface of the road.

The locations of start and finish points for the HDD have been identified following desktop assessments, site visits and consultation with TII. Site investigation was carried out near the proposed crossing location to confirm the suitability of the proposed crossing method at this location. Site investigation works are described in detail in Chapter 9 of the EIAR.

A detailed methodology for HDD operations is contained in the CEMP in Appendix 3-1.

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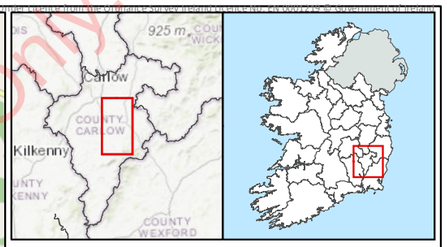
Feature ID	Easting	Northing	Watercourse Crossing Methods
GCR - WCC1	679097	670299	Standard trench crossing under existing culvert
GCR - WCC2	679111	670057	HDD in public road corridor
GCR - WCC3	679529	670126	HDD in public road corridor
GCR - WCC4	680263	665039	HDD in public road corridor
GCR - WCC5	680438	662508	HDD in public road corridor
GCR - WCC6	681594	659058	Ducts laid in flat profile within concrete bridge beam in road deck
GCR - WCC7	684253	659716	HDD in private field
GCR - WCC8	679645	670366	HDD in private field
GCR - WCC9	681642	660122	HDD in private field

Area 6
Area 5
Area 4
Area 3
Area 2
Area 1
T1
T2
T3
T4
T5
T6
T7



- Proposed Turbine Layout
- HDD Location (N80)
- Watercourse Crossings
- Proposed Development Boundary
- Kellistown Substation
- Proposed Grid Connection Route
- Grid Connection Route Variant 1
- Grid Connection Route Variant 2

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TITLE:	Grid Connection Route General Arrangement Overview		
PROJECT:	Croaghaun Wind Farm		
FIGURE NO:	13.4.1		
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Feature ID	Easting	Northing	Watercourse Crossing Methods
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GCR - WCC3	679529	670126	HDD in public road corridor
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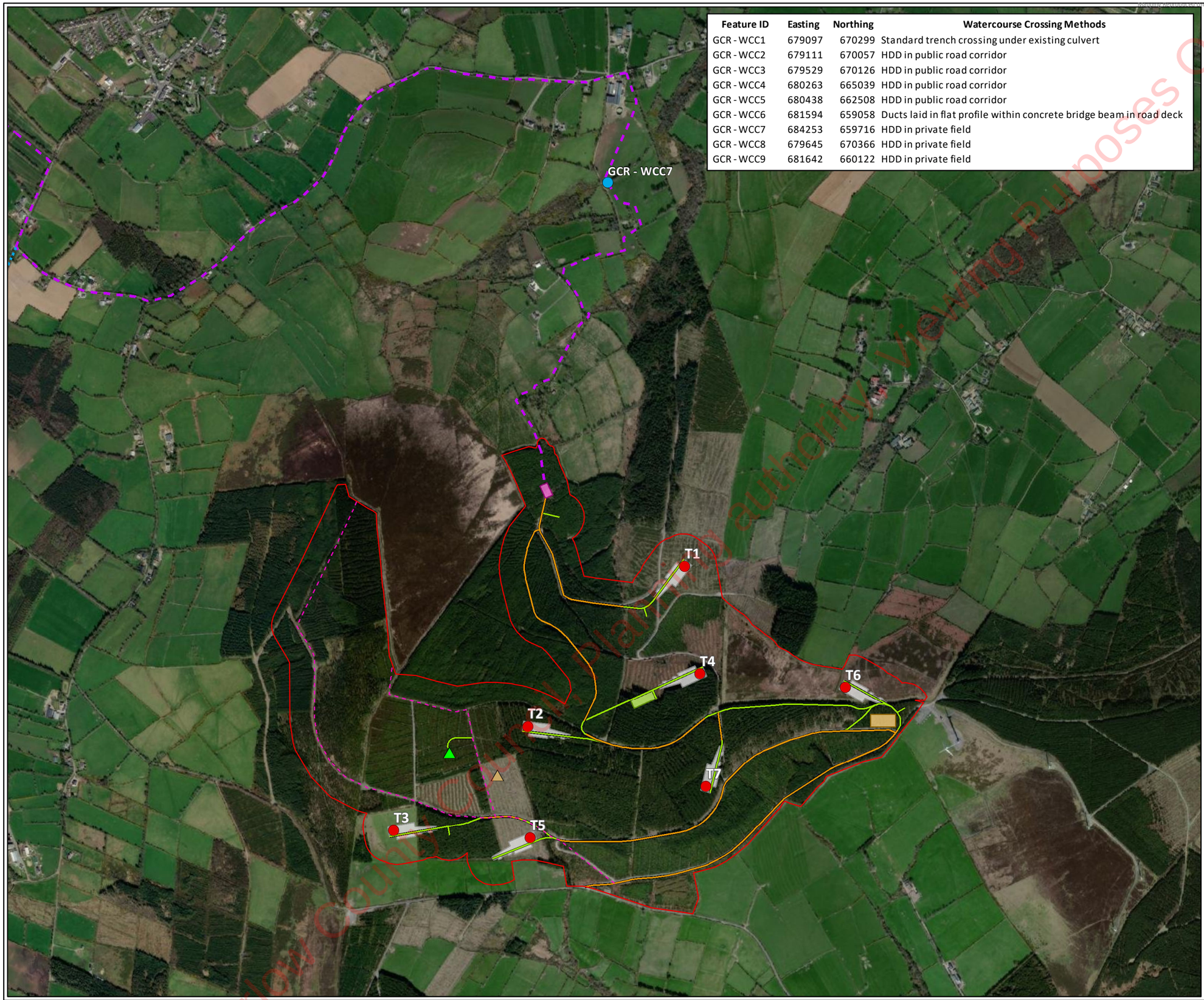
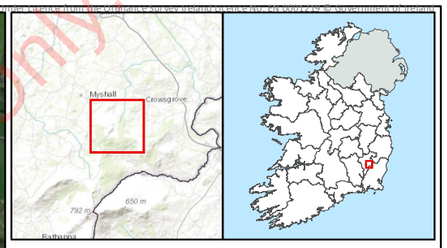
GCR - WCC9	681642	660122	HDD in private field





- Proposed Turbine Layout
- Watercourse Crossings
- Proposed Development Boundary
- Existing 80m Met Mast
- Proposed Permanent 100m Met Mast
- Proposed Grid Connection Route
- Grid Connection Route Variant 1
- Proposed Croaghaun Loop
- Proposed Existing Road Upgrade
- Proposed New Road
- Proposed Turbine Hardstanding
- Proposed Borrow Pit
- Proposed Temporary Compound
- Proposed Substation Compound

TITLE:	Grid Connection Route General Arrangement Area 1		
PROJECT:	Croaghaun Wind Farm		
FIGURE NO:	13.4.2		
CLIENT:	Coillte		
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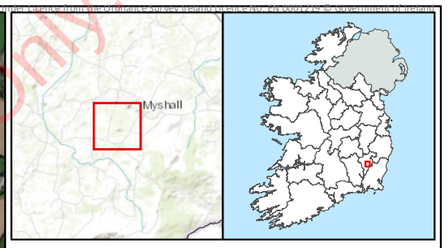
Feature ID	Easting	Northing	Watercourse Crossing Methods
GCR - WCC1	679097	670299	Standard trench crossing under existing culvert
GCR - WCC2	679111	670057	HDD in public road corridor
GCR - WCC3	679529	670126	HDD in public road corridor
GCR - WCC4	680263	665039	HDD in public road corridor
GCR - WCC5	680438	662508	HDD in public road corridor
GCR - WCC6	681594	659058	Ducts laid in flat profile within concrete bridge beam in road deck
GCR - WCC7	684253	659716	HDD in private field
GCR - WCC8	679645	670366	HDD in private field
GCR - WCC9	681642	660122	HDD in private field

GCR - WCC9

GCR - WCC6



Watercourse Crossings

Proposed Grid Connection Route

Grid Connection Route Variant 1

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TITLE:	Grid Connection Route General Arrangement Area 2		
PROJECT:	Croaghaun Wind Farm		
FIGURE NO:	13.4.3		
CLIENT:	Coillte		
SCALE:	1:10000	**REVISION:**	0
DATE:	19/11/2020	**PAGE SIZE:**	A3

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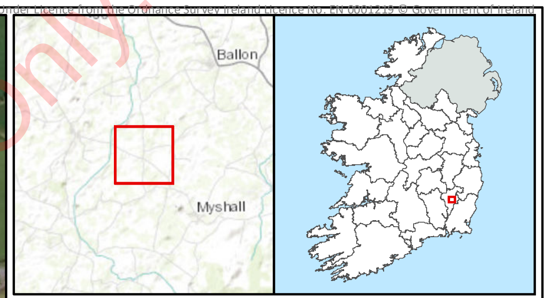
Feature ID	Easting	Northing	Watercourse Crossing Methods
GCR - WCC1	679097	670299	Standard trench crossing under existing culvert
GCR - WCC2	679111	670057	HDD in public road corridor
GCR - WCC3	679529	670126	HDD in public road corridor
GCR - WCC4	680263	665039	HDD in public road corridor
GCR - WCC5	680438	662508	HDD in public road corridor
GCR - WCC6	681594	659058	Ducts laid in flat profile within concrete bridge beam in road deck
GCR - WCC7	684253	659716	HDD in private field
GCR - WCC8	679645	670366	HDD in private field
GCR - WCC9	681642	660122	HDD in private field



Watercourse Crossings

Proposed Grid Connection Route

TITLE: Grid Connection Route General Arrangement Area 3

PROJECT: Croaghaun Wind Farm

FIGURE NO:	13.4.4		
CLIENT:	Coillte		
SCALE:	1:10000	**REVISION:**	0
DATE:	19/11/2020	**PAGE SIZE:**	A3

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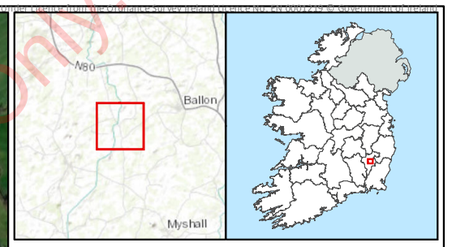
Feature ID	Easting	Northing	Watercourse Crossing Methods
GCR - WCC1	679097	670299	Standard trench crossing under existing culvert
GCR - WCC2	679111	670057	HDD in public road corridor
GCR - WCC3	679529	670126	HDD in public road corridor
GCR - WCC4	680263	665039	HDD in public road corridor
GCR - WCC5	680438	662508	HDD in public road corridor
GCR - WCC6	681594	659058	Ducts laid in flat profile within concrete bridge beam in road deck
GCR - WCC7	684253	659716	HDD in private field
GCR - WCC8	679645	670366	HDD in private field
GCR - WCC9	681642	660122	HDD in private field

GCR - WCC4



Watercourse Crossings

Proposed Grid Connection Route

TITLE:	Grid Connection Route General Arrangement Area 4
PROJECT:	Croaghaun Wind Farm
FIGURE NO:	13.4.5
CLIENT:	Coillte
SCALE: 1:10000	**REVISION:** 0
DATE: 19/11/2020	**PAGE SIZE:** A3

