Derrybrien Wind Farm Project

Gort Windfarms Ltd.

Remedial Environmental Impact Assessment Report
Chapter 2-Project Description

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Contents

Table of appendices

Table of figures

Table of tables

2. Description of Project

2.1 Introduction

Figures are contained in A4 format as they are referenced within the chapter. Where necessary for clarity these are reproduced at A3 in Appendix 2.3

2.1.1 Chapter Scope

This chapter describes the Derrybrien Wind Farm Project (the Project) and comprises information on the project site[1] together with the design, size and relevant features of the Project.

As set out in Chapter 1, this remedial Environmental Impact Statement (rEIAR) has been prepared to comply with the EIA Directive. [2]

The project description information to be included in an Environmental Impact Assessment Report (EIAR) (in this instance the rEIAR) is set out in Article 5(1) (a) and Point 1 of Annex IV of the EIA Directive[3] is as follows:

Article 5(1)(a)-

"1. … The information to be provided by the developer shall include at least:

(a) a description of the project comprising information on the site, design, size and other relevant features of the project…"

"Annex IV-

1. A Description of the project, including in particular:

(a) a description of the location of the project;

(b) a description of the physical characteristics of the whole project, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases;

[1] Refer subsection 2.4.1.1 for explanation of project site
[2] Directive 2011/92/EU as amended by Directive 2014/52/EUDIRECTIVE 2011/92/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment as amended by Directive 2014/52/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014

[3] Directive 2011/92/EU as amended by Directive 2014/52/EUDIRECTIVE 2011/92/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment as amended by Directive 2014/52/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014

(c) a description of the main characteristics of the operational phase of the project (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used;

(d) an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation) and quantities and types of waste produced during the construction and operation phases."

It is noted that more detailed information, in relation to the characteristics of the project site from before the commencement of development (in 1998-the baseline year) to date and the residues and emissions associated with the Project, is provided in the relevant topic chapter within this rEIAR.

2.1.2 Methodology

The extent and scope of information provided in this chapter has been based on the information to be provided by the developer as set out in the EIA Directive (refer subsection 2.1.1.), relevant guidance and professional judgement.

Regard has been had to the following guidance in compiling the information for the project description:

- European Commission, "Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU)", 2017[4]
- Draft EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports, 2017[5]

Based on these guidelines, the Project Description describes *inter alia*:

- The objectives of and need for project
- Project timeline
- Project location information
- Size of project
- Activities involved in project construction, operation and decommissioning
- Related projects
- Projects identified for cumulative effects assessments
- Materials and resources used
- Residues and Emissions

[4] European Commission, "Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU)", 2017

[5] EPA, "*Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports",* August 2017

- Risk of accidents

Information related to the project was sourced as follows:

- In relation to construction works, consultation with staff and agents who worked on the Derrybrien Wind Farm Project, with knowledge of the construction activities undertaken on the site, available contemporaneous records, Geological Survey of Ireland (GSI) aerial photography and information from as constructed surveys
- In relation to description of installed infrastructure and works -as constructed surveys undertaken in 2018 and 2019 (topographical and LidAR) of wind farm, grid connection, site of peat slide and offsite works undertaken as a result of peat slide
- In relation to activities and works associated with project operational phase which have occurred to date and activities associated with ongoing and future continued operations consultations with Derrybrien wind farm representatives.

Information related to the physical characteristics and land use within and in the vicinity of the project location and in the vicinity of the site from pre-development phase to date was obtained from a variety of sources, including:

- Ordnance Survey Ireland (OSI) and Environmental Systems Research Institute (ESRI) mapping, datasets and aerial photography
- Environmental Protection Agency (EPA) and Office of Public Works (OPW) mapping -hydrological datasets
- Forestry compartment information from (a) Coillte and (b) Department of Agriculture Food and Marine (for private forestry)

2.1.3 Statement of Authority

The chapter was prepared by Roisin O'Donovan B.E. (Civil), C. Eng., MIEI; PgDip (Environmental Engineering); PgDip (Physical Planning); LLM (Environmental Law and Practice). Key inputs were provided by experts as set out below.

Information in relation to the soils and geology context within the Wind Farm site was provided by Michael Brides BA BAI (Civil & Environmental Engineering), MSc (Structural Engineering)., CEng., MIEI together with Conor O'Donnell (AGL Consulting) BA, BAI (Civil, Structural & Environmental Engineering), MS (Geotechnical Engineering), CEng., MIEI.

Information in relation to soils and geology context for the grid connection and the peat slide related works was provided by Paul Jennings BEng, CEng, MIEI, PhD, DipArb and Ian Higgins (BSc, MSc, FGS, MIEI.) (Feehily Timoney & Associates).

Information in relation to the hydrological and drainage context was provided by Harry Griffin BA BAI Civil, Structural & Environmental Engineering, MSc Hydrology & Climate Change.

Information in relation to construction activities was provided by the project's staff and agents who were part of the ESBI team involved in the construction phase of the project –Henry Bouchier B.E., MEng Sc, PgDip Project Management; PgDip Management) and John McLoughlin BAI, BA (Civil, Structural & Environmental Engineering), CEng., MIEI; PgDip (Project Management); PgDip (Financial Management).

The as constructed surveys of the Project elements were undertaken by land surveyors Adrian Tuite BSc (Geomatics) and Dean Trainor B.Sc. (Geomatics).

Available construction records were sourced by Clodagh Moran BE (Electrical), MIEI., HDip Project Management, HDip Management.

2.1.4 Difficulties Encountered

Given the time that has elapsed since the project was constructed certain information was no longer available or could not be sourced, including:

- Construction waste quantities (i.e. building material waste from substation, other sources of packaging waste and domestic waste from the construction compound)
- Dimensions of the temporary barrages installed in response to the peat slide during construction but no longer in place
- Precise dimensions of earthworks-excavations and peat repository areas on site

However, the information gaps are not considered to be such as to affect the robust assessment of the environmental effects of the Project.

2.2 Project Overview

2.2.1 Objectives of Project

The overall objective of the Derrybrien Wind Farm Project was the development of renewable energy generation as a means of sustainable non fossil fuel generation, thereby reducing harmful greenhouse emissions.

Since the mid-1990s, the development of renewable energy has been a central aim of EU and Irish energy policy.[6] [7]

The original Renewable Energy Directive (2009/28/EC) established an overall policy for the production and promotion of energy from renewable sources in the EU. It required the EU to fulfil at least 20% of its total energy needs with renewables by 2020 – to be achieved through the attainment of individual national targets.

Under the Renewable Energy Directive (2009/28/EC), Ireland has a legally binding target of 16% of final energy use (from all sectors) to be from renewable sources by 2020, with 40% of electricity to be generated from renewable sources.

In December 2018, the revised Renewable Energy Directive 2018/2001/EU entered into force, which established a new binding renewable energy target for the EU for 2030 of at least 32%, with a clause for a possible upwards revision by 2023. From 1 January 2021, the share of energy from renewable sources in each Member State's gross final consumption of energy shall not be lower than the baseline share (16% for Ireland). Directive 2009/28/EC is repealed with effect from 1 July 2021 and references to the repealed Directive thereafter shall be construed as references to Renewable Energy Directive 2018/2001/EU.

In Ireland, the share of electricity from renewable energy (mostly wind energy) has increased significantly between 1990 and 2018 – from 5.3% to 33.2% but is still short of the 40% target.[8]

The County Galway Wind Energy Strategy (WES) which was originally developed in 2011 is included as Appendix IV to the current Galway County Development Plan 2016-2021. The WES included a target of 500 MW of wind energy to be installed in Co. Galway by 2017. In setting the targets, the WES included the existing operational wind farms of which Derrybrien was at the time by far the largest. Appendix IV of the County Development Plan 2016-2021 noted that the generation capacity of operating

[6] Commission of the European Communities, *"Energy for the Future: Renewable Sources of Energy, Green Paper for a Community Strategy, COM(96) 576 final",* November 1996; DIRECTIVE 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market; DIRECTIVE 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC; DIRECTIVE (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources

[7] Department of Public Enterprise "*Renewable Energy – A Strategy for the Future",* 1996; Department of Public Enterprise, *"Green Paper on Sustainable Energy",* September 1999; Wind Farm Development Guidelines for Planning Authorities, 1996; DCMNR, *"Delivering A Sustainable Energy Future for Ireland-2007-2020*", (2007); DCENR, *"Strategy for Renewable Energy: 2012-2020"*, May 2012; DCENR, *"Ireland's Transition to a Low Carbon Energy Future 2015-2030"*, 2015.

[8] SEAI, "ENERGY IN IRELAND 1990-2016-2019 Report", Dec 2019

wind farms in County Galway in 2013 was approximately 71MW of which Derrybrien Wind Farm contributed 59 MW and Sonnagh Old Wind Farm 7.65MW.

Therefore, until recently, the two wind farms in the Slieve Aughty Mountains comprised the vast majority (approximately 95%) of installed onshore renewable energy generation in County Galway. While there has been a significant increase in renewable energy generation in County Galway in the period 2017-2019[9][10], the installed capacity is still over 135 MW short of target, indicating the importance of existing wind farms such as Derrybrien Wind Farm to the achievement of renewable energy generation targets.

Derrybrien Wind Farm therefore has, is and will continue to contribute to the achievement of national and county wide renewable energy targets through the following specific objectives

Objective 1: To continue to operate the Derrybrien wind farm project to circa 2040 contributing to renewable electricity input to the national grid.

Objective 2: To contribute to and continue to meet the EU and Ireland's stated policy and legally binding targets with respect to Renewable Energy Generation and displacement of fossil fuel energy production.

Objective 3: To contribute to and continue to meet the renewable wind energy targets set in the County Galway Wind Energy Strategy (WES) which was originally developed in 2011 to meet a target of 500 MW to be installed in Co. Galway by 2017

2.2.2 Scope of Project

For the purposes of the Remedial Environmental Impact Assessment Report (rEIAR) and the accompanying Remedial Natura Impact Statement (rNIS), the Project comprises:

- Derrybrien Wind Farm and associated ancillary works
- Grid connection comprising Derrybrien-Agannygal 110kV Overhead Line and Agannygal Substation connecting into the Ennis-Shannonbridge 110kV Overhead Line and associated ancillary works
- Works undertaken in response to the peat slide which occurred during construction of wind farm and associated ancillary works

The main elements of the Project are the wind farm and grid connection. The other elements assessed are the works undertaken in response to the peat slide event

[9] http://www.eirgridgroup.com/site-files/library/EirGrid/TSO-Connected-Renewable-Generation.pdf

[10] https://www.esbnetworks.ie/docs/default-source/publications/dso-connected-energised-wind-generators-q1-2020.pdf?sfvrsn=379506f0_24

which occurred during construction of the project. Given the unique nature of this event, some background to the event is provided in Section 2.2.2.2. below in order to understand the scope of the event and works subjected to assessment in this rEIAR.

2.2.2.1 Wind Farm and Grid connection

The main Project is a 70 turbine wind farm together with associated grid connection comprising a 7.8km 110kV overhead line, substation and connection to the pre-existing Ennis-Shannonbridge 110kV overhead line. The components and works required for the wind farm and grid connection are identified and described in Section 2.6.

2.2.2.2 Peat Slide Event and response works

A peat slide occurred during Project construction on the 16th October 2003. Works were undertaken in response to this unforeseen event. This section provides a brief description of the peat slide event, the measures/works undertaken in response to the peat slide and an outline of contributory causes of the peat slide. A more comprehensive review of the peat slide is provided in Chapter 10-Soils, Geology and Land and the publications and reports referenced therein.

Description of Peat Slide Event: The peat slide originated within the wind farm site close to the southern boundary, as excavation works were underway at the location for the foundations for turbine T68.

The peat slide involved the disturbance and partial displacement of peat and forest debris mainly onto land downslope of the peat slide area to Black Road Bridge.

The site of the peat slide extended approximately 1.65km downslope from turbine T68 and displaced peat and forestry over an area of approximately 25ha. This approximately 25ha area is referenced throughout this rEIAR as the site of the peat slide or the peat slide area. The majority of the peat slide area was in Coillte coniferous forests outside and to the south of the wind farm site.

From the peat slide area, debris passed down a stream valley and into an area of open flatter ground where it lost momentum and was deposited upstream of a minor road bridge (the Black Road Bridge).

From the peat slide area, debris from the slide entered the valley of the stream located in the Derrybrien North sub-catchment (i.e. stream SC7(b) on **Figure 2.7: Location of Projects/Activities considered for cumulative impact assessments**) into an area of flatter ground down to the Black Road Bridge approximately 1.0 km downslope from the slide area. This was the primary run-out zone for the slide. The location of the peat slide and run-out zone is shown in **Figure 2.3: Location of and Approximate Extent of Peat Slide and Main Peat Slide Run Out Area**

Some peat was transported further down the Owendalulleegh River with some peat being deposited along the river banks.

The peat debris remobilised on the 30th October 2003 after heavy rain.[11]

In the days and weeks after the peat slide, following subsequent rainfall events, water entered the upper reaches of the stream and caused the peat slide debris to move downstream.

A site walkover by geotechnical specialists in 2019 (downslope of Black Road Bridge) showed little/no visual evidence of any remaining peat debris deposited along the banks of the streams/rivers. Over time, any material deposited along the river banks has been eroded/degraded.

The estimated volume of peat in the peat slide area, based on the extent of the peat slide area was 450,000m^3. Estimates suggest that possibly 50 to 70% of the failed debris left the peat slide area. The remaining material within the peat slide area comprised typically isolated detached rafts of peat, peat debris and a thin covering of intact basal peat. The balance of the debris remains within the site of the peat slide.

The peat slide occurred in the Owendalulleegh Catchment with the bulk of the debris settling out in the 4km^2 lake area of Lough Cutra. The finer buoyant material is likely to have over time been carried through Lough Cutra in the Beagh/Gort River and eventually discharged into Galway Bay at Kinvarra.

Works in response to peat slide: Measures undertaken in response to the peat slide included the rebuilding of short sections of road within the wind farm site at two locations (one in the vicinity of T68 and the second at T23-T70) and the installation of eight barrages (three temporary earthen barrages, one temporary rockfill barrage and four extant boulder barrages) along and downslope of the route of the slide between the wind farm and downstream of Flaggy Bridge. Four of the barrages are still in place and details of these barrages are provided in this chapter. An amount of peat debris was subsequently placed within three peat repository areas, which are described elsewhere in chapter.

[11] Based on review of hourly data for Shannon synoptic station (nearest then-active station with hourly data) and daily data for Derrybrien II daily station. In the month prior to the 16th October slide a daily average of 1.6mm rain fell at Derrybrien met station, well below the long-term average (1982-2019) of 3.9mm. No rainfall was recorded on the 16th October for either station. The 39.3mm rainfall on 30th October was the highest daily rainfall at the station since 1999 when 64mm fell.

Causes of Peat Slide: It is understood that construction activity on the wind farm site – specifically the placement of excavated material from the site of turbine bases, on intact peat slopes, triggered the peat slide.

The loading itself was not considered that substantial and indeed such activity had been carried out on site on numerous occasions prior to the peat slide. However, based on subsequent investigations into the failure, the peat slope within the area of T68 was considered, to be predisposed to failure due to a combination of key contributory causes, which are summarised as follows:

- The presence of a natural drainage line which was not apparent from surface topography
- The presence of a zone of weaker peat within the drainage line
- Loading from floating access track in vicinity of T68
- Loading from placement of arisings on slope in vicinity of T68
- Possible sub-surface transmission of water from the excavation at T68 along the base of the peat
- Drainage works being undertaken downslope of T68
- Possible previous instability
- Lines of potential surface weakness caused by forestry plough/drain channels

The key contributory causes identified from the investigations were used as the basis of mitigation measures undertaken to prevent further peats slides during the completion of the wind farm construction as set out in this chapter and Chapter 10.

It is noted that, at the time of the peat slide at the Derrybrien Wind Farm site in 2003, the knowledge within the construction industry of failures of peat slopes was very limited. The peat slide at Derrybrien Wind Farm stimulated subsequent investigation into peat slides which greatly increased the knowledge base within the industry and resulted in the production of a number of publications and guidelines (e.g. Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments, Scottish Government, 2006, 2017).

2.2.3 Project Chronology

2.2.3.1 Overview

There are five main phases associated with the project lifecycle and the activities and scope of works associated with each phase is outlined in the following sub-sections.

- Pre-Development Phase (January 1998-June 2003)
- Construction Phase 1 (June -October 2003)
- Peat Slide and Response Phase (October 2003-June 2004)
- Construction Phase 2 (June 2004-March 2006)
- Operational Phase (March 2006-2040)

- Decommissioning Phase (2040-2042)

In July 2008, the Court of Justice of the European Union (CJEU) delivered its judgment against the State in Case C-215/06 referencing Derrybrien Wind Farm. In November 2020, the CJEU delivered a further judgment against the State in Case C-261/18 for failure to comply with the 2008 judgment regarding Derrybrien Wind Farm.

2.2.3.2 Pre-Development Phase (January 1998-June 2003)

This phase ran from the date of the first application for planning permission (January 1998) to commencement of construction (June 2003). The relevant planning permissions are listed in Table 1-1 of Chapter 1-Introduction. In summary, there were four key consents, three associated with the wind farm (which was consented in three phases) and one with the grid connection.

- Wind Farm Phase 1: The planning application was made to Galway County Council (GCC) on 15th December 1997 (GCC Reg. Ref. 97/3470) and granted on appeal by An Bord Pleanála (ABP) (ABP PL. 07.106290) on 12th October 1998
- Wind Farm Phase 2: The planning application was made to Galway County Council on 22nd December 1997 (GCC Reg. Ref. 97/3652) and granted on appeal by An Bord Pleanála (ABP PL. 07.106292) on 12th October 1998
- Wind Farm Phase 3: The planning application was made to Galway County Council on 5th October 2000 (GCC Reg. Ref. 00/4581) and granted on appeal by An Bord Pleanála (ABP PL.07 122803) on 15th November 2001
- Grid Connection: The planning application was made to Galway County Council (GCC) on 11th June 1999 (GCC Reg. Ref. 99/2377) and granted on 10th August 1999

During this pre-development phase, the majority of the project site was in use as managed commercial forestry (which had been planted between 1963 and 1994). The remainder of the site comprised turbary land. Turbary rights simply means the right to cut and carry away turf from a specific plot of bogland, and includes the right of preparing and storing on the bogland any turf that is cut from it. Turf cutting on turbary lands is referred to hereinafter in this rEIAR as “turbary”.

2.2.3.3 Construction Phase 1 (June -October 2003)

This phase comprised construction works up to the peat slide in October 2003 including development of the temporary construction compound and access road to the wind farm site from the Black Road, initial tree felling to facilitate construction of wind farm site access roads, construction of site access tracks, construction of 37 reinforced concrete bases across the south, east and western side of the site and partial construction of hardstands.

2.2.3.4 Peat Slide and Response Phase (October 2003-June 2004)

The Peat Slide and Response phase covers the period from the occurrence of the peat slide to the resumption of construction activity on the Project during which works were carried out in response to the peat slide. Following the peat slide on 16th October, construction work was halted on the Wind Farm site for seven months.

The wind farm construction site resources, plant and personnel, were re-directed to carry out the emergency measures to contain the movement of debris downstream. Additional resources were mobilised to site, including geotechnical specialists, engineers and works supervisors.

A timeline of works undertaken in response to the peat slide is set out in Table 2.1.

Table 2.1: Sequence of remedial works undertaken following 2003 peat slide

Date	Event/Works
Peat Slide and Response Phase (October 2003-June 2004)	
16 Oct 2003	Excavation works underway at foundation for turbine 68 (T68). At 4.00pm workers at this location notified Wind Farm Project agents of the occurrence of the peat slide. All works suspended immediately. All personnel confirmed accounted for. Galway County Council (GCC) and Gardaí notified. Investigations into extent of peat slide and its possible further development commenced immediately. On the evening of 16th October, the downslope extremity of the disturbed peat had reached approximately 250m upstream of Black Road Bridge.
18 Oct 2003	The Wind Farm Project provided plant (that had been in use for the wind farm construction) to GCC for the construction of Barrage A upstream of Black Road Bridge. This barrage was formed using locally sourced earthen material.
19 Oct 2003	Peat began to overtop Barrage A. GCC directed the Wind Farm Project and its sub-contractor to construct a second barrage (Barrage B) downstream of Barrage A (but still upstream of Black Road Bridge). Second barrage formed using rock.
20, 21 Oct 2003	Construction of Barrage B continued.

Date	Event/Works
30 Oct 2003	The disturbed peat began to flow downhill again following very heavy rain.[12] Peat was observed flowing across the Black Road and at Flaggy Bridge on the R353. Construction plant was mobilised from the wind farm site, and other external sources, to work on creating barrages across the disturbed peat. These works were co-ordinated with GCC. Routes for diverting drainage flowing into the main slide area were investigated and diversions completed over the next few days.
1 Nov 2003	After constructing an access track to the location of Barrage 2, construction of Barrage 2 (using rock boulders) commenced. Rock used for building the access track was sourced from Borrow Pit/Quarry 3 on the wind farm site. Rock used for building Barrage 2 was sourced from a small borrow pit opened up on adjacent Coillte lands.
4 Nov 2003	Commenced excavation works for the diversion of a stream around peat deposited on lands upstream of Black Road Bridge, including peat built up behind Barrage A and Barrage B. Some tree felling was carried out by Coillte in advance of these excavation works. The construction of Barrages 3 & 4 was completed, located between Black Rd and R353.
8 Nov 2003	Parapet reinstated on Flaggy Bridge.
Nov 2003	Roads in vicinity of Black Rd Bridge and Flaggy Bridge cleaned off and resurfaced under GCC supervision; bridge parapets reconstructed.
28 Nov 2003	By this date (a) the access track within the wind farm site at T68 had been reconstructed (b) access track T23-T70 had been reconstructed and all barrages had been constructed
Dec 2003	Temporary Barrages A, C and D no longer in place
Construction Phase 2-works associated with peat slide	
5 Oct 2004	Peat overflowed Barrage 1 following heavy rains. Excavator mobilised to alleviate build-up behind the barrage.
12 Oct 2004	Carried out drainage works over three days at Black Road Bridge.
4 Nov 2004	Clearing out of peat blockages at Black Road Bridge carried out, using JCB. Co-ordinated with GCC.
9 Dec 2004	Upgrade works commenced at Barrage 1 using rock from Borrow Pit/Quarry adjacent to Barrage 1

[12] Based on review of hourly data for Shannon synoptic station (nearest then-active station with hourly data) and daily data for Derrybrien II daily station. In the month prior to the 16th October slide a daily average of 1.6mm rain fell at Derrybrien met station, well below the long-term average (1982-2019) of 3.9mm. No rainfall was recorded on the 16th October for either station. The 39.3mm rainfall on 30th October was the highest daily rainfall at the station since 1999 when 64mm fell.

Date	Event/Works
19 Jan 2005	Works to remove excess peat build up at Black Road Bridge.
2 Aug 2005	Commenced works in creating peat repository adjacent to Black Rd Bridge to store peat from stream bed and adjacent land (1 month's work).
August 2005	In August 2005, further works commenced to aid drainage from the site of the peat slide. Peat was removed from the river bed and transferred to adjacent peat repository.
29 Aug 2005	Prepared area to accommodate more peat removed from behind Barrage 2.
29 Aug 2005	Between Black Rd and R353 – works commenced in creating peat repository area.
2 Sept 2005	Temporary Barrage B removed

2.2.3.5 Construction Phase 2 (June 2004-March 2006)

This phase covers all construction works post-peat slide to commercial operation of the project, which included the bulk of felling, civil and electrical works associated with the wind farm site and grid connection, some works associated with the peat slide and wind farm commissioning.

Prior to and during this phase, there were two extensions of duration of planning permission for both Wind Farm Phases 1 and 2, an application in relation to change of turbine type for Wind Farm Phase 3 and an extension of duration of planning permission in relation to the grid connection.

- Wind Farm Phase 1: An extension of duration of permission to 31st March 2005 was granted on by Galway County Council on 24th November 2003 (GCC Reg. Ref. - 03/5642); A second extension of duration of permission to 31st June 2006 was granted on by Galway County Council on 31st March 2005 (GCC – 05/317)
- Wind Farm Phase 2: An extension of duration of permission to 31st March 2005 was granted on by Galway County Council on 24th November 2003 (GCC Reg. Ref. - 03/5637); A second extension of duration of permission to 31st June 2006 was granted on by Galway County Council on 30th March 2005 (GCC – 05/316)
- Wind Farm Phase 3: A planning application was made to Galway County Council on 9th September 2002 (GCC Reg. Ref. 02/3560) to change the turbine type and granted on 6th January 2003
- Grid Connection: An extension of duration of permission to 31st December 2005 was granted on by Galway County Council on 5th November 2004 (GCC Reg. Ref. - 04/4085)

2.2.3.6 Operational Phase (March 2006-2040)

In order to capture the operational works and activities which have occurred, are occurring and will occur in future, this phase is sub-divided as follows:

- works and activities which have occurred associated with the operation of the project from the start of commercial operations (March 2006) to date of application for substitute consent (Quarter 3 2020) (Q3 2020)
- ongoing and future works and activities associated with the continued operation of the project from Q3 2020 to cessation of wind farm generation activities on the site (estimated 2040)

2.2.3.7 Decommissioning Phase (2040-2042)

This decommissioning phase covers the final decommissioning of the project site (estimated 2040-2042).

2.2.4 Related Projects

On 20th May 2003, Coillte was granted a two-year felling licence by the Forest Service under the Forestry Act 1946, to fell 263ha of forestry on the wind farm site. In lieu of the clear-felling and non-replanting of 263ha of Lodgepole pine and Sitka spruce on the wind farm site, the Felling Licence (Ref FL 3983) required the licensee, within 1 year from the expiry date of the felling licence, to plant 119.3 ha within identified townlands in Counties Tipperary and Roscommon to comprise 55% Sitka spruce, 30% Diverse conifers and 15% Broadleaved species.

In subsequent correspondence between Coillte and the Forest Service, Coillte committed to plant the appropriate portion of this 119.3ha or an appropriate equivalent yield class area agreed with the Forest Service, as a percentage of the 263ha clearfelled under the terms of the felling licence. If all 263ha were not clearfelled, Coillte agreed to plant this appropriate portion within the 12 months from expiry of felling licence.

Coillte has advised that the planting was carried out within forestry compartments at lands in County Tipperary and County Roscommon. The townlands within which the forestry compartments are located are as listed in Table 2.2. The planting locations in County Tipperary and Roscommon are over 50km and 80km respectively from the wind farm site and are not physically connected to the Wind Farm Project site.

Table 2.2 Derrybrien Felling Licence-Townlands within which trees planted

County	Townland	Planting Year	Compartment	Area (ha)
Roscommon	ARDCORCORAN	2008	73915C	17.8
Roscommon	BRACKLOON	2008	68170Q	5.2
Roscommon	BRACKLOON	2008	68170Q	13.3
Roscommon	OLDTOWN	2008	73918K	16.0
Tipperary	FOILMAHONMORE	2006	44777M	8.2

Tipperary	COONMORE	2003	44751I	24.4
Tipperary	COONMORE	2006	44778H	14.3
Tipperary	KNOCKNABANSHA	2007	44776R	51.7

Additionally, all the lands in the compartments set out in Table 2.2 had been under use for horticultural plantation (Christmas trees) prior to the year 2000, which was not considered to be afforestation by the Forest Service. When planting with commercial forest plantation occurred the lands were then considered to be afforested and became part of the National Forest estate.

In County Roscommon, the Ardcorcan compartments are located approximately 2.8km south of Boyle. The Oldtown compartments are located south of the Regional road (R370) approximately 8.5km south of Boyle and 7.7km of north west of Elphin. The Brackloon compartments are located north of the regional road (R369), approximately 8.6km west of Elphin.

In County Tipperary, the Knocknabansha compartments are located just north of Regional road (R503) approximately 33.5km east of Limerick. The Coonmore and the Foilmahonmore compartments are just south of the Regional road (R503) close to the County Limerick border, approximately 28km east of Limerick.

As set out in Section 2.6.4 approximately 222ha of forestry was felled on the wind farm site during construction rather than 263 ha and the area of planting required using the equivalent yield class in the licence would have thus been reduced pro-rata. The reduced requirement would have been approximately 101ha. However, the total area of the listed forest compartments is 151.8ha.

The planting locations relative to Derrybrien are shown on **Figure 2.7 - Location of Projects/Activities considered for cumulative impact assessments** and the townland locations in Counties Roscommon and Tipperary are shown in Figure **2.34 - Location of tree planting in lieu of forestry felled for Project -County Roscommon** and **Figure 2.35 - Location of tree planting in lieu of forestry felled for Project - County Tipperary.**

A cumulative assessment of the impacts of the wind farm and the tree planting has been carried out in this rEIAR.

2.3 Project Developer & Operator

The planning permissions for Derrybrien Wind Farm Project (the Project) and grid connection were obtained between 1998 and 2001. In 2003 Hibernian Wind Power Limited (a subsidiary company of ESB) acquired 100% of the shares in Gort Windfarms Limited, which owned the consented Project. Gort Windfarms Limited began the construction of the Project in 2003.

The wind farm and overhead line is operated by Gort Windfarms Ltd. Agannygal 110kV Substation is under the control of ESB Networks.

2.4 Project Location and Setting

2.4.1 Project Location and Access

2.4.1.1 Project site

The location of the Project is provided in **Figure 2.1: Location of Project**.

In line with the three main constituents of the Project identified in section 2.1.1, the Project is located on three distinct 'sites' – namely:

a) the wind farm site and associated discrete ancillary works locations,
b) the site of the grid connection (route of Derrybrien-Agannygal 110kV overhead line and Agannygal Substation) and
c) the site of peat slide and associated discrete ancillary works locations

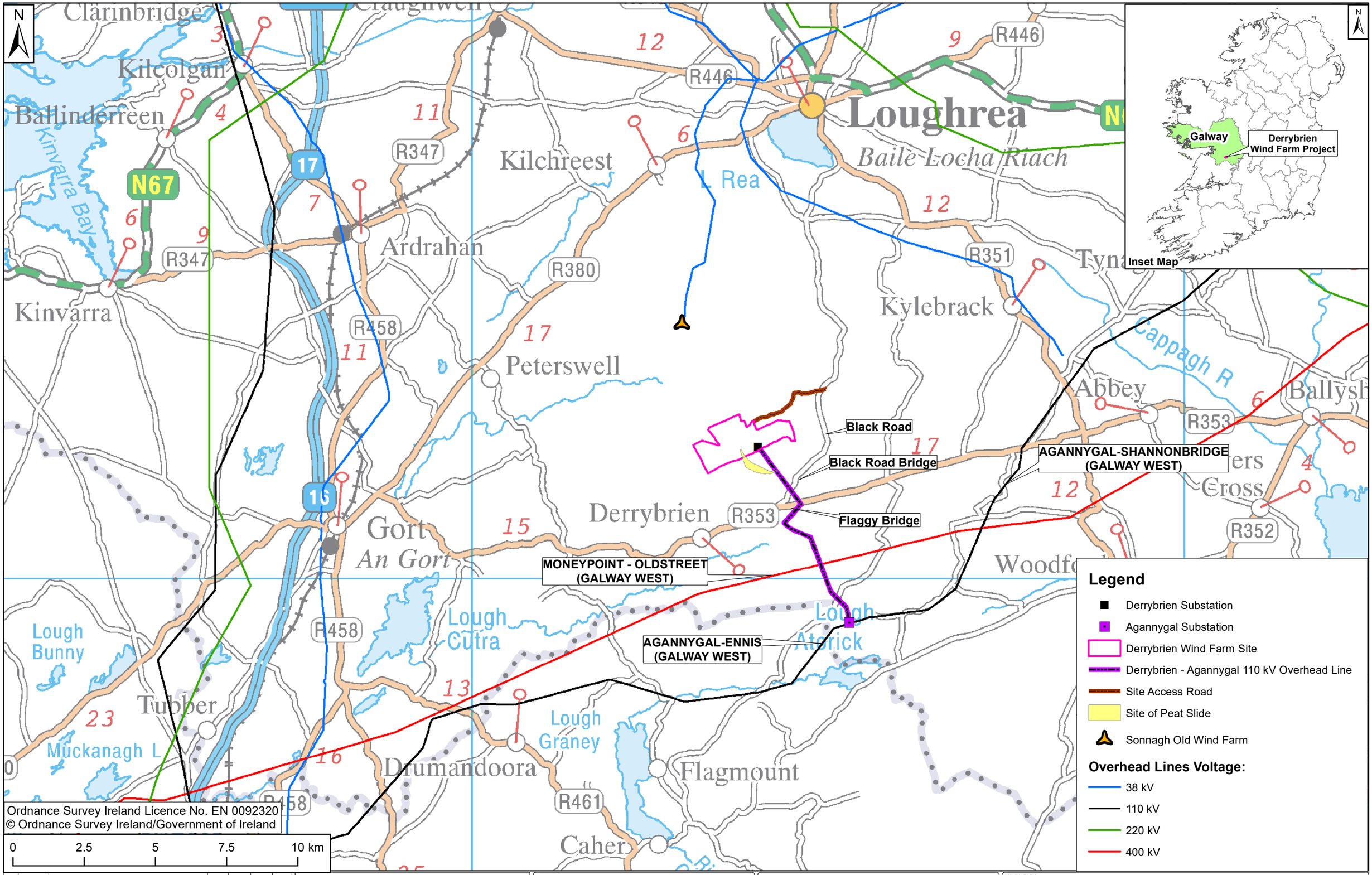
Throughout this rEIAR where reference is made to the Project site in the singular, it means all of the locations associated with the three distinct sites identified in the preceding paragraph.

