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SPRINGFIELD RENEWABLES LIMITED

CASTLEBANNY WIND FARM

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

JANUARY 2021

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Abbreviations

AA – Appropriate Assessment

AOD – Above Ordnance Datum

BCA – Building Control Authority

BCMS – Building Control Management System

C&D – Construction & Demolition

CEMP – Construction Environmental Management Plan

CER – Commission for Energy Regulation

DAFM – Department of Agriculture, Food and the Marine

Dbh – diameter at breast height

DCHG – Department of Culture, Heritage and the Gaeltacht

DHPLG – Department of Housing, Planning and Local Government

DMP – Dust Management Plan

ECoW – Ecological Clerk of Works

EIA – Environmental Impact Assessment

EIAR – Environmental Impact Assessment Report

EMP – Environmental Management Plan

EPA – Environmental Protection Agency

ERP – Emergency Response Plan

ESBN – ESB Networks

FRA – Flood Risk Analysis

GHG – Greenhouse Gas

GI – Ground Investigation

GII – Ground Investigation Ireland

GSI – Geological Society of Ireland

Ha - Hectares

HDD – Horizontal Directional Drilling

HSA – Health and Safety Authority

HV – High Voltage

IAA – Irish Aviation Authority

IAQM – Institute of Air Quality Management

IFI – Inland Fisheries Ireland

IPP – Independent Power Producer

KCC – Kilkenny County Council

LV – Low Voltage

MV – Medium Voltage

MW – Megawatts

NBDC – National Biodiversity Data Centre

NIS – Natura Impact Statement

NPWS – National Parks and Wildlife Service

NRA – National Roads Authority

OPW – Office of Public Works

OSI – Ordnance Survey of Ireland

PSCS – Project Supervisor Construction Stage

PSDP – Project Supervisor Design Process

RSA – Road Safety Audit

SAC – Special Area of Conservation

SEPA – Scottish Environmental Protection Agency

SHEQ – Safety, Health, Environment and Quality Officer

SPA – Special Protection Area

SuDS – Sustainable Drainage System

TDR – Turbine Delivery Route

TIA – Traffic Impact Assessment

TII – Transport Infrastructure Ireland

TMP – Traffic Management Plan

TTA – Traffic and Transport Assessment

1.0 INTRODUCTION

Springfield Renewables Ltd. (hereafter referred to as the Developer) intend to apply for planning permission to develop a wind farm and all associated infrastructure at a site in south-east County Kilkenny. The site of the proposed wind farm lies between the settlements of Ballyhale, Mullinavat and Inistioge and is located within the townlands of Castlecosker, Derrynahinch, Kiltorcan, Coolroebeg, Baunskeha, Castlebanny, Kilvinoge, Cappagh, Coolnahau, Ballytarsna, Mullennakill, Glenpipe, Ballymartin, Ballyvatheen, Ballynoony West and Derrylacky in County Kilkenny. The proposed grid connection from the wind farm site to the existing Great Island to Kilkenny 110 kilovolt (kV) overhead electrical transmission line will be made through the townlands of Castlebanny, Cappagh, Coolnahau, Garrandarragh, Ballygegan and Ballyvool in County Kilkenny. Some additional temporary works are also required at a number of locations to allow the transport of oversize infrastructure components (abnormal loads) for the proposed development.

The planning application for the proposed development will be submitted to An Bord Pleanála (ABP) under Section 37E of the *Planning and Development Act 2000* (as amended). An Environmental Impact Assessment Report (EIAR) and Natura Impact statement (NIS) have been prepared to accompany the planning application and incorporate all elements of the proposed project works including the main wind farm site, the electrical grid connection, the road/junction accommodation works to facilitate the abnormal load deliveries and forestry replanting works. Collectively this is referred to as the Castlebanny Wind Farm.

This Construction Environmental Management Plan (CEMP) has been prepared to outline the proposed management and administration of site activities for the Construction Phase of the proposed development, to ensure that all construction activities are undertaken in an environmentally responsible manner. This CEMP summarises the environmental commitments of the construction project, and the measures to ensure compliance with legislation and the requirements of statutory bodies, all as detailed in the EIAR and NIS.

This CEMP will be a live document and will be reviewed and updated, as necessary. Upon appointment, the Main Contractor for construction of the proposed development shall update this document to produce a Final CEMP which will account for any additional requirements set out in Planning Conditions.

The following relevant guidance has been referenced in the preparation of this CEMP:

- Environmental Protection Agency (EPA), *Guidelines on the Information to be contained in Environmental Impact Assessment Reports – Draft* (August 2017)
- Department of Housing, Planning and Local Government (DHPLG), *Draft Revised Wind Energy Development Guidelines* (December 2019)

1.1 Proposed Development

The proposed development will comprise the following:

- Erection of 21 no. wind turbines with an overall blade tip height of up to 185m and all associated foundations and hard-standing areas in respect of each turbine;
- Improvement of existing site entrance with access onto the R704 regional road, vertical realignment of the R704 in proximity to this entrance, and creation of two new site entrances on the L7451 to form a new crossing point;

- Improvements and temporary modifications to existing public road infrastructure to facilitate delivery of abnormal loads and turbine delivery and construction access at two locations on the R704 in the townland of Ballynoony West;
- Construction of 2 no. temporary construction compounds with associated temporary site offices, parking areas and security fencing;
- Installation of 1 no. permanent meteorological mast up to a height of 100m;
- 3 no. borrow pits;
- Construction of new internal site access roads and upgrade of existing site roads, to include passing bays and all associated drainage;
- Construction of drainage and sediment control systems;
- Construction of 1 no. permanent 110kV electrical substation including:
    - 2 no. control buildings containing worker welfare facilities and equipment store;
    - All electrical plant and infrastructure and grid ancillary services equipment;
    - Parking;
    - Security Fencing;
    - Wastewater holding tank;
    - Rainwater harvesting equipment;
    - All associated infrastructure and services including site works and signage;
- All associated underground electrical and communications cabling connecting the wind turbines to the proposed wind farm substation;
- All works associated with the connection of the proposed wind farm to the national electricity grid, which will be via a loop-in 110 kV underground cable connection approximately 4km in length to the existing overhead 110 kV line in the townland of Ballyvool, Co. Kilkenny, with two new 16m high steel lattice loop-in/out masts at the connection point;
- All related site works and ancillary development including berms, landscaping, and soil excavation;
- Ancillary forestry felling to facilitate construction and operation of the proposed development and any onsite forestry replanting;
- Development of a permanent public car park with seating/picnic tables at the end of the construction phase of the development on the footprint of the southern temporary construction compound; and
- Permanent recreational facilities including marked walking and cycling trails along the site access roads, and associated recreation and amenity signage and outdoor fitness equipment.

A 10-year planning permission and 35-year operational life from the date of commissioning of the entire wind farm is being sought.

The proposed development layout is shown in Appendix A (Figure 1) which shows the proposed development boundary including the proposed turbine locations and grid connection route.

1.2 Scope of this CEMP

This CEMP addresses all relevant environmental aspects of the management of site preparation and construction work within the proposed development works area as set out in Section 1.1. The scope of this CEMP includes:

- All construction elements of the proposed development;
- The proposed implementation and management of environmental controls and mitigation measures during each phase of construction works; and
- A documented process to ensure measures identified through the planning phase of the proposed development will be applied in practice.

This CEMP contains:

- A statement of the environmental aims and policy objectives of the proposed development;
- Roles and responsibilities of key individuals;
- Environmental management and reporting structure;
- Site management and construction activity details;
- Environmental mitigation measures;
- Environmental awareness training programmes;
- Environmental monitoring programmes and requirements;
- Inspection and auditing programmes; and
- Emergency response plans and procedures for any environmental incidents.

This CEMP should be read in conjunction with the EIAR, NIS and supporting documentation. In the unlikely event of any contradiction between this CEMP and the EIAR/NIS, the EIAR/NIS shall take precedence.

1.3 Implementation of the CEMP

Key to the implementation of this CEMP is the delegation of responsibility for the CEMP to the Construction Environmental Manager/Safety, Health, Environmental and Quality (SHEQ) Officer, or other suitably qualified appointed person on behalf of the Contractor, who will regularly liaise with and update the Developer on all environmental issues relating to the project during the construction phase. As part of the appointment of a Contractor and agreement of Contracts, the Developer will determine the lines of communication for environmental compliance with the local authorities and relevant stakeholders.

In terms of overall environmental responsibility, everyone on-site is responsible for ensuring that their actions constitute good environmental practice and will be provided with site specific information to ensure compliance as part of the site induction. All site personnel are charged with following good practice and encouraged to provide feedback and suggestions for improvements. All site personnel are also required to ensure compliance with the requirements of this CEMP and subsequent revisions thereof.

1.4 Aims and Objectives

The key project aims are:

- To ensure the project is undertaken in accordance with best practice guidance for the management of the environment during construction works;
- To ensure that mitigation measures to protect designated sites as set out in the NIS are put in place;
- To ensure that mitigation measures to protect all aspects of the environment as set out in the EIAR are put in place;
- To ensure that construction activities are carried out in accordance with all planning conditions for the proposed development; and
- To carry out the proposed works with minimal impact on the environment.

The primary objectives to ensure the above aims are achieved during the construction phase are:

- Appointment and delegation of responsibility to an individual for monitoring environmental compliance and adherence to this CEMP;
- Updating the Final CEMP on a continuous basis in accordance with regular environmental auditing and site inspections. This will confirm the efficacy and

implementation of all relevant mitigation measures and commitments identified in the application documentation;
- Providing adequate environmental training and awareness to all project personnel;
- Establishing documented schedules and records for monitoring and inspections;
- Establishing reporting procedures for any incidents on site with potential to impact on the environment;
- Providing opportunities for community feedback and submission of complaints; and
- Adopting a sustainable and socially responsible approach to construction.

1.5 Revisions of the CEMP

All the elements of this CEMP will be included in the final CEMP, which will be produced prior to construction by the contractor. In addition, the final CEMP will implement conditions attached to any planning permission granted. The final CEMP will be subject to ongoing review (throughout the construction phase of the proposed development), through regular environmental auditing and site inspections. This will confirm the efficacy and implementation of all relevant mitigation measures and commitments identified in the application documentation.

The appointed Contractor is required to include further details and/or confirmation in the final CEMP which will include:

- Details of emergency plan including personnel and contact numbers;
- Details of fuel storage areas (including location and bunding);
- Construction lighting details;
- Site and traffic signage; and
- Method statements.

1.6 Environmental Training and Awareness

In order to ensure that environmental awareness and compliance is communicated effectively at the start and throughout the construction works, this CEMP and its contents will be communicated to all site personnel, including management staff, operatives and sub-contractors. The key elements of this CEMP will form part of the site induction which will be mandatory for all employees, contractors and visitors attending the site.

Environmental toolbox talks will be provided to all site personnel and sub-consultants on a regular basis. These will be targeted at particularly sensitive environmental issues such as:

- Protection of sensitive ecological habitats and key ecological receptors;
- Works close to water bodies;
- Water pollution and silt control;
- Water pollution in relation to cement and concrete handling;
- Spill prevention and control;
- Dust management;
- Sensitive archaeological sites; and
- Waste management.

2.0 OVERVIEW OF THE EXISTING SITE

2.1 Site Location

The proposed wind farm site is located within an agricultural and forested landscape between the settlements of Mullinavat, Inistioge and Ballyhale in County Kilkenny. The majority of the existing land-use at the wind farm site is commercial forestry and with some areas of pastoral agriculture. A map of the EIAR Study Area showing the site of the proposed wind farm is included in Appendix A (Figure 2).

The site of the proposed wind farm is approximately 7.3km long in the north/south direction and is approximately 2.7km wide in the east/west direction at its widest point. The site has an area of approximately 1,434 hectares (ha) and comprises a single elongated land parcel. The closest rural settlements of Mullinavat, Inistioge and Ballyhale are located approximately 4.1km south-west, 5.7km north-east and 1.9km north-west of the site of the proposed wind farm, respectively. The main urban centres in the region are Waterford City, located approximately 15.5km to the south of the proposed wind farm site and Kilkenny City, located approximately 20km to the north.

The M9 Dublin to Waterford Motorway runs to the west of the wind farm site and the River Nore runs to the east at a distance of approximately 5.5km at the nearest point. The River Arrigle is located approximately 1.1km to the east of the proposed wind farm site at its nearest point and is a tributary of the River Nore. The R704 Regional Road runs to the south of the site between Mullinavat and New Ross in County Wexford.

The proposed grid connection will run from a new on-site substation eastward to connect into the existing Great Island to Kilkenny 110kV overhead electrical transmission line. The on-site substation will be located in the townland of Castlebanny and the proposed grid connection will extend underground for approximately 4km to connect to the existing overhead transmission line in the townland of Ballyvool. The proposed grid connection will traverse a mix of forestry and agricultural lands as well as sections of existing public and private roads. The grid connection will cross under the River Arrigle in the townlands of Coolnahau and Garrandarragh.

There are a number of locations which require temporary additional works to accommodate oversize load deliveries to the site (turbine components and substation transformer). These temporary works are located in the townlands of Ballynoony West, Garranadarragh, Granny, Kilmurry and Rathpatrick in County Kilkenny as well as Ballyduff East in County Waterford. It is intended that the turbine components will be delivered to the site from Belview Port in southern County Kilkenny via the M9.

2.2 Existing Land, Soils and Geological Environment

The majority of the proposed wind farm site, as shown in Figure 1, (c. 1,200 ha) is commercial forest owned by Coillte, while the remaining areas are third-party lands comprising a mix of agricultural grassland, arable crops and forestry. Coillte forestry within the site comprises different stages of coniferous plantation. The surrounding landscape is a mixture of agricultural land and forestry, with some existing wind farms located to the south and south-east of the proposed wind farm site.

The topography of the site can be described as gently sloping, rising from c. 145m above ordnance datum (mAOD) to a high point of c. 250 mAOD in the north and c. 265 mAOD in the

south. The site consists largely of resistant Devonian sandstone forming the higher ground with the eastern boundary tapering to lower elevations.

The Geological Survey of Ireland (GSI) indicate glacial landforms orientated north-south across the site, subglacial streamlined bedrock further supported by glacial straie at St. Mullin's Cave, located on the wind farm site's eastern boundary.

The bedrock geology on the 1:100,000 scale mapping from the GSI indicates that the wind farm site is characterised by 12 no. geological formations which are detailed in Table 8-1 of Chapter 8 (Land, Soils and Geology) of the EIAR. The bedrock formation underlying each proposed turbine are summarised as Carrigmaclea Formation (Turbines 1-11, 13, 15, 17, 19-21), Diorite (Turbines 12 & 14) and Granite (undifferentiated) (Turbines 16 & 18).

The GSI database contains records of verified borehole logs, groundwater wells and springs within and close to the proposed development area. A summary of the information available from within 1km of the wind farm site boundary is presented in Table 8-3 of Chapter 8 (Land, Soils and Geology) of the EIAR.

There are no active quarries on the site. An historical quarry lies approximately 1.5km to the north-west of the northern site boundary. No active mineral or aggregate sources have been identified by GSI data within 2km of the site boundary.

The GSI online Aggregate Potential Mapping Database shows that the wind farm site is located within an area mapped as typically being 'Moderate' in terms of crushed rock aggregate potential, with some areas of low to high potential. There are no significant mapped areas of granular aggregate potential (i.e., potential for gravel reserves).

According to the GSI data, there are no Geological Heritage sites located inside the site boundary.

The regional soils mapped by the EPA indicate that this region which includes the turbine delivery route (TDR) and the grid connection, consists of nine types of soil detailed in Chapter 8 (Land, Soils and Geology) of the EIAR. The databases indicate that the proposed wind farm site and site entrance is generally underlain by tills derived from mainly non-calcareous parent materials. The bedrock outcrop or sub-crop forms 40-50% of the wind farm site area.

The dominant subsoil occurring in the region surrounding the wind farm site is classified as till. The four subsoil types are characterised as follows:

- Alluvium (A);
- Bedrock outcrop or sub-crop (Rck);
- Lucstrine sediments (L); and
- Till derived from Devonian sandstones (TDSs).

Bodies of till derived from sandstones are present across the wind farm site area. Alluvium is mapped within the study area and site boundary.

A desk study of available information from the EPA did not identify any waste facilities, illegal waste activities or industrial EPA licensed facilities within a 2km radius of the wind farm site.

A review of information on the GSI Landslide Events database shows that the nearest recorded landslide (Event ID: GSI_LS16-037) occurred approximately 5km north-east of the wind farm

site boundary in January 2013. The event is described as *"the Thomastown/Inistioge Rd (R700) partially blocked at Brownsbarn Bridge following a landslide"*[1].

Ground Investigation (GI) of the development area was carried out in January/February 2020 by Geological Investigations Ireland (GII). 36 no. trial pits were completed at the proposed turbine locations, substation location, borrow pit locations and along the grid connection route. Rotary core boreholes were completed at the proposed borrow pit locations and at either side of the River Arrigle. The investigation report identifies that the site is generally covered by organic and gravelly clay, overlying sand and gravel which overlie weathered shale bedrock. A summary of the ground conditions encountered during the GI at the site is given in Table 8-4 of Chapter 8 (Land, Soils and Geology) of the EIAR. The ground investigation report including laboratory test results carried out on samples from the investigations are included in Appendix 8-1 of the EIAR.

An evaluation of the peat stability at the wind farm site was undertaken. However, there is limited peat/peaty soil, as identified during the desk study, and as supported by the GI. The GI identified that the shallow organic soils, where present, did not exceed 0.5m in depth at any of the GI locations across the site.

2.3 Existing Hydrological and Hydrogeological Environment

The proposed development site is located within the National River Basin District and on a regional scale, the proposed development and its environs is located across the Nore (Area No. 15) and the Suir (Area No. 16) Hydrometric Areas and Catchments.

At a local scale, the proposed wind farm site is located between the Arrigle River (IE_SE_15A020250) to the east and the Ballytarsna River (IE_SE_16B020080) to the west. The Arrigle River discharges to River Nore and eventually into the River Barrow. The Ballytarsna River discharges to River Blackwater (Kilmacow) and then into River Suir.

The Mullenhakill Stream (IE_SE_15A020250) rises on the eastern side of the wind farm site and is a tributary feeding into the Arrigle River. To the west of the site, Crowbally Stream (IE_SE_16B020080) collects with Ballytarsna River, also known as Derrylacky River, which then feed into River Blackwater (Kilmacow) (IE_SE_16B020080). Following site walkovers in February 2020, July 2020 and September 2020, a number of surface water features were noted on site. These are illustrated in Figure 9-3 in Chapter 9 (Hydrology and Hydrogeology) of the EIAR.

Drainage within the site is predominantly via man-made drainage channels. A number of streams/drainage channels were identified to be flowing through or adjacent to the proposed wind farm site and are described in Chapter 9. The site and adjacent lands also include numerous man-made drains which flow to these watercourses and assist in the drainage of agricultural land use and forestry. Extensive arterial drainage and field drains occur on the Coillte forestry lands. No streams are crossed by the proposed access tracks or turbine locations; however, a number of drainage ditches will be crossed. There will be some realignment of drains on-site, particularly near the proposed substation.

St. Molin's Spring is located to the east of the wind farm site in the low permeability granites. Excavations are proposed within 890m of the well but topographical data indicates no hydraulic connectivity or pathway to St Molin's Well .

[1] GSI Online Mapping Database - https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=ebaf90ff2d554522b438ff313b0c197a&scale=0 (Accessed on 06 October 2020)

2.4 Existing Ecological Environment

This section presents a high-level summary of the existing ecological environment at the proposed development site. A more detailed description of desktop studies, field studies and species encountered is provided in Chapter 6 (Biodiversity) and Chapter 7 (Ornithology) of the EIAR.

2.4.1 Designated Areas

There are no Natura 2000 sites in or adjacent to the proposed wind farm site; however, the grid connection route is proposed to cross the River Arrigle, which is part of the River Barrow and River Nore Special Area of Conservation (SAC) (Site Code: 2162). There are three other SACs within 15km of the proposed wind farm site listed in Table 6-2 of Chapter 6 (Biodiversity) of the EIAR. There is one Special Protection Area (SPA) within 15km of the proposed wind farm site, the River Nore SPA (Site Code: 4233), which encompasses the main channel of the River Nore to the north of the site.

There are no Natural Heritage Areas (NHAs) or pNHAs (proposed NHAs) in or adjacent to the proposed wind farm site. In addition, there are no NHAs within 15 km of the proposed wind farm site. There are 18 no. pNHAs within 15 km of the proposed wind farm listed in Table 6-3 of Chapter 6 (Biodiversity) of the EIAR. The majority of these are included within the River Barrow and River Nore SAC or the Lower River Suir SAC (Site Code: 2137).

The Kilkenny County Development Plan 2014-2020 does not identify any sites of ecological importance at the county level in or near the proposed wind farm.

2.4.2 Habitats

The majority of the site is dominated by plantation forestry, most of which is mapped as *conifer plantation* (WD4). The most common tree species was Sitka spruce, but a diverse range of other conifers had been planted, including lodgepole pine, noble fir and Japanese larch. Pre-thicket plantations (all at least second rotation) where the forest canopy had not yet closed were mapped as *immature woodland* (WS2), as the habitat was quite different from mature or thicket stage conifer plantation.

Smaller areas of broadleaf plantation were present, mapped as *broadleaf woodland* (WD1). These were mostly relatively young and mainly comprised alder, beech, eucalyptus and sycamore.

Gravelled forestry tracks were only sparsely vegetated or not at all. They were mapped as *buildings and artificial surfaces* (BL3). Some tracks were bounded by drains, only the more significant of which were mapped as *drainage ditches* (FW4). Typical drain flora included rushes, lesser spearwort, ragged robin, marsh bedstraw, water mint, marsh horsetail and glaucous sedge. More substantial, wetter drains, such as that east of T9, supported sweet-grass and greater tussock sedge and were lined with grey and eared willow.

A comprehensive description of the existing habitats encountered at the site is provided in Section 6.3.2 of Chapter 6 (Biodiversity) of the EIAR.

2.4.3 Flora

A vegetation survey was carried out at key infrastructure elements, the results of which are detailed in Section 6.3.3.1 of Chapter 6 (Biodiversity) of the EIAR.

No rare or protected plant species were recorded during the field surveys.

The invasive cherry laurel was recorded during field surveys from ornamental hedges around dwelling houses and gardens. It was not recorded naturalised in the proposed wind farm site. The invasive sycamore has been planted for forestry around T21. It also occurred in hedgerows and pockets of broadleaf woodland in a few places at lower elevations around the margins of the study area. No other invasive species were recorded during the field surveys.

In an open stand of *broadleaved woodland* (WD1), there was a group of five very mature trees approaching veteran status. They comprised two beech, two ash and one sessile oak ranging from 0.75 to 1.2m diameter at breast height (dbh) and 15-20m in height.

2.4.4 Bats

During 2017 and 2018, a total of 17 no. buildings considered to have high potential as bat roosting sites were investigated by means of dusk and/or dawn surveys. A total of nine roost sites were identified. Brown long-eared bats were confirmed roosting at three sites, all of which were considered to be nursery roosts, Whiskered bats were recorded at two sites, both nursery roosts, Soprano pipistrelles at three roost sites, one of which was a large nursery roost containing over 300 bats and one roost of Natterer's, also a nursery roost. All nine recorded bat roosts were in buildings. In 2020, a nursery roost of Natterer's bats was recorded in a derelict farmhouse building in Kilvinoge townland.

No bat roosts were identified in trees on site. No roosts of Leisler's bats were recorded.

A total of four species of bat were detected during transect surveys – Common pipistrelle, Soprano pipistrelle, Leisler's bat and Whiskered bat.

Static bat surveys were conducted at various sites within the proposed wind farm in 2017 and 2018. Surveys conducted at forestry tracks generally recorded constant bat activity throughout the night. Further surveys were carried out in 2019 and 2020 in line with the methodology outlined in the new 2019 Scottish Natural Heritage (SNH) guidance document for wind farm surveys. In both the Summer 2019 and Autumn 2019 survey periods, the three most frequently recorded species were Common pipistrelle, Soprano pipistrelle and Leisler's bat in descending order, which mirrors the estimated populations of these three species in Ireland. In both the Spring 2020 and Summer 2020 survey periods, the three most frequently recorded species were Common pipistrelle, Leisler's bat and Soprano pipistrelle (in descending order).

Further details of the survey results are provided in the EIAR.

2.4.5 Other Fauna

Records of terrestrial mammals within the vicinity of the wind farm site, obtained from the National Biodiversity Data Centre (NBDC) and NPWS, are presented in Table 6-4 of Chapter 6 (Biodiversity) of the EIAR. These include badger, bank vole, brown rat, fallow deer, fox, Irish hare, Irish stoat, pine marten, rabbit, red squirrel and wild boar.

The mammal species of greatest conservation significance that has been recorded in the vicinity of the proposed wind farm is red squirrel. During field surveys, signs of red squirrel feeding on spruce and pine-cones were frequently observed. The species is likely to be widespread throughout the site as mature conifer plantations provide good habitat. Detailed descriptions are provided in the EIAR.

During field surveys, a large badger sett with approximately 24 no. entrances was discovered in mature conifer plantation close to the originally proposed location of T18. Given the significance of this sett and the protection badger setts are offered under the Wildlife Act 1976, as amended, the location of T18 was moved to avoid impacting the badgers.

Frogs were recorded several times during field surveys, especially in pre-thicket conifer plantation, wet grassland and areas of wet heath and bog. Tadpoles were noted within water-filled tyre ruts in forest plantations during a spring site visit. Common frog is certain to be widespread across the wind farm site and grid connection route.

During field surveys, both dingy skipper and small heath (butterflies) were recorded from the site.

2.4.6 Aquatic Ecology

The majority of the aquatic survey sites were located in the Blackwater (Kilmacow)_010, Arrigle_010, Arrigle_020 and Nore_220 WFD sub-catchments within the wider Nore and Suir catchments, respectively.

Physiochemical and biological (Q-value) water quality data was recorded at the survey sites and the results are detailed in Section 6.3.6 of Chapter 6 (Biodiversity) of the EIAR. As summarised in the EIAR, the physiochemical water quality was indicative of high-status water quality across all of the survey sites with the exception of one site (Site A4). This site, however, was still representative of good status water quality. All of the 13 survey sites met target 'good status' water quality as required under the WFD, with all but one site achieving 'high status' physiochemical water quality.

A total of n=38 species across n=26 families were recorded in the kick samples (Q-sampling). The results of the Q-sampling are presented in Table 6-9 and Table 6-10 of the EIAR.

2.4.7 Ornithology

A total of 15 waterbird species, seven raptor species, and another two notable species, were recorded during the bird surveys. The only regularly occurring raptor species were Sparrowhawk, Buzzard and Kestrel. Hen Harrier and Peregrine were recorded infrequently and there were a few records of Goshawk, Red Kite and Merlin. Breeding Woodcock were widespread across the wind farm site, and there were scattered records of breeding Snipe, while breeding Water Rail occurred in a small swamp at the edge of the site. Lesser Black-backed Gull regularly occurred in summer feeding in fields around the edge of the site. The only other regularly occurring waterbirds were Mallard, Moorhen and Grey Heron. There were occasional records of Whooper Swan, Greylag Goose, Teal, Golden Plover, Lapwing, Whimbrel, Black-headed Gull, Common Gull, Herring Gull and Great Black-backed Gull. The other notable species recorded were Nightjar and Great Spotted Woodpecker. The Barn Owl survey did not find any evidence of Barn Owls.

A detailed description of the findings of the bird surveys is presented in Section 7.3 of Chapter 7 (Ornithology) of the EIAR.

3.0 OVERVIEW OF THE CONSTRUCTION WORKS

3.1 Duration and Phasing of the Proposed Development

It is anticipated that the overall construction phase of the development will take approximately 24 months from starting on-site to completion of the commissioning of the turbines. Pending planning approval, an arbitrary start date of January 2024 has been selected for commencement of construction. All vegetation clearance that is required during construction works will commence outside the breeding birds season, which runs from the 1st of March to the 31st of August.

Although no-instream works are proposed, directional drilling under the Arrigle River will only be done over a dry period in September. This period is required to avoid the salmonid spawning season (October – June) and the Kingfisher breeding season (March-August; mitigation for Kingfisher arises from the NIS that accompanies this EIAR). If directional drilling outside September is unavoidable and a period in July-August is required, a survey for breeding Kingfisher will first be carried out to ensure no breeding birds will be disturbed by the drilling works. Similarly, directional drilling under the Mullenhakill Stream will only be done over a dry period in July-September to avoid the salmonid spawning season and the badger breeding season. Further detail is provided in Chapter 6 (Biodiversity) of the EIAR and Section 5.6 of this CEMP.

The construction phase can be broken down into five main phases as follows:

- Civil works – 14 months
- Electrical works – 12 months
- Turbine delivery – 4 months
- Turbine installation – 4 months
- Commissioning – 2 months

Figure 3-1 presents an indicative schedule for the construction works.

ID	Task Name	Task Description
1	Site Health and Safety	
2	Site Compounds	Site compounds, site access, fencing, gates
3	Site Roads	Construct roads, install drainage measures, install culvert, install water protection measures
4	Turbine Hardstands	Excavate base, construct hardstanding areas
5	Turbine Foundations	Fix steel, erect shuttering, concrete pour
6	Substation Construction & Electrical Works	Construct substation, underground cabling between turbines, export cabling
7	Backfilling & Landscaping	
8	Turbine Delivery and Erection	
9	Substation Commissioning	
10	Turbine Commissioning	

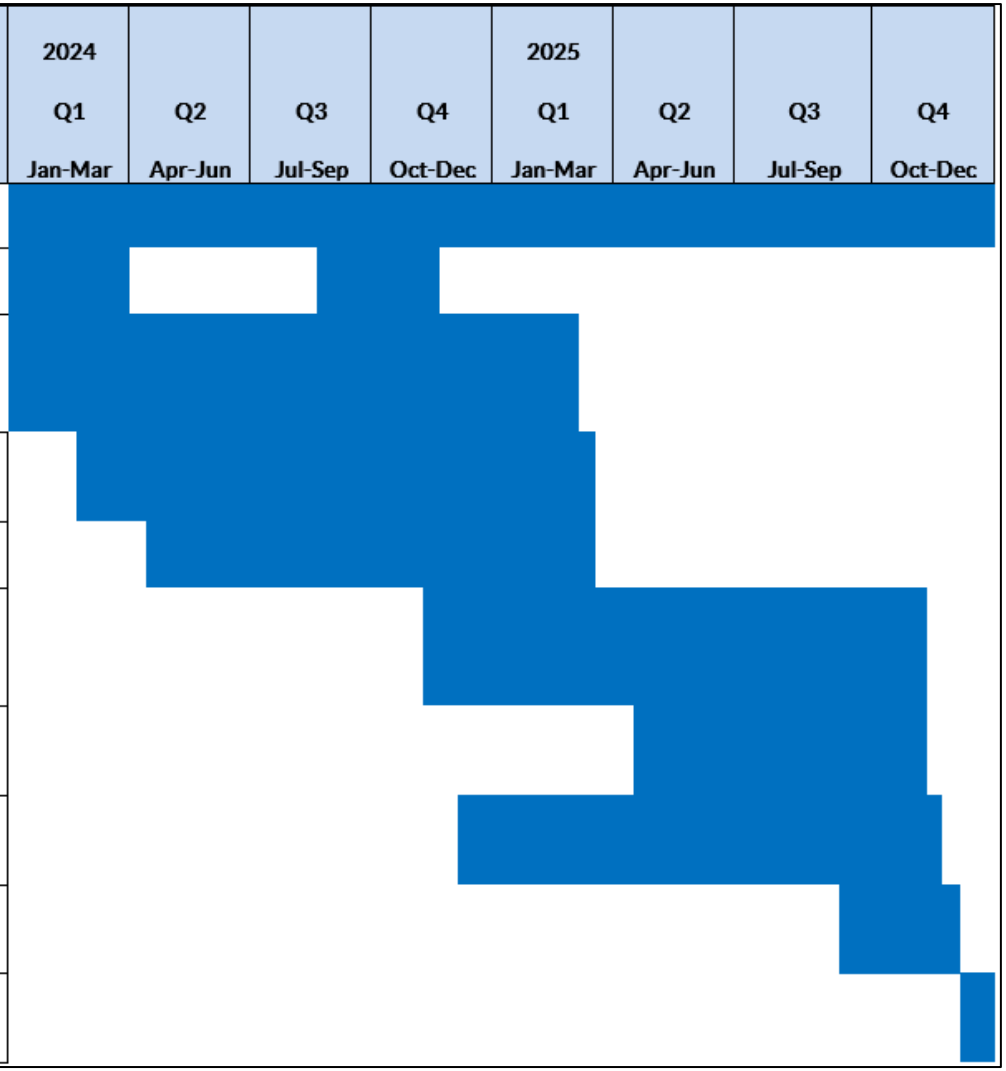


Figure 3-1 Indicative Construction Schedule

The main tasks to be completed in line with the above phases are:

Civil Works:

- Tree felling required to facilitate the proposed development will be carried out in advance of the civil works;
- Improve hardcore covering at the site entrance from the R704 and clearance works to ensure adequate visibility in both directions and capacity to facilitate delivery of large turbine components;
- Construct secure construction site boundary fencing as required;
- Construct new site roads, drainage ditches and culverts;
- Carry out necessary improvement works to existing site roads, drainage ditches and culverts;
- Clear and construct hardcore area for two temporary construction compounds and associated parking areas and install facilities;
- Prepare excavation areas at three proposed borrow pit locations as required;
- Construct remaining road infrastructure, hard-standing areas and crane pads;
- Install ducting in the roads for electrical and telecommunications cables;
- Install permanent meteorological mast;
- Prepare on-site substation compound and associated drainage ditches and culverts;
- Construct substation control buildings as well as bunds and plinths as necessary for transformers and electrical equipment. Erect security fencing around substation;
- Prepare turbine base areas. Store excavated material locally for backfilling and re-use, where possible. Place blinding concrete to turbine bases on competent strata. Fix reinforcing steel and anchorage system for tower section. Construct shuttering. Fix any ducts etc. to be cast in. Pour concrete bases. Cure concrete and remove shuttering after a suitable number of days;
- Backfill around tower foundations and prepare the area to the specific requirements of the turbine supplier and installer;
- Excavate trench and install ducting for grid connection between the on-site substation and the proposed connection point to the existing overhead 110kV transmission line in Ballyvool, including stream crossings;
- Establish launch and receiving pits for horizontal directional drilling (HDD) underneath the River Arrigle and complete drilling works;
- Construct bases and steel towers for underground cable transition to overhead line at existing overhead 110kV transmission line connection point in Ballyvool;
- All improvements and temporary modifications required to facilitate delivery of the turbine components from Belview Port to the site entrance;
- Upon completion of commissioning works, commence reinstatement works on surrounding lands as required;
- Remove temporary site offices, reinstate northern construction compound to pre-construction condition, provide secured site access and signage as required;
- Upgrade southern temporary construction compound to accommodate permanent public car park and install picnic/seating facilities and signage; and
- Complete landscaping works.

Electrical Works:

- Install internal and external electrical equipment at the on-site substation;
- Install medium voltage (MV) electrical cabling and fibre-optic telecommunications cabling between the turbines and the on-site substation in the underground ducting; and
- Install electrical and telecommunications cabling from the on-site substation to the existing overhead 110kV transmission line in Ballyvool.

Turbine Delivery, Installation and Commissioning:

- Prepare transport delivery plan for the turbine components from Belview Port to the site;
- Co-ordinate approval for deliveries with the relevant authorities;
- Erect cranes and associated equipment for installation of turbine components;
- Erect tower sections and nacelle first, followed by the turbine blades;
- Complete electrical connection of each of the turbines to the installed MV electrical network;
- Commence turbine commissioning and testing; and
- Complete commissioning and authorisation for wind farm to commence operations.

3.2 Construction Hours

The hours of construction activity will be limited to avoid unsociable hours, where possible. Construction operations shall generally be restricted to between 07:00hrs and 19:00hrs on weekdays and between 07:00hrs and 14:00hrs on Saturdays.

However, to ensure that optimal use is made of good weather periods or at critical periods within the programme (i.e., concrete pours or to accommodate delivery of large turbine components along public routes), it may be necessary on occasion to work outside of these hours. Any such out of hours working will be agreed in advance with the Local Authority.

3.3 Employment

It is anticipated that approximately 100 persons will be directly employed during peak construction activities.

3.4 Summary of Key Project Elements

3.4.1 Wind Turbines

The proposed wind turbines will have a maximum tip height of up to 185m. Detailed drawings, which accompany the planning application, show a typical turbine that may be used for the proposed development, however, the exact make and model of the turbine will be dictated by a competitive tender process of the various turbines on the market at the time, but will not exceed the maximum size envelope set out within the EIAR (i.e. tip height of up to 185m and rotor diameter of up to 155m). A drawing of the typical size envelope of the proposed wind turbine is shown in Drawing No. 10730-2032.

The proposed wind turbines will have an assumed rated electrical power output of between 5 – 6 megawatts (MW) which would result in an estimated installed capacity of between 105 – 126 MW for the proposed wind farm. This may vary as a result of the final turbine type, power output modelling and turbine development over the period leading up to commencement of construction and turbine procurement.

The turbines installed on the site will be the conventional three-bladed, tubular tower model with horizontal axis. The rotor blades are bolted to the central hub, which is connected to the nacelle. The nacelle typically holds the following turbine components as shown in Figure 3-2:

- Generator;
- Electrical components; and
- Aviation lighting to Irish Aviation Authority (IAA) specifications.

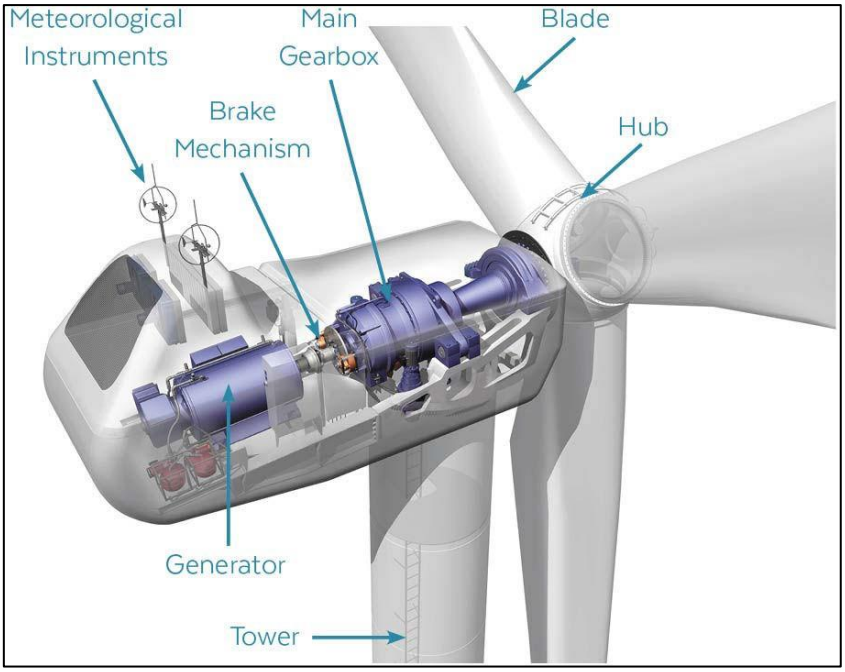


Figure 3-2 Typical turbine nacelle and hub components

The wind turbines will be geared to ensure that the rotors of all turbines rotate in the same direction at all times. The entire nacelle and rotor are designed to rotate, or 'yaw', in order to face the prevailing wind. A wind vane located on the nacelle of the turbine controls the yaw mechanism. A control unit is typically located at the base of the turbine and an internal lift or ladder leads up to the nacelle where the shaft, generator and gearbox are located.

The turbine tower is typically a conical steel tube with multiple layer paint finish. Towers generally comprise a steel ring at the base of the tower which is assembled on top of the concrete foundations. The first section is bolted to the steel base, which is cast into the concrete foundation. The tower is usually delivered to site in three to six sections. The base of the tower is typically around 5m in diameter, tapering to approximately 2-3m where it is attached to the nacelle. The tower is accessed by a galvanised steel hatch door, which will be kept locked except during maintenance. The nacelle is typically 4m in width and varies in length depending on the final hub height. The exact details of the turbine tower will be dictated by final selection of the turbine make and model but will be within the design envelope outlined above.

The blades of modern turbines are generally made of fibreglass or carbon fibre reinforced polyester and are aerodynamically shaped to improve efficiency and lower noise production.

The turbines are multi-ply coated to protect against corrosion. It is proposed that the turbines will be of an off-white or light grey colour to blend into the sky background.

3.4.2 Turbine Foundations

Construction of the turbine bases will require excavation of the surrounding soil from the foundation and crane hardstanding area to founding level with access being provided from adjacent roads at or near the surrounding ground level. The soil will be replaced with select granular fill where required.

Each wind turbine will require a reinforced concrete foundation comprising a base slab bearing onto rock or other competent substrata with a central upstand to support the tower. The foundations for each turbine will be designed by the appointed civil designer. The exact size of

the foundation will be dictated by the turbine manufacturer, and the final turbine selection will be the subject of a competitive tender process. It is anticipated to be approximately 24m in diameter.