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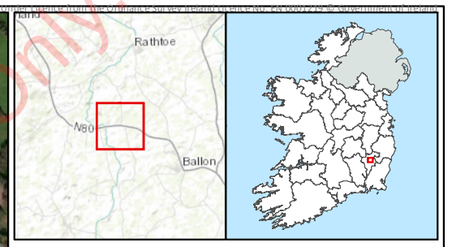
Feature ID	Easting	Northing	Watercourse Crossing Methods
GCR - WCC1	679097	670299	Standard trench crossing under existing culvert
GCR - WCC2	679111	670057	HDD in public road corridor
GCR - WCC3	679529	670126	HDD in public road corridor
GCR - WCC4	680263	665039	HDD in public road corridor
GCR - WCC5	680438	662508	HDD in public road corridor
GCR - WCC6	681594	659058	Ducts laid in flat profile within concrete bridge beam in road deck
GCR - WCC7	684253	659716	HDD in private field
GCR - WCC8	679645	670366	HDD in private field
GCR - WCC9	681642	660122	HDD in private field



HDD Location (N80)

Proposed Grid Connection Route

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TITLE:	Grid Connection Route General Arrangement Area 5		
PROJECT:	Croaghaun Wind Farm		
FIGURE NO:	13.4.6		
CLIENT:	Coillte		
SCALE:	1:10000	**REVISION:**	0
DATE:	19/11/2020	**PAGE SIZE:**	A3

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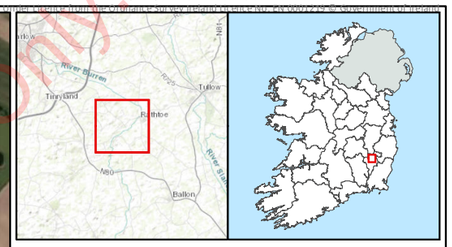
Feature ID	Easting	Northing	Watercourse Crossing Methods
GCR - WCC1	679097	670299	Standard trench crossing under existing culvert
GCR - WCC2	679111	670057	HDD in public road corridor
GCR - WCC3	679529	670126	HDD in public road corridor
GCR - WCC4	680263	665039	HDD in public road corridor
GCR - WCC5	680438	662508	HDD in public road corridor
GCR - WCC6	681594	659058	Ducts laid in flat profile within concrete bridge beam in road deck
GCR - WCC7	684253	659716	HDD in private field
GCR - WCC8	679645	670366	HDD in private field
GCR - WCC9	681642	660122	HDD in private field

GCR - WCC1
GCR - WCC2
GCR - WCC3
GCR - WCC8



- Watercourse Crossings
- Kellistown Substation
- Off-site Substation Compounds
- Proposed Grid Connection Route
- Grid Connection Route Variant 2

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TITLE:	Grid Connection Route General Arrangement Area 6		
PROJECT:	Croaghaun Wind Farm		
FIGURE NO:	13.4.7		
CLIENT:	Coillte		
SCALE:	1:15000	**REVISION:**	0
DATE:	19/11/2020	**PAGE SIZE:**	A3

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Trench Details

Details for trench reinstatement are contained in the CEMP in Appendix 3-1.

The pavement will be reinstated to a condition equal or better than the existing pavement, pre-construction.

All materials used in the reinstatement of trenches will comply with the requirements of the Department of Transport Tourism and Sport guidelines for the Opening, Backfilling and Reinstatement of Trenches in Public Roads and the TII Specifications for Road Works.

Following consultation with Carlow County Council, it is understood that an extensive programme of road recycling and resurfacing has commenced and will take place over the coming years for a number of local roads which form part of the proposed grid connection. For these roads, a full surface overlay shall be incorporated as part of the trench reinstatement works to a specification agreed with Carlow County Council.

Trench construction methodologies are described in Chapter 3 and CEMP.

13.4.3.2 Offsite Substation at Kellistown

As described in Chapter 3, works will also be required in proximity to the Kellistown substation to accommodate the proposed project's grid connection. The proposed substation compound will be self-contained and positioned in a neighboring field to that of the existing Kellistown substation as shown in Figure 3-4 and accompanying planning drawings. Two locations have been assessed for this off-site substation as part of this EIAR. The proposed design for the offsite substation is a worst-case scenario in terms of footprint and scale of infrastructure. The detailed design shall be carried out in accordance with network operator functional specifications subject to upgrade requirements and grid connection agreement.

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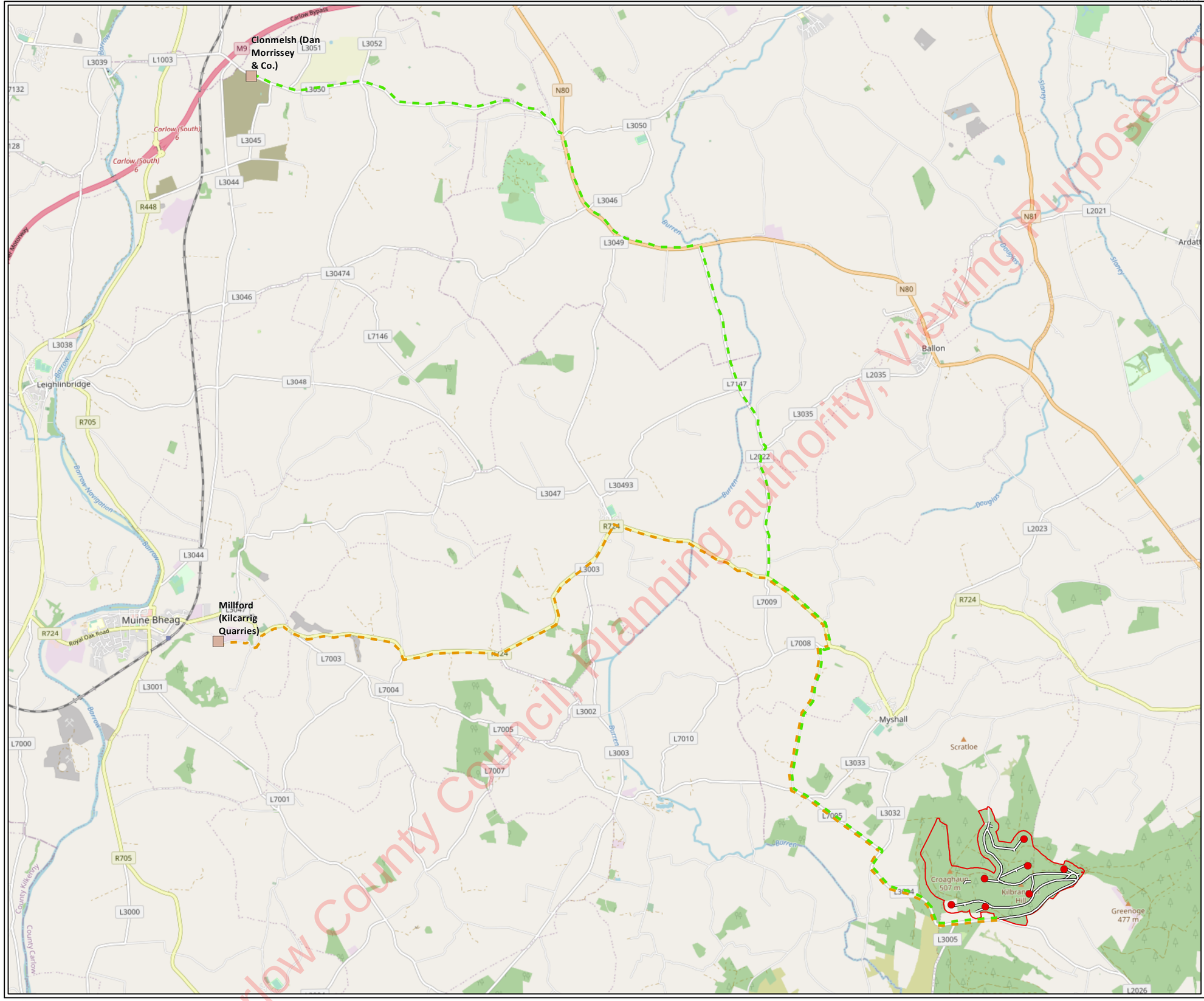

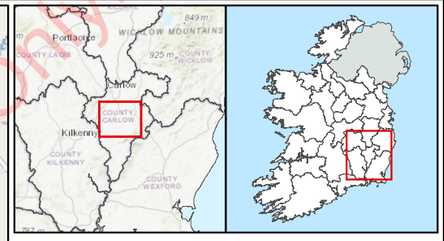

- Proposed Turbine Layout
- Proposed Development Boundary
- Quarries
- Clonmelsh (Dan Morissey & Co.) Haulage Route
- Millford (Kilcarrig Quarries) Haulage Route
- Proposed Internal Access Tracks

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TITLE:	Haul Routes		
PROJECT:	Croaghaun Wind Farm		
FIGURE NO:	13.4		
CLIENT:	Coillte		
SCALE:	1:60000	**REVISION:**	0
DATE:	19/11/2020	**PAGE SIZE:**	A3

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13.4.4 Turbine Delivery Route

The proposed turbine delivery route is presented in Figure 13-7. A Delivery Route Selection and Assessment was carried out to identify the optimum delivery route to site and is presented as Appendix 13-2 of this EIAR.

Large components associated with the wind farm construction will be transported to site via the identified turbine delivery route (TDR). The proposed access route to site is as follows:

- Loads will depart Dublin Port and travel through the Dublin Port Tunnel to the M50;
- Loads will travel south on the M50;
- Loads will continue south on the N11 and M11;
- Loads will depart the M11 and continue west on the N30;
- Loads will continue north west on the N30 and onto the N80 to Bunclody;
- Loads will travel through Bunclody on the N80 before departing left onto the L2026 travelling west;
- Loads will continue west on the L2026 to the proposed site entrance.

In some cases, accommodation works are required along the turbine delivery route such as hedge or tree cutting, relocation of powerlines/poles, lampposts, signage and local road widening. Any accommodation works within the public road corridor will be carried out in advance of the turbine deliveries in agreement with the local authority and subject to a road opening license.

The location of accommodation works are shown in Figure 3-3 and identified as “Points of Interest (POI’s)”.

Key elements of the temporary accommodation works for the delivery of turbines are summarised below;

- POI18: N30 / N11 Roundabout - Load bearing surface through the centre of the roundabout island. Temporary removal of street furniture;
- POI29: N80 / L2026 Junction – Removal of street furniture, removal of low wall and trees. Preparation of local load bearing surfaces for vehicle over-run. Removal of overhead utilities and obstructions;
- POI30: L2026 West of Bunclody – Preparation of local load bearing surface and localised vegetation trimming. Removal of stone wall. Removal of street furniture;
- POI43: L2026 Kilbranish – Removal of road signs and telegraph pole. Road widening with localised load bearing surface to verges. Removal of trees and vegetation, construction of a temporary bridge crossing;
- POI52: Proposed Turning Point – Extension of existing car park hard standing to facilitate vehicle turning. Load bearing surface to existing field. Removal of trees and vegetation.

Turbine blades will be carried on a hybrid trailer to reduce the need for mitigation in constrained sections of the route. Towers will be carried in a 4+7 clamp adaptor style trailer, whereas loads such as the hub, nacelle housing and drive train will be carried on a six axle step frame trailer.

As described in Chapter 3, for oversized loads associated with turbine component deliveries, it is proposed to construct a temporary bridge directly south of the existing bridge crossing at POI43. The temporary bridge will comprise of a modular steel structure that shall be assembled and erected on site by a crane.