The wind farm site boundary shown on figures throughout this rEIAR and accompanying rNIS is the boundary of the leased wind farm site.

In this description, distances given represent the most direct straight line between locations (i.e. as the crow flies). Unless stated to the contrary, distances provided are from the nearest point on the wind farm site boundary.

The site/area of the peat slide is the area from which peat and forestry was displaced by the peat slide.

The location of all Project works which are the subject of the rEIAR (and accompanying rNIS) are shown in **Figure 2.2: Project Works and Townlands**.



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PROJECT: Derrybrien Wind Farm Project

CONTRACT

PRODUCTION UNIT: Civil & Environmental Engineering

DRAWING TITLE: **Figure 2.1 - Project Location**

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N

DRUMKEARY WEST
DRUMMIN
BOLEYBEG
CULLENAGH
COPPANAGH
FUNSHADAUN
KILBEG
TOORMACNEVIN
BOHABOY
ALLYKEOLAUN
KNOCKAUNDARRAGH
REYNABRONE
DRUM
BOLEYNEENDORRISH
KYLENAGAPPA
KNOCKMOYLE WEST
KNOCKMOYLE EAST
KNOCKDRUMMORE
BALLYCORBAN
MARBLEHILL
GORTNAKILLA
LOUGHPARK
GORTEENAYANKA
ROSSEESHAL
SILVERSTREAM
CAPPAGHCON WEST
DERRYBRIEN NORTH
KNOCKOURA
R353
CLOGHVOLEY
KEELDERRY
BALLINLOUGH
TULLA
ACRES
SLATEFIELD
DERRYBRIEN WEST
Derrybrien
LAGGOO
REYRAWER
MOYGLASS
BUNNAGLASS
DERREENNAMUCKA
DERRYBRIEN EAST
DERRYBRIEN SOUTH
DERRYWEE EAST
INCHAMORE
DERRYWEE WEST
LOUGHATORICK NORTH
TOORLEITRA
SCALP
LOUGHATORICK SOUTH
GORTAVEHA
SLIEVEANORE
LOUGHATORICK SOUTH
POLLAGOONA MOUNTAIN

Inset Map
Galway
Derrybrien Wind Farm Project

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0 1 2 3 4 km

Legend

Townland Boundaries
Overhead lines

Location of Wind Farm and Ancillary Works

- Derrybrien Wind Farm Site
- Derrybrien Wind Farm Site Entrance
- Derrybrien Substation
- Access Road to Wind Farm Site
- Construction Compound (Hardstands)
- Upgrade works to section of Black Road
- Coillte track (turbaby road) upgraded
- Bridge upgrade

Location of Grid Connection and Ancillary Works

- Derrybrien - Agannygal 110kV Overhead Line
- Agannygal Substation
- Upgrade works to Access Road to Agannygal Substation
- Connection works to Ennis-Shannonbridge 110kV OHL span

Location of works associated with peat slide

- Site of Peat Slide
- Barrages
- Pre-existing Coillte Track
- New Access Track Constructed
- Borrow Pit / Quarry Adjacent to Barrage 1
- Bridge Repairs (Private)
- Bridge Repairs (Public)
- Stepping Stones
- Crooked Bridge

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Figure 2.2 - Project Works and Townlands

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2.4.1.2 Wind Farm Site

Derrybrien Wind Farm site is located in County Galway in the northern part of the Slieve Aughty Mountains approximately 11km due south of Loughrea, 12.7km north north east of Gort and 24 km west of Portumna. Galway City lies some 35km to the north west of the wind farm site. The wind farm site is in the south of the county approximately 4.6km from the border with County Clare and 21km from the border with County Tipperary in the south east.

The approximate centre of the wind farm site is at ITM[13] co-ordinates Easting 559572, Northing 705010.

The wind farm site is located within the townlands of Coppanagh, Boleyneendorrish, Kilbeg, Toormacnevin, Funshadaun, Bohaboy, Derrybrien North and Derrybrien West. The postal address is Derrybrien North, Kylebrack, Loughrea, County Galway, Eircode H62 PE08.

The closest settlement to the wind farm site is the village of Derrybrien some 2km to the south. The village of Peterswell is approximately 7.5 km west of the site. The nearest occupied houses are located approximately 2km from the wind farm site. The closest occupied house to the wind farm is also approximately 2km from Turbine T18.

The wind farm site is leased from a private landowner. The overall area of the wind farm site is approximately 344.5ha, but the wind farm infrastructure occupies only a small proportion of this (31.1ha -approximately 9% of site).

The wind farm site is accessed from a Coillte access road in the townlands of Bohaboy, Funshadaun and Coppanagh, via a minor public road known as the Black Road (approximately 3.1 km from wind farm to the Black Road/Coillte junction). The Black Road generally runs in a north south direction between the R353 at its southern end and Killeenadeema village (south of Loughrea) at its northern end. Access to the Black Road is via the R353 Regional Road, which originates near Portumna, passes over Flaggy Bridge before passing through the village of Derrybrien to join the N66 Loughrea - Gort National Secondary Road near Gort. From Gort the Black Road is accessed via the N66 for a distance of 1.7 km and the R353 for a distance of 14km. Alternatively, the Black Road /Coillte access road can be accessed via minor public roads from Loughrea a distance of approximately 10km.

The approximate centre of Derrybrien Substation which is located within the wind farm site boundary is at ITM co-ordinates Easting 559916, Northing 704736.

2.4.1.3 Grid Connection

The grid connection constructed for exporting the electricity generated at the wind farm to the national grid, comprises the overhead line from the Derrybrien Substation

[13] ITM-Irish Transverse Mercator

(located within the wind farm site) to Agannygal Substation together with Agannygal Substation and associated access track/road.

Overhead Line (OHL): The 7.8km long 110kV OHL route is located approximately 10km south of Loughrea and located within the townlands of Loughatorick North, Derrybrien East, Derreennamucka and Derrybrien North.

The overhead line route crosses the site of the peat slide between pole sets 5 and 6 in the vicinity of three of the barrages (Barrages 2,3 and 4) installed as a result of the peat slide.

Access to the overhead line structures is from nearby roads and forestry tracks.

Agannygal Substation: The substation site is located within the townland of Loughatorick North and the approximate centre point of Agannygal Substation is at ITM co-ordinates Easting 563118, Northing 698593.

The site is owned by Gort Windfarms Ltd. and a proportion of it is occupied by ESB Networks. The transfer of ownership of this portion to ESB networks has not yet been completed. The substation is under the control of ESB Networks.

The nearest villages to Agannygal Substation are the following: Derrybrien -5km to the north west of the site, Ballynakill – 8.7km to the north east, Woodford – 10km to the east and Flagmount - 8.4km to the south west.

2.4.1.4 Peat slide and associated works

The site of the peat slide extends downslope from turbine T68. The majority of the peat slide area was in Coillte coniferous forests outside and to the south of the windfarm site. The main peat slide run out area from the slide extended to Black Road Bridge approximately 1.0 km downslope from the slide area. Some of the peat debris was transported further downstream along the channel of the Owendalulleegh River. The location of the peat slide and main peat slide run-out zone is shown in Figure 2.3

As previously noted, barrages were constructed along and downslope of the route of the slide between the wind farm and downstream of Flaggy Bridge of which four (Barrages 1,2 3 and 4) remain in-situ in 2020. Peat and soil from the peat slide which had accumulated on adjacent lands, together with material excavated for the construction of barrages and had accumulated behind the barrages was placed in three peat repository areas.

N

Borrow Pit / Quarry Adjacent to Barrage 1

Peat Repository Area at Barrage 2

Barrage 1

Barrage 2

Stream SC(7)(b)

Peat Repository Area at Black Road Bridge

Replacement access track

Derelict house

Barrage A

Barrage B

Black Road Bridge

Stream SC(7)(b)

Peat Repository Area at Barrage 3

Barrage 3

Barrage 4

R353

Barrage C

Flaggy Bridge

Barrage D

Unnamed Bridge C

Legend

- Approximate Temporary Barrage Locations (no longer in place)
- Private Bridge
- Public Bridge
- Derelict House
- Drainage channel formed by peat slide
- Pre-existing forestry drainage
- Constructed Drainage
- Approximate Site of Peat Slide
- Main peat slide run out area
- Derrybrien Wind Farm Site
- Barrages
- Peat Repository Area
- Rivers/Streams
- Borrow Pit / Quarry Adjacent to Barrage 1
- New Access Track Constructed

Note: Aerial photography from 2005

0 0.25 0.5 0.75 1 km

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Figure 2.3 - Location of and Approximate Extent of Peat Slide and Main Peat Slide Run Out Area

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The location of the peat slide and works associated with the peat slide are mainly located within the townlands of Derrybrien North. Some minor works are located in the townland of Derrybrien East.

Short sections of access tracks were rebuilt in vicinity of T68 and T23-T70.

The access track at T68 within the wind farm site is located at the head of the site of the peat slide at an approximate elevation of 350m OD[14].

The access track T23-T70 is located within and adjacent to the southern boundary of the wind farm at an elevation of 335m OD.

Barrage 1 is located approximately 1,100m downslope of the head at the peat slide. The barrage is located at an elevation of 265m OD. The closest turbine T71 is approximately 770m from Barrage 1.

Barrage 2 is located at the head of a tributary stream of the Owendalulleegh River (stream SC7(b)) within a gorge beyond the downslope end of the site of the peat slide, approximately 468m from Barrage 1. The barrage is located at an elevation of 245m OD.

Barrage 3 is located in stream SC7(b) over approximately 1000m downstream of Barrage 2 and 560m downstream of Black Road Bridge.

Barrage 4 is located in stream SC7(b) approximately 150m downstream of Barrage 3 and 720m downstream of Black Road Bridge at an elevation of 165m OD.

Repository areas 2 and 3 are located adjacent to Barrages 2 and 3 respectively.

The repository area at the Black Bridge is located approximately 700m southeast of the end of the site of the peat slide alongside a public road (The Black Road).

2.4.2 Terrain and Ground Conditions

2.4.2.1 Wind Farm Site

Current ground surface elevation and terrain information is described briefly below. This is generally relevant to the pre-development conditions on the site in 1998.

Derrybrien Wind Farm site is located on the upper slopes of Cashlaundrumlahan Mountain within the Slieve Aughty Mountains. The upper slopes form a gently sloping plateau aligned on a northeast to southwest axis with a summit elevation of 365mOD. The wind farm site is located at altitudes of 320m to 365mOD. This part of the Slieve Aughty Mountains has two main peaks, Cashlaundrumlahan and Sonnagh Old, which latter has a peak of 328mOD and is located to the north of the current site.

The site is covered by blanket peat, which in 1998 was largely forested.

The peat is underlain by both glacial till and bedrock. In terms of bedrock, the site lies within the Ayle River Formation which is described as Mudstone, Siltstone and

[14] mOD-metres above Ordnance Datum

Conglomerate. The Derryfadda formation lies just north of the site which is described as comprising Greywackes, Siltstone and Mudstone.

The depth to the top of rock is variable but typically ranges from 3.0m to 6.2m- the rock is shallower (at the northern part of the site and there are some locally deeper depths to rock at the north eastern and central parts of the site.

Site slopes range from less than 3° to 7.5° and locally up to 10º. There is a broad zone that runs across the full width of the site for a distance of approximately 250-300 m to the north and south of the peak of the mountain where the ground surface slopes gently away from the peak at slope angles less than 3°. To the south of this zone the slope is convex in profile with slopes generally increasing up to 4-5° degrees and locally 5.0-7.5° within the site boundary, particularly between Turbines T21 and T41. Downslope from the site in this area the slopes increase more consistently up to 7.5° and locally up to 10°. The peat slide that happened during construction occurred within this zone of locally steeper slopes between Turbines T68 and T70.

The northern upper slopes of the mountain within the site boundary are characterised by a terraced profile with broad flat areas where the slope angles are less than 3°, separated by benches where the slopes are locally steeper at up to 5.0 - 7.5°, locally up to 10°.

In general, the depth of peat tends to be deeper on flatter slopes and shallower on steeper slopes.

2.4.2.2 Grid connection

Overhead Line (OHL): From the site of Derrybrien Substation, the elevation along the overhead line route falls to a flat-bottomed valley where it crosses the R353 road and the tributaries of the Owendalulleegh River at an elevation of approximately 130mOD. From here, the route skirts around the Slieve Aughty Bog Natural Heritage Area (NHA) (site number 001229) before gaining elevation again as it passes Lough Agannygal, at about 195mOD. The route ends at the Agannygal Substation, which is located to the south east of Cashlaundrumlahan Mountain and north of Lough Atorick, at an elevation of approximately 190mOD.

The majority of the OHL route is covered by shallow to locally deep blanket peat which was largely forested in 1998.

Peat thicknesses measured by probing during site walkovers ranged from 0.0m to 3.8m with an average of 0.85m. Approximately 70 percent of the probes recorded peat depths of less than 1.0m. The deepest peat (3.8m) was recorded in the area of angle mast 28 where the topography is flatter than the remainder of the route.

Agannygal: Prior to the construction of Agannygal Substation, the ground at the site comprised a shallow layer of peat (approximately 1m) over glacial till.

2.4.2.3 Peat slide and associated works

Ground conditions in the area of the Barrages 1 and 2 and the peat repositories are typically blanket peat overlying glacial till or subsoil overlying weathered to intact bedrock. The till is typically derived from sandstone deposits.

The bedrock geology in the area comprises siltstones, mudstones, sandstones and conglomerate from the Ayle River Formation.

2.4.3 Hydrological and Drainage Context

2.4.3.1 Hydrological Context

The wind farm site partially extends over the catchments of three rivers, the Boleyneendorrish and Owendalulleegh in the **Galway Bay South East** EPA catchment and Duniry in the **Lower Shannon** EPA catchment[15][16].

The Derrybrien-Agannygal 110kV Overhead Line is predominately located within the Owendalulleegh catchment with a short section close to Agannygal Substation and Agannygal Substation itself being located within the Bleach catchment within the Lough Derg WMU.

The site of the peat slide and associated offsite works is within the Owendalulleegh catchment.

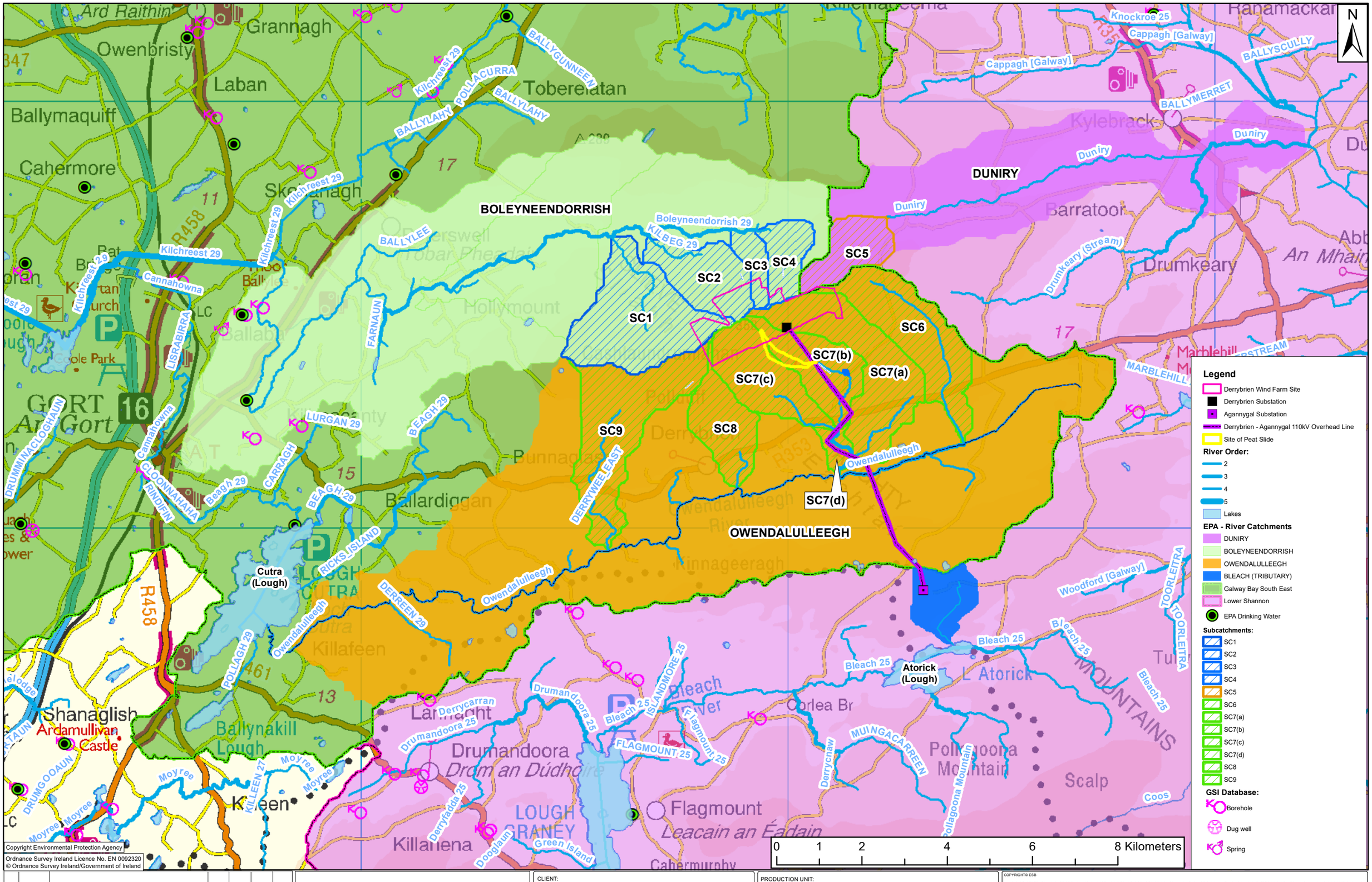
The location of projects works relative to the hydrological Water Management Units, catchments and sub-catchments are shown in **Figure 2.4: Hydrological and Hydrogeological Context**.

The sub-catchments directly connected to the wind farm site are described briefly below.

- The Owendalulleegh River System drains approximately two-thirds (67%) of the wind farm site through a number of small hill slope stream tributaries – Cloghvoley (designated as subcatchment SC6), Derrybrien North (SC7, further divided into SC7(a), (b), (c) and (d) owing to the large portion of the wind farm which drains to the respective streams) and Derrybrien South (SC8 and SC9). The Owendalulleegh River rises in the townland of Gorteenayanka and flows westward to the south of the site to Lough Cutra approximately 22 km downstream. It then flows to the northwest through a heavily karstified region where it disappears underground. It reaches Kinvarra town approximately 15 km further downstream, at which point it enters Galway Bay.

[15] Catchment information from EPA Database
[16] Sub-catchment information obtained from OPW Flood Studies Update (FSU) portal

- The Boleyneendorrish River drains approximately 31% of the site via subcatchments SC1, SC2, SC3 and SC4. It flows westward to the northwest through a heavily karstified region before also entering the sea at Kinvarra town.
- The Duniry River drains a very small section of the overall site (<1%) to the northeast, designated as subcatchment SC5. The river is a tributary of the River Kilcrow which flows into Lough Derg on the River Shannon.



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DRAWING TITLE: **Figure 2.4 - Hydrological and Hydrogeological Context**

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2.4.3.2 Drainage Context

Wind Farm Site: The wind farm site had been comprehensively drained in the years prior to 1998 and the subsequent construction of the wind farm. The pre-existing drainage system on the site consisted of approximately 27 km of longitudinal drains and stream channels associated with the commercial forestry and domestic turf cutting on site which discharged surface drainage off site to the local river systems. The pre-existing drains were utilised as part of the drainage system for the wind farm.

Grid connection: Several watercourses exist within the footprint of the OHL route, the largest being the Owendalulleegh River, approximately 6.0 m wide, which passes beneath the OHL between pole sets 25 and 26. Major natural drainage features tend to run east to west in the OHL corridor, with minor tributary features aligned approximately north to south to tie into the major drainage features. There are several flat areas where local ponding of surface water occurs. Such a feature – Lough Agannygal (area 0.85 ha), located between pole set 37 and angle mast 38 – prevents access directly beneath the OHL.

The Agannygal Substation location prior to construction was under forestry. The land is elevated with respect to the surrounding area to the north, west and south. There is no record of pre-existing drainage on the site of the substation prior to construction. The Agannygal Substation is situated in the Bleach River catchment within a tributary catchment.

Peat slide area and associated works: Surface runoff from the part of the site where the peat slide originated fed into the river downslope from the site forming sub-catchment SC7(b).

Drainage patterns were altered locally by the peat slide within and in the vicinity of the site of the peat slide. Specifically, as part of the works to stabilise the debris contained within the site of the peat slide a series of drains were constructed. In addition, a number of natural drains/flow paths have formed in the site of the peat slide as a result of the development of preferential flow paths following rainfall events.

2.4.4 Population and Land use

2.4.4.1 Population and settlements

From a population and settlement perspective, the area has remained relatively unchanged from before development (the baseline year of 1998) to date (mid-2020).

Wind Farm site: The wind farm site is located in a rural area.

The nearest property to the wind farm site is approximately 1.3km from the nearest turbine. It is a derelict house, which it is understood, was unoccupied prior to the construction of the project and has not been occupied subsequently.

The nearest concentration of houses to the wind farm site is within and in the vicinity of the village of Derrybrien approximately 2km to the south of the site which is within Derrylaur Electoral Division (ED)[17]. Population data for Derrybrien village could not be sourced but the population of the Derrylaur ED was 144 (1996) and 84 (2016).[18] As previously noted, the closest occupied house to the wind farm is 2km from T18. There is a scattered rural population in the wider area.

The village of Derrybrien has limited infrastructure. There was a national school in the village which was closed and amalgamated with a school in another village (approximately 7km to the east of Derrybrien) in May 2017.

Grid Connection: The grid connection is also located in a rural area with the closest houses to the overhead line route and Agannygal Substation respectively located at approximately 0.38km (from the overhead line route) and 0.54km (from Agannygal Substation) (based on 2020 An Post data). The nearest village to the grid connection is Derrybrien which is to the east of the overhead line approximately 5km to the north of Agannygal Substation.

Peat slide and associated works: As previously noted, there is a derelict house which was unoccupied prior to construction of the Project and has not been occupied subsequently. The derelict house is located 0.49km from the site of the peat slide and is within the run-out zone of the slide. Derrybrien is the closest village.

Barrage 1 is approximately 1,348m from the closest house.

Barrage 2 is approximately 1,374m from the closest house.

Barrage 3 is approximately 692m from the closest house.

Barrage 4 is approximately 564m from the closest house.

2.4.4.2 Land Use

From a land use perspective, the wider local area has remained relatively unchanged from the baseline date (1998) to date (2020). The land use at the wind farm site, the site of the peat slide, 110kV OHL grid connection and Agannygal Substation over the period 1998 to 2020 is described in following subsections.

Wind Farm site: The wind farm site is located within the Slieve Aughty Mountains which has some of the largest concentrations of coniferous forest in the country and was mainly planted in the 1960s and 1970s.

In 1998, prior to project construction, approximately 76% of the site (263ha) was used for commercial forestry, with most of the remainder used for turbary. Based on Coillte

[17] ED-Electoral Division
[18] Based on Central Statistics Office (CSO) data

data much of the wind farm site had been planted in 1963-1973, a smaller proportion in 1980-1988 and a section to the south west of the site in 1994.

The development of the wind farm entailed the felling of approximately 222ha of forestry within the wind farm site. The remaining forestry on site was not felled. Most of the resulting timber was taken off site, some used for the construction of floating roads on site and some was left on site. No commercial forestry activities have taken place on the wind farm site since the development of the wind farm.

In 1998, prior to project construction, approximately 83ha were designated turbary a portion of which was planted by Coillte and has since been felled. 19% of the site (67ha) comprised non forested turbary lands. The area was used by local people for turf cutting who hold turbary rights to a large proportion of the area.

As of 2020 turf cutting still takes place on the eastern part of site.

Grid connection: In 1998, prior to project construction, the overhead line route was dominated by commercial forestry plantations which had been planted over blanket bog. The Agannygal Substation site was also predominately used for forestry, the remainder being agricultural land. The development of the grid connection entailed the felling of forest plantation along the overhead line route corridor (to achieve safety clearances) and at the Agannygal Substation site.

As of 2020, some regrowth of trees in previously felled area had occurred along much of the OHL route.

Peat slide area and associated works: In 1998, prior to the construction of the wind farm, the site of the peat slide was largely planted with commercial forestry, much of which was removed by the action of the peat slide in 2003. The works associated with the peat slide were located in an area of forestry and farm land and within a stream valley.

The site of the peat slide has been revegetating naturally since the peat slide with some natural regrowth of trees.

2.4.5 Nature Conservation Designations

Ireland has designated sites and species of conservation value and/or concern in an effort to protect their biodiversity resource. Designated conservation areas are areas containing habitats or species of national or international conservation importance. The types of designation considered are as follows: European sites comprising Special Areas of Conservation (SAC) and Special Protection Areas (SPA) and nationally designated Natural Heritage Areas (NHA).

SACs are protected under the EU Habitats Directive (92/43/EEC) and SPAs are designated under the EU Birds Directive (79/409/EEC). Together these form the backbone of the Natura 2000 network.

Natural Heritage Areas (NHAs) are sites that are designated for the protection of flora, fauna, habitats and geological sites of national importance. Management of NHAs is guided by planning policy and the Wildlife Acts, 1976-2012.

Proposed NHAs (pNHAs) were published on a non-statutory basis in 1995 but have not since been statutorily proposed or designated. These sites are of significance for wildlife and habitats.

Derrybrien Wind Farm is within the Slieve Aughty Mountains Special Protection Area (SPA)(Site Code 004168) which was classified as an SPA in March 2007 (post construction of Project) and formally designated by Statutory Instrument in March 2012. The SPA encompasses the entire Slieve Aughty range from just south of Lough Rea in the north to Lough Derg in the east and beyond Lough Graney to the south west. The qualifying features of the SPA are the bird species Hen Harrier and Merlin.

There are four Natural Heritage Areas (NHAs) and sixteen Proposed Natural Heritage Areas (pNHAs) within 15km of the Project. There are three pNHAs outside of the 15 km radius that are hydrologically connected to the Project location.

There are 24 European sites within 15 km radius of the Project (wind farm site, OHL and Agannygal Substation) (5 SPAs and 19 SACs) and there are 6 European sites outside of the 15 km radius that are hydrologically connected to the Project location. The name, reference, date site proposed for classification for the European sites are listed in Table 2.3. See Figure 2.5 Further details in relation to these sites are provided in Chapter 7- Biodiversity and the Remedial Natura Impact Statement.

Table 2.3: European sites

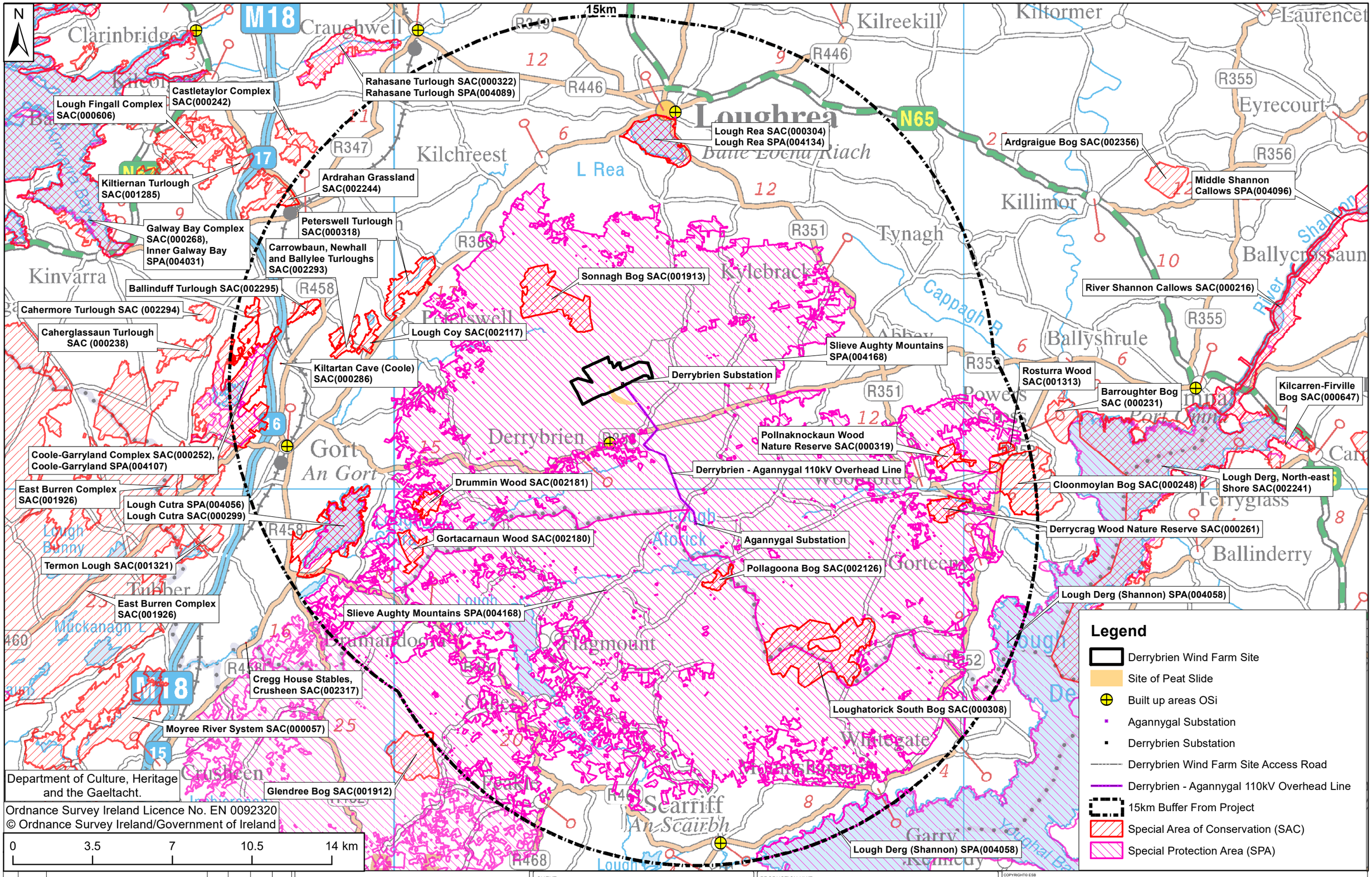
European Sites	Date site proposed for Classification[19]	Date of Statutory Instrument[20]
Slieve Aughty Mountains SPA (004168)	March 2007	21 March 2012
Sonnagh Bog SAC (001913)	November 1997	17 December 2019
Drummin Wood SAC (002181)	December 1999	17 May 2016
Peterswell Turlough SAC (000318)	November 1997	None
Lough Rea SPA (004134)	February 2007	19 February 2010
Lough Rea SAC (000304)	May 1998	12 October 2017
Lough Coy SAC (002117)	November 1997	None
Pollagoona Bog SAC (002126)	August 1997	29 November 2019

[19] https://www.npws.ie/protected-sites

[20] http://www.irishstatutebook.ie/

European Sites	Date site proposed for Classification[19]	Date of Statutory Instrument[20]
Gortacarnaun Wood SAC (002180)	September 1999	17 May 2016
Carrowbaun, Newhall and Ballylee Turloughs SAC (002293)	February 2003	3 June 2016
Lough Cutra SPA (004056)	November 1995	26 May 2010
Lough Cutra SAC (000299)	March 2003	12 October 2017
Ballinduff Turlough SAC (002295)	February 2003	12 October 2016
Pollnaknockaun Wood Natura Reserve SAC (000319)	August 1997	17 May 2016
Loughatoric South Bog SAC (000308)	November 1997	20 September 2019
Kiltartan Cave (Coole) SAC (000286)	January 2002	17 May 2016
Derrycrag Wood Natura Reserve SAC (000261)	August 1997	17 May 2016
Coole-Garryland Complex SAC (000252)	May 1998	None
Coole-Garryland SPA (004107)	October 1996	26 May 2010
Ardrahan Grassland SAC (002244)	January 2002	22 October 2019
Rosturra Wood SAC (001313)	August 1997	17 May 2016
Cloonmoylan Bog SAC (000248)	November 1997	None
Glendree Bog SAC (001912)	November 1997	None
Barroughter Bog SAC (000231)	November 1997	None
Lough Derg (Shannon) SPA (004058)	November 1995	2 July 2019
Lough Derg, North-east Shore SAC (002241)	January 2002	6 February 2018
Caherglassaun Turlough SAC (000238)	January 2002	None
Cahermore Turlough SAC (002294)	February 2003	17 May 2016
Galway Bay Complex SAC (000268)	August 1999	None
Inner Galway Bay SPA (004031)	November 1994	16 October 2019

The NHAs and proposed NHAs are shown in **Figure 2.6: NHAs and pNHAs within 15km radius of Project**.



REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP
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PROJECT: Derrybrien Wind Farm Project

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Figure 2.5: European Sites within 15km radius of Project

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N

15km

Rahasane Turlough pNHA (000322)

Lough Fingall Complex pNHA(000606)

Castletaylor Complex pNHA(000242)

Lough Rea pNHA(000304)

Eskerboy Bog NHA(001264)

Moorfield Bog NHA(001303)

Cloonoolish Bog NHA(000249)

Ardgraigue Bog pNHA(001224)

Meeneen Bog NHA(000310)

Kiltiernan Turlough pNHA(001285)

Capira/Derrew Bog NHA(001240)

Peterswell Turlough pNHA(000318)

Sonnagh Bog pNHA(001913)

Galway Bay Complex pNHA(000268)

Slieve Aughty Bog NHA(001229)

Caherglassaun Turlough pNHA (000238)

River Shannon Callows pNHA(000216)

Friar's Lough pNHA(000933)

East Burren Complex pNHA (001926)

Kiltartan Cave (Coole) pNHA(000286)

Derrybrien Substation

Pollnaknockaun Wood Nature Reserve pNHA(000319)

Coole-Garryland Complex pNHA(000252)

Slieve Aughty Bog NHA(001229)

Slieve Aughty Bog NHA(001229)

Rosturra Wood pNHA(001313)

Derrybrien - Agannygal 110kV Overhead Line

Cloonmoylan Bog pNHA(000248)

Pollduagh Cave, Gort pNHA(000320)

Slieve Aughty Bog NHA(001229)

Slieve Aughty Bog NHA(001229)

Spring Park Wetlands pNHA(000941)

East Burren Complex pNHA(001926)

Derrycrag Wood Nature Reserve pNHA(000261)

Lough Atorick District Bogs NHA(002377)

Agannygal Substation

Slieve Aughty Bog NHA(001229)

Termon Lough pNHA(001321)

Lough Atorick District Bogs NHA(002377)

Lough Cutra pNHA(000299)

Lough Atorick District Bogs NHA(002377)

Loughatorick South Bog pNHA(000308)

Derryoober Bog NHA(002379)

Lough Derg pNHA(000011)

Cahermurphy Wood pNHA(000022)

East Burren Complex pNHA(001926)

Lough Atorick District Bogs NHA(002377)

Maghera Mountain Bogs NHA(002442)

Loughatorick South Bog pNHA(000308)

Lough Derg pNHA(000011)

Ballyogan Lough pNHA(000019)

Maghera Mountain Bogs NHA(002442)

Lough Graney Woods pNHA(001714)

Moyree River System pNHA(000057)

Glendree Bog pNHA(001912)

Cloonamirran Wood pNHA(001686)

Maghera Mountain Bogs NHA(002442)

Lough O'Grady pNHA(001019)

Lough Derg pNHA(000011)

Department of Culture, Heritage and the Gaeltacht.

0 3.5 7 10.5 14 km

Legend

- Derrybrien Wind Farm Site
- Site of Peat Slide
- Built up areas OSi
- Agannygal Substation
- Derrybrien Substation
- Derrybrien Wind Farm Site Access Road
- Derrybrien - Agannygal 110kV Overhead Line
- 15km Buffer From Project
- Proposed Natural Heritage Area (pNHA)
- Natural Heritage Area (NHA)

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CLIENT: Gort Windfarms Ltd

PRODUCTION UNIT: Civil & Environmental Engineering

PROJECT: Derrybrien Wind Farm Project

DRAWING TITLE: **Figure 2.6 - NHAs and pNHAs within 15km radius of Project**

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2.4.6 Zoning for Wind Energy Development

The evolution of Galway County Council Policy on wind energy development is outlined below as it pertains to the location of wind farms.[21] The statutory plan for the area is the Galway County Development Plan (GCDP), which is reviewed and updated on a six-yearly cycle.

Galway County Development Plan 1997-2003

The plan in place at the time of the original planning applications for the Derrybrien Wind Farm Project was the GCDP 1997-2003. The GCDP 1997 contained no statement of policy on renewables or wind energy development other than Objective no 13 in Chapter 7, Rural Areas which stated that:

"The Planning Authority will require that windfarm development comply with the Department of Environment Guidelines, particularly the policy statement at Subsection 3.2 (Page 5) and also the main considerations set out in Section 4 e.g. Visual Amenity, Noise, Electromagnetic Interference and other environmental factors."

The Guidelines referred to in Objective 13 were the 1996 Wind Farm Development Guidelines for Planning Authorities.

Landscape Character Assessment of County Galway 2003

The first specific wind energy policy for County Galway formed part of the *2003 Landscape Character Assessment (LCA 2003)* of County Galway.

The LCA (2003) was carried out to inform the *Galway County Council Development Plan 2003-2009* and formed the basis of the wind energy development policy between 2003 and 2011, as well as landscape and visual amenity policy. The Slieve Aughty Mountains Landscape Character Area was characterised as being capable of accommodating developments such as wind farms and associated developments. Further details in relation to this are provided in Chapter 9- Landscape.

In order to identify zones of varying suitability for wind farms the LCA (2003) combined (a) available information on the wind resource, (b) landscape sensitivity ratings and (c) exclusions zones (identified as cities and towns, national archaeological monuments, railway lines, national roads, high voltage cables, the Galway Airport aviation zone, forestry, nature designations). The county was divided into:

- *Strategic Areas – 'where wind farm development is considered appropriate, i.e. wind resource at or above 6, outside of all exclusion zones and in areas of low to high landscape sensitivity, i.e. class 1-3'.*

[21] Note: Further information regarding renewable energy policy statements is provided in the Planning Report which accompanies the Substitute Consent Application.

- *Areas for Consideration – 'where each project would be dealt with on its merits, i.e. within perimeter areas of exclusion zones and in areas of special to unique landscape sensitivity, i.e. class 3-5'.*
- *No Go Areas – 'where wind farms development is considered inappropriate, i.e. wind resource at or above 6, inside exclusion zones and in areas of unique landscape sensitivity, i.e. class 5'.*

The Slieve Aughty Mountains were classified in the LCA (2003) as a Strategic Area for wind farm development. The Slieve Aughty Mountains were not designated as a Special Protection Area when the LCA (2003) was undertaken.

Galway County Development Plan 2003-2009-The LCA formed the basis of the wind energy policy in the Galway County Development Plan 2003-2009 and the Galway County Council Development Plan 2009-2015 until the 2011 Galway County Council Wind Energy Strategy was adopted.

In 2007, the Slieve Aughty Mountains were proposed for designation as a Special Protection Area (SPA) for the Annex I bird species hen harrier and merlin.

Galway County Development Plan 2003-2009

The LCA formed the basis of the wind energy policy in the Galway County Council Development Plan 2003-2009.

Galway County Development Plan 2009-2015

The LCA formed the basis of the wind energy policy in the Galway County Council Development Plan 2009-2015 until the 2011 Galway County Council Wind Energy Strategy was adopted.

The County Galway Wind Energy Strategy (WES) was developed in 2011. It was adopted in 2011 as a variation to the 2009-2015 County Development Plan.

In undertaking the WES, the need to achieve greater energy security, achieve commitments at national and international level regarding reductions in greenhouse gases, and protect areas of high biodiversity were specifically considered together with wind resource and landscape considerations.

Under the WES, the Slieve Aughty Mountains are no longer designated as a Strategic Area for wind energy development. It is now identified as a Not Normally Permissible Area (with some pockets of land Open for Consideration). Not Normally permissible areas are areas generally not suitable for wind farm development unless project level Habitats Directive Assessment and Environmental Impact Assessment can demonstrate to the satisfaction of the planning authority, that environmental and other impacts, can be successfully avoided, minimised and/or mitigated.

Galway County Development Plan 2016-2021. An updated version of the WES is included as Appendix IV to the current Galway County Development Plan 2016-2021

2.5 Projects/activities identified for assessment of cumulative effects

The cumulative effect of the Derrybrien Wind Farm Project together with other existing and/or approved projects has been considered.

Based on consideration of the receiving environment existing/approved projects and activities were identified for cumulative effects assessment. It is noted that not all projects are relevant or within the zone of influence for each topic. The projects considered for each topic are identified in individual topic chapters. The following projects/activities were considered as relevant for cumulative effects assessment. See Figure 2-7.

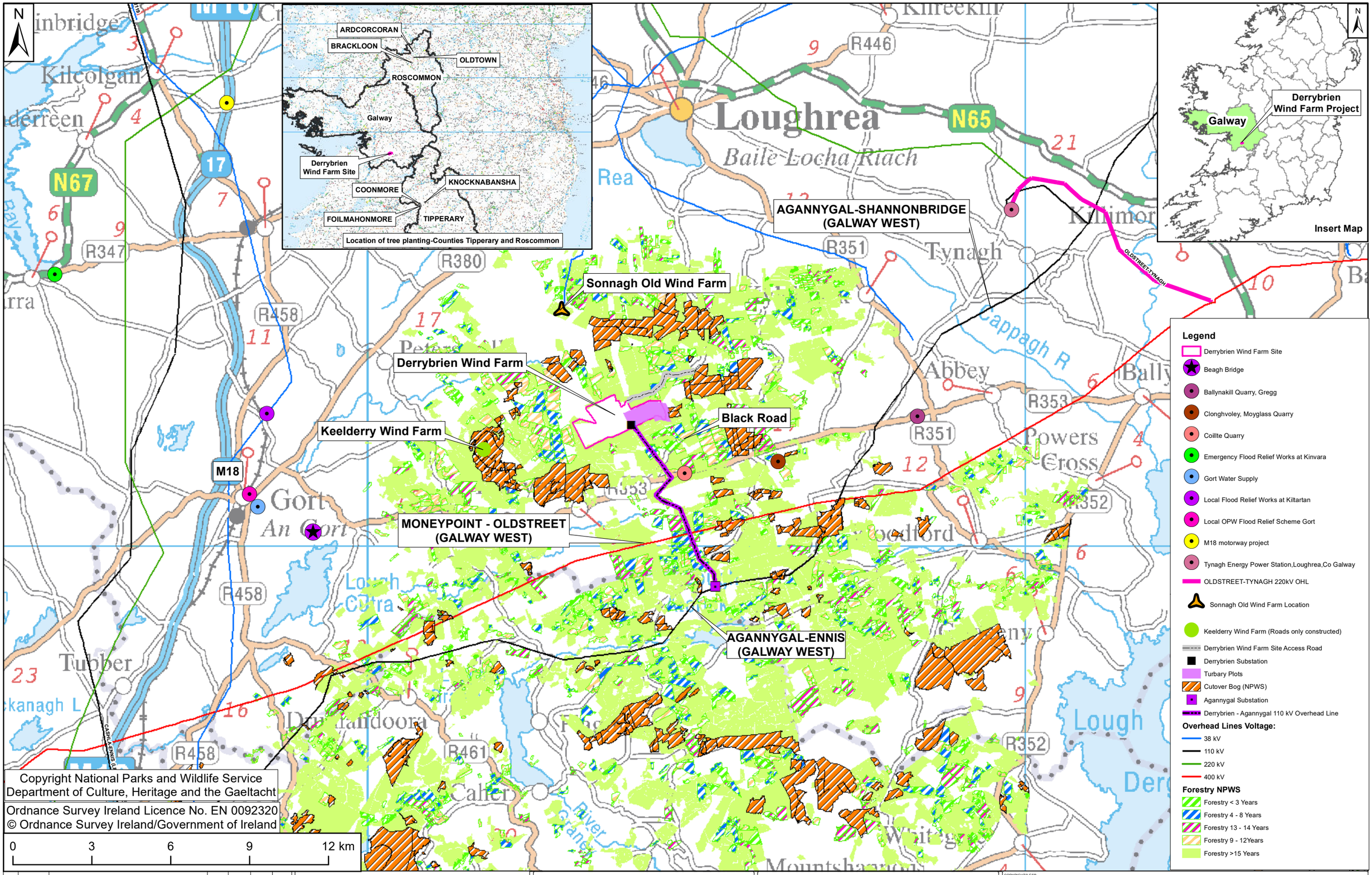

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Figure 2.7 - Location of Projects/Activities considered for cumulative impact assessments

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2.5.1.1 Turbary within and immediately adjacent to wind farm site

Location and Extent of Turbary: An area of approximately 83ha of land occupies the eastern part of the wind farm site. Of this approximately 15ha had been converted to forestry lands having been planted prior to the project development and subsequently felled by Coillte. The remaining circa 67ha are drained turbary lands Turbary lands also extend immediately beyond the site to the east covering an area of approximately 15ha. There are 136 turbary plots within or immediately adjacent to the windfarm site, 22 are partially or fully outside the wind farm site boundary. Individual plot sites range in area between approximately 0.55ha and 1.10ha. The turbary rights are understood to be held by a number of local people.

The location and extent of turbary plots is shown in **Figure 2.32 -Location of Turbary within and immediately adjacent to wind farm.**

Extent of turf cutting undertaken: It is not known where the turbary rights were exercised prior to construction. However, the original Phase 1 Environmental Impact Statement (EIS) noted that old and new turf banks and drainage channels could be found throughout the site, that the turbary was used by a small number of local people with turbary rights on the site but at the time (1997), turbary activity was not intense.[22]

Up until 2012, the extent of turf cutting carried out mechanically is not known but based on observations from wind farm staff on site, turf cutting by hand was carried out on a number of plots, normally in late Spring/early Summer. Since 2012 a contractor has been retained by some plot owners to mechanically cut turf and there has been an increase in the number of plots where mechanical turf cutting has been carried out. Based on consultation with the local peat cutting contractor, the following turbary plots have been worked at some point since 2012 -Plots 6, 7, 9, 10, 15, 24, 27-29, 31-35, 39, 40, 42-44, 142, 143, 155, 159-162, 219-221, 228-232.

The location of plots which have been worked since 2012 to date are shown **in Figure 2.33 -Indicative location of turf cutting activities (post 2012).**

The mechanical turf cutting has been carried out using a Difco Bogmiser hopper machine, which cuts 8 sods wide and approximately 80 yards in length. The characteristics of a similar albeit newer model (Link: https://www.difcoequipment.com/difco-product-range/difco-hydratrack) are as follows:

- Working length: 5.2m
- Working width: 3.6m
- Transport length: 4.7m
- Transport width: 2.45m

[22] EIS submitted with GCC Reg. Ref. 97/3470 / ABP Reg. Ref. PL.07.106290 – 'the Phase 1 EIS'

- Weight: 3920 kg

Traditional methods: Turf cutting using a sausage machine is still being carried out on a single plot somewhere between plots 20-30. There is one other location where turf is still cut traditionally with a slane nearer the public road running east of the site.

Peat Disturbance in Turbary Area: In April 2020, a peat disturbance was noticed in the turbary area of the wind farm site. The exact date of the original occurrence of the disturbance is unknown. The disturbance was located in the southern portion of Turbary Plot No 160 which is located south of the central turbary access track in an area between turbines T34, T37 and T38. The area of peat disturbed is approximately 0.25ha. The peat disturbance mass was heavily saturated with water.

Following inspection by geotechnical specialists, it was concluded that no wind farm related activity could have contributed to the peat disturbance and that it was likely to have been caused by a combination of:

- Concentrated groundwater pressures in the peat within the turbary plot
- Undercutting for the drain along the toe of the slope
- Loading due to the more recent use of mechanical harvesting in the peat involving large hoppers

Further details in relation to this incident are provided in Chapter 10-Soils, Geology and Land.

The peat disturbance did not give rise to any discharge of materials to watercourses.

Subsequently, remedial drainage works were carried out in the vicinity of the turbary plot to mitigate the risk of water pressure build up in the peat. The excavation of drains was undertaken by hand. Check dams were provided in the drains of alternating straw bale, stone and impermeable barrier type.

Geotechnical risk assessments were carried out in advance of the work.

In light of this recent incident, constraints on turbary activities are being put in place to ensure that there is no risk of further peat instability issues associated with turbary activities going forward. These are detailed in Chapter 10-Soils, Geology and Land.

2.5.1.2 Peat extraction outside Project site

No peat extraction activities subject to a development consent have been identified in the vicinity of the Project.

An inspection of EPA licences and planning files in the area has not found any peat extraction projects in the area. Despite no licensed or permitted projects being identified, turbary turf cutting is likely to be practiced in the wider area as at the Derrybrien site.

Property based data is not readily available regarding the extent of turbary lands in the area. In the absence of such data, the extent of turbary in the vicinity of the project has been assumed to equate to the habitat category "cutover bog" obtained from the National Parks and Wildlife Service (NPWS) Hen Harrier mapping project for the Slieve Aughty Mountains SPA. In the report (Moran and Wilson, 2015) accompanying the digital mapping the habitat category Cutover Bog has been defined as –

"This category should be used in situations where part of the original mass of peat has been removed through turf cutting or other forms of peat extraction."

The primary data-source utilised for identifying non-forestry habitats was the Digital Globe Satellite Imagery. There are limitations as to accuracy of this data, in particular, the categorisation of habitats based on the interpretation of aerial images has an inherent limitation in that it is dependent on the ecologist interpreting the image. The categorisation of many of the habitat types is subjective, and different ecologists may assign different habitat categories.[23]

Figure 2.7 shows considerable areas of cutover bog but a considerable distance from the project and largely separated from the site by forestry.

2.5.1.3 Wind Farms in Slieve Aughty Mountains

Sonnagh Old Wind Farm: There is a second wind farm (Sonnagh Old Wind Farm) within the Slieve Aughty Mountains to the north of the Derrybrien Wind Farm site which was commissioned a year before Derrybrien Wind Farm (2004). This wind farm comprises 9 no. Vestas V52-850KW turbines (same turbine model as at Derrybrien Wind Farm) situated on high ground about 3.4 km north west of the Derrybrien wind farm.

The original permission for the wind farm was granted to Corr Na Gaoithe Teo on 16th October 2000 (GCC Reg. Ref. 00/3234) for a 10-turbine wind farm.

The main construction activity for Sonnagh Old Wind Farm Project coincided with construction activity for Derrybrien Wind Farm in 2003-2005.

Planning permission was granted to ESB for the 38kV overhead line grid connection from Loughrea 38kV Substation at Caherlavin to Sonnagh Old Wind Farm on 29th October 2001.

Keelderry Wind Farm: Planning permission was granted by Galway County Council (Reg. Ref. 00/5248) and on appeal by An Bord Pleanála (ABP -PL 07 125978) to Keelderry Windfarm Ltd. in July 2002 for a 48 x 1MW wind farm and associated works at Keeldeery approximately 3 km to the west of the Derrybrien wind farm site

[23] Moran, P. & Wilson-Parr, R.,Hen Harrier Special Protection Area (SPA) Habitat Mapping Project 2014. Irish Wildlife Manuals, No. 83. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland. (2015)

(in an unforested area of the Slieve Aughty Mountains). An extension of duration of planning permission until September 2011 was granted in September 2007 (Reg. Ref. 07/3345).

Internal access roads were constructed circa 2007 but the rest of the development was never built.

2.5.1.4 Thermal Generation

Tynagh 400MW Combined Cycle Gas Turbine Power Station in the townland of Derryfrench County Galway at the site of Tynagh Mines was granted planning permission in 2003 (GCC Reg. Ref. 03/2943). The main construction activity for the Power Station took place in 2004-2006. The plant is over 10km from Derrybrien wind farm site.

The Tynagh 220kV grid connection to the ESB Oldstreet to Cashla Line was granted planning permission in 2003 (GCC Reg. Ref. 04/1974). The main construction activity for the Power Station grid connection took place in 2004-2006.

2.5.1.5 Adjacent coniferous forestry plantations

The extensive forest cover is one of the defining characteristics of the Slieve Aughty Mountains area generally, which has some of the largest concentrations of coniferous forest in the country and which was mainly planted in the 1960s and 1970s.

The State-owned company Coillte owns most of the forestry in the area, non Coillte private forestry represents less than 10% of forestry in the area.

Based on Coillte forestry data, forestry represents over 50 % of land use within the river sub-catchment areas within which the wind farm site is located.

The data shows that the extent of forestry has not changed appreciably since prior to Project construction and that forestry prior to construction represented and currently represents over 50% of land use in the immediate vicinity of the wind farm.

Due to its age profile, much of the forestry estate has over the last number of years, and will over the next decade, require felling and replanting as part of the normal lifecycle of such commercial plantations.

For example, between 2016 and 2018 a total of 257ha of forestry was earmarked for felling on Coillte land (actual date felling undertaken is not known) within the catchments within which Derrybrien Wind Farm is located.

2.5.1.6 Planting in lieu of felling on wind farm site

The planting undertaken circa 2006 arising from the felling licence associated with forestry felled on the wind farm site is described in Section 2.2.4.

2.5.1.7 Overhead Transmission Lines

Moneypoint - Oldstreet 400 kV Overhead Line (OHL): The OHL was developed prior to the development of the Derrybrien Wind Farm Project. The line was commissioned in 1984, is 102.5 km long, and runs from the Moneypoint substation in Kilrush, Co. Clare to the Oldstreet substation in Portumna, Co. Galway.

Planning permission for refurbishment works on the overhead line was granted by Clare County Council (CCC) (Reference 16/1011) in September 2017 and Galway County Council (GCC) (Reference 16/1747) in October 2017.

All structures on the OHL will be refurbished. The scheduled outage for this project was in February 2020. The works will continue periodically into 2021.

The Derrybrien-Agannygal 110kV line passes under the Moneypoint – Oldstreet 400kV line at co-ordinates Easting - 562119, Northing -700626.

Ennis - Shannonbridge 110kV Line: The Ennis - Shannonbridge line was installed in 1952 with some further structures installed in 1968.

The Derrybrien Wind Farm Project connected into this line. Specifically, the construction of Agannygal Substation for the Derrybrien Wind Farm Project resulted in the line being split into two circuits: Agannygal - Shannonbridge (Galway West) and Agannygal - Ennis (Galway West).

2.5.1.8 Gort Regional Water Supply Scheme

Prior to construction of the Derrybrien Wind Farm Project up to the present time, the public water supply for the Gort region was supplied from the Gort Regional Water Supply Scheme which is sourced from the Gort/Cannahowna River within the Owendalulleegh River System. The water treatment plant is located in the townland of Rindifin to the east of Gort. It is envisaged that the Gort/Cannahowna River water supply source will continue to be used for the foreseeable future.[24]

2.5.1.9 Flood Relief Schemes

Local OPW Flood Relief Scheme Gort: In 1997, prior to the development of the Derrybrien Wind Farm Project, the OPW completed a local flood relief scheme in Gort to combat potential serious winter flooding events (such as had occurred in 1994).

Local Flood Relief Works at Kiltartan: Permanent remedial works constructed at Kiltartan in 2011-2012 by Galway County Council to combat potential serious winter flooding events (such as had occurred in November 2009).

[24] Galway County Development Plan 2015 – 2021

Flood Relief Works at Kinvarra: Temporary flood relief works were undertaken at Kinvarra in December 2015 during a flood event.

Proposed Gort Lowlands Flood Relief Scheme: The proposed Gort Lowlands Flood Relief Scheme is examining options of providing flood overflow pathways from a number of turloughs (Lough Coole to Caherglassaun to Cahermore and an overland spill to the Galway Bay at Dungory Castle at Kinvarra). This is currently at preliminary engineering and feasibility stage and will be the subject to a planning application stage assuming that a feasible scheme can be achieved.

2.5.1.10 M18 Motorway Project

The M18 motorway project was planned and constructed after the Derrybrien Wind Farm Project was developed.

Construction of the motorway between Oranmore and Gort as part of the overall Gort to Tuam scheme was carried out between January 2015 and September 2017. This resulted in the N18 being retained as the R458 regional road while the newly constructed M18 became the primary route between Galway and Limerick.

2.5.1.11 Quarries/Sand extraction

Sand extraction at Cloghvoley: Planning permission was granted for a sand extraction site (GCC Ref. Ref. 08/1664) located at Cloghvoley to the south-east of the Project in May 2008 after the Derrybrien Wind Farm Project was developed.

Coillte Quarry: There is a Coillte quarry just east of the junction between the R353 and the Black Road, to the south-east of the Derrybrien wind farm site. The quarry is registered under Section 261 of the Planning and Development Act 2000 (as amended) ((ref QRY62).

Documents in relation to quarry registration were submitted to GCC in April 2005 by Coillte. It's a relatively small (1.8 ha aggregate quarry with an extraction area of 1.3 Ha), the aggregate being used for forest road repairs.

Ballynakill Quarry: Ballinakill Quarry is operated by Ballinakill Quarries Ltd at Cregg on the R353. The quarry is registered under Section 261 of the Planning and Development Act 2000 (as amended) (ref QY 6).

In October 2013, An Bord Pleanála granted a substitute consent for works and operations undertaken prior to August 2012 (Ref. 07.SU0038).

Planning permission was granted in December 2018 for the quarry extension (GCC Ref:18/687).

2.5.1.12 Works to Beagh Bridge

The privately owned four-span Beagh Bridge at the outlet of Lough Cutra which provides access to a private house and farm was structurally assessed by ESBI in August 2004. This followed on from the temporary installation of straw filter barriers on the upstream face of the bridge in the aftermath of the peat slide to capture and filter any suspended sediment that may have transported from the landslide area. Deterioration of the bridge identified comprised corrosion of deck slab reinforcement bars, some cracks in pier wall and some scouring at base of two of the three intermediate piers. It was noted by ESBI engineers at the time that the installation of straw filter barriers could not have caused or contributed to the corrosion in deck or cracks in pier wall. ESBI recommended in their assessment report that river flow be diverted away from these piers during the repair works to the pier bases. The recommended works were undertaken in January 2005.

2.6 Description of Project Features and Design

2.6.1 Overview of Project Works/Components

This section identifies the main components and work elements of the Project and their current status. The main components of the Project are listed in **Table 2.4** and shown on **Figure 2.8: Location of Wind Farm and Ancillary Works**, **Figure 2.9: Location of Grid Connection and Ancillary Works** and **Figure 2.10: Location of works associated with peat slide**.

Table 2.4: Project components and associated works

Project/work elements
Wind Farm and associated ancillary works (Figure 2.8)
Wind Farm Access Road: Upgrade of Coillte access road connecting the local road (Black Road) to wind farm site entrance-approximate length 3.1km; approximate widened width 4m, approximate width at bends 4.5m
Provision of hardstanding associated with temporary contractor compound and laydown area on access road to wind farm site-approximate dimensions 77 x 38m
Works to improve and maintain sections of local roads and bridges including: (a) Minor widening works and resurfacing of sections of the Black Road used for construction and operational access-approximate length 5km (b) Upgrade works to three bridges (Unnamed Bridge A, Unnamed Bridge B, Black Road Bridge) on Black Road involving strengthening of the bridges, surfacing works and the replacement of the bridge parapets. (c) road widening for a distance of approximately 30m on either side of the Crooked Bridge on the R353 to facilitate the delivery of equipment to the wind farm site
Felling: Construction phase on site- approximately 222 ha of forestry felled within wind farm site

Project/work elements
Operational phase offsite- offsite to west of wind farm (2016-2018)-approximately 46.2ha
Seventy (70) Vestas V52-850 kW wind turbines (with hub height and blade length of 49m and 26m respectively) on reinforced concrete bases. The turbines are numbered T1 to T15 & T17 to T71. It is noted that a permitted turbine T16 and the connecting access tracks were not constructed as a peat stability risk mitigation measure.
Seventy (70) crane hard standing areas adjacent to turbines.
Access roads/tracks within site (approximately 17.5km in total) for the construction, operation and maintenance of the wind farm comprising: • New floating roads-approximately 14.6 km of access track • New non-floating roads-approximately 0.9 km, (including access tracks rebuilt within the wind farm site at T68 and between T23 and T70 to replace sections of on-site floating roads damaged by the 2003 peat slide) • Upgrade of pre-existing floating roads-approximately 2.0km
Drainage: (a) Improvement works were undertaken on the 27km (approx.) of pre-existing drainage within wind farm site and (b) 12km (approx.) of new drainage channels were constructed.
On-site 110kV/20kV Substation (including end mast) with control building in palisade fenced compound and associated services.
Hardstanding area to north west of substation - 0.15ha (approx.)
Temporary containers (number varies) for equipment and parts located on hardstanding adjacent to Derrybrien Substation- currently three 40ft x 8ft, one 30 ft and one 20ft container.
Two (2) anemometer (met) masts
3 borrow pits / quarries for the sourcing of a total of approximately 232,000 cum of rock and clay; with works to manage these areas following the cessation of extraction activities: Borrow Pit/Quarry 1: Area 0.46ha (approx.); estimated volume 40,000cum (approx.) Borrow Pit/Quarry 2: Area 0.42ha (approx.); estimated volume 12,000cum (approx.) Borrow Pit/Quarry 3: Area1.72ha (approx.); estimated volume 180,000cum (approx.)
On site peat spoil storage: Peat repository areas (up to 1m in height) in areas of flat or gently sloping ground (less than 3°) across the site, for the storage of peat/spoil excavated from the turbine hard standing areas and substation locations.
Electrical cabling: Approximately 22.5km of direct buried (no ducts) underground 20kV (3 core) electrical cables
Communication cabling: • Direct buried copper communication cables for Supervisory Control and Data Acquisition (SCADA) system laid alongside electrical cables from substation to each turbine • 7.6km of fibre optic cable run in approximately 2.6km of ducting from the substation to the first turbine on communications cable run which connects into the existing copper communication cables at Turbine T25, T10, T26, T29, T24, T63 and T67

Project/work elements
Fencing to borrow pits
Lighting necessary to meet aeronautical requirements
Measures for the management of silt
Upgrading of Coillte access track linking turbary access track within the wind farm site to the Black Road -total length-approximately 1.6km
Grid connection and associated ancillary works (Figure 2.9)
Felling of approximately 33.1 ha of forestry along OHL route
Access tracks rebuilt within the wind farm site at T68 and between T23 and T70 to replace sections of on-site floating roads damaged by the peat slide
Felling of approximately 1.6 ha of forestry at site of Agannygal Substation
Access to Agannygal Substation-(a) upgrading of pre-existing Coillte track (approx. length 2.9km, approx. width 3.5m) including removal of bend plus (b) construction of new access road (approx. length 0.14km, approx. width 3.5m) from public road to Agannygal Substation
An overhead line, approximate length 7.8 km connecting the wind farm from Derrybrien Substation to the National Grid on the Agannygal-Shannonbridge (Galway West) 110kV line via Agannygal Substation comprising 34 double wood pole structures, 2 end masts (1 within Derrybrien Substation), 6 angle masts and 1 intermediate mast.
Lowering of ground below 400kV overhead line to facilitate required ground clearance to Derrybrien-Agannygal 110kV line crossing underneath
Agannygal Substation with control room in palisade fenced compound and all associated works and services connecting into National Grid on the Ennis-Shannonbridge (Galway West) 110kV line, including removal of approximately 1.3km of pre-existing conductor on the pre-existing Ennis-Shannonbridge line and replacement with 2 spans emanating from Agannygal Substation comprising: • End mast and Agannygal-Shannonbridge line span (approximate length 0.7km) • End mast and Agannygal-Ennis line span (approximate length 0.6km)
Works as result of peat slide (Figure 2.10)
Felling and site preparation works
Construction of Borrow pit adjacent to Barrage 1 for sourcing material for barrages. Approximate plan area 2,314m^2 (0.23ha), estimated volume 1371 cum.
Barrage 1-approximate max length 94m, max width 8m, estimated volume 900cum rock/boulders
Replacement of forestry access road across area of peat slide and Barrage 1 -approximate length 830m, width 4.5m (approx.)
New access track to Barrage 2 -approximate length 284m, approximate width 4.5m

Project/work elements
Barrage 2: approximate max length 17m, max width 20m, estimated volume 650 cum rock/boulders
Peat repository area at Barrage 2 -approximate max length 34m, max width 108m, estimated area 3498m^2
Barrage 3: approximate max length 41m, max width 9m; estimated volume 350cum rock/boulders
Peat repository area at Barrage 3 -approximate max length 41.5m, max width 16m; estimated area 597m^2
Barrage 4: approximate max length 25m, max width 10m; estimated volume 300cum rock/boulders
Peat repository area at Black Road Bridge- repository in two sections -north west section and south east section: • North west section: approximate max length 130m and width 73m; estimated area 5322m^2. • South east section: approximate max length 68m and width 51m; estimated area 2898m^2.
Drainage works within and in the vicinity of the site of the peat slide area and peat repository areas
Fencing to offsite peat repository areas
Repairs to bridges on public roads (Black Rd Bridge and Flaggy Bridge)
Repair to Bridge on private land (Unnamed Bridge C)
Replacement of stepping stones across Owendalulleegh River

The plan area occupied by the works within the wind farm site, the peat slide and associated works and Agannygal Substation together with the area of peat excavated for the works is set out in **Table 2.5**. Small areas of peat were excavated for the grid connection infrastructure.