Different turbine manufacturers use different shaped turbines foundations, ranging from circular to hexagonal and square, depending on the requirements of the final turbine supplier. A worst case estimate of 660m^3 of concrete has been assumed as part of the EIAR. The turbine foundation transmits any load on the wind turbine into the ground. After the foundation level of each turbine has been formed on competent strata, the bottom section of the turbine tower or "can" is levelled (Figure 3-3). Reinforcing steel is then built up around and through the can as in Figure 3-3 and the outside of the foundation is shuttered with demountable formwork to allow the pouring of concrete.

Figure 3-3 Levelled turbine tower can (left) and steel reinforcement being added (right)

3.4.3 Access Roads and Hardstanding

The proposed development site will be accessed via the R704 Regional Road. The site entrance access track will intersect the L7451 Local Road in order to access the main wind farm site, and at this crossing point, traffic control measures will be implemented to ensure the safety of public road users and site traffic. This will include manning the junction with flagmen during particularly busy periods such as turbine pours. Internal access roads will be constructed as part of the initial phase of the construction of the wind farm. The layout of proposed new roads and road upgrades is shown on Drawing No. 10730-2005. Material will be sourced from the proposed on-site borrow pits to provide the required base material for the internal roads. The final graded surface material may be sourced from local quarries (such as Roadstone Kilmacow, Kent Quarry and quarries at Bennettsbridge, to the southeast of Kilkenny Town).

New roadways will have a running width of approximately 5m (5.5m including shoulders), with wider sections at corners and on the approaches to turbine locations. The proposed new roadways will incorporate passing bays to allow traffic to pass easily while travelling around the site. Soil excavated as part of the construction of the internal roads will be sidecast, bermed and profiled on either side of the roadway. It is proposed that the majority of excavated material will be used for borrow pit reinstatement with the remainder used locally on-site for landscaping. All new roadways will be constructed with a 2.5% camber to aid drainage and surface water run-off. The surface water run-off management during both the construction and operational phases of the proposed development is designed to collect rainfall run-off from impermeable surfaces and direct it to drains installed around new infrastructure and upgraded roads. Further details on surface water management during construction are provided in Section 5.3.

Hardstanding areas consisting of levelled and compacted hardcore will be constructed around each turbine base. The hardstanding areas are used mainly to accommodate large cranes used in the assembly and erection of the turbines, offloading and storage of turbine components, and generally provide a safe, level working area around each turbine. This area is designed primarily for the construction phase works but will also provide safe access for maintenance during operations. The hardstanding area at each turbine is extended to cover the turbine foundations once the foundation infrastructure is in place. The exact size, arrangement and positioning of hardstanding areas are determined by turbine supplier requirements but will be contained within the maximum dimensions described and assessed in the EIAR. A typical hardstanding layout is shown on Drawing No. 10730-2031.

Unbound, levelled assembly areas will be located adjacent to the hardstanding areas at each turbine as shown on Drawing No. 10730-2031. These assembly areas are required for offloading turbine blades, tower sections and hubs from trucks until such time as they are ready to be lifted into position by cranes. They will be surfaced with Clause 804 material or similar.

Similar levelled storage areas will be prepared at the construction compounds for temporary material storage and handling prior to construction. Material will be removed from the temporary storage and assembly areas, and the ground reinstated at the completion of the construction works, except for at the southern construction compound where this area will be upgraded to accommodate the permanent public car park and recreational facilities.

3.4.4 Stone and Fill Requirements

As part of construction of the proposed development, a significant amount of stone and aggregate fill material will be required. This will be used under and around key infrastructure including the turbines, substation, site roads, hardstands and construction compounds. The following are estimates of the material requirements at the various main infrastructure locations:

- Internal access tracks – 50,325m^3 of which 33,000m^3 will come from onsite borrow pits;
- Substation and construction compounds – 24,570m^3, all of which will come from onsite borrow pits;
- Turbine hardstand, blade set-down area and vehicle turning area – 121,803m^3, of which 106,703m^3 will come from onsite borrow pits; and
- Turbine foundations – 14,785m^3, all of which will come from off-site sources.

By sourcing the majority of the required stone volume from the onsite borrow pits, the volume of traffic that will occur on public roads in the area will be significantly reduced.

Hardstands and site roads will be constructed to be above the existing ground level. The lower layer of this will be lower grade stone, with the top 150mm being high quality compacted gravel. Internal cable trenches which connect each turbine to the proposed onsite substation will be up to a maximum of 1500mm deep, with the first 600mm being backfilled with sand. The excavated material will be used to complete the backfilling to the surface.

3.4.5 Borrow Pits

It is proposed that up to three borrow pits will be constructed as part of the proposed development, in order to provide a source for the majority of stone material requirements within the site itself. These are located near T3, T6 and T15, with each covering an area of approximately 17,000m^2. The locations of these borrow pits are shown on Drawing No. 10730-

2005. Having three borrow pits onsite will minimise material transport on site and will minimise the depth to which the borrow pit excavations will be required.

Once the required rock has been extracted from each borrow pit, they will be reinstated using any surplus inert material from the site and made secure using permanent stock proof fencing. It is also proposed to replant forestry in these areas on the spoil which will have been used to reinstate them.

Rock and fill material may need to be extracted from a number of proposed turbine foundation locations as part of the required excavations there. In that case, this material will be used where possible to replace the material requirements from borrow pits, meaning the figures may be lower than mentioned above. Rock will be extracted from the proposed borrow pits using two main methods; rock breaking and blasting.

3.4.6 Spoil Management

The use of the borrow pits shall be phased. This will then allow materials to be placed in the first borrow pit thereby minimising the volume of soils requiring temporary storage. In order to further reduce temporary storage requirements, reinstatement of soils and turves around infrastructure, and in restoration and landscaping works on areas of excavated/disturbed ground, will be carried out during the construction phase or as soon as is practical after the completion of the works in any one area of the site. Approximately 164,300m^3 of stone material will be excavated from the borrow pits for use onsite and a total of c. 211,500m^3 of material will be used to reinstate the borrow pit areas as well as landscaping areas.

Topsoil and sub-soil will be stockpiled separately. Turves will be stored turf side up and will not be allowed to dry out. Stockpiles will be isolated from any surface drains and a minimum of 50m away from watercourses. Measures such as interceptor ditches around the bases of these areas, sediment traps and seeding of the bunds shall be incorporated to prevent runoff of suspended solids laden surface water and soil erosion. No permanent spoil or stockpiles will be left on site.

The method for restoration of excavated or disturbed areas is to encourage stabilisation and early establishment of vegetation cover. Where available, vegetative sods/turves or other topsoil in keeping with the surrounding vegetation type will be used to provide a dressing for the final surface.

To prevent erosion and run-off and to facilitate vegetation reinstatement, any sloped embankment will be graded such that the slope angle is not too steep and that embankments match the surrounding ground profile.

3.4.7 On-Site Substation

It is proposed to construct a 110kV electricity substation within the site boundary between T10 and T11 as shown on Drawing No. 10730-2005. This substation will provide a connection point to the existing overhead 110kV electrical transmission line running from Great Island to Kilkenny. The grid connection will be via a 'looped-in' arrangement and is described in more detail in Section 3.4.8.

The construction and electrical components of the on-site substation will be to EirGrid specifications and within the parameters assessed in the EIAR. The substation compound will have a maximum area of approximately 18,000m^2, measuring up to 150m by 120m, and will include one control building and electrical components necessary to export generated power

from the wind farm to the transmission system. A second smaller building will be required for site offices and welfare facilities.

The main control building will measure up to 18m by 25m and 8.7m in height. A second smaller switchgear building will measure up to 20.2m by 10.8m.

The substation and compound will be surrounded by steel palisade fencing which will be approximately 2.6m in height. Internal fences will also be provided to segregate different areas within the main substation compound. Lighting will be required on site and this will be provided by lighting poles located around the substation and exterior wall mounted lights on the control buildings.

The wind farm control buildings will include the Independent Power Producer (IPP) and ESB control room, as well as an office space and welfare facilities for staff during the operational period. Toilet facilities will be installed with a low-flush cistern and low-flow wash basin. Due to the specific nature of the proposed development there will be a very small water requirement for occasional toilet flushing and hand washing. It is proposed to install a rainwater harvesting system as the source of water for this, with all potable water being brought onsite in bottles.

It is proposed to manage wastewater from the staff welfare facilities in the control buildings by means of a sealed storage tank, with all wastewater being tankered off-site by a permitted waste collector to a wastewater treatment plant. It is not proposed to treat wastewater on-site. The proposed wastewater storage tank will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying.

A local electrical power supply will be provided as a back-up to the on-site substation for light, heat and power purposes. The local supply will be designed and constructed by ESBN and the exact source of the supply will be confirmed and determined by ESBN. It is anticipated that the local supply will enter the site by either overhead or underground MV cable and will include a step-down transformer to covert to low voltage (LV). The supply will enter the substation by underground cable and terminate on a distribution board in the control building.

3.4.8 Internal Underground Cabling

Each turbine will be connected to the proposed on-site substation at Castlebanny via underground MV cables. Fibre-optic cables will also connect each wind turbine to the wind turbine control system located within the Control Building. The electrical and fibre-optic cables running from the turbines to the onsite substation compound will be run in cable ducts up to 1.5m below the ground surface within the proposed internal roads and/or their verges.

3.4.9 Grid Connection

Approval for connection of the wind farm to the national electrical transmission network will be sought from EirGrid. A valid grid application can only be made subsequent to a grant of permission for the wind farm. It is proposed that the on-site substation will connect to the transmission network via underground cable and no overhead lines will be required. A detailed methodology for the proposed grid connection works is provided in Appendix 2-8 of the EIAR.

The existing 110kV overhead transmission line will be 'broken' at the grid connection point in the townland of Ballyvool as shown on Drawing No. 10730-2005. The overhead line will transition to an underground cable at this location via two new overhead masts. The underground cable route is shown in Drawing No. 10730-2005 and has an overall length of approximately 4km. Approximately 1km of this length will be within the proposed wind farm site

with approximately 0.3km installed in the public road corridor. The remaining approximately 2.7km will be located off-road in third party lands.

The grid connection will require the crossing of four watercourses, namely the River Arrigle, two smaller tributaries feeding into the River Arrigle from the west (EPA name: Mullenhakill Stream) and east (EPA name: Garrandarragh Stream) and a drainage ditch as shown in Figure 9-2 of the EIAR. The River Arrigle crossing will be carried out by horizontal directional drilling (HDD) beneath the river. The launch and receiving pits for the HDD will be located outside of the designated River Barrow and River Nore SAC area as shown on Drawing No. 05699-DR-003. The crossing of the Mullenhakill Stream will also be carried out by HDD. The Garrandarragh Stream crossing to the east of the River Arrigle will be via an existing bridge on the local road. Further details for watercourse crossings are provided in Section 5.3.1and will be agreed with KCC, the Office of Public Works (OPW) and Inland Fisheries Ireland (IFI) prior to commencement of the works.

The underground electrical connection from the on-site substation to the existing overhead line will comprise high voltage (HV) cables at 110 kV. Fibre optic cables will also be installed for communications. Cabling will be installed in ducts which are laid in trenches approximately 1.5m below the ground surface. In the public road, the exact depth will be subject to the presence of existing utilities and services in the road. Typical details of cable trench installations are provided in the drawings in Appendix 2-1 of the EIAR.

Joint bays are pre-cast concrete chambers where individual lengths of cables are joined to form one continuous cable. Joint bay locations have been selected to maximise the lengths of cables, following consideration of cable detailed design issues, the space requirements for cable drums and cable pulling equipment as well as the impact on local residents and road users. The joint bays will be located at various points along the ducting route within the corridor that has been assessed as specified by EirGrid requirements and as shown on the drawings in Appendix 2-1.

A joint bay will be constructed in a pit. The bay will measure up to 6m x 2.5m x 2m. A reinforced concrete base and sides will be constructed in the bay to accommodate the jointing enclosure. Communication chambers, which are similar to small manholes, will also be installed at the joint bay locations to facilitate connection of fibre-optic communication cables.

A Traffic Management Plan (TMP) has been prepared for the proposed development and is included as Appendix B to this CEMP. This is a living document and will be used by the Contractor throughout the construction project to address traffic management. A confirmatory survey of the road condition, including the condition of all water crossings in the public road, will be carried out along the grid connection route in advance of any works, and these will be submitted to the local authority.

3.4.10Meteorological Mast

A permanent meteorological mast will be installed as part of the proposed development. The mast will be equipped with wind monitoring equipment at various heights and will be a slender, free-standing lattice structure up to 100m in height. The mast will be constructed on a hardstanding area sufficiently sized to accommodate the crane that will be used to erect the mast. The mast will be located to the west of T9 and T11 as shown on Drawing No. 10730-2005 and will be accessed via an existing internal access road. An indicative detail of the proposed met mast is shown on Drawing No. 10730-2037.

3.4.11Forestry

A portion of the proposed works are located within an area which is currently planted with forestry. The majority of this area is located within Coillte lands, while some is located within private lands. As part of the proposed development, there will be a requirement to fell some of this forestry in the areas immediately around the footprint of the wind farm infrastructure. All tree felling will be subject to appropriate consent from the Forest Service in the Department of Agriculture, Food and the Marine (DAFM). The total area of forestry to be felled is estimated to be approximately 82.9 ha.

A comprehensive harvesting plan combined with best practice operating techniques will ensure the protection and enhancement of the environment at Castlebanny Wind Farm during forestry felling. All felling operations associated with this project will adhere to the *Felling and Reforestation Policy (Forest Service), Standards for Felling and Reforestation (Forest Service), Code of Best Forest Practice (Forest Service, 2000), Forest Harvesting and the Environment (Forest Service, 2000) and Forest* and *Water Quality Guidelines (Forest Service, 2000)*. A Forestry Report, including harvesting plan, has been prepared to examine the effects of the proposed forestry felling activities associated with the proposed development and is included in Appendix 2-4 of the EIAR. The Forestry Report also sets out specific mitigation measures with regard to protection of the environment during felling operations and is included as Appendix B to this CEMP.

The remaining area of Coillte-owned forestry within the site boundary, which will not require felling as part of the wind farm development, will continue to be managed as a commercial forestry operation and will be scheduled for felling in future in accordance with existing felling plans. Construction of the wind farm will be co-ordinated with ongoing forestry maintenance and felling operations to ensure there is minimal impact to the schedule of either works.

3.4.12Recreation and Amenities

At the end of the construction phase of the proposed development, it is proposed to convert the southernmost construction compound to a permanent public car park, which will allow for improved public access to the existing South Leinster Way (SLW), and to the proposed on-site walking routes. Access to this car park will be via the L7451 local road. The site entrance here will have sufficient visibility for cars and cyclists.

The proposed walking routes will utilise the site roads and will offer a number of routes (of varying lengths) which will be marked around the site. Small signs will be used to mark these routes at site road junctions and otherwise at regular intervals. Eight outdoor exercise stations will be located along one of the walking routes. A small number of picnic tables and bench seats will be provided within the car park area. A small number of simple bench seats will be provided at suitable locations along the proposed walking routes onsite. A number of informative signs will be positioned at the proposed car park to provide information to the public. In addition to this, waypoint signage will be provided around the site at junctions as required.

3.4.13Decommissioning

The wind turbines proposed as part of the proposed development are expected to have a lifespan of 35 years. Following the end of their useful life, the wind turbines may be replaced with a new set of machines, subject to planning permission being obtained, or the site will be decommissioned fully, with the exception of the electricity substation, access tracks and the recreation car park.

Upon decommissioning of the proposed wind farm, the wind turbines will be disassembled in reverse order to how they were erected. All above ground turbine components will be separated and removed off-site for recycling. Turbine foundations and hardstanding areas will remain in place underground and will be covered with earth and allowed to revegetate or reseed as appropriate. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in potentially significant environment nuisances such as noise, dust and/or vibration. The site access tracks will be in use for additional purposes other than the operation of the wind farm (e.g. for forest/agricultural and recreational access) and therefore it will be appropriate to leave the site access tracks in situ for future use.

The on-site substation and grid connection will not be removed at the end of the useful life of the wind farm project as it will form part of the national electricity network. Therefore, the substation and grid connection infrastructure will be retained as a permanent structure and will not be decommissioned.

3.5 Roles and Responsibilities

An indicative organisational chart is provided below which identifies the typical roles and associated responsibilities for the construction of the proposed development. This will be subject to specific contractual agreements upon appointment of a Main Contractor and any additional/further appointments required in compliance with a grant of permission.

The Project Manager will have overall responsibility for environmental management and compliance during the construction works. He/she will be supported in this role by an SHEQ Officer, or Environmental Officer as appropriate, who will liaise directly with the relevant regulatory bodies and stakeholders throughout the construction phase. Additional specialist input will be included from an ecological clerk of works, archaeologist or other disciplines as required.

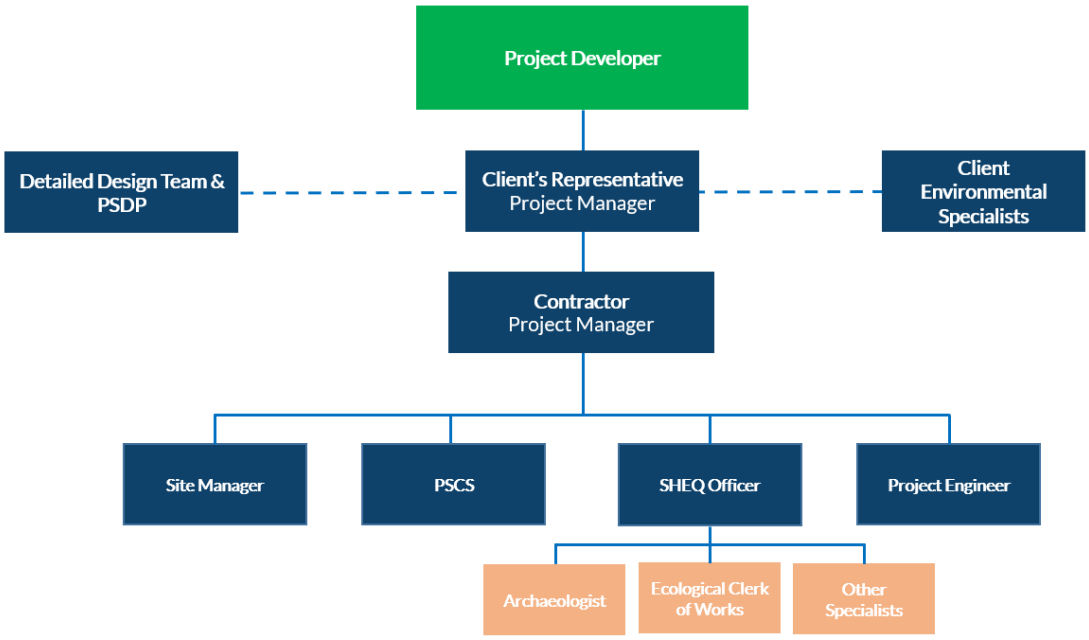


Figure 3-4 Project Development Organisation Chart

3.6 Consents, Licences, Notifications and Permissions

The key consents, licences, notifications and permissions which may be required for the project are summarised as:

- Planning permission and associated planning compliance;
- Commission for Energy Regulation (CER) Authorisation and Licence to Generate;
- A Commencement Notice for Development will be lodged with the Building Control Authority (BCA) via the online Building Control Management System (BCMS) not less than 14 days and not more than 28 days before development works commence on site;
- Abnormal loads – it is envisaged that permits will be required for the abnormal loads that will be required for the delivery of turbine components to the site;
- Road opening licences for underground cable works;
- Archaeological excavation licence, as required;
- OPW consultation and agreement for watercourse crossings;
- IFI method statement approval for works in or near to watercourses;
- NWPS consent will be required for surface water protection measures; and
- 30-day prior notification to the Irish Aviation Authority (IAA) ahead of turbine erection works.

The above list is non-exhaustive but identifies the key consents, licenses, notifications and permissions required for the project. This list will be further populated as required through planning compliance and stakeholder engagement to ensure that any further consents are identified as early as possible and do not impact on the construction programme.

Additional method statement and monitoring programme submissions may be required by the Local Authority as part of the grant of planning.

4.0 CONTRACTOR FACILITIES, SAFETY AND SITE SECURITY

4.1 Construction Compound and Facilities

At the commencement of the construction phase, two temporary compound areas will be constructed at locations as shown Drawing No. 10730-2005 to provide office space, welfare facilities, car parking and material laydown areas. During the operational phase of the proposed development, the southern compound will be re-purposed as a public car park for the proposed amenity trails. The northern compound will be reinstated by planting trees, with any temporary placed stone being used towards reinstatement of the nearest on-site borrow pits.

The site accommodation will consist of temporary porta-cabins constructed on unbound, levelled hardcore aggregate. Trees will be felled and soil covering stripped within the compound areas and stockpiled locally for reuse. Broken stone and appropriate capping aggregate will be used to create a base for the welfare facilities as well as a suitable surface for material lay-down areas and car parking. The southern compound will be located close to the site entrance and the northern compound will be located close to T15 as shown on the drawings. The use of two separated construction compounds will improve efficiency and capacity across the wind farm site area.

Both compounds will be secured by means of a chainlink fence on timber posts which will be approximately 3m in height. There will be one access gate into each compound which will be secured and controlled by the Contractor. A combination of bottled water, tankered water supply and rainwater harvesting will be used to supply water for the welfare facilities in both compounds during the construction works. Rainwater harvesting will be utilised to supplement

the water supply for non-potable uses. Wastewater generated at the welfare facilities in the construction compounds will be managed by means of a temporary sealed storage tank, with all wastewater being tankered off-site by a permitted waste collector to a wastewater treatment plant. The proposed temporary wastewater storage tanks will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying.

Fuels, oils, lubricants and other hazardous liquids required for maintenance of equipment during the construction phase will be stored on a dedicated impermeable storage platform in the compound. This area will be away from drains and open water and will be easily accessible for machinery to refuel and to accommodate fuel deliveries to site. Fuel containers will be stored within additional secondary containment e.g. bund for static tanks or drip trays for smaller mobile containers. A fuel bowser, used for refuelling equipment on-site where off-site refuelling is not possible, will be stored in the compound area on a dedicated storage platform. Whenever possible, this bowser will be refilled off-site and brought to site for on-site refuelling. The fuel bowser will be hauled around the site by a suitably equipped 4x4 vehicle.

A temporary self-contained wheelwash will be installed on the site access road as shown in Drawing No. 10730-2005 to minimise the transfer of dirt and dust from the site onto the public road and to minimise the potential for transfer of alien invasive species onto the site. A typical detail of such a system is provided in Drawing No. 10730-2040. A system which utilises recirculated wash water will be used to minimise raw water consumption for washing activities. The wheelwash will be emptied on a regular basis in accordance with supplier recommendations and the nature of soiling on vehicles, with the collected material being removed off-site as waste material.

A road sweeper will be available if any section of the surrounding roads become soiled by vehicles associated with the proposed development.

Indicative compound layouts are presented in Drawing No. 10730-2030 showing the proposed arrangement of welfare facilities, fuel storage, car parking and storage areas. The actual arrangement of cabins and storage areas within the compounds will vary depending on Contractor requirements but will be similar to that shown in the drawings.

4.2 Safety and Security

All activities carried out by the appointed Contractor on the proposed development will be in accordance with the requirements of the *Safety, Health and Welfare at Work Act 2005* as amended and Regulations made under this Act.

The scale and scope of the proposed development will require the appointment of a Project Supervisor Design Process (PSDP) and Project Supervisor Construction Stage (PSCS) in accordance with the provisions of the *Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2103)*, as amended. These persons will be appointed by the Developer and notified to the Health and Safety Authority (HSA) prior to commencement of detailed design works (in the case of the PSDP) and prior to commencement of construction (in the case of the PSCS). The PSDP will prepare a Preliminary Health and Safety (H&S) Plan which will identify any particular risks, residual risks and particular sequences of work that are envisaged during the design of the works.

Prior to commencement of construction, this Preliminary H&S Plan will be provided to the Contractor and the PSCS will further develop the document to prepare a Construction Stage H&S Plan addressing all aspects of the construction process and providing relevant contact details and emergency response procedures for the project. This H&S Plan will be developed at

the procurement stage and developed further at construction stage to the satisfaction of the Developer. The H&S Plan will identify the potential safety hazards associated with the site and the works and assess the associated risks. Mitigation and control measures will be implemented to minimise the identified risks.

Evidence of completion of construction safety training, typically in the form of a Safepass Card, will be required for all construction personnel prior to commencing on site. A record of Safepass Cards and personnel approved for entrance to site will be completed as part of a site induction process. The Contractor's H&S Plan will detail the site induction and access requirements. Where relevant, equipment operators or specialist works will require personnel to hold a valid Construction Skills Scheme Card. All equipment and machinery used on site will be appropriately certified for its intended purposes. The Developer will ensure that only competent contractors are appointed to carry out the construction works on the site.

Public safety will be addressed by restricting site access during construction works and the erection of security fencing as appropriate at construction works areas. There will be only one entrance to the wind farm construction site from the south which will be controlled by the Contractor. Construction vehicle access to the site will be via the R704 to the south, wherein construction vehicles will travel on internal access roads and cross over the L7451 local road as shown on Drawing No. 10730-2005. Access to the site from the L7451 will not be permitted. The site entrance gates from the R704 will be securely locked outside of construction hours to prevent unauthorised entry and will be monitored during construction hours to regulate access to the site for authorised personnel.

For the duration of the construction works, the South Leinster Way walking trial will be closed at the locations where it crosses into the site boundary. Appropriate signage will be erected directing the public onto analternative route as set out in Chapter 5 (Population and Human Health) of the EIAR. Access rights to the forestry lands for local groups (i.e. gun clubs, ramblers etc.) will also be restricted during the construction phase to minimise the risks for public health and safety.

4.3 Signage

Warning signs will be erected at the construction works areas clearly stating that construction works are underway (see Figure 4-1). A notice board will be erected at the site entrance and at the construction compound gates with information on the contact details for site management, PPE requirements for the site and any other information deemed necessary in accordance with the H&S Plan.

Signage will be erected on both sides of the R704 Regional Road both north and south of the site entrance location to warn approaching vehicles of the construction site entrance location and the potential presence of slow-moving vehicles. Signage will also be erected on the L7451 Local Road where construction vehicles will cross the road. On the internal roadway, signage will be erected at either side of the L7451 crossing to remind construction traffic that this local road is not permitted to be used as part of the project construction works. Prior to exit from the site onto the R704, signage will be erected directing traffic to main settlement areas to the left and right.

Road signage on the public road will be in accordance with the current *Traffic Signs Manual*[2] Chapter 8 and associated best practice guidelines. Signage in respect of traffic management is

[2] Department of Transport, Tourism and Sport, *Traffic Signs Manual – Chapter 8: Temporary Traffic Measures and Signs for Roadworks* (August 2019)

discussed in the TMP in Appendix B and will be in accordance with the Local Authority recommendations and relevant planning conditions. Within the site, maximum speed signage will be erected along the access roads for construction vehicles and health and safety signage will be erected at borrow pits and where deep excavations, or other areas of increased risk, are occurring. Signage will also be erected as a reminder to concrete delivery drivers that concrete truck wash-out is not permitted on-site and identifying the area(s) where concrete chute wash-out is permitted.

Figure 4-1 Indicative Safety Signage (Source: safetysigns.ie)

4.4 Emergency Response Plan

The Contractor will be responsible for developing a detailed Emergency Response Plan (ERP) for the proposed works, to cover health and safety emergencies as well as environmental emergencies, as part of the H&S Plan. This ERP shall be activated in the event of an emergency such as an accident, fire, spillage, collapse etc. and will provide details on who is required to be notified, first aid facilities and closest hospitals. The ERP will also include details of all personnel inducted and authorised to work on the site as well as next of kin contact details and relevant medical information.

In the event of an emergency, the SHEQ Officer and Project Manager will be notified immediately and will determine the scale of the emergency and the requirement for the assistance of emergency services. Works will cease in the area of the incident and contact will be maintained with the emergency services to direct them to the scene of the incident as required.

As part of the ERP, an evacuation drill will be carried out on a regular basis to make all personnel aware of the procedure to be followed in the event of an emergency where a full site evacuation is required. Emergency muster point(s) will be identified at suitable locations in the construction compounds and the ERP will outline the persons responsible for checking names at the safety muster points. Records will be maintained of such drills.

The ERP must include contact names and telephone numbers for the relevant local authorities (all sections/departments) including ambulance, fire brigade, An Garda Siochána and the HSA. Reporting of environmental emergencies to the local authority will be required as well as other relevant stakeholders such as IFI, NPWS or the EPA.

Further information relating to the management of spills or leaks is provided in Section 4.6 and the procedure for responding to a health and safety or environmental incident is outlined in Section 4.7.

4.5 Fuels and Oils Management

Construction vehicles will be refuelled off-site, wherever possible. This will primarily be the case for road vehicles such as vans and trucks. However, for construction machinery that will be based on-site continuously, a limited amount of fuel will have to be stored on site. On-site refuelling of machinery will mainly be carried out using a mobile double skinned fuel bowser typical of that shown in Figure 4-2. Refuelling will be carried out at least 50m from any watercourse. The fuel bowser, typically a double-axle custom-built refuelling trailer, will be re-filled off-site, where possible, or at either of the two construction compounds and will be towed as required within the site by a 4x4 vehicle to where machinery is located. It is not practical or preferable for most heavy construction vehicles (such as cranes, excavators, dozers, dumpers etc.) to travel back to the refuelling point in the construction compounds given the size of the proposed wind farm site. The 4x4 vehicle will also carry fuel absorbent material and pads in the event of any accidental spillages. The fuel bowser will be parked on a level impermeable area in either of the construction compounds when not in use.

Figure 4-2 Typical mobile fuel bowser (Source: Clarke Machinery Group)

Oils, lubricants and other hazardous liquids required for maintenance of equipment during the construction phase will be stored on the dedicated impermeable storage platform in the construction compounds as described in Section 4.1. Any additional fuel containers, other than the fuel bowser, used for smaller equipment (such as generators, lights etc.) will be stored within additional secondary containment e.g. bund for static tanks or drip trays for smaller mobile containers. Taps/nozzles for fuels and storage containers for oils will be fitted with locks to ensure their use is controlled. Only designated trained and competent operatives will be authorised to refuel plant on site.

New clean ancillary machinery equipment such as hoses, pipes and fittings required on-site will be contained within a bunded area, however any used or damaged parts will not be stored on-site and will be removed immediately. Any repair works required on machinery involving fuel and oil control will be carried out off-site where practical, or in the construction compounds over an impermeable surface. Unless unavoidable, repair works carried out in the field where

machinery is operational will use spill trays and absorbent materials to prevent release of contaminants to the ground. Maintenance and repair works will be carried out at least 50m from any watercourse.

At least daily checks prior to start-up of plant and machinery will minimise the risk of break-down and associated contamination risks for on-site repairs. Records of daily pre-start checks will be maintained and kept in the site office. A clean site policy and diligent housekeeping will also reduce the potential of hydrocarbon release on-site.

4.6 Spill Control and Response

Emergency spill kits with oil boom and absorbent materials will be kept on-site in the event of an accidental spill. Spill kits will be kept in both construction compounds, the 4x4 vehicle transporting the fuel bowser and smaller spill control kits will be kept in all construction machinery. All construction personnel will be notified of where the spill kits are located as part of the site induction and will be trained on the site procedures for dealing with spills.

In the event of a leak or a spill in the field, the spill kits will be used to contain and absorb the pollutant and prevent any further potential contamination. The absorbed pollutants and contaminated materials will be placed into leak proof containers and transferred to a suitable waste container for hazardous materials in the construction compounds. Where a leak has occurred from machinery, the equipment will not be permitted to be used further until the issue has been resolved.

The SHEQ Officer (or equivalent appointed person) will be notified of any spills on-site and will determine the requirement to notify the authorities as set out in Section 4.7.

4.7 Incidents

All safety or environmental incidents associated with the project will be reported and investigated in line with the ERP. Typically, the following procedures will be followed in the event of an incident:

- Works will stop immediately where safe to do so;
- The SHEQ Officer will be contacted;
- The size of the incident will be assessed and determined if it can be controlled by site staff or if emergency services are required to attend;
- The appropriate enforcing authority will be contacted;
- The SHEQ Officer will investigate after the incident;
- The findings will be sent to the appropriate authority; and
- An action plan will be prepared to set out any modifications to working practices required to prevent a recurrence.

4.8 Complaints

This section sets out a procedure to manage and resolve any complaints received from members of the public during the construction phase of the proposed development. The following measures will be adopted and refined, as necessary, taking account of any relevant planning conditions. The following measures will be implemented to deal with complaints and the Final CEMP will contain more specific details with regard to phone numbers to contact:

- Clearly display a notice board at the site entrance so that the public know whom to contact if they have a complaint or comment;

- Personnel on site, including sub-contractors are required to perform their duties in accordance with this CEMP, and in such a way as to minimise the risk of complaints from third parties;
- All complaints received regarding the construction works will be recorded and categorised (e.g. noise, property damage, traffic, dust etc.) within a central Site Complaints Log. This complaints log will include the following key details:
    - Name, address and contact details of the complainant (with the complainant's permission);
    - Brief outline of the complaint;
    - Date of Complaint;
    - Name of person receiving complaint details; and
    - Agreed timeline for response to complaint.
- All complaints will be communicated to the Project Manager and the Developer immediately;
- All complaints will be followed up and resolved in so far as is practicable; and
- The complainant, Developer and other stakeholders will be kept informed of the progress in resolving the complaint.

5.0 ENVIRONMENTAL MANAGEMENT

As part of the development of this CEMP, a series of Environmental Management Plans (EMPs) have been prepared to ensure appropriate environmental management of specific aspects of the proposed works. The EMPs have been prepared in accordance with the design and mitigation measures set out in the EIAR and the NIS. The particular requirements outlined within the following plans are a summary of key implementation constraints, site specific obligations and best practice requirements with which the Contractor shall comply. The construction methodology for the proposed development is set out in Chapter 2 (Description of the Proposed Development) of the EIAR.

Construction of the proposed development will be carried out in line with best practice guidance in all areas of potential environmental impact and these specific guidance documents are identified within the following sections. Across the full project duration, the Contractor will utilise the general guidelines set out in the CIRIA C741 publication *Environmental Good Practice on Site (4th Edition)*[3].

Following grant of planning for the proposed development, the appointed Contractor will further develop this planning stage CEMP into a final CEMP which will incorporate any additional measures identified during the planning assessment process, specified in planning conditions and associated post-planning statutory body consultation for the management of the environment during the construction works. The final CEMP will include an updated and refined construction phase programme of works and will set out specific timings and requirements for surveys and monitoring prior to and throughout the construction works. The final CEMP will be a dynamic document and will be continuously reviewed and updated throughout the construction works to ensure it takes account of all environmental auditing and site inspections.

[3] CIRA *Environmental Good Practice on Site (4th Edition)* (C741) (2015)

5.1 Noise and Vibration

The Contractor will be required to have regard to BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites*[4], which sets out detailed guidance on the control of noise and vibration from construction activities.

An assessment of construction phase noise emissions has been carried out in Chapter 12 (Noise and Vibration) of the EIAR and outlines the predicted noise levels from construction activities at the closest noise sensitive locations (sensitive receptors). The SHEQ Officer, or equivalent, will supervise the works to ensure compliance with the noise and vibration limits set out in the Standards document referred above and the EIAR.

The following general measures for control of noise and vibration from construction works will be implemented:

- Construction working hours are limited to those set out in Section 3.2 to avoid noise generation during unsociable hours;
- Duration of works which create high levels of noise or vibration, such as rock-breaking, blasting or piling, will be limited and staggered to prevent constant annoyance;
- Communication channels will be established between the Developer/Contractor and local residents to inform of upcoming works which may generate higher than normal construction noise or vibration and provide a means for local residents to register complaints with regard to noise and vibration;
- The local authority will also be informed of the communication channels;
- The SHEQ Officer, or equivalent, will address complaints relating to noise and vibration;
- Periodic monitoring of construction noise and vibration during critical periods will be carried out at sensitive receptor locations; and
- Internal access roads will be maintained in good condition to minimise noise and vibration generation from heavy goods vehicles.

In addition to the above, the Contractor will be required to select plant and equipment with a low inherent potential for generation of noise and/or vibration in lieu of noisier alternatives and place noisy/high vibration equipment as far away from sensitive receptors as permitted by site constraints. Where possible, contractors will use noise dampers or other attenuation methods for particularly noisy operations. Compressors will be attenuated models, fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers. Any noisy plant, such as generators or pumps, which is required to operate outside of the typical working hours (for maintaining water levels or safety lighting etc.), will be surrounded by an acoustic enclosure or portable screen. Regular maintenance of plant and equipment will be carried out to ensure that the equipment is operated efficiently and generating minimal noise emissions. Plant or equipment which is not in use will be shut down while not required or throttled back to a minimum.

Specifically in relation to rock-breaking activities, the following measures will be employed as required:

- Fitting suitably designed muffler or sound reduction equipment to the rock breaking tool to reduce noise without impairing machine efficiency;
- Ensuring all leaks in air lines are sealed;

[4] British Standards Institute (BSI), *BS 5228-1:2009+A1:2014 Code of Practice for noise and vibration control on construction and open sites* (2008)

- Erecting acoustic screen(s) between compressor or generator and a noise sensitive area. Where possible, the line of sight between top of machine and reception point needs to be obscured; and
- Enclosing the breaker or rock drill in portable or fixed acoustic enclosure with suitable ventilation.

Where rock blasting occurs, a number of measures will be employed to minimise the effect of air overpressure. A reduction in the amount of primer cord used, together with the adequate burial of any cord that is above the ground, can give dramatic reduction to air overpressure intensities especially in the audible frequency range. Sensitive receptors downwind of a blast site are likely to be the most affected, so where issues with complaints are occurring, the blasts can be postponed during unfavourable weather conditions. Using the minimal required quantity of explosives will also reduce the air blast intensity and associated effects on receptors. The Contractor will also adhere to the recommendations contained within BS 5228: Part 1 and the *European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations 1988* in relation to blasting operations.

Further measures to minimise noise and vibration effects of blasting will include:

- Restriction of hours within which blasting can be conducted;
- Undertaking a publicity campaign before any work and blasting starts and providing written notification to potentially affected receptors;
- Firing of blasts at similar times to reduce the 'startle' effect;
- Providing on-going circulars informing people of the progress of the works;
- Recording any complaints related to blasting in accordance with the complaint's procedure set out in Section 4.8;
- Monitoring of noise and vibration effects by external bodies;
- Carrying out trial blasts in less sensitive areas to assist in blast designs and identify potential zones of influence;
- Ensuring appropriate burden to avoid over or under confinement of the charge;
- Accurate setting out, drilling and charging;
- Appropriate stemming with appropriate material such as sized gravel or stone chipping;
- Delaying detonation to ensure small maximum instantaneous charges;
- Using decked charges and in-hole delays;
- Blast monitoring to enable adjustment of subsequent charges;
- Good blast design to maximise efficiency and reduce vibration; and
- Avoiding using exposed detonating cord on the surface.

Further requirements with regard to noise and/or vibration monitoring which may be set out in planning conditions will be updated in the final CEMP.

5.2 Air Quality

The Contractor will have due regard to relevant guidance such as *The Control of Dust and Emissions during Construction and Demolition* published by the Greater London Authority (GLA) in 2104 and *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* published by the NRA (now TII) in 2011.

During the construction phase, dust or air pollutants generated from the proposed development will typically arise from:

- Movement of construction vehicles;
- Transportation of turbines and construction materials to and within the site;

- Excavation and crushing of rock for use as a base material for internal roads and hardstanding areas;
- Excavation, movement and placement of soil stockpiles; and
- Wind generated dust from stockpiles, exposed unconsolidated soils and roads.

An assessment of the potential effects of construction traffic movements associated with the proposed development is presented in Chapter 14 (Air Quality and Climate) of the EIAR. Maximum utilisation of the on-site borrow pits will reduce the need to import excavated materials to the site and where excavated material, concrete and building materials are required to be brought to site, local quarries (such as Roadstone Kilmacow, Kent Quarry, Kiltorcan and quarries at Bennettsbridge, to the southeast of Kilkenny Town) and suppliers will be preferred to minimise the carbon footprint of construction material deliveries.

In order to minimise emission of pollutants from plant and equipment, the following measures will be implemented during the construction works:

- Regular maintenance of plant and equipment will be carried out to ensure that the equipment is operated efficiently and generating minimal air emissions; and
- Plant or equipment will not be left running unnecessarily and low emission fuels will be used.

The greatest potential impact on air quality during the construction stage will be from dust emissions associated with the construction works. The proactive control of fugitive dust, rather than an inefficient attempt to control dust once released will ensure the prevention of significant emissions.

The following measures will be implemented to minimise the potential for dust generation:

- Minimisation of extent of working areas;
- Stockpiling of excavated materials will be limited to the volumes required to practically meet the construction schedule;
- Drop heights of excavated materials into haulage vehicles will be minimised to a practicable level; and
- Daily inspections by site personnel to identify potential sources of dust generation along with implementation measures to remove causes where found.