A temporary stone access track and hard standing will be constructed to facilitate the installation of the crossing as well as laying of aggregate load bearing surface to public road verges. The works will include the removal of hedgerows and trees within the footprint of the works, construction of concrete bridge supports which will be built from both the field and public road and lifting of the assembled bridge structure into place. The bridge components will be delivered to site on standard HGV's.

The bridge will only be used for oversized turbine component deliveries. Following completion of turbine component deliveries, the bridge shall be disassembled and removed. The temporary aggregate track hard standing areas shall be removed and fully reinstated. Concrete bridge supports shall be left in situ, covered with soil in line with ground level and grass will be reinstated

A construction methodology is detailed in the CEMP in Appendix 3.1

The general arrangement of the proposed temporary bridge is presented in Plate 13-4.

Plate 13-4: Temporary Bridge Location and General Arrangement

13.4.4.1 Existing Structures Along TDR

There are a number of existing watercourse crossing structures along the turbine delivery route that will be crossed by the proposed oversized loads associated with the delivery of turbine components.

No modification or structural reinforcement of existing structures is predicted to be required to facilitate the delivery of the proposed loads along the TDR.

Appendix 13.2 contains a report detailing a structural survey of Bridges/Culverts carried out on local road L-2026-0 from Bunclody to the proposed site access in response to a request for further information by Carlow County Council for Planning Reference PL 15/87, by Jennings O'Donovan, July 2015.

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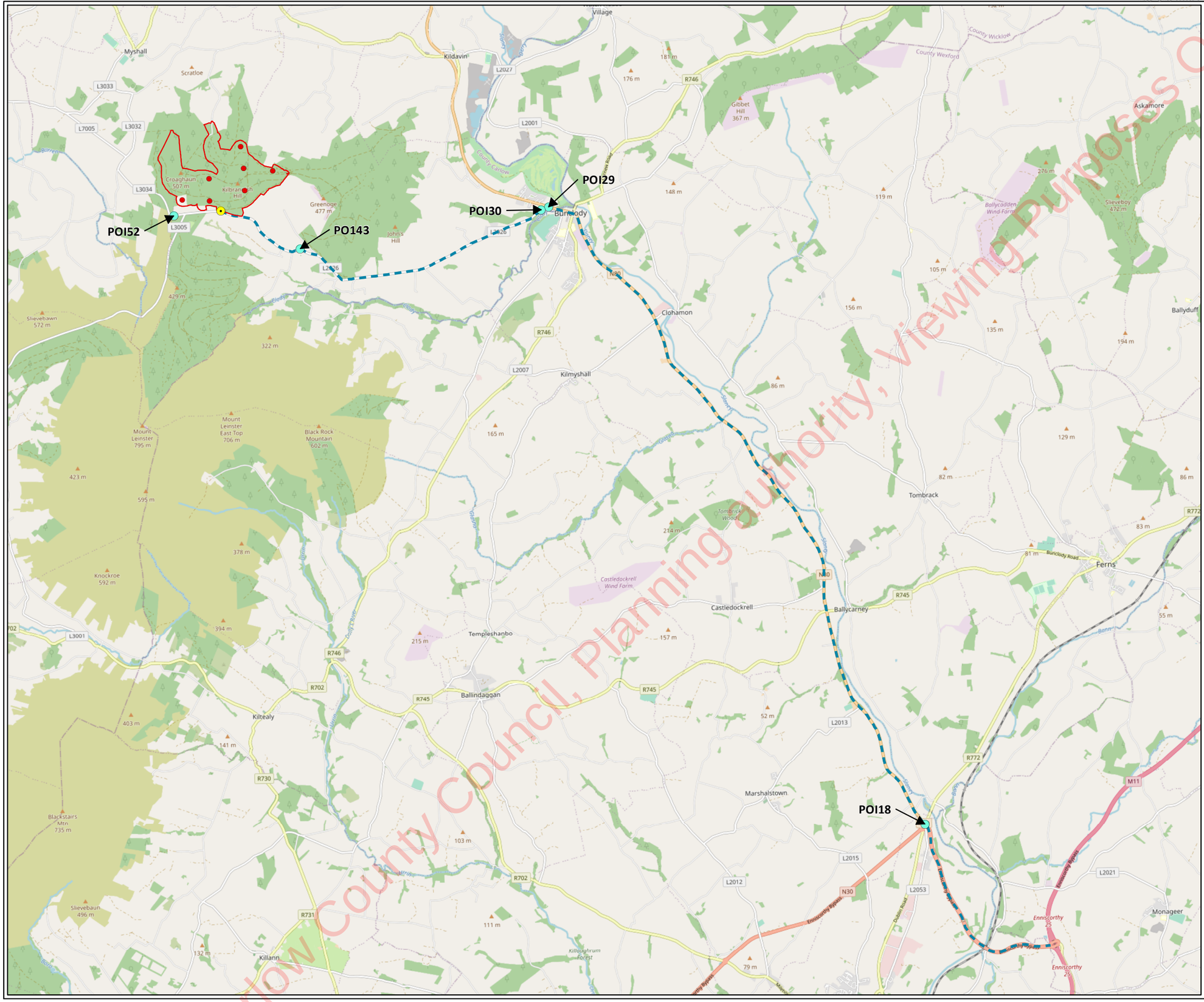

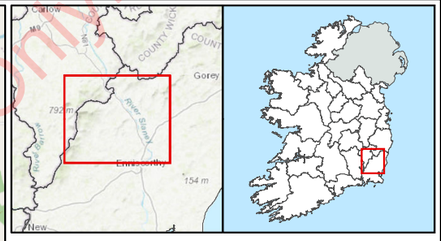

- Site Entrance
- Proposed Turbine Layout
- TDR Nodes
- Proposed Turbine Delivery Route
- Proposed Development Boundary

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TITLE:	Turbine Delivery Route		
PROJECT:	Croaghaun Wind Farm		
FIGURE NO:	13.6		
CLIENT:	Coillte		
SCALE:	1:75000	**REVISION:**	0
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13.5 Potential Impacts of Proposed Project

Potential impacts of the proposed project are outlined below, these are categorised in relation to the construction phase, operational phase and decommissioning of the project.

13.5.1 Do-Nothing Scenario

If the proposed project is not constructed, there will be no change to the current road network and existing traffic patterns within the study area.

13.5.2 Construction

13.5.2.1 Main Wind Farm Site

The construction activities associated with the project will lead to additional construction related traffic on the existing public road network over the duration of the construction works. These impacts will include:

- Heavy Goods Vehicles (HGVs) transporting materials to and from the site, including road making materials, concrete, building materials, drainage/ducting materials, cabling, electrical components and excavated material.
- HGVs transporting conventional earthworks machinery such as excavators, dumper trucks and rollers.
- Fuel trucks transporting fuel for plant to each site compound during the construction phase
- Light Goods Vehicles (LGVs) such as cars, 4x4s and vans used by the workers and supervisory staff involved in the construction works.
- Oversized loads including turbine components (more details below).

Without appropriate mitigation measures, the proposed works have the potential to lead to a negative impact on the existing road network including:

- Delay and disruption to road users;
- Road safety issues should the works not be carried out in line with good traffic management practices;
- Inappropriate parking of construction related vehicles along the route of the works;
- Soiling of the public road leading to a general lack of cleanliness and poor skid resistance on roads;
- Damage to existing road surface.

Tree felling will be required as part of the project. Felling of coniferous forestry is required within and around the wind farm infrastructure to accommodate the construction of some turbines, hardstands, crane pads, temporary compounds, borrow pits, access tracks and the proposed onsite substation.

For the purposes of assessing worst case, it has been assumed that clearance felling for the project shall take place at the start of the construction programme in advance of the commencement of the main balance of plant construction works.

It is likely that significant areas will be felled in advance of the commencement of wind farm construction. ~~It is also likely that felling associated with the project will overlap with stock earmarked for felling as part of ongoing commercial forestry operations which will further reduce cumulative impact between felling and construction operations.~~ Haul routes used for felling activities will generally be the same as those identified for the project construction.

Felling of approximately 25.7 ha of coniferous forestry is required within and around the wind farm infrastructure to accommodate the construction of turbines, hardstands, crane pads, temporary compounds, borrow pits, access tracks and the proposed onsite substation.

The following sawmills are located in the vicinity of the proposed development:

- Graiguecullen Sawmills, Graigue, Co. Laois;
- Laois Sawmills, Portlaoise, Co. Laois;
- Inch Sawmills, Purcellsinch, Co. Kilkenny;
- Richard White Sawmills Limited, Blue Hill, Co. Kilkenny;
- Murphy Sawmill, Enniscorthy, Co. Wexford;
- Forristal Sawmill, Thomastown, Co. Kilkenny;
- Michael Grace Limited, Baltinglass, Co. Wicklow.

All of the above sawmills are located close to motorways and national routes and area easily accessible from the project transport routes.

The construction of the permanent met mast will be carried out by a small crew and the following mobile plant:

- Low-loader
- Flatbed trucks
- Works Van
- Telescopic Handler
- Mobile Crane

Access to the mast locations shall be via the internal wind farm access track and forestry road network as shown in Figure 3.1.

Construction of the met mast shall take place over a number of days. Construction traffic shall consist of a small number of truck movements for delivery of mast sections and construction plant and crew.

13.5.2.2 Grid Connection

Cable Works

The traffic impact associated with the grid connection cable works will fall into two main categories, the construction traffic related impacts and the road/lane closure related impacts.

The proposed grid connection is shown on Figure 13.4.

Construction Traffic Related Impacts

The cable route construction works will involve constantly moving the working area as the cable installation works progress. Grid works within the public road corridor are estimated to take approximately 10 months on the assumption that an average of 75m of cable is installed each day. These works will lead to additional traffic associated with the cable route construction.

Road/Lane Closure Related Impacts

The grid connection construction works will require a combination of temporary road closures with traffic diversions and temporary lane closures along the proposed route.

All road works will be subject to a road opening licence, but it is anticipated that the cable installation along local roads will be advanced using a combination of rolling lane closures and temporary road closures where the existing road width is insufficient to accommodate an open lane for traffic to pass the works area.

The grid connection cable works by its nature will be isolated to a relatively small works area which will move on a daily basis. Impacts associated with the works will be experienced on the road network in the immediate vicinity to the works area.

The route follows the R724 regional route for 1.5km. Along this section of the route, sufficient space is available to implement a single lane closure around the moving works area. Where lane closures are implemented, the traffic will be allowed to travel in both directions. A stop/go system will be used to control the flow of traffic passing the works.

Off-line sections of the proposed grid connection through private lands will not generate an impact to existing traffic flows.

Temporary road closures will be required at specific locations for the installation of joint bays and cable pulling and jointing operations at later dates. These activities are isolated and carried out in under a day at each location.

Horizontal directional drilling operations will be required at a number of locations along the grid connection between Croaghaun and Kellistown. These activities are isolated and carried out in under a day at each location and with the exception of 1no. location, shall be carried out off line in private lands adjacent to the public road. 1no. crossing (GCR-WCC4) will involve HDD within the public corridor. A temporary road closure will be required for this crossing.

The locations of HDD operations are indicated in Figure 13-4.

Two route variants have also been assessed as shown in Figure 13-4. Should either of these be used as part of the grid connection, the maximum number of HDD crossings in the public road will be up to 4.

Offsite Substation at Kellistown

The construction activities associated with the construction of the offsite substation and associated compound will lead to additional construction related traffic on the existing public road network over the duration of the construction works.