Table 2.5: Area occupied by Project Works and excavated areas

Category	Item	Area (ha)	Area of peat excavation (ha)
WF site	Area of turbine bases (included in hardstanding area figure)		
WF site	Area of turbine hardstandings	4.87	4.87
WF site	Derrybrien Substation	0.26	0.26

Category	Item	Area (ha)	Area of peat excavation (ha)
WF site	Derrybrien Substation (adjacent hardstanding)	0.15	0.15
WF site	Borrow Pit/Quarry 1	0.46	0.46
WF site	Borrow Pit/Quarry 2	0.42	0.42
WF site	Borrow Pit/Quarry 3	1.72	1.72
WF site	Floating roads	7.72	0
WF site	Non floating roads	0.56	0.56
WF site	Anemometer Mast 1-Hardstanding Area	0.01	0.01
WF site	Anemometer Mast 2-Hardstanding Area	0.01	0.01
WF site	On-site peat repositories (located over peat) total area	14.89	0
Offsite	Construction compound hardstanding	0.29	0.29
Offsite	Site Access Road (pre-existing route)	0	0
Grid connection	Overhead Line structure bases	0.006	0.005
Grid connection	Agannygal Substation	0.30	0.30
WF site	Site of peat slide within WF site	2.17	2.17
Offsite	Site of peat slide outside WF site	23.11	23.11
Peat slide related works	Borrow pit adjacent to Barrage 1	0.23	0.23
Peat slide related works	Barrage 1	0.16	0
Peat slide related works	Replacement (forestry) access road across peat slide	3.74	2
Peat slide related works	New access road to Barrage 2	0.10	0.1
Peat slide related works	Barrage 2	0.02	0
Peat slide related works	Peat repository area at Barrage 2	0.42	0
Peat slide related works	Barrage 3	0.02	
Peat slide related works	Peat repository area at Barrage 3	0.06	0
Peat slide related works	Barrage 4	0.02	
Peat slide related works	Peat repository area at Black Road Bridge	0.82	0

The area of peat extracted for the turbine bases, hardstandings, floating roads and borrow pits was approximately 8.46ha in total within the wind farm site.

It is noted that most of the peat extracted was in areas that had been previously forested and drained.

N

Coillte track upgraded for site access

Hard standing associated with temporary construction compound

Borrow Pit/Quarry 3

Borrow Pit/ Quarry 1

Borrow Pit/Quarry 2

Derrybrien Substation

Unnamed Bridge A

Coillte track upgraded (turbary access)

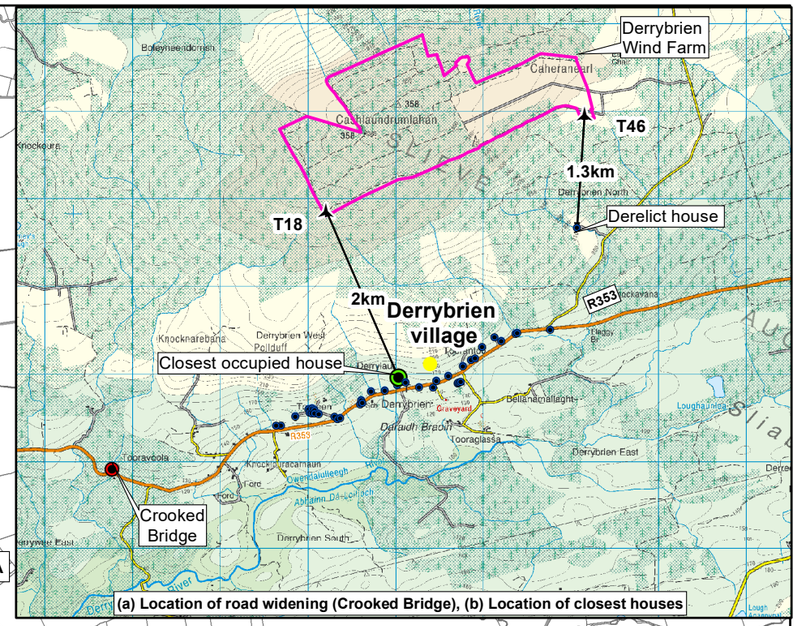
Black Road

Unnamed Bridge B

Black Road Bridge

R353

T1 T2 T3 T4 T5 T6 T7 T8 T9 T10 T11 T12 T13 T14 T15 T17 T18 T19 T20 T21 T22 T23 T24 T25 T26 T27 T28 T30 T31 T32 T33 T34 T35 T36 T37 T38 T39 T40 T41 T42 T43 T44 T45 T46 T47 T48 T49 T50 T51 T53 T54 T55 T56 T57 T58 T59 T60 T61 T62 T63 T64 T65 T66 T67 T68 T69 T70 T71



(a) Location of road widening (Crooked Bridge), (b) Location of closest houses

Legend

- Derrybrien Wind Farm Site
- Turbine Locations
- Met Masts
- Borrow Pits / Quarry
- On-Site Peat Repository Area
- Hard standing associated with construction compound
- Derrybrien Substation
- Floating Road
- Non Floating Road
- Turbine Hardstands
- Bridge upgrade
- Road Widening Crooked Bridge R353
- Coillte Tracks Upgrade
- Upgrade works to section of Black Road
- Coillte track upgraded (turbary access)
- Fibre optic cable ducting
- LV cables (approximate location)
- Derrybrien Wind Farm Felling
- Felling completed 2016-2018

Geo-Directory (An Post) Q1 2020

- Occupied Property

0 0.25 0.5 1 1.5 2 Kilometers

REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP
0	05/05/20	Issued for substitute consent	E.O'S	E.O'S	R.O'D	H.O'K

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PROJECT: **Derrybrien Wind Farm Project**

CONTRACT

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DRAWING TITLE:

Figure 2.8 - Location of Wind Farm and Ancillary Works

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	R.O'Donovan	H.O'Keeffe	27/07/2020

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DRAWING NUMBER: **QS-000280-01-D460-003-008-000**

N

Derrybrien Substation

R353

Ground lowered under existing 400kV line

Agannygal Substation

EX ISTING AGANNYGAL - SHANNONBRIDGE (GALWAY WEST)

Agannygal Substation

EXISTING AGANNYGAL - ENNIS (GALWAY WEST)

Insert Map Agannygal Substation

Note: Aerial photography on insert map from 2018

0 0.25 0.5 1 1.5 2 Kilometers

Legend

- Derrybrien - Agannygal 110kV Overhead Line

Mast type:

- Poleset
- Intermediate Mast
- Angle
- End
- Connection works to Ennis-Shannonbridge 110kV OHL span
- Lowering ground under the 400kV Line
- Agannygal Substation
- Felling for overhead line route & Agannygal substation
- New Road to access Agannygal Substation
- Coillte track upgraded for access to Agannygal Substation

Existing Line Voltages:

- 110 kV Overhead Line
- 400 kV Overhead Line

REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP
0	04/08/20	Issued for substitute consent	E.O'S	E.O'S	P.K	J.McL

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DRAWING TITLE:

Figure 2.9 - Location of Grid Connection and Ancillary Works

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	P.Kavanagh	J.McLoughlin	04/08/2020

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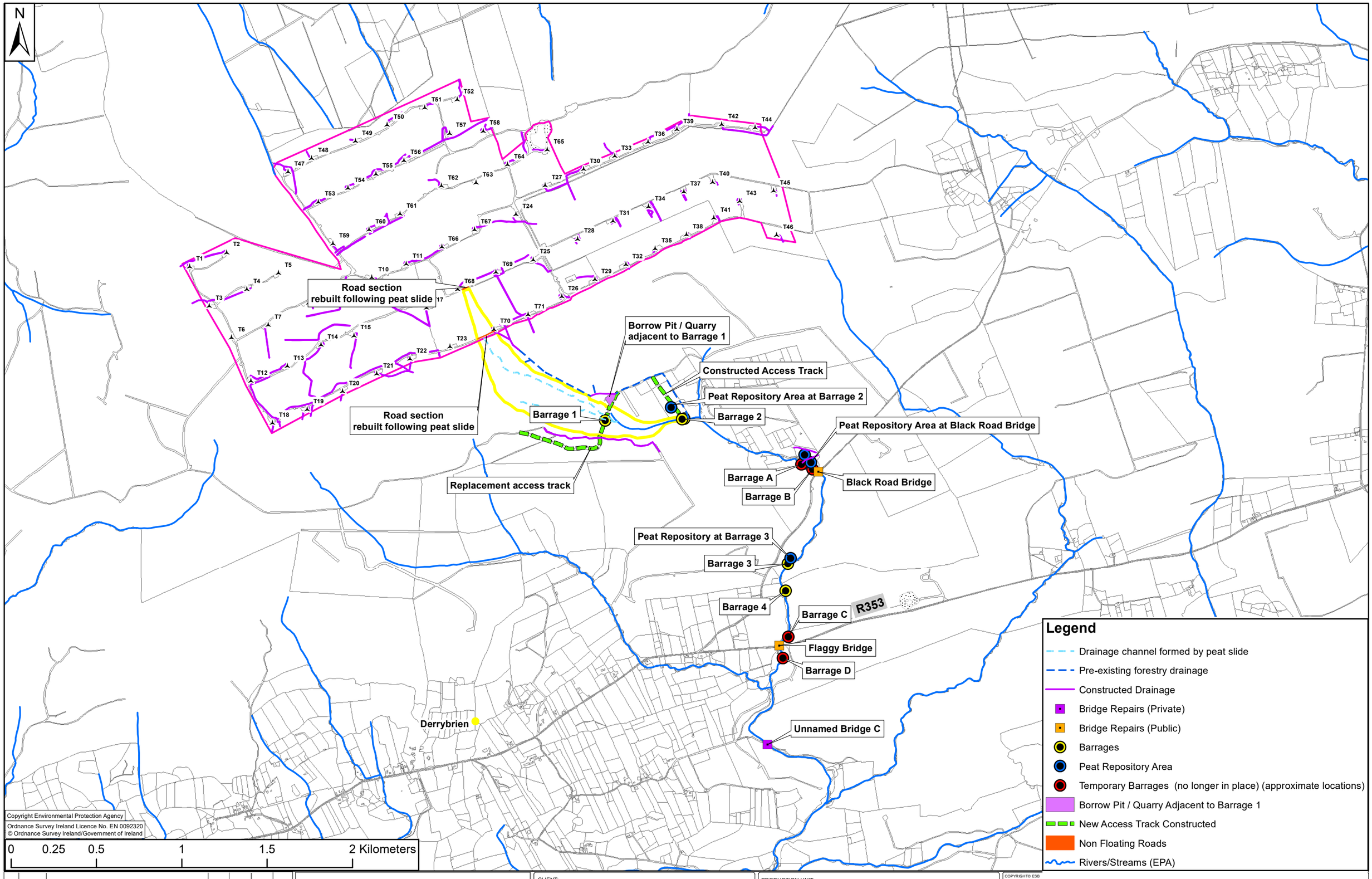
DRAWING NUMBER: **QS-000280-01-D460-003-009-000**



REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP
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DRAWING TITLE: **Figure 2.10 - Location of works associated with peat slide**

CONTRACT

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	R.O'Donovan	H.O'Keeffe	10/05/2020

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DRAWING NUMBER: **QS-000280-01-D460-003-010-000**

2.6.2 Ancillary Works: Wind Farm

2.6.2.1 Contractor Compound-Wind Farm site

The granular hardstanding area on which the contractor compound was located during construction of the wind farm remains in place on the access road to the wind farm site. The dimensions of hardcore area are approximately 77m x 38m.

2.6.2.2 Road upgrades for wind farm

Upgrade works to the Coillte road from Black Road to the wind farm site comprised widening, strengthening, construction of lay-bys and remedial works to drainage along the road as well as the placement of geogrid, rock material and regrading and surfacing works.

The length of the road upgraded was approximately 3.1 km and the road was generally widened to 4 m; 4.5 m at bends. There is a hinged Coillte barrier at the public road with a double lock that both the project's team and Coillte can access.

The bell mouth entrance at the intersection of the Black Road and the Coillte track providing access to the Wind Farm was widened.

Localised road widening was undertaken at Crooked Bridge on the R353, for a distance of approximately 30m on either side of the bridge.

2.6.2.3 Works to Bridges -Black Road

In order to facilitate the project, works were undertaken to three bridges on Black Road involving strengthening of the bridges, surfacing works and the replacement of the bridge parapets. The bridge locations are as follows:

Table 2.6: Bridge Locations

Unnamed Bridge A (Easting)	Unnamed Bridge A (Northing)	Unnamed Bridge B (Easting)	Unnamed Bridge A (Northing)	Black Rd Bridge (Easting)	Black Rd Bridge (Northing)
562240	705630	561836	704082	561367	703601

2.6.2.4 Coillte Track-Black Rd-Turbary Road

An existing Coillte owned track running in an east west direction from Black Road provides access to turbary lands located within the wind farm site boundary. The track was upgraded during construction of the project and provided access for some haulage during construction in addition to access for turbary land users.

The road is typically less than 3 m in width.

2.6.3 Ancillary Works: Grid Connection

2.6.3.1 Access to Agannygal Substation

Upgrade works were undertaken on approximately 2.9km of an existing Coillte track which formed the haul route to Agannygal Substation including widening of the track, removal of bends and resurfacing.

A new permanent section of road (approximately 0.14km long) was constructed from the local public road (Unnamed Local Rd A) to access Agannygal Substation.

2.6.3.2 Ground lowering below 400kV OHL

In order to provide the required clearances between the pre-existing 400kV line and Derrybrien - Agannygal 110kV line passing underneath and between the ground and the 110kV line, the ground was lowered by 3.5m below the crossing point of the two lines.

2.6.4 Tree Felling Undertaken for Project

Based on OSI aerial photography, the estimated area of felling undertaken for the project together with the estimated area of forestry removed by the moving peat during the peat slide and associated works is set out in **Table 2.7**.

Table 2.7: Extent of Project felling and forestry removed as a result of peat slide

Location	Estimated Area (ha)
Wind farm and grid connection during construction 2003-2005	
Wind Farm site	221.9
Grid connection -overhead line (assuming overhead line corridor width of 45m)	33.1
Grid connection –Agannygal Substation	1.6
Works associated with peat slide during construction 2003-2005	
Newly constructed access track to south west of Barrage 1	3.7
Coillte borrow pit	0.0
Newly constructed access track to north west of Barrage 2	0.2
Peat repository area at Black Road Bridge	0.8
Rerouting of drainage around peat scar	1.2
Forestry removed as a result of peat slide 2003	
From site of peat slide	25
Operational Phase-Offsite	
Offsite to west of wind farm (2016-2018)	46.2

Wind Farm site: On 20th May 2003, Coillte was granted a two-year felling licence to fell 263ha of forestry on the wind farm site. Approximately 222 ha of forestry was felled for construction of the wind farm for which replacement planting was carried out by Coillte at locations in Counties Tipperary and Roscommon (See 2.2.4)

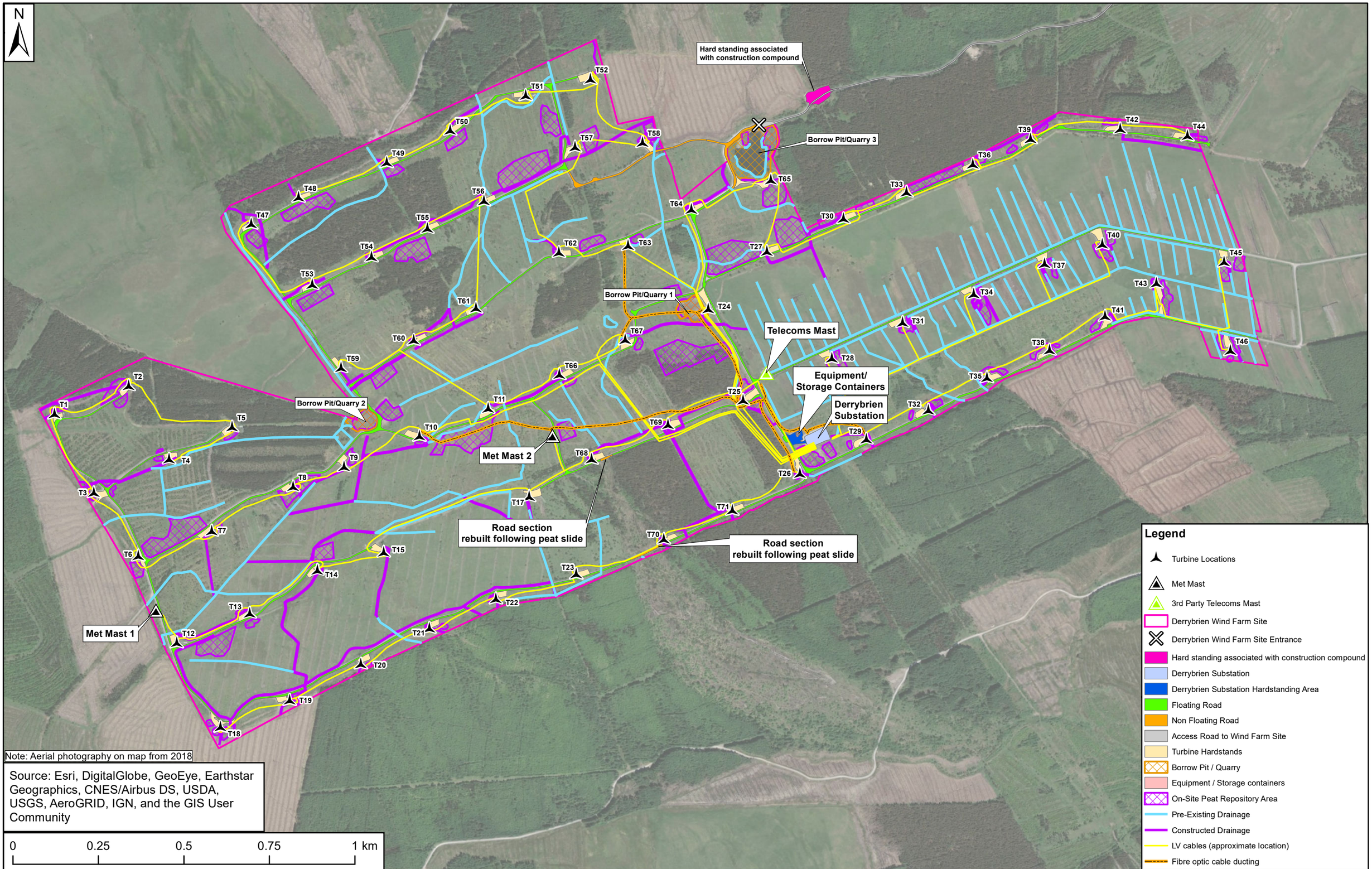
A further Felling Licence (Ref FL4890) was issued on the 1st August 2007 for the felling of the remaining forestry on the wind farm site, however the felling was not undertaken.

Grid connection: Approximately 34.7 ha of forestry in all was felled for the grid connection.

Offsite felling 2016-2018: Offsite phased tree felling (approximately 46.2 ha in total) was undertaken by Coillte under felling licence (Ref FL 18197) immediately to the west of the wind farm site in 2016, 2017 and 2018 to optimise productivity of the wind farm. It is noted that these areas had been scheduled for felling in 2015 as part of Coillte's routine tree felling programme and that the felled areas are being replanted.

2.6.5 Development on the Wind Farm Site

As set out in in **Table 2.4**, the main wind farm infrastructure comprises turbines, crane hardstandings, access tracks, drainage channels, borrow pits/quarries, on site material storage, 110kV substation, direct buried electric cables and anemometer masts. These infrastructure elements are described in the following subsections. The wind farm layout is presented in **Figure 2.11: Wind Farm Site Layout**.



Note: Aerial photography on map from 2018

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 0.25 0.5 0.75 1 km

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0	05/05/20	Issued for substitute consent	E.O'S	E.O'S	R.O'D	H.O'K

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PROJECT: Derrybrien Wind Farm Project

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PRODUCTION UNIT: Civil & Environmental Engineering

DRAWING TITLE: Figure 2.11 - Wind Farm Site Layout

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	R.O'Donovan	H.O'Keeffe	01/07/2020

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2.6.5.1 Wind Turbines

There are seventy (70) Vestas V52-850 kW turbines on site. The wind turbines have a rotor diameter of 52m, a hub height of 49m and overall height of up to 75m. A number of turbines were buried to give a reduced hub height. It is noted that these turbines are small compared to modern turbines. A drawing of the Vestas V52-850kW turbine is provided in Appendix 2.1

The co-ordinates of turbine locations are presented in **Table 2.8**.

Table 2.8: Turbine Locations and ground elevations

Ref.	Easting	Northing	Elevation mOD	Estimated tip height mOD	Ref.	Easting	Northing	Elevation mOD	Estimated tip height mOD
T1	557684	704807	327.0	401.3	**T37**	560579	705246	325.7	398.6
T2	557901	704889	341.1	415.5	**T38**	560594	704993	307.2	380.0
T3	557800	704576	328.9	403.4	**T39**	560539	705611	332.1	406.5
T4	558020	704675	341.1	415.5	**T40**	560748	705302	319.3	392.2
T5	558204	704769	349.7	424.1	**T41**	560756	705092	307.3	380.1
T6	557929	704392	337.6	411.9	**T42**	560801	705640	320.7	395.2
T7	558144	704464	344.4	418.8	**T43**	560907	705189	302.2	375.0
T8	558382	704594	352.4	426.8	**T44**	560997	705620	311.0	385.3
T9	558531	704652	354.7	429.0	**T45**	561105	705250	296.2	369.0
T10	558752	704742	359.1	434.1	**T46**	561123	704991	288.5	361.3
T11	558953	704823	360.6	435.1	**T47**	558260	705361	343.2	417.6
T12	558042	704138	334.6	409.0	**T48**	558398	705440	343.4	417.8
T13	558256	704224	341.6	414.5	**T49**	558656	705541	338.5	412.8
T14	558454	704350	346.0	418.8	**T50**	558842	705635	338.4	412.9
T15	558647	704403	347.7	422.1	**T51**	559062	705737	331.6	405.8
T17	559072	704565	356.4	429.2	**T52**	559252	705785	325.9	400.3
T18	558170	703891	327.7	400.6	**T53**	558438	705185	353.2	427.7
T19	558372	703970	331.3	404.1	**T54**	558612	705266	357.5	431.8
T20	558580	704076	335.5	408.3	**T55**	558775	705349	352.3	426.8
T21	558781	704180	336.9	409.7	**T56**	558940	705429	344.1	418.6
T22	558975	704266	336.0	408.8	**T57**	559206	705587	337.0	411.3
T23	559210	704338	334.3	407.2	**T58**	559404	705600	336.2	410.4
T24	559596	705113	351.0	425.4	**T59**	558523	704942	359.3	433.5
T25	559698	704847	347.0	419.8	**T60**	558735	705021	359.3	435.1
T26	559864	704632	330.3	403.1	**T61**	558917	705116	363.0	437.3
T27	559768	705282	344.5	419.1	**T62**	559160	705279	358.6	433.0
T28	559957	704968	335.5	408.4	**T63**	559362	705299	353.1	427.5
T29	560059	704733	323.0	395.8	**T64**	559547	705405	348.4	422.7
T30	559992	705377	341.5	416.2	**T65**	559779	705491	341.5	415.7
T31	560164	705074	330.5	403.3	**T66**	559161	704921	358.8	432.9

Ref.	Easting	Northing	Elevation mOD	Estimated tip height mOD	Ref.	Easting	Northing	Elevation mOD	Estimated tip height mOD
T32	560240	704818	315.6	388.4	**T67**	559353	705023	356.8	431.2
T33	560176	705455	340.8	415.2	**T68**	559255	704674	353.5	426.3
T34	560372	705157	330.9	403.8	**T69**	559478	704775	348.0	420.8
T35	560411	704913	310.1	383.0	**T70**	559466	704440	333.5	406.3
T36	560370	705536	337.4	411.9	**T71**	559667	704525	333.9	406.8

There are two prevailing wind directions-to the west and south west. The approximate spacing between turbines is between 150m to 260m in a west/south west direction.

The main turbine components comprise:

- 2 x cylindrical towers sections
- 1 x nacelle, which encapsulated the mechanical machinery of the wind turbine and was placed on top of the tower sections
- 3 x blades connecting to the hub of the nacelle

The turbine towers are of tubular steel tapering from about 3.3 m diameter at the base to 2.1 m diameter at the top where the nacelle is mounted. Access to the tower is via a staircase located outside on the hardstand and a secure hinged door into the tower. The nacelle is accessed from the tower using an internal ladder with landing/rest positions. The tower and nacelle incorporate internal and emergency lighting.

The nacelle contains the generator and control unit, which is designed for computer controlled monitoring of all major functions of the turbine. The glass-fibre reinforced nacelle cover protects all the components inside the nacelle against the elements.

A three-blade rotor is attached to the nacelle. The blades are made of fibreglass-reinforced epoxy material with each blade consisting of two blade shells, bonded to a supporting beam.

The wind turbines are painted light grey with a matt finish.

The wind turbines are geared to ensure the blades rotate in the same direction. Transformers are located internally within the turbine tower.

The equipment is protected from lightning strike by deep earthing and from corrosion by multiple coatings. The turbine tower and nacelle are equipped with optical smoke sensors.

Aviation lights are provided on nine turbines, specifically T1, T18, T26, T44, T46, T47, T52, T61 and T65.

Transformers: A separate transformer is located internally within each wind turbine to uprate the generation voltage of the turbines from 380 – 660 V to a higher voltage for connection via underground cables to the Derrybrien Substation. The hermetically

sealed wind turbine transformers can be considered as leak free and largely maintenance free. They are dispatched from the factory leak free and can primarily only be damaged during transport or installation. Once in service, they remain closed for their lifetime.

Method of Turbine Operation: The basis of wind turbine operation is as follows:

- Sensors are used to monitor wind direction and a yaw mechanism turns the turbines to keep the blades facing into the wind.
- The blades of the turbine, which are bolted onto a hub rotate at a rate of once every 3 – 5 seconds (s), depending on wind conditions.
- Inside the nacelle (housing) located at the turbine hub, the rotor drives a large shaft into a gearbox, which steps up the revolutions per minute to a speed suitable for the electrical generator. The rotor speed range is 14.0-31.4 revs per minute (rpm).
- The electricity generated at each turbine is fed via underground cables to electrical transformers in Derrybrien Substation where it is transformed to a higher voltage for supply to the national electricity network.

The turbines commence operation at a wind speed of 4 m per second (m/s) (the cut-in speed) and shut down when the wind speed reaches about 25 m/s (the cut-out speed). Power is controlled automatically as wind speed varies.

At wind speeds greater than 25 m/s (80 km/hr) the turbines automatically cut-out, stop rotating and “feather” or point into the wind to reduce the surface area exposed to the wind to prevent unnecessary strain on the turbine tower, nacelle and rotor.

2.6.5.2 Anemometer Masts

There are two anemometer lattice masts (meteorological masts or met masts) with a height (49m) corresponding to that of the turbines on the site which monitor wind speeds and validate the performance of the wind turbines. Each leg of the mast sits on a concrete plinth of plan dimension 1m x 1m x 1.5m (depth to top of foundation). The base of the mast is triangular in plan 2m x 2m x 2m. The mast is supported on reinforced concrete foundations. Location details are provided in **Table 2.9**. A drawing of the anemometer mast is provided in Appendix 2.1.

The masts are lattice masts, comprising a free-standing galvanised lattice type meteorological tower, being approximately 2 m wide at its base x 0.6 m wide at its top. Equipment on each mast comprises anemometers, wind direction vanes, a barometric pressure sensor and a data logger. Anti-climb screening (3m high) is provided to masts.

A mobile phone network operator has a cell on the wind farm anemometer mast beside turbine T68 to facilitate phone coverage on site.

Table 2.9: Locations of Anemometer Masts

Location	Easting	Northing	Ground Elevation (mOD)
Adjacent to T68	559140.81	704741.63	356.998
Between T6 and T12	557981.21	704230.59	338.479

There is a broadband service from a 70m high third-party service provider mast (beside turbine T25) which has been present on the site since the 1980s. The mast is located at Easting 559757/Northing 704928.

2.6.5.3 Wind Farm Access Tracks

The access tracks are utilised for on-going access to the wind turbines and anemometer masts for operation and maintenance.

The total length of access tracks within the site boundary is 17.5 km. These comprise:

- Approximately 2.0km of pre-existing floating roads which were upgraded through the turbary plots on the east side of the site.
- Approximately 14.6 km of new floating roads
- Approximately 0.9 km of new non-floating roads

The floating turbary roads which had been in place prior to the construction of the wind farm on the east side of the site were upgraded with a capping layer of crushed rock granular fill reinforced with a layer of geogrid on the surface of the existing road. The width of these roads was not increased so they are narrower than the other site access tracks/roads at 3-4 m wide.

The floating roads built for the project are typically 4.5 m wide and comprise 600-1000 mm of crushed rock granular fill reinforced with 1-2 layers of geogrids, as necessary, over a regulating layer of granular fill on a layer of logs, branches and brash from trees that were felled on the site.

The non-floating roads were constructed of granular rockfill on the glacial till below the peat. After the peat slide in 2003, the sections of road that had originally been constructed as floating roads across the slide area at Turbines T68 and T70 were replaced with rock fill embankments supported on the glacial till below the peat. The floating roads to either side of the slide area remain in place'.

2.6.5.4 Turbine Foundations

The construction of the wind farm required local excavation to bearing strata (such as bedrock or suitable glacial till) for turbine foundations. Excavations were carried out in peat depths generally ranging from 1.0-4.0m, but locally between 4-5m.

The turbine foundations are reinforced concrete pad design that are founded onto stratum with suitable bearing capacity, predominantly rock.

The dimensions of the foundations used were either 9.8m x 9.8m (type-1) or 11m x 11m (type-2) in plan, with the main section of the foundation being 1m in depth. There

are 64 bases of type-1 dimensions and 6 bases of type-2 dimensions. The majority of the foundations comprised foundation type 1, however, 6 No. of the 70 foundations were foundation type 2 (i.e. T11, T60-T62, T66, T67).

2.6.5.5 Hardstandings

A hardstanding area adjacent to each wind turbine was provided to support the mobile cranes used to erect the turbines during construction and to facilitate maintenance activity involving the use of cranes and machinery that arise over the lifetime of the wind farm. These were constructed of crushed rock granular fill supported on the glacial till below the peat. The individual hardstandings typically cover an area of approximately 47m x 18m.

2.6.5.6 Drainage

Prior to construction of the wind farm, the site had already been subjected to a programme of drainage to facilitate forestry (in the 1960s and 1970s) and turbary. The majority (27km out of 39 km) of drainage channels on site were in place prior to the wind farm development. During construction of the wind farm the majority of the pre-existing channels were left unchanged except where there was a conflict with new infrastructure. In areas of high concentrations of flow upstream of access tracks and / or close to turbine foundations, sections of drainage were re-aligned or deepened to reduce the risk of localised surface ponding and flooding and some minor cleaning out and maintenance work took place as required.