A Dust Management Plan (DMP) has been prepared which sets out the measures that will be implemented by the Contractor to minimise and control dust emissions (see Section 5.2.1) This DMP will be updated by the Contractor in the final CEMP to account for any additional measures identified in Planning Conditions.

5.2.1 Dust Management Plan

The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for impact from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The majority of any dust produced will be deposited close to the potential source and any impacts from dust deposition will typically be within 200m of the construction area. It is noted that the vast majority of construction works are located at distances greater than 200m from residential properties with the exception of small areas of work, namely along the grid connection route and the TDR, which will have a short duration at any one location.

In order to ensure mitigation of the effects of dust nuisance, a series of measures will be implemented. Site access roads shall be regularly cleaned and maintained as appropriate; dry sweeping of large areas shall be avoided. Hard surface access roads shall be swept to remove mud and aggregate materials from their surface while any un-surfaced access roads shall be restricted to essential site traffic only. Furthermore, any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.

Vehicles using site access tracks shall have their speeds restricted where there is a potential for dust generation. Vehicles delivering material with dust potential to an off-site location shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust. Access gates to site from the R704 and the L7451 are located at least 250m from receptors which will prevent significant dust effects on residents.

Vehicles exiting the site, prior to the local road crossing point, will make use of a wheelwash facility prior to entering onto public roads to ensure mud and other wastes are not tracked onto public roads. Public roads outside the site shall be regularly inspected for cleanliness on a daily basis and cleaned using a street sweeper, as necessary (see Figure 5-1). Before entrance onto public roads, trucks shall be adequately inspected to ensure no potential for dust emissions. On-site haul routes shall be inspected for integrity and necessary repairs to the surface instigated as soon as reasonably practicable. Records shall be kept of all inspections of the haul routes and any subsequent action(s) in a site logbook.

Figure 5-1 Typical road sweeper (Source: CMP Road Planing)

The following measures will be implemented to prevent significant dust emissions from material stockpiles. Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind as per Section 3.4.6 and Section 5.5. Sand and other aggregates will be stored in bunded areas and not allowed to dry out unless this is required for a particular process, in which case appropriate additional control measures will be put in place. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods. At all times, the procedures put in place shall be strictly monitored and assessed by the SHEQ Officer. In the event of dust nuisance occurring outside the site boundary, appropriate procedures shall be implemented to rectify the problem.

This DMP shall be reviewed at regular intervals during the construction phase to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practices and procedures. As per Section 4.8, the name and contact details of a

person to contact regarding air quality and dust issues shall be displayed on a notice board at the site entrance. Community engagement before works commence on site will be put in place, including a communications plan. All dust and air quality complaints shall be recorded, and causes identified, along with the measures taken to reduce emissions. Daily on and off-site inspections shall occur for nuisance dust and compliance with this DMP. This shall include regular dust soiling checks of surfaces within 100m of the construction works. Cleaning shall be provided if necessary.

5.2.2 Climate

There is the potential for a number of embodied greenhouse gases (GHGs) and GHG emissions during the construction phase of the development. Construction vehicles, generators etc., may give rise to CO_2 and N_2O emissions as well as the large quantities of material such as stone, concrete and steel that will be required for the proposed development. The Institute of Air Quality Management (IAQM) document *Guidance on the Assessment of Dust from Demolition and Construction* (2014) states that site traffic and plant is unlikely to make a significant impact on climate.

To minimise climate impacts associated with delivery of construction materials to the site, the Contractor will source quarry materials as close to the site location as possible and use local builder's providers where possible. Borrow pits on-site will be utilised as much as possible to minimise import of quarried stone material. In some cases, it will not be possible to locally source building materials due to the technical nature of parts and equipment required.

There will be a net loss of approximately 82.9 ha of forestry during the construction works which will result in a loss of carbon sequestration potential. An area of at least equivalent size will be replanted to offset the loss of this carbon sink.

Prior to commencement of construction on-site, the turbines to be installed at the site will be manufactured off-site. The chosen route for delivery of the turbine components from Belview Port to the site has been determined based on the suitability of port infrastructure and the shortest feasible route, given the nature of road network constraints, which will minimise vehicle emissions associated with the turbine component deliveries.

5.3 Surface Water Management

The Contractor will employ the best practice measures outlined in CIRIA C532 publication *Control of Water Pollution from Construction Sites: Guidance for Consultants and Contractors*.

The surface water drainage design concept is set out in Section 2.8.2 of the EIAR and is designed to capture surface water run-off from the roads and other hardstanding areas in swales and discharge into settlement ponds specifically constructed for managing surface water run-off generated from the wind farm infrastructure. After passing through the settlement pond, surface run-off will be permitted to spread across the adjacent lands. This treated water will ultimately percolate to groundwater or travel over ground and be assimilated into the existing drainage network within the boundary of the proposed development at appropriate greenfield run-off rates. There will be no direct discharges from the wind farm to any existing natural watercourse.

The permanent surface water management infrastructure will be constructed early in the project along with the construction of impermeable surfaces so that surface water run-off during construction works will be controlled and managed to prevent discharge of sediment laden water to the existing surface water network and local streams. The internal access tracks

will be constructed using unbound aggregate materials such that they will permit some degree of infiltration and reduce the volume of run-off generated. The permanent settlement ponds are shown on Drawing No. 10730-2005 at locations downstream of turbine, laydown, met mast and substation hardstand areas. In addition, temporary settlement ponds will be established during construction works in areas of high construction activity and groundworks. The locations of temporary settlement ponds will be adjacent to significant earthworks, as close as possible to the source of sediment while maintaining a minimum 50m buffer distance from existing watercourses. These additional temporary ponds will be decommissioned and reinstated on completion of the construction works. The combination of temporary and permanent settlement ponds will provide the necessary attenuation to limit the rate of outflow from the new wind farm infrastructure areas at or below greenfield run-off rates and are classified as sustainable drainage system (SuDS) measures. The settlement ponds will also provide containment capacity in the event of a spill or leak on the installed infrastructure and the outflow can be closed off to contain any potential pollutants within the settlement ponds. In the event of contaminated run-off being contained in a settlement pond, the incident will be reported as set out in Section 4.7, samples taken of the contaminated liquid for classification, as required, and the liquid pumped out of the pond using a suitable vacuum truck and disposed of at a licensed waste facility off-site.

The surface water management system will be visually inspected on a daily basis during construction works by the SHEQ Officer to ensure that it is working optimally. The frequency of inspection will be increased at settlement ponds adjacent to areas where earthworks are being carried out and at the borrow pits during excavations. Where issues arise, construction works will be stopped immediately, and the source of the issue will be investigated. Records of all maintenance and monitoring activities associated with the surface water network will be retained by the Contractor on-site, including results of any discharge testing requirements.

The Contractor will implement control measures such as temporary drains and drainage diversions, from commencement of construction to limit the volume of water that requires treatment. Temporary control measures implemented during construction works may include silt fences, silt bags, temporary settlement tanks and run-off attenuation, as required. Examples of silt fences and temporary settlement tanks are shown in Figures 5-2 and 5-3.

Figure 5-2 Silt fencing measures (Source: SSI Environmental (left) and Thrace Group (right)

Figure 5-3 Temporary site settlement tanks (Source: Siltbuster)

There is potential for earthworks to lead to release of suspended solids to surface water bodies. The main factors influencing the rate of soil erosion and subsequent sediment release includes:

- Climate;
- Length and steepness of slopes;
- Characteristics of the soil/soil erosion potential;
- Soil vegetation/cover;
- Duration and extent of works; and
- Erosion and sediment control measures.

Erosion and sediment control measures which will be implanted will include, but will not be limited to:

- Minimisation of soil exposure, by controlling, in so far as is practical, the locations where vegetation/soil is stripped and when vegetation/soil is stripped;
- During the side casting of soils, silt fences, straw bales and/or biodegradable geogrids will be used to control surface water run-off from material storage areas; and
- All surface water run-off from the development (including during construction works) will pass through either temporary or permanent settlement ponds.

To maximise the erosion and sediment control benefits of natural vegetation soil cover, stripping of soil is to be kept to a minimum and confined to construction areas only. Where practical, construction works will be staged to minimise the extent and duration of disturbance, e.g. plan for progressive site clearance, only disturbing areas when they are scheduled for current construction work.

Pre-Emptive Site Drainage Management

The works programme for the initial construction stage of the proposed development will take account of weather forecasts and predicted rainfall in particular. Large excavations and movements of subsoil or vegetation stripping will be suspended or scaled back if heavy rain is

forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

The following forecasting systems are available and will be used on a daily basis at the site to direct proposed construction activities:

- General Forecasts: Available on a national, regional and county level from the Met Eireann website (www.met.ie/forecasts). These provide general information on weather patterns including rainfall, wind speed and direction but do not provide any quantitative rainfall estimates;
- MeteoAlarm: Alerts to the possible occurrence of severe weather for the next two days. Less useful than general forecasts as only available on a provincial scale;
- 3-hour Rainfall Maps: Forecast quantitative rainfall amounts for the next 3 hours but does not account for possible heavy localised events;
- Rainfall Radar Images: Images covering the entire country are freely available from the Met Eireann website (www.met.ie/latest/rainfall_radar.asp). The images are a composite of radar data from Shannon and Dublin airports and give a picture of current rainfall extent and intensity. Images show a quantitative measure of recent rainfall. A 3-hour record is given and is updated every 15 minutes. Radar images are not predictive; and
- Consultancy Service: Met Eireann provide a 24-hour telephone consultancy service. The forecaster will provide interpretation of weather data and give the best available forecast for the area of interest. Using the safe threshold rainfall values will allow work to be safely controlled (from a water quality perspective) in the event of forecasting of an impending high rainfall intensity event.

Works will be suspended if forecasting suggests any of the following is likely to occur:

- >10 mm/hr (i.e. high intensity local rainfall events);
- >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or
- >half monthly average rainfall in any 7 days.

Prior to works being suspended the following control measures will be completed:

- Secure all open excavations;
- Provide temporary or emergency drainage to prevent back-up of surface runoff;
- Avoid working during heavy rainfall and for up to 24 hours after heavy events to ensure drainage systems are not overloaded; and
- Provide cover to material storage areas i.e. adequate tarpaulin over stockpile areas if material cannot be reinstated prior to suspension.

As a further precaution, near-stream construction work will only be carried out during the period permitted by IFI for in-stream works according to the Eastern Regional Fisheries Board (2004) guidance document *"Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites"*, that is, May to September inclusive. This time period coincides with the period of lowest expected rainfall and, therefore, minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses.

Run-off will be maintained at greenfield (pre-development) run-off rates. The layout of the development has been designed to collect surface water run-off from hardstanding areas within the development and discharge to associated surface water attenuation ponds adjacent to the proposed infrastructure. It will then be managed by gravity flow at greenfield run-off rates.

During the ground clearance of the proposed development, the Contractor will implement water control measures to limit the impact on water quality using standard measures as set out in the Forestry Report in Appendix B. Brash will be used along harvesting and extraction routes for soil protection. The forwarder will be loaded to the manufacturer's maximum specification and no more to avoid overloading and unnecessary soil compaction.

All temporary and permanent drainage from the site shall be designed to have as a minimum three stages of treatment, as defined in the SuDS Manual. Management of run-off will include the following:

- Filtration of water through filter media (sand / stone check dam, silt fence);
- Detention / settlement in settlement ponds or behind check dam in swales; and
- Conveyance of shallow depths of water in vegetated swale.

Interceptor Drains

Interceptor drains/diversion ditches will be installed ahead of the main earthworks activities to minimise the effects of collected water on the stripped/exposed soils once earthworks commence. This drainage will integrate into the existing forestry drainage. These drainage ditches will be installed on the upgradient boundary of the areas affected by the access track earthworks operations and installed ahead of the main track construction operations commencing. They will generally follow the natural flow of the ground. The interceptor drains will intercept any storm water surface run-off and collect it to the existing low points in the ground, allowing the clean water flows to be transferred independently through the works without mixing with the construction drainage. It will then be directed to areas where it can be redistributed over the ground.

Swales

Swales along access tracks will be installed in advance of the main construction phase. On sections of track where there is significant longitudinal gradient, regular surface water interception channels will be employed – these will typically be at 10-20m intervals to collect any surface water that is discharging as sheet flow along the track and discharge the flow into the trackside swale. Swales will provide additional storage of storm water where located along gradient. Given the steep longitudinal gradients on some sections of access track, regular check dams will be employed within the trackside swale on these sections to reduce the flow velocity and provide settlement opportunity. Check dams will be constructed from course gravel/ crushed rock (See Figure 5-4). Check dams will have a minimum 0.2m freeboard (from top of check dam) to top of swale level, to prevent overtopping of flows onto the access track. All check dams, etc will be checked at least once weekly via a walkover survey during the full period of construction. All excess silts will be removed and placed in borrow pit reinstatement or embankments. Where check dams have become fully blocked with silt, they will be replaced.

Figure 5-4 Typical example of stones used in a check dam to slow down water flow (Source: SNH, 2015)[5]

Swales will be re-vegetated by hydro-seeding with indigenous seed mix as soon as is practicable following excavation. This will reduce the flow velocity, treat potential pollutants, increase filtration and silt retention.

Settlement Ponds

Settlement ponds will be located downstream of road swale sections and at turbine/hardstand locations, to manage/buffer volumes of run-off discharging from the drainage system during periods of high rainfall, thereby reducing the hydraulic loading to watercourses. Settlement ponds are designed in consideration of the greenfield run-off rates.

The following shall apply to construction of settlement ponds at the site:

- Pond depths generally to be excavated to less than 2m;
- Side slopes to be shallow, nominally at a 1 in 3 side slope (maximum); and
- Material excavated from the settlement pond should be compacted around the edge of the pond.

The settlement pond design is based on primary settling out of suspended solids from aqueous suspension. The theory behind the design of the settlement lagoons is the application of Stoke's Law. The settlement lagoons will be designed to provide sufficient retention time and a low velocity environment to allow suspended solids of a very small particle size to fall out of suspension prior to allowing the water to outfall to the receiving environment. Flow rates for storm events will be maintained at or below greenfield run-off rates.

Settlement ponds will be installed concurrently with the formation of the road and will be fenced off for safety. They will be located as close to the source of sediment as possible and maintain a buffer of 50m from existing watercourses. Machine access will be required at settlement ponds to remove accumulated sediment.

Further sediment pond control measures include:

- Settlement pond maintenance and/or cleaning will not take place during periods of extended heavy rain;

[5] Scottish Natural Heritage (SNH), *Good Practice during Wind Farm Construction* (2015)

- Settlement ponds will, where practicable, be constructed on even ground and not on sloping ground and where possible will discharge into vegetation areas to aid dispersion; and
- Settlement ponds will be monitored closely over the construction timeframe to ensure that they are operating effectively.

Correct buffer zone management will help reduce the risk of sedimentation from felling operations. Buffer zone guidelines for planting and felling activities are provided by the Forestry Service in the *Forestry and Water Quality Guidelines* (2000). It is proposed to apply these buffer zone guidelines to construction activities also. Construction activities will be curtailed within buffer zones in order to reduce erosion and sedimentation and, therefore, to protect water quality. Buffer zone widths vary from 10m to 25m, depending on slope and soil erosion classification. Details of buffer zones are included in Table 5-1.

Table 5-1 Recommended Buffer Zone Widths

Average slope leading to aquatic zone	Buffer zone width on each side of the aquatic zone	Buffer zone width for highly erodible soils
Moderate (even to 1:7 / 0 -15%)	10 m	15 m
Steep (1: 7 to 1: 3 / 15 - 30%)	15 m	20 m
Very steep (1: 3 / > 30%)	20 m	25 m

The slopes across the proposed wind farm site are predominantly moderate with some steep slopes. As the soil type varies across the site, this suggests that a 10 to 20m buffer zone is appropriate. As an additional measure, all infrastructure on the proposed wind farm site including for turbines, borrow pits, site compounds, substation and access tracks (excluding grid connection) will maintain a 50m set back from streams.

All associated tree felling will be undertaken using good working practices as outlined in the Forest Service in their *Forestry Harvesting and Environment Guidelines* (2000) and the *Forestry and Water Quality Guidelines* (2000). The latter guidelines deal with sensitive areas, erosion, buffer zone guidelines for aquatic zones, ground preparation and drainage, chemicals, fuel and machine oils. Brash mats will also be used to support harvesting and forwarding machinery. The brash mats reduce erosion of the surface and will be renewed as they become used and worn over time.

<u>Temporary Settlement Tanks</u>

Temporary settlement tanks can be utilised, in lieu of constructing temporary settlement ponds, to remove suspended particles from controlled water in small works areas such as localised excavations that require pumping out of water. The tanks, as per Figure 5-3 are proven to be very effective, have a small footprint and are very mobile with the potential to move around the wind farm site using a telehandler. These types of units are recommended by the Scottish Environmental Protection Agency (SEPA) and the UK Environmental Agency for use on construction sites for the treatment of sediment laden water. Sediment retained in settlement ponds or tanks will be removed on a regular basis and deposited at a suitable location, such as embankments or borrow pit reinstatement stockpiles.

Dewatering silt bags allow the flow of water through them while trapping any silt or sediment suspended in the water. The silt bags provide a passive non-mechanical method of removing silt from silt-laden water collected from works areas within a construction site. Check dams will also be used in the site drainage system during construction to minimise sediment transport (see Figure 5-4). These check dams will slow down the movement of water in site drains, and thereby reducing the amount of sediment transported by the water. Stones are typically used at each dam to reduce soil erosion, to stabilise the dam and aid in filtration.

The proposed works will require significant trenching for on-site cabling and for the grid connection. Trenches will be dug in short sections at any one time to avoid potential for water flowing into the excavations. Any water that does accumulate in trenches will be allowed to naturally percolate to ground where possible. Any excavated material which is not removed immediately will be stored on the upgradient side of the trench, where possible, so that any sediment run-off will be collected in the trench. Clay plugs will be installed at regular intervals to prevent conduit flow of water through the trench after construction.

Monitoring of surface water quality during the construction works will be carried out on a regular basis and primarily through daily visual inspections and field monitoring for pH, conductivity and temperature. Continuous monitoring for turbidity will also be carried out during works in proximity to the watercourses. Monitoring will be carried out upgradient (where possible) and downgradient of active construction works to identify any unstable quality trends. Monitoring will be the responsibility of the SHEQ Officer.

Daily field monitoring will be supplemented by taking monthly water quality samples from the monitoring point locations for off-site laboratory analysis. Analysis will include water quality parameters listed in the *European Communities Environmental Objectives (Surface Waters) Regulations 2009* and additional parameters as required by the relevant stakeholders or local authority. It is proposed that the sampling locations used during EIAR field studies (SW1 – SW6 as shown in Figure 9-3 of the EIAR) will be used for monitoring during construction. Additional locations for on and off-site monitoring, as required, will be agreed with the local authority in advance of construction works commencement.

Inspections of silt traps are critical after prolonged or intense rainfall while maintenance will ensure maximum effectiveness of the proposed measures. Turbidity monitors/alarms will be strategically placed upgradient on the River Arrigle and downgradient of works to assess on-going construction works. The alarms will be programmed to notify the SHEQ Officer of any irregularities. A checklist of the inspection and maintenance control measures will be developed, and records kept.

5.3.1 TDR and Grid Connection Route

Silt fencing will be erected at the location of stream crossings along the grid connection route. Silt curtains and floating booms will also be used where deemed to be appropriate and this will be assessed separately at each individual location.

No refuelling of machinery will take place within 50m of a watercourse. Excavated material will not be stockpiled or side-cast within 50m of a watercourse. Appropriate steps will be taken to prevent soil/dirt generated during the temporary upgrade works to the TDR from being transported on the public road. Road sweeping vehicles will be used to ensure that the public road network remains free of soil/dirt from the location of the TDR works and grid connection when required. This will reduce the potential for sedimentation of surface watercourses locally.

5.3.2 Watercourse Crossings and Directional Drilling

There are two main drain crossings required for the proposed new internal access road network adjacent to T5 and T9, for which the proposed crossing methodology is a clear-span bridge. This crossing locations are shown on Drawing No. 10730-2005. The use of a clear-span bridge will avoid the requirement for in-stream works by utilising foundations on either side of the stream and will facilitate traffic movements during construction works. The bridge will be sufficiently high off the stream to allow unrestricted flow of water beneath.

A number of localised field/forest drains exist within the wind farm site and appear stagnant or dry except during wet weather. Required crossing of these drains will be carried out by the installation of culverts which will be installed in dry weather, where possible, when there is no flow in the drains, or the water is stagnant. There will be minimal disturbance to the drain bed and banks during installation and excavated materials will be stockpiled at a suitable distance from the edge of the drain to minimise soil and sediment run-off entering the drain. Silt traps will be installed downgradient of the works to capture any potential run-off sediment.

The grid connection works will require crossing of four watercourses, namely the River Arrigle, two smaller tributaries feeding into the River Arrigle; one from the west (EPA name: Mullenhakill Stream) and one from the east (EPA name: Garrandarragh Stream), and a drainage ditch, as shown on Drawing No. 10730-2005.

The River Arrigle crossing will be made by drilling underneath the river from outside the associated SAC zone boundary so as to avoid potential impacts on the watercourse and qualifying interests during construction works. The appointed drilling contractor will establish launch and receiving pits for the drilling equipment on either side of the river outside of the SAC boundary. All materials stored in the compounds at the launch and receiving pits will in secured bunded containers in accordance with the measures set out in Sections 4.5 and 4.6. Excavated materials temporarily stockpiled locally during the drilling works will be compacted to minimise generating sediment laden run-off during the works. Silt fences will be erected as required. Crossing of the Mullenhakill Stream will also be carried out using directional drilling following the same measures as outlined above.

Where groundwater is encountered in the drilling works and is impacting on works in the launch and receiving pits, water will be diverted using a shallow swale and sump down slope of the disturbed ground. From here water will be pumped onto a vegetated distribution area at least 50m from a watercourse. Discharge will be via a silt bag or temporary settlement tank, which will filter any remaining sediment from the pumped water.

Crossing of the Garrandarragh Stream and the drainage ditch will be made within the existing road network utilising the existing bridge and a shallow trench formation. Details on the construction methodology for the crossings are set out in Chapter 2 (Description of the Proposed Development) of the EIAR.

5.3.2.1 Directional Drilling Mitigation

The following specific mitigation measures will be implemented for directional drilling works:

- There will be no storage of material / equipment or overnight parking of machinery inside the 50m buffer zone from a watercourse;
- Before any ground works are undertaken, double silt fencing will be placed upslope of the watercourse channel along the 50m buffer zone boundary;

- Additional silt fencing or straw bales (pinned down firmly with stakes) will be placed across any natural surface depressions / channels that slope towards the watercourse;
- Silt fencing will be embedded into the local soils to ensure all site water is captured and filtered;
- The area around the bentonite batching, pumping and recycling plant will be bunded using terram (as it will clog) and sandbags in order to contain any spillages;
- Drilling fluid returns will be contained within a sealed tank / sump to prevent migration from the works area;
- Spills of drilling fluid will be cleaned up immediately and stored in an adequately sized skip before being taken off-site;
- If rainfall events occur during the works, there will be a requirement to collect and treat small volumes of surface water from areas of disturbed ground (i.e. soil and subsoil exposures created during site preparation works);
- Any sediment laden water from the works area will not be discharged directly to a watercourse or drain;
- Daily monitoring of the compound works area, the water treatment and pumping system and the percolation area will be completed by the SHEQ or suitably qualified person during the construction phase. All necessary preventative measures will be implemented to ensure no entrained sediment, or deleterious matter is discharged to the watercourse;
- If high levels of silt or other contamination is noted in the pumped water or the treatment systems, all construction works will be stopped. No works will recommence until the issue is resolved and the cause of the elevated source is remedied;
- On completion of the works, the ground surface disturbed during the site preparation works and at the entry and exit pits will be carefully reinstated and re-seeded at the earliest opportunity to prevent soil erosion;
- The silt fencing upslope of the river will be left in place and maintained until the disturbed ground has re-vegetated;
- There will be no refuelling allowed within 50m of the watercourse crossing;
- All plant will be checked for purpose of use prior to mobilisation at the watercourse crossing;
- The drilling fluid/bentonite will be non-toxic and naturally biodegradable (i.e. Clear Bore Drilling Fluid or similar will be used);
- Adequately sized skips will be used where temporary storage of arisings are required;
- The drilling process / pressure will be constantly monitored to detect any possible leaks or breakouts into the surrounding geology or local watercourse;
- This will be gauged by observation and by monitoring the pumping rates and pressures. If any signs of breakout occur then drilling will be immediately stopped;
- Any frac-out material will be contained and removed off-site; and
- The drilling location will be reviewed, before re-commencing with a higher viscosity drilling fluid mix.

5.3.3 Dewatering

It is not anticipated that significant dewatering will be required at the turbine bases during the construction works due to elevated nature of the site. Some water ingress was encountered at a number of trial pits during the site investigation works ranging from slow seepage to fast ingress as detailed in Chapter 8 (Land, Soils and Geology).

Pumping of water from turbine or substation base foundations, where required, will be carried out until the concrete bases have been fully cured. Any pumped water from the foundations will be discharged into the surface water drainage network so that it will be returned to the existing

forestry drains in a controlled manner via the installed settlement ponds. If required, additional temporary settlement tanks will be installed to improve sediment removal prior to discharge.

The borrow pit areas are anticipated to encounter groundwater during excavation. Groundwater inflows will likely need to be pumped from the pits resulting in a short-term localised drawdown of the water table. Field tests were carried out at two of the borrow pits to provide an estimate of the hydraulic conductivity of the bedrock in the vicinity of the pits. This is discussed in Chapter 9 (Hydrology and Hydrogeology) of the EIAR. Any dewatering of the borrow pits will be discharged to the surface water drainage network via settlement ponds. There will be no direct discharge to the existing drainage network.

5.3.4 Concrete Handling

Only ready-mixed concrete will be used during the construction phase, with all concrete being delivered from local batching plants in sealed concrete delivery trucks. The use of ready-mixed concrete deliveries will eliminate any potential environmental risks of on-site batching. When concrete is delivered to site, only the chute of the delivery truck will be cleaned, using the smallest volume of water necessary, before leaving the site. Concrete trucks will be washed out fully at the batching plant, where suitable facilities are already in place.

The small volume of water that will be generated from washing of the concrete trucks chute will be directed into a temporary lined impermeable containment area, or a concrete wash unit. This type of unit catches the solid concrete and filters and holds wash liquid for pH adjustment and further solids separation. The residual liquids and solids can be disposed of off-site as waste material. Where temporary lined impermeable containment areas are used, such containment areas will be excavated and lined with an impermeable membrane (see Figure 5-5).

Figure 5-5 Example of temporary concrete washout area

Measures to prevent surface water contamination from concrete pouring on-site will include:

- Using weather forecasting to assist in planning large concrete pours and avoiding large pours where prolonged periods of heavy rain is forecast;
- Restricting concrete pumps and machine buckets from slewing over watercourses while placing concrete;
- Ensuring that excavations are sufficiently dewatered before concreting begins and that dewatering continues while concrete sets;
- Ensuring that covers/mesh are available for freshly placed concrete to avoid the surface washing away in heavy rain;

- Disposal of surplus concrete after completion of a pour off-site; and
- Discussing arrangements for concrete deliveries with the suppliers before works commence to ensure they are aware of on-site wash-out restrictions.

5.4 Groundwater

Some groundwater ingress was noted in the trial pits at turbine locations during the GI works. The observations noted by the GI contractor ranged from slow seepage at Turbine 5 (TP05) and Turbine 7 (TP07), moderate seepage at Turbine 2 (TP02) and fast ingress at Turbine 9 (TP09) and Turbine 15 (TP15). No groundwater was encountered in the remaining trial pits at the proposed turbine locations. Trial pits were also carried out at two potential substation locations and no groundwater was encountered in the trial pit at the selected substation location (TPSS1). Monitoring wells were installed in boreholes at two borrow pits and showed groundwater levels at the locations at 1.9m bgl and 6.7m bgl. Details on groundwater monitoring surveys are provided in Chapter 9 (Hydrology and Hydrogeology) of the EIAR.

Therefore, it is not anticipated that significant quantities of groundwater will be encountered in excavations for the turbine bases or substation foundations, however it is likely that groundwater ingress will need to be managed at the borrow pits. Groundwater levels will vary seasonally and with recent weather conditions. The Contractor will give due regard to groundwater levels at the time of construction and optimise the borrow pit excavation works to minimise groundwater ingress.

As per Section 5.3.3, where groundwater is encountered in excavations and dewatering is required, the pumped water will be released back into the existing surface water drainage network via the settlement ponds, silt bags or dedicated settlement tank to minimise the level of sediments entering the existing watercourses.

Groundwater is highly likely to be encountered in the horizontal drilling under the River Arrigle due to the location of the river in a valley and the presence of soft marshy ground in the flood plain on either side of the river at the crossing location. As discussed previously, where groundwater is encountered in the drilling works and is impacting on works in the launch and receiving pits, water will be diverted using a shallow swale and sump down slope of the disturbed ground. From here water will be pumped onto a vegetated distribution area at least 50m from a watercourse. Discharge will be via a silt bag or temporary settlement tank, which will filter any remaining sediment from the pumped water.

The drilling contractor will use environmentally friendly drilling lubrication oils (i.e. biodegradable oils or similar), for the horizontal drilling works to minimise the impact of drilling on the underlying groundwater and soils at the crossing locations.

Monitoring of selected groundwater wells/spring including St Molins Well will be undertaken by the SHEQ Officer during the construction period.

5.5 Land, Soils and Geology

The disturbance of soil, subsoil and bedrock is an unavoidable effect in the development of the proposed infrastructure at the site, however excavations for the infrastructure will be kept to a minimum to limit disturbance of the current ground conditions and to minimise costs associated with earthmoving. As set out previously, three potential borrow pit locations have been identified within the site boundary to provide an on-site source of aggregate stone material for use in road sub-base, hardstanding areas, assembly areas and construction compounds. Utilising on-site borrow pit resources will increase the impact on local geology, however there will be less

demand for off-site aggregate materials resulting in less traffic movements to and from the site as well as shorter travel distances.

The management of excavated materials is an important component of controlling dust as well as sediment and erosion control. Excavated topsoil, subsoils and pockets of peat, where encountered, will only be moved short distances from the point of extraction and will be used locally for landscaping and benching/battering, where possible. Excavated material will not be stored in excessive mounds on the site. Excess soils/subsoils/peat, including from the grid connection cable trench excavations and drilling, will be hauled to the borrow pits and stockpiled temporarily pending backfill into the pits once the required rock resources have been extracted. Placed soils will be sealed and levelled using the back of an excavator bucket to prevent erosion. Where possible, the upper vegetative layer will be stored with the vegetation side of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the berms. Seeding of the placed materials with indigenous species will be carried out only where natural revegetation or the reuse of the upper vegetated layer is unsuccessful. The re-vegetation of these areas will promote stability, reduces desiccation, run-off erosion and susceptibility to freeze/thaw action.

Excavations in some areas may be susceptible to collapsing depending on material encountered and depth of the excavation. Where battering back of excavations to a safe angle is not feasible, a physical barrier will be applied between the excavations and the potentially unstable material in the form of a granular berm or sheet piles. Excavations for turbine bases and substation infrastructure will be backfilled to ground level following foundation installation. Temporary works designs will be carried out by a competent engineer during detailed design to account for the existing ground conditions and the particular chosen turbine specification. The borrow pits will be reinstated insofar as is possible with excess excavated material from across the wind farm site and grid connection route.

Vehicular movements will be restricted to the footprint of the proposed development works, particularly with respect to the newly constructed access roads. This means that machinery will remain on access roads and will not move onto areas that are not permitted for development. This will prevent disturbance of existing soils and vegetation.

As discussed in Section 4.1, temporary wastewater holding tanks will be used to store wastewater generated from the welfare facilities in the two construction compounds. This will eliminate the need for any wastewater treatment and percolation at the site. No concrete truck wash-out will be permitted at the site either so as to protect the existing ground conditions. Only concrete truck chute washing will be permitted on site in accordance with the measures outlined in Section 5.3 above. The management and handling of fuels, oils and lubricants will be in accordance with the measures set out in Section 4.5 so as to reduce the potential for spillage or contamination of soils.

Surface water management measures as set out in Section 5.3 will be put in place from start of construction works and installed alongside internal roadways to ensure that surface water run-off is controlled and does not cause erosion of exposed surfaces or generate sediment laden discharge.

Tree felling required for new infrastructure will expose new areas of soils/subsoils but will be kept to a minimum. Forestry felling activities will be carried out in accordance with existing approved Coillte practices for commercial forestry operations under licence from the Forestry Department, as described in the Forestry Report in Appendix B.

Works required in the public road and on third party lands to facilitate the turbine component deliveries from Belview Port to the site will be kept to the minimum land take required to permit safe working platforms and access for the haulage machinery. Any material clearance and excavations will be agreed with the Local Authorities or relevant landowners and will be reinstated to their original condition, at a minimum, as agreed with the owners.

5.6 Biodiversity

The following general measures will be taken to minimise potential effects on the local and regional biodiversity during construction:

- An Ecological Clerk of Works (ECoW) will be appointed to ensure compliance during the construction stage with all mitigation measures and planning conditions related to ecology and with wildlife law.
- A Biodiversity Management Plan has been prepared and is included in Appendix 6-6 of the EIAR. It will be a living document, updated and amended by the ECoW during the lifetime of the project. The updated Biodiversity Management Plan will become part of the final CEMP for the construction works;
- A particular focus of the plan will be the management of habitat creation and enhancement measures and bat buffer zones.

5.6.1 Habitats

5.6.1.1 Habitat Creation and Enhancement

A total of 19.1 ha of land will be managed with biodiversity as the primary objective. The habitat creation and enhancement sites are mainly marginal farmland. Management measures will be developed on a site-specific basis and will include:

- Drain blocking, to increase wetland habitat area and improve ecological function and species composition;
- Scrub removal; and
- Extensive grazing, where appropriate, to maintain open conditions especially for snipe.

5.6.1.2 Bat Buffer Zone Management

Significant areas of forest and hedgerow will have to be cleared and maintained as open space as mitigation against collision mortality of bats. Within the forest matrix, areas of open space with low vegetation can be important habitats for plants, small mammals, and invertebrates such as the Red List dingy skipper. Regularly disturbed habitats can be important for insects that nest in bare soil, such as solitary bees, and early successional plant species. Areas of willow and gorse scrub can provide cover and foraging for passerines and small mammals. The objectives of bat buffer zone management will be:

- To control regeneration and height growth of tree species, such as birch and naturally regenerating conifers;
- Maintain for the long-term patches of scrub totalling 25% of the bat buffer areas, where this does not conflict with the first objective;
- Maintain a proportion (50%) of open grassland or heathland habitats; and
- Maintain a proportion (25%) of disturbed habitat with high cover of bare soil, through machine disturbance during tree regeneration control and/or conversion of open habitats that become too scrubbed up.

It is anticipated that management interventions will be required on the order of every 3-4 years. A patch dynamics approach will be used in which open grassland or heathland that has become

rank or invaded by bramble, gorse, bracken or other scrub will be cleared and converted to disturbed / bare soil habitats. Further details are provided in the Biodiversity Management Plan in Appendix 6-6 of the EIAR.

5.6.1.3 Maintaining Site Hydrology

Existing surface water flows across the site will be maintained through such measures as cross drains transferring water across access tracks. Further information on surface water management is provided in Section 5.3.

5.6.1.4 Habitat Protection

Habitats in Complexes A and B (as detailed in the EIAR), which are partially within the wind farm site planning boundary, will be protected from disturbance, such as vehicle traffic or construction material set-down, by robust temporary fencing – post and wire or similar. Fencing will be erected prior to construction works and will be marked with suitable hazard signs (e.g. *Keep Out. No Construction Traffic. Wildlife Protection Zone*). Similar temporary fencing and warning signage will be erected to protect the River Barrow and River Nore SAC where it intersects and is adjacent to the grid route corridor.

5.6.2 Flora

Wheels and tracks of machinery used in construction will be washed and free of soil before they are brought into the wind farm site to prevent accidental introduction of invasive plant species propagules.

5.6.3 Bats

5.6.3.1 Buffer Zones

Buffer zones of 50m from blade tip to nearest forestry/treeline/hedgerow will be implemented around all turbines on site (with the exception of T18 as per below and Section 5.6.4.2). This buffer zone is established best practice recommended as a standard mitigation measure for all wind farms, including all key-holed turbine sites (Scottish Natural Heritage *et al.*, 2019). As most bat activity in Ireland and Britain is in close proximity to habitat features, such as forest edges and hedgerows, this measure is predicted to be effective for all bat species, with the exception of high-flying species, such as Leisler's bat.

The radius of a bat buffer zone on the ground depends on the height of the forest edge or hedgerow: taller trees require a broader buffer zone to maintain the 50m distance from blade tip to treetop. To reduce the effects of the bat buffer zones on hedgerows, other linear features and scrub, two buffer zones, an outer and an inner, were calculated. Where turbines are sited in or near forests, the outer buffer zone radius was calculated based on the predicted top height of the trees at felling. Within this outer buffer zone, all trees greater than 5m tall (at present or at commercial maturity) will be felled. The inner buffer zone radius (74.2 m) was calculated based on a height of 5m, which is the threshold between scrub and woodland given by Fossitt (2000). Within this buffer zone, all hedgerows, scrub and small trees/shrubs will be removed. This will discourage Common and Soprano pipistrelles from approaching turbines, as they generally commute and forage along linear features such as treelines and hedgerows. Between the outer and the inner buffer zone boundaries, hedgerows, scrub and small trees/shrubs less than 5m tall will be retained.

At T18, trees within 20m of the badger sett will be left in situ and not felled. The turbine blade tips will be 35m from the retained trees at their closest point (c.f. recommended distance of 50m). This minor adjustment of the buffer zone will have little impact on foraging bats.

At T21 it was considered whether it would be preferable to retain some or all of the *broadleaved woodland* (WD1) and associated mature trees within the bat buffer. As Common and Soprano pipistrelle and Leisler's bat activity was high in one or more seasons in this area, it was considered that the collision risk outweighed woodland retention. In addition, the mature trees were situated along or near the proposed access route, making retention difficult.

5.6.3.2 Roost Buffer

Although no significant risks were predicted for bat roosts, a 50m buffer zone will be established at Dempsey's stone shed and stone house ruin, located 168 m and 182 m, respectively, south-west of T12. No construction machinery will be permitted within this buffer zone to eliminate any slight risk of accidental damage to the roosts.

5.6.4 Other Fauna

5.6.4.1 Pre-Clearance Surveys and Monitoring

Prior to tree felling and vegetation clearance, areas to be cleared will be surveyed by the ECoW or other qualified ecologist for mammal breeding or resting places, such as badger setts, and also bird nesting sites. Pre-clearance surveys will also inspect all known active and inactive badger setts on site and verify that inactive setts have not been reoccupied since the original survey. In the event that badgers have reoccupied a location where there is a risk of significant negative effects, solutions to eliminate this risk will be developed in conjunction with a badger specialist and in consultation with the NPWS. Solutions may include establishing and marking buffer zones, changing the timing or season of construction works in the area, or sett exclusion under license.

In some locations, scrub or thicket-stage conifer plantation was impenetrable, and it was not possible to survey the entire length of access tracks and entire areas of hardstanding for mammal breeding or resting places, such as badger setts. In these situations, the EcoW or other qualified ecologist will monitor scrub and thicket conifer clearance on the ground to ensure that no setts or other mammal breeding places are present. In the event that a badger sett or other breeding or resting place for protected fauna are discovered, vegetation clearance will be halted. Solutions will be developed in conjunction with a badger or other appropriate specialist and in consultation with the NPWS. Solutions may include establishing and marking buffer zones, changing the timing or season of construction works in the area, or sett exclusion under license.

5.6.4.2 Badger Protection at T18

A large badger sett was discovered at the originally proposed location of T18. The turbine location was moved as a result, and the current proposed location of T18 is 79.1m from the nearest sett entrance; the closest point of the T18 hardstand is located 48.7 m from the nearest sett. Because of the proximity of the large breeding badger sett to T18, the following special mitigation measures will be undertaken in this area. These are also included in the Biodiversity Management Plan in Appendix 6-6.

Pre-construction survey

As above, the setts at T18 will be checked for activity and sett status prior to construction commencing in the vicinity. The setts may have been expanded or perhaps have become disused. Additional setts may be present in the construction areas.

Exclusion zones

An exclusion zone of 20m minimum is required from the breeding sett entrances. In practice, this refers to a distance of 20m from the extremity of the sett at its west but also to its north (and also in the case of tree felling to the south and east also – when this might be required in the future) (see Figure 6-24 in EIAR).

A post and rail fence will be erected at 20m from the western and northern sett entrances or at the edge of forest, whichever is larger. This will be erected before any other construction or tree felling takes place in this area, and suitable hazard signs will be erected (e.g. *Keep Out. No Construction Traffic. Wildlife Protection Zone*).

In accordance with the NRA badger mitigation guidelines (NRA, 2005), no heavy machinery will be used within 30m of badger setts (unless carried out under licence); lighter machinery (generally wheeled vehicles) will not be used within 20m of a sett entrance (see Figure 6-24 in EIAR).