These impacts will include:

- Heavy Goods Vehicles (HGVs) transporting materials to and from the site, including road making materials, concrete, building materials, drainage/ducting materials, cabling, electrical components and excavated material.
- HGVs transporting conventional earthworks machinery such as excavators, dumper trucks and rollers.
- Fuel trucks transporting fuel for plant to each site compound during the construction phase
- Light Goods Vehicles (LGVs) such as cars, 4x4s and vans used by the workers and supervisory staff involved in the construction works.

Without appropriate mitigation measures, the proposed works have the potential to lead to a negative impact on the existing road network including:

- Delay and disruption to road users;
- Road safety issues should the works not be carried out in line with good traffic management practices;
- Inappropriate parking of construction related vehicles along the route of the works;
- Soiling of the public road leading to a general lack of cleanliness and poor skid resistance on roads;
- Damage to existing road surface.

13.5.2.3 Turbine Delivery Route

The delivery of turbine components including blades, tower sections and nacelles is a specialist transport operation owing to the oversized loads involved. The blades are the longest component and have been considered for the purpose of this assessment.

Turbine component deliveries will be carried out during off-peak times and will be done using a convoy and a specialist heavy haulage company. Turbine deliveries will also be escorted by An Garda Siochána. This will ensure the impacts of the turbine deliveries on the existing road network are minimised.

As described in Section 13.4, accommodation works are required along the turbine delivery route such as hedge or tree cutting, relocation of powerlines/poles, lampposts, signage and temporary local road widening through the laying of compacted aggregate to verges.

Without appropriate mitigation measures, the construction of the proposed temporary accommodation works have the potential to lead to a negative impact on the existing road network including:

- Delay and disruption to road users;
- Road safety issues should the works not be carried out in line with good traffic management practices;
- Inappropriate parking of construction related vehicles in the public road in the vicinity of the works areas;
- Soiling of the public road leading to a general lack of cleanliness and poor skid resistance on roads;
- Damage to existing public road infrastructure.

13.5.3 Operation

A small number of full-time wind farm personnel are expected to be present during the operational phase of the project. Traffic associated with the operational phase of the project will be associated with the wind farm owner/operator and grid network operator personnel visiting the substation, and maintenance staff. There will also be a limited infrequent attendance by routine environmental monitoring/compliance staff.

Routine turbine maintenance is generally conducted by personnel climbing inside the tower. However, there may be circumstances where a crane may need to be mobilised to site to conduct non-routine maintenance.

The proposed substations have been designed in accordance with network operator requirements with welfare facilities however they will not require full time operational staff and shall be largely automated with occasional visits from maintenance teams.

Unforeseen or unplanned events such as emergency turbine repair works could potentially require the mobilisation of construction plant and personnel to site. The replacement of a large turbine component such as a blade will require a crane and the re-installation of some TDR temporary accommodation works. The temporary bridge crossing at Kilbrannish shall be re-instated in the unlikely event of a bade or large turbine component replacement. In such an event the impacts associated with these works will be less than those associated with the construction stage as detailed in Table 13-12.

A cable fault along the grid connection could potentially require temporary road works for intrusive investigations and repair. The above unplanned events are extremely unlikely to occur, however.

The recreational amenity trail will attract small numbers of visitors to the site throughout the operational phase of the project. An existing public car park shall be used by visitors in order to access the trail. The existing car park is directly accessible from the public road and does not share access with the proposed wind farm.

13.5.4 Decommissioning

On decommissioning, cranes will disassemble the above ground turbine components which will be removed off site for recycling. The foundations will be covered over and allowed to re-vegetate naturally if required. It is proposed that the internal site access tracks and hard standings will be left in place with the exception of T3 and T6 hard standings which will be removed, and the land reinstated at these locations.

Infrastructure associated with the grid connection will form part of the national transmission network and will be left in-situ.

The traffic impact associated with the decommissioning phase will be significantly less than the construction phase due to the considerably lower number of vehicle movements.

The decommissioning phase of the project is described in Chapter 3 of this EIAR and these works will be subject to a decommissioning plan .

13.6 Impact Assessment

13.6.1 Construction

The construction phase traffic generated by the project on the surrounding road network has been calculated by estimating the number of vehicles required for each phase of the project (construction, operation and decommissioning). The number of vehicles is then converted to the equivalent two-way trips, whereby every vehicle will generate two trips, one to and one from the site.

In order to assess the impact of the additional construction related traffic on the existing road network it is first required to estimate the amount of construction traffic that will be generated (trip generation) as a result of the proposed project.

This assessment was done by estimating the amount of traffic, in the form of heavy goods vehicles (HGV) and light goods vehicles (LGV) that will be generated during the construction phase and then distributing it over the duration of the construction programme. In determining the number of 'trips' the estimated number of HGV vehicles was multiplied by a factor of 2 to account for a single trip 'in' and a corresponding single trip 'out'.

In the case of LGVs, the estimated number of vehicles was multiplied by 2.5 to account for some additional LGV movements e.g. some workers taking lunch breaks in the local area. The analysis allowed for a total number of trips per month to be calculated. This could be translated to annual average trips per day (AADT).

Some key assumptions taken when preparing the trip generation estimates include:

- An average ready mix concrete truck carries a load of approximately 8m3 of concrete;
- An average tipper truck carries approximately 10 m3 of soil/rock/aggregate;
- A construction period of 12 - 18 months is expected based on the nature and scale of the proposed works. In order to assess for worst case in terms traffic volumes per day, a 12-month construction programme has been assumed here;
  It has also been assumed that cable trenching works associated with the construction of the grid connection, which is expected to take 10 months to complete, shall be carried out in parallel with the wind farm construction;
- It is expected following intrusive site investigations that site won material from the site will provide sufficient aggregates for general and engineering fill purposes and that surface course stone shall be imported from local quarries. More detail on material volumes can be found in Chapter 9.

Project related traffic will vary over the course of the construction programme. Activities can be broken up into the following main categories:

- Mobilisation and site setup
- Site clearance and felling
- Internal access tracks
- Turbine hard standing
- Turbine foundations
- Turbine Installation
- Onsite substation

- Offsite substation
- Grid connection cable works
- Private electrical network.
- Landscaping, reinstatement, demobilisation.

Table 13-8 and Figure 13-9 show construction stage vehicle trips and their distribution across the 12-month construction programme for the entire project.

Table 13-4: Vehicle Trip Distribution – Project Including Grid Connection Cable Works

	One-Way	Month											
Activity	**Movements**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Total Trips per month	25301	1403	2339	2326	2326	2326	2431	2703	2517	2273	1951	1816	890
Total HGV Trips per month (x2)	13046	597	1372	1359	1359	1359	1463	1413	1227	983	983	848	84
Total LGV Trips per month (x2.5)	12255	806	968	968	968	968	968	1290	1290	1290	968	968	806
Total Trips Per Week	5884	326	544	541	541	541	565	629	585	529	454	422	207
Total HGV Trips Per Week	3034	139	319	316	316	316	340	329	285	229	229	197	20
Total LGV Trips Per Week	2850	188	225	225	225	225	225	300	300	300	225	225	188
Total Trips Per Day	981	54	91	90	90	90	94	105	98	88	76	70	35
HGV Trips Per Day	506	23	53	53	53	53	57	55	48	38	38	33	3
LGV Trips Per Day	475	31	38	38	38	38	38	50	50	50	38	38	31

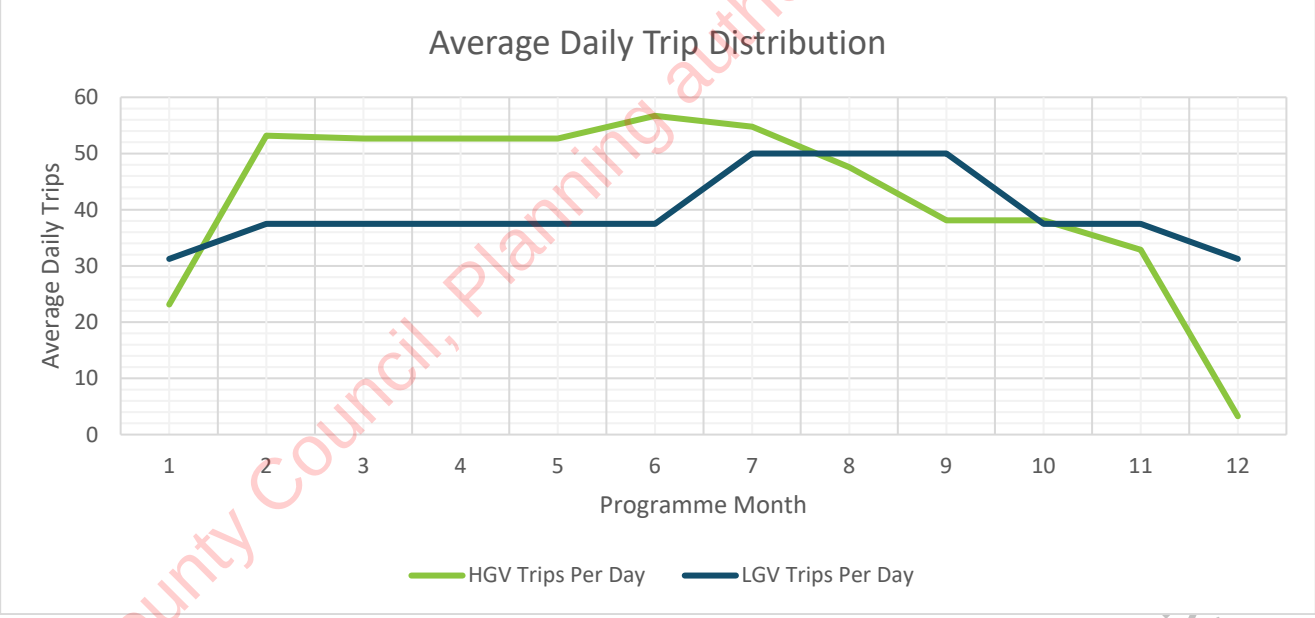

Figure 13-7: Average Daily Trip Distribution – Project Including Grid Connection Cable Works

The construction phase for the entire project will lead to 13,046 additional HGV trips (two-way) over the duration of the construction works.

Calculations of HGV movements associated with the construction of the project indicate an average daily increase of 42 HGV trips per day over a construction period of 12 months. This increases to an average of 57 HGV trips per day during the peak month which occurs in month 6 of the programme for HGV traffic.

An average workforce of 30 persons is anticipated, increasing to 40 persons during peak periods. This is estimated to give rise to an increase of LGV traffic of 40 trips per day on average rising to 50 trips during peak construction periods which occur for LGV traffic during months 7, 8 and 9.

The combined HGV and LGV average daily increase is 82 trips per day throughout the construction programme.

The predicted AADT during the construction phase of the proposed project is presented in Table 13-5. The impact on predicted future traffic on the surrounding road network is also presented in this table.