The remaining 12 km of drainage channels were newly constructed for the wind farm project. These drain the site access tracks and connect the turbine foundation drainage to the drainage network.

The constructed channels are narrow open drains, typically 0.5 to 1.5 m deep, with culverts under the site access tracks.

Culverts of either 450mm or 600 mm in diameter have been inserted at various wind farm access road drain crossings as necessary to maintain the conveyance path of the existing drains crossed.

The on-site drainage network connects to the natural regional network of streams and rivers downslope from the site.

2.6.5.7 Wind Farm- spoil management/Peat Repositories

It is estimated that approximately 160,000m^3 of peat was excavated for the wind farm infrastructure (turbine foundations and crane hard-standings, borrow pits, site compound, substation and anemometers). Prior to the peat slide, spoil which arose from construction excavations was side cast. Following the peat slide, the spoil was

placed up to a height of 1.0m in designated locations in areas of flat or gently sloping ground (<3°) across the site.

Following the peat slide, some of the previously side cast material was also transferred to the peat repositories. The peat repositories are identified by the adjacent turbine reference number, the suffix R signifies repository area. It is noted that there is more than one repository adjacent to certain turbine locations. The relevant co-ordinates are provided in **Table 2.10.** The peat repository areas are shown on **Figure 2.11: Wind Farm Site Layout**.

Table 2.10: Peat/spoil repository areas on wind farm site

Location	(Centre) Easting (approx)	(Centre) Northing (approx)	Area (Ha) (approx)	Location	(Centre) Easting (approx)	(Centre) Northing (approx)	Area (Ha) (approx)
T2R	557859	704871	0.21	T32R	560261	704835	0.07
T2R	557878	704842	0.09	T33R & T36R	560262	705492	0.39
T3R	557840	704602	0.04	T34R	560402	705114	0.20
T3R	557854	704579	0.03	T35R	560425	704922	0.12
T3R	557782	704573	0.07	T36R	560399	705551	0.07
T4R	557992	704696	0.01	T37R	560605	705230	0.07
T4R	557989	704674	0.03	T38R	560576	704990	0.10
T5R	558202	704742	0.05	T39R	560485	705578	0.04
T6R	557926	704348	0.13	T39R	560570	705635	0.06
T6R & T7R	558035	704447	0.93	T40R	560772	705318	0.07
T7R	558165	704473	0.03	T40R	560751	705274	0.12
T8R	558397	704581	0.35	T41R	560730	705062	0.07
T9R	558553	704677	0.08	T42R	560776	705657	0.07
T10R	558753	704718	0.03	T43R	560936	705144	0.17
T10R & T11R	558887	704743	0.98	T44R	561034	705610	0.04
T12R	558157	704134	0.53	T45R	561150	705245	0.12
T13R	558262	704192	0.07	T45R	561105	705216	0.11
T13R	558227	704228	0.03	T46R	561123	704965	0.03
T14R	558466	704394	0.28	T46R	561094	705015	0.06
T18R	558139	703900	0.03	T46R	561139	705006	0.05
T18R	558157	703875	0.03	T47R	558275	705317	0.20
T18R	558184	703870	0.06	T47R	557705	704817	0.02
T19R	558387	703978	0.03	T48R	558427	705409	0.50
T20R	558603	704071	0.02	T49R	558675	705515	0.13
T21R	558821	704183	0.03	T50RB	558859	705605	0.19
T22R	558958	704262	0.01	T51R & T51RB	559134	705659	0.35
T24R	559484	705159	0.19	T53R	558447	705144	0.34
T24R & T25R	559545	704972	1.24	T54R & T55R	558733	705282	0.49

Location	(Centre) Easting (approx)	(Centre) Northing (approx)	Area (Ha) (approx)	Location	(Centre) Easting (approx)	(Centre) Northing (approx)	Area (Ha) (approx)
T25R	559735	704834	0.10	T56R & T57R	559058	705519	0.92
T25R	559705	704885	0.11	T57R	559250	705608	0.28
T27R	559666	705264	1.04	T58R	559433	705618	0.21
T27R	559834	705337	0.61	T59R & T60R	558647	704916	0.28
T28R	559986	704954	0.13	T62R	559256	705305	0.19
T29R	560009	704714	0.03	T63R	559388	705316	0.07
T30R	559948	705369	0.13	T65R	559790	705450	0.43
T30R	560055	705410	0.09	T66R	559191	704897	0.06
T31R	560175	705055	0.08	T67R	559393	705008	0.05
T32R	560190	704800	0.02	T68R	559182	704757	0.21
Derry-brien Sub-station	559895	704679	0.27	Derry-brien Sub-station	559950	704698	0.11

As of 2020, blanket bog vegetation has re-established on the surface of almost all of the repository/storage areas, in some cases making them difficult to distinguish from the surrounding ground.

2.6.5.8 Borrow Pits/Quarries

There are 3 borrow pits/quarries on site. These were used during construction as a source of bedrock to be processed into crushed rock granular fill for use in the construction of the access tracks and hard standing areas. Some clay was also extracted. Borrow Pit/Quarry No. 3 adjacent to Turbine T65 at the site entrance, was the main source of rock fill for the works.

The estimated volume of rock/clay extracted from each borrow pit is:

- BP1 = 40,000 m^3 (primarily rock)
- BP2 = 12,000 m^3 (primarily clay)
- BP3 = 180,000 m^3 (primarily rock)

The exact depth of the borrow pits is unknown but it is understood that Borrow Pits 1 and 2 were up to 10 m deep relative to ground level and Borrow Pit 3 is deeper.

The borrow pits have been closed since the end of the construction phase in 2006.

The three borrow pits/quarries have also been partially rehabilitated by backfilling with excavated peat. The location and approximate area of the peat repository/storage areas is set out in **Table 2.11**.

Table 2.11: Peat/spoil repository areas within borrow pits/quarries

Location	Centre Point Easting (ITM)	Centre Point Northing (ITM)	Area (ha)
PR at Borrow Pit 1	559545	705110	0.395
PR at Borrow Pit 2	558593	704787	0.32
PR at Borrow Pit 2	558663	704813	0.27
PR at Borrow Pit 3	559779	705599	0.25
PR at Borrow Pit 3	559704	705609	0.06

Borrow Pit/Quarry 1: Borrow Pit/Quarry1 is located in an area of shallow peat adjacent to Turbine T24. Peat was removed from the site and the underlying glacial till and weathered rock was excavated for re-use as backfill material over the turbine foundations. The borrow pit/quarry was rehabilitated by backfilling with excess excavated peat/soil prior to completion of the works on site and blanket bog vegetation and some small trees have become established at the surface.

Borrow Pit/Quarry 2: Borrow Pit/Quarry 2 is located in an area of shallow and outcropping rock on the west side of the site between Turbines T9 and T10. Shallow peat was initially removed from the site and mineral soil and rock were extracted for use as backfill material for the turbines and for road construction.

The borrow pit/quarry was rehabilitated by backfilling with excess excavated peat/soil from the excavations for the turbine foundations and crane hard-standings prior to completion of the works on site. Bunds of mineral soil were constructed around the perimeter of the borrow pit so that the remoulded peat was fully contained within the pit.

The borrow pit/quarry area is fenced off as a safety measure.

Borrow Pit/Quarry 3: Borrow/Quarry 3 located near the site entrance on the north side of Turbine T65 was the main source of rock on the site for the construction of the site access tracks and hardstanding areas.

Borrow Pit/Quarry 3 has been partially rehabilitated by backfilling sections of the borrow pit which are fully contained within rock fill and mineral soil bunds.

The borrow pit/quarry is flooded to the natural water table level 1.0-1.5 m below the level of site access road at the entrance to the borrow pit/quarry.

There is a drain along the edge of the road to divert any rising water from the borrow pit to the offsite drainage network.

The area is fenced off with timber fencing to restrict access as a safety measure.

2.6.5.9 LV and communication cables

Throughout the site there is an installed buried cable network of LV electrical cables and copper SCADA communication cables. The LV cables connect each wind turbine to the sub-station on the south side of the site between Turbines T26 and T29. They

feed the electrical output from each turbine generator to the sub-station at a rating of 20kV, for export onto the electrical transmission network.

The cables are buried within a trench to an approximate depth of 1.1m.

A drawing of a typical cable trench section is provided in Appendix 2.1.

In September 2017, as part of an upgrade to the turbine control systems, approximately 7.6km of new 12 core single-mode fibre-optic cable was installed on the site which was run in 2.6km of ducts to improve the response of communication signals between the turbine controllers and the central control system. The cable routes are shown on **Figure 2.11: Wind Farm Site Layout** and the installation methodology utilised is set out in Section 2.6.4.

2.6.5.10 Signage

There are a number of information signs throughout the site as follows:

- Panel signs at the wind farm entrance indicating the presence of the wind farm
- Signage on each turbine indicating the turbine number, potential hazards and an emergency contact telephone number.
- Other operational signage as required (Buried HV Cables, warning sign beside Borrow Pit/Quarry 3 etc.).

2.6.5.11 Water supply

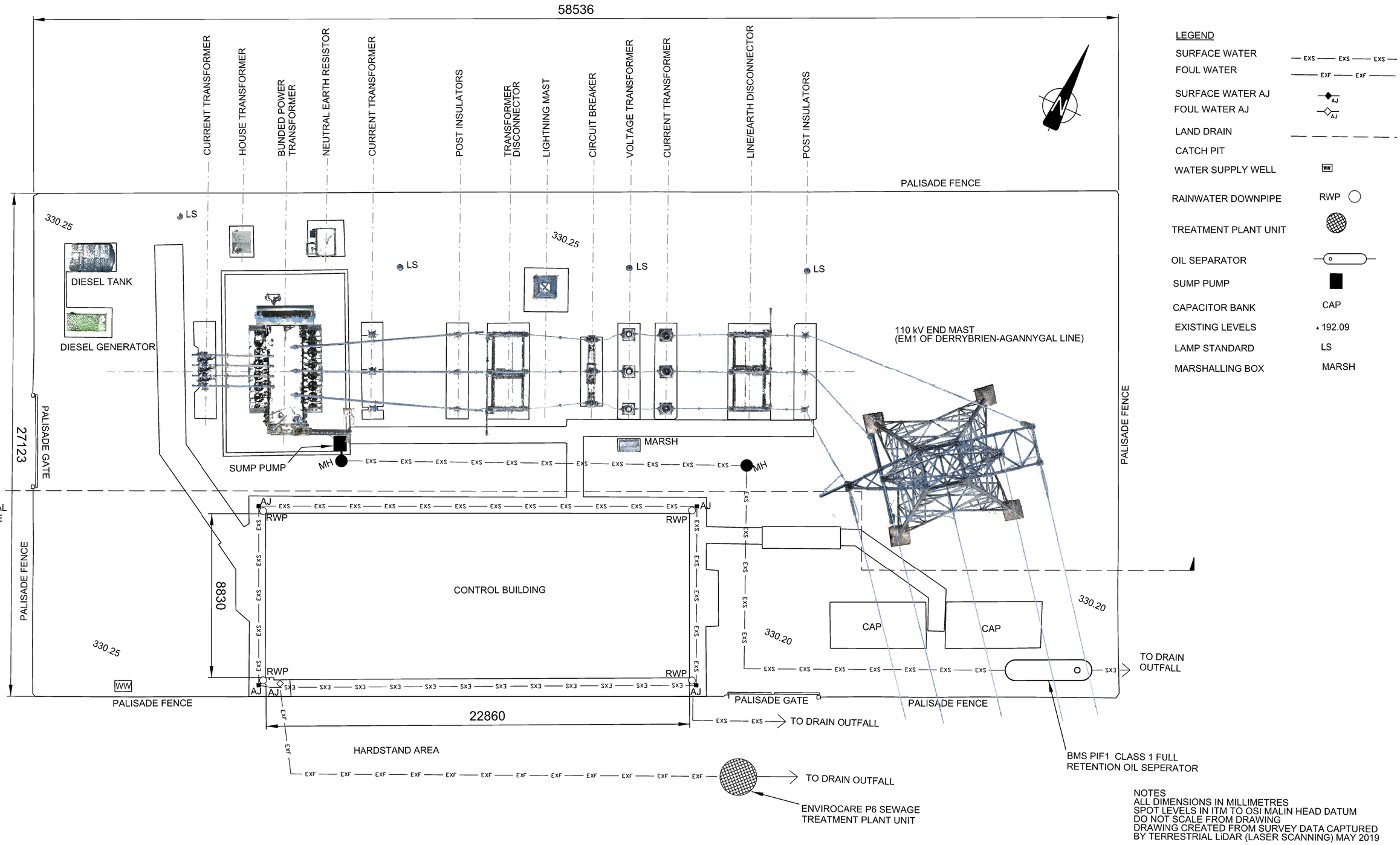
Non drinking water supplies are sourced from wells at two locations for the project- Derrybrien Substation and Agannygal Substation. Otherwise there is no water supply requirement associated with the project.

2.6.5.12 Derrybrien Substation

The purpose of Derrybrien Substation which is located within the wind farm site is to transform the 20 kV output from the wind turbine generators to 110kV for export out to the national grid at 110 kV.

See **Figure 2.12: Derrybrien 110kV Substation - Layout Plan**.

See **Figure 2.13: Derrybrien 110kV Substation - Sectional Elevation**.



NOTES
ALL DIMENSIONS IN MILLIMETRES
SPOT LEVELS IN ITM TO OSI MALIN HEAD DATUM
DO NOT SCALE FROM DRAWING
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Purpose of issue - Preliminary unless indicated

Client Approval ☐ Planning ☐ Tender ☐ Construction ☐ As-built ☐

Energy for generations

Engineering and Major Projects,
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Client: GORT WINDFARMS LTD.

Project: DERRYBRIEN WIND FARM PROJECT

Contract:

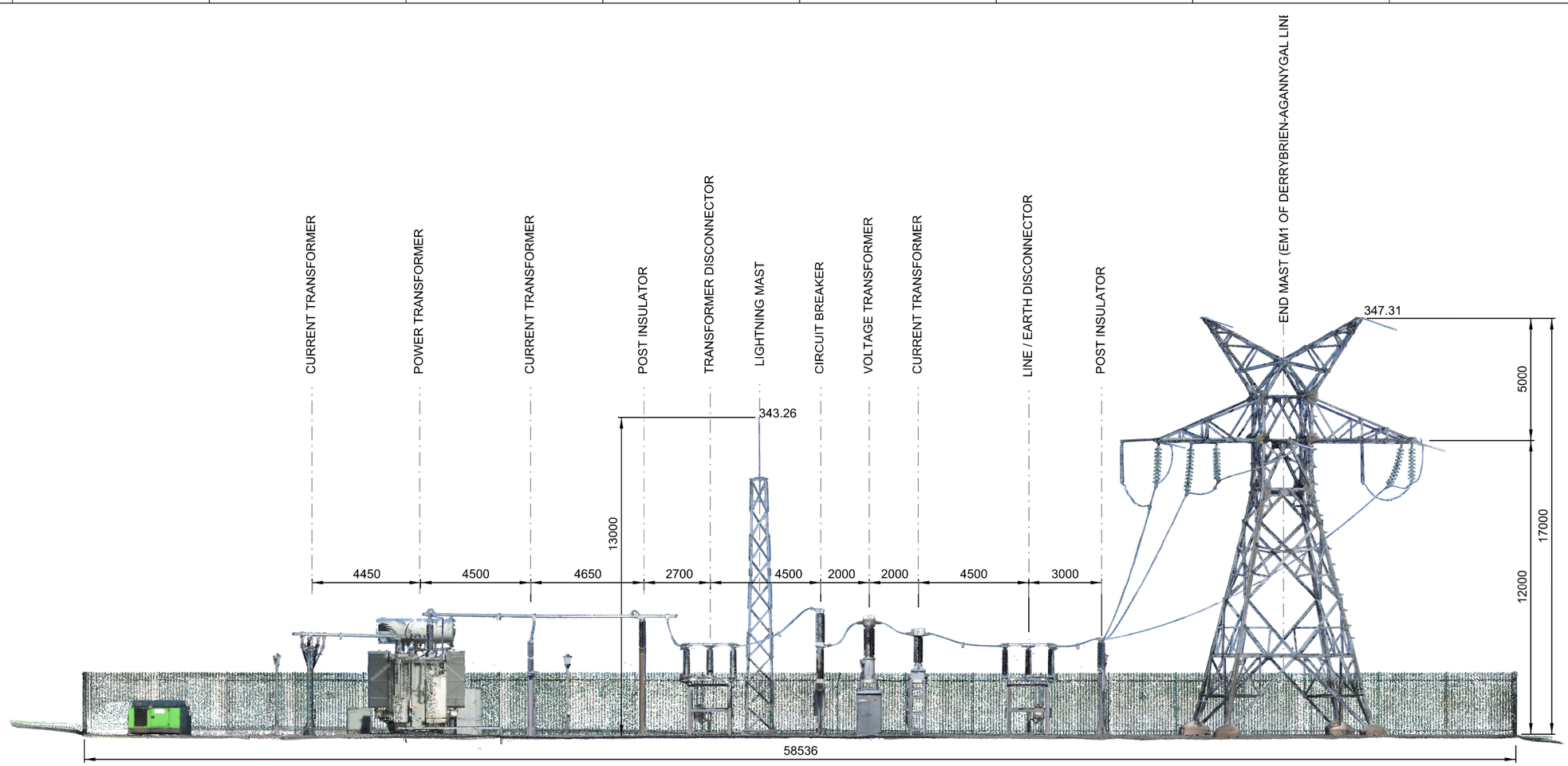
Production Unit: CIVIL & ENVIRONMENTAL ENGINEERING

Drawing Title: FIGURE 2.12 DERRYBRIEN 110 kV SUBSTATION LAYOUT PLAN

DRAWN	PRODUCED	VERIFIED 1	VERIFIED 2	APPROVED	APPROVAL DATE
P.CARROLL	P.CARROLL	C.DOLAN	R.O'DONOVAN	H.O'KEEFFE	07/05/2020

CLIENT REF	No. OF SHTS	SIZE	SCALE
Client Ref. No.	-	A3	1:200

Drawing Number: QS-000280-01-D460-003-012-000 SHEET REV



SECTION A-A

NOTES
ALL DIMENSIONS IN MILLIMETRES
SPOT LEVELS IN ITM TO OSI MALIN HEAD DATUM
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Tel: 353 1 703 8000 **Web:** www.esb.ie
Engineering and Major Projects is a division of ESB.

Client: GORT WINDFARMS LTD.

Project: DERRYBRIEN WIND FARM PROJECT

Contract:

Production Unit: CIVIL & ENVIRONMENTAL ENGINEERING

Drawing Title: FIGURE 2.13
DERRYBRIEN 110 kV SUBSTATION
SECTIONAL ELEVATION

DRAWN	PRODUCED	VERIFIED 1	VERIFIED 2	APPROVED	APPROVAL DATE
P.CARROLL	P.CARROLL	C.DOLAN	R.O'DONOVAN	H.O'KEEFFE	07/05/2020

CLIENT REF	No. OF SHTS	SIZE	SCALE
Client Ref. No.	-	A3	1:200

Drawing Number: QS-000280-01-D460-003-013-000
SHEET REV

Compound Size and Construction: The 110kV/20kV Substation consists of a compound (approximately 58.5m x 27.1m) containing outdoor electrical equipment and a Control Building.

The foundations for the control building, the electrical equipment steelwork and transformer within the compound comprise reinforced concrete pads or plinths supported on the granular rockfill or the underlying firm or stiff glacial till. The compound hardstanding is capped with hardcore surfacing.

Other features include a reinforced concrete transformer bund support, external cable trenching, standby generator and bunded diesel tank, external lighting poles, lightning mast, palisade fencing and a well supplying non drinking water.

There is a 4m wide hardcore surfaced access track around the external perimeter of the substation.

Control Building:

The Control Building is a single storey building (22.86m x 8.83m) with pitched roof, double leaf cavity blockwork walls, pre-cast concrete ceiling slabs with wooden roof trusses overlain with felt and slates. The internal floor is a reinforced concrete slab, cast in-situ.

Equipment contained in the control building includes a Supervisory Control and Data Acquisition (SCADA) system, which allows for off-site monitoring via a telephone connection. The following is located with the control building-control room, MV switchgear room, relay room (protection relays) battery room, toilet, workshop and office area.

Substation Drainage: The substation site is finished on 50 mm single size clean compound stone. The permeable compound stone provides a means of attenuation of runoff and allows rainwater to infiltrate to ground. Rainwater from the roof of the control building connects via downpipes away from the compound into the wind farm drainage system. There is a proprietary pump that directs drainage to an oil separator ((Butler Manufacturing Services) Ltd. PIF Class 1 Full Retention Oil Separator) when oil is detected before discharge to the site drainage network. The concrete access road within the compound is cambered to drain to the permeable compound stone.

The welfare facilities in the control building of Derrybrien Substation consists of one toilet and two sinks. An Envirocare P6 sewage treatment plant unit caters for the wastewater generated in these facilities. It is regularly serviced under a maintenance contract with a private service company.

The grid transformer is located within an impermeable bund capable of oil retention of 110% of oil volume in the event of a leakage from the transformer.

Electrical Equipment: The station contains outdoor and indoor electrical equipment.

The outdoor electrical equipment within the substation compound comprises

- 1 70 MVA Transformer 110 kV/MV
- Cable chair
- 3 surge arresters
- 1 NER (Neutral Earth Resistor)
- 1 Busbar Disconnect
- 1 Circuit Breaker
- 3 Current Transformers
- 3 Voltage Transformers
- 1 Line/Earth Disconnector
- 2 capacitor banks
- 6 Post Insulators
- 1 End Mast
- 1 house transformer

The indoor electrical equipment within the substation control room comprises

- Control and protection panels
- Batteries
- MV metal enclosed switchgear

Electrical insulating material: Sulphur Hexafluoride (SF_6) is used as insulating material in the substation switchgear -specifically the outdoor Siemens 110 kV circuit breaker (8.10kg SF6), the two capacitor bank units (2 x0.34kg SF6) and in the ten 20 kV radial circuit breakers within the control building. The equipment containing SF6 is labelled and sealed.

There is a maintenance contract in place in relation to testing and monitoring of SF_6 containing equipment.

There is an alarm system in the switch room to alert operator to any loss of SF6.

2.6.6 Grid connection

2.6.6.1 Overview

The electricity generated at Derrybrien Wind Farm is transmitted from the 20kV/110kV Derrybrien Substation via a 7.8km overhead line to the national grid at Agannygal 110kV Substation on the Ennis-Shannonbridge 110kV Line. There are a total of 45 structures in the grid connection for the project, 43 on the constructed 110kV Derrybrien-Agannygal OHL and a further 2 end masts, within Agannygal Substation compound, to connect the project into the pre existing Ennis-Shannonbridge 110kV OHL.

2.6.6.2 Overhead Line

The 7.8km Derrybrien –Agannygal 110kV overhead line (with earth wires) is supported on double pole sets and mast structures, 43 structures in total. Of these

34 are double wood polesets (PS), 2 are end masts (EM) (1 end mast within Derrybrien Substation), 6 angle masts (AM) and 1 intermediate mast (IM). The location of the overhead line structures is set out in **Table 2.12** and mapped on **Figure 2.14: Derrybrien-Agannygal 110kV Overhead Line Route (Sheet 1 of 2)** and **Figure 2.15: Derrybrien-Agannygal 110kV Overhead Line Route (Sheet 2 of 2)**.

The following mast types were used:

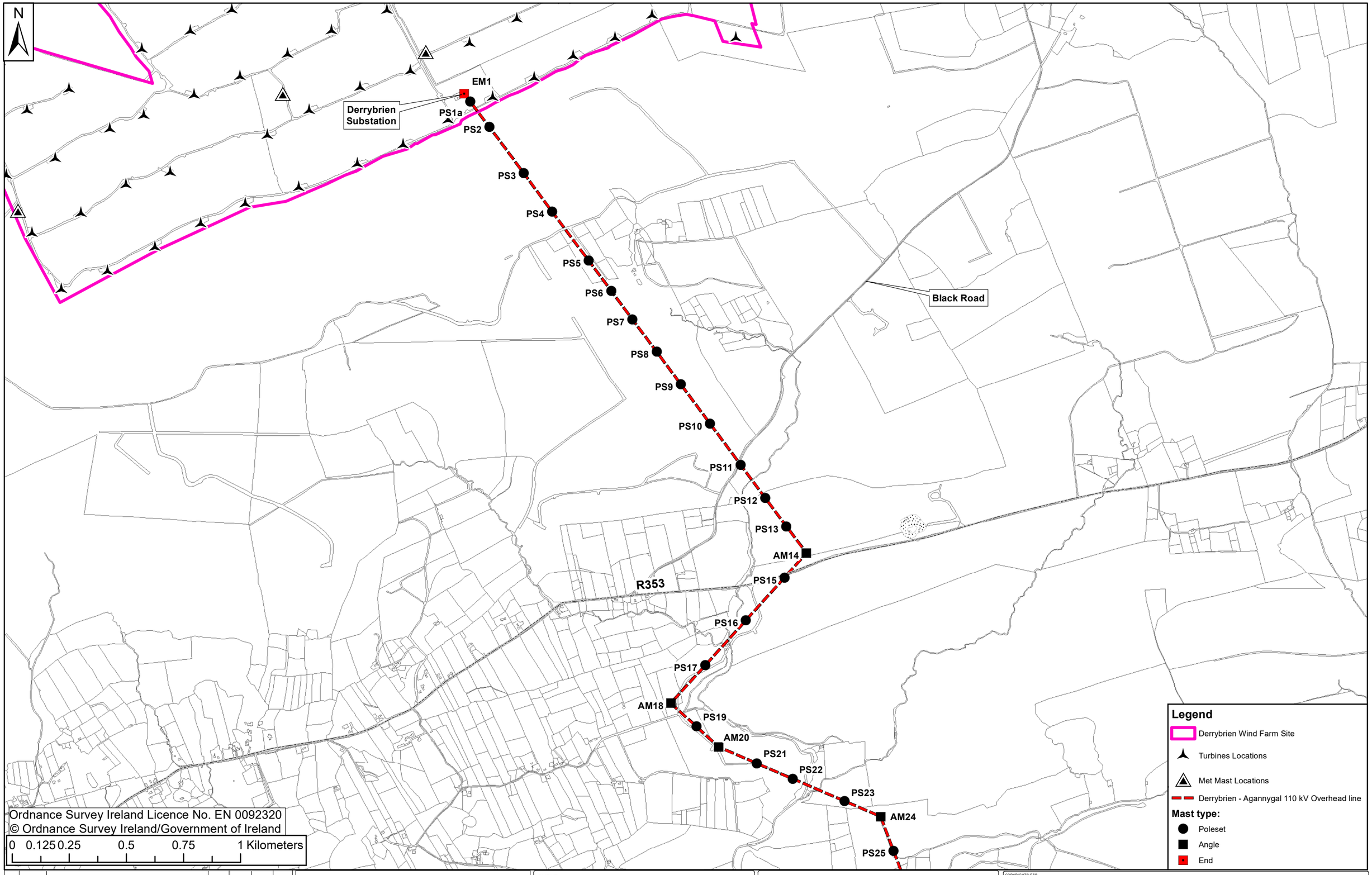
- Type 61 -Structure Nos 1, 14,30, 34, 41
- Type 60-Structure Nos 18, 20, 24
- Type 149E-Structure No 38.

The height of the masts above ground ranges between approximately 13.4 and 20.1m.

The following foundation types were used for the 9 mast structures:

- Type B-Structure Nos 14, 18, 30
- Type C-Structure Nos 1, 20, 24, 34, 41
- Type D-Structure No 38

Drawings of the mast types and foundation types are presented in Appendix 2.2.



REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP
0	05/05/20	Issued for substitute consent	E.O'S	E.O'S	R.O'D	H.O'K

PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

CLIENT APPROVAL ☐ PLANNING ☒ TENDER ☐ CONSTRUCTION ☐ AS-BUILT ☐

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CLIENT: **Gort Windfarms Ltd**

PROJECT: **Derrybrien Wind Farm Project**

CONTRACT

PRODUCTION UNIT: **Civil & Environmental Engineering**

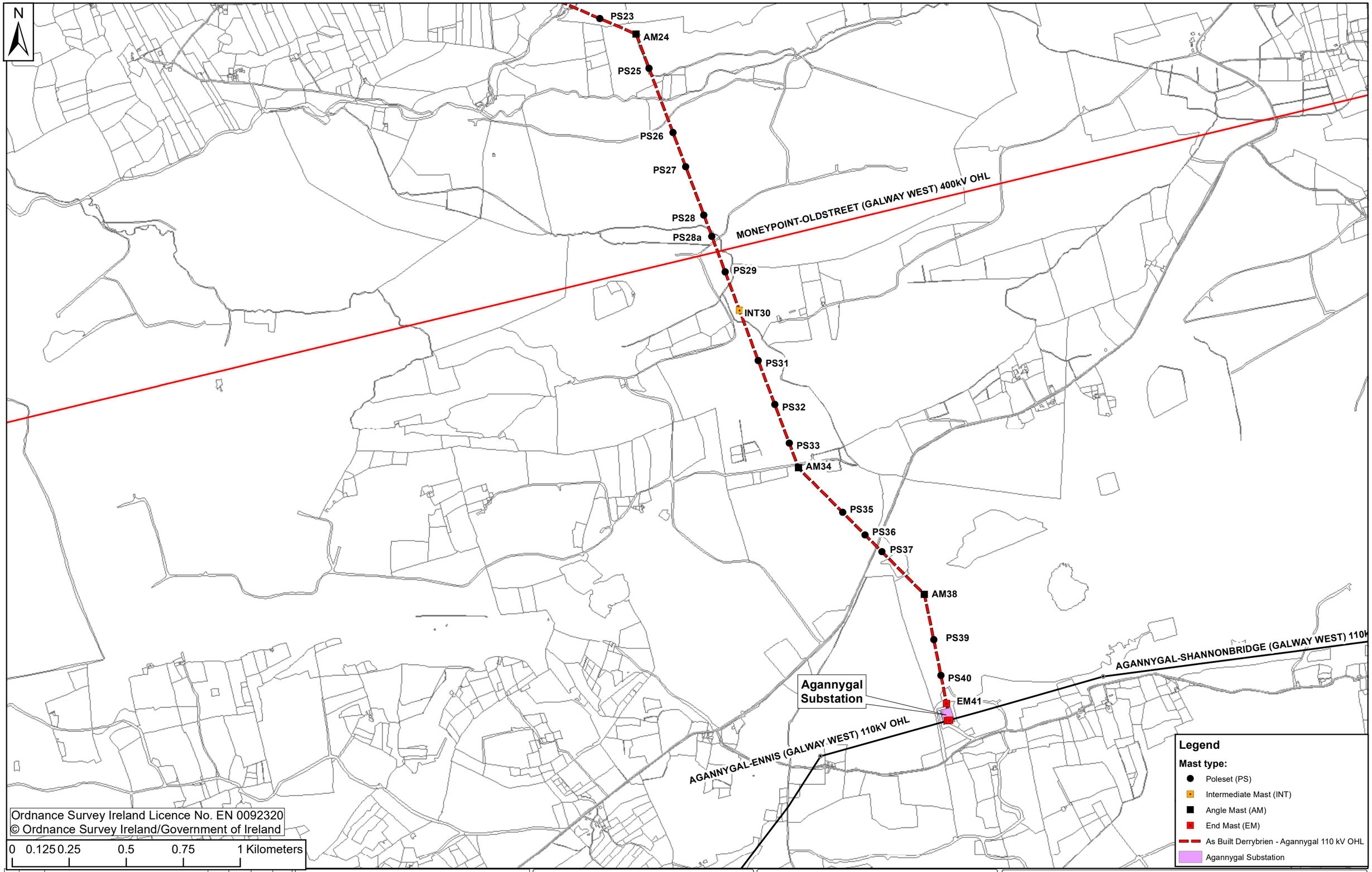
DRAWING TITLE:

Figure 2.14 - Derrybrien - Agannygal 110kV Overhead Line Route (Sheet 1 of 2)

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	R.O'Donovan	H.O'Keeffe	14/05/2020

CLIENT REF.	NO. OF SHEETS	SIZE	SCALE
00-00	1/2	A3	1:15,000

DRAWING NUMBER: **QS-000280-01-D460-003-014-000**



0 0.125 0.25 0.5 0.75 1 Kilometers

REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP
0	04/08/20	Issued for substitute consent	E.O'S	E.O'S	P.K	J.McL

PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

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PROJECT: **Derrybrien Wind Farm Project**

CONTRACT

PRODUCTION UNIT: **Civil & Environmental Engineering**

DRAWING TITLE: **Figure 2.15 - Derrybrien - Agannygal 110kV Overhead Line Route (Sheet 2 of 2)**

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	P.Kavanagh	J.McLoughlin	04/08/2020

CLIENT REF.	NO. OF SHEETS	SIZE	SCALE
00-00	2/2	A3	1:15,000

DRAWING NUMBER: **QS-000280-01-D460-003-015-000**

Table 2.12: Overhead Line Structure Locations

No	Centre Point Easting (ITM)	Centre Point Northing (ITM)	Ground Level (mOD)	Length of pole above ground (m)	No	Centre Point Easting (ITM)	Centre Point Northing (ITM)	Ground Level (mOD)	Length of pole above ground (m)
EM1 Station	559934	704741	330	17.1	PS22	561372	701743	118	19.0
PS1a	559961	704706	328	15.5	PS23	561599	701645	126	19.9
PS2	560045	704595	319	19.5	AM24	561757	701577	129	13.9
PS3	560195	704393	298	16.8	PS25	561814	701427	125	19.2
PS4	560319	704225	277	18.4	PS26	561919	701145	128	19.1
PS5	560479	704011	247	17.9	PS27	561975	700996	122	20.2
PS6	560577	703878	242	16.8	PS28	562055	700783	118	17.0
PS7	560670	703753	236	17.6	PS28a	562089	700690	119.	12.1
PS8	560777	703611	226	19.9	PS29	562148	700535	122	11.9
PS9	560883	703469	224	19.1	IM 30	562211	700366	128	20.1
PS10	561011	703297	205	19.3	PS31	562293	700146	151	19.0
PS11	561144	703117	184	19.8	PS32	562365	699953	155	20.1
PS12	561252	702972	186	15.2	PS33	562429	699785	169	18.4
PS13	561345	702846	175	18.4	AM34	562469	699675	171	19.8
AM14	561432	702731	170	16.9	PS35	562663	699480	188	17.7
PS15	561336	702623	158	19.8	PS36	562761	699382	191	16.3
PS16	561167	702436	146	19.3	PS37	562835	699307	191	18.7
PS17	560989	702239	146	20.2	AM38	563021	699120	199	16.0
AM18	560839	702073	143	15.4	PS39	563062	698922	199	18.3
PS19	560951	701971	138	16.9	PS40	563093	698765	197	15.6
AM20	561048	701882	137	13.4	EM41	563118	698642	193	15.4
PS21	561215	701810	131	19.5					

2.6.6.3 Agannygal Substation

Compound Size and Construction: The 110kV Substation consists of a compound (approximately 63m x 47.5m) containing outdoor electrical equipment and a Control Building.