Tree retention

The mature trees within 20m of the breeding sett will be left in situ and not felled in order to maintain a non-interference zone of 20m. The calculated area of the bat buffer zone around T18 has been adjusted to take this restriction into account. There are also small areas of trees north and south of the sett within the calculated bat buffer zone. These will also be retained and the buffer zone has been adjusted accordingly (see Figure 6-24 in the EIAR). The turbine blade tips will be 35m from the retained trees at their closest point (c.f. recommended distance of 50m). This minor adjustment of the buffer zone will have little impact on foraging bats.

Seasonality and construction exclusion zones

Where possible, any construction works or tree felling in the vicinity of the breeding sett will be conducted outside of the badger breeding season, which is 1st December to end June (hence operations may be conducted from 1st July to 30th November).

If construction work is necessary at T18 within the badger breeding season, then no works will be conducted within 50m. Where the works involve blasting, rock piling, rock breaking or similar very noisy work during the breeding season, this zone will be expanded to 150m. In particular, blasting or rock breaking will not be used to excavate the turbine base at T18 during the breeding season.

Tree felling in future years

Any tree felling or clear felling in future years whether by Coillte or by the wind farm project will require a badger licence from NPWS if such is within 30m of the sett (or 50m if such felling is to be conducted during the breeding season). If any badger sett is known to those responsible for tree felling, then impacts on the breeding or resting place of a protected species *cannot be considered as unintentional*. If the need for tree felling arises as part of the wind farm project, a badger license will be applied for beforehand. In addition, a badger licence will be applied for prior to any tree felling in the vicinity of a known sett in the course of conventional forest

management so that adequate mitigation measures can be taken to ensure the welfare of badgers present at the breeding sett or any other setts present on site.

NPWS license requirements

- NPWS will not entertain a request for a badger licence prior to planning approval for any development scheme.
- It is considered that a badger licence is required if works or tree felling operations are conducted within 30m of the breeding sett at T18 (and other known setts).
- It is considered that a badger licence is required if works or tree felling operations are conducted within 50m (the estimated distance of 48.7m from the nearest sett entrance to the T18 hardstand at its closest point is acceptable according to the specialist badger survey report in Appendix 6-3 of the EIAR) of the main sett during the badger breeding season.
- It is considered that a badger licence is required if blasting or rock piling works or similar are conducted within 150m of the main sett during the badger breeding season (NRA, 2005).

NB: the license application is made by a badger expert involved in oversight of such works or tree felling and not by the Developer or forestry company. The conditions of a licence granted by NPWS may require additional mitigation measures to be taken.

5.6.4.3 Badger Protection along the Grid Connection Route

An active badger sett is present in woodland along the Mullenhakill Stream, approximately 40m from the grid connection route at its closest point. There is the potential for disturbance when carrying out directional drilling and cable route excavation. It is not known if it is a breeding sett; however, mitigation will be implemented under the precautionary principle that it is. Mitigation will follow that detailed for the sett at T18, i.e.:

- **Pre-construction survey:** the sett will be checked for activity and sett status prior to construction commencing in the vicinity.
- **Exclusion zones:**
  - An exclusion zone of 20m will be observed from sett entrances. This exclusion zone will be marked with a post and rail fence erected before any other construction or tree felling takes place in this area, and suitable hazard signs will be erected.
  - No heavy machinery will be used within 30 m of a sett entrance, unless carried out under license.
- **Seasonality:** directional drilling will not be carried out during the breeding season (December – June inclusive). Other construction work will not be carried out within 50m of a sett entrance during the breeding season.
- **NPWS license requirements:** As above.

5.6.4.4 Fauna Protection at Excavations

At any of the construction sites required for the wind farm development, mammals and other fauna, such as frogs, are at risk of falling into open excavations. Silt ponds pose no risk as their sides are sufficiently sloped to permit escape. During construction, open excavations must incorporate facilities for animals to escape, by means of:

- gently sloping earth or stone inclines to be left at the end of each day's operation – at each end of open trenches;

- for long excavations, timber escape planks to be left at c. 50m intervals along the trench at the end of each day's operations; these will usually be placed at right-angles to the trench;
- for long excavations, occasional earth/stone or wooden plank bridges to allow badgers to cross the trench during construction; and
- works will be limited to daylight hours where feasible to allow fauna to forage at dawn, dusk, and at night.

5.6.5 Aquatic Ecology

Proposed drainage measures to reduce and protect the receiving waters from the potential impacts during the construction of the proposed development are set out in Section 5.3. These include measures to prevent run-off erosion from vulnerable areas and consequent sediment release into nearby watercourses to which the proposed development site discharges. Additional mitigation measures specific to aquatic ecological receptors are proposed, where appropriate, below.

5.6.5.1 Aquatic Ecology Mitigation

Potential grid connection route and directional drilling effects

There are three stream/river crossings associated with the grid connection route (i.e., crossings of the Mullenhakill Stream, Arrigle River and Garrandarragh Stream). There will also be a crossing of a drainage ditch. The Mullenhakill Stream and Arrigle River will be crossed via directional drilling, with the Garrandarragh Stream and the drainage ditch crossed via trenching (shallow trefoil cable formation) within the existing culvert crossing. Mitigation measures relating to water quality preservation during construction are outlined in Section 5.3. These measures will also serve to protect aquatic ecological receptors.

Further to the mitigation measures outlined for directional drilling (Section 5.3.1), the ECoW will monitor both turbidity and observe the riverbed during the drilling process to detect any leakage of drilling fluid. Should this leakage be observed from the trenches or riverbed, works will cease immediately.

Although no-instream works are proposed, directional drilling under the Arrigle River will only be done over a dry period in September. This period is required to avoid the salmonid spawning season (October – June) and the Kingfisher breeding season (March-August; mitigation for Kingfisher arises from the NIS that accompanies this EIAR). The primary risk to salmonids from directional drilling is frac out, which is unlikely but potentially serious if it occurs. The primary risk to Kingfisher is noise disturbance. If directional drilling outside September is unavoidable and a period in July-August is required, a survey for breeding Kingfisher will first be carried out to ensure no breeding birds will be disturbed by the drilling works.

Similarly, directional drilling under the Mullenhakill Stream will only be done over a dry period in July-September to avoid the salmonid spawning season and the badger breeding season.

A pre-construction otter survey will be undertaken in the vicinity of the drilling locations to ensure than no breeding or resting areas within 150m of the drilling locations have been established since the survey work for the EIAR. Should a holt be detected, a derogation licence from NPWS will be obtained.

Potential TDR effects

Modifications along the TDR involve the temporary removal of street furniture and clearing of some vegetation in addition to the temporary local widening at bends/junctions using hardcore material. Only a single road widening location was identified as posing a risk to aquatic ecological receptors, i.e. Rathpatrick Stream at the Slieverue Roundabout, N29, through the potential release of suspended solids and contaminated surface water run-off (e.g. pollutants/fuels from machinery).

Whilst the Rathpatrick Stream in the vicinity of the proposed road widening works was not of value for fish, the watercourse likely supports European eel in its lower reaches (where it increases in size), given the close proximity to the River Suir estuary. European eels are less sensitive to siltation than other species (e.g. salmonids) but would be impacted by hydrocarbon pollution, should a fuel spillage etc. occur during works. Mitigation to prevent indirect water quality impacts during road widening works will be applied, as detailed in Section 4.5.

Potential turbine base construction and access track construction effects

Turbine hard-standing areas associated with turbines T8, T9, T12 and T13 are located ≥120m from the nearest watercourses (i.e. Ballytarsna River, Mullenhakill Stream, and unnamed tributaries). The Ballytarsna River and Mullenhakill Stream supported salmonids (brown trout observed at the time of survey).

Two significant existing drains, in the vicinity of T5 and T9, will be crossed via a precast concrete clear-span bridge. This will avoid in-stream works and reduce potential impacts to aquatic receptors at the crossing point and downstream. Clear-span bridge installation and access track works will only be done over a dry period between July and September (as required by IFI for in-stream works) to avoid the salmonid spawning season.

Potential borrow pit excavation effects

There is no identified direct connectivity between proposed three borrow pit locations and watercourses, which would reduce the potential negative effects resulting from borrow pit construction and excavation activities. However, the excavation of the borrow pit may result in silt-laden run-off entering receiving watercourses via the roadside drainage network. A lack of or an inadequate silt-attenuation system for the borrow pit may result in down-slope suspended solids and nutrient escapement to surface waters.

While risks of water quality impacts are low given the location of borrow pits away from watercourses (i.e., >500m distance), siltation control measures will be applied where risk of silt-laden water entering roadside drainage network is encountered. Borrow pits will maintain a 50m set back from streams. Machinery will not be refuelled within 50m of surface water pathways.

Potential tree felling effects

Tree felling is required at each of the 21 no. turbine locations, with the exception of T10 and T19. However, the greatest risk of impact from felling activities was identified in turbine areas near watercourses, i.e. T9 (Ballytarsna Stream), T8 (Mullenhakill Stream) and T12 (unnamed Mullenhakill Stream tributary). These felling areas are located ≤150m from the nearest watercourses.

All associated tree felling will be undertaken using good working practices as outlined in the Forest Service in their *Forestry Harvesting and Environment Guidelines* (2000c) and the *Forestry and Water Quality Guidelines* (2000b). The latter guidelines deal with sensitive areas,

erosion, buffer zone guidelines for aquatic zones, ground preparation and drainage, chemicals, fuel and machine oils. Brash mats will also be used to support harvesting and forwarding machinery. The brash mats reduce erosion of the surface and will be renewed as they become used and worn over time.

To ensure a tree clearance method that reduces the potential for sediment and nutrient run-off, the construction methodology will follow the specifications set out in the following guidance documents:

- Forest Service (2019). Standards for Felling and Reforestation;
- Forest Service (2000b). Forest Service Forestry and Water Quality Guidelines; and
- Forest Service (2000c). Forest Harvesting and Environmental Guidelines.

Given the sensitivity of aquatic ecological receptors downstream (e.g. salmonid and lamprey habitats), it is proposed to undertake felling in the spring to facilitate the sowing of grass seed post-harvest to aid sediment filtration and nutrient absorption, using native grass species *Holcus lanatus* and *Agrostris capillaris* (DAFM, 2018). Machine operations will not take place in the 48-hour period before predicted heavy rainfall, during heavy rainfall or in the 48-hour period following heavy rainfall (DAFM, 2018).

Removal of branch lop-and-top and other debris (brash) from felling areas within 20m of forestry drains (i.e. up-slope of active pathways to larger downstream watercourses) will reduce nutrient seepage immediately post-felling and in the years after felling has occurred (DAFM, 2019).

Potential site drainage effects

Although there are limited surface water pathways within the site, run-off may enter receiving watercourses via the road/access track drainage network or over-land seepage from infrastructure. Measures to protect surface water quality are outlined in Section 5.3.

5.6.6 General Ornithological Mitigation

Construction-phase mitigation measures to protect retained habitats and to protect watercourses are described in Section 5.6.5 and Section 5.3.

Pre-construction / construction breeding bird surveys will be carried out. These will be carried out in the breeding season preceding the start of construction, and in every subsequent breeding season across the duration of the construction period. The primary aims of these surveys will be to verify that no Hen Harriers are nesting in the wind farm site, and to identify breeding Snipe locations. In the unlikely event that Hen Harrier are nesting, any works within the potential disturbance zone of the nest site will be postponed until after the end of the Hen Harrier breeding season. The pre-construction confirmatory bird survey will also search for nest sites of any other sensitive species and implement specific mitigation measures as required.

The following additional specific measures will be implemented to mitigate impacts to bird populations:

- Where possible, tree felling and scrub clearance will not be carried out during the bird breeding season (1st March - 31st of August);
- Based on the results, of the pre-construction/construction breeding bird surveys, construction work will be timed to avoid work in close proximity to any breeding Snipe locations within the wind farm site during the Snipe breeding season; and

- Subject to the findings of the pre-construction bird surveys, construction work along the section of the grid connection route that crosses the Arrigle River will not be carried out during the Snipe breeding season to avoid disturbance to any breeding Snipe in this area.

5.7 Waste Management Plan

All waste generated from the proposed development will be managed in accordance with the provisions of the *Waste Management Act* 1996 as amended and associated Regulations.

All excavated topsoil, subsoils and peat will be reused within the site boundary, insofar as possible, primarily for reinstatement of the borrow pits. Any excess material which cannot be reused in creating berms or reinstating the borrow pits will be transferred off-site to a licensed waste facility. Similarly, any excess or unsuitable rock material which cannot be reinstated in the borrow pits will be transferred off-site. However, it is not anticipated that any excess material will not be suitable for reuse within the site.

Typical waste streams (including material-related streams such as metals, paper and cardboard, plastics, wood, rubber, textiles, bio-waste and product-related streams such as packaging, electronic waste, batteries, accumulators and construction waste) will be managed, collected, segregated and stored in separate areas at the construction compounds and removed off site by a licensed waste management contractor at regular intervals for the duration of the construction works. Skips and bins of appropriate sizes will be stored in both construction compounds and used to maximise source segregation of waste materials. This will include food and packaging waste from welfare facilities. Appropriate control of food waste in the compound will minimise the potential for pests and rodents to visit the area.

Any contaminated materials used for spills and equipment maintenance works will be separately stored in a suitable container for collection by an authorised hazardous waste contractor.

The Contractor will encourage all project teams to minimise waste generation and to maximise the segregation of waste at source. Material wastage will be avoided by delivering only the required quantities of material to site and utilising off-site manufacturing of steel reinforcement cages and concrete materials as much as possible. The Contractor will establish 'just-in-time' deliveries to avoid excess material storage at the site which can lead to waste generation. Delivery drivers will be encouraged to remove any excess packaging from materials delivered to site and remove unused timber pallets where possible.

Reusable formwork for concrete pouring will be used, particularly for turbine bases, in preference of non-reusable options. Other opportunities for material reuse across the site will be sought by the Contractor.

Due to the current use of the site for commercial forestry and agriculture, it is not anticipated that there will be contaminated soils or materials encountered during the excavation works. No contaminated soils were identified during the site investigation works. It is noted, however, that illegal dumping is common in large forestry areas and may be encountered at the time of construction. Where illegal dumping is discovered, Coillte's forestry management team will be informed, and measures taken to try and identify the source of the illegal waste. The appropriate authorities will be notified and the materials will be removed from site by authorised waste collection contractors and transferred to suitably licensed waste facilities.

The SHEQ Officer, or other appropriate person, will be appointed as the Waste Manager for the duration of the project in accordance with the general guidance set out in the *Best Practice*

Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects (Department of the Environment, Heritage and Local Government (DoEHLG, 2006).

At the pre-construction stage, the construction and demolition (C&D) Waste Manager will be in a position to require fellow designers to take full advantage of all reasonable C&D waste prevention, reuse and recycling opportunities. During construction, the practicalities of waste prevention, salvaging re-useable materials, and the need to synchronise the recycling of waste materials through the timing of their use in the new construction works will be emphasised by the Waste Manager.

The Waste Manager will be responsible for auditing waste handling and storage throughout the project and for advising construction personnel on best practices. All waste collections and records of waste movement off-site will be collated by the Waste Manager and retained in the site office.

5.8 Traffic and Transport

A TMP for the construction phase of the works has been prepared and is included in Appendix B to this document. The primary objectives of the TMP as set out in the document are to:

- Outline minimum road safety measures to be undertaken at site access / egress locations during the Construction Phase, including approaches to such access / egress locations; and
- Demonstrate to the Developer, Contractor and suppliers the need to adhere to the relevant guidance documentation for such works.

Mitigation measures with regard to traffic and transport as set out in the EIAR are provided in the following sections.

5.8.1 Site Entrance

Existing forestry accesses are available on the local road network around the wind farm site. The selection of the site access location on the L7451, was based on minimising the impact of the proposed development on the local residents. The proposed new crossing point on the L7451 was selected over a site access further south with existing infrastructure, to increase the separation distance between residents and the construction traffic crossing point on the L7451.

Use of the R704 access into the forestry instead of along the L7451 at the R704 junction, will also remove the construction traffic off the local road (L7451) and passing of larger vehicles in proximity to the local community.

5.8.1.1 Junction Visibility

Adequate visibility is available from the site accesses onto the local road, L7451, of 2.4m 'x-distance' by 'y-distance' of 160m in accordance with the TII DN-GEO-03060. Maintenance of the hedgerows within the visibility splays shall be undertaken to maintain the required visibility splays and mitigate the potential for overgrown vegetation which may result in inadequate visibility at the accesses during the construction activities, see Appendix 2-2 Drawing No. 10730-2051.

At the R704, the existing visibility is not in accordance with the current standards and was highlighted as a problem in the Road Safety Audit (RSA) undertaken by the independent RSA Team. A hidden dip is located within the current vertical road profile, obstructing the visibility to approaching vehicles from the west at the R704 site access. To improve safety at this access

ensuring adequate visibility, it is proposed to widen the existing site access, realign the existing access road and modify the vertical geometry of the existing road to remove the hidden dip and improve the visibility.

Adequate visibility at the site accesses will mitigate the potential increased likelihood for collisions between construction generated traffic and existing road network traffic.

5.8.1.2 Junction Swept Paths

In accordance with the TII DN-GEO-03060 and as agreed during scoping with KCC, swept path analysis has been undertaken at the site access for a worst-case typical construction vehicle (i.e. articulated truck (16.5m long)), in addition to those undertaken for the abnormal indivisible loads (AIL). The swept path of the maximum legal articulated vehicle accessing/departing the site are available in Appendix 2-2 on Drawings No. 10730-2052 and 70730-2053.

The swept path analysis of the longest AIL, the turbine blade, were undertaken following identification of potential pinch points in the route assessment report in Appendix 2-2.

The proposed site access design has been developed to take cognisance of the swept path of all vehicles arriving to and departing from the site. On the R704, an overrun area is proposed where infrequent larger movements are required. The gate has been positioned to allow for a large vehicle to wait clear of passing traffic on both the R704 and L7451, to avoid potential collision between passing vehicles and one stopped to open the gates at the site access. At the approach to the site accesses, the internal access tracks are proposed at a widened width of 7.0m, to accommodate safe clearance width between two large construction vehicles passing and acting as passing bays.

5.8.2 Internal Access Tracks & Passing Bays

Along the access track from the R704 to the L7451 site access cross-road, the road width is approximately 5m (5.5m including shoulders) widening locally on approach to the site accesses to 7.0m over a distance of 50m. In addition to these facilities for passing of vehicles, a long passing bay will be constructed within this forestry area to facilitate queuing of vehicles away from the public road network. This passing bay is 5.0m x 70m long which can accommodate 7 no. concrete trucks.

Each passing bay within the wind farm site is approximately 50m long by 4.5m wide, accommodating up to 5 no. of 10m standard rigid trucks. The passing bays will facilitate continuous movements to the works areas with limited disruptions. Passing bays are shown on the drawings in Appendix 2-2.

The internal road layout has been designed to accommodate the swept paths of the vehicles anticipated onsite. The internal access track layout has been created with two loops. These loops may be used by vehicles onsite to queue on approach to the works areas and allow for continuation from the works area in a forward manner to depart the site.

To supplement the internal access track loops and pending their full construction as the works progress, there will be 2 no. compounds, 9 no. passing bays and a widened internal access track location at the junction of the access track to T2 and T3 within located within the wind farm site.

5.8.3 Drainage

Drainage works to be carried out alongside the internal access tracks are discussed in Section 5.3.

5.8.4 Haul Routes

Mitigation measures on the haul roads and cable route includes:

- The crossing point of the L7451 was moved to create additional distance to residents to minimise construction traffic noise impact.
- Selection of a viable route with the lowest impact on the road network.
- Avoidance of sensitive receptors and urban settings
    - The construction route to the site is from the regional road R704 via forestry lands to the site via a new crossroad access located on the L7451. This proposal removes multiple interaction locations with residents along this local road and has one fixed location for interaction.
    - The site access route encourages the use of the strategic infrastructure in the area while avoiding the local road and potential sensitive receptors.
    - Turbine delivery route along national and regional roads with largest capacity to accommodate the vehicles.
    - The typical construction traffic haul roads are principally along the national and regional road network, avoiding the local primary and secondary roads.
    - Restricting HGV movements during peak sensitive times on the road networks (i.e. at school times).
    - The grid connection route will be laid primarily in forestry and agricultural lands, minimising works within the public road with the exception of road crossings and a short section (approximately 300m) along the L3418.
    - There will be no effect on the L8273 during cabling works as the cable will be laid by drilling underneath it, resulting in no impact on use.
- To mitigate traffic on the national road network, a number of possible routes have been investigated as possible sources of material for delivery in Chapter 16 (Traffic and Transport).
- To mitigate the impact of the AIL delivery on the road network, advance works will be undertaken (i.e. hardstanding preparation, making signs demountable, utility diversions etc). The hardstanding works areas will be temporary in nature and removed once the final turbine is delivered to site.

To mitigate the impact of the AIL deliveries these deliveries will be undertaken under garda and traffic management escort during off-peak (i.e. night-time) hours. The arrangement of the appropriate abnormal load licenses will be obtained by the appointed contractor in a timely fashion on procurement of the AIL. The appointed contractor will liaise with the relevant road's authorities and An Garda Síochána on the delivery schedule for the AILs.

5.8.5 Traffic Impact

To mitigate the impact of the construction traffic, the wind farm site works will utilise all available resources within the existing site to reduce the requirement for importation of materials to site. Excavation of stone material from 3 no. borrow pits within the wind farm site to provide capping material will reduce the HGV volumes.

The second largest traffic volume impact is associated with the haulage of the materials for the internal access track construction. In addition to the borrow pits, the internal access tracks have

been designed to utilise existing forestry access tracks where feasible, reducing the volume of materials required for importation to the site.

The largest volume traffic impact is associated with the concrete pours for the turbine foundations. The works at other areas within the main site will continue during these concrete pours, but only essential deliveries will be scheduled to occur on the same days as the concrete pours. To mitigate this impact, liaison with local authorities and the community in advance of the foundation pours as well as minimising other works/deliveries as noted.

5.8.6 Trench Reinstatement

To mitigate the impact of the cable laid within the public road, the reinstatement works will be backfilled and reinstated as soon as practicable. The reinstatement works will be undertaken in accordance with the "Purple Book" best guidance and practices as required by KCC. The proposed reinstatement and construction details and phasing will be agreed with associated Local Authorities Municipal District Office in advance of the works. The Contractor will be responsible for arranging for the required road opening licenses.

5.8.7 Pre- and Post-Construction Pavement Surveys

The client will undertake pre-construction and post-construction visual pavement surveys on the haul roads. Where the surveys conclude that damage on the roadway is attributable to the construction phase of the proposed project, the Developer will fund the appropriate reinstatement works to bring the road back to pre-construction condition as a minimum, details for which will be agreed with the Roads Authorities.

5.8.8 Traffic Management Plan (TMP)

The successful completion of this project will require significant co-ordination and planning and a comprehensive set of mitigation measures will be put in place before and during the construction stage of the project in order to minimise the effects of the additional traffic generated by the proposed development. A TMP proposed for the Castlebanny Wind Farm is included in Appendix B.

The following mitigation has been incorporated into the TMP:

- Haul route selection to avoid sensitive receptors.
- Widened approaches to the site accesses within the development to facilitate queuing of construction vehicles off the public road.
- Traffic Management Operatives (TMOs) will be provided by the Contractor in accordance with their TMP at the site accesses during peak construction traffic activities.
- A wheel wash will be provided within the site as shown on Drawing No. 10730-2005.
- Passing bays on the internal access track and a loop layout within the wind farm site to facilitate safe passing of vehicles within the site, vehicles travelling in a forward direction (reducing higher risk reversing manoeuvres).
- For the longitudinal cabling works on the L3418, to reduce the potential impact by the traffic management road closure, a suitable diversion route will be agreed with the Local Authority in advance of the works.

5.8.9 Project Delays

To avoid delays to the project programme, all required road opening licenses and agreements with the Local Authorities and An Garda Síochána to facilitate movement of abnormal loads shall be sought by the appointed Contractor in a timely manner.

5.9 Cultural Heritage

The National Monuments Act, as amended requires that, in the event of the discovery of archaeological finds or remains that the relevant authorities, the National Monuments Service of the Department of Culture, Heritage and the Gaeltacht (DoCHG) and the National Museum of Ireland, should be notified immediately. Allowance will be made for full archaeological excavation, in consultation with the National Monuments Service of the DoCHG, in the event that archaeological remains are found during the construction phase.

In areas where there is the potential that archaeological, architectural or cultural heritage site, structures, monuments or features could be impacted on during the construction phase, one or both of the following mitigations measures will be implemented:

Archaeological testing – best practice in areas of moderate archaeological potential demands caution, to ensure that archaeological deposits are identified as early as possible, thereby ensuring that any loss from the archaeological record is minimised. During archaeological testing, a licensed eligible archaeologist will supervise excavations of pre-determined trenches undertaken with a toothless grading bucket, under licence to the National Monuments Service of the DoCHG. Undertaking this confirmatory surveying will ensure that sufficient time can be allowed within the construction schedule for the excavation of any archaeological deposits discovered.

Archaeological monitoring – in areas of moderate archaeological potential, excavations associated with construction works, namely topsoil stripping, will be monitored by a suitably qualified archaeologist. In the event that archaeological deposits are discovered, work in the area will cease immediately and the archaeologist will liaise with the National Monuments Service of the DoCHG and the National Museum of Ireland.

A suitably qualified cultural heritage consultancy/consultant will be appointed to oversee the effective implementation of the archaeological mitigation measures recommended in this chapter for the construction phase of the proposed development. The consultancy/consultant will maintain continuing liaison with the National Monuments Service of the DoCHG and KCC's Executive Archaeologist throughout the construction phase of the development.

All archaeological mitigation is to be undertaken under licence to the National Monuments Service of the DoCHG and the National Museum of Ireland.

Due to differences in the nature of aspects of the development as well as variable ground conditions – particularly where there has been planted forest which is considered to have caused prior ground disturbance – mitigation measures to ensure the recording and management of any unrecorded archaeological sites are tailored to the specific conditions at each proposed development area.

Archaeological mitigation measures for different components and locations of the wind farm project are detailed below and summarised in Table 5-2.

Table 5-2 Summary of construction phase archaeological mitigation measures

Works planned	Archaeological mitigation
Wind farm – developments in areas of previously or currently planted forest	Inspection of topsoil stripping at the development locations to determine level of ground disturbance; archaeological monitoring if minimal ground disturbance is identified; licenced excavation if required
Wind farm – tracks and hard stands along existing tracks	No archaeological mitigation required
Wind farm – developments in areas with no previous or current planted forest	Archaeological testing in advance of ground works at the location of the development for turbines T5, T10, T12, T16, T19 and T21 and for the tracks between turbines T10-T12 and T19-T21-T20 followed by archaeological monitoring of all topsoil stripping at these locations; licenced excavation if required
Grid connection cable	Archaeological monitoring of topsoil stripping in advance of trenching along the route
TDR works areas	Archaeological testing in advance of ground works within the zone of notification for the recorded castle at the Ballynoony West (KK040-003)

Wind farm – turbines, compounds, borrow pits and other developments

Archaeological testing will be carried out across the footprint of the wind turbines and other development areas where these occur on land which has not previously been planted forest. Six turbines are planned for areas of unplanted pasture: T5, T10, T12, T16, T19 and T21. Following testing, full-time monitoring of topsoil stripping at the six locations of unforested pasture will take place.

The testing and monitoring will be conducted by a suitably qualified archaeologist licenced by the DoCHG. Should archaeological material be uncovered during this testing, the feature will be trowelled back to determine its form, age, nature and extent then photographed and recorded to best professional standards (MoLAS 1994) and adhering to the Department's *Policy and Guidelines on Archaeological Excavation* (1999). Based on information gathered from archaeological testing and monitoring, and in consultation with the National Museum and the National Monuments Section of the DoCHG, further mitigation such as excavation may be required.

In areas of the development where there is or has been planted forest, archaeological inspections of topsoil stripping by a suitably qualified archaeologist will take place to determine the level of ground disturbance and to assess the presence of any archaeological features. If the ground disturbance is found to be minimal at these locations, then full-time archaeological monitoring will occur.

Wind farm – tracks and hard stands

In two areas of the development where tracks are being newly built on previously unforested pasture, archaeological testing will be carried out along the route of proposed tracks and across hard stand areas. The two identified locations are the track between T10-T12 in the centre of the area and the track between T19-T21-T20 in the northwest of the area. The testing will be conducted by a suitably qualified archaeologist licenced by the DCHG. Should archaeological material be uncovered during this testing, the feature will be trowelled back to determine its form, age, nature and extent, then photographed and recorded to best professional standards. Based on this information and in consultation with the National Museum and the National Monuments Section of the DoCHG, further mitigation such as excavation may be required.

Where existing tracks are being used or upgraded, no archaeological mitigation measures are required.

Grid connection cable

Where the grid connection crosses unforested pasture, archaeological monitoring of topsoil removal along the route will be carried out. The archaeological monitoring will occur prior to the main excavation of the trench to ensure that if any archaeological features are exposed that these can be investigated as required. The testing will be conducted by a suitably qualified archaeologist licenced by the DoCHG. Should archaeological material be uncovered during this testing, the feature will be trowelled back to determine its form, age, nature and extent then photographed and recorded to best professional standards (MoLAS 1994). Based on this information and in consultation with the National Museum and the National Monuments Section of the DoCHG, further mitigation such as excavation may be required.

TDR works areas

Two of the TDR works areas, in Ballynoony West, have archaeological potential and one crosses a zone of notification for a recorded monument. The remaining areas are in heavily built-up land such as highways and roundabouts. In advance of construction, archaeological testing will be carried out at the location of the recorded castle and its zone of notification at Ballynoony West (KK040-003). The testing will be conducted by a suitably qualified archaeologist licenced by the DoCHG. Should archaeological material be uncovered during this testing, the feature will be trowelled back to determine its form, age, nature and extent then photographed and recorded to best professional standards. Based on this information and in consultation with the National Museum and the National Monuments Section of the DoCHG, further mitigation such as excavation may be required.

5.9.1 Architectural Heritage

There are no architectural heritage sites (RPS) located within the wind farm project area or beside the grid connection cable route or TDR works areas.

Impacts to vernacular heritage buildings within the project area have been avoided through the project design. One location where the potential direct impact of the development on above-ground vernacular historical feature, in the vicinity of T21, was avoided by routing the track next to the building. Construction of the track north of T21 will avoid the standing stone structure. The design shows this track as running directly to the west of the structure.

6.0 CONCLUSION

This Construction Environmental Management Plan (CEMP) presents a summary of the overall proposed development works, the management of the site during the construction works and the mitigation measures required to ensure the proposed works do not have a significant effect on the environment. This document is prepared in accordance with Best Practice documents as set out above and in the EIAR and the NIS.

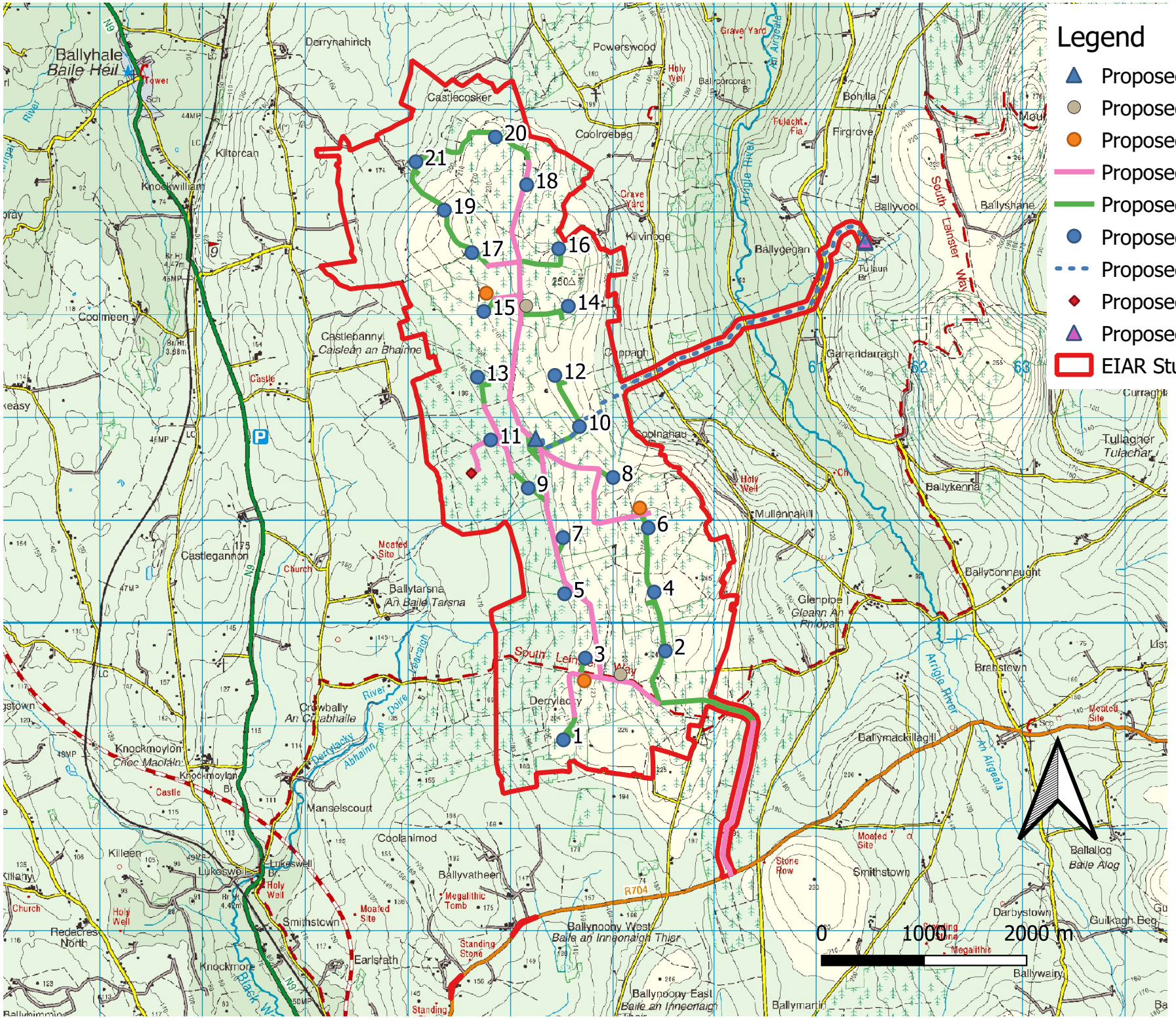
Prior to commencement of construction, the appointed Contractor will be required to update this document with site specific details including the location of spill kits on the site, the layout of the construction compounds, machinery pre-start checklists and provide details on the persons responsible for environmental management for the duration of the works. The updated CEMP will also be required to include any specific construction phase environmental management procedures identified in the grant of planning for the development or subsequent

to the planning submission. The final CEMP document will be agreed with the Developer prior to commencement of works and submitted to the planning authority. It will be a live document and updated accordingly throughout the project.

Appendix A – Figures

Figure 1 – Proposed Wind Farm Layout

Figure 2 – Proposed EIAR Study Area Boundary

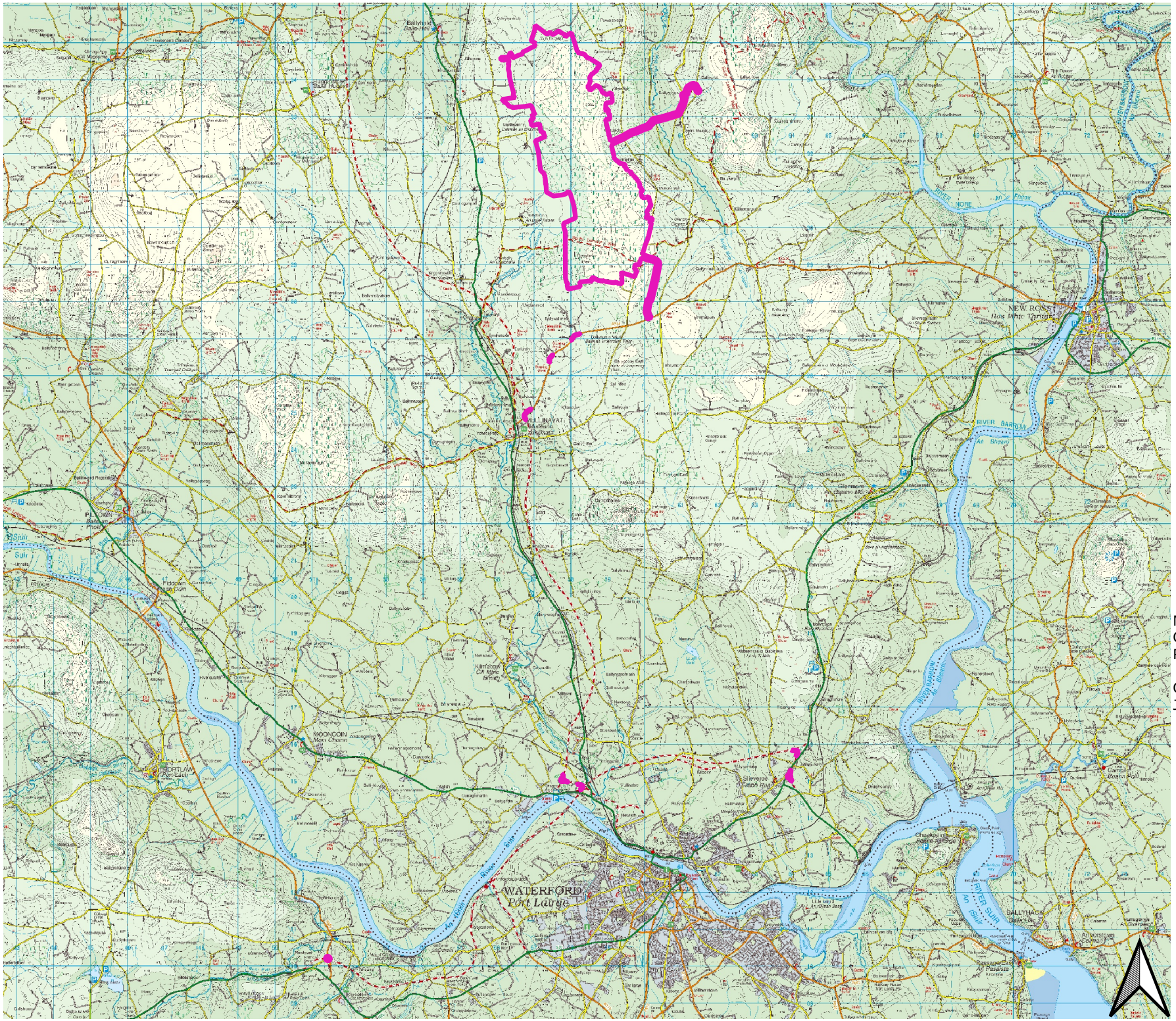


Map by: JS
Checked by: ST
Rev: 1

Client: Coillte
Job: Castlebanny WF

TOBIN
CONSULTING ENGINEERS

Figure 1
Title:
Proposed Wind Farm Layout
08.12.20



Legend

EIAR Study Area

Map by: JS
Checked by: ST
Rev: 1

Client: Springfield Renewables Ltd.
Job: Castlebanny WF

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Figure 2
Title: Proposed EIAR Study Area Boundary

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Appendix B – Traffic Management Plan

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GENERATION LTD

CASTLEBANNY WIND FARM

TRAFFIC MANAGEMENT PLAN

JANUARY 2021

CASTLEBANNY WIND FARM

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

Document Control Sheet	
Document Reference	10730-TMP
Report Status	Issue
Report Date	January 2021
Current Revision	A
Client:	Springfield Renewables Limited (Coillte Cuideachata Ghniomhaiochta Ainmnithe/ART Generation)
Client Address:	Dublin Road, Newtownmountkennedy, Co. Wicklow.
Project Number	10730

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Revision	Description	Author:	Date	Reviewed By:	Date	Authorised by:	Date
A	Final Issue	LG	22/01/21	RH	22/01/21	JS	22/01/21

TOBIN Consulting Engineers

Table of Contents

Table of Figures

1.0 INTRODUCTION

This Traffic Management Plan (TMP) was prepared as requested by Kilkenny County Council's Roads Department. The TMP is a "living document". Therefore, any changes which may occur in the planning process and in the detailed construction programme can be incorporated, as can inputs by the contractor(s), the detailed design team and Client. The commitments included within the Environmental Impact Assessment Report (EIAR) are the minimum commitments that the Contractors shall follow, and others will be developed during the Construction Phase in consultation with the various stakeholders, including the Local Authorities.

1.1.1 OBJECTIVES

This document is a Traffic Management Plan (TMP), prepared as an Appendix to the Construction Environmental Management Plan (CEMP). This TMP has been prepared prior to the appointment of a contractor, material suppliers and final Construction Phase programme. It will be updated following grant of planning permission and prior to commencement of any construction works as outlined in section 1.5 of the CEMP.

The primary objectives of this TMP are to:

- Outline minimum road safety measures to be undertaken at site access / egress locations during the Construction Phase, including approaches to such access / egress locations; and
- Demonstrate to the developer, contractor and suppliers the need to adhere to the relevant guidance documentation for such works.