Table 13-5: Predicted AADT with Average Daily Construction Phase Traffic

Location	Predicted AADT During Construction (Estimated Site Start 2023)	HGV AADT Pre-Development	Average Daily HGV Trips Generated by Development	Predicted HGV AADT During Construction	% Increase	LGV AADT Pre-Development	Average Daily LGV Trips Generated by Development	Predicted LGV AADT During Construction	% Increase	Average Daily Trips Generated by Development (Combined)	Predicted Combined AADT During Construction	% Increase
M11 - TMU M11 085.0 S	10,596	1,133	42	1,175	3.7%	9,463	40	9,503	0.42%	82	10,677	0.77%
M11 - TMU M11 070.0 N	21,086	1,064	42	1,106	4.0%	20,022	40	20,062	0.20%	82	21,168	0.39%
N80 - TMU N80 090.0 S	7,859	702	42	744	6.0%	7,157	40	7,197	0.55%	82	7,941	1.04%
N30 - TMU N30 003.0 E	5,364	513	42	556	8.2%	4,850	40	4,890	0.82%	82	5,445	1.52%
R724	9,441	909	42	951	4.6%	8,532	40	8,572	0.46%	82	9,523	0.87%
L3046	1,025	33	42	75	127.5%	992	40	1,031	3.99%	82	1,107	7.97%
L7111	299	29	42	71	146.4%	270	40	310	14.65%	82	381	27.33%
L2026[4]	500	25	42	67	168.6%	500	40	540	7.92%	82	582	16.34%

[4] Existing traffic count data not available for this road. A low traffic volume of 500 AADT has been assumed with a HGV/LGV split in line with nearby local roads in the receiving environment for which traffic count data was available.

The busiest period during the construction programme is expected to occur in month 7 when multiple construction activities take place concurrently. These activities include turbine hard standing and foundation construction, turbine installation, on-site and off-site substation construction, grid connection cable works and internal electrical works. During this month, combined HGV and LGV traffic increases to 105 average daily trips.

The predicted AADT for the project during peak months of the construction phase of the proposed project is presented in Table 13-6.

It should be noted that the traffic increases presented include all construction stage traffic associated with the project including the grid connection cabling works and off-site substation construction at Kellistown, and therefore represents an absolute worst-case. In reality, traffic impact on the roads listed in Table 13-4, and Table 13-8 will be considerably less than shown here due to the nature of grid connection works which are spread over a distance of approximately 20km of public roadway. For example, the N30 and M11 do not form part of the proposed grid connection however it has been assumed for worst case that all construction related traffic associated with the grid connection cabling works will pass along these roads. Likewise, it is extremely unlikely that the L7111 will be impacted by traffic associated with the construction of the main wind farm site.

Table 13-6: Predicted AADT with Peak Construction Phase Traffic

Location	Predicted AADT During Construction (Estimated Site Start 2023)	HGV AADT Pre-Development	Average Daily HGV Trips Generated by Development during Peak Construction Month	Predicted HGV Daily Trips During Peak Construction Month	% Increase	LGV AADT Pre-Development	Average Daily LGV Trips Generated by Development during Peak Construction Month	Predicted LGV AADT During Construction	% Increase	Average Daily Trips Generated by Development (Combined) During Peak Construction Month	Predicted Combined AADT During Peak Construction Month	% Increase
M11 - TMU M11 085.0 S	10,596	1,133	57	1,189	5.0%	9,463	50	9,513	0.53%	105	10,700	0.99%
M11 - TMU M11 070.0 N	21,086	1,064	57	1,120	5.3%	20,022	50	20,072	0.25%	105	21,191	0.50%
N80 - TMU N80 090.0 S	7,859	702	57	758	8.1%	7,157	50	7,207	0.70%	105	7,964	1.33%
N30 - TMU N30 003.0 E	5,364	513	57	570	11.0%	4,850	50	4,900	1.03%	105	5,468	1.95%
L3046	9,441	909	57	966	6.2%	8,532	50	8,582	0.59%	105	9,546	1.11%
L7111	1,025	33	57	90	171.6%	992	50	1,042	5.04%	105	1,130	10.22%
L2026	299	29	57	85	197.0%	270	50	320	18.50%	105	404	35.03%

The following sub-sections assess the impacts associated with the various elements of the project.

The construction of the proposed grid connection cable works has been separated from the rest of the project as these works will be isolated from the main wind farm site and carried out by a largely independent construction team.

Trips associated with the construction of the offsite substation at Kellistown have been included with the main wind farm site to represent worst case as it is expected that this substation will be built largely at the same time as the onsite substation as shown in the programme.

13.6.1.1 Main Wind Farm Site

The volume and distribution of vehicle trips generated by the construction of the main wind farm site (including the offsite substation at Kellistown) are presented in Table 13-7 and Figure 13-8.

Table 13-7: Vehicle Trip Distribution - Project Excluding Grid Connection Cable Works

	One-Way	Month											
Activity	**Movements**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Mobilisation and site setup	60	60											
Site clearance and felling	257	129	129										
Internal access tracks	661	110	110	110	110	110	110						
Turbine hard standings	750		125	125	125	125	125	125					
Turbine foundations	732			122	122	122	122	122	122				
Turbine Installation	62							15	15	15	15		
Onsite substation	261						52	52	52	52	52		
Offsite substation	348							70	70	70	70	70	
Private electrical network	161								32	32	32	32	32
Landscaping, reinstatement, demob	10												10
Site staff	4257	323	323	323	323	323	323	452	452	452	323	323	323
Total Trips per month	17243	1403	1533	1520	1520	1520	1625	1897	1711	1467	1145	1010	890
Total HGV Trips per month (x2)	6600	597	727	714	714	714	818	768	582	338	338	203	84
Total LGV Trips per month (x2.5)	10643	806	806	806	806	806	806	1129	1129	1129	806	806	806
Total Trips Per Week	4010	326	357	354	354	354	378	441	398	341	266	235	207
Total HGV Trips Per Week	1535	139	169	166	166	166	190	179	135	79	79	47	20
Total LGV Trips Per Week	2475	188	188	188	188	188	188	263	263	263	188	188	188
Total Trips Per Day	668.3	54	59	59	59	59	63	74	66	57	44	39	35
HGV Trips Per Day	255.8	23	28	28	28	28	32	30	23	13	13	8	3
LGV Trips Per Day	412.5	31	31	31	31	31	31	44	44	44	31	31	31

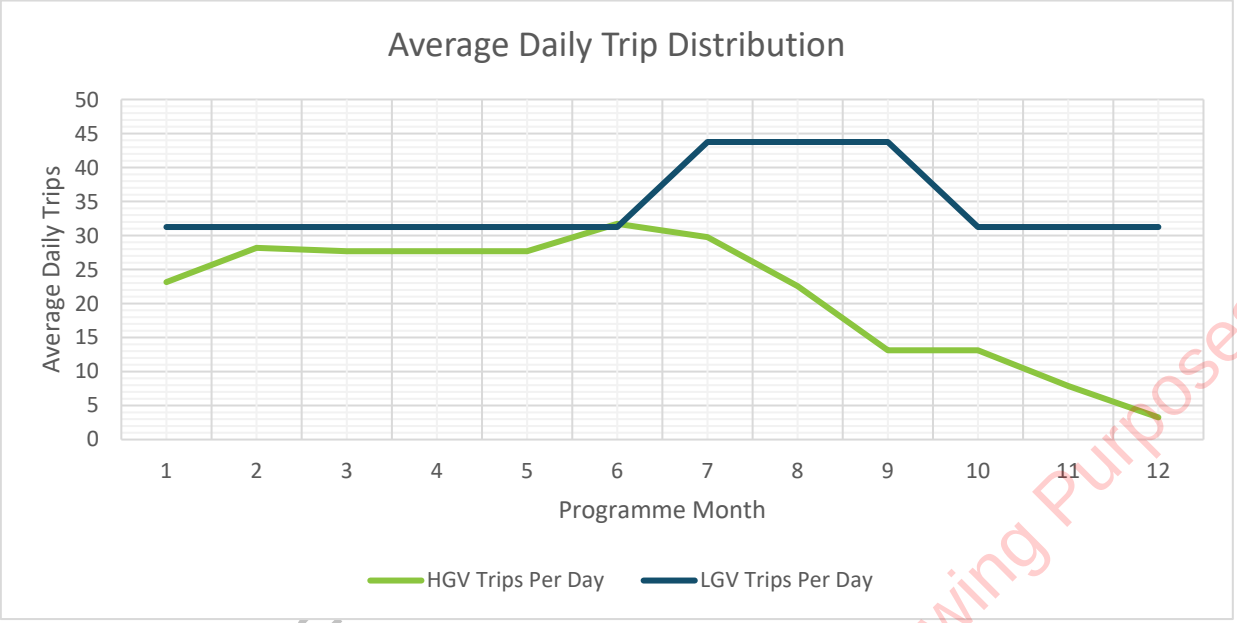

Figure 13-8: Average Daily Trip Distribution - Project Excluding Grid Connection Cable Works

It is estimated that the construction phase for the main wind farm site (and offsite substation at Kellistown) will lead to 6,600 additional HGV trips (two-way) over the duration of the construction works.

Calculations of HGV movements associated with the construction works indicate an average daily increase of 21 HGV trips per day over the course of the construction programme. The peak month for HGV trips occurs in month 6 where average daily HGV trips rises to 32.

An average workforce of 25 persons is anticipated, increasing to 30 persons during peak periods. This is calculated to give rise to an average daily increase of 34 LGV trips per day over a construction period of 12 months. The peak month for LGV trips occurs in month 7, 8 and 9 where average daily LGV trips rises to 44.

The combined HGV and LGV average daily increase is 56 trips per day throughout the construction programme.

The predicted AADT during the construction phase of the main wind farm site is presented in Table 13-8 over. The impact on predicted future traffic on the surrounding road network is also presented in this table.

Table 13-8: Predicted AADT with Construction Phase Traffic - Main Wind Farm Site Only

Location	Predicted AADT During Construction (Estimated Site Start 2023)	HGV AADT Pre-Development	Average Daily HGV Trips Generated by Development	Predicted HGV AADT During Construction	% Increase	LGV AADT Pre-Development	Average Daily LGV Trips Generated by Development	Predicted LGV AADT During Construction	% Increase	Average Daily Trips Generated by Development (Combined)	Predicted Combined AADT During Construction	% Increase
M11 - TMU M11 085.0 S	10,596	1,133	21	1,154	1.9%	9,463	34	9,497	0.36%	56	10,651	0.53%
M11 - TMU M11 070.0 N	21,086	1,064	21	1,085	2.0%	20,022	34	20,057	0.17%	56	21,142	0.26%
N80 - TMU N80 090.0 S	7,859	702	21	723	3.0%	7,157	34	7,192	0.48%	56	7,915	0.71%
N30 - TMU N30 003.0 E	5,364	513	21	535	4.2%	4,850	34	4,885	0.71%	56	5,419	1.04%
R724	9,441	909	21	930	2.3%	8,532	34	8,567	0.40%	56	9,497	0.59%
L3046	1,025	33	21	54	64.5%	992	34	1,026	3.47%	56	1,081	5.43%
L7111	299	29	21	50	74.1%	270	34	305	12.72%	56	355	18.63%
L2026[5]	500	25	21	46	85.3%	500	34	534	6.88%	56	556	11.14%

[5] Existing traffic count data not available for this road. A low traffic volume of 500 AADT has been assumed with a HGV/LGV split in line with nearby local roads in the receiving environment for which traffic count data was available.

The works will result in a less than 1% temporary increase in traffic volumes on the M11, N80 and R724 and approximately a 1% increase in traffic volumes on the N30. These roads form part of the TDR and haul routes for the construction of the project. A short section of the R724 forms part of the proposed grid connection cable route.