The foundations for the control building, the electrical equipment steelwork and transformer within the compound comprise reinforced concrete pads or plinths supported on the granular rockfill or the underlying firm or stiff glacial till. The compound hardstanding is capped with hardcore surfacing.

Other features include external cable trenching, standby generator (bunded) and diesel tank, external lighting poles, lightning mast, palisade fencing and a well supplying non drinking water.

There is a wide hardcore surfaced access track around the external perimeter of the substation.

Control Building: The Control Building is a single storey building (14.5m x 8.9m) with pitched roof, double leaf cavity blockwork walls, pre-cast concrete ceiling slabs and wooden roof trusses overlain with felt and slates. The internal floor is a cast in-situ reinforced concrete slab. The control building comprises the control room, battery room, store room and toilet.

Compound Drainage: Clean surface water drainage from the control building roof is collected by guttering and downpipes and directed to the substation drainage system. Land drains surrounding the substation compound collect surface water runoff which drains downhill offsite along the edge of the access road constructed to the substation.

The wastewater from the control room is treated by a Biocycle wastewater treatment system.

Electrical Equipment: The station contains outdoor and indoor electrical equipment.

The outdoor electrical equipment within the substation compound comprises

- 2 end masts
- 1 line bay gantry
- 4 line traps (Telecoms Equipment)
- 1 busbar
- 5 post insulators
- 3 line/earth disconnects
- 9 current transformers
- 9 voltage transformers
- 3 circuit breakers
- 5 busbar disconnectors

The location and height of masts is detailed in **Table 2.13**.

Table 2.13: Agannygal Substation mast locations

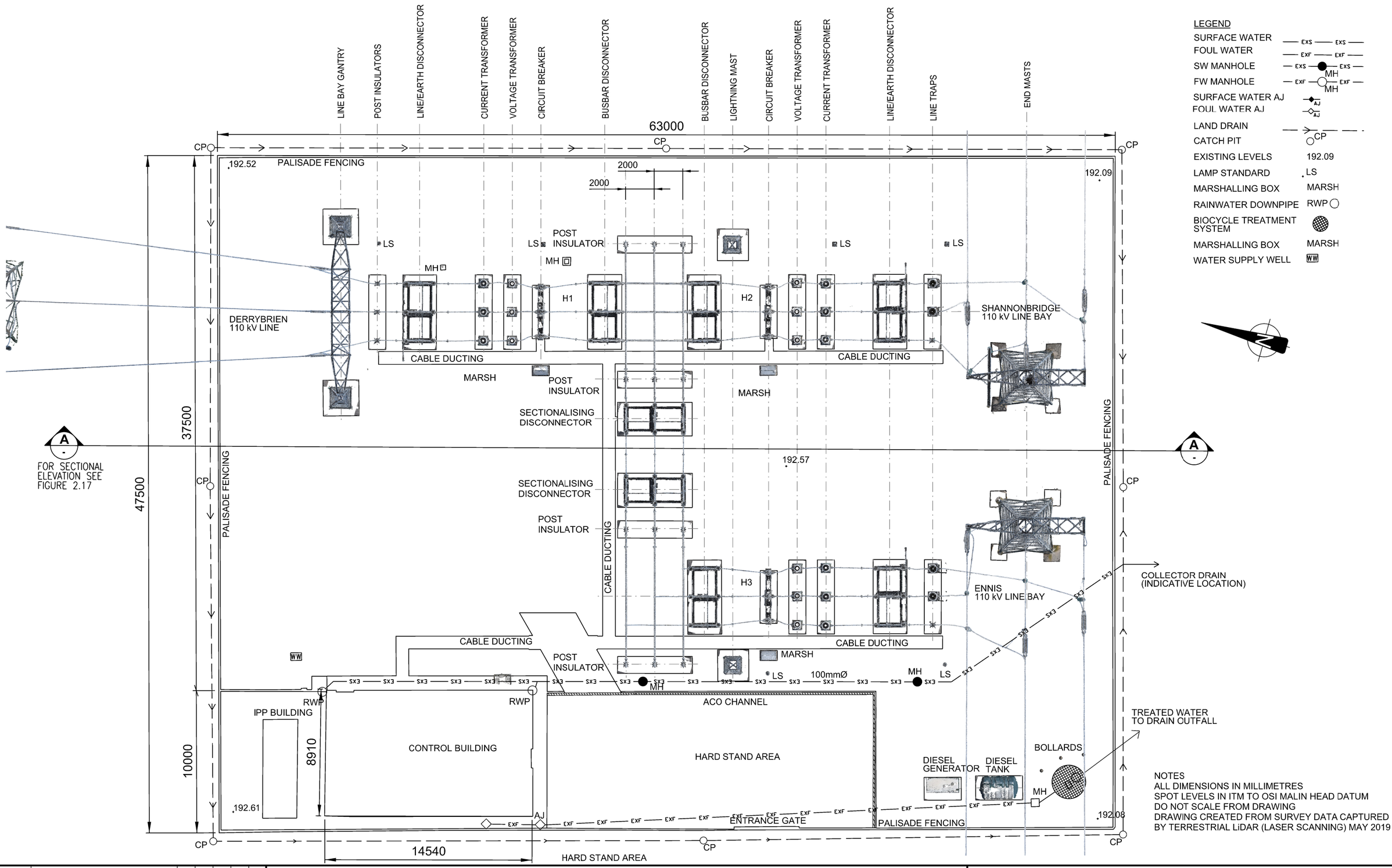
Centre Point Easting (ITM)	Centre Point Northing (ITM)	Ground Level (mOD)	Height of mast above ground (m)
563122	698567	192	12.7
563132	698570	192	12.7

The indoor electrical equipment within the substation control room comprises

- Control and protection panels
- Batteries

See **Figure 2.16: Agannygal Substation - Layout Plan**.

See **Figure 2.17: Agannygal Substation - Sectional Elevation**.



Rev.	Date	Revision Description	Drn.	Prod.	Ver.1	Ver.2	App.

Purpose of issue - Preliminary unless indicated

Client Approval ☐ Planning ☐ Tender ☐ Construction ☐ As-built ☐

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Project: DERRYBRIEN WIND FARM PROJECT

Contract:

Production Unit: CIVIL & ENVIRONMENTAL ENGINEERING

Drawing Title: FIGURE 2.16 AGANNYGAL 110 kV SUBSTATION LAYOUT PLAN

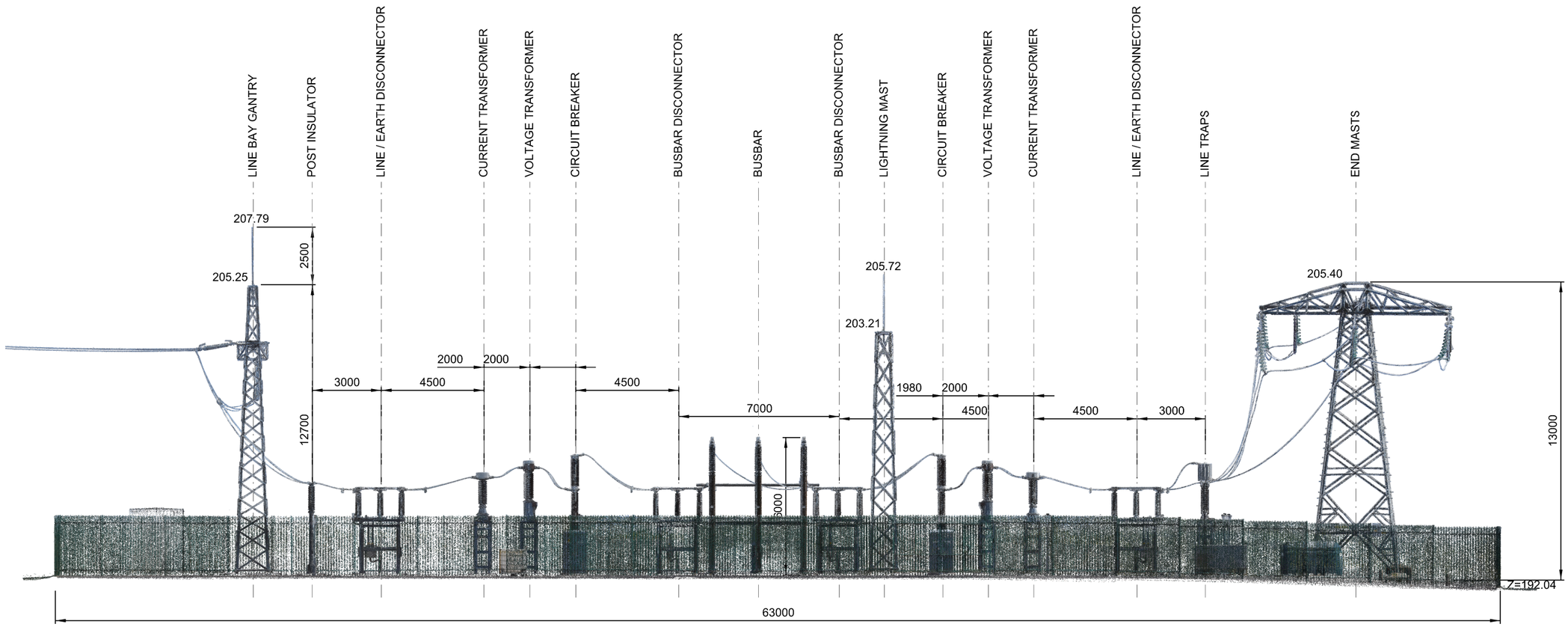
PLANNING

DRAWN	PRODUCED	VERIFIED 1	VERIFIED 2	APPROVED	APPROVAL DATE
P.CARROLL	P.CARROLL	C.DOLAN	R.O'DONOVAN	H.O'KEEFFE	07/05/2020

CLIENT REF	No. OF SHTS	SIZE	SCALE
Client Ref. No.	-	A3	1:250

Drawing Number: QS-000280-01-D460-003-016-000

SHEET REV



SECTION A-A

NOTES

ALL DIMENSIONS IN MILLIMETRES

SPOT LEVELS IN ITM TO OSI MALIN HEAD DATUM

DO NOT SCALE FROM DRAWING

DRAWING CREATED FROM SURVEY DATA CAPTURED BY TERRESTRIAL LiDAR (LASER SCANNING) MAY 2019

Rev.	Date	Revision Description	Drn.	Prod.	Ver.1	Ver.2	App.

Purpose of issue - Preliminary unless indicated

Client Approval ☐ Planning ☐ Tender ☐ Construction ☐ As-built ☐

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Project: DERRYBRIEN WIND FARM PROJECT

Contract:

Production Unit: CIVIL & ENVIRONMENTAL ENGINEERING

Drawing Title: FIGURE 2.17 AGANNYGAL 110 kV SUBSTATION SECTIONAL ELEVATION

DRAWN	PRODUCED	VERIFIED 1	VERIFIED 2	APPROVED	APPROVAL DATE
P.CARROLL	P.CARROLL	C.DOLAN	R.O'DONOVAN	H.O'KEEFFE	07/05/2020

CLIENT REF	No. OF SHTS	SIZE	SCALE
Client Ref. No.	-	A3	1:200

Drawing Number: QS-000280-01-D460-003-017-000 SHEET REV

2.6.6.4 Connection to Ennis-Shannonbridge 110kV Line

The Derrybrien-Agannygal overhead line was connected to the National Grid on the Ennis-Shannonbridge (Galway West) 110kV line. The connection entailed the removal of an approximately 1.3km long line span, on the pre-existing Ennis-Shannonbridge overhead line and replacement with 2 spans emanating from Agannygal Substation comprising:

- End mast and Agannygal-Shannonbridge line span (approximate length 0.7km)
- End mast and Agannygal-Ennis line span (approximate length 0.6km)

See **Figure 2.18: Connection Works to Ennis-Shannonbridge 110kV Line**.

2.6.7 Works associated with peat slide

2.6.7.1 Overview

In the response to the peat slide, works were undertaken to minimise effects on lands and receiving watercourses. The works remaining in place in 2020 associated with the peat slide comprise:

- Borrow Pit adjacent to Barrage 1
- Rebuilt access track/embankment at T68 - (within wind farm site)
- Rebuilt access track/embankment between T23 and T70 – (within wind farm site)
- Barrage 1 including
  an access track
- Barrage 2 & associated repository area and access track
- Barrage 3 & associated repository area
- Barrage 4
- Repository area at the Black Bridge
- Repairs to instream structures/bridges

The access tracks at turbine 68 (T68) and between T23 and T70 are located within the wind farm site and Barrages 1,2,3 and 4 together with associated peat/soil repository areas are outside the wind farm site.

It is noted that the temporary earthen barrages constructed following the peat slide are no longer in place (Refer subsection 2.2.3.4) and that dimensions of these structures are not available.

2.6.7.2 Borrow Pit/Quarry adjacent to Barrage 1

The borrow pit/quarry was opened up adjacent to Barrage 1 as a source of rock for the barrages built in response to the peat slide (approximate area 2314m^2).

See **Figure 2.19: Borrow Pit/Quarry adjacent to Barrage1-Plan and Section**.

Please Note:
Structures on both the Agannygal – Ennis and Agannygal – Shannonbridge Lines numbered sequentially from Agannygal Substation

Agannygal-Shannonbridge (Galway West)

Agannygal 110 kV Substation

Agannygal-Ennis (Galway West)

Line restrung between End Mast 1 and Angle Mast 5 for Agannygal -Shannonbridge (Galway West) Line

Line restrung between End Mast 1 and Angle Mast 4 for Agannygal -Ennis (Galway West) Line

Incoming Derrybrien - Agannygal 110kV Line

2 no. End Masts were installed to connect the exisitng Ennis – Shannonbridge 110 kV Line into Agannygal Substation

1:1,000

0 10 20 40 60 80 Meters

Legend

- Mast
- Poleset
- Agannygal-Shannonbridge 110kV Line
- Agannygal-Ennis 110kV Line
- Agannygal 110 kV Substation

0 55 110 220 330 440 Meters

Rev	Revision Description

Purpose of Issue - Preliminary unless indicated

Tender ☐ Client Approval ☐ Construction ☐ As-built ☒ Revised ☐

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CLIENT: **Gort Windfarms Ltd.**

PROJECT: **Derrybrien Wind Farm Project**

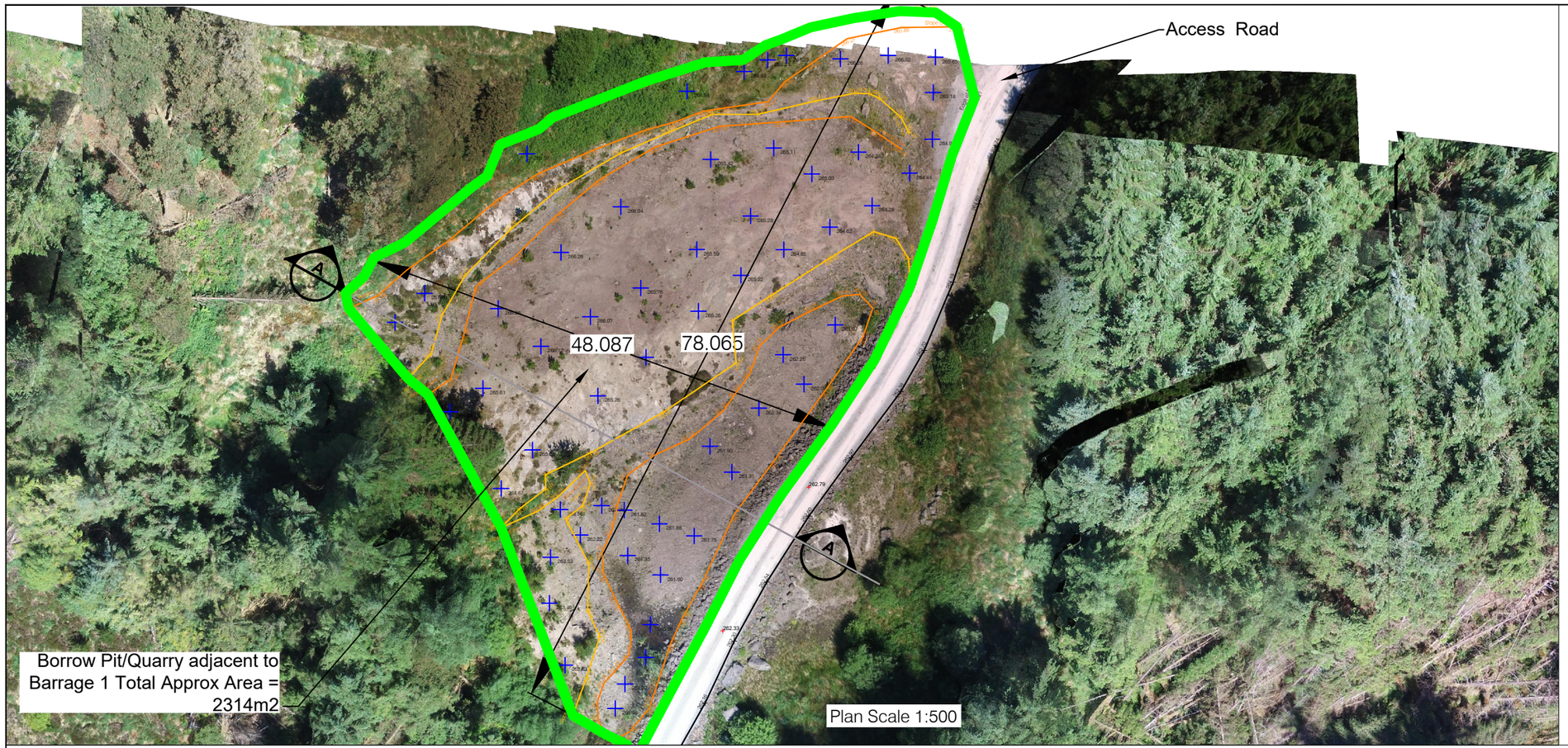
PRODUCTION UNIT: **High Voltage Engineering**

DRAWING TITLE:
Figure 2.18
Grid connection works undertaken to Ennis-Shannonbridge OHL span

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVED DATE
GMM	GMM	GB	RO'D	May 2020

CLIENT REF.	NO. OF SHTS	SIZE	SCALE
-	1 of 1	A3	1:3,500

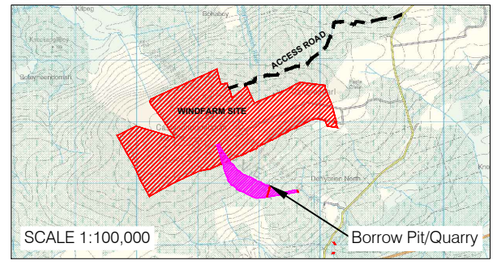
DRAWING NUMBER: **QS-000280-01-D460-003-018-000** SHEET REV



LEGEND

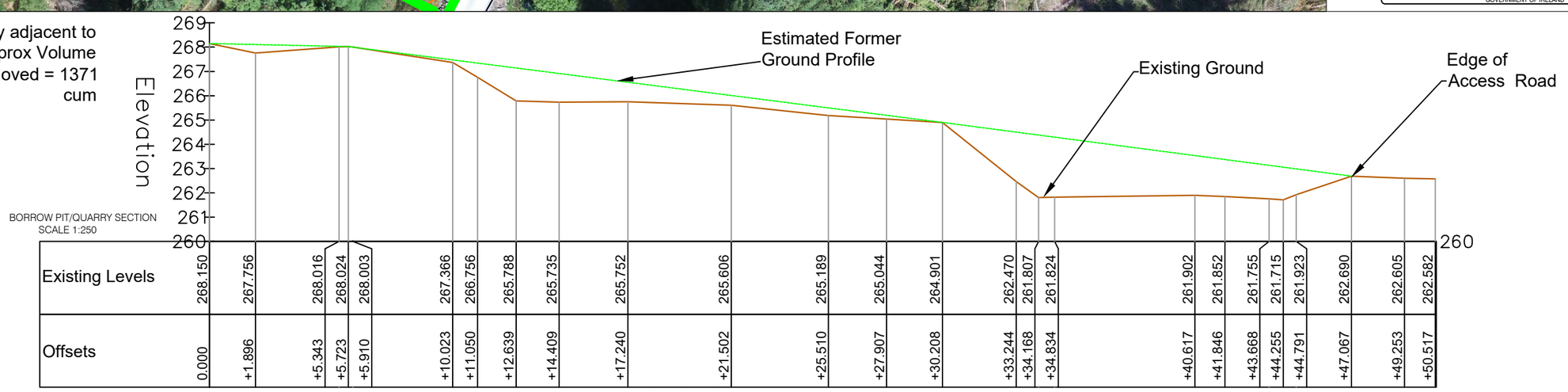
- Edge of Road
- Spotheight
- Section
- Extent of Borrow Pit/Quarry
- Top of Slope
- Bottom of Slope

KEY PLAN



Note:
All levels in meters above ordnance datum Malin Head
Coordinates are given in Irish Transverse Mercator coordinate system
Topographical survey undertaken on week commencing 16/09/2019
Background imagery taken from ESB EMP Drone

Borrow Pit/Quarry adjacent to Barrage 1 Total Approx Volume of material removed = 1371 cum



BORROW PIT/QUARRY SECTION
SCALE 1:250

Existing Levels	268.150	267.756	268.016	268.024	268.003	267.366	266.756	265.788	265.735	265.752	265.606	265.189	265.044	264.901	262.470	261.807	261.824	261.902	261.852	261.755	261.715	261.923	262.690	262.605	262.582
Offsets	0.000	+1.896	+5.343	+5.723	+5.910	+10.023	+11.050	+12.639	+14.409	+17.240	+21.502	+25.510	+27.907	+30.208	+33.244	+34.168	+34.834	+40.617	+41.846	+43.668	+44.255	+44.791	+47.067	+49.253	+50.517

Section A

Rev	Date	Revision description	Drn.	Prod.	Ver.	App
0	05.05.20	ISSUED FOR SUBSTITUTE CONSENT	DT	DT	AT	RO'D

Purpose of issue - Preliminary unless indicated

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Tel: 353 1 703 8000 Web: www.esb.ie
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Client Gort Windfarms Ltd

Project Derrybrien Wind Farm Project

Contract

Drawing title
Figure 2.19
Borrow Pit/Quarry Adjacent to Barrage 1
Plan and Section

Production unit Civil & Environmental Engineering

Drawn	Produced	Verified	Approved	Approval date
D. Treanor	D. Treanor	A. Tuite	R. O'Donovan	05.05.2020

Client ref.	No. of sheets	Size	Scale
	1	A3	As Shown

Drawing number QS-000280-01-D460-003-019-000 | SHEET | REV

2.6.7.3 Wind Farm Access Track at T68

The original access track at T68 within the wind farm site is located in the vicinity of the head of the peat slide.

The track was rendered effectively unusable following the peat slide in 2003 and was reinstated along its original route by removing all peat below the track and re-constructing the track on mineral soil using coarse fill. The reconstructed access track varies in width due to the hardstand at turbine T68.

The reconstructed access track acted as a containment measure following the peat slide.

The access track forms part of the access track network within the wind farm site and it is envisaged that it will remain in place in the long term.

2.6.7.4 Wind Farm Access Track T23-T70

Following the 2003 peat slide, part of the access track between T23-T70 was reinstated along its original route by removing all peat below the track and re-constructing the track on mineral soil using coarse fill. As with the access track at T68, the access track acted as a containment measure following the peat slide.

The width of the access track varies from 3.5 to 5m wide at its surface. A small berm approximately 300mm high carrying services buried in concrete is located on the upslope side of the access track.

The access track forms part of the access track network within the wind farm site and it is envisaged that it will remain in place in the long term.

2.6.7.5 Barrage 1

The barrage was constructed as a containment measure shortly after the peat slide occurred. The barrage was built along the line of the pre-existing Coillte track located upstream of the main gorge. A Coillte access track was rebuilt over the barrage.

This is a low embankment constructed using boulders and crushed rock. A sump on the upslope side of the barrage is provided for drainage purposes.

The barrage functioned as a containment/stability measure for a number of years after the peat slide.

Although Barrage 1 is no longer required as a containment/stability measure, as the access track over the barrage forms part of the Coillte forestry access track network, it is envisaged that it will remain in place in the long term.

See

Figure 2.20: Barrage 1 Plan and Sections.

2.6.7.6 Barrage 2 and Repository Area

Barrage 2: The barrage was constructed as a containment measure shortly after the peat slide occurred.

An access track was constructed from an existing Coillte access track in order to access this location.

See **Figure 2.21: Barrage 2 Plan and Sections**.

The barrage functioned as a containment/stability measure for a number of years after the peat slide.

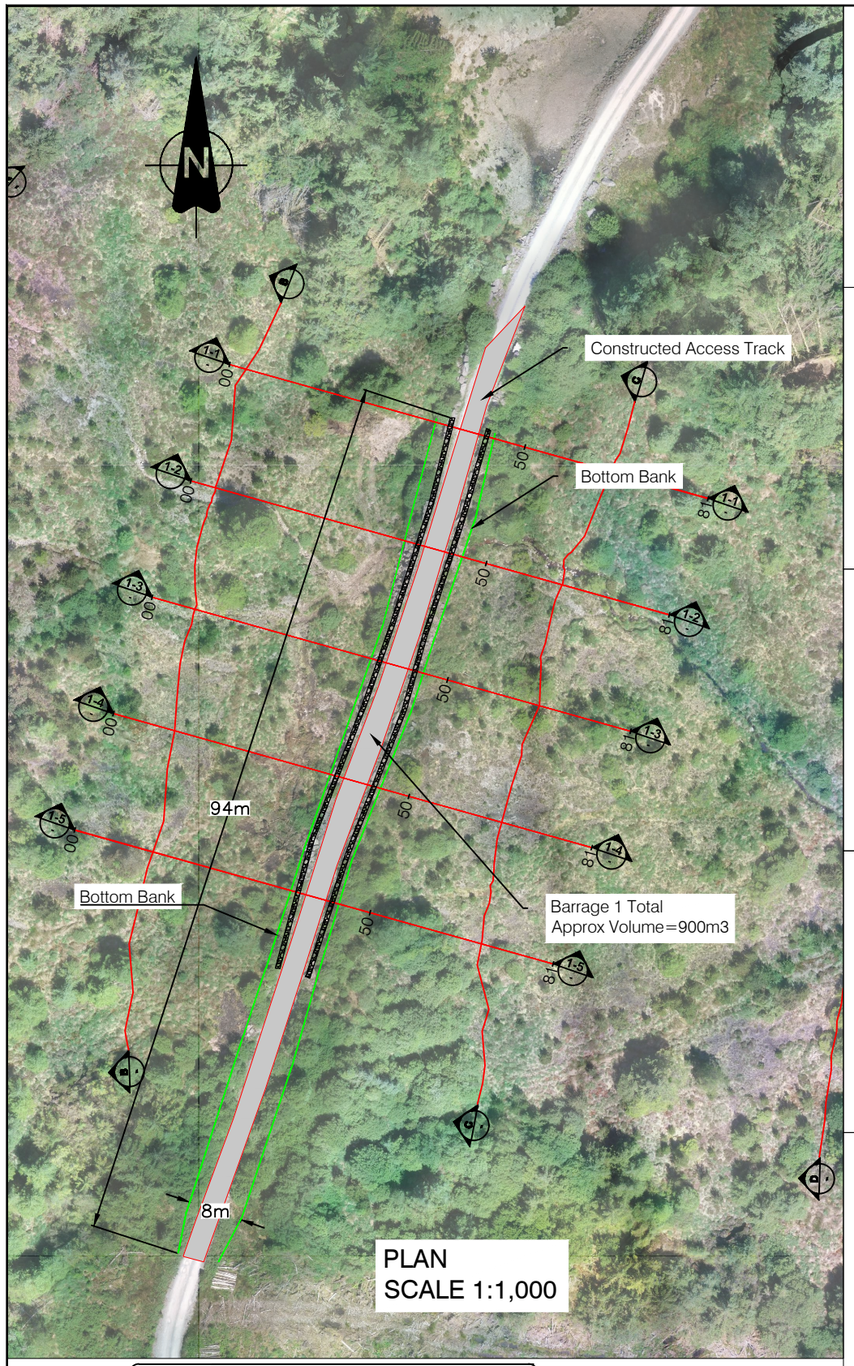
Although Barrage 2 is no longer required as a containment/stability measure, because the access track over the barrage and the access track constructed to it are suitable for use by Coillte, it is envisaged that it will remain in place in the long term.

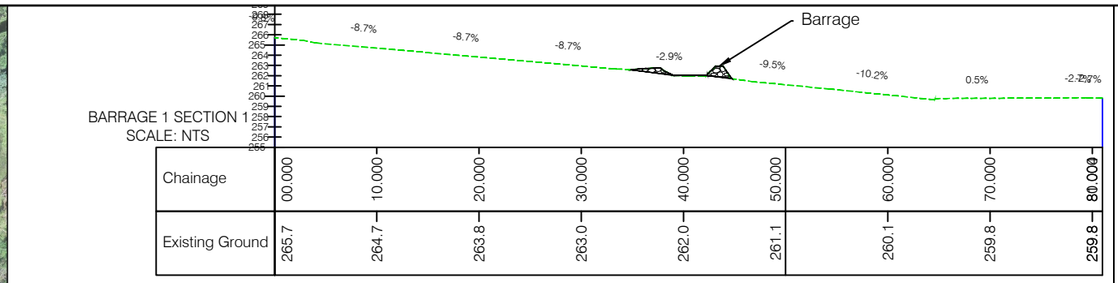
Repository adjacent to Barrage 2: The repository area associated with Barrage 2 contains peat, silt and sand which was removed during construction of the barrage from behind the barrage in the years following the peat slide.