The TMP shall address the following issues which are explained in detail in this report:

- Consent, Licenses, Notifications and Permissions;
- General Provisions;
- Site Access and Egress;
- Routing of Construction Traffic;
- Site Specific Temporary Traffic Measures;
- Enforcement of Traffic Management Plan; and,
- Emergency Procedures During the Construction.

1.1.2 IMPLEMENTATION AND MONITORING

The principal contractor shall agree and implement measures to monitor the effectiveness of the TMP, in conjunction with the Local Authority and Client. On finalisation of the TMP, the contractor shall adopt the plan and associated monitoring measures.

In order to ensure that environmental awareness and compliance is communicated effectively at the start and throughout the construction works, this TMP in conjunction with the CEMP and its contents will be communicated to all site personnel, including management staff, operatives and sub-contractors. The key elements of this CEMP will form part of the site induction which will be mandatory for all employees, contractors and visitors attending the site. Refer to Environmental Training and Awareness in section 1.6 of the CEMP.

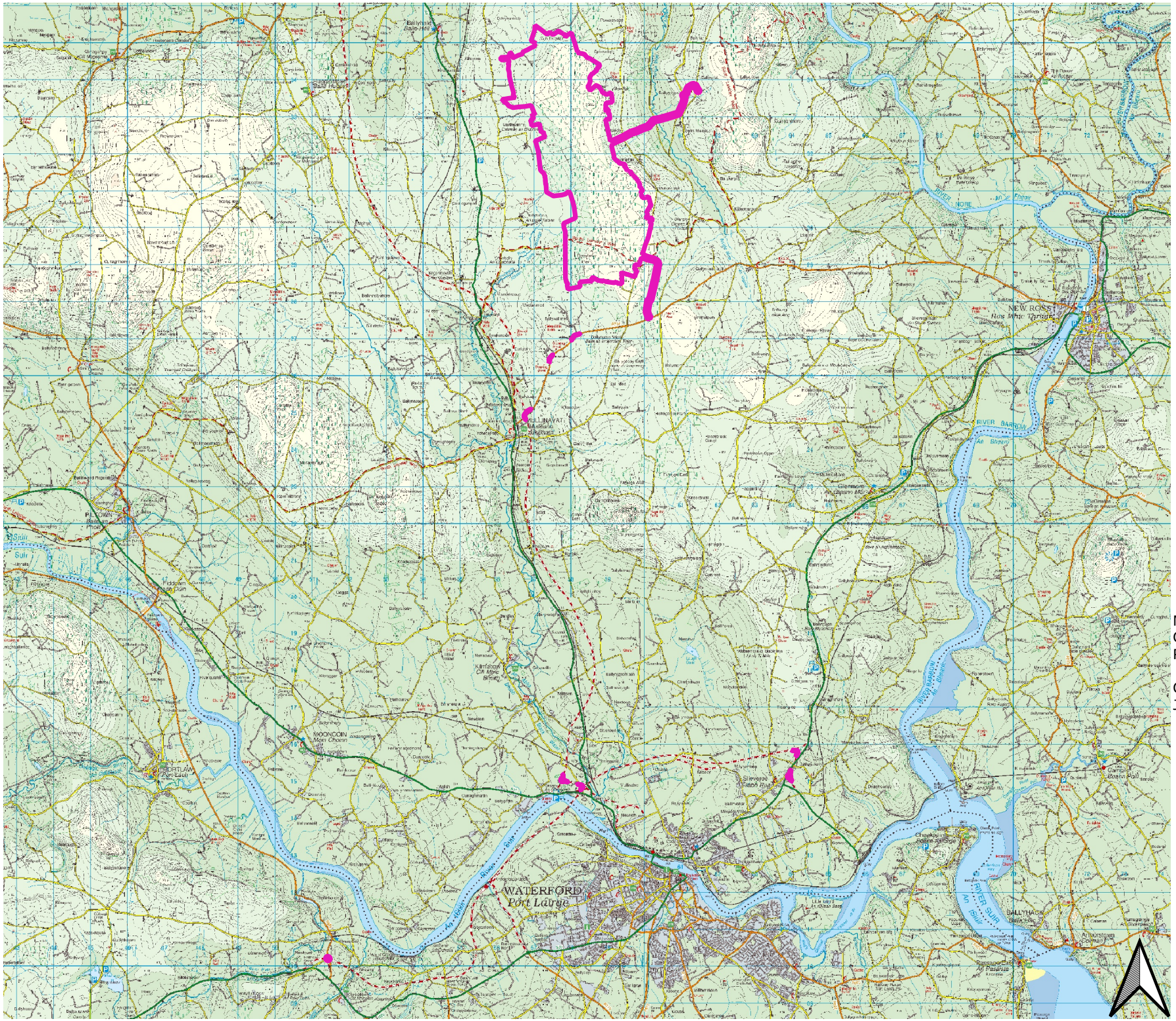
2.0 THE PROJECT

2.1 PROJECT LOCATION

The proposed wind farm site is located primarily within forestry landscape between the settlements of Mullinavat, Inistioge and Ballyhale in County Kilkenny. The majority of the existing land-use is commercial forestry owned by Coillte and includes areas of privately owned forestry as well as some areas of pastoral agriculture. A Site Location Map is included as Figure 2-1.

The closest rural settlements of Mullinavat, Inistioge and Ballyhale are located approximately 4.1km south-west, 5.7km north-east and 1.9km north-west of the site of the proposed wind farm, respectively. The site of the proposed wind farm is located approximately 20km south of Kilkenny City, and 15km north of Waterford City.

The M9 Dublin to Waterford Motorway runs to the west of the wind farm site and the River Nore runs to the east at a distance of approximately 5.5km at the nearest point. The River Arrigle is located approximately 1.1km to the east of the proposed wind farm site at its nearest point and is a tributary of the River Nore. The R704 Regional Road runs to the south of the site from Mullinavat to New Ross.



Legend

EIAR Study Area

Map by: JS
Checked by: ST
Rev: 1

Client: Springfield Renewables Ltd.
Job: Castlebanny WF

TOBIN
CONSULTING ENGINEERS

Figure: 2-1
Title: Proposed EIAR Study Area Boundary

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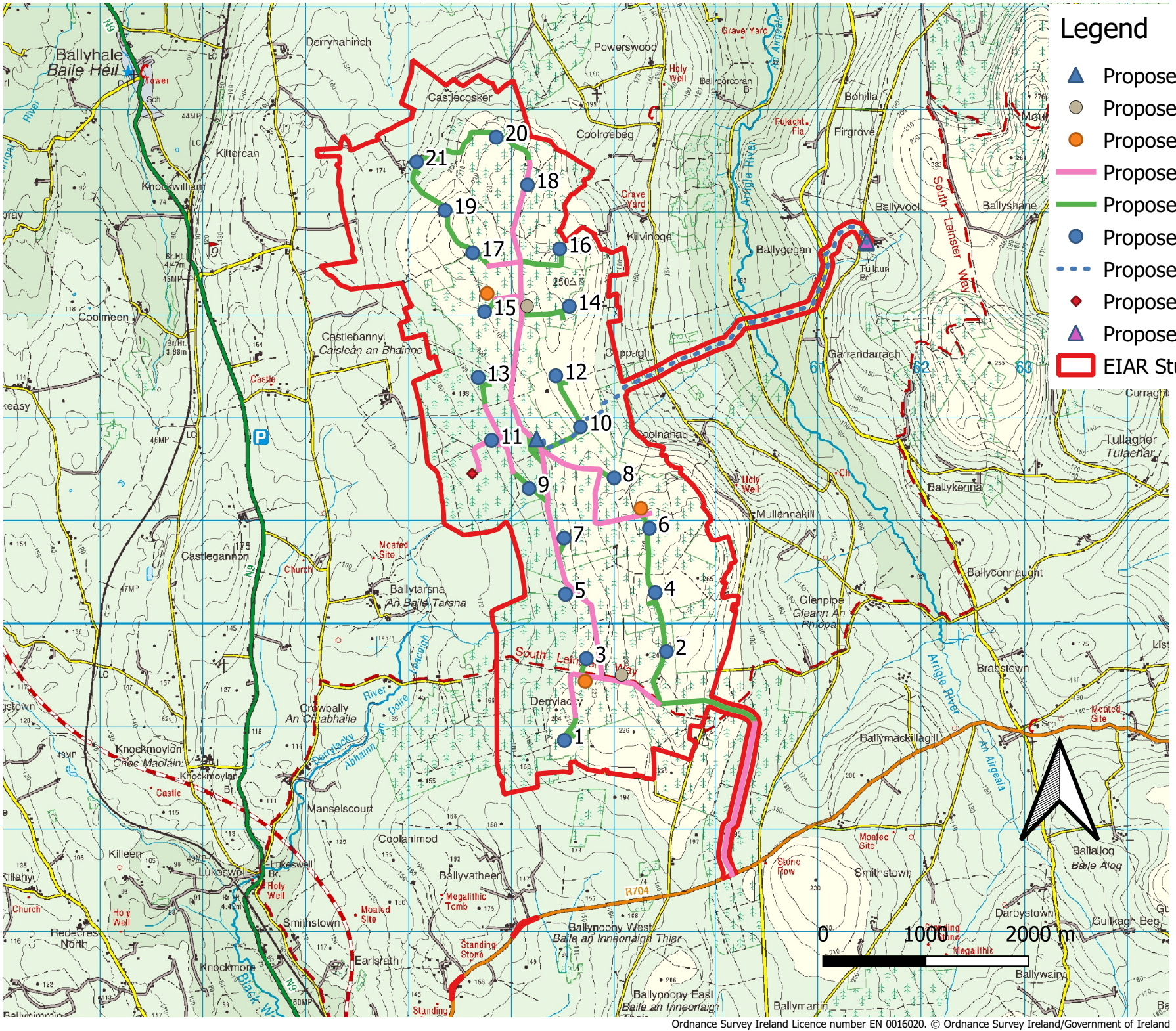
2.2 PROJECT DESCRIPTION

The project development includes a proposal to construct a wind farm and a 110 kV substation with loop-in connection to the national grid in the townland of Ballyvool, County Kilkenny via underground cabling. The site of the proposed wind farm comprises a single elongated land parcel. A 10-year planning permission and 35-year operational life from the date of commissioning of the entire wind farm is being sought. The Environmental Impact Assessment Report (EIAR) submitted with the planning application describes the development in more detail. A Site Layout Map is provided in Figure 2- and shows the proposed development boundary and the locations of the proposed turbines.

The proposed development (as described in full in Chapter 2 (Description of the Proposed Development) of the main EIAR) will generally comprise the following:

Wind Farm

- Upgrade works to the existing forestry access on the R704 regional road, and vertical realignment of the R704;
- New site access crossroad on the L7451 (Glenville) local road located approximately 180m north of the existing forestry access road to create a crossroad junction;
- Traffic associated with all related civil site works including:
    - forestry felling,
    - berms, landscaping, soil excavation
    - 2 no. temporary construction compounds with associated temporary site offices with parking areas,
    - Construction of approximately 11.1km of new internal site access tracks, and upgrade of approximately 11.4km of existing site roads, to include passing bays
    - Construction of turbine hardstanding and turbine foundations
    - All associated site drainage
- Construction of 1 no. 110kV electrical substation including 2 no. buildings, electrical infrastructure, parking, fencing, water services, associated landscaping and all associated underground electrical and communications cabling connecting the wind turbines to the proposed substation;
- Transport of 21 no. wind turbines with an overall blade tip height of up to 185m, blade length of up to 77.5m and all associated foundations and hard-standing areas in respect of each turbine;
- Transport of components for a 100 m permanent anemometry mast;
- Excavation of stone material from 3 no. Borrow Pits within the site;
- Development of a permanent public car park at the end of the construction phase on the footprint of the southern temporary construction compound. Permanent recreational facilities will be developed on the site including marked walking and cycling trails along the site access roads, seating and a picnic area.



Grid Connection

All traffic and construction work associated with the connection of the proposed wind farm to the national electricity grid.

All works associated with the approximately 4km connection of the proposed wind farm to the national electricity grid at Ballyvool, Co. Kilkenny by underground cabling by trenching and horizontal directional drilling.

Advanced Abnormal Indivisible Load (AIL) Haul Route Works

It is intended at this stage that the AILs will be delivered to the site from Waterford Port (Belview) via the national road network and the R704. Several junction locations along the national road and both bends and junctions on the regional road network require temporary works to accommodate these AIL deliveries to the site, as well as construction works at the site access on the R704. These works include temporary improvements at locations on the R704, M9, N9, N25 and N29 road network at junctions and bends for hardstanding areas, making signposts, lighting columns and kerbs demountable / hinged, utility diversions, minor drainage works (i.e. temporary relocated interceptor ditches) hedgerow / vegetation cutting for oversail.

2.2.1 PROPOSED SITE ACCESS & EGRESS

The proposed site will have a single direct access off the public road network from the R704 regional road. This access is located in a rural setting with limited dwellings and agricultural / field accesses in proximity to it on the R704. This access will facilitate access to the main site (i.e. Wind Farm) via existing forestry lands to the north and west of this direct access along upgraded and new internal access tracks to a new crossing point on the L7451, local road.

The L7451 crossing point has been located away from existing residential properties on the L7451, approximately 250m north of the nearest dwelling. Construction traffic will be prohibited from use of the L7451, except at the crossing location (i.e. no traffic travelling from the R704 along the L7451 to the site).

The new proposed access on the L7451 (to the west) following completion of construction, will be used by the low level of traffic associated with the maintenance and operation of the proposed development and for the proposed recreation use.

A Road Safety Audit (RSA) was undertaken at the site access points on the R704 and the L7451. The RSA highlighted an existing visibility concern on the R704 to the west presented by the existing hidden dip in the vertical road alignment. Proposals have been incorporated into the project to improve the visibility in line with the relevant standards (i.e. vertical road realignment). Trimming and maintenance of existing foliage clear of sight lines are proposed on the R704 and L7451. Modifications to the junctions to widen the access for safe manoeuvrability of AILs and HGVs are proposed. Advanced warning signs are proposed to advise motorists of the slower turning vehicles to site from the public road network.

The junctions have been designed and upgraded in accordance with the Transport Infrastructure Ireland (TII) document *Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade separated and compact grade separated junctions)* DN-GEO-

03060 June 2017. The visibility at the access junctions complies with the requirements of a 2.4m 'x-distance' setback with 'y-distance' of 160m. Swept path analysis for the largest vehicles accessing the site at both locations have been undertaken and the accesses modified to accommodate the wheel tracks of these vehicles (i.e. AIL (turbine blade) and maximum legal articulated vehicle (16.5m in length)).

2.2.2 EXISTING ROAD NETWORK

The EIAR Traffic Chapter describes the existing surrounding road network impacted by the proposed wind farm development. The main haul routes to the site are via the national and regional road network, which has sufficient width to accommodate two-way passing typical construction vehicles (i.e. HGVs). Construction traffic movements are limited on the local road network, with use of the local roads only in the absence of an alternative on the national and regional road network. Five typical construction haul routes have been identified and the haul route will be determined on procurement of materials by the appointed Contractor.

The haul route for the AILs is from the Belview Port to the site via the N29, N25, N9, M9 and R704. At the junction W1 of the N25, two alternative swept path movements have been investigated. With the advanced works outlined in the EIAR under Chapter 16 section 16.3.2.5, the existing road network can accommodate these AIL deliveries.

The cabling works will impact primarily on the local road network to the east of the development, with access to these locations from the R704 and the national and regional road network. The following existing roads will be potential impacted by the proposed wind farm development as outlined in section 3.3.5:

- National Road Network
  - N29
  - N25
  - N9
  - M9
  - N24
  - N10
- Regional Road Network
  - R704
  - R700
  - R448
- Local Road Network
  - L7451
  - L8273
  - L3418
  - L8276
  - L7434
  - L8269
  - L4200

3.0 CONSTRUCTION PHASE

3.1 CONSTRUCTION PHASE WORKS

The wind farm construction has a construction period of approximately 24 months with construction envisaged to commence in January 2024. The proposed development has 5 Construction Phases:

- Phase 1 Civil 14 months
- Phase 2 Turbine deliveries 12 months
- Phase 3 Electrical 4 months
- Phase 4 Installation 4 months
- Phase 5 Commissioning 2 months

The durational and phasing of the works are outlined in detail in the EIAR Chapter 2 and Chapter 16 and included in Section 3.1 of the CEMP. As evident in the above list, the phases will be overlapping and occurring concurrently at different works areas within the main site.

3.2 CONSTRUCTION HOURS

The hours of construction activity will be limited to avoid unsociable hours, where possible. Construction operations shall generally be restricted to between 07:00hrs and 19:00hrs on weekdays and between 07:00hrs and 14:00hrs on Saturdays.

However, to ensure that optimal use is made of good weather periods or at critical periods within the programme (i.e. concrete pours or to accommodate delivery of large turbine components along public routes), it may be necessary on occasion to work outside of these hours. Any such out of hours working will be agreed in advance with the Local Authority.

3.3 CONSTRUCTION PHASE TRAFFIC

3.3.1 STAFF LEVELS

For the wind farm construction, a peak workforce of 100 persons are anticipated on the main site. There will be peaks and troughs in the numbers, with a larger workforce during the general site works.

In addition to the onsite construction workforce, additional construction staff will be required for the cable laying works and the advanced AIL haul route works. At each location off site, a maximum of 10 construction staff are anticipated including traffic management operatives.

3.3.2 STAFF TRAFFIC GENERATIONS

The 100 workers will generally travel to the site via light vehicle (LV) (i.e. car or small van) assuming 2 persons per vehicle, or 50 trips to and 50 trips from the site.

3.3.3 CONSTRUCTION VEHICLES

The construction phase for the proposed development will result in additional traffic on the roads in the vicinity of the development. The proposed HGVs will typically be rigid vehicles (i.e. concrete trucks, dump trucks, delivery vehicles) or maximum legal articulated vehicles within normal vehicle loading.

This additional construction traffic will include the following:

- Construction worker vehicles, e.g. cars or vans (light vehicles).
- HGVs carrying conventional earthworks equipment such as an excavator, a roller, stone crusher, forklifts, etc.
- Forestry felling machinery and timber transportation trucks.
- Mobile Cranes.
- Delivery vehicles carrying:
    - conventional construction materials for the site, e.g. aggregate, concrete, rebar, etc.
    - conventional construction materials for the substation, e.g. electrical components, bricks, concrete, rebar, fencing, etc.
    - drainage infrastructure i.e. culverts, clear span bridge, tanks, etc.
    - met mast, electric cabling, inverter stations and electrical equipment for the on-site substation.

3.3.3.1 ABNORMAL INDIVISIBLE LOAD

The transformer and the wind turbine components will be abnormal indivisible loads (AILs). An assessment of the AIL loads have been made based on the details in the EIAR Chapter 16 section 16.3.2.1 pending confirmation of the specification during procurement at Construction Stage. The contactor will be responsible for obtaining all associated licenses from the Local Authority or Gardaí during construction for the abnormal load.

3.3.4 CONSTRUCTION VEHICLES TRAFFIC GENERATION

It is estimated that the peak construction phase will generate approximately 252 no. additional HGV and 100 LV movements during peak construction activity at the main site. Outside of the 21 no. peak delivery days, the construction traffic generated by the proposed development is on average 18 HGVs two-way per day. The concrete pours for the turbine foundations increase the background HGV content significantly by approximately 9.7%, from 6% to 15.7% on the R704. The impact on the national road network is less impactful due to the higher background HGV content on the national roads (i.e. increases by a maximum of 1.9% on the N24). These will only occur on the 21 days associated with turbine foundation concrete pours. The average construction traffic HGV and LV impact by the wind farm is an increase of 0.9% on the R704 and 0.1% on the national road network.

In addition to the traffic associated with the Wind Farm site works, off site works will occur over approximately a 2-week period for the advanced works for the AIL delivery and the grid connection cable works. This was assessed in conjunction with the Wind Farm site construction traffic as the works will overlap during the projects 2 year construction programme. The combined Wind Farm traffic (i.e. both on and offsite) will have a slightly more adverse effect on the road network. Their peak and average construction traffic increases the background HGV content from a baseflow of 6.0% to 17.3% at peak and to 8.1% on average on the R704. The

national road network HGV content increases by a maximum of 2.3% during peak construction activities and 0.3% for the average construction traffic.

As outlined in the EIAR Traffic Chapter section 16.3.2.8.1., the worst-case scenario (i.e. peak construction activities) indicates a spare link capacity on the R704 of 63.8%. It is therefore not considered that the proposed development will exceed national or regional road network capacity or will give rise to local traffic obstruction

3.3.5 CONSTRUCTION HAUL ROUTE

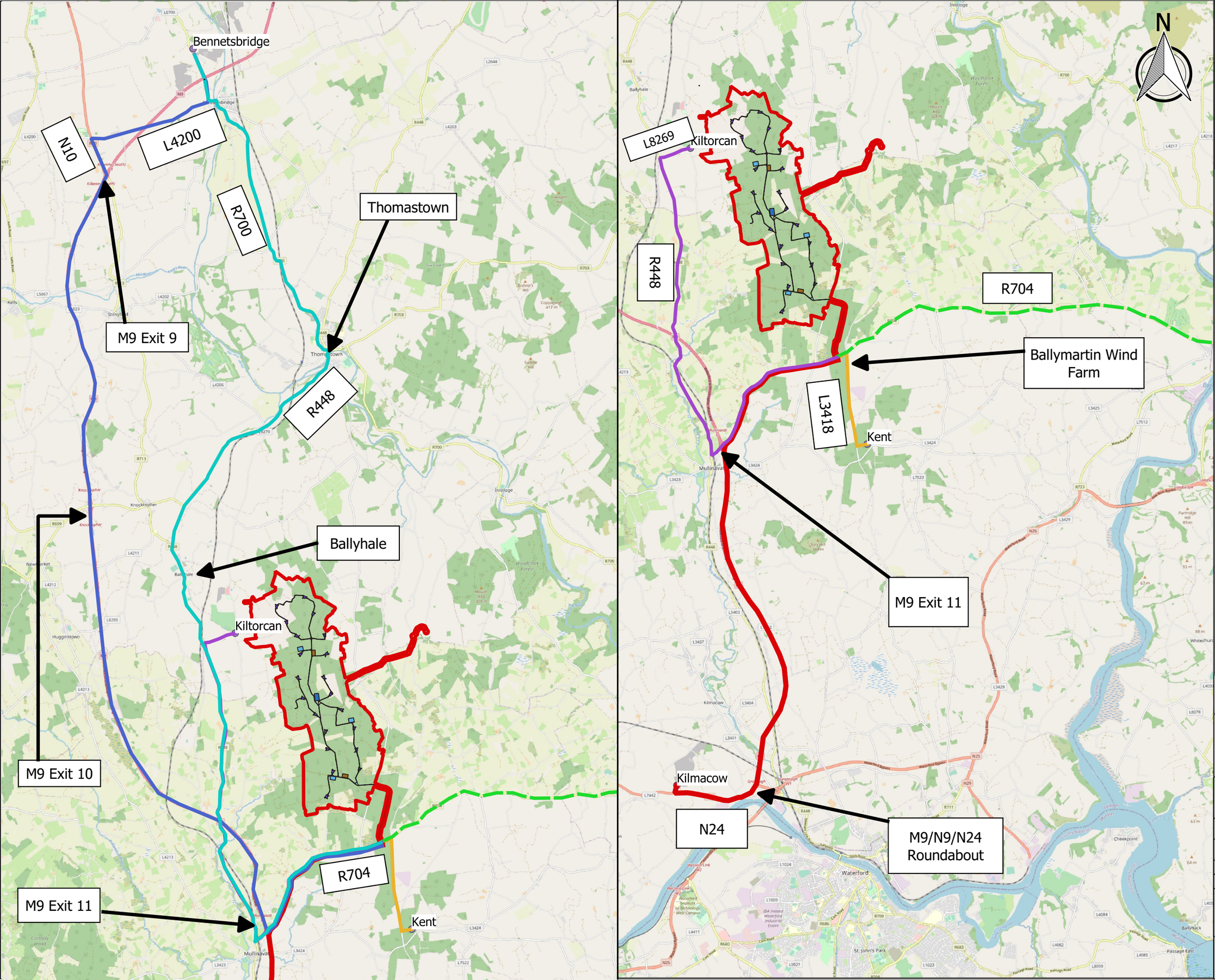
3.3.5.1 TYPICAL CONSTRUCTION TRAFFIC DELIVERIES

Several haul routes have been assessed including 5 no. alternative typical construction traffic haul routes and 1 no. abnormal indivisible load haul route. All haul routes cumulate on the R704 to the site via the improved junction on the R704. The proposed haul routes to the applicant site for the construction traffic are shown in Figure 3-1. The majority of material deliveries and trips to the site will be via the M9 and R704, as this route is the best access to the site from the wider area.

The haul routes identified utilise principally the national and regional road network with carriageway cross sections facilitating passing of two-way HGV movements. Short sections of local roads form part of the haul routes in the absence of these national and regional roads. The haul routes have been optimised to maximise the use of the national and regional road network over the use of local roads.

The haul routes selected also take into consideration the sensitive receptors presented by towns and villages, with routes avoiding towns and villages when the opportunity presents itself.

The haul routes have been reviewed and are considered suitable to accommodate the two-way passing delivery vehicles anticipated at the site in terms of alignment, condition, and width. It is not anticipated that any works will be required on the road network for the purpose of normal construction deliveries beyond the provision of the upgraded site access on the R704 and the new crossroad on the L7451.



Legend

- Study Area

Haul Delivery

- Route 1 - N24/M9/R704
- Route 2A - R700/R448/R704
- Route 2B - R700/L4200/M9/R704
- Route 3 - L3418/R704
- Route 4 - L8269/R448/R704
- Route 5 - R704
- Quarries

Notes:

- All coordinates relate to Irish Transverse Mercator (ITM)
- All levels shown relate to ordnance survey datum at Malin head.
- Drawings are for Planning Purposes only

Client: COILLTE

Project: Castlebanny Wind Farm

Title: Construction Material Haul Routes

Scale 1:100000 @A3

Prepared by:	Checked:	Date:
NOC	JS	Nov 2020

Project Director: Damien Grehan

Drawing Status: Information

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Drawing 10730 - 3.1

Issue: A

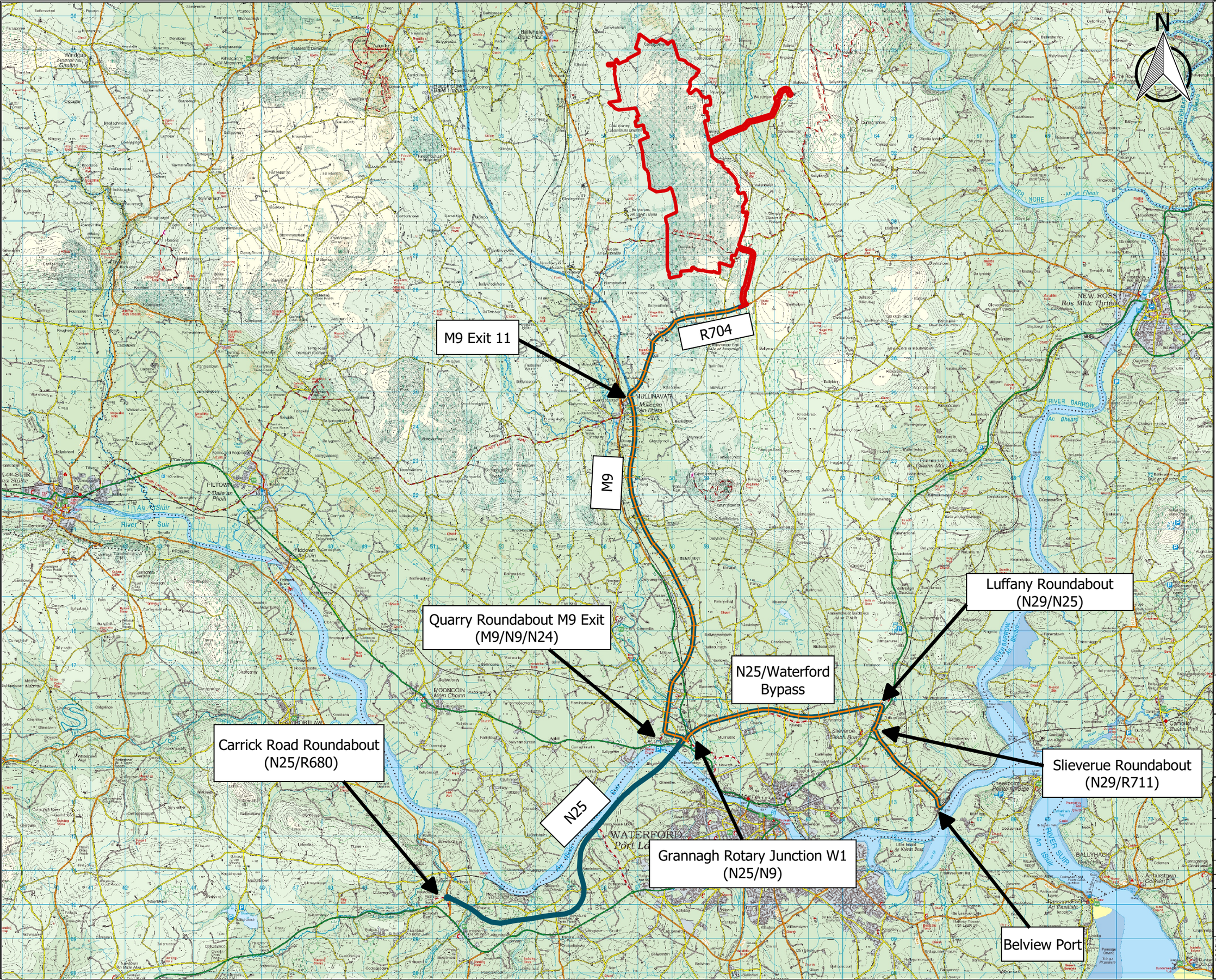
3.3.5.2 ABNORMAL INDIVISIBLE LOAD DELIVERIES

Belview Port is the anticipated port for import of the AILs. The route selected for the AILs utilised the national road network and its dual carriageway / motorway network as much as feasible from the port to the site as outlined in Figure 3-2. The AIL route on the national road network is on a Type 1 single carriageway with wide carriageway widths and hard-shoulder when not a dual carriageway.

The final leg of the haul route is via the R704, regional road, to the upgrade site access on the R704 to accommodate the longest swept path of the AILs, the turbine blade. Kilkenny County Council have been advised of the proposed AIL haul route during the scoping process.

A desktop study of the haul route was undertaken to consider the proposed haul routes suitability to accommodate the size of delivery vehicles in terms of alignment, capacity, condition and width on the national and regional road network. This is discussed further in the EIAR Chapter 16.

The study identified advanced works will be required at approximately 11 no. location on the haul route (excluding the site access on the R704). These works will include but not be limited to making traffic signs and lighting columns demountable / hinged, temporary hardstanding, vegetation and hedgerow cutting, utility diversions etc. It is noted that the first location is at the Belview Port with any works at this location being undertaken by the Port Authority and not forming part of this TMP.



Notes:

- All coordinates relate to Irish Transverse Mercator (ITM)

- All levels shown relate to ordnance survey datum at Malin head.

- Drawings are for Planning Purposes only

Client

COILLTE

Project

Castlebanny Wind Farm

Title

Turbine Delivery Route (TDR) / Abnormal Indivisible Load (AIL) Delivery Route

Scale	1:100000	@A3
Prepared by: NOC	Checked: JS	Date: Nov 2020
Project Director	Damien Grehan	
Drawing Status	Information	

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Drawing 10730 - 3-2

Issue A

3.3.6 INTERNAL ACCESS TRACK CONSTRUCTION HAUL ROUTE

Internal to the main site and the forestry area access from the R704, a new internal access track layout will be constructed. These access tracks will consist of upgraded existing forestry access tracks and construction of new access tracks. There will be approximately 11.1km of new internal permanent access track constructed and approximately 11.4km of internal access track upgrade works carried out. The proposed internal access track layout is indicated in Figure 3-3.

Internal access tracks will have a running width of approximately 5m (5.5m including shoulders), with wider sections at corners and on the approaches to turbine locations. In addition, the access tracks on approaches to the road crossing of the L7451 and the direct access on the R704, will be widened on the approach to a minimum road width of 7.0m over a length of 50m to accommodate two large vehicles (i.e. HGVs) to pass at the approach to each public road interface and to allow for queuing of vehicles within the site and off the public road.

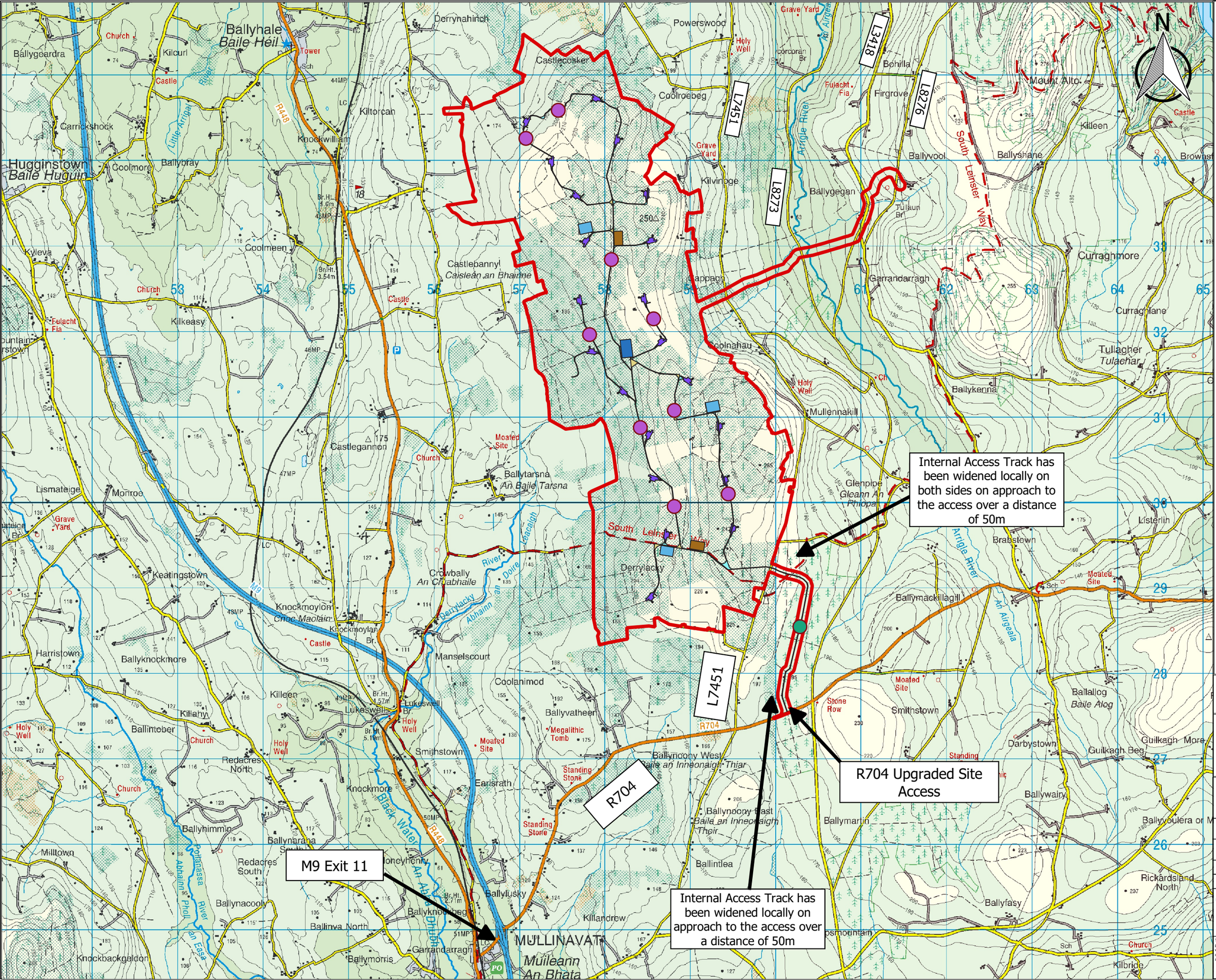
The layout of the access track within the main site area has two access track loops, turning areas, compounds and hardstanding areas. The layout will allow for a one-way system to be utilised as a means of traffic management for the deliveries on the site once constructed. Passing bays will also facilitate passing of HGV's within the site.

The compounds onsite will be utilised for material laydown areas and for staff office and welfare facilities and car parking. The southern compound will be located close to the site entrance from the L7451 local road and the northern compound will be located close to Turbine 15 and Borrow Pit 2. The use of two separated construction compounds will improve efficiency and capacity across the extensive wind farm site area.

The proposed internal access track layout will incorporate regular passing bays to allow traffic to pass easily while travelling around the site. The passing bays are indicated in Figure 3-3, and will have dimensions of 5m wide by 50m long, suitable to accommodate 5 no. 10m long rigid trucks within each passing bay including the passing bay tapers.

During the construction stage a temporary self-contained wheel wash will be installed at the site entrance to minimise the transfer of dirt and dust from the site onto the public road and to minimise the potential for transfer of alien invasive species onto the site. A typical detail of such a system is provided in Drawing No. 10730-2040 (Appendix 2-1 of this EIAR).

The internal access track network will also be utilised for ongoing commercial forestry operations and will facilitate the public recreational use of the lands.



Legend

- Study Area

Passing Bay Locations

- 50m Passing Bay
- 70m Passing Bay

Site Layout

- Borrow Pits
- Compound
- Improved Forest Roads
- Proposed Roads
- Turbine hardstand
- Substation

Passing bay dimensions are 5.0m wide by 50m long

Notes:

- All coordinates relate to Irish Transverse Mercator (ITM)
- All levels shown relate to ordnance survey datum at Malin head.
- Drawings are for Planning Purposes only

Client: COILLTE

Project: Castlebanny Wind Farm

Title: Internal Access - Passing Bay

Scale	1:40000	@A3
Prepared by: NOC	Checked: JS	Date: Nov 2020
Project Director	Damien Grehan	
Drawing Status	Information	

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Drawing 10730 - 3-3

Issue: A

3.4 CONSTRUCTION PHASE SUMMARY

The construction traffic impact of the additional HGVs and light vehicles on the existing road network has the potential to impact on the existing pavement condition, the carrying capacity of the road, the existing junctions flows on the haul route and at the site access and crossing point of the local road for the duration of the construction programme. The 5 construction phases, as outlined in section 3.1, and the cable laying and advanced AIL works will have varying impacts on the road network and environs.

The Wind Farm construction has an envisaged construction programme of 24 months, with lower traffic volume impacts on the road network outside of the 21-day peak period for the concrete pours for the turbine foundations. The main construction traffic associated with the development, the typical construction vehicles may result in a negligible / slight increase in delay due to the increase of traffic at junctions removed from the site and the increase in vehicle slowing on the R704 to turn to the site. This impact will be more adverse during the peak construction activities (i.e. turbine foundation pours) but these will be isolated occurrences on 21 days over 12 months.

Motorists may encounter minor delays along the L7451 at the new crossroad where traffic management operatives' control will be required to facilitate safe access / egress at the site during the peak construction activities.

Minor delays for short duration may be encountered on the following road networks due to temporary traffic management employed by the appointed contractor to safely facilitate works on / adjacent to the live carriageway for the advanced works for the AIL including the N29, N25, N9, M9 and R704. It should be noted that these AIL advanced works on the national roads are at the junctions and their associated on and off ramps only, with no works on the mainline. At these locations, the driver speeds will be lower on approach to junction than encountered on the mainline. The works themselves will be of short duration within the verges, splitter island and the roundabout centre islands. These advanced AIL works will occur in advance of the delivery of the AILs to site.

The grid connection cabling works will impact on the local road network (i.e. L7451, L8273, L3418 and L8276) over typically a short length and for short duration. The cabling works will require a temporary road closure of the L7451 and L8276 for a day each for trenched crossings with longer temporary road closure over 5 days on the L3418 for the longitudinal trench over 300m. This will result in disruption for local road users; however, diversions will be provided, local access maintained and carried out at off-peak times / night-time works as agreed with the Local Authority. It should be noted that no trenching works will be required on the L8273 as cabling will be by hydraulic directional drilling.

Passing bays will be utilised within the internal access track layout to accommodate two-way traffic. On construction of the internal access track loops, these will be utilised as a one-way system within the site for deliveries. The widened approaches to the accesses will provide safe locations for vehicles to queue and pass clear of the public road network.

4.0 CONSTRUCTION PHASE TRAFFIC MANAGEMENT PLAN

The contractor shall develop and take account of the commitments imposed within this TMP. The following are the commitments made at the planning stage of the project which shall be further developed by the contractor and agreed with the Roads Authorities, prior to works commencing on site:

- General Provisions;
- Site Access & Egress;
- Routing of Construction Phase Traffic;
- Site Specific Temporary Traffic Measures;
  - Traffic Management Logistics;
  - Traffic Management Speed Limits;
  - Traffic Management Signage;
  - Road Closures;
  - Timings of Material Deliveries to Site;
  - Abnormal Load;
  - Road Cleaning;
- Enforcement of Traffic Management Plan and
- Emergency Procedures During the Construction.