The L3046, L7111 and L2026 will see a more significant temporary increase in traffic volumes over the course of the construction phase of ca. 5%, 19% and 11% respectively according to the table. It should be noted however that the L3046 and L7111 do not form part of the TDR or haul routes identified in Figure 13-5 and will therefore not experience this level of construction traffic shown here. These roads are representative of the local road network along which the proposed grid connection cable route passes and impacts on these roads will be primarily generated by the grid connection cable works.

Based on the above, negative or adverse effects on the receiving environment associated with the construction works at the main wind farm site are considered to be short-term in duration and slight to moderate in significance without appropriate mitigation.

13.6.1.2 Grid Connection

The volume and distribution of vehicle trips generated by the construction of the grid connection cable works are presented in Table 13-9 and Figure 13-9.

Table 13-9: Vehicle Trip Distribution - Grid Connection Cable Works

	One-Way	Month										
Activity	**Movements**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Grid connection cable works	3223		322	322	322	322	322	322	322	322	322	322	
Site staff	645		65	65	65	65	65	65	65	65	65	65	
Total Trips per month	8059	0	806	806	806	806	806	806	806	806	806	806	0
Total HGV Trips per month (x2)	6446	0	645	645	645	645	645	645	645	645	645	645	0
Total LGV Trips per month (x2.5)	1613	0	161	161	161	161	161	161	161	161	161	161	0
Total Trips Per Week	1874	0	187	187	187	187	187	187	187	187	187	187	0
Total HGV Trips Per Week	1499	0	150	150	150	150	150	150	150	150	150	150	0
Total LGV Trips Per Week	375	0	38	38	38	38	38	38	38	38	38	38	0
Total Trips Per Day	312.3	0	31	31	31	31	31	31	31	31	31	31	0
HGV Trips Per Day	249.8	0	25	25	25	25	25	25	25	25	25	25	0
LGV Trips Per Day	62.5	0	6	6	6	6	6	6	6	6	6	6	0

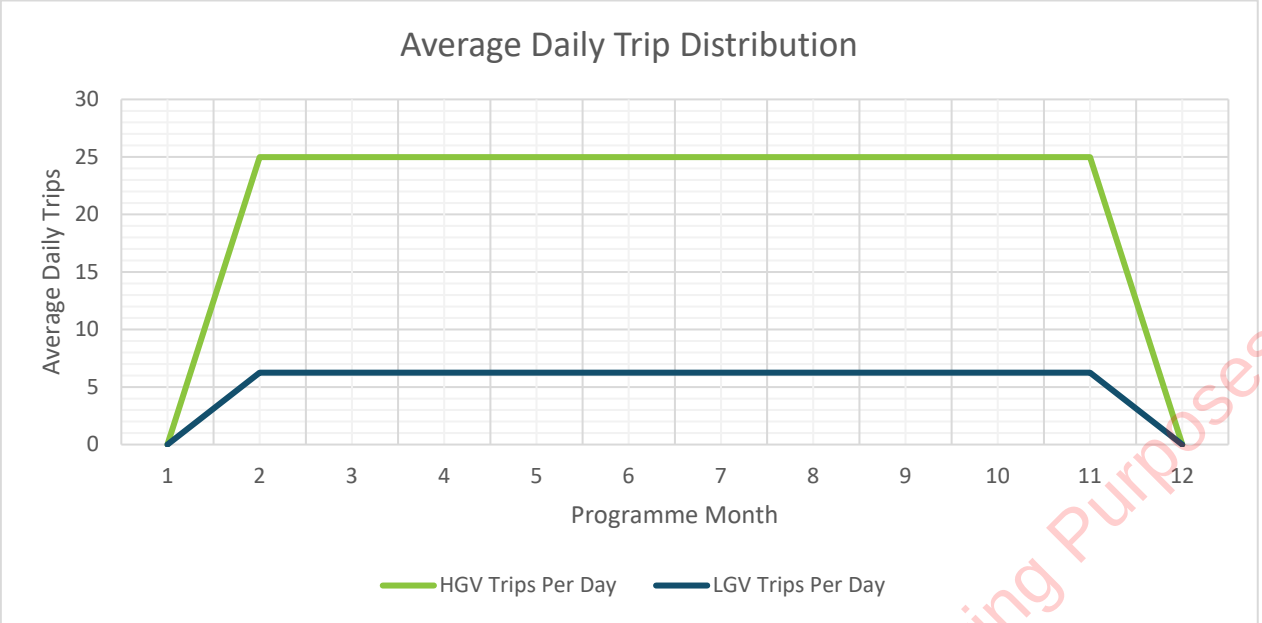

Figure 13-9: Average Daily Trip Distribution - Grid Connection Cable Works

It is estimated that the construction phase for the grid connection cable works will lead to 6,446 additional HGV trips (two-way) over the duration of the construction works.

Calculations of HGV movements associated with the construction works indicate an average daily increase of 21 HGV trips per day over the course of the construction programme. The pattern of HGV trips shall remain relatively steady throughout the construction works and does not exceed 25 HGV trips per day on average over a 10-month duration.

The workforce associated with this activity is expected to give rise to an average daily increase of 5 LGV trips per day over a total construction programme period of 12 months. The pattern of LGV trips shall remain relatively steady throughout the construction works and does not exceed 6 LGV trips per day on average over a 10-month duration.

The combined HGV and LGV average daily increase is 26 trips per day throughout the construction programme.

As described in Section 13.5.2.2, the grid connection cable works by its nature will be isolated to a small works area which will move on a daily basis as the construction progresses along the route. Adverse impacts associated with the works will therefore be experienced on the road network in the immediate vicinity to the works area. Should the construction of the grid connection works be split over two or more works areas, this would result in a significant reduction in overall construction time. This approach would also have the effect of increasing the overall average number of construction vehicle trips per day associated with the construction of the grid connection, albeit over a shorter timeframe. In such a scenario, as each of the works areas would be isolated from each other, the impacts associated with the works at each location would be as described above for that locality and would not act cumulatively with each other.

The predicted AADT during the construction phase of the grid connection cable works is presented in Table 13.10. The impact on predicted future traffic on the surrounding road network is also presented in this table.

Table 13-10: Predicted AADT with Construction Phase Traffic – Grid Connection Cable Works

Location	Predicted AADT During Construction (Estimated Site Start 2023)	HGV AADT Pre-Development	Average Daily HGV Trips Generated by Development	Predicted HGV AADT During Construction	% Increase	LGV AADT Pre-Development	Average Daily LGV Trips Generated by Development	Predicted LGV AADT During Construction	% Increase	Average Daily Trips Generated by Development (Combined)	Predicted Combined AADT During Construction	% Increase
M11 - TMU M11 085.0 S	10,596	1,133	21	1,153	1.8%	9,463	5	9,468	0.06%	26	10,622	0.25%
M11 - TMU M11 070.0 N	21,086	1,064	21	1,084	2.0%	20,022	5	20,028	0.03%	26	21,112	0.12%
N80 - TMU N80 090.0 S	7,859	702	21	722	3.0%	7,157	5	7,162	0.07%	26	7,885	0.33%
N30 - TMU N30 003.0 E	5,364	513	21	534	4.1%	4,850	5	4,855	0.11%	26	5,390	0.49%
R724	9,441	909	21	930	2.3%	8,532	5	8,537	0.06%	26	9,467	0.28%
L3046	1,025	33	21	54	63.0%	992	5	997	0.53%	26	1,051	2.54%
L7111	299	29	21	50	72.3%	270	5	275	1.93%	26	325	8.70%
L2026[6]	500	25	21	46	83.3%	500	5	505	1.04%	26	526	5.21%

[6] Existing traffic count data not available for this road. A low traffic volume of 500 AADT has been assumed with a HGV/LGV split in line with nearby local roads in the receiving environment for which traffic count data was available.

The works will result in a less than 1% temporary increase in traffic volumes on the M11, N80 and R724 and N30. These roads form part of the TDR and haul routes for the construction of the project. A short section of the R724 forms part of the proposed grid connection cable route.

The L3046, L7111 which are representative of the local roads along which the grid connection cable route passes will see slightly a more significant temporary increase in traffic volumes over the course of the construction phase of ca. 3% and 9% according to the table. While the overall temporary increase in traffic volumes can be considered low, there will be a noticeable temporary uplift in HGV traffic as a result of the grid connection cable works along these local roads throughout the duration of the works. HGV traffic associated with the grid connection cabling works will average 3no. trips per hour and is not expected to exceed this throughout the duration of the works.

As described in Section 13.5.1.2, the local roads associated with the proposed grid connection have very low levels of traffic and therefore the impact that the temporary proposed road works will have on the wider road network will be limited to the vicinity of the works area and surrounding local roads where diversions will be in place.

The cable route construction works will involve constantly moving the working area as the cable installation works progress.

The grid connection construction works will require a combination of temporary road closures with traffic diversions and temporary lane closures along the proposed route. The impact of the traffic diversions and lane closures on a section of road will depend on the location of the grid connection works and active traffic at the time of installation. All road works will be subject to a road opening licence. The cable installation along local roads will be advanced using a combination of rolling lane closures and temporary road closures where the existing road width is insufficient to accommodate an open lane for traffic to pass the work.

The route follows the R724 regional route for 1.5km. Along this section of the route, sufficient space is available to implement a single land closure around the moving works area. Where lane closures are implemented, the traffic will be allowed to travel in both directions. A stop/go system will be used to control the flow of traffic passing the works. This will have a temporary negative impact on road users.

Off-line sections of the proposed grid connection through private lands will not generate any impact to existing traffic flows.

Temporary road closures will be required at specific locations for the installation of joint bays and cable pulling and jointing operations at later dates. These activities are isolated and carried out in less than a day at each location.

As described in Section 13.5.2.2, the grid connection cable works by its nature will be isolated to a small works area which will move on a daily basis as the construction progresses along the route. Traffic management measures associated with the works that will impact existing road users in the form of delays and diversions, will therefore be experienced on the road network in the immediate vicinity to the works area, where lane or road closures, and diversions would be implemented. Should the construction of the grid connection works be split over two or more works areas, additional lane/road closers and diversions will be required, however as mentioned above, this approach would result in a significant reduction in overall construction time over the entirety of the route. In such a scenario, the works areas would be isolated from each other to such a degree that the impacts associated with the works at each location would be as described above for that locality and would not act cumulatively with each other.

Horizontal directional drilling operations will be required at a number of locations along the grid connection between Croaghaun and Kellistown as described in Section 13.4.3. These activities are isolated and carried out in less than a day at each location A temporary road closure will be required for HDD operations within the public road corridor.

Based on the above negative or adverse effects on the receiving environment associated with the construction of the grid connection cable works are considered to be short-term in duration and slight to moderate in significance without appropriate mitigation.

13.6.1.3 Turbine Delivery Route

Impacts along the TDR will be limited to specific locations where temporary accommodation works are required and on occasions where large turbine component deliveries are brought to the site.

Temporary accommodation works are at isolated locations and will not generate significant construction traffic. Works associated with the construction of the temporary bridge crossing at POI43 can take place off the public road with the exception of works required on the east bank of the stream which will take place from the public road. This involves the removal of trees and vegetation, laying of temporary load bearing aggregate to verges and the construction of a concrete bridge support. These works will take place from the public road under a stop-go traffic management system with traffic diverted around the works area with the exception of concrete pouring which will require a brief temporary road closure for up to 4 hours during off- peak times.

The greatest potential for a negative impact on existing road users along the TDR is during the delivery of oversized turbine components through the town of Bunclody.