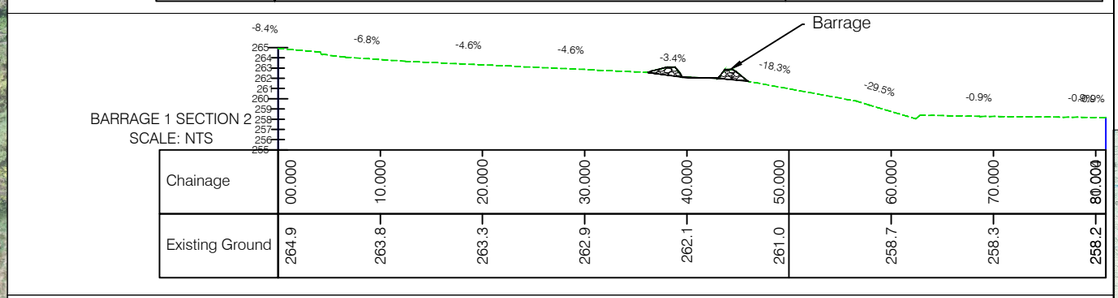
Probing indicates that the placed arisings depth ranges from 0.6 to 1.9m with an average of about 1.6m.

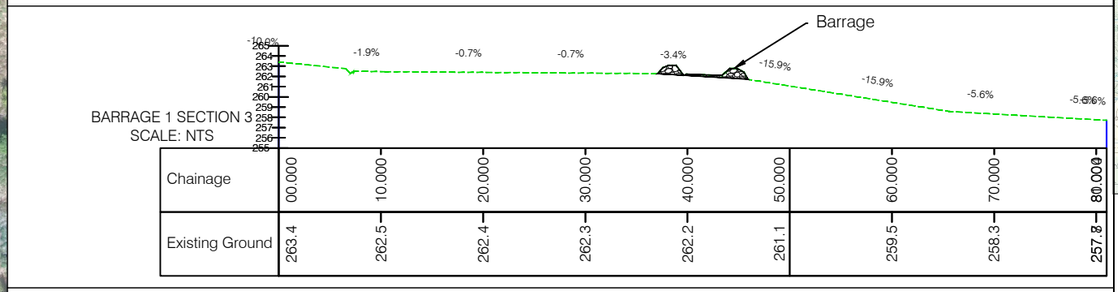
The repository area has become re-vegetated and is partially fenced with post and wire fencing.

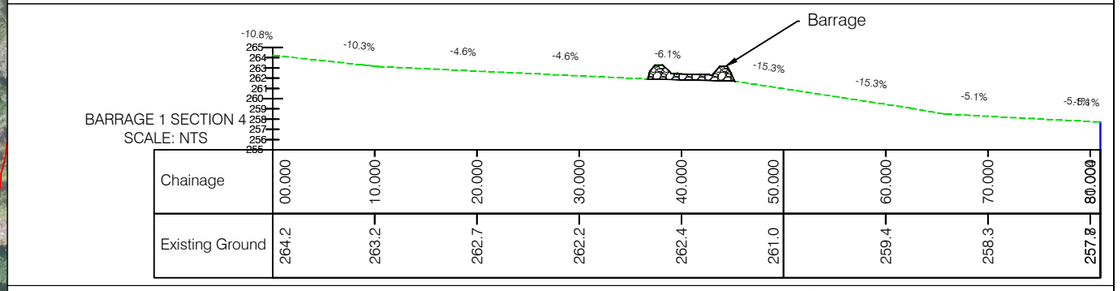
See **Figure 2.22: Peat Repository at Barrage 2**.

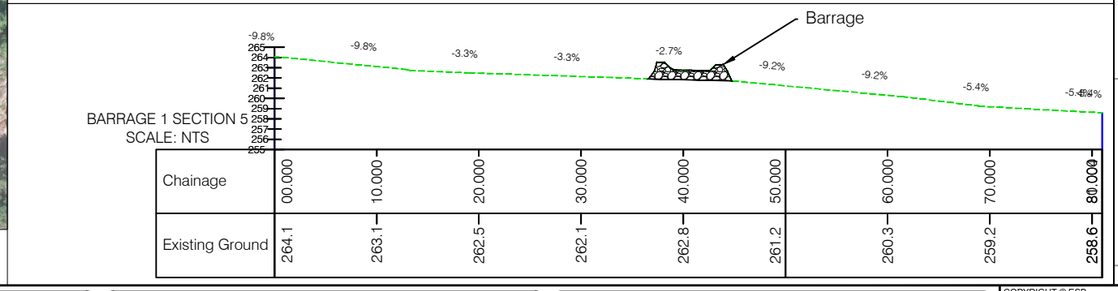








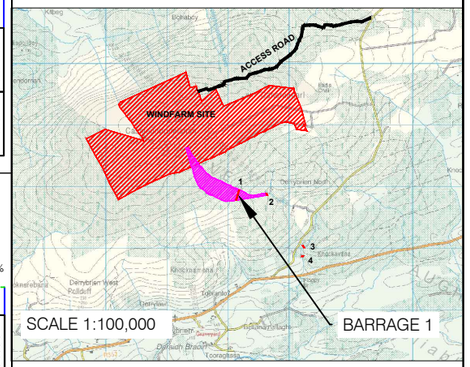




LEGEND

- Bottom Bank
- Stone Barrage
- Constructed Access Track
- Existing Ground

KEY PLAN



Note:
All levels in meters above ordnance datum Malin Head
Coordinates are given in Irish Transverse Mercator coordinate system
Topographical survey undertaken on week commencing 16/09/2019
Background imagery taken from ESB EMP Drone

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0	07.05.20	Issued for substitute consent	LMcM	LMcM	MB	ROD

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Tel: 353 1 703 8000 **Web:** www.esb.ie
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Client Gort Windfarms Ltd

Project Derrybrien Wind Farm Project

Contract

Drawing title
Figure 2.20
Barrage 1 Plan and Sections

Production unit Civil & Environmental Engineering

Drawn	Produced	Verified	Approved	Approval date
LMcM	LMcM	M.Brides	R.O'Donovan	07.05.2020

Client ref.	No. of sheets	Size	Scale
	1	A3	AS SHOWN

Drawing number QS-000280-01-D460-003-020-000 | SHEET | REV

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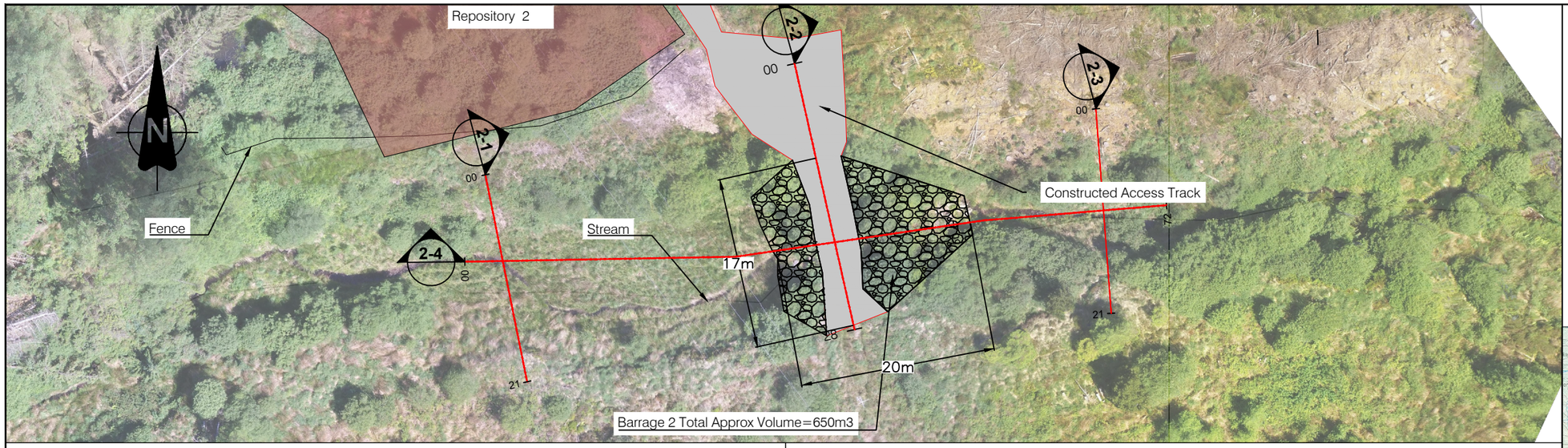
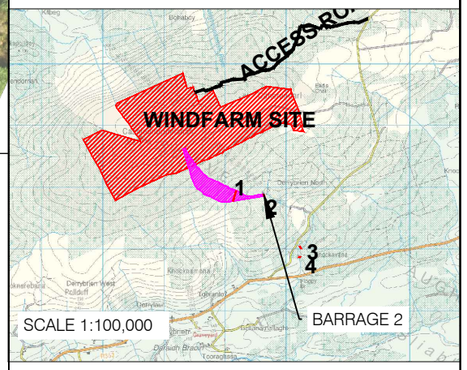


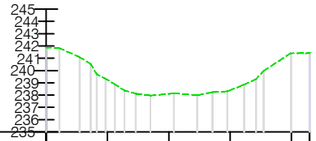
LEGEND

- Stone Barrage
- Constructed Access Track
- Existing Ground

KEY PLAN

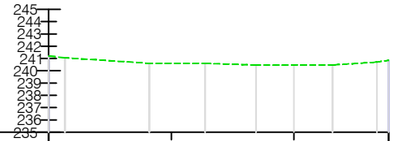


BARRAGE 2 SECTION 1
SCALE: 1:500



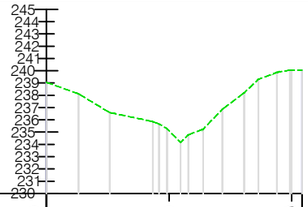
Chainage	00.000	05.000	10.000	15.000	20.000	21.473
Existing Ground	241.9	239.2	238.1	238.4	241.4	241.4

BARRAGE 2 SECTION 2
SCALE: 1:500



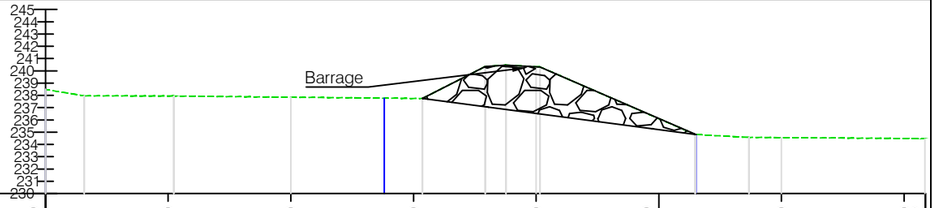
Chainage	00.000	10.000	20.000	27.722
Existing Ground	241.2	240.6	240.5	240.8

BARRAGE 2 SECTION 3
SCALE: 1:500



Chainage	00.000	10.000	20.000
Existing Ground	239.1	235.1	240.0

BARRAGE 2 SECTION 4
SCALE: 1:500



Chainage	00.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	71.735
Existing Ground	238.5	237.9	237.9	237.8	240.3	236.1	234.6	234.5	

Note:
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Client: Gort Windfarms Ltd

Project: Derrybrien Wind Farm Project

Contract:

Drawing title: Figure 2.21 Barrage 2 Plan and Sections

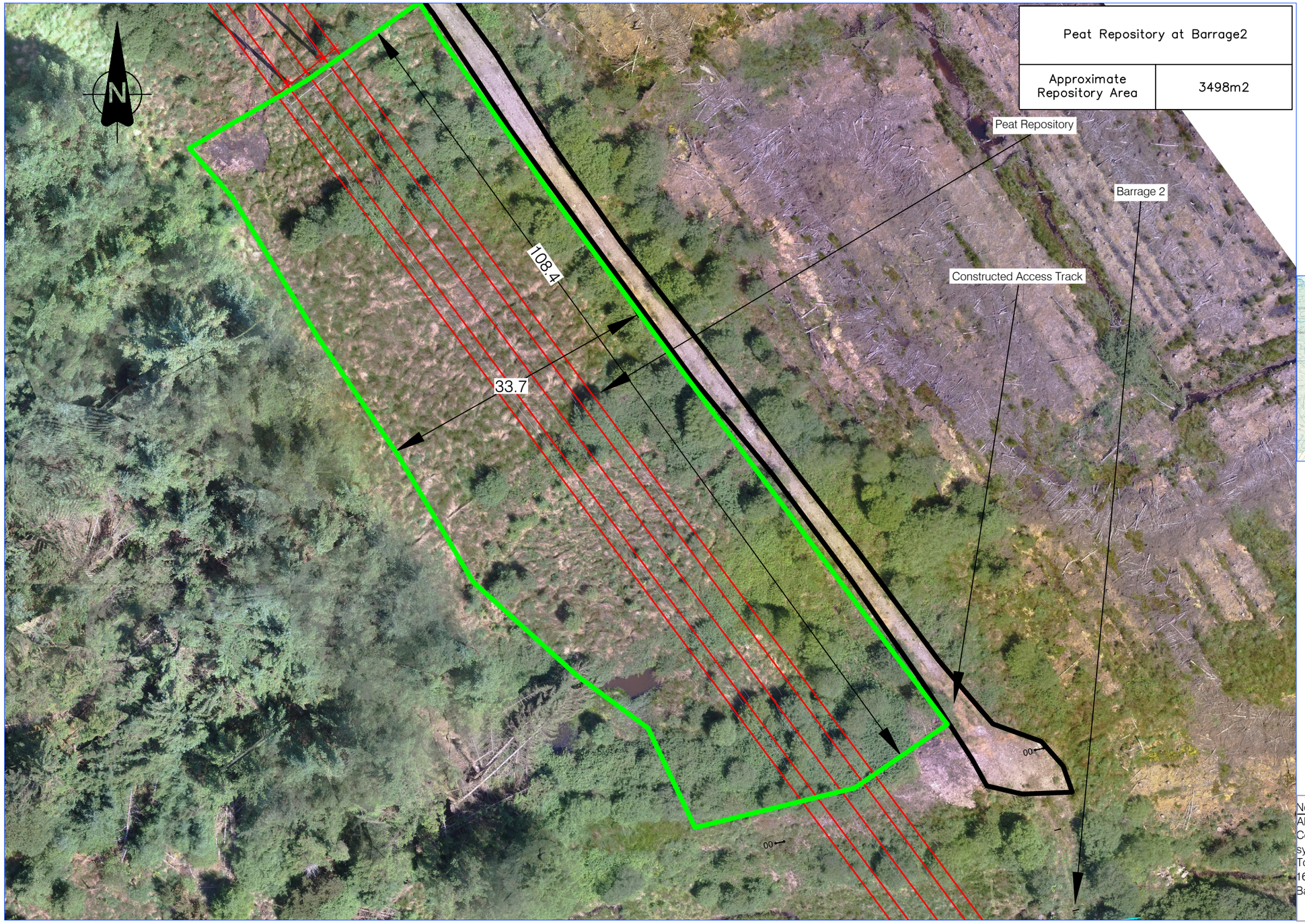
Production unit: Civil & Environmental Engineering

Drawn	Produced	Verified	Approved	Approval date
LMcM	LMcM	M.Brides	R.O'Donovan	07.05.2020

Client ref.	No. of sheets	Size	Scale
	1	A3	1:500

Drawing number: QS-000280-01-D460-003-021-000 | SHEET | REV

w:\eileen o' shea\derrybrien\lmcm\barrage 2 plan and sections(a3).dwg

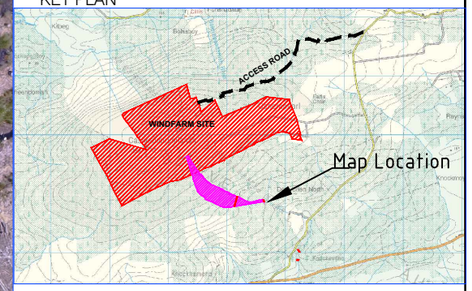


Peat Repository at Barrage2	
Approximate Repository Area	3498m2

LEGEND

- Approximate Extent of Peat Repository
- Overhead Line
- Constructed Access Track

KEY PLAN



Note:
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Client Gort Windfarms Ltd

Project Derrybrien Wind Farm Project

Contract

Drawing title
Figure 2.22
Peat Repository at Barrage 2
Plan

Production unit Civil & Environmental Engineering

Drawn	Produced	Verified	Approved	Approval date
A.Tuite	A.Tuite	M.Brides	R.O'Donovan	14.05.2020

Client ref.	No. of sheets	Size	Scale
	1	A3	1:500

Drawing number QS-000280-01-D460-003-022-000 SHEET REV

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2.6.7.7 Barrage 3 and Repository Area

Barrage: Barrage 3 was constructed as a containment measure shortly after the peat slide. The barrage is a porous structure comprised of boulders within a section of an incised stream which forms a tributary of the Owendalulleegh River and is located over 1km downstream of the site of the peat slide. As of 2020, the barrage is covered by heavy vegetation.

See **Figure 2.23: Barrage 3 & Associated Repository – Plan**.

See **Figure 2.24: Barrage 3 & Associated Repository - Sections**.

The barrage functioned as a containment/stability measure for a number of years after the peat slide. It is no longer required for that purpose and it has no other function and therefore it is proposed that it will ultimately be removed.

The removal of Barrage 3 is assessed in this rEIAR as part of project decommissioning phase activities.

Repository: The repository area adjacent to Barrage 3 contains silt, sand and peat which were removed from the area following the peat slide.

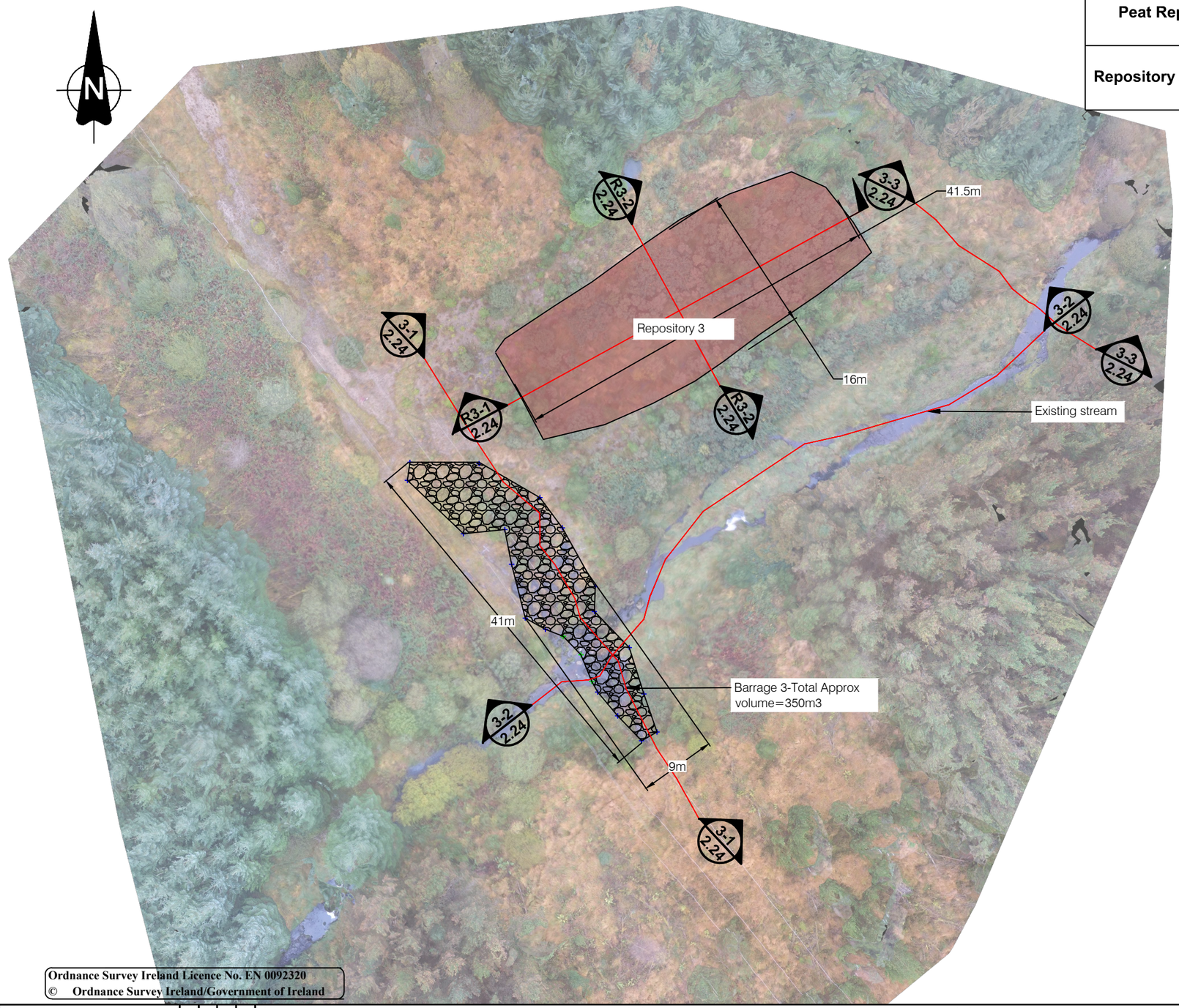
Probing indicates the placed arisings depth ranges from 1.0 to 1.6m.

The repository area has become re-vegetated.

The repository area adjacent to Barrage 3 is fenced with post and wire fencing.

.

Peat Repository at Barrage3	
Repository Area	**596m2**

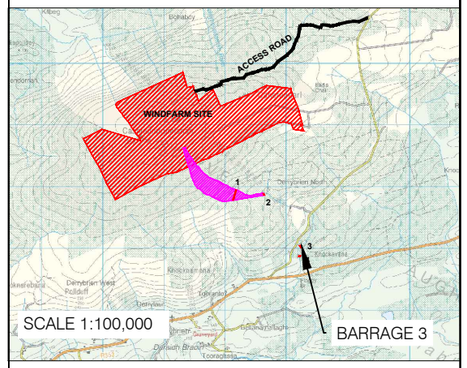


LEGEND

Stone Barrage

Repository 2

KEY PLAN



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Background imagery taken from ESB EMP Drone

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Project Derrybrien Wind Farm Project

Contract

Drawing title
Figure 2.23
Barrage 3 and Associated Repository Area Plan

Production unit Civil & Environmental Engineering

Drawn	Produced	Verified	Approved	Approval date
LMcM	LMcM	M.Brides	R.O'Donovan	07.05.20

Client ref.	No. of sheets	Size	Scale
	1	A3	1:500

Drawing number QS-000280-01-D460-003-023-000 | SHEET | REV

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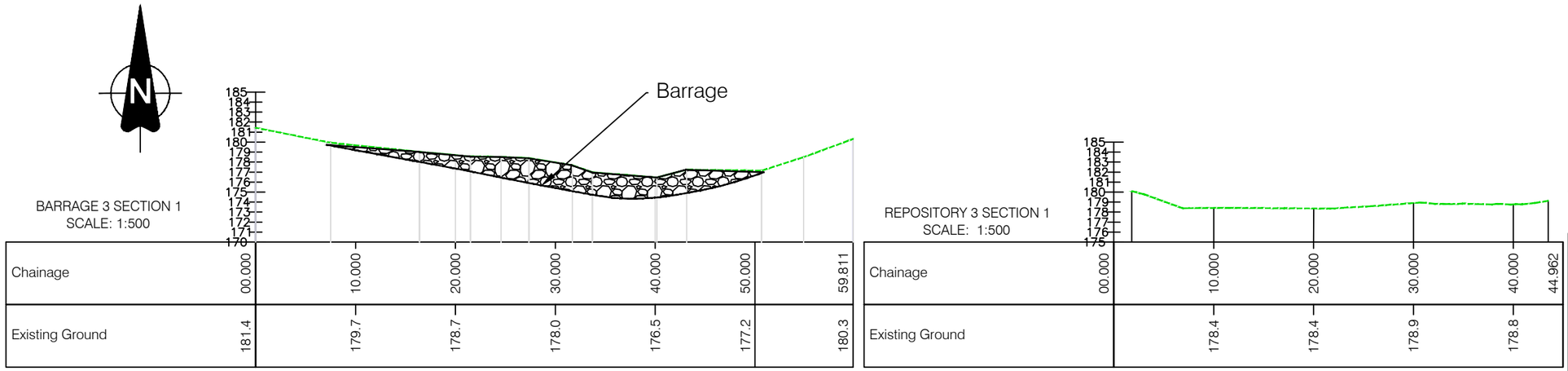
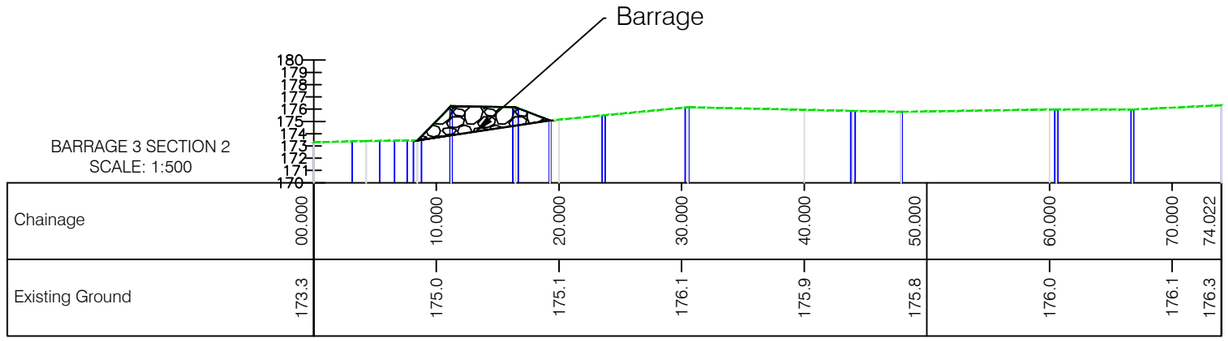
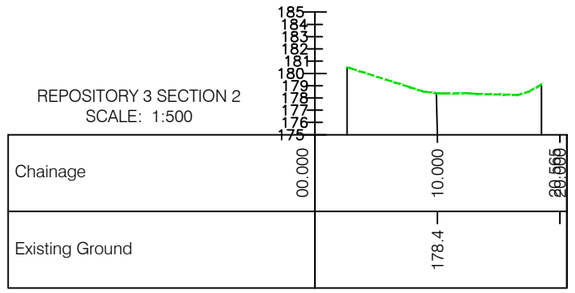
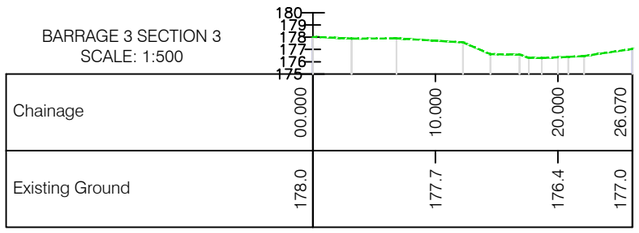






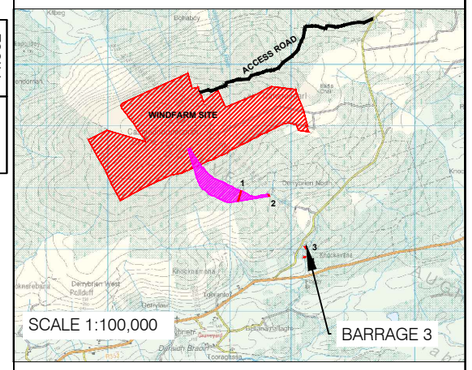


LEGEND

Stone Barrage

Existing Ground

KEY PLAN



Note:
All levels in meters above ordnance datum Malin Head
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Topographical survey undertaken on week commencing 16/09/2019
Background imagery taken from ESB EMP Drone

Rev.	Date	Revision description	Drn.	Prod.	Ver.	App.
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Client Gort Windfarms Ltd

Project Derrybrien Wind Farm Project

Contract

Drawing title
Figure 2.24
Barrage 3 and Associated Repository Area Sections

Production unit Civil & Environmental Engineering

Drawn	Produced	Verified	Approved	Approval date
LMcM	LMcM	M.Brides	R.O'Donovan	07.05.2020

Client ref.	No. of sheets	Size	Scale
	1	A3	1:500

Drawing number QS-000280-01-D460-003-024-000 SHEET REV

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2.6.7.8 Barrage 4

Barrage 4 was constructed as a containment measure shortly after the peat slide. The barrage is a porous structure comprised of boulders placed within a section of stream which forms a tributary of the Owendalulleegh River. The containment barrage is approximately 20m long and 3m wide at the surface. See **Figure 2.25: Barrage 4 Plan and Sections**.

The barrage was required to function as a containment/stability measure for a number of years after the peat slide. It is no longer required for that purpose and has no other function and therefore it is proposed that it will ultimately be removed.

The removal of Barrage 4 is assessed in this rEIAR as part of decommissioning phase activities.

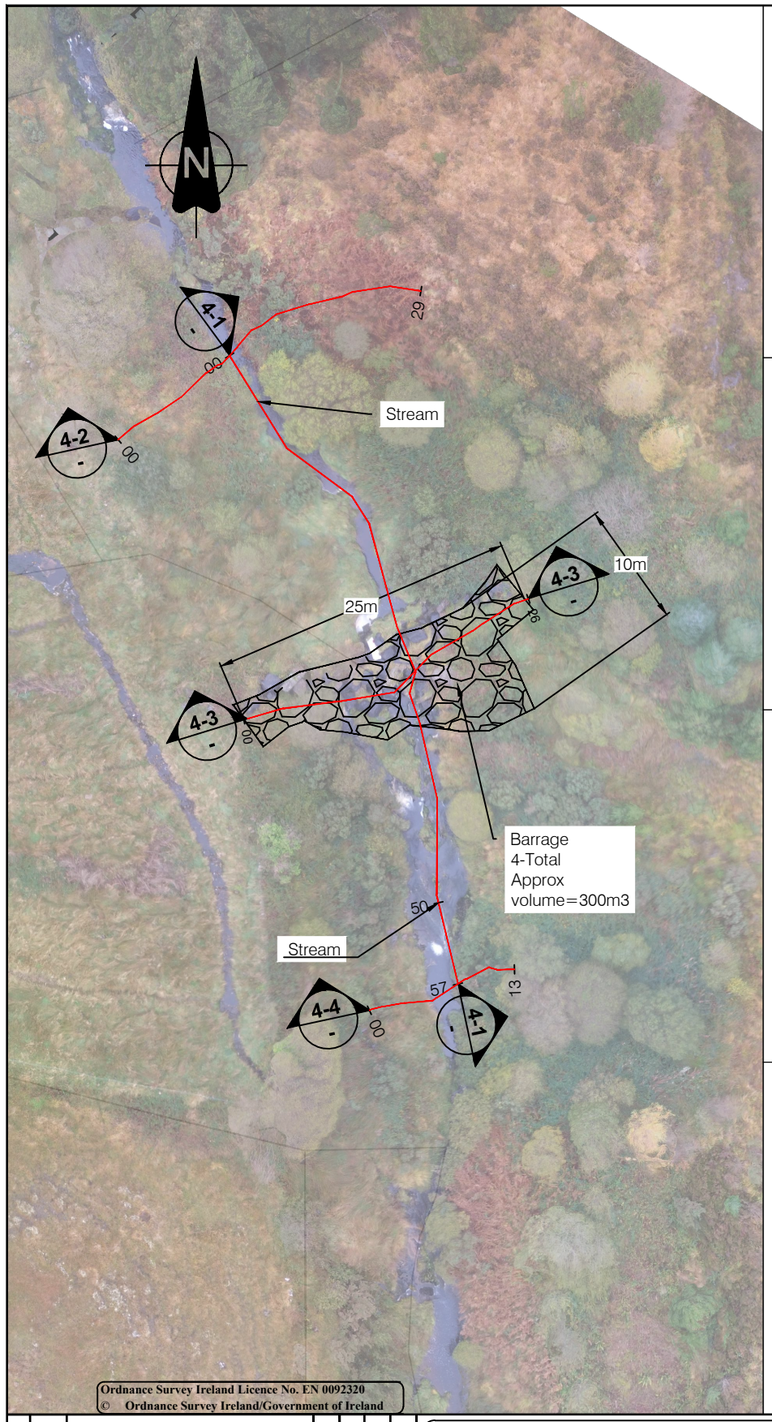
2.6.7.9 Repository Area at Black Road Bridge

The repository area at Black Road Bridge comprises two separate sections with a total area of 8,220m^2. Refer to **Figure 2.26: Peat Repository at Black Road Bridge**. The repository area at Black Road Bridge contains stored peat (up to about 2m high), together with some soil/rock debris from the site of the peat slide. Both sections are heavily vegetated and are bunded.