4.1 CONSENTS, LICENCES, NOTIFICATIONS AND PERMISSIONS

The key consents, licences, notifications and permissions likely to be required for the project with regards to traffic and roads are summarised as:

- Planning permission and associated planning compliance.
- Abnormal loads – it is envisaged that permits will be required for the abnormal loads that will be required for the delivery of the transformer and turbine components to the site.
- Road opening licences for underground cable works, junction upgrade works, foundations in the public roadway etc.
- Approval of temporary traffic management plans.
- Road closures and diversions.
- Permission for works outside of standard construction operation hours agreed with the Kilkenny County Council.
- Permission from the Motorway Maintenance and Renewal Contractor (MMaRC) / Public Private Partnership Contractor (PPP) on the relevant national roads.

The above list is non-exhaustive but identifies the key consents, licenses, notifications and permissions required for the project. This list will be further populated as required through planning compliance and stakeholder engagement to ensure that any further consents are identified as early as possible and do not impact on the construction programme.

4.2 GENERAL PROVISIONS

The construction traffic impacts of the proposed development have been identified as being temporary in nature. It is important that any impact caused by the proposed development is minimised as far as possible and, considering this the following mitigation measures shall be included in future developments of this TMP:

- Traffic movements will be limited to 07:00 - 19:00 Monday to Friday and 07:00 – 14:00 Saturday, unless otherwise agreed in writing with Kilkenny County Council.
- HGV movements will be restricted during peak road network hours (including morning school hours) from 08.00 – 09.00 and 17.00 - 18.00 Monday to Friday, unless otherwise agreed in writing with Kilkenny County Council.
- HGV movements for the proposed development shall be directed away from sensitive areas (i.e. schools, urban centres).
- No construction traffic will be permitted on the L7451, except for at the new crossing point.
- No parking shall be permitted along the access route for unloading or activities that result in blockages of access routes. Such vehicles will be immediately requested to move to avoid impeding the works and traffic on the road network.
- Measures to remove queuing of construction traffic on the adjoining road network including turning space and queuing of convoy HGVs will be provided within the site (i.e. one-way internal access track loop system and passing bays).
- Wheel wash equipment will be used on site to prevent mud and stones being transferred from site to the public road network.
- Activities generating dust will be minimised where practical during windy conditions. Loads will be covered on arrival and departure from site, where required. Other measures are outlined in the CEMP.
- Clear construction warning signs will be placed on the public road network to provide advance warning to road users to the presence of the construction site and slower moving vehicles making turning manoeuvres.
- Access to the construction site will be controlled by on site personnel and all visitors will be asked to sign in and out of the site by security / site personnel and site visitors will all receive a suitable Health and Safety site induction.
- Security gates will be sufficiently set back from the public road, so that vehicles entering the site will stop well clear of the public road.
- The approaches to the site accesses have a width of 7.0m over a length of 50m to accommodate queuing and passing of vehicles clear of the public road.
- The passing bay located between the R704 and L7451 has an increased length of 70m long, to accommodate 7 concrete trucks queuing while other vehicles pass.
- Passing bays located within the main Wind Farm site with have dimensions of 5.0m x 50m long.
- Compound locations have been identified for storage, site offices and welfare facilities.

The final TMP will also include provision by the appointed Contractor, for details of intended construction practice for the development, including:

- Traffic Management Co-ordinator – a competent traffic management co-ordinator will be appointed for the duration of the project and this person will be the main point of contact for all matters relating to traffic management;
- Delivery Programme – a programme of deliveries will be submitted to Kilkenny County Council (KCC) in advance of the delivery of the turbine components to site;
- Information to locals – local residents in the area will be informed of any upcoming traffic related matters, e.g. temporary lane/road closures (if required) or any night deliveries of turbine components, via letter drops and posters in public places. Information will include the contact details of the Developer's representative, who will be the main point of contact for all queries from the public or local authority during normal working hours. An "out of hours" emergency number will also be provided;
- Pre and Post Construction Condition Survey;

  - A pre-condition survey of roads on approach to the site will be carried out prior to construction commencement to record the condition of the road;
  - A post construction survey will be carried out after works are completed;
  - Impacts on the road condition as a result of the proposed development will be rectified and the road condition returned at least to its original condition.
  - The timing of these surveys will be agreed with KCC;
- Liaison with Local Authorities – liaison with KCC and other Local Authorities, including the roads and transport section, through which the delivery route traverses and An Garda Siochána, during the delivery phase of the AILs, wherein an escort for all convoys may be required;
- Temporary Alterations – implementation of temporary alterations to road network at critical junctions;
- Travel plan for construction workers – a travel plan for construction staff and sub-contractor construction staff;
- Temporary traffic signs – As part of the traffic management measures, temporary traffic signs will be put in place;
- TMOs will be present at all site access points during peak delivery times; and,
- Delivery Times of Large Turbine Components – The management plan will include the option to deliver the large wind turbine plant components at night in order to minimise disruption to general traffic during the construction stage.

The Traffic Management Plan (TMP) will be updated by the principal contractor (on appointment) and agreed with the Planning Authorities prior to commencement of development in the event of a grant of permission.

4.3 SITE ACCESS AND EGRESS

At the proposed access points to the proposed development, visibility splays shall be provided and maintained in accordance with the TII guidelines of a 2.4m setback over a length of 160m in both directions. On the R704, construction works to realign the vertical geometry of the road to the west will be required to achieve these visibility standards. To ensure a safe working access for all construction vehicles on the Wind Farm, these works will be required to be undertaken in advance of all other activities on the site utilising this access. Minor improvements to the sight lines in the form of trimming and ongoing maintenance of existing foliage within the lands of the applicant shall be required once completion of the site access construction works on the L7451 and the R704 upgrade works.

The principle contractor shall be required to utilise a safe system of traffic management, including the use of Traffic Management Operatives (TMOs) for the control of traffic during access / egress operations at the site access locations during the peak construction activities (e.g. during the 21 days of delivery for the concrete pours).

4.4 ROUTING OF CONSTRUCTION PHASE TRAFFIC

The proposed haul roads were identified based on review of existing quarry sources, principal road networks (i.e. national and regional) and consultation with the local authorities. The haul routes utilise the national and regional road network as much as feasible, with only localised use of the local road network. All construction traffic to the Wind Farm site will arrive via the R704, with the most prevalent use of the national road network to be the M9. As detailed in Section

3.3.3, the majority of materials delivered to site will be delivered using maximum legal articulated lorries or smaller vehicles.

Project construction HGV traffic will be directed away from communities and sensitive receptors (i.e. schools, dense residential areas, urban centres) where possible to minimise the effect on these communities. Hence, the proposed new crossing point on the L7451, instead of the utilisation of the L7451 (from the R704) and existing forestry access which is immediately adjacent to residential properties on the L7451.

Other Construction Materials such as stone fill required for internal access tracks, concrete, fencing materials and landscaping elements will be sourced by the principle contractor. Such material deliveries are envisaged to utilise one of the haul routes identified in Figure 3-1. The principle contractor shall be required, in the further development of the TMP, to identify the sources and proposed haul routes for all material supplies.

4.5 SITE SPECIFIC TEMPORARY TRAFFIC MEASURES

The specific details of each temporary traffic measure shall be developed by the contractor(s) for each site access in consultation with the Roads Authority, An Garda Síochána and other Emergency services, before being submitted to the Roads Authority for formal approval prior to any works taking place.

The maximum length of the active traffic management area (i.e. including taper lengths) shall be no more than 500m in length for any proposed shuttle system i.e. the length of road affected by the works. In order to minimise traffic delays, it may be necessary to limit the works site to shorter lengths if queuing delays are encountered.

Any requirement for a traffic lane closure will be controlled by an active traffic management system (i.e. temporary traffic signals or Stop & Go / Téigh discs). An Garda Síochána shall be consulted prior to the implementation of the active traffic management system. The operation of a manual 'Stop & Go / Téigh' system will be undertaken by trained personnel, wearing suitable high visibility garments. The operators of this type of system will be in verbal contact (i.e. walkie talkie) and preferably inter-visible. At these locations queue lengths will be estimated initially with onsite measurements to determine the necessary warning distance for approaching drivers. The signage shall be adjusted as necessary when the actual impact on traffic flows is established.

The optimum traffic lane width shall be 3.3m, with a minimum width of 3.0m. Reduction of the temporary traffic lane width below these parameters may result in the requirement for marshalling of larger vehicles (i.e. HGV and buses) or alternatively implementing a diversion route for traffic, which shall be approved by the Road Authority following consultation with the Road Authority, An Garda Síochána and other emergency services.

Where roadworks impede dwelling access onto the road network, the residents shall be instructed on how to egress the property at times when a shuttle system is in operation. The contractor shall provide a TMO at accesses where the motorist is having difficulty following the instructions.

Where reasonably practicable, consideration will be given to the possibility of removing the traffic management measures in order to deal with:

- Particularly high traffic volumes due to sporting or other events;
- Adverse weather conditions;
- Emergency access; or
- Times when work is not in progress.

If the night-time or weekend Temporary Traffic Management (TTM) measures varies from daytime plan, a separate TTM will be prepared to be approved by the Roads Authority.

On completion of the works, the traffic management measures are to be removed when the road is safe and free from obstructions, all reinstatement of road surfacing is completed and all permanent signs, road markings and other items are in place.

4.5.1 TRAFFIC MANAGEMENT SYSTEMS / LOGISTICS

The principal contractor as a minimum shall employ the following traffic management systems and logistics to facilitate the safe transport of materials to and from the proposed development.

4.5.1.1 TRAFFIC MANAGEMENT OPERATIVES (TMOs)

No pinch points are present on the public road during the delivery of materials from the sources on the haul routes to the site access on the R704. Due to improvement works at the site access it is not envisaged that TMOs would be required at the R704 access during average construction traffic volumes. The road has adequate width for vehicles to turn into the site and advanced warning signage is proposed. During peak construction activities, the appointed contractor may require TTM (i.e. stop / go system) at the site access to facilitate movement of construction vehicles off site if in convoy.

At the L7451, during the average construction deliveries TMOs and TTM are not envisaged to be required. However, during large volume of movements both to and from the site of HGVs, TMOs implementing a Stop / Go System are recommended at the L7451 crossroads.

TMOs will be required within the site to manage the movement of HGVs within the internal layout, in particular during peak construction activities.

TMOs and TTM for the AIL delivery will be developed by the appointed contractor in consultation with the specialised haulage provider, An Garda Síochána and the Local Authority.

4.5.1.2 CONVOY SYSTEM

A convoy system shall be employed by the principal contractor, applied to HGVs departing the site, involving:

- Traffic management operatives at the proposed development access / egress points. The TMOs shall restrict HGVs exiting the site, to facilitate the development of a convoy system (maximum 4 no. HGVs);
- Suitable spaces shall be made available within the site for queuing of HGVs (i.e. passing bays and at widened crossing points / site accesses);

- Traffic management operatives shall be stationed at the L7451 crossroads with suitable intercommunication system (i.e. radio) to control the release of the convoy system between the main site and the forestry access to the R704;
- The convoy shall have separation between convoys to facilitate use of the public road network in the absence of construction HGV movements.

4.5.2 TRAFFIC MANAGEMENT SPEED LIMITS

It shall be noted that where a temporary speed limit is deemed appropriate by the contractor(s) to facilitate the Construction Phase activities along the public roads serving the proposed development, it shall be a requirement for the appointed Contractor to liaise with the relevant Roads Authority for the purpose of obtaining a temporary speed limit.

Adherence to posted / legal speed limits will be emphasised to all staff / suppliers and contractors during induction training. In speed zones greater than 60km/h, drivers of construction vehicles / HGVs will be instructed that vehicular movements in sensitive locations, such as schools and local community areas, shall be restricted to 60 km/h. Such advisory speed limits will only apply to Construction Phase haulage traffic and shall not apply to general traffic. It is not proposed to signpost such speed limits in the interest of clarity for local road users.

4.5.3 TRAFFIC MANAGEMENT SIGNAGE

Signage for temporary traffic measures shall be provided in accordance with the Department of Transports Traffic Signs Manual, August 2019 - Chapter 8 – Temporary Traffic Measures and Signs for Roadworks (or any subsequent update of the standards that will be in place at the time of construction).

Advanced warning signs will be used to alert drivers to the unexpected road layout. Clear construction warning signs shall be placed at adjacent roads and the entrances, to advise the general public of the presence of construction sites and activities. All permanent road signs contrary to the proposed roadworks will be covered for the duration of the works and uncovered on removal of the temporary traffic management measures.

4.5.4 TIMING OF MATERIAL DELIVERIES

In order to reduce impacts on local communities and residents adjacent to the proposed sites, it is proposed that:

- Construction activities will be undertaken based on a six-day working week, with deliveries between 07:00-19:00 on weekdays and 07:00-14:00 on Saturdays.
- HGV deliveries shall avoid passing schools at opening and closing times where it is reasonably practical. Deliveries are restricted between the hours of 08:00 and 09:00hrs, the school morning peak and peak traffic on the road network.
- Construction activities and deliveries outside these hours shall be agreed with the Local Authority in advance.
- The contractor shall liaise with the management of other construction projects and the local authority to co-ordinate deliveries.
- The contractor shall schedule deliveries in such a way that construction activities and delivery activities do not occur during peak traffic flows or run concurrently, such as;

  - avoiding pouring of concrete on the same day as other large material deliveries to site in order to avoid conflicts between vehicles.
  - staggering the pouring of concrete on different days.
- HGV deliveries to the development site will be suspended on the days of any major events (i.e. sporting, agricultural etc), that have the potential to cause larger than normal traffic volumes on the existing road network, in the vicinity of the works.
- The contractor will be required to interact with members of the local community to ensure that deliveries will not conflict with sensitive events such as funerals; and
- It is likely that some deliveries will be required to be undertaken outside these hours. For example, during large concrete pours or other essential continuous operation whereby the continuous delivery of material will be required. Such deliveries will be agreed in advance with Kilkenny County Council.

The scheduling of material deliveries is required in order to facilitate the implementation of traffic management activities at the site and the works zones within the site. It will also impact on the offsite works locations for the AIL advanced works. A convoy system shall be employed for HGVs departing the proposed development to reduce the frequency of isolated HGV movements on the public road network as much as practicable.

4.5.5 ABNORMAL INDIVISIBLE LOAD

A total of 191 no. AILs are anticipated to be transported to the site along the AIL haul route identified in Figure 3-2. It is envisaged that these loads will be moved outside of normal hours as night-time works in convoys. A maximum of 3 turbines (i.e. all tower, nacelle and blades) will be delivered to site per month. The convoys are anticipated to be have 3 or 5 no. AILs per convoy with deliveries over a maximum of 9 days or a minimum of 6 days.

The principal contractor shall ensure that the haulage of these AILs is done in conjunction with an Gardaí Síochána and the Roads Authorities. The principal appointed contractor and their haulage provider will be responsible for obtaining all necessary permissions and licences from the local authorities and Gardaí.

4.5.6 ROAD CLOSURE

In order to facilitate the grid connection of the proposed wind farm to the national grid, a connection between the proposed site and 110kV overhead line is required, see Figure 4-1. This requires 2 no transverse trenched road crossings of the local roads, the L7451 and the L8276. The L8273 cable laying will be by hydraulic directional drilling. The longest section of cable laying will be within the L3418 carriageway for a distance of approximately 300m.

A temporary road closure or off-peak works shall be required to facilitate the laying of the cable crossing and the longitudinal cable run. For the crossing works, the road closure or off-peak works will be limited to 1 day or night. For the longitudinal cable laying, it is envisaged to take approximately 5 days / nights. The principle contractor shall carry out such temporary road closures outside of peak traffic flow times, and only for the duration of the working day. At the time of this construction work and in advance of the required Road Closure, the appointed Contractor shall consult and comply with the Roads Authority, An Garda Síochána and other Emergency services to agree a suitable diversion route prior to implementing a Road Closure.

The trench shall be suitably backfilled at the end of the working day, with the provision of suitable temporary surfacing material, as may be requested by the local authority. Such closures

shall only be undertaken following consultation with the local authority and following any requests for notifications by the local authority. A road opening licence shall also be applied for, by the principle contractor to the local authority. The contractor will also be required to provide the requisite bond to ensure reinstatement is completed to the satisfaction of the road's authority. Full pavement reinstatement is required in accordance with the "Purple Book" or former Department of Transport, Tourism and Sport '*Guidelines for Managing Openings in Public Roads'*, Second Edition Rev 1 April 2017.

Grave Yard
Kilvinoge
Ballygegan
Tullaun Br
Ballyvo
Cappagh
Coolnahau
Garrandarragh
Holy Well
Ch
Mullennakill
Annagh
L8276
L3418
L8273
L7451
Transverse road crossing trench
Existing 110kV overhead line at Ballyvool
Horizontal Directional Drilling
Transverse road crossing trench
N

Legend
- Study Area
- Grid Route

Site Layout Elements
- Substation
- River Network
- River Barrow & River Nore SAC

Notes:
- All coordinates relate to Irish Transverse Mercator (ITM)
- All levels shown relate to ordnance survey datum at Malin head.
- Drawings are for Planning Purposes only

Client: COILLTE

Project: Castlebanny Wind Farm

Title: Grid Connection Route

Scale	1:12500	@A3
Prepared by: NOC	Checked: JS	Date: Nov 2020
Project Director	Damien Grehan	
Drawing Status	Information	

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Drawing 10730 - 4-1

Issue: A

For the AIL advanced works, road and lane closures should be avoided due to the high volume of baseflow traffic and the strategic importance of these routes at the works locations. At these locations, a short-term temporary traffic management system of an "All Stop" may be more appropriate. Off-peak working hours would also reduce the impact on the high traffic volumes. The details of these traffic management plans will be formalised by the appointed Contractor and agreed with the Roads Authority (including TII representatives on the national roads).

4.5.7 ROAD CLEANING

Regular visual surveys of the road network in the vicinity of the sites will be carried out. Where identified / required, the contractor shall carry out road sweeping operations, employing a suction sweeper to remove any project related dirt and material deposited on the road network by construction / delivery vehicles. It shall be a requirement of the works contract that the contractor(s) will be required to provide wheel cleaning facilities, and any other necessary measures to remove mud and organic material from vehicles. In addition, the cleaning of delivery lorries such as concrete delivery lorries shall be carried out at the material storage yard as outlined in the CEMP.

4.6 ENFORCEMENT OF TRAFFIC MANAGEMENT PLAN

The appointed contractor will further develop this TMP in consultation with the Road's Authority Kilkenny County Council. The contractor will, during the development and adoption of the TMP, agree and implement an appropriate way of monitoring the effectiveness of the plan.

All project staff and material suppliers will be required to adhere to the Traffic Management Plan. Inspections / spot checks will also be carried out by the contractor(s) to ensure that all project staff and material supplies follow the agreed measures adopted in the Traffic Management Plan.

4.7 EMERGENCY PROCEDURES DURING THE CONSTRUCTION

In the case of an emergency, the following procedure shall be followed:

- Emergency Services will be contacted immediately by dialling 112;
- Exact details of the emergency/ incident will be given by the caller to the emergency line operator to allow them to assess the situation and respond in an adequate manner;
- Follow the instructions of the Local Authorities and An Garda Síochána;
- The emergency will then be reported to the Site Team Supervisors and the Safety Officer;
- Where required, appointed site first aiders will attend the emergency immediately; and
- The Safety Officer will ensure that the emergency services are enroute.

It is important that during the Construction Phase, emergency services can gain ready access to any property along the Haul Road or in the vicinity of any of the Infrastructure sites, or indeed can gain priority usage of any Haul Road. Emergency procedures will be agreed, and contact numbers provided to the local Emergency Services. On being notified of a priority condition, all construction vehicles will be directed to give right of way to the emergency vehicles until the need for priority access has passed.

With respect to an emergency condition arising on any of the sites, priority access to and from these sites will be given to ambulance or fire tenders.

5.0 OPERATIONAL AND DECOMMISSIONING PHASES

5.1 OPERATIONAL PHASE

On completion of the construction works, and when the wind farm is operational, the majority of the traffic generated for the operation of the site will be for routine maintenance by a small van or four by four. The access to the site will not be via the R704 construction access, but via the junction of the R704/L7451 to the west arm of the new L7451 crossing point access.

The site will be regularly accessed for forestry proposes similar to the existing background traffic generated. The site will also have recreational use for walkers and cyclists on completion of the construction. This will generate a small amount of additional traffic to the L7451.

Overall, due to the relatively low operational and recreational traffic, it is envisaged that the operational impacts of the proposed development will be slight when compared to the existing background traffic.

As the site accesses for construction have been designed as new or upgraded in accordance with the TII DN-GEO-03060, adequate visibility splays are available from the accesses in both directions. Minor maintenance of hedgerows and vegetation to maintain the required visibility shall be required.

5.2 DECOMMISSION PHASE

The wind turbines proposed as part of the proposed development are expected to have a lifespan of up to 35 years. Following the end of their useful life, the wind turbines may be replaced with a new set of machines, subject to planning permission being obtained, or the site may be decommissioned fully, with the exception of the electricity substation.

Upon decommissioning of the proposed wind farm, the wind turbines will be disassembled in reverse order to how they were erected. All above ground turbine components will be separated and removed off-site for recycling. Turbine foundations will remain in place underground and will be covered with earth and allowed to revegetate or reseeded as appropriate. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in potentially significant environment nuisances such as noise, dust and/or vibration. The site roadways will be in use for additional purposes to the operation of the wind farm (e.g. for forestry and recreational use) by the time the decommissioning of the project is to be considered, and therefore the site roads will remain in situ for future use. If it were to be confirmed that the roads were not required in the future for any other useful purpose, they could be removed.

The traffic management of the decommissioning phase will be advised by the road conditions at the time of decommissioning. It is not possible to predict the changes to the public road infrastructure and policies in the next 30-40years. It is envisaged that a Traffic Management Plan will be developed for the decommission phase.

6.0 CONCLUSION

The TMP is a living document and shall be developed through the Detailed Design and Construction phases with ongoing consultation with the Local Authority, An Garda Síochána, Emergency Services and other stakeholders.

This TMP has thus far been developed to the Planning Stage, so that the necessary steps are taken throughout the planning proposals to support an efficient, safe transportation operation, with the least possible impact upon vulnerable road users and traffic along the haul roads or in close proximity to the proposed development.

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Appendix C – Forestry Report

Western Forestry Co-op
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Forestry Report

1.0 BACKGROUND

This report examines the effects of the proposed Castlebanny Wind Farm project across the existing forest area and the potential impact associated with forestry clearfelling for this development. It will describe the existing forest environment and the impact of the proposed wind farm in relation to the ongoing operation of the forest. Environmental impacts associated with forestry clearfelling and replanting e.g. ecology, water quality, landscape, soils etc. is addressed in the relevant technical sections of the EIAR.

1.1 STATEMENT OF AUTHORITY

This report has been prepared by the following staff of Western Forestry Co-op:

Marina Conway is the author of the report and holds a Bachelor and Master's degree in Agricultural Science in Forestry, a postgraduate certificate in Water Pollution Control and is professional Member of the Society of Irish Foresters. Marina has 24 years specialised experience as a professional manager in the field of forestry and environmental development. Her key skills are in forest management from afforestation to harvesting, reforestation, appropriate assessments and biodiversity. Marina has experience in project management, implementation, environment & climate change policy, capacity building, data analysis, auditing and government policy.

Joseph McManus holds a BSc in Forestry and is professional Member of the Society of Irish Foresters. Joseph has 6 years specialised experience in harvesting, forest inventory, field work, site assessment and mapping for harvest operations and health and safety. Joe assisted with the field work and the mapping.

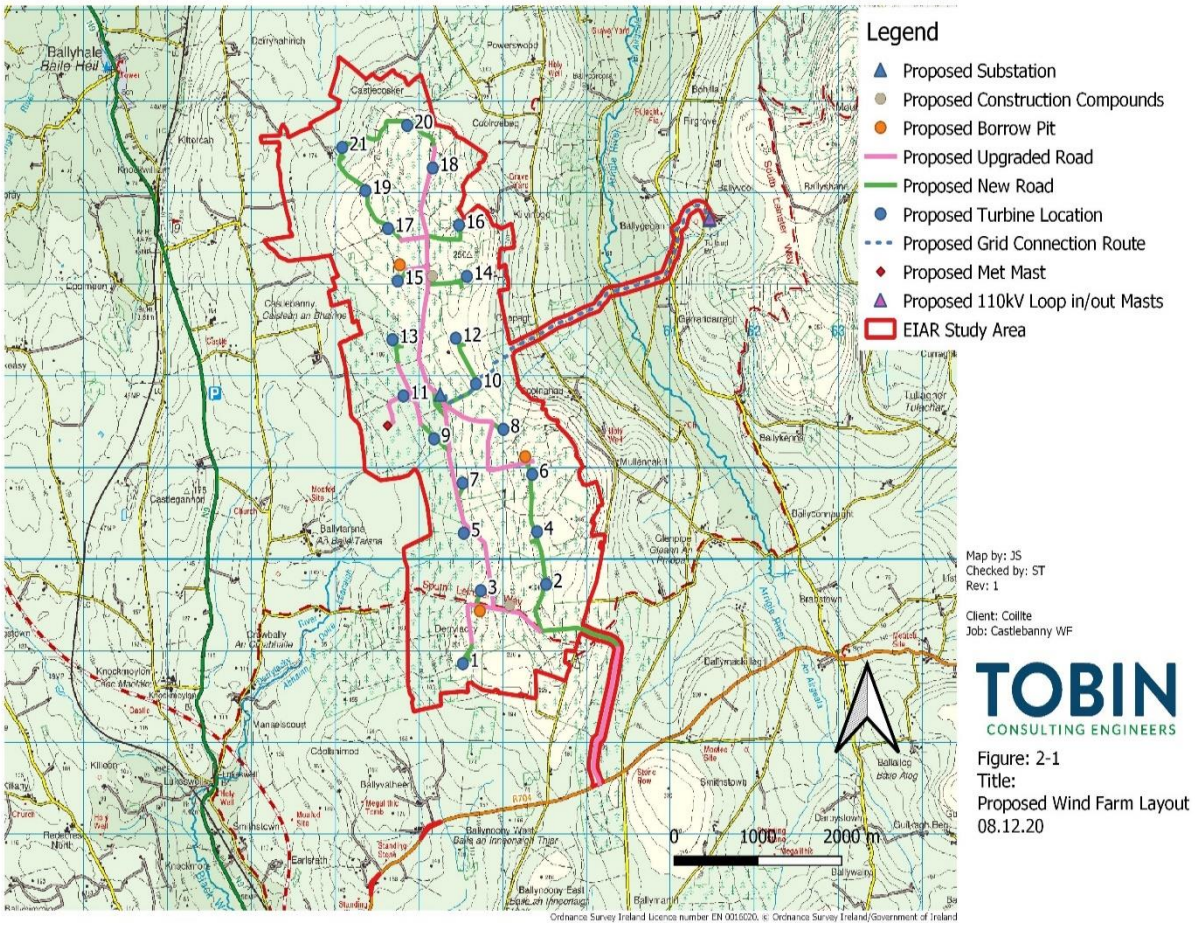
Kevin Dunne holds a BSc in Forestry and is professional Member of the Society of Irish Foresters. Kevin has 2 years specialised experience in forest inventory, field work and mapping for harvest operations specialising in forest roads, thinning and clearfelling. Kevin assisted with the field work and forest measurement data.

1.2 INTRODUCTION

The proposed Castlebanny Wind Farm project includes 21 no. turbines, and all associated infrastructure which is described in detail in Chapter 2 (Description of the Proposed Development) of this EIAR: Description of the Proposed Development. The site of the proposed wind farm measures c. 1,434 ha and is predominantly covered in actively managed coniferous forestry plantations. Approximately 1200 ha are in Coillte's ownership whilst the remaining area comprise third-party owned areas of agricultural grassland, arable crops and commercial forest. There is an extensive network of existing access roads across the site to facilitate the

ongoing forestry operations. Figure 1 shows the proposed wind farm layout with associated grid connection.

Figure 1 - Site Study Area and Turbine Layout (Extracted from main EIAR)



The site is characterised by locally steep topography between 145m and 265m above ordnance datum (AOD) and is bounded to the east by the Arrigle River, to the south-west by the Derrylacky River and the north-west by the Little Arrigle River

As part of the proposed development there will be a requirement to clearfell some of this forestry in the areas immediately around the footprint of the wind farm infrastructure. As a commercial crop, this forestry is scheduled to be felled in the future regardless of the proposed wind farm being constructed or not, and within two years of felling the area would be replanted.

Felling is the process of cutting down trees. Clearfelling involves most or all of the trees in an area being cut down at the same time. The felling operations will be done both by manual (chainsaw felling) and mechanical means. For mechanical harvesting this includes a harvesting machine (Plate 1) which mechanically cuts, delimbs and processes the tree into different timber assortment sizes (pulp, stakewood, palletwood, sawlog) and an 8 wheel mounted forwarder

machine (Plate 2) that collects the different timber assortments and stacks them at the road for removal by the timber lorries to the sawmill.

Plate 1 - Timber Harvester

Plate 2 - Timber Forwarder

Clearfelling for this proposed development will be in small compartments or coupes within the forest areas. Felling has the potential to impact adversely upon the environment if done in an uncontrolled manner; however, by the adoption of sound planning procedures, operating

techniques and control measures as outlined in Section 1.6, this will considerably reduce any potential adverse environmental effects.

Subject to receipt of consent for the proposed Castlebanny Wind Farm project, the developer will apply to the Forest Service for a Felling Licence for clearfelling works, in line with the requirements of the Forestry Act, 2014. A felling licence granted by the Minister for Agriculture, Food and the Marine provides authority under the Forestry Act 2014 to fell or otherwise remove a tree or trees and to thin a forest for silvicultural reasons. The proposed development must have obtained planning consent before an application can be made for a felling license from the Forest Service, as per their policy on tree felling for wind farms. As part of this process, an area of at least an equivalent size to that which will be permanently felled must be replanted. This replanting land can be located anywhere within the state, provided an afforestation license is granted for the land.

The regulatory authority in Ireland, the Forest Service, has developed the Code of Best Forest Practice (Forest Service 2000b) which details forestry operations and the manner in which they should be carried out to ensure the implementation of sustainable forest management in our forest ecosystems and a suite of environmental guidelines which prescribe best practice in relation to Forestry and Water Quality and Forest Harvesting and the Environment (Forest Service 2000a, 2000b, 2000c), Felling and Reforestation Policy and Standards for Felling and Reforestation.

Coillte is certified to two forest management certification schemes, namely FSC (Forest Stewardship Council) certification of responsible forest management, and PEFC (Programme for the Endorsement of Forest Certification) certification of sustainable forest management. Both FSC and PEFC forest management certification schemes are independent schemes which audit and inspect forest managers to ensure their work meets strict forest management standards against social, economic and environmental criteria. For more information see https://www.coillte.ie/our-forests/public-goods/certification/.

1.3 METHODOLOGY

The methodology used to produce this report included a review of relevant legislation and guidance documents, a desk study, site walkthrough and field inspection of the proposed development footprint, evaluation of potential effects and an identification of measures to avoid and mitigate effects. Permanent felling requirements, which assume the worst case scenario and may be less than estimated, while ensuring constructability, should be the minimal possible area and have been determined based on turbine manufacturers requirements and any environmental or other mitigations proposed. The requirements include the felling required for the wind farm to assess impacts in terms of runoff and nutrient mobilisation and present mitigation measures against all impacts.

1.3.1 Relevant Legislation and Guidance Documentation

The following documents have been referenced in the preparation of this report:

- Felling and Reforestation Policy, Forest Service, Department of Agriculture, Food and the Marine, Dublin. May 2017
- Standards for Felling and Reforestation, Forest Service, Department of Agriculture, Food and the Marine, Dublin. October 2019

- Forestry Act 2014 and the Forestry Regulations 2017 (SI No 191 of 2017) and SI 31 of 2020 - Forestry (Amdmt) Regs 2020 re reg 19AA procedures (pdf 99Kb)

- Forest Service. 2000a. Forestry and Water Quality Guidelines. Forest Service, Department of the Marine and Natural Resources, Dublin.

- Forest Service. 2000b. Code of Best Forest Practice – Ireland. Irish National Forest Standard. Forest Service, Department of the Marine and Natural Resources, Dublin.

- Forest Service. 2000c. Forest Harvesting and the Environment Guidelines. Forest Service, Department of the Marine and Natural Resources, Dublin.

1.3.2 Desk Study

A desk study was undertaken in order to collate and review background information in advance of the site survey. The desk study was carried out initially in December 2019 and again in June 2020. It involved the following:

- Examination of the IFORIS (Integrated Forestry Information System) INET online mapping system, Department of Agriculture, Food and the Marine. To include assessment of the site against the following environmental GIS mapping layers:
    - EPA Hydrology
    - High status objectives waterbodies
    - OPW Flood Hazard areas
    - Fisheries Sensitive Areas
    - Landscape Sensitivity
    - Sites, Monuments and Records
    - NPWS Natura Sites
    - ESB Buffers
    - County Development Plan
    - Fresh Water Pearl Mussel
    - Acid Sensitive Areas
- Examination of the EPA Appropriate Assessment mapping
- Coillte Castlebanny Forest Sub-compartment data

1.3.3 Field Work

Initial site walkover was undertaken during December 2019 by Marina Conway and a detailed site assessment during June 2020 by a project team of Marina Conway, Joseph McManus and Kevin Dunne. The purpose of the field work was to identify the forest type and the impact of the proposed felling on the forest environment. All of the proposed infrastructure locations that occurred within forest areas were visited. During the visit 0.01ha measurement plots were taken in order to calculate the standing volume and estimate a yield class for the plots as an assessment of volume to be removed and associated carbon loss as a result of permanent forest removal. The baseline/existing conditions of the forest areas to be felled were assessed for:

- Area of impacted forest (felling area hectares)
- Age of forest
- Species planted
- Standing Volume

1.3.4 Evaluation of Potential Impacts

The significant effect of the proposed windfarm and the associated felling and forest impacts that will be identified and monitored include:

- Soil disturbance and compaction
- Carbon loss
- Water quality (sediment & nutrient)

A Site Hazard & Risk Assessment was undertaken to identify hazard and risk factors that have the potential to identify and protect social and environmental features and considerations, these are recorded in the harvest plan in section 1.6.1, potential hazards include:

- ESB/Gas lines
- Water Mains
- Steep banks
- Roadside harvesting
- Deep drains
- Erosion Risk
- Public Access/Rights of Way

1.4 EXISTING ENVIRONMENT (BASELINE DESCRIPTION)

The existing environment is discussed in terms of felling area, tree species, forest age, condition, estimated standing volume (m^3) and Yield Class (where appropriate, i.e. in younger trees it is not possible to take measurements in trees <7cm diameter at breast height), aquatic zones or relevant watercourses (any other watercourse that has the potential to act as a pathway for the movement of significant amounts of sediment and/or nutrients from the site to an aquatic zone, they are often artificial, and include existing drains and channels and other potential pathways that contain flowing water during and immediately after rainfall).

1.4.1 Description of Forestry plots

1.4.1.1 Area, age & species

The total forest area comprises approximately 1,200 ha of commercial forest owned by Coillte and approximately 100 ha of third party commercial forests planted since 1996. As part of the windfarm development, areas of forest will be felled to facilitate both infrastructure and construction felling, as set out in Table 1 Total Area to be felled for Windfarm Development. As per the Felling and Reforestation Policy, Forest Service, Department of Agriculture, Food and the Marine, the Infrastructure felling relates to trees that are permanently removed from the site in order to make way for infrastructure associated with the wind farm (Table 2) and the construction felling relates to areas that require temporary forest removal to facilitate windfarm construction such as borrow pits and a temporary construction compound where the land will be replanted once construction is completed (Table 3). Bat felling buffers were taken into account in the calculation of the areas required for permanent tree removal around the turbines (see chapter 6 of this EIAR – Biodiversity, Flora & Fauna).

The total area of forestry to be felled is 82.88 ha, as shown in Table 1 and outlined on maps in Figures 2 and 3.

Table 1 - Total Area (ha) to be felled for Windfarm Development

Windfarm Infrastructure & Construction Felling	**Area (ha)**
Turbine Felling Area Incl Met Mast	45.32
Substation	2.68
Temp Construction Compound (2)	4.31
New Road	12.51
Borrow Pits	5.94
Upgraded Road	10.52
Passing Bays	0.42
Corner Widening	0.2
Grid connection Route	0.98
Total Felling Area	**82.8**

Table 2 - Area (ha) to be permanently felled for Windfarm Infrastructure

Windfarm Infrastructure	**Area (ha)**
Turbine Felling Area Including Met Mast	45.32
Substation	2.68
Temporary Construction Compound (2)	2.37
New Road	12.51
Upgraded Road	10.52
Passing Bays	0.42
Corner Widening	0.2
Grid connection Route	0.98
Total Felling Area	**75.00**

Table 3 - Area (ha) to be temporarily felled for Windfarm Construction

Windfarm Construction	**Area (ha)**
Borrow Pits (3)	5.94
Temporary Construction Compound (1)	1.94
Total Felling Area	**7.88**

Figure 2 – Forest areas to be felled for Turbines 1, 2, 3, 4 and 5 borrow pit, passing bay, temporary construction compound, corner widenings and new roads.

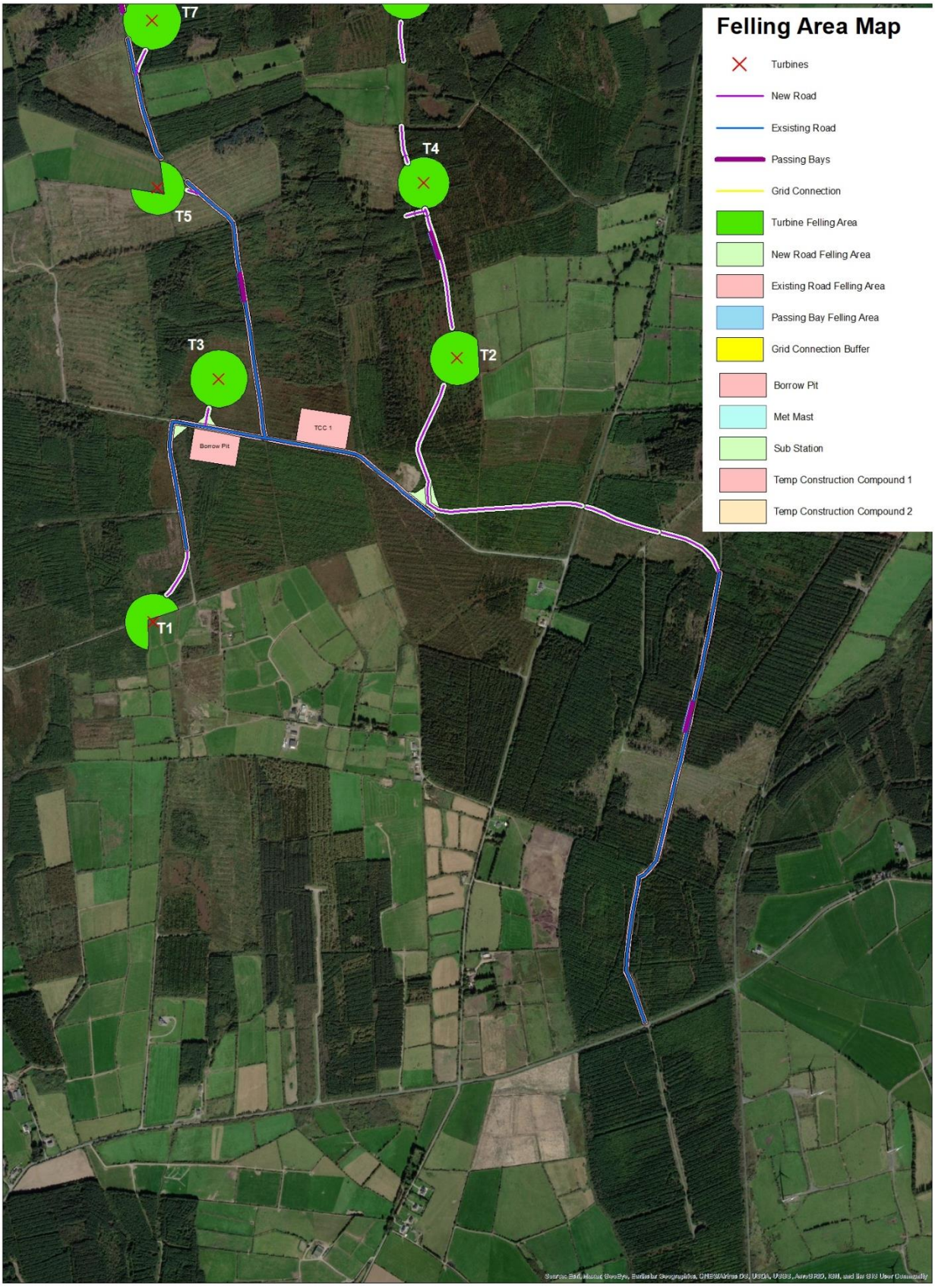
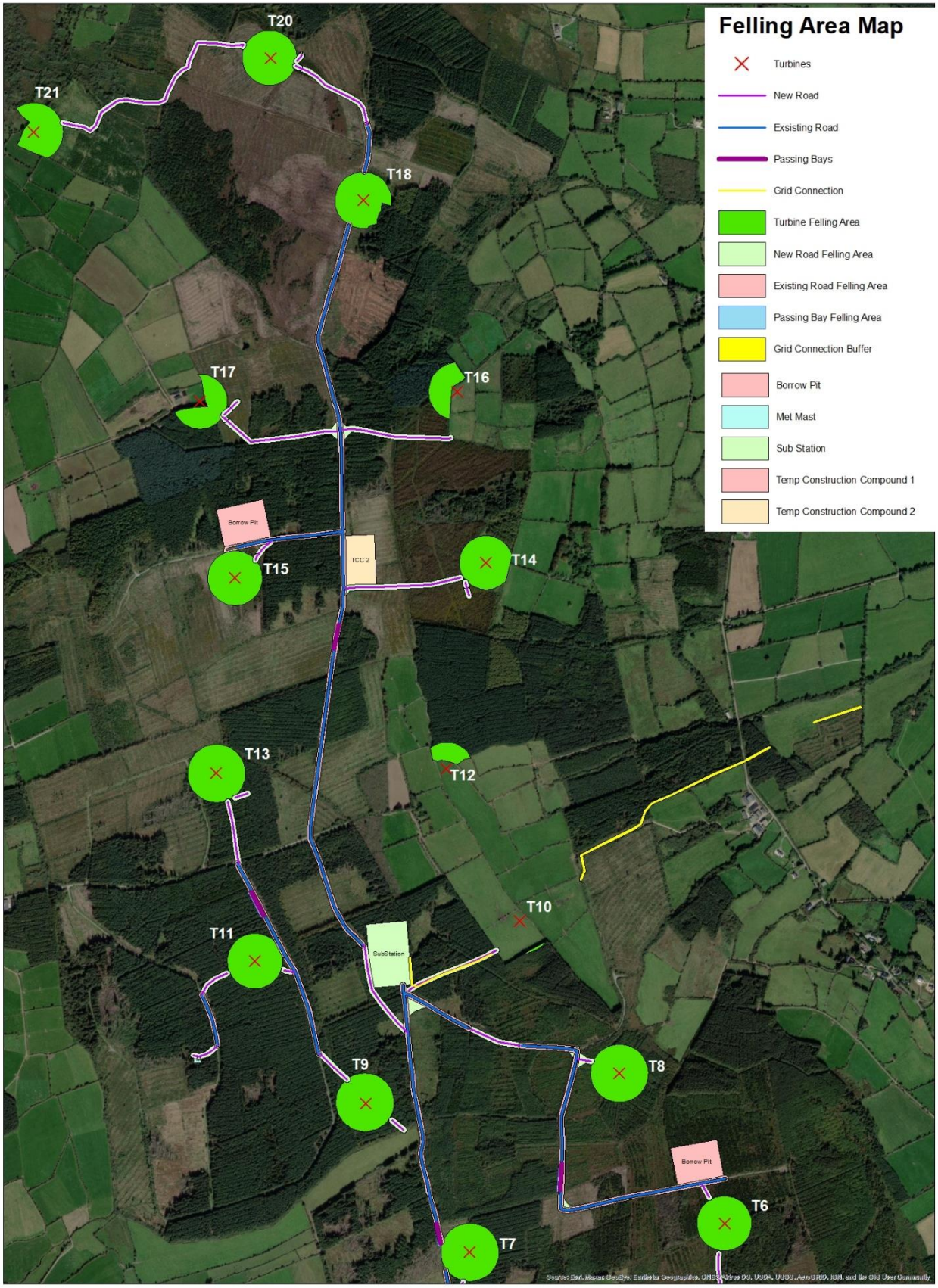


Figure 3 - Forest areas to be felled for Turbines 6 – 18 and 20 – 21, borrow pit, mast, substation, passing bay, temporary construction compound, corner widenings and new roads.