It has been assumed that all turbine blades will be carried on a hybrid trailer to reduce the need for mitigation in constrained sections of the route. Where constraints are significant, it is possible to raise the scissor lift to a maximum of 10m in height. This allows loads to be either lifted over height constraints and to reduce the overall swept path of the delivery vehicle. The turbine blades shall be transported in the flat position for the majority of the delivery route. On approach to bends within Bunclody town, the vehicle will stop at an appropriate location where the blade will be raised and the extendible trailer shortened.

Overhead utilities and obstructions will need to be removed at any locations that the blade is raised on the scissor lift. The removal of overhead utilities will be either temporary disconnections or permanent re-routing. Such works will be carried out by the utility providers in advance of turbine delivery to site.

The permanent re-routing of overhead utilities will result in a temporary disruption to power and telecommunications services for existing residents and business and will also involve temporary road works to 'underground' these services. In addition, a traffic management plan will be agreed with Carlow County Council in advance of any such works. Any trenching and road reinstatement works associated with utility diversions will be subject to a road opening license and can be carried out in such a way as to ensure one lane of traffic on the N80 through the town will be open to traffic at all times. Such works will be carried out over a number of days.

However if the Permanent re-routing of overhead utilities is not possible, temporary disconnections of overhead lines will be required on several occasions to facilitate the delivery of turbine blades and will be carried out during the delivery of the components. Advance disconnection works will be required before the first turbine deliveries. The schedule of turbine component deliveries will be determined by the turbine supplier however it is reasonable to assume that several convoys will be required to deliver all of the turbine components to site over the course of the turbine installation works which is expected to take place over the course of 4 months.

It is reasonable to assume a worst-case scenario where temporary disconnections will be required during off peak times, on up to seven different occasions over the course of four months to facilitate convoys, with a duration of several hours between disconnection and re-connection of services on each occasion.

Temporary disconnections of overhead utilities will result in a significantly greater impact on local residents and businesses in terms of disruption to services than permanent diversions. It will also result in greater disruptions to traffic flows as the delivery of components through the town on each occasion will take slightly longer due to additional temporary works each time.

Table 13-11 identifies where the blades will be raised in the scissor lift position and summarises the operation in each case:

Table 13-11: Blade Lifting Operations

POI	Location Description	Summary Description of Operation
26	N80 left bend at Bunclody	Loads will continue through the tight left bend. Blades will be raised in the scissor lift in advance of this location. This can be undertaken at the road edge and would not need a separate third party transfer area. The convoy will need to be stopped at the side of the road for circa 5 mins per convoy to allow the blades to be elevated and be ready to proceed. Traffic will need to be diverted around the convoy during this time under the control of the Garda. Once through the junction, the blade will be lowered to reduce the need for overhead utility line modifications.
29	N80 / L2026 Junction	Loads will perform a reversing manoeuvre into the Glanbia car park then proceed onto the L2026. Blades will be raised to allow this manoeuvre to occur. All vehicle parking will need to be banned in the vicinity of the junction and along Barker's Road. Loads will overrun and oversail the northern footway west of the Glanbia car park junction where three signs, a lighting column with utility wires, low wall and tree will be removed. Ground to be lowered to carriageway level and a load bearing surface will be laid. Overhead utilities and obstacles will need to be removed. Once through the junction, the blade will be lowered to reduce the need for overhead utility line modifications.

Based on the above, negative or adverse effects on the receiving environment associated with the turbine delivery route are considered to be temporary in duration and slight to moderate in significance without appropriate mitigation.

13.6.2 Operation

The trip generation for the project once operational is anticipated to be minimal as both the wind farm and substations will be operated remotely. as described in Section 13.5.3.

Effects on the receiving environment associated with the operation phase of the project are considered to be neutral in terms of quality, long-term in duration and imperceptible in significance.

The proposed recreational amenity trail is not expected to generate additional traffic movements as no new car parking spaces are proposed as part of the project.

For unforeseen or unplanned works described in Section 13.5.2, it is predicted that negative or adverse effects on the receiving environment will be temporary in duration and slight in significance without appropriate mitigation.

13.6.3 Decommissioning

Negative or adverse effects on the receiving environment associated with decommissioning works at the main wind farm site are considered to be temporary in duration and slight in significance without appropriate mitigation.

Infrastructure associated with the grid connection will form part of the national transmission and distribution system and will be left in-situ. Therefore, no impacts are envisaged upon decommissioning of the grid connection and no mitigation is required.

Negative or adverse effects on the receiving environment associated with the turbine delivery route are considered to be temporary in duration and slight in significance without appropriate mitigation.

Impacts are summarised in Table 13-12:

Table 13-12: Impact Summary

Phase	Project Element	Main Receiving Environment	Description of Potential Effect		
			Duration	Quality	Significance
Construction	Main Wind Farm Site	N30, N80, L2026 and surrounding local road network	Short-term	Negative/Adverse	Slight - Moderate
	Turbine Delivery Route	N30, N80, L2026, Town of Bunclody	Temporary	Negative/Adverse	Slight - Moderate
	Grid Connection	Local road network along Grid connection, R724, N80	Short-term	Negative/Adverse	Slight - Moderate
Operation	Main Wind Farm Site	N30, N80, L2026 and surrounding local road network	Long-term	Neutral	Imperceptible
	Turbine Delivery Route	N30, N80, L2026, Town of Bunclody	Long-term	Neutral	Imperceptible
	Grid Connection	Local road network along Grid connection, R724, N80	Long-term	Neutral	Imperceptible

Phase	Project Element	Main Receiving Environment	Description of Potential Effect		
			Duration	Quality	Significance
Decommissioning	Main Wind Farm Site	N30, N80, L2026 and surrounding local road network	Short-term	Negative/Adverse	Slight
	Turbine Delivery Route	N30, N80, L2026, Town of Bunclody	Temporary	Negative/Adverse	Slight
	Grid Connection	Local road network along Grid connection, R724, N80	N/A	N/A	N/A
Unplanned Events (i.e. Accidents (See Section 13.5.3)	Main Wind Farm Site	N30, N80, L2026 and surrounding local road network	Temporary	Negative/Adverse	Slight
	Turbine Delivery Route	N30, N80, L2026, Town of Bunclody	Temporary	Negative/Adverse	Slight
	Grid Connection	Local road network along Grid connection, R724, N80	Temporary	Negative/Adverse	Slight

13.7 Mitigation Measures

13.7.1 Construction

13.7.1.1 Main Wind Farm Site

This section outlines the mitigation measures that will reduce, minimise or eliminate the potential impacts created by the project and outlined above.

The following mitigation measures are proposed to reduce the impact of the construction activity in relation to the construction phase of the project:

Traffic Management Plan

A detailed traffic management plan (TMP) has been submitted with this EIAR in Appendix 3.1. This shall be developed further at construction stage by the main Contractor and in consultation with the roads authority and An Garda Siochána prior to commencing construction and shall include all of the mitigation measures described in the TMP in Appendix 3.2.

The following traffic management measures shall be implemented:

Traffic Management Co-Ordinator – A dedicated Traffic Management Coordinator 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 on the project.

Roads and Routes: The final TMP will clearly identify roads that will be used to access the project site and roads that are not to be used. Turbine component and quarry material deliveries shall use haul routes identified in Figure 13-5 and Figure 13-6.

One-way Systems: as some of the local roads are relatively narrow, the roads authority may want to introduce a system of one-way construction traffic movements during the construction of the development. Any such one-way systems will be identified in the construction stage TMP in agreement with the roads authority.

Road Condition Survey: a pre-condition survey will be carried out on all public roads that will be used in connection with the development to record the condition of the public roads in advance of construction commencing. A post-construction survey will also be carried out after the works are completed. The specification and timing of the surveys will be agreed with the roads authority. Joint surveys shall be completed if the roads authority requests.

Road Reinstatement: All roads will be reinstated expeditiously on completion of the construction works. Roads will be reinstated to their pre-works condition or better and to the satisfaction of the roads authority.

Site Inductions: All workers will receive a comprehensive site induction which will include a section on traffic management and clear guidance on the routes to be used/not used to access the site.

24-Hour Emergency Contact: a 24-hour emergency phone number will be maintained for the duration of the construction works and the number will be noted on temporary signage at each works area (for grid connection) and the site entrance for the wind farm site.

Traffic Management Guidance: all necessary temporary traffic management will be planned and executed in accordance with best practice, including Chapter 8 of the Traffic Signs Manual published by the Department of Transport.

Letter Drops: a letter drop will be carried out to notify members of the public living near the proposed site and cable route to advise them of any particular upcoming traffic related matters e.g. temporary lane/road closure or delivery of turbine components.

Signage: Clear signage relating to the development, both temporary and permanent, will be provided for accessing the site.

Road Sweeper: Appropriate steps will be taken to prevent soil/dirt generated during the works from being transported on the public road. When, if necessary, a road sweeper will be used to maintain the public roads in a clean condition during the construction activities of the project.

Site Entrances: The entrances to the site will be secured when the site is not in use. When necessary a flagman will be used to assist traffic movements at the site entrance or in other areas as required.

Abnormal Load Deliveries: Abnormal loads will require an abnormal load permit prior to delivery and will be delivered at times and frequencies directed by An Garda Siochána.

Measures contained within the construction stage CEMP and TMP shall be agreed with Coillte forestry operators in advance of the works to ensure no conflicts occur with ongoing forestry activities.

13.7.1.2 Grid Connection Works

Mitigation measures proposed for the grid connection works include:

Road Opening Licence: The road works associated with the grid connection cabling will be completed in line with the requirements of a road opening license as agreed with the local authority.

Route Proofing: In advance of the main grid connection works an assessment will be carried out to define the precise alignment of the cable route within the corridor which has been assessed. This will include slit trenching with the aim of minimising the construction impacts and avoiding existing services in the road.

Maintaining Local Access: reasonable access to local houses, farms and businesses will be maintained at all times during any road closures associated with the grid connection works. The details of this will be agreed with the roads authority in advance of the grid connection works commencing.

Road Cleanliness: Appropriate steps will be taken to prevent soil/dirt generated during the works from being transported on the public road. Road sweeping vehicles will be used when necessary, to ensure that the public road network remains clean.

Temporary Trench Reinstatement: Trenches on public roads, once backfilled, will be temporarily reinstated to the satisfaction of the roads authority.

Surface Overlay after Trench Reinstatement: following temporary reinstatement of trenches on public roads, sections of the public roads will receive a full surface overlay. Details to be agreed with the roads authority At a minimum they will be reinstated to their pre-works condition or better and to the satisfaction of the roads authority.

Haul Route Interface: aggregate imported to the wind farm site from local quarries will be managed to ensure they do not conflict with the grid connection works. Grid connection works will be planned to avoid conflicts with other major activities on the main construction site such as concrete foundation pours and large component deliveries. Measures contained within the construction stage TMP shall be agreed with Coillte forestry operators in advance of the works to ensure no conflicts occur between felling and construction operations.

On the local roads from the site to Kellistown it is anticipated that grid cable installation will involve short rolling temporary road closures. Diversion routes will be signposted utilising alternative local roads, the N80 and the R724 where appropriate. Roadworks along these sections will impact on road users and will lead to slightly increased journey times for the duration of the roadworks.

Traffic management for the HDD operations in the public road shall be carried out in accordance with the TMP submitted with this EIAR.