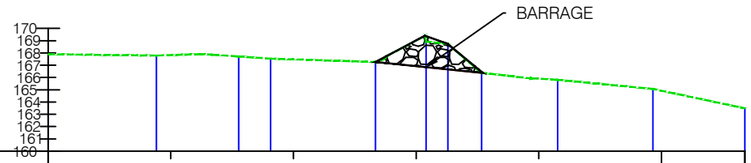
The repository area is fenced with post and wire fencing.

2.6.7.10 Drainage diversion works

As part of the works to stabilise the peat debris contained within the site of the peat slide a series of drains were constructed to allow excess water to effectively drain away. In addition, since the peat slide occurred, a number of natural flow paths have formed within the site of the peat slide as a result of the development of preferential flow paths following rainfall events.

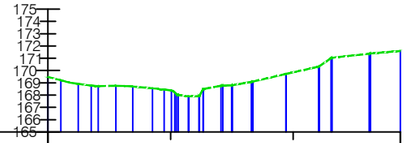


BARRAGE 4 SECTION 1
SCALE: 1:200



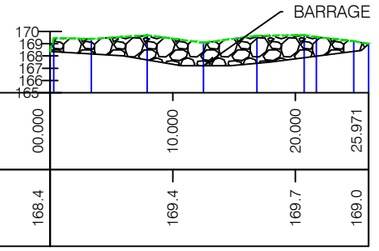
Chainage	00.000	10.000	20.000	30.000	40.000	50.000	56.803
Existing Ground	167.9	167.8	167.5	169.0	165.9	164.9	163.5

BARRAGE 4 SECTION 2
SCALE: 1:200



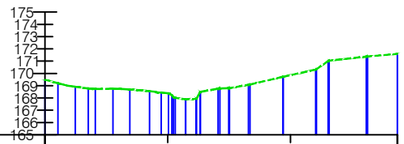
Chainage	00.000	10.000	20.000	28.722
Existing Ground	169.5	168.4	169.9	171.6

BARRAGE 4 SECTION 3
SCALE: 1:200



Chainage	00.000	10.000	20.000	25.971
Existing Ground	168.4	169.4	169.7	169.0

BARRAGE 4 SECTION 2
SCALE: 1:200



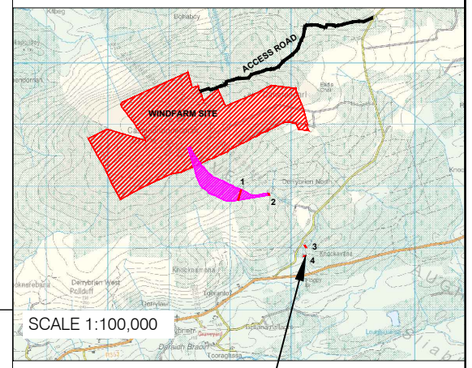
Chainage	00.000	10.000	20.000	28.722
Existing Ground	169.5	168.4	169.9	171.6

LEGEND

Stone Barrage

Existing Ground

KEY PLAN



Note:
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Topographical survey undertaken on week commencing 16/09/2019
Background imagery taken from ESB EMP Drone

Rev.	Date	Revision description	Drn.	Prod.	Ver.	App.
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Purpose of issue - Preliminary unless indicated

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Client
Gort Windfarms Ltd

Project
Derrybrien Wind Farm Project

Contract

Drawing title
Figure 2.25
Barrage 4 Plan and Sections

Production unit
Civil & Environmental Engineering

Drawn	Produced	Verified	Approved	Approval date
LMcM	LMcM	M.Brides	R.O'Donovan	07.05.2020
Client ref.		No. of sheets: 1	Size: A3	Scale: 1:500

Drawing number QS-000280-01-D460-003-025-000 | SHEET | REV

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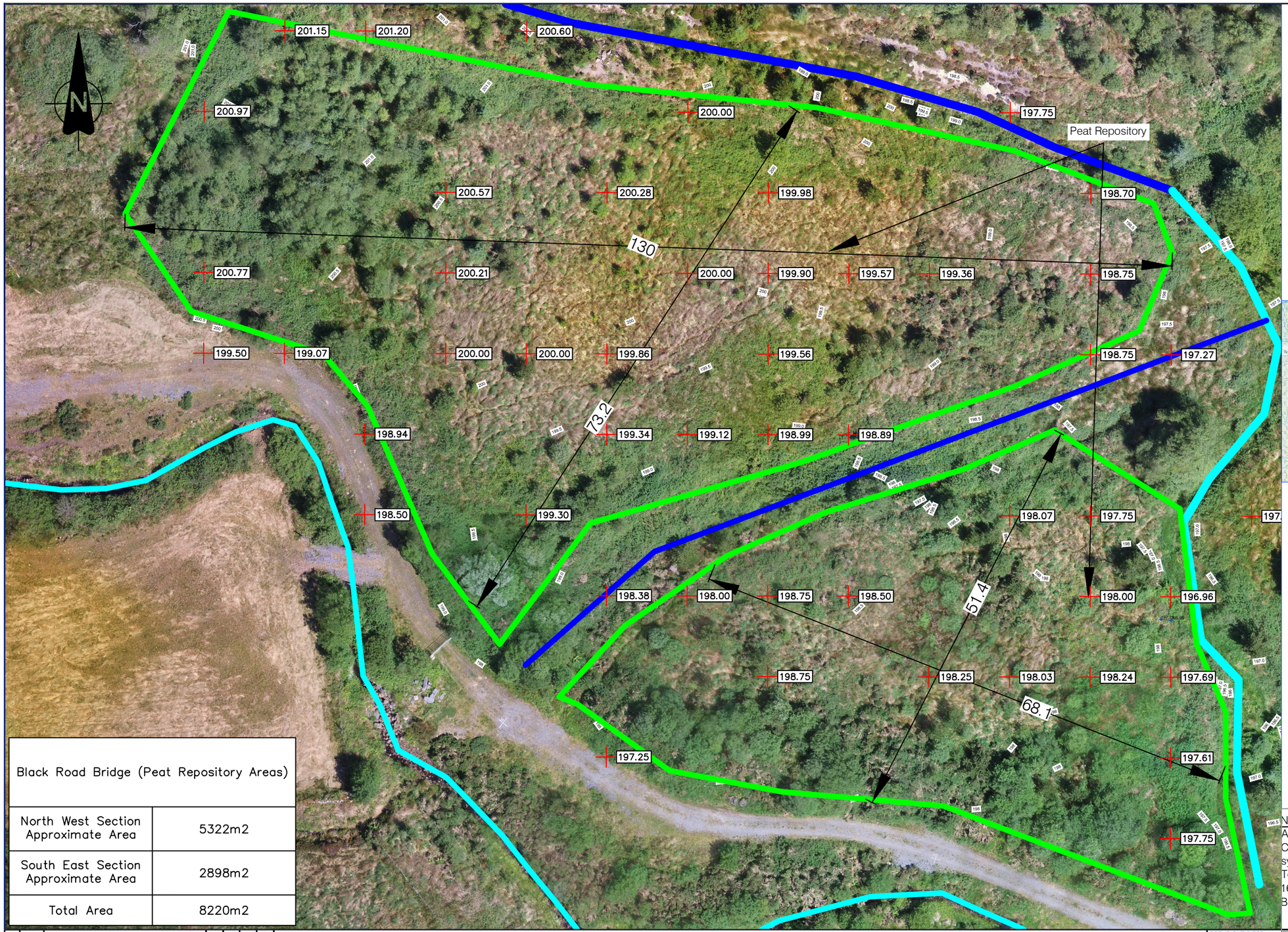
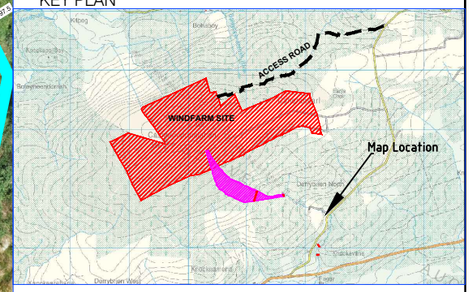


LEGEND

- Approximate Extent of Peat Repository
- Pre - Existing Drainage
- Constructed Drainage
- Spot Height

KEY PLAN



Black Road Bridge (Peat Repository Areas)	
North West Section Approximate Area	5322m2
South East Section Approximate Area	2898m2
Total Area	8220m2

Note:
All levels in meters above ordnance datum Malin Head
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Background imagery taken from ESB EMP Drone

Rev.	Date	Revision description	Drn.	Prod.	Ver.	App.
0	14.05.20		AT	AT	MB	ROD

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Project Derrybrien Wind Farm Project

Contract

Drawing title
Figure 2.26
Peat Repository Area at Black Road Bridge Plan

Production unit Civil & Environmental Engineering

Drawn	Produced	Verified	Approved	Approval date
A.Tuite	A.Tuite	M. Brides	R. O' Donovan	14.05.2020
Client ref.		No. of sheets: 1	Size: A3	Scale: 1:500

Drawing number QS-000280-01-D460-003-026-000 | SHEET | REV

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2.6.7.11 Repairs to bridges

The peat slide resulted in damage to a number of bridges downstream of the wind farm (**Figure 2.10: Location of works associated with peat slide**). Repairs were carried out to address structural stability and capacity concerns. These individual structures are identified below in order from upstream to downstream.

Black Road Bridge: At Black Road Bridge structural repairs consisted of replacing the parapets of the bridge.

Flaggy Bridge: At Flaggy Bridge on the R353, damaged parapets were repaired and replaced after the peat slide.

Unnamed Bridge C: Damage to Unnamed Bridge C (privately owned) by the peat slide necessitated removal of the existing structure and re-construction of the entire bridge span.

2.7 Construction Phase-Overview

2.7.1 Overview

2.7.1.1 Construction Contracts

There were four main contracts associated with the construction of the Derrybrien Wind Farm Project, as follows:

- The main civil works contract for the wind farm construction was an Engineer, Procure and Construct (EPC) contract. In addition to the main construction works, the main civil contractor also undertook the road upgrade works on the Black Road.
- The Electrical Balance of Plant (EBOP) works were carried out under a separate Design and Build contract and consisted of (1) installation of electrical cabling from wind turbines to Derrybrien Substation, (2) electrical works for the two 110 KV substations (Derrybrien Substation and Agannygal Substation) and (3) installation of overhead line from Derrybrien Substation to Agannygal Substation.
- The wind turbines were supplied and installed under a separate Turbine Supply Agreement (TSA).
- All tree felling activities were managed by Coillte who employed their own specialist tree felling sub-contractors to carry out the felling activities. These felling activities included tree felling within the main site, along the overhead line route and for the construction of Agannygal Substation. Some tree felling works were also required as part of the response to the peat slide to allow emergency works to be carried out.
- Some works to public roads and to Coillte access tracks were undertaken in the aftermath of the peat slide by Galway County Council and Coillte respectively. The installation of temporary barrages was undertaken by Galway County Council.

2.7.1.2 Construction working hours

The normal working hours for the construction activities was 7am to 7pm, up to 6 days a week. Due to the nature of the works, there were occasions during construction of the project where extended working hours were required. In particular, works were carried out up to 24 hours/day in response to the peat slide.

2.7.1.3 Employment

The construction team on the Project site varied in size through the construction phase; it typically consisted of between 4-10 representatives on site.

Coillte had approximately 10 personnel on site at peak periods to carry out felling activities.

The main civil contractor had a team of up to approximately 60 staff on site during the peak construction activities. It is noted that on cessation of construction activities in the aftermath of the peat slide, the wind farm construction contractor staff were redeployed to undertake works in response to peat slide.

The EBOP Contractor had up to approximately 30 personnel on site and the Wind Turbine Generator (WTG) supplier had up to approximately 50 staff on site at peak workload.

Not all activities occurred simultaneously. Each discipline had its own peak workforce.

2.7.1.4 Site Compounds/Facilities

Wind Farm site: A site compound was established to the north east corner of the site, adjacent to the pre-existing Coillte track. The compound provided parking for workers at the wind farm site and a location for temporary construction offices/facilities.

Temporary portacabin accommodation was located within the construction compound and consisted of offices, welfare facilities, meeting room and toilet facilities for use by construction contractors and owner's representatives.

The temporary accommodation consisted of:

- 6 x office containers
- 2 x canteen containers
- 1 x drying room container
- 1 x toilet block
- 2 x storage containers
- Electrical Power Generator + diesel bowser

The toilet facilities at the compound were formed by a self-contained toilet block with a temporary holding tank for managing the sewage and wastewater. These toilet facilities were removed upon completion of the works.

Container units were placed in the compound area for the storage of tools and materials during the construction works.

In addition, approximately 10 self-contained portaloos were provided across the site, which were serviced and maintained on a regular basis during the construction activities.

All portacabins, containers and portaloos were removed upon completion of the works.

Overhead Line: Materials for the overhead line were generally stored at locations on the Coillte tracks close to the works and at a yard location adjacent to the R353. However, the precise location of these sites is not known.

Agannygal Substation: A small contractors' compound of approximately 20m x 50m was established adjacent to the sub-station site. This provided space for all temporary facilities and construction worker parking.

2.7.1.5 Fencing

Temporary: Excavations on site were fenced off during construction. This fencing was formed from lightweight components for ease of reuse around the site and were all removed upon completion of the works.

Fencing was also erected at the interface between the construction site and the publicly accessible turbary area.

Permanent: Wooden post and wire mesh fencing was erected around Borrow Pit 3 at the end of the construction activities.

Palisade fencing was installed around Derrybrien Substation.

2.7.1.6 Construction Plant

Wind Farm site: During project construction a wide range of mechanical plant was mobilised to the wind farm site. This plant was generally kept on the site (except for the mobilisation of plant for use in response to peat slide) and not removed from the site until it had fulfilled its purpose.

The amount and type of plant on site varied in accordance with the level and type of activity on site over the period of construction.

The type and number of heavy civil works plant on the site during the peak construction period typically comprised:

- Excavators (20)
- Crusher (1)
- Front loaders (3)
- Dumpers (5)

- Dozers (4)
- Roller (10)
- Tractor and diesel bowser (1)
- Tractor and trailer (1)
- JCB (1)
- 3 & 4 axle lorries (17)
- Personnel 4- wheel drive vehicles (15-20)
- Mobile task lighting generator (3)
- Mobile pumps (5)
- Air compressor (1)
- Water bowser (1)
- Mobile Concrete Pump (not based on the site, mobilised for specific concrete pours only)
- Mobile Crane (50ton, 100ton, not based on the site, mobilised for specific concrete pours)
- Mobile Crane (60ton, 300ton, not based on the site, mobilised for erection of wind turbines)
- Ready mix Concrete delivery vehicles
- HGV delivery vehicles

Tree Felling: Typical plant associated with tree felling comprised 3 x Harvesters (e.g. Daewoo 3600 excavator with Silvatec 555 Harvesting Head), 3 x Forwarders (e.g. Timberjack 1210 or 810) and lorries for transporting timber offsite.

Overhead Line: The main types of plant and equipment used for the installation of the overhead line comprised:

- Excavators
- All-terrain crane
- Tracked dumpers to transport concrete
- All-terrain vehicles
- Flat-bed trucks to transport masts and poles.

Works related to peat slide: Plant was mobilised from the wind farm site and other external sources for use in undertaking the works related to the peat slide.

These comprised mainly excavators, bulldozers, JCBs and tracked dumpers.

2.7.1.7 Drainage/Silt Management

Wind Farm site: The main locations (11) where pre-existing drains crossed the site boundary were identified and silt traps comprising straw bales were installed at these locations to manage and control any silt generated by the construction activities.

In cases where water ponded in the turbine base excavations, this was removed using 4" mobile pumps and pumped to a nearby existing drain, often over ground on existing vegetation. Any silt resulting from this pumped water was captured by both existing vegetative matter and constructed straw silt traps which connected into the local existing drainage network.

Concrete wash-out areas were also established for the purpose of capturing wash-out water from ready mix concrete lorries.

At specific turbine excavation locations, existing drains were rerouted around the excavation area as deemed necessary.

No wheel wash was installed during the construction period.

Overhead Line (OHL): In general silt traps in the form of instream sumps and straw bales were installed in pre-existing drains where there was potential for pollution to watercourses from works associated with construction of masts. It is understood that bog mats were used to bridge drains at some locations.

2.7.1.8 Water Requirements

Drinking water at the wind farm site compound was supplied by a proprietary bottled water supplier. Non-potable water supply for toilet blocks etc. was initially supplied by 3rd party suppliers, but later sourced from a well installed at the compound. At the demobilisation stage the well was decommissioned and capped.

2.7.1.9 Dust Suppression

The primary source of dust was from the borrow pit/quarry activities and vehicle movements on site along the access tracks. Dust suppression measures implemented on site entailed using water bowsers to suppress dust in these areas. Water for dust suppression was sourced from excavations or the borrow pits/quarries.

2.7.1.10 Energy supply

There was no rural electricity network in the immediate vicinity of the wind farm site. Temporary electrical generators were used to supply power at the wind farm site construction compound and at Agannygal Substation.

2.7.1.11 Materials - Sourcing

The main materials required for construction of the wind farm project comprised:

- Crushed Rock Material
- Imported Rock Material
- Concrete

- Reinforcement Steel
- Drainage Pipes
- Building materials for substation

Crushed Rock Material: The majority of the rock used for the construction of the wind farm access tracks, crane hard-standings and for backfilling activities was sourced from the borrow pits/quarries opened up on the wind farm site for the project. Rock that was extracted was processed in a Nordberg L7105 Crusher located inside the area of Borrow Pit 3. Refer to 2.6.5.8 for volumes of rock excavated.

The processed stone was temporarily stockpiled within the confines of the borrow pit prior to being loaded onto dumper vehicles for transporting to its location of use within the site.

It is noted that, there was additional localised extraction of material (rock) for emergency works in response to the peat slide.

Imported Rock Material: There was a requirement to import some stone material, including Cl804 for access track and crane hardstanding surfacing and 50mm single sized crushed limestone for surfacing inside the sub-station compound.

Concrete-Wind Farm: The concrete for the wind farm was sourced from local ready-mix concrete suppliers (e.g. in Ennis, Ardrahan). The concrete used was ready mix concrete which was batched at supplier batching plants and transported (using standard ready-mix concrete lorries, typically in the range of 7-8 m^3 per lorry) by road to the wind farm site. The concrete was delivered to the site via N18, R353 and the Black Road. The estimated total volume of ready mixed concrete used for the works was approximately 7,100m^3. There was no concrete batching plant installed at the site and no concrete batching was carried out within the wind farm site.

Concrete-OHL mast foundations: The concrete for the overhead line mast foundations was sourced from ready-mix concrete suppliers in Loughrea and Birr.

The total volume of ready mixed concrete used for the works was approximately 780m^3.

Reinforcement Steel: All reinforcement steel for the reinforced concrete structures was sourced from a supplier in Galway. This steel was pre-formed to specific lengths and shapes at the supplier's facility and delivered to site for assembly.

Drainage Pipes: The drainage pipes used were mostly ‘Rigidrain’ plastic pipes, with some steel tube and some concrete pipes.

Geo-Grid & Geotextile Membrane: Geo-grid of specification Tensar SS20 and SS40 were predominantly used for constructing the floating site access tracks. In some instances, two layers were placed on sections of road. These products were supplied in rolls from proprietary suppliers and delivered to the site on articulated lorries.

Building materials: General building materials for the substation construction included concrete, reinforcement, bricks/blocks, stone, pre-cast concrete, structural steelwork, ready mix concrete, timber trusses, slates, felt, windows, doors and internal building fit out materials were supplied as and when required during the sub-station construction.

The materials used for the substation compound included external stoning, steel supports, palisade fencing and electrical equipment.

2.7.1.12 Spoil Management on wind farm site

In construction Phase 1, excavated spoil was generally side cast adjacent to excavation locations. In construction Phase 2, following the peat slide, controlled designated peat repository locations were utilised for storage of excavated peat and mineral soil. (Refer subsection 2.6. 5.7).

2.7.1.13 Construction Waste

The types of construction waste which arose during the project construction comprised

- Domestic waste from the construction compound
- Building material waste from substation
- Other sources of packaging waste

Construction waste was placed in dedicated skips in the substation compounds and disposed of through authorised waste management companies to licenced facilities.

It is noted that construction waste records could not be sourced during a search undertaken for this rEIAR.

2.7.1.14 Control of Oils & Fuels

Wind Farm Site: Oils were stored in enclosed containers within the wind farm construction site compound. The diesel supply tank to the temporary electrical generator supplying the site compound was double skinned.

Agannygal Substation: During construction a small temporary compound was established at the site where a temporary electrical generator and a double skinned diesel supply tank were located.

Fuel was stored in a double skinned diesel bowser which was moved around the site to re-fuel plant and machinery at its point of use.

Spill kits were available and used to deal with minor oil/fuel spills on site. Drip trays were used during refuelling of machinery.

2.7.1.15 Residues and Emissions

The residues and emissions which arose from project construction comprised the following:

- **Water**: Surface water drainage emanating from the wind farm site -refer to subsection 2.7.1.7; drainage from peat slide area -refer to subsection 2.7.4.11
- **Air and Climate:** Dust generated by excavation works and vehicle movements across the site -refer to subsection 2.7.1.9; Carbon losses associated with felling, peat extraction and peat slide.
- **Noise:** Noise from construction plant and activities,
- **Lighting:** Task lighting.
- **Excavation Spoil**: Refer to sub-section 2.6.5.7 and 2.7.1.12
- **Waste:** Refer to subsection 2.7.1.13
- **Spoil related to peat slide measures:** Refer to subsection 2.7.4.10

2.7.1.16 Safety Management and Risk of Accidents

During the construction phase there was a Safety Management Plan in place. This set out the procedures and practices for health and safety on the construction site.

There was an emergency plan which

- Identified the hazards on site
- Listed contact numbers of emergency services
- Defined the roles and responsibilities of key personnel on site
- Detailed emergency procedures in the event of specific major accidents

Site emergency procedures were updated following the 2003 peat slide during construction.

In construction phase 2 (June 2004-March 2006), following the peat slide, a significant increased level of site investigation was carried out and assessments of each activity separately and in combination (using current risk assessment methodologies) were undertaken. Mitigation measures were implemented to prevent any further peat instability arising from the project activities.

2.7.2 Construction Phase 1 Activities

2.7.2.1 Access Track to Wind Farm site

An existing Coillte access track approximately 3.1km long was upgraded for use as an access route from the “Black Road” to the wind farm site. These upgrading works included installation of passing bays, some drainage and the re-surfacing of the road with a layer of Cl804 material and a surface dressing of tar spray and chip.

2.7.2.2 Set up of construction compound

A site compound was established to the north east corner of the wind farm site, on the existing Coillte track extended turning circle hardstanding. It was formed either side of the pre-existing Coillte access track. The compound was expanded by the stripping of the peat layer at this location and the placement of stone material, mostly sourced from the borrow pits at the site. A layer of imported crushed rock granular fill was placed on top and surfaced with a Clause 804 subbase material. The compound provided parking for workers at the wind farm site and a location for temporary construction offices/facilities.

Temporary portacabin structures were transported to the construction compound complete on flatbed lorries and lifted into position.

2.7.2.3 Construction Phase 1-Felling of Forestry

Wind Farm Site: From June 2003 to the date of the peat slide in October 2003, the felling on the site comprised felling of a 15-40m wide corridor along all of the site tracks, extended areas around many of the turbine bases, felling around borrow pits and at the site of Derrybrien Substation.

The tree felling involved the use of harvesting and forwarding machinery including tracked mechanical machines with specialist tree harvesting grabs mounted onto their hydraulic arm.

Trees were cut as low as possible to the ground. Trees were de-branched, cut into logs of approximately 3m in length and placed on the ground beside the harvester. A forwarding machine followed behind the harvester; collected the cleaned logs and transported these to a temporary stockpiling location within the wind farm which was located beside a site access track. On a regular basis Coillte would remove the stockpiled logs by loading them onto an articulated trailer for processing offsite.

Not all of the harvested trees were exported from the site by Coillte, some of the felled trees were used to provide a support mat for some of the wind farm floating roads. In areas of soft ground some of the trees and/or branches were placed in front of the harvester to provide a support mat for the harvester to position itself on in this area of soft ground.

Felling by hand was also carried out on the parts of the site where the trees were too small for excavator mounted harvesting equipment. These trees were felled manually using chain saws. These trees were left on site.

In areas where the trees were large enough to fell using machinery, a lighter version of the harvesting excavator was used with only a cutting head attachment. In this instance, the felled timber was not de-branched and was not harvested for removal from site. These trees were felled in position and were subsequently gathered into windrows within these zones, where they remain.

Overhead Line: The tree felling works required for the overhead line were also carried out by Coillte using the same techniques as on the wind farm site. A corridor of approximately 45m width was felled along the forested areas on the OHL route.

Prior to the peat slide on 16th October 2003, a significant proportion of the OHL route which passed through forestry had been felled. Felling stopped on the OHL due to the peat slide and only re-commenced in July 2004.

2.7.2.4 Construction Phase 1-Borrow Pits/Quarries

In order to extract the rock, rock breakers (utilising a 50ton excavator with rock breaker attachment) and rock drill and blast techniques were used.

For rock blasting, a specialist expert sub-contractor prepared and conducted the blasts. These involved creating a sequence of drill holes parallel to the rock face. Explosives were inserted into these drilled holes in the rock, the holes were plugged, and a controlled explosion was conducted by the specialist expert to fracture the rock.

Once the fracturing of the rock was completed, mechanical excavators handled the fractured rock, to sort it and pass it through a mechanical crusher and screening equipment to create aggregate suitable for use for the works. This prepared aggregate was temporarily stockpiled at the location of the borrow pit until being loaded onto dumper trucks and transported within the site to its point of use at the works. This rock was used for access track building, crane hardstanding construction, backfilling at turbine bases and for the creation of barrages following the peat slide of 16th October 2003.

Once all the extracted rock had been used, the process of fracturing further rock on the borrow pit was repeated on the new rock face within the pit as required to continue the provision of aggregate during the progression of the works.

2.7.2.5 Construction Phase 1-Wind Farm Access Roads

The construction of the tracks was carried out in a linear manner, where a previously installed section of track was used as the route for the on-site lorries to deliver new stone to the next section of the track that was under construction.

Floating Road construction: The main sequence of floating road construction was as follows:

1) Following tree felling, the route was set out by a surveyor

2) In some areas, felled trees were placed on the undisturbed peat surface, along the route of the track to form an initial support base prior to the laying of any stone. In cases where trees were not used, an initial layer of geogrid was used in-lieu of the trees.
3) A regulation layer of crushed rock from a site borrow pit was placed onto the geogrid or trees; this was transported within the site using 3 or 4-axle lorries.
4) A layer of geogrid was placed on top of the regulation surface, followed by a 500mm layer of crushed rock from the site borrow pits.

The roads were surfaced with 100-150mm of Clause 804 granular sub-base material, which was imported to site from nearby quarries.

Existing drainage channels were maintained.

Non-Floating Road construction:

In the locations where the peat was very shallow and suitable ground was near the surface, a non-floating track was constructed by:

1. Removing the thin layer peat layer and side casting, trimming the underlying boulder clay to the formation level of the track.
2. Placing a regulation layer of coarse crushed rock onto the formation level. Rock was sourced from the site borrow pits.
3. Laying Terram 1000 gauge filter membrane and place 225mm layer of crushed rock from the site borrow pits on top.
4. Finishing with a c50mm layer of imported crushed stone.
5. Existing drainage channels were maintained as part of this construction methodology.

2.7.2.6 Construction Phase 1-Turbine Foundations

The process of turbine foundation construction was as follows:

1. Following tree felling, the foundation area was set out by a surveyor
2. The peat layer at the location of the turbine foundation base was removed by mechanical excavators (utilising long reach machines and excavators with wide tracks or bog mats underneath to provide support for the excavators on the peat surface). The arisings were side cast. Excavation continued into the boulder clay layer below the peat until the rock surface or a suitable bearing stratum was reached. Prior to the peat slide occurring peat was side cast on areas adjacent to the wind turbines which were constructed. Post the peat slide, side casting on peat was first preceded by an assessment of the locations for peat stability and only occurred on areas which were deemed to be stable
3. De-watering of the excavation was undertaken where there was water ponding.
4. Placement of the layers of rock and lean mix concrete to achieve the required bearing level for the bottom of the foundation

5. A lean mix concrete blinding layer (C20 concrete) was placed onto the bearing level in preparation for steel reinforcement placement. The concrete for this blinding layer was provided by an off-site concrete supplier.
6. Reinforcement steel was placed onto the blinding concrete surface and steel fixers formed the steel reinforcement cage in situ at the foundation location that was to be cast within the concrete. Further to the reinforcement steel, lightning protection earthing and cast-in base elements of the turbine towers were also placed at this time within the steel reinforcement cage.
7. When the steel reinforcement cage, earthing, cast-in base elements for the turbine towers and shuttering were complete, concreting of the turbine base was carried out.
8. After completion of the concreting works and removal of all temporary works including the shuttering, backfilling was carried out around the edges and on top of the turbine pad. The material used for this was the excavated boulder clay which was placed and compacted in 300mm layers. This was carried out using excavators. A layer of 300mm depth of crushed stone was placed at the top to provide a finish for suitable future access around the turbine. The top layer of crushed stone was sourced from the site borrow pits.
9. During the backfilling process, a land drain was also placed around the turbine base with a local discharge into the site drainage network.

At the time of the slide in October 2003 a total of 37 reinforced concrete bases had been constructed across the south, east and western side of the site (T1-T5, T9-T13, T17- T29, T32, T34, T35, T37, T38, T40-T46, T66 & T67). Excavations had been completed at T63 and T69, excavations were underway at T62 and T68 (location of peat slide) and excavations had just commenced at T6 and T31.

2.7.2.7 Construction Phase 1-Hardstanding Areas

The crane hardstanding areas adjacent to each turbine were generally completed after the construction of the turbine base.

The sequence of excavation for the crane hardstanding area was similar to that used for the turbine base excavation. In this process, the peat was removed from the surface using mechanical excavators and side cast. While the turbine foundation excavations continued down to rock surface, for the crane hardstanding's the excavations only proceeded to a suitable depth into the boulder clay until a suitable bearing for the hardstanding had been reached. Backfilling was carried out by placing crushed rock from the site borrow pits into the excavation in layers. This rock was transported to the location of the works from the borrow pits using 3 and 4-axle lorries within the site and placed using 360^0 excavators. At specific locations, precautionary peat stabilising rock reinforcement lines were used around the perimeter of the excavations in deep peat prior to excavation commencing.

In some instances, a layer of imported clause 804 granular material was placed on the top of the hardstanding or on sections of the hardstanding to level the finished surfaces.

At the time of the slide in October 2003, the crane hardstandings for the turbines for which reinforced concrete bases had been constructed had been partially constructed.

2.7.3 Works associated with Peat Slide

2.7.3.1 Scope of peat slide related works

As previously detailed, a peat slide occurred on 16th October 2003 during the excavation work for turbine base T68 within the wind farm site. Stabilisation and containment works were installed both within and outside the wind farm site immediately following the peat slide to prevent further propagation of the peat slide and to prevent further release of debris into watercourses downstream.

The works comprised the replacement of two sections of access track within the wind farm site (access track at T68 and access track at T23-T70) (as described in Sub-sections 2.4.6.3 and 2.4.6.4), four rock barrages (Barrages 1, 2, 3 and 4) which are still in-situ (as described in Subsection 2.4.6.6-2.4.6.9) and four temporary barrages which were removed within a few months of the peat slide (Barrages A, B, C & D). As noted in Subsection 2.1.4 details in relation to Barrages A, B, C and D were not available.

Where required, debris arising from the 2003 peat slide that had accumulated behind the barrages was removed and stored in repository areas located adjacent to the containment barrages. Repository areas were constructed adjacent to barrages 2 and 3.

In 2005, a repository area was located in an area upstream of the Black Road Bridge to contain material displaced from the peat slide area and the run-out zone.

In total three repository areas were constructed as part of works related to the peat slide, as described in subsections 2.6.7.6, 2.6.7.7 and 2.6.7.9.

A number of measures were also carried out on the wind farm site as a direct consequence of the peat slide. These measures included precautionary removal of some of the previously side cast excavated material to geotechnically assessed peat repository areas; increased maintenance of drains throughout the site and activities to ensure no water logging at open excavations on the site.

The construction activities associated with the peat slide are described in the following subsections.

2.7.3.2 Temporary Barrages

The temporary barrages were constructed in October 2003. Barrages A and B were earthen barrages located close together just upstream of Black Rd