The Coillte owned and privately owned forests in the proposed study area are managed as commercial forestry. The main tree species present is Sitka spruce (Plate 1) which is managed on a commercial forestry basis which includes multiple rotations of establishment, thinning harvest (selective removal of trees in 3-5 year periods), final harvest by clearfell and replanting for the forest cycle to start again (Plate 2 and 3). The rotation length of the different plots will vary depending on productivity, soil type and exposure. There was evidence of windblow (Plate 4) during the site visits and significant areas of the commercial forest were damaged during Storm Darwin in 2014 as mapped on IFORIS INET Mapping system. Other species of trees that were present included Lodgepole pine mainly planted in mixture with Sitka spruce (Plate 5). There are trial plots of Eucalyptus where Sitka spruce and Birch is regenerating freely. There are also some small broadleaf plots of Sycamore, Birch, Alder and Willow, mostly regenerating freely in different areas throughout the forest. Of the different forest areas that were field surveyed for this study, the age of the forest ranged from newly planted (4 month) trees to a closed canopy 38 year old stand of Sitka spruce where windblow is occurring. The forest areas were at various stages of newly planted, pre-thicket forest, thicket[1] stage, closed canopy, thinned areas and clearfelled. The forest species and age in the infrastructural felling areas are shown in Table 4.

Table 4 – Forest Tree Species, Age and Area - Infrastructural felling areas

Infrastructure Type*	Tree Species	Planting Year	Area (ha)
T1 & R	SS Bi (90:10)	2014	2.74
T2 & R & PB	SS LP (90:10)	2002	3.23
T2 New Road	SS/Willow (Regen)	2011	1.15
T2 TCC	EUC	2014	2.37
T3 CW	Syc/ Willow/Bi/Alder	2003	0.046
T3 BP	Euc/SS/Bi	2003	1.98
T3 & R	Euc/SS/Bi	2008	2.81
T4 & R	SS/LP 50:50	1994	3.6
T5 & R	SS/Bi	2017	2.24
T6 BP	SS/LP 50:50	2007	1.98
T6 & R	SS/Bi	2007	2.45
T7 & PB	SS	1996	2.72
T8 & R	SS/LP 50:50	2003	2.84
T8 CW (2)	SS/LP 50:50	2003	0.1
T9	SS	1996	2.65
T10 & R	SS	1992	0.78
T10 Sub	SS	1992	2.68
T10 CW	Bi/Willow	2013	0.046
T11 & R	SS	1997	2.87
T12	NF	1997	0.49
T13 & R & PB	SS	1990	3.22
T14 TCC	SS	2020	1.94
T14 R & PB	Euc/SS Regen/Oak	2014	0.56
T14	SS/JL 50:50	1997	2.35
T15 & R	Clearfelled	NA	2.89

[1] Densely planted trees

T15 BP	SS	1985	1.98
T16 & R	SS	2020	2.53
T17 & R	SS	1995	3.65
T18 & R & PB	SS Windblow	1982	3.09
T20 & R	LP/BI	2012	3.82
T21	SS/Syc/Bio	2013	2.25
T21 Road	SS	2012	1.66
MM & R	SS	1988	0.45
Proposed Entrance Road	SS	1995	1.21
Grid Connection	SS	1992	0.98
Road Upgrade	SS (>90%)	Various	10.52

^ T – Turbine; PB – Passing Bay; Sub – Substation; TCC – Temporary Construction Compound; MM – Met Mast; CW – Corner Widening; BP – Borrow Pits; R - Roads

* SS (Sitka spruce *Picea sitchensis*); LP (Lodgepole pine, *Pinus contorta*); Euc (*Eucalyptus*); Bi (Birch, *Betula*); Willow (*Salix)*; Alder (*Alnus glutinosa*), Oak (*Quercus*); Syc (Sycamore, *Acer pseudoplatanus*)

Plate 3 – Semi mature Sitka spruce at T10, Substation

Plate 4 – T14 TCC Recently clearfelled forest replanted during 2020 with Sitka spruce

Plate 5 – Clearfelled forest area not replanted

Plate 6 – T18 Windblow Sitka spruce stand

Plate 7 – T2 Sitka spruce and Lodgepole pine intimate mixture

1.4.1.2 Standing Volume and Carbon

The standing volume in a forest refers to the volume in cubic metres of the standing trees present at the time of forest measurements. In order to calculate the standing volume, it is necessary to take sample measurement plots, these are laid out as 0.01ha plots. In these plots tree stocking, DBH (diameter at breast height) and Top Height of the largest DBH tree is recorded. Forest measurement plots were only taken in areas where the trees were >7cm diameter at breast height as per standard forest practice. Where it was not possible to take measurements, a general yield class was taken from the forest sub-compartment data supplied by Coillte. A yield class is an estimate of the average volume production of a crop in m^3 per hectare per annum that it is estimated an even aged stand can achieve, it is an estimate of the productivity potential of the forest crop. Using the Forestry Commission Forest Yield the volume per hectare was calculated. In most cases the rotation that maximises return (net present value) will be less than the rotation of Maximum Mean Annual Increment (MMAI). For this reason and for supply and market reasons it has been customary in Ireland to use rotations of MMAI minus 20% for Sitka spruce. Based on this the total volume to be removed for the windfarm development is 11,721 m3. Table 5 outlines the different Yield class, area and standing volume for the different forest areas that are to be cleared for the proposed windfarm development.

Table 5 - Standing Volume in Forest Areas to be cleared for Windfarm Infrastructure

Infrastructure	Tree Species	Area (Ha)	Vol per Ha (m3)	YC	Total Vol (m3)
T1 & R	SS Bi (90:10)	2.74	30	18	82
T2 & R & PB	SS LP (90:10)	1.15	45	18	52
T2 New Road	SS/Willow (Regen)	3.23	59	12	191
T2 TCC	EUC	2.37	20	18	47
T3 CW	Syc/ Willow/Bi/Alder	0.046	81	6	4
T3 BP	Euc/SS/Bi	1.98	81	18	160
T3 & R	Euc/SS/Bi	2.81	60	18	169
T4 & R	SS/LP 50:50	3.6	58	6	209
T5 & R	SS/Bi	2.24	16.8	20	38
T6 BP	SS/LP 50:50	1.98	65	18	129
T6 & R	SS/Bi	2.45	293	24	718
T7 & PB	SS	2.72	213	18	579
T8 & R	SS/LP 50:50	2.84	95	20	270
T8 CW (2)	SS/LP 50:50	0.1	95	20	10
T9	SS	2.65	241	20	639
T10 & R	SS	0.78	271	18	211
T10 Sub	SS	2.68	306	20	820
T10 CW	Bi/Willow	0.46	4.2	6	0.2
T11 & R	SS	2.87	231	20	663
T12	NF	0.49	137	14	67
T13 & R & PB	SS	3.22	173	12	557
T14 TCC	SS	1.94	0	18	0
T14 R & PB	Euc/SS Regen/Oak	0.56	60	6	34
T14	SS/JL 50:50	2.35	133	10	313

T15 & R	Clearfelled	2.89	0	N/A	0
T15 BP	SS	1.98	361	18	715
T16 & R	SS	2.53	0	18	0
T17 & R	SS	3.65	252	20	920
T18 & R & PB	SS (Windblow)	3.09	345	16	1066
T20 & R	LP/BI	3.82	34	12	130
T21	SS/Syc/Bio	2.25	35	18	79
T21 Road	SS	1.66	40	18	66
MM & R	SS	0.45	349	20	158
Proposed Entrance Road	SS	1.21	280	22	339
Grid Connection	SS	0.98	306	20	300
Road Upgrade	SS	10.52	189	18	1988
Subtotal		**82.88**			**11721**

Forest Carbon

The ability of forests to store and sequester atmospheric carbon is well known and established. Indeed, forests represent the largest global terrestrial store of carbon, containing approximately 39% of global soil carbon and 77% of global vegetation carbon (Bolin et al. 2000). Trees absorb carbon dioxide from the atmosphere for growth, convert it to wood and release oxygen back to the atmosphere. Harvesting the trees before they die naturally (and return their carbon to the atmosphere) locks the carbon into the wood and harvested wood products. Replanting the trees then begins the cycle of carbon storage immediately.

The Carbon cycle in forests is characterised by a number of carbon pools. Pools are locations of carbon in the forest, such as the above- and below-ground biomass, forest floor and soil. The above ground biomass consists of stemwood, branchwood, bark and foliage and is the carbon pool that is referred to here.

Carbon sequestration in woodland biomass is restricted to the long-term average carbon stock that is projected to accumulate on the site in the woody biomass. Carbon values are based on those used in the UK Woodland Carbon Code (https://www.woodlandcarboncode.org.uk/), a voluntary standard for woodland creation projects and the amount of carbon dioxide they can sequester based on different types of tree species, yield class, stocking and forest management. The Woodland Carbon Code calculator has been chosen due to the choice of species and management and the similar assumptions and conditions that exist in forest management data in the UK and Ireland, and due to the absence of similar data in Ireland currently. The total forest carbon that would be removed due to the proposed windfarm development is 15,128.65 tCO^2e, Table 6 - Total Carbon (tCO^2e) in the Above Ground Woody Biomass. Much of this carbon will be locked up in the harvested wood products that are produced from the timber such as construction timber used in housing, fencing material, decking, pallet wood, fibreboards, plywood, veneers, laminates etc. Furthermore, an equivalent area of land is being replanted to account for the permanently felled areas of 75 ha and temporary felled areas of 7.88ha which will be replanted in situ and so the forest carbon cycle starts again. Therefore, any loss of forest carbon due to this proposed windfarm development is only a temporary loss of carbon, which would occur at different stages through normal commercial forest management of harvesting and replanting.

Table 6 – Total Carbon (tCO^2e) in the Above Ground Woody Biomass

Infrastructure	Tree Species	Carbon (tCO^2e/ha/yr)	Total Carbon (tCO^2e)
T1 & R	SS Bi (90:10)	4.21	69.21
T2 & R & PB	SS LP (90:10)	12.23	126.58
T2 New Road	SS/Willow (Regen)	12.79	743.61
T2 TCC	SS/Willow (Regen)	6.92	98.40
T3 CW	Syc/ Willow/Bi/Alder	4.31	0.91
T3 BP	Euc/SS/Bi	20.61	693.73
T3 & R	Euc/SS/Bi	9.74	328.43
T4 & R	SS/LP 50:50	2.25	210.60
T5 & R	SS/Bi	2.55	17.14
T6 BP	SS/LP 50:50	16.26	418.53
T6 & R	SS/Bi	24.9	793.07
T7 & PB	SS	11.27	735.71
T8 & R	SS/LP 50:50	22.05	1064.57
T8 CW (2)	SS/LP 50:50	22.05	22.49
T9	SS	16.33	1038.59
T10 & R	SS	11.27	246.14
T10 Sub	SS	16.33	1225.40
T10 CW	Bi/Willow	4.31	0.91
T11 & R	SS	16.03	1058.14
T12	NF	3.51	39.56
T13 & R & PB	SS	5.79	559.31
T14 TCC	SS	2.02	3.92
T14 R & PB	Euc/SS Regen/Oak	4.31	14.48
T14	SS/JL 50:50	3.62	110.59
T15 & R	Clearfelled	0	0.00
T15 BP	SS	12.7	880.11
T16 & R	SS	2.02	5.11
T17 & R	SS	9.22	841.33
T18 & R & PB	SS (Windblow)	12.99	1619.07
T20 & R	LP/BI	4.72	144.24
T21	SS/Syc/Bio	4.21	75.78
T21 Road	SS	4.21	55.91
MM & R	SS	15.58	225.85
Proposed Entrance Road	SS	17.47	528.47
Grid Connection	SS	14.63	356.39
Road Upgrade	SS	7.38	776.38
Subtotal			**15128.65**

1.5 POTENTIAL EFFECTS

This section addresses the potential impacts on the surrounding environment due to the felling and removal of the trees for the proposed wind farm. The potential impacts include soil disturbance and compaction, carbon loss, water quality (sediment & nutrient) and biodiversity from the proposed infrastructure works.

1.5.1 Do Nothing Scenario

In the do-Nothing scenario, if the proposed wind farm development for which this EIAR has been prepared does not proceed, the existing practice of commercially managed forest would continue, i.e. it would be harvested in line with sustainable forest management practices on a continuous basis and replanted in line with the requirements of the felling license as per the Forestry Act 2014, on a continuous basis. Felling would normally take place when the crop reaches its MMAI (Maximum Mean Annual Increment) minus 20%. Due to the exposed nature of the site and incidences of windblow some areas may be felled before MMAI. It should be noted that any of the potential impacts in *Section 1.5.2.1 Potential Effects Felling and Removal of Trees for the Construction Phase* due to clearfelling and subsequent replanting would also occur in the do-nothing scenario under the normal felling cycle.

1.5.2 Construction Phase

1.5.2.1 Felling and Removal of Trees

A number of potential effects can arise from forest harvesting. Harvesting will be done by clearfelling. Clearfelling involves most or all of the trees in an area being cut down at the same time. The felling operations will be done by manual and mechanical means as outlined in Section 1.2.

The associated felling and forest impacts that will be identified and monitored include:

- Soil disturbance and compaction
- Carbon loss
- Water quality (sediment & nutrient)
- Biodiversity impact
- Landscape impact

The potential impacts of the proposed felling and onsite replanting activities are assessed in Appendix 2-5 to this EIAR for an assessment of off-site Replacement lands.

1.5.2.1.1 Soil Disturbance and Compaction

The movement of harvesting machinery over the soil can contribute to soil disturbance and compaction. Potential adverse impacts include:

- Felling and extraction machines unsuited to the site and material, leading to crop, soil and machine damage
- Excessive haulage distances to roads, leading to site soil damage
- Damage to the soil such as rutting and compaction by extraction machines due to overloading
- Inadequate brash mats, leading to soil damage and sedimentation

- Machine damage to drains
- Site and environmental damage due to poor timing and failure to curtail operations in adverse weather conditions
- Sediment entering aquatic zones
- Brash and debris in aquatic zones
- Rutting and compaction through the overuse of tracks

The main sources of sediment in forest activities due to harvesting are:

- Disruption of the soil surface by harvesting machinery, removal of tree cover causing the soil to be exposed to erosion and eventually the transportation of the finer particles by overland flow.
- Weathering of parent material resulting in particle movement by overland flow.
- The transportation of loose or decaying organic particles.

Due to the fact there are many ages classes that are to be felled i.e. commercial and non-commercial timber, it is envisaged that any commercial timber will be removed from the site for haulage to a timber sawmill. A proportion of construction traffic for the windfarm development will be associated with the haulage of the timber from these felling activities. Based on the volume of timber to be harvested as detailed in Table 5 - Standing Volume in Forest Areas to be cleared for Windfarm Infrastructure, this will involve approximately 350 articulated timber truck movements. Any timber that is not of merchantable quality, i.e. less than 7cm diameter relates to the tops of trees and branches known as lop and top and will be left on site where the trees are felled. This protects the soil and provides deadwood for habitat Where full tree removal is required for infrastructure such as turbine hardstands, substation, met mast, roads etc. smaller trees can be removed by excavator and/or tree shears depending on size. In the bat felling buffer areas, any timber that is not of merchantable value i.e. lop and top will be left on site so as to minimize disturbance.

1.5.2.1.2 Carbon Loss

There will initially be a decrease in the carbon sequestration potential of the forest due to the clearfelling of 82.88 ha for infrastructure and construction felling associated with the footprint of the proposed development. As referred to in section 1.4.1, infrastructure felling relates to trees that are permanently removed from the site in order to make way for infrastructure associated with the wind farm (Table 2) and construction felling relates to areas that require temporary forest removal to facilitate windfarm construction such as borrow pits and temporary construction compounds. The total carbon that would be removed due to the felling of this 82.88ha is 15,128.65 tCO^2e. Some 75 ha will involve permanent forest removal for infrastructure felling and an equivalent area of bare land will be afforested as replacement land (See Appendix 2-5 to this EIAR for further information and an assessment of off-site Replacement lands) in lieu of this within 2 years of clearfelling as required under the Forestry Act 2014. The remaining 7.88ha that will be temporarily felled will be replanted in the same location as soon as proposed development is completed. Therefore, although there will be a temporary loss of carbon, the overall impact on carbon stock will be neutral.

1.5.2.1.3 Water Quality Impact

Harvesting and associated activities such as extraction have the potential to cause temporary and local damage to soils and adversely impact on water quality, through increased erosion rates, sedimentation and nutrient losses. However, adherence to best practices will minimise this risk. All water and hydrological impacts are assessed in detail in Chapter 9. The main sources of sediment from harvest operations are described in Section 1.5.2.1. The key factors associated with sediment release and potential water quality impact during harvest operations are:

- Soil type, sensitivity and slope – the soil conditions at Castlebanny are varied from well drained acid brown earths to poorly drained surface water gleys (See Chapter 8 Land, Soils and Geology). As outlined in *Forestry and Water Guidelines* correct buffer zone management will help reduce the risk of sedimentation
- The felling and extraction system and harvesting machinery to be used including number and type of machine passes
- Operation details such as extraction routes, landing bays for harvested material, location of machine maintenance, refuelling and repair areas and storage areas for fuel, motor oils, lubricants and chemicals.
- Availability of brash material (lop and top) for placing under machines to protect the soil. This is more of a concern in forest thinning operations where brash availability is low then in clearfell operations as proposed here and would be a low risk.
- Environmental receptors such as water features, including aquatic zones, relevant watercourses, hotspots, water abstraction points and crossing points.

With regard to the source of nutrients, during clearfelling there is a higher potential for nutrient loss as there are no living tree roots left to take up the nutrients. Any organic matter (particularly recently dead material such as brash or roots) that is left on site to rot will release phosphorus and nitrogen. Decaying brash resulting from the clearfell can generate nutrients which could potentially lead to nutrient enrichment of any small first order streams. The breakdown of brash, roots and other organic matter takes a number of years. Potentially a clearfell site continues to release phosphorus to the aquatic zone for at least three years after clearfelling. The rate of decomposition is influenced by temperature, moisture and humidity. Consequently, phosphorus loss tends to be greatest during the warmer months and may be particularly problematic during a flood event following a prolonged hot and dry period (Cummins & Farrell 1999 & 2003; Rodgers et al 2010)

In addition to sediment and nutrient release, accidental spillage or leakage of chemicals potentially used on site (herbicides and pesticides during reforestation operations and urea sprayed on freshly felled tree stumps to prevent the spread of disease as is a condition of all felling licenses in Ireland), fuel and machine oils (hydraulic, engine, gearbox, lubricant or cutting oils) are detrimental to aquatic flora and fauna and impair water quality; however adherence to best practices will minimise this risk; mitigation measures are outlined under Section 1.6

It should be noted that potential impacts on water quality as outlined above as a result of clearfelling will also be relevant in the do-nothing scenario in the course of normal forest harvesting at Castlebanny.

1.5.2.1.4 Biodiversity Impact

Wildlife habitats can be affected during harvesting, especially the removal of the forest canopy. Mature conifer stands are important wildlife habitats for a variety of birds and other fauna.

In Chapter 6 of the EIAR, Biodiversity, the potential impacts section assesses in detail the potential impacts on habitats from the tree felling associated with the wind farm development.

It should be noted that any potential impacts on biodiversity as a result of clearfelling will also be relevant in the do-nothing scenario in the course of normal forest harvesting that would occur at Castlebanny.

1.5.2.1.5 Landscape Impact

The visual effect of the premature harvesting of trees is assessed in Chapter 13 of the EIAR, Landscape and Visual Impact Assessment.

Brash left onsite after clearfelling can be unsightly, particularly if the forest flanks a scenic route.. The majority of the areas to be clearfelled for the proposed development occur within commercially managed forestry.

It should be noted that any potential impacts on the landscape as a result of clearfelling will also be relevant in the do-nothing scenario in the course of normal forest harvesting that would occur at Castlebanny.

1.6 MITIGATION MEASURES

1.6.1 Construction Phase

Comprehensive planning (as outlined in Section 1.6.1.1 Harvest plan) combined with best practice operating techniques will ensure the protection and enhancement of the environment at Castlebanny Wind Farm Development. Felling operations associated with this project will adhere to the *Felling and Reforestation Policy (Forest Service), Standards for Felling and Reforestation (Forest Service), Code of Best Forest Practice (Forest Service 2000b), Forest Harvesting and the Environment (Forest Service 2000c) and Forest and Water Quality Guidelines (Forest Service 2000a).*

Notwithstanding the hydrological distance from the proposed development site to any Natura site or fisheries sensitive area, the potential sediment and nutrient loss risks will be managed through the application of the mitigation measures outlined hereunder and in the mitigation measures of the EIAR outlined in Chapter 5 Population and Human Health, Chapter 6 Biodiversity: Flora & Fauna, Chapter 7 Biodiversity: Ornithology, Chapters 8 Land, Soils and Geology, Chapter 9 Hydrology and Hydrogeology, Chapter 13 Landscape and Visual Impact and Chapter 14 Air Quality & Climate

The Harvest Plan (Section 1.6.1.1) and associated Harvest Plan Maps, outline the measures to be implemented with regard to forest harvesting at the proposed development site for Castlebanny Windfarm development.

All forestry operations are to be undertaken in accordance with current best practice guidelines as listed in the Harvest Plan, which details practical measures to protect the existing environment.

Further information on mitigation measures for onsite activity are provided in the various EIAR chapters, as well as the CEMP (Appendix 2-7 to this EIAR).

1.6.1.1 Harvest Plan

A harvest plan outlines strict environmental guidance to minimise environmental and social disturbance. This harvest plan is specific to forest harvesting operations and is the standard plan used by the felling license authority of the Department of Agriculture, Food and the Marine. It encompasses all possible felling methods, social and environmental considerations and measures to protect same, only those of relevance to the tree felling at Castlebanny Windfarm have been selected.

Harvest Plan for Felling at Castlebanny Windfarm, Co Kilkenny

Proposed Felling & Reforestation Methods	
Thinning	☒ N/A ☐ Harvester ☐ Chainsaw ☐ Forwarder ☐ Tractor/Quad ☐ Skyline ☐ Other (specify):
Clearfelling	☐ N/A ☒ Harvester ☒ Chainsaw ☒ Forwarder ☐ Tractor/Quad ☐ Skyline ☒ Other (specify): Excavator and Tree Shears
Reforestation	☐ N/A ☒ Windrowing ☒ Pit planting ☒ Mounding ☐ Scrap mounding ☐ Scarification ☐ Other (specify):
Site access (i.e. via forest road)	☒ Present ☐ Planned ☐ Not required ☐ Other (e.g. temporary roading/forest track):

Social & Environmental Features & Considerations		
Social	**Habitat & Biodiversity**	**Soil & Water**
☒ Recreational usage	☐ Designated area (SAC, SPA, etc)	☒ Aquatic zone(s) on/adjoining site
☒ Adjoining dwelling(s)	☒ Broadleaves/diverse conifers	☒ Relevant watercourse(s)
☐ Right(s)-of-way present	☒ Hedgerows	☐ Water-related 'hotspots'
☐ Utilities (power lines/water main)	☐ Old/veteran trees	☐ Water abstraction point
☐ Sensitive landscape	☐ Large scale deadwood	☒ Peaty or peaty/gley
☐ Important viewpoint(s)	☒ Badger sett, rookery, etc.	☐ Steep slope(s)
☐ Archaeological site(s) & feature(s)	☐ Protected fauna	☒ Water setback(s) present & intact
☐ Cultural feature(s)	☐ Protected flora	☐ Supply of brash limited
☒ Anti-social (dumping, fire etc)	☐ Wetland habitat	☐ Other:
☐ Other (specify):	☐ Other (specify):	☐ Other:

Proposed Measures to Protect Social & Environmental Features & Considerations	
☒ Consult with local residents	☐ Establish excl. zones around arch. sites/features
☒ Erect safety signage	☒ Temporary bridging points (TBPs) required
☒ Onsite briefing of all operators, pre-commencement	☒ Install water setback at refor.
☒ Carefully selected refuelling/repair/storage depot	☒ Install dwelling setback at refor.
☐ Measures to protect right(s)-of-way	☒ Install public road setback at refor.
☐ Measures to protect service features	☐ Install archaeological setback at refor.
☒ Measures to protect habitats & biodiversity features	☒ Install biodiversity setback at refor.
☐ Limit operations to dry weather	☒ Install landscape setback at refor.
☒ Daily visual monitoring of ground conditions	☐ Inclusion of Refor. Objective 'CCF'
☒ Daily visual monitoring of water	☐ Inclusion of Refor. Objective 'BIO'

Proposed Measures to Protect Social & Environmental Features & Considerations (Cont..)	
☒ Water sampling	☐ Forest edge planting
☒ Install silt traps/barriers	☐ Environmental setback planting
☐ Drain blocking/slow-water dams	☐ Other (specify)
☒ Utilise brash mats along extraction routes	☐ Other (specify)
☒ Exclude machinery in areas adjoining aquatic zones, water abstraction points & water-related 'hotspots'	☐ Other (specify)

Ancillary Information (include relevant information to expand on above & to detail important aspects such as the sequencing of operations, the width of environmental setbacks & contingency planning. Ensure accurate cross-referencing and consistency with maps)

The following guidelines will be adhered to for all harvest operations:

Interim Standards for Felling and Reforestation Forest Service, Department of Agriculture, Food and the Marine, Dublin. October 2019

Forestry and Water Quality Guidelines, Forestry and Water Quality Guidelines. Forest Service, Department of the Marine and Natural Resources, Dublin, 2000

Forestry and the Landscape Guidelines, Forestry and Water Quality Guidelines. Forest Service, Department of the Marine and Natural Resources, Dublin, 2000

Forestry and Archaeology Guidelines, Forestry and Water Quality Guidelines. Forest Service, Department of the Marine and Natural Resources, Dublin, 2000

Forest Biodiversity Guidelines, Forestry and Water Quality Guidelines. Forest Service, Department of the Marine and Natural Resources, Dublin, 2000

Forest Harvesting and Environment Guidelines, Forestry and Water Quality Guidelines. Forest Service, Department of the Marine and Natural Resources, Dublin, 2000

Forest Protection Guidelines, Forestry and Water Quality Guidelines. Forest Service, Department of the Marine and Natural Resources, Dublin, 2000

Felling and Reforestation Policy, Forest Service, Department of Agriculture, Food and the Marine, Dublin. May 2017

Harvesting

Harvesting will be done by clearfelling. Clearfelling involves most or all of the trees in an area being cut down at the same time. The felling operations will be done by mechanical means which includes a harvesting machine which mechanically cuts, delimbs and processes the tree into different timber assortment sizes (namely pulp, stakewood, palletwood, sawlog) and a 8 wheel mounted forwarder to collects the different timber assortments and stacks them at the roadside for removal by the timber lorries to the sawmill.

Low ground pressure harvester and forwarder is to be used for all clearfelling operations. In areas where it is not feasible to cut the trees by harvester due to the trees being too small (i.e. <7cm DBH) an excavator with tree shears will be sufficient to cut and windrow the trees and for stump removal (for example Turbines 1, 2, 3). In the bat felling buffer areas, the brash will be left to decompose. For the footprint of the proposed infrastructure there will be full tree removal to facilitate the windfarm development infrastructure.

Clearfelling operations should be carried out during suitable weather conditions where feasible. Where felling is to be carried out adjoining any buffer zones or set back areas, the timber should be felled away from these zones. Any timber stacking for removal should also be outside these buffer zones and setback areas.

The machine maintenance and refuelling area is to be located on a dry elevated site with a minimum distance of 50 metre from any aquatic zones. Any material that is to be used for any maintenance operations will be removed from site when the work is completed. Harvest operations will be planned to minimise surface water flow rates and flow volume during heavy rains to prevent sediment and silt from entering environmental sensitive areas.

Brash will be used along harvesting and extraction routes for soil protection. The forwarder will be loaded to the manufacturer's maximum specification and no more to avoid overloading and unnecessary soil compaction.

Where it is necessary to cross existing forest drains this will be done by determining a suitable crossing point. The crossing point will be made by laying logs in the drain length ways so as not to restrict the flow of water (temporary bridging point). Brash (branches) will be placed across the logs. The crossing point will be maintained during its use and removed when works are completed. The crossing point will be monitored for any possible water flow restriction and material deposited in the drain. If any material is deposited in the drain it is to be removed immediately. Drain crossings are to be installed during operations and to be removed when felling is complete. Where existing drains flow into water course these will have silt traps and silt fences installed before the end of the drain. Any branches or debris that accidently enters any watercourses will be removed immediately.

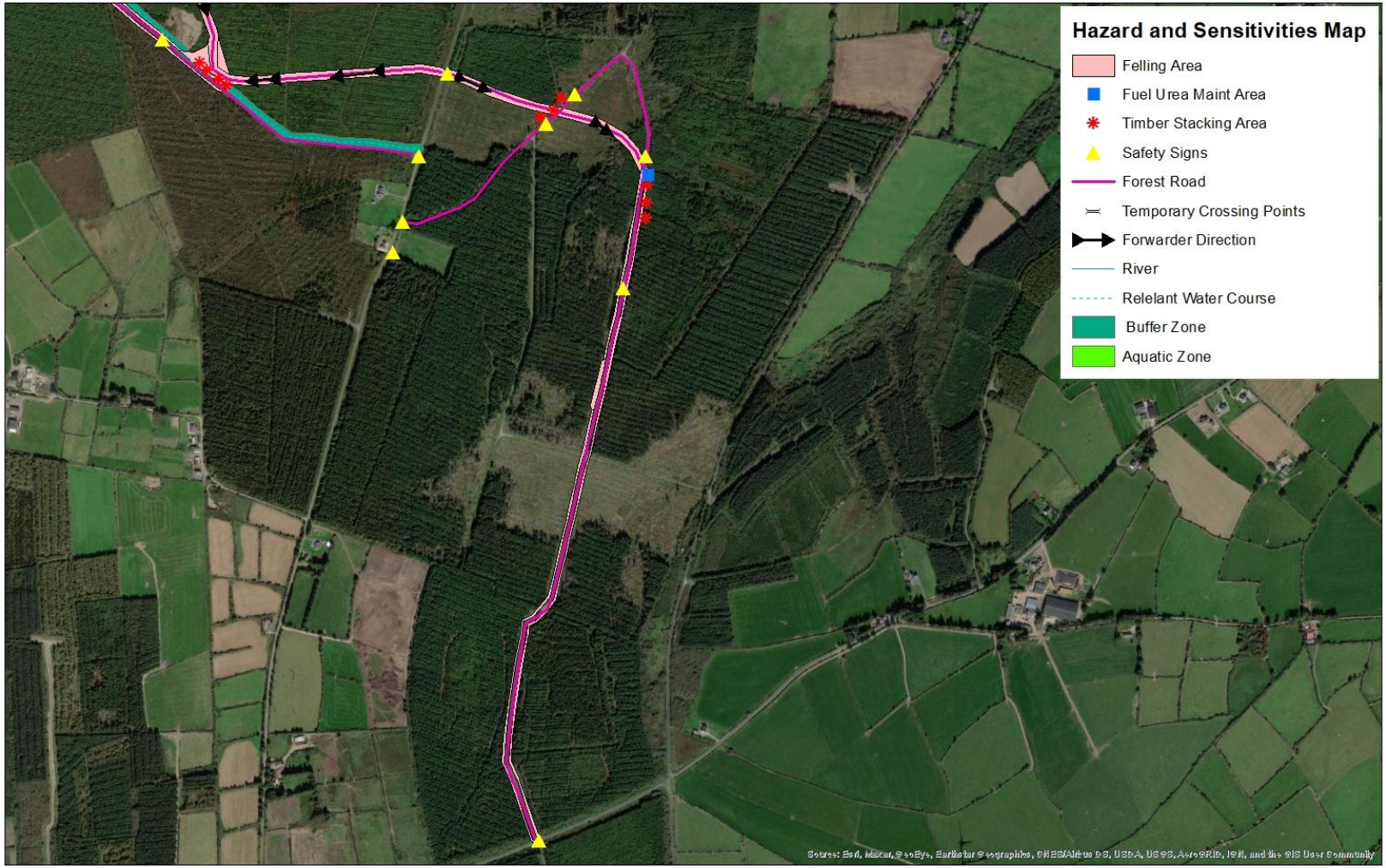
The extraction directions are marked with black arrows on the Harvest Plan Map. Excessive use of extraction routes is to be avoided. Silt traps will be installed within the drains along roadside drains and

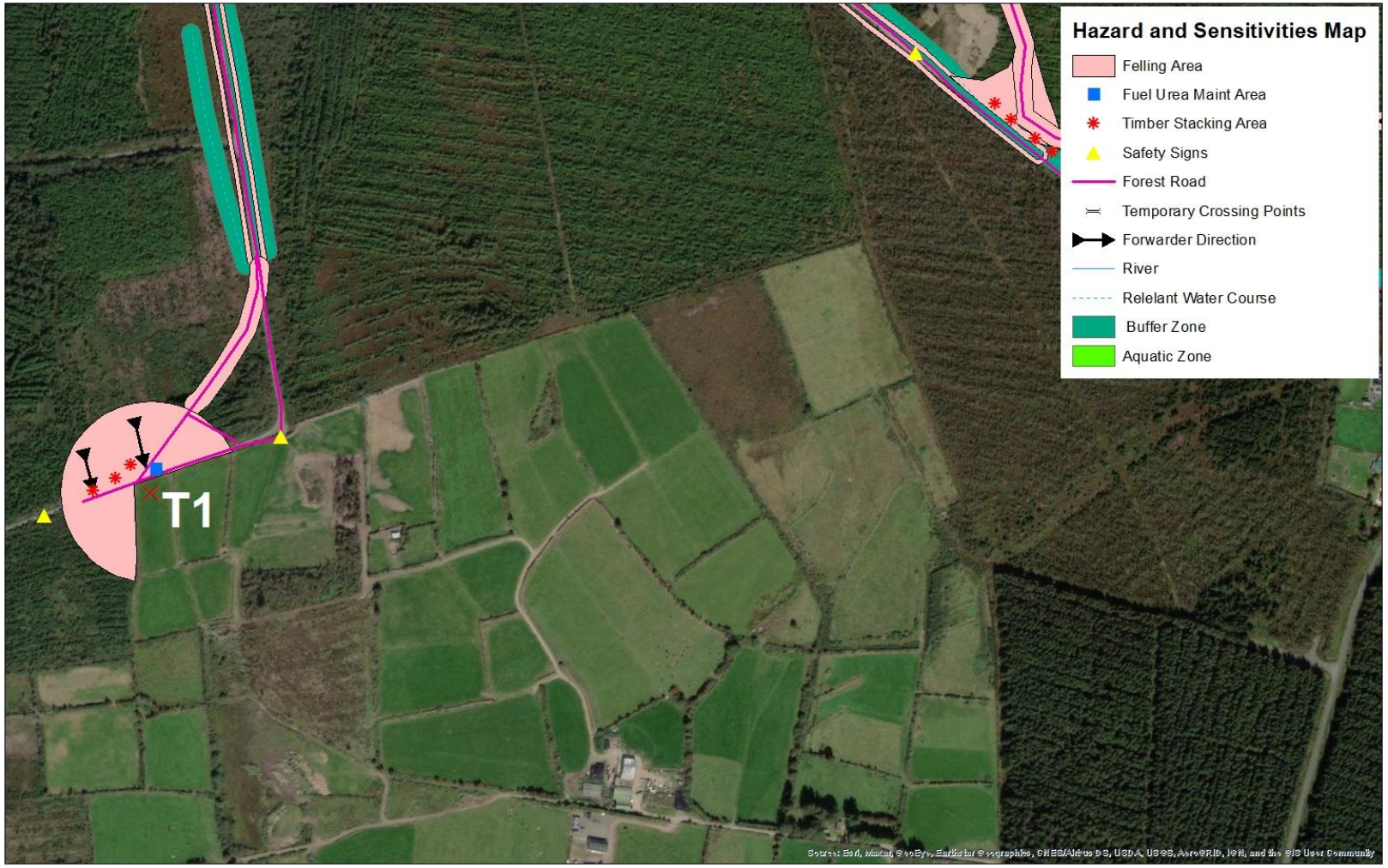
along extraction routes as required to intercept any sediment and needles. Existing silts trap will be checked regularly to ensure that they are working properly.