13.7.1.3 Turbine Component Delivery Mitigation

The turbine delivery route has been assessed using a detailed appraisal of potential routes and the identification of the most appropriate route including the required accommodation works along the route to mitigate the impact of the turbine delivery. The impact of the deliveries on traffic is mitigated by delivering components during off-peak or night-time deliveries.

Mitigation measures proposed for the turbine delivery route also include:

Programme of Deliveries: a programme of deliveries will be submitted to the roads authority in advance of deliveries of turbine components to the site. The programme will include details of the dates and times of each component delivery along with the route to be taken.

Turbine component deliveries will be carried out during off-peak times and will be done using a convoy and a specialist heavy haulage company.

Garda Escort: Turbine deliveries will be escorted by An Garda Siochána. This will ensure the impacts of the turbine deliveries on the existing road network are minimised.

Reinstatement: Any area affected by the works to facilitate turbine delivery will be fully reinstated to its original condition.

Consultation: Consultation with the local residents and Carlow County Council will be carried out in advance to manage turbine component deliveries.

13.7.2 Operation

It is considered that no further mitigation measures are necessary for the operational stage of the project.

13.7.3 Decommissioning

The traffic impact associated with the decommissioning phase will be significantly less than the construction phase.

Traffic and transportation impact mitigation for decommissioning of the project will be the same as those identified here and in the TMP in Appendix 3.2 for construction stage works and will be tailored to suit the existing environment conditions of the day and technology available.

Infrastructure associated with the grid connection will form part of the national transmission network and will be left in-situ. Therefore, no impacts are envisaged upon decommissioning of the wind farm project and no mitigation is required.

Mitigation measures adopted for project decommissioning shall be in line with those identified for the construction phase of the project.

All decommissioning works are to be carried out in accordance with a decommissioning plan to be agreed with the planning authority in advance of the decommissioning works. Traffic management measures identified will be included in the decommissioning plan for the wind farm.

13.8 Residual Impacts

The implementation of mitigation measures outlined in Section 13.7 will ensure that residual impacts are minimised throughout the duration of the proposed activities.

13.8.1 Construction

Negative or adverse effects on the receiving environment associated with the construction works on the main wind farm site are considered to be short-term in duration and slight in significance following mitigation.

Negative or adverse effects on the receiving environment associated with the turbine delivery route are considered to be temporary in duration and slight following mitigation.

Negative or adverse effects on the receiving environment associated with the construction of the grid connection are considered to be short-term in duration and slight in significance following mitigation.

13.8.2 Operation

The trip generation for the project once operational is anticipated to be minimal.

Effects on the receiving environment associated with the operation phase of the project are considered to be neutral in terms of quality, long-term in duration and imperceptible in significance.

For unforeseen or unplanned works such as emergency turbine repair works described in Section 13.5.2, it is considered that negative or adverse effects on the receiving environment will be temporary in duration and not significant to slight following appropriate mitigation.

13.8.3 Decommissioning

Negative or adverse effects on the receiving environment associated with decommissioning works at the wind farm site are considered to be temporary in duration and not significant following mitigation.

Negative or adverse effects on the receiving environment associated with the turbine delivery route are considered to be temporary in duration and not significant following mitigation.

Infrastructure associated with the grid connection will form part of the national transmission network and will be left in-situ. Therefore, no impacts are envisaged upon decommissioning of the project and no mitigation is required.

Table 13-13: Summary of Residual Impacts

Phase	Project Element	Main Receiving Environment	Description of Potential Effect		
			Duration	Quality	Significance
Construction	Main Wind Farm Site	N30, N80, L2026 and surrounding local road network	Short-term	Negative/Adverse	Slight
	Turbine Delivery Route	N30, N80, L2026, Town of Bunclody	Temporary	Negative/Adverse	Slight
	Grid Connection	Local road network along Grid connection, R724, N80	Short-term	Negative/Adverse	Slight
Operation	Main Wind Farm Site	N30, N80, L2026 and surrounding local road network	Long-term	Neutral	Imperceptible
	Turbine Delivery Route	N30, N80, L2026, Town of Bunclody	Long-term	Neutral	Imperceptible
	Grid Connection	Local road network along Grid connection, R724, N80	Long-term	Neutral	Imperceptible
Decommissioning	Main Wind Farm Site	N30, N80, L2026 and surrounding local road network	Temporary	Negative/Adverse	Not significant
	Turbine Delivery Route	N30, N80, L2026, Town of Bunclody	Temporary	Negative/Adverse	Not significant
	Grid Connection	Local road network along Grid connection, R724, N80	N/A	N/A	N/A
Unplanned Events (i.e. Accidents)	Main Wind Farm Site	N30, N80, L2026 and surrounding local road network	Temporary	Negative/Adverse	Not significant - Slight
	Turbine Delivery Route	N30, N80, L2026, Town of Bunclody	Temporary	Negative/Adverse	Not significant - Slight
	Grid Connection	Local road network along Grid connection, R724, N80	Temporary	Negative/Adverse	Not significant - Slight

13.9 Cumulative Impacts

All known existing and proposed projects within the study area that could potentially generate a cumulative impact with Croaghaun Wind Farm in relation to traffic and transportation during construction, operation and decommissioning were identified and examined as part of this assessment. Table 13-14 provides details of the projects within the study area that were considered for cumulative impacts.

Further details on existing and proposed projects assessed in the EIAR for cumulative impacts are contained in Chapter 1.

Table 13-14: Existing and Proposed Projects Assessed for Cumulative Impacts

Project	Existing/Proposed	Reason for Assessment
Replanting works	Proposed	Lands at Sroove, Co. Sligo and Crag, Co. Limerick form part of the overall project and relate to replant lands and these have been assessed in detail in Appendix 3.3 and 3.4 of this EIAR but are considered cumulatively with other elements of the wind farm project in this section.
Existing Greenoge Wind Farm, Kilbrannish, Co. Carlow	Existing	Proximity to proposed main wind farm site and sharing of TDR
Consented 100MW Battery Energy Storage Facility (BESF) at Kellistown East, County Carlow	Proposed	Proximity to Kellistown Substation and proposed off-site substation at Kellistown.
Solar PV Development at Garreenleen, Bendinstown, Tinnaclash and Ardbearn, Co. Carlow	Proposed	Proximity to Kellistown Substation and proposed off-site substation at Kellistown. Shares section of grid connection route with Croaghaun.
Ongoing forestry operations at the proposed main wind farm site	Existing	Shares works area with main wind farm site

13.9.1 Replanting Works

Lands at Sroove, Co. Sligo and Crag, Co. Limerick form part of the overall project and relate to replant lands and these have been assessed in detail in Appendix 3.3 and 3.4 of this EIAR but are considered cumulatively with other elements of the wind farm project in this section.

Works associated with replanting are isolated from the main project construction works and traffic associated with replanting is expected to be very low. HGV traffic associated with replanting works involve the mobilisation of an excavator for drainage works (if required) and delivery of tree saplings by truck. The works can be carried out by a small team.

There is no cumulative impact associated with replanting activities due to distance from the site.

13.9.2 Existing Wind Farm, Kilbrannish, Co. Carlow.

The existing Greenoge shares its TDR and site access with Croaghaun. The wind farm does not generate any perceptible levels of traffic as it is remotely operated.

This wind farm has been operational for several years and will not be decommissioned during either the construction stage or decommissioning stage of Croaghaun Wind Farm should it be granted planning permission.

In the highly unlikely event of a significant turbine component replacement during the Croaghaun construction phase, this will involve a small number of HGV trips along the TDR route over a short period of time.

Based on the above, it is considered that no cumulative impact will be created as a result of this development during the construction operation or decommissioning of Croaghaun Wind Farm.

13.9.3 Consented 100MW Battery Energy Storage Facility (BESF) at Kellistown East, County Carlow

The development consists of construction and operation of up to 34 containers to store up to a total of 100MW of sealed battery cells each with entrances, fire suppression systems, Heating Ventilation and Air Conditioning systems, Inverters, control systems, other electrical components, security lighting and ancillary infrastructure and all associated works including security fencing and ancillary grid infrastructure on lands at Kellistown East, County Carlow. The site is located adjacent to the existing Kellistown Substation.

A ten year planning permission was granted in February 2018 (Planning Ref. 1823). It is likely the development will be constructed in advance of Croaghaun Wind Farm however in the situation where constriction works take place at the same time as Croaghaun Wind Farm, the main overlap between the developments will be associated with the construction of the offsite substation at Kellistown and the grid connection cable works along the L3046. There are no off-site grid connection works associated with the BESF project.

The combined HGV traffic associated with the above elements of the Croaghaun Wind Farm project amount to up to 27 trips per day.

According to documents submitted to Carlow County Council with the planning application, the development's construction stage is anticipated to take 9-12 months and generate a maximum of 30 HGV trips per day. The majority of HGV movements associated with this development are associated with the enabling works, compound construction, battery storage container foundation construction and delivery of battery racks. Based on the total number of HGV trips identified for the construction of the development and an accelerated 9-month construction programme, the average daily HGV trips generated by the project can be estimated as less than 6 per day which is very low.

Negative or adverse effects on the receiving environment associated with these activities coinciding is considered to be temporary in duration and slight in significance.

13.9.4 Solar PV Development at Garreenleen, Bendinstown, Tinnaclash and Ardbearn, Co. Carlow

A planning application has been submitted for a 10 year Planning Permission for a solar farm (Planning Ref: 20143) 1.5km form Kellistown Substation at Garreenleen, Bendinstown, Tinnaclash and Ardbearn, Co. Carlow .

The proposed site is circa 127 hectares in size, consisting of solar panels on ground mounted frames, 28 No. single storey electrical inverter/transformer stations and associated equipment container, security fencing, satellite communications pole, CCTV, upgrading to existing access tracks and new access tracks, temporary construction compounds, landscaping and all associated ancillary development works. At the time of writing, this development was being appealed to An Bórd Pleanála following refusal of permission by Carlow County Council and is therefore not consented.

Construction and operational access will be via entrances from the L-7111 and L-7112. These roads form part of the proposed Croaghaun Wind Farm grid connection. The solar farm's grid connection also shares part of its route with Croaghaun's for a short section near Kellistown.

According to documents submitted to Carlow County Council with the planning application, the development's construction stage is anticipated to take up to 46 weeks and generate an average of 16 HGV trips per day.

A worst case scenario involves the construction of Croaghaun Wind Farm's grid connection in this area taking place at the same time as the solar farm construction and grid connection works.

Negative or adverse effects on the receiving environment associated with these activities coinciding is considered to be temporary in duration and moderate to significant without adequate mitigation.
In each case, trenching works will be subject to a road opening license and traffic management plan agreed with Carlow County Council.

13.10 Conclusion

There are no significant impacts expected on the receiving environment as a result of the construction, operation and decommissioning of the proposed project.

The proposed project is likely to result in a slight to moderate short-term negative impact on the existing road network during the construction phase if adequate mitigation measures are not implemented.

Following implementation of mitigation measures outlined herein, residual impacts during the construction phase shall be reduced and are not expected to exceed 'slight' in significance.

Impacts during operation and decommissioning are considered imperceptible to not significant.

There are no significant cumulative impacts expected on the receiving environment as a result of other existing or proposed projects.

The mitigation measures identified in this Chapter will be adopted and implemented by the Contractor and incorporated into the construction stage CEMP and TMP for the project .

A TMP is contained in the Construction Environmental Management Plan (CEMP) which is included in Appendix 3-1 of Volume 3 of this EIAR. In the event planning permission is granted for the proposed development, the final TMP will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned.

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