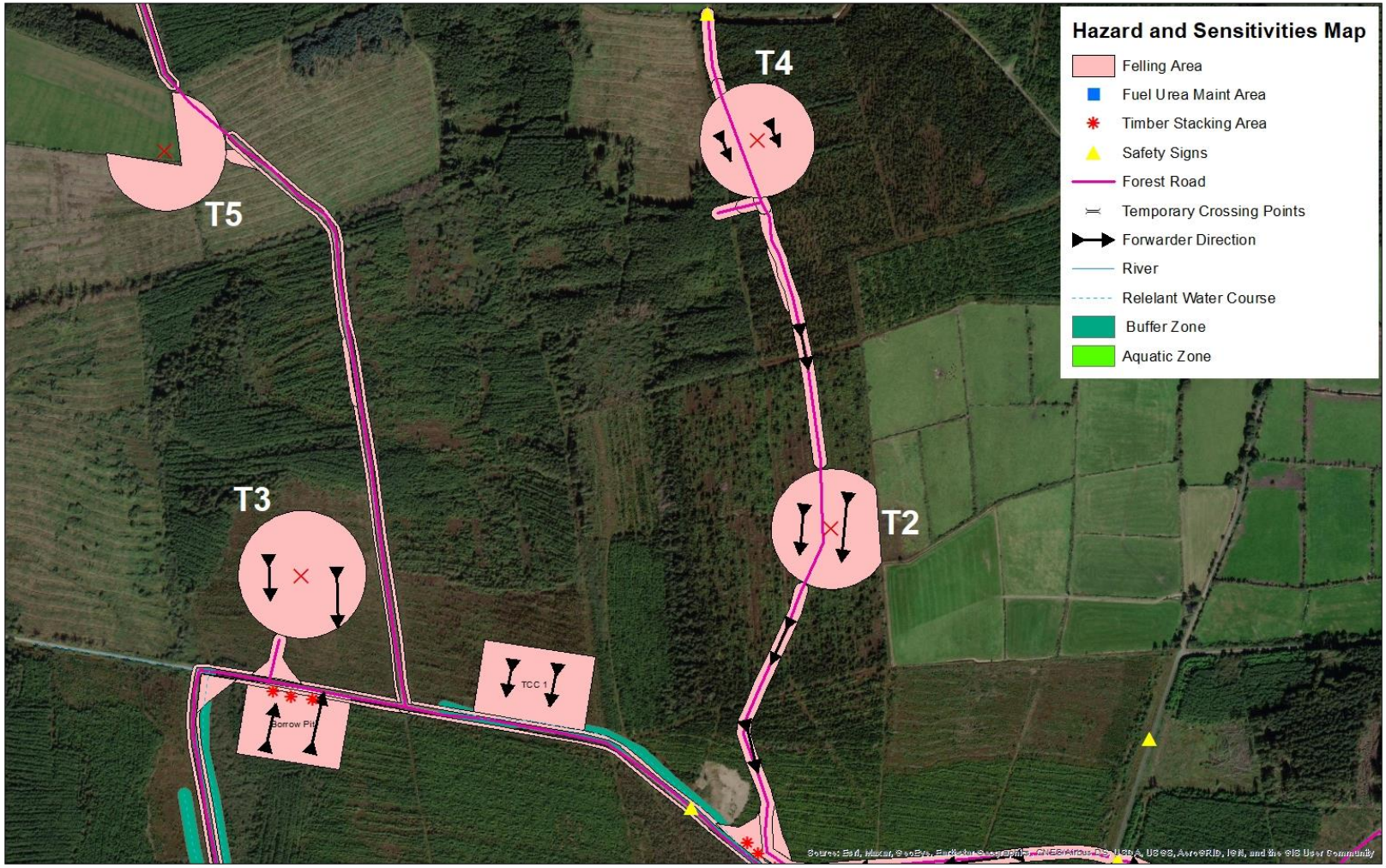
Onsite supervision and checks are necessary to ensure that felling and extraction operations are carried out appropriately and that water protection measures are adequate and remain effective throughout, and also to trigger contingency measures, if necessary (e.g. to cease operations if rainfall creates a risk of sediment mobilisation and runoff).

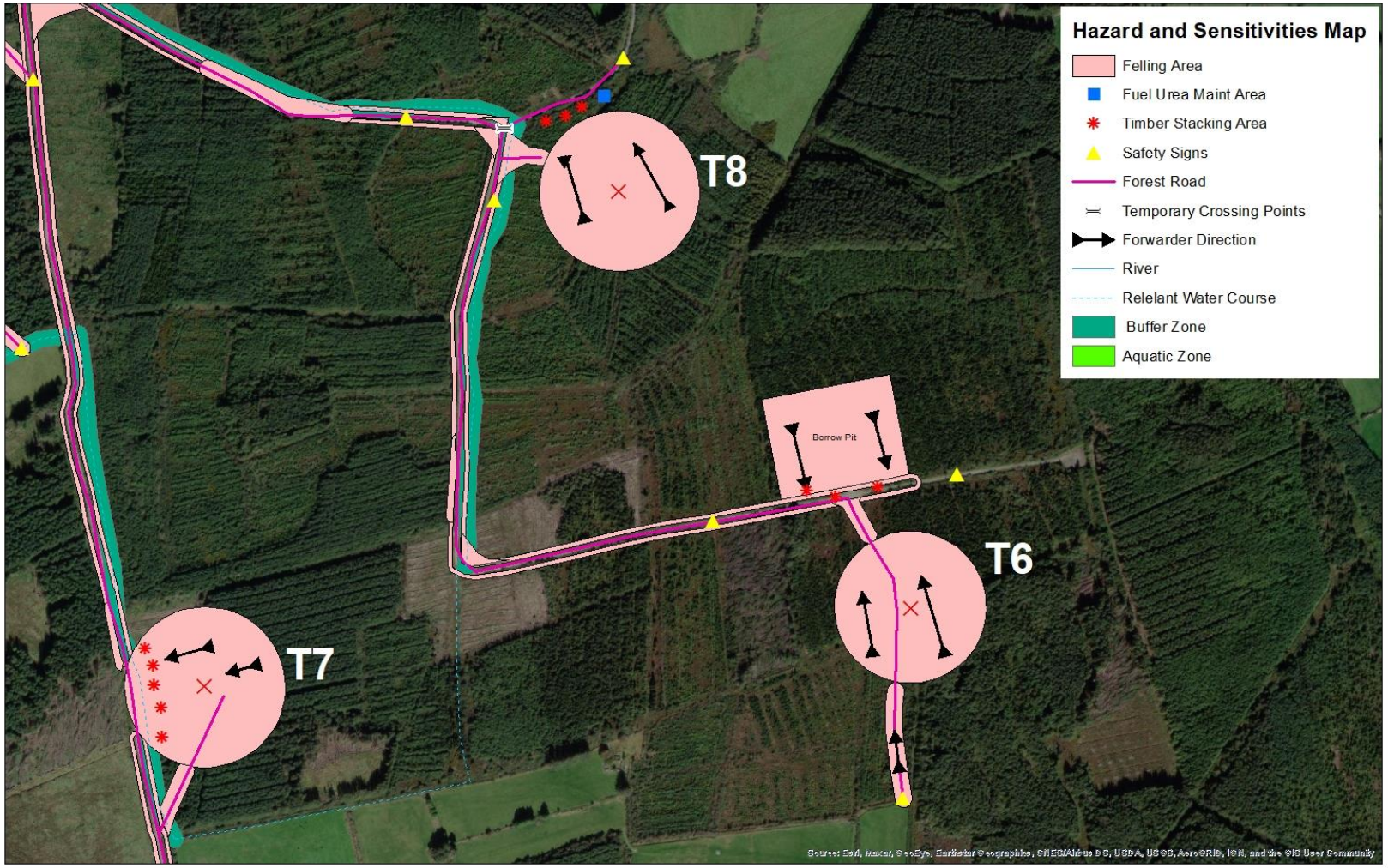
All sub-contractors should be briefed prior to operations starting and a copy of the Harvest Plan and harvest plan maps made available to them.

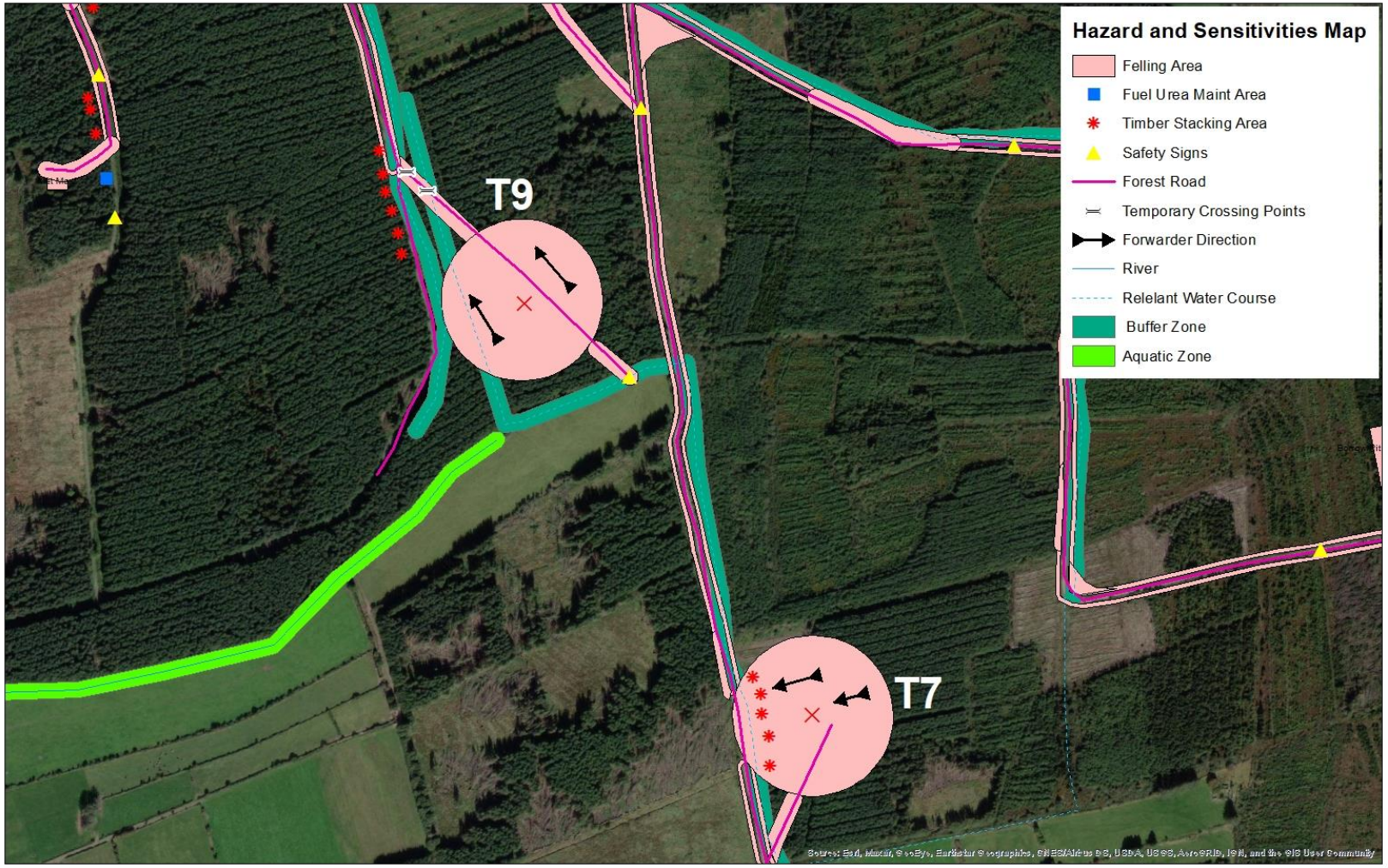
Figure 4(a–i)- - Harvest Plan Maps for Turbines 1-20, Substation, New Roads, Existing road widening, Corner Widening, Met Mast, Borrow Pits, Temp Construction Compounds, Passing Bays, Grid Connection



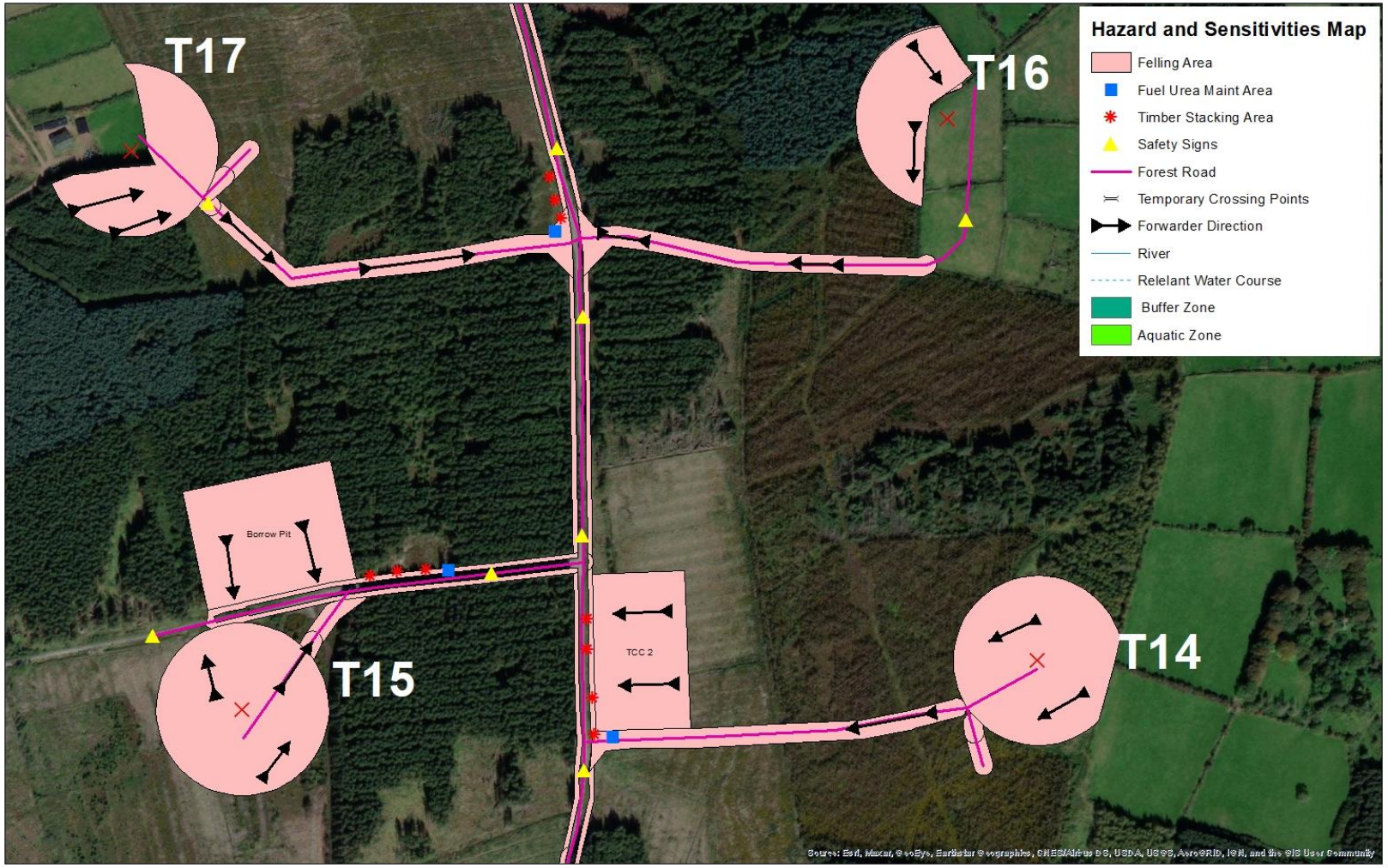

Hazard and Sensitivities Map
Felling Area
Fuel Urea Maint Area
Timber Stacking Area
Safety Signs
Forest Road
Temporary Crossing Points
Forwarder Direction
River
Relelant Water Course
Buffer Zone
Aquatic Zone
T1


Hazard and Sensitivities Map
Felling Area
Fuel Urea Maint Area
Timber Stacking Area
Safety Signs
Forest Road
Temporary Crossing Points
Forwarder Direction
River
Relelant Water Course
Buffer Zone
Aquatic Zone
T5
T4
T3
T2
TCC 1
Borrow Pit


Hazard and Sensitivities Map
Felling Area
Fuel Urea Maint Area
Timber Stacking Area
Safety Signs
Forest Road
Temporary Crossing Points
Forwarder Direction
River
Relelant Water Course
Buffer Zone
Aquatic Zone
T8
T7
T6
Borrow Pit


Hazard and Sensitivities Map
Felling Area
Fuel Urea Maint Area
Timber Stacking Area
Safety Signs
Forest Road
Temporary Crossing Points
Forwarder Direction
River
Relelant Water Course
Buffer Zone
Aquatic Zone
T9
T7


Hazard and Sensitivities Map
Felling Area
Fuel Urea Maint Area
Timber Stacking Area
Safety Signs
Forest Road
Temporary Crossing Points
Forwarder Direction
River
Relelant Water Course
Buffer Zone
Aquatic Zone
T13
T12
T10
T11
SubStation


T17
T16
T15
T14
Borrow Pit
TCC 2
Hazard and Sensitivities Map
Felling Area
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Timber Stacking Area
Safety Signs
Forest Road
Temporary Crossing Points
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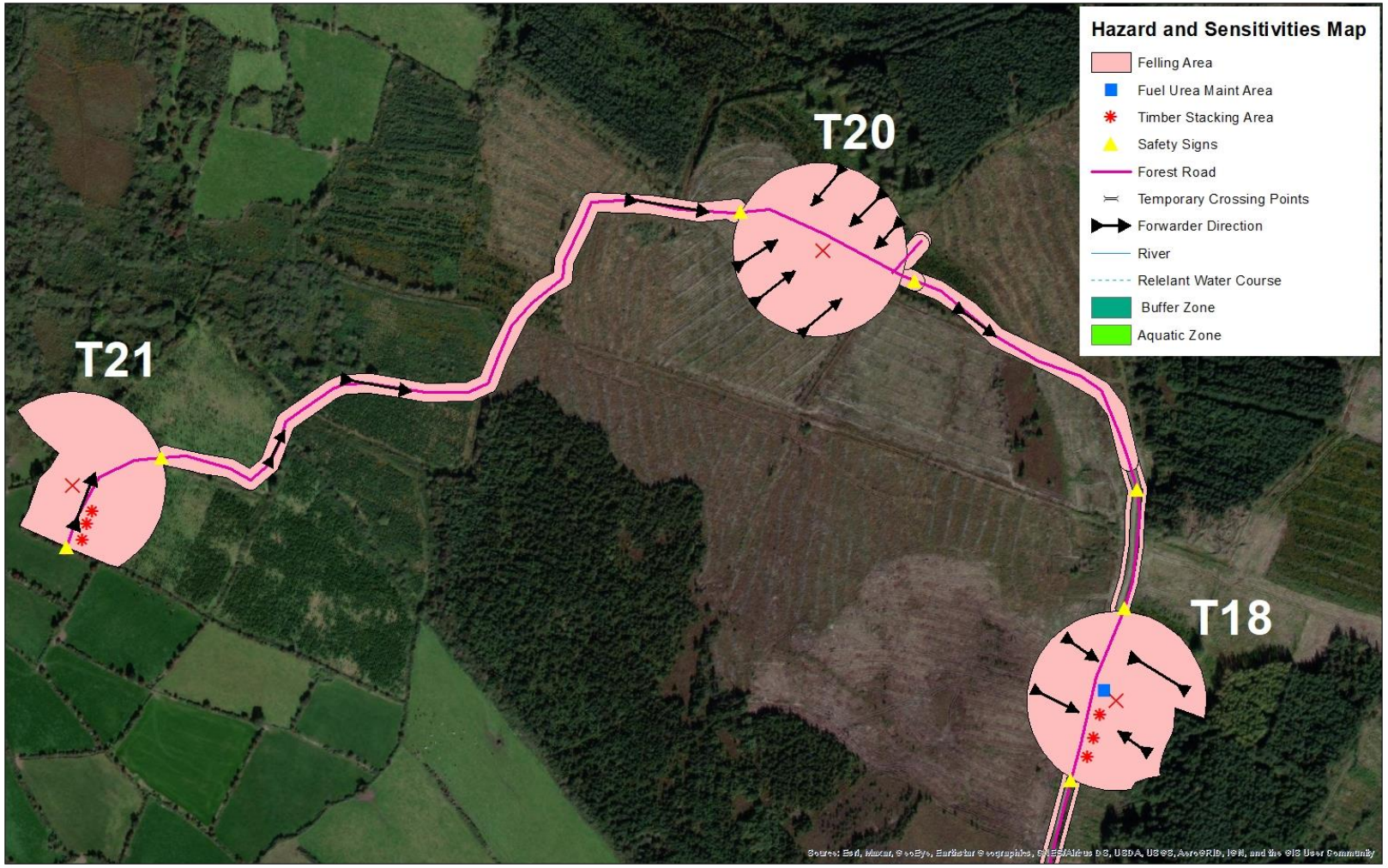
River
Relelant Water Course
Buffer Zone
Aquatic Zone


Hazard and Sensitivities Map
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Timber Stacking Area
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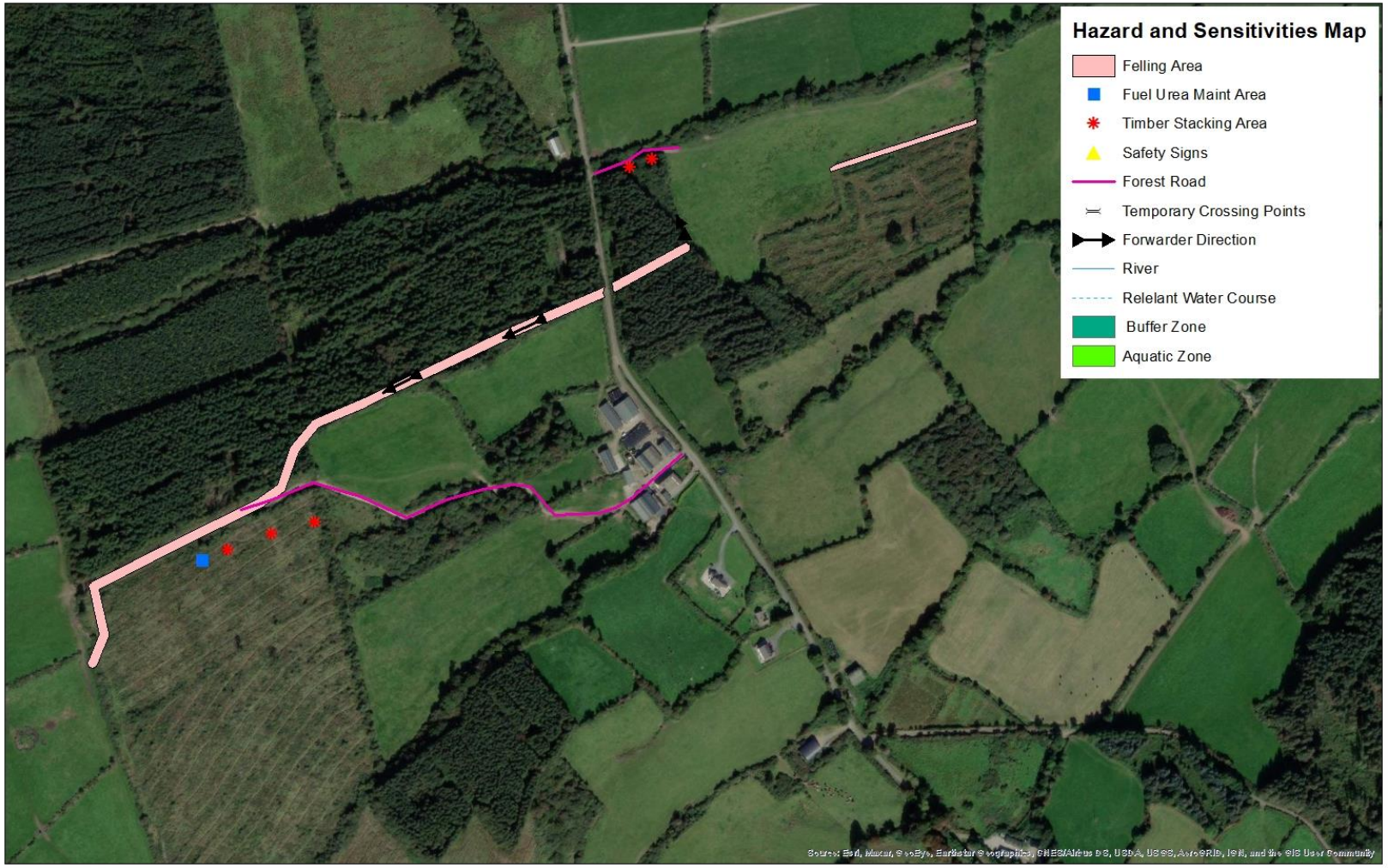
Forwarder Direction
River
Relelant Water Course
Buffer Zone
Aquatic Zone
T20
T21
T18


Hazard and Sensitivities Map
Felling Area
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Safety Signs
Forest Road
Temporary Crossing Points
Forwarder Direction
River
Relelant Water Course
Buffer Zone
Aquatic Zone

1.6.1.1.1 Harvesting Site Specifications

All staff must wear high visibility jacket and hard hat at all times. Chainsaw contractors must wear all required PPE equipment during operations set out in the Health & Safety Authority's (HSA) *Code of Practice for Managing Safety & Health in Forestry Operations*. All personnel on site must have appropriate Health and Safety training.

Agreed Truck Types: Artic ☑ Rigid ☐ Rigid and Trailer ☐

EMERGENCY CONTACT NUMBERS

Agencies	Telephone	Location
Coillte Forest Representative	TBC	Kilkenny
Garda Síochána	999; (051) 898 122	Mullinavat, Co Kilkenny
NPWS Wildlife Ranger Regional Office	076 1002667	NPWS South Eastern Region
Forest Service Inspector Robert Windle	053-9165506 087-1460011	Johnstown Castle Estate Wexford
Fire Station New Ross	999 or 112 (051) 421 777	New Ross, Co Wexford

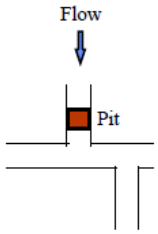
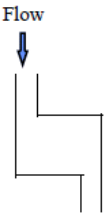
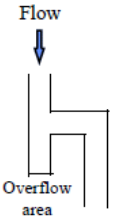
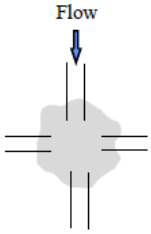
It is essential that all forest workers and machine operators involved in any forest operation are made aware of and understand the Forest Service Environment Guidelines, all relevant environmental issues relating to the site and the working practices which minimise environmental disturbance. All operators will have contact telephone numbers onsite for all relevant agencies (Owners, Local Authorities, Regional Fisheries Board, NPWS, Garda Síochána, etc.) in case of accidental damage to aquatic zones, archaeological sites, important wildlife habitats and other environmental features. Furthermore all Coillte forest workers and machine operators will have completed the Coillte Environmental Risk Assessment Training as well as all appropriate training and certification as required for harvesting operations.

Further information in relation to site safety and operations can be found in the Construction & Environmental Management Plan which forms which forms Appendix 2-7 to Chapter 2 (Description of the Proposed Development) of this EIAR.

1.6.1.1.2 Silt and Sediment Control Measures

Best forest practice aims at minimising sediment mobilisation by reducing soil disturbance through planning, timing of operations and using appropriate machinery. Mobilised sediment transportation is minimised by the use of naturally occurring vegetated overland flow areas and the use of sediment traps. The following mitigation measures with regard to forest clearfelling will be followed:

- Prior to commencement of operations sediment or silt traps will be installed at intervals, as close as possible to the source of the sediment. Where required, correctly planned, installed and maintained sediment traps/drains for each individual felling site will help to ensure that water quality is protected. Typical sediment trap designs are illustrated below (source *Forestry Schemes Manual, 2011)*:

No. 1 (Pit)	No. 2 (Staggered Type)	No. 3 (Run Off Type)	No 4 (Swamp Type)
			
The end of the mound drain is slightly deepened for c. 0.3 metres before it enters the collector drain.	Forces water to slow down within the trap - more efficient than if the water ran straight through the trap. Minimum 1 metre long.	Caters for runoff events that exceed the design capacity. Useful on slopes. Overflows floods onto vegetation. Do not plant within 4 metres of the lower side in order to conserve dense vegetation.	Many drains may enter a natural depression to create a mini "swamp". Dimensions of the "swamp" depend on the needs of the site. May be c. 20 sq. metres. Do not plant within 4 metres of the "swamp".

Sediment traps will require monitoring and maintenance throughout the operations. Sediment traps are to be constructed and maintained in line with the requirements of the *Forestry Schemes Manual (2011), the Forest Road Manual and Forest Drainage Engineering – A Design Manual.* Sediment or silt trap mitigation measures are also included in Chapter 9 Hydrology & Hydrogeology.

- Silt traps and silt fences, such as geotextile membrane and straw bales, should be placed in the forest drainage network to minimise silt loss. Silt traps should be staggered along the length of the drain, and not only at the lower reaches towards its outflow. These should be inspected and cleaned regularly. A series of stepped silt traps/fences to trap any silt/debris will be installed. Their purpose will be to slow water flow and allow settlement of solids to occur. These will be regularly inspected and cleared out to ensure they are functioning properly. Traps should not be constructed immediately adjacent to natural water courses.
- Silt trap design can vary, from depressions added to the drain bed, to log sections laid lengthways into the drain or the use of geotextile barriers.
- Apply silt fences where necessary, to block pathway for silt in areas where overland flow is possible.
- Brash from the clearfell should be utilised as roading material to reduce impact on ground thereby minimising ground disturbance.
- Existing forest drainage shall be reinstated where damaged to allow use to be made of vegetated ground areas to reduce the flow of silt overland.
- A 15m buffer zone should remain between the silt trap and the watercourse with natural vegetation left intact so as to assist in silt interception.
- Within the buffer zone, forest harvesting, machine refuelling, forwarder movement and other forest operations are prohibited in order to protect water quality. Furthermore, drainage channels leading from the site must taper out before entering the buffer zone. This ensures that discharged water gently fans out over the buffer zone before entering the aquatic zone, with sediment filtered out from the flow by ground vegetation within the zone.

During a study of a harvesting site by Rodgers et al 2002 in Co Mayo, sediment concentrations, yields and release patterns upstream and downstream were compared before and after harvesting. These showed that harvesting did not significantly increase the sediment concentrations in the receiving water, confirming that if the Forests and Water Quality Guidelines are followed and care is taken on site, the aquatic zone need not be adversely affected by sediment releases from sites without a buffer strip.

1.6.1.1.3 Temporary Water Crossings

Temporary water crossings include forest drains, roadside drains, relevant watercourses[2] and aquatic watercourses. The following measures should be adhered to as per the *Interim Standards for Felling and Reforestation:*

Forest Drains:

- Minimise the crossing of drains during felling and extraction and restrict machine activity to brashed extraction racks and forwarding routes as shown in Figure 4 Harvest Plan Maps
- Where a drain crossing is needed, based on the size of the forest drain one of the following methods will be selected that prevents the breakdown and erosion of drain sides, namely:
    - For larger drains , deploy a heavy-duty plastic culvert lengthways into the channel and cover with brash material. The culvert must be of a diameter approximating the depth of the drain, to avoid any unnecessary undulation along the extraction route.
    - Where required, a solution for smaller drains is to temporarily lay log sections lengthways into the channel and overlay with brash. Again, select logs that approximate the depth of the channel to be crossed.

Aquatic Zones and Larger Relevant Watercourses:

- Minimise the crossing of aquatic zones and larger relevant watercourses during felling and extraction by choosing alternative routes which avoid the watercourses/aquatic zones where possible.
- Direct crossing over the stream bed is not permitted.
- If you must cross an aquatic zone or larger relevant watercourse install a temporary crossing point. When installing and removing the temporary crossing, ensure that no work is carried out within the aquatic zone, and that the stream bed and bankside remain undisturbed.
- Avoid crossing points in hollows where surface water gravitates towards, or in areas of the site more prone to sediment release, as indicated by terrain classification.
- Ensure the feature is crossed at a right angle to the flow of water.
- Where needed, any necessary crossing shall be via an appropriate structure that spans proud of the flow of water and prevents the breakdown and erosion of the banks.
- Typical solutions include the laying down of a bridge comprising logs overlaid with geotextile and brash to intercept soil falling off wheels.
- Alternatively, utilise prefabricated concrete drop-in bridging

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[2] **Relevant watercourse:** Any other watercourse that has the potential to act as a pathway for the movement of significant amounts of sediment and/or nutrients from the site to an aquatic zone. Relevant watercourses are existing drains and channels that may contain flowing water during and immediately after rainfall.
Note, not every watercourse is a 'relevant watercourse'. For example, a well-vegetated agricultural drain or ditch draining a small area of moderately sloping ground may not be a relevant watercourse, as there will be little or no potential for it to carry significant amounts of sediment/nutrients

1.6.1.1.4 Brash Management

The objective of brash management is to contribute to the retention of the nutrients on site, thus preventing nutrients entering watercourses and to provide for access of machinery, specifically harvesters and forwarders, minimising damage to the soil.

The decay of brash takes place for some time after harvesting is completed and this process releases nutrients to the environment. These nutrients can be taken up by the soil or plants either within the forest or in a buffer zone/strip. Nutrients, which are not immobilised, can be washed away by overland flow, usually during the first significant rainfall event after their release.

Retention of the nutrients on site is achieved by the control of water, ensuring that the sediment and nutrients it contains are retained on site and as far away from the watercourse as possible. The following points will be implemented for this site:

- Where the brash is not required to form brash mats, it should be allowed to decay evenly distributed over the harvesting site. This allows for a more even distribution of the nutrient release on the site. If windrowing[3] is required, it should not be carried out until the needles have been shed
- Where the brash is required to form brash mats, it is laid out at harvesting stage as a mat to prevent soil disturbance by machine movement. Brash which has not been pushed into the soil may be moved within the site to facilitate the creation of mats in more demanding locations
- Extraction routes, and hence brash mats, should be aligned to the contour where possible. This assists in reducing the rate of water flow towards the receiving waters and consequently assists in onsite sediment entrapment
- Brash mats must be minimum 20m away from the watercourses, and
- The removal of brash mats in normal clearfell and replanting is not recommended as it is likely to be a source of sedimentation and ineffective in reducing nutrient loss.

1.6.1.1.5 Ancillary structures

The following ancillary structures will be required on site:

- Sediment traps in drains where considerable sediment flow is expected
- Brash mats to reinforce short sections of soft ground subject to high traffic usage
- Log steps on steep routes to prevent the flow of sediment-laden surface water along machine paths, especially where wheel ruts form.

Furthermore, prevent the accumulation of brash, logs and debris in drains and aquatic zones. The installation of heavy-duty plastic culverts with a protective brash cover is preferable for drain crossings. If logs are used for this purpose, they should be examined regularly and removed, if necessary, to avoid blockages and localised flooding. Remove temporary bridges and crossings as harvesting progresses.

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[3] Windrowing is the stacking of leftover vegetation, brash and other organic. matter into long narrow rows. The purpose of windrowing is to clear enough space for the replanting of new trees.

1.6.1.1.6 Site restoration

After felling has been completed, the felled areas will be checked to replace any damaged culverts, clear and repair drains, clean sediment traps, correctly dispose of hazardous materials such as machine oils or lubricants and remove log bridges and other temporary structures as necessary. Clearfelling, if possible, should be carried out early in the season, to facilitate reforestation and to allow the site to 'green over' quickly.

1.6.1.1.7 Wildlife habitats and biodiversity

Assess harvest operations with due regard to the breeding and nesting seasons of important species, and associated features such as badger setts and red squirrel dreys, as discussed in Chapter 6 Biodiversity: Ornithology.

1.6.1.1.8 Method of harvesting and the harvesting equipment

Load sizes recommended by machinery manufacturers will not be exceeded. Overloading will damage extraction machinery and will increase the risk and severity of soil compaction and rutting. Good management practices such as the use of brash mats and harvesting only in dry weather should be used to minimise soil surface disturbance and stream bank erosion. As some of the soils at the site are poorly drained soils, 8 wheeled harvesters should be used which will distribute the weight and reduce the loading and compaction and damage to the soil.

1.6.1.1.9 Storage and Handling of Chemicals, Fuels and Oils

Prepare and securely store all chemicals, fuel and machine oils under shelter on a dry, elevated site at least 50m from the nearest aquatic zone. Cleaning of equipment should not take place within 50m of an aquatic zone. All wash waters must be disposed of carefully. Spent oil must be collected and retained for correct off-site disposal. Biodegradable oil should be used as a substitute for mineral oil, where possible. Refer to the CEMP (Appendix 2-7) and Chapter 9 Hydrology and Hydrogeology for more information.

1.6.1.1.10 Landscape

Coupe sizes should reflect the scale of the landscape. Landscape issues favour asymmetric and irregularly shaped coupes which follow landform, with edges diagonal to the contour, rising in hollows and descending on spurs. Skylines need to be treated on a large scale, with the forest either left standing or cleared fully to reveal the shape of the underlying landform. Narrow belts of perimeter trees on the skyline tend to accentuate the negative visual impact of harvesting operations and generally, should not be retained. The coupe sizes for this proposed development are generally small in nature averaging 2-3 hectares.

1.6.1.1.11 Monitoring Requirements

Regular inspections during the course of harvesting operations will be undertaken to allow for immediate corrective action to be taken in the event of deviations from the plan or unforeseen problems. An assessment should involve an evaluation of the location and condition of roads, landings and machine routes, particularly in relation to drainage, compaction and rutting. Sites should be visited in the aftermath of an extended period of heavy rainfall to ensure that, if merited, operations are suspended. An assessment should be undertaken to determine whether protected areas are undamaged, and that fuel, lubricants and other hazardous compounds are stored correctly and removed from the site on the completion of operations.

1.6.2 Operational Phase

1.6.2.1 Onsite Replanting

Under the Forestry Act 2014, permanent forest removal is permitted under certain scenarios. Supporting renewable energy in the form of windfarm installation is an acceptable scenario as outlined in Table 7, Forest Service Felling and Reforestation Policy May 2017.

Table 7 – Requirements for each category of felling associated with wind farm development, regarding reforestation, alternative afforestation, and the refunding of grant and premiums.

Category of tree felling		Reforestation of felled area required?	Alternative afforestation required? (See Note 1)	Refunding of grant & premiums required? (See Note 2)
Infrastructure felling		No	Yes	Yes
Construction felling		Yes	No	No
Turbulence felling	≤20 ha	Yes	No	No
	>20 ha	Yes	Yes, 10% turbulence fell area – see Section 5.3.2.4	No

Note 1 If 'YES', the alternative site must be of an area equivalent in size. Section 5.7 sets out the procedures required. If the forest area proposed for permanent removal is still in receipt of premiums and / or is still in contract under the Afforestation Grant & Premium Scheme, the alternative site may be eligible under the Afforestation Grant & Premium Scheme.

Note 2 If 'YES', the refunding of any afforestation grants and premiums already paid out by the Forest Service is required if the forest area proposed for permanent removal is still in receipt of premiums and / or is still in contract under the Afforestation Grant & Premium Scheme. Also, if 'YES' or 'NO', if premiums are still being paid, premium payments on the area will cease.

As outlined in Section 1.4.1.1, it is estimated a total of 75 ha will be required to be replanted under the Infrastructural felling. Construction felling areas (7.88 ha) as outlined in section 1.4.1.1 will be temporarily felled and replanted at the same location once construction works are completed. There areas will be replanted with the same tree species that were felled, namely Sitka spruce, Lodgepole pine, Eucalyptus and Birch.

As part of the application for a Felling License for permanent forest removal, details of the replacement lands must be included. The offsite replacement lands are outlined in Appendix 2-5 to the main EIAR. A Technical Approval for an afforestation license for these replacement lands must be granted by the licensing authority, the Department of Agriculture, Food and the Marine (DAFM), which will have assessed the silvicultural and environmental suitability for planting.

1.7 RESIDUAL EFFECTS

The premature and semi-mature felling of the different forest areas for the construction of the infrastructure (temporary and permanent) will result in a slight effect to the forest structure within the proposed development site as opposed to the do nothing scenario.

The residual impacts of the proposed felling and onsite replanting activities are assessed through the EIAR chapters for the relevant topic.

1.8 CONCLUSION

There is an extensive network of existing access roads across the site to facilitate the ongoing forestry operations and will subsequently facilitate the windfarm development. The area of forest to be permanently removed for infrastructural felling is estimated at 75 ha distributed throughout much of the study area. This loss of forest area and carbon stored is temporary as an equivalent area of 75 ha of bare land will be planted as replacement land elsewhere. A further 7.88 ha will be felled to facilitate the wind farm construction phase and replanted once construction operations have ceased. It is expected that clearfelling works would be carried out over a period of up to 18months period and during dry weather conditions.

It is concluded that, with the implementation of the Harvest Management Plan and associated mitigation measures, forestry operations associated with the proposed Castlebanny Wind Farm development will not give rise to significant impacts on the surrounding environment..

References:

Bolin, B., Sukumar, R., Ciais, P., Cramer, W., Jarvis, P., Kheshgi, H., Nobre, C., Semonov, S. and Steffen, W. 2000. 1. Global Perspective. In: Watson, R.T., Noble, I.R., Bolin, B., Ravindranath, N.H., Verardo, D.J. and Dokken, D.J. (eds.) 2000. Land Use, Land-Use Change, and Forestry. Cambridge University Press, pp. 23-52.

Cummins, T., Farrell, E. P., 2003. Biogeochemical impacts of clearfelling and reforestation on blanket peatland streams I. phosphorus. *Forest Ecology and Management* **180**, 545 – 555.

Cummins. T., Farrell, E. P. (Eds), 1999. *Environmental Impacts of Harvesting and Reforestation Practices in Blanket Peatland Forests*. COFORD, Dublin.

M. Rodgers, M. O'Connor, M. G. Healy, C. O'Driscoll, Z. Asam, M. Nieminen, R. Poole, M. Muller, L. Xiao, Phosphorus release from forest harvesting on an upland blanket peat catchment, Forest Ecology and Management, Volume 260, Issue 12, 15 December 2010, Pages 2241-2248

Suspended solid yield from forest harvesting in an upland blanket peat. Michael Rodgers, Mark O'Connor, Marcus Muller, Liwen Xiao. COFORD 2012. Environment No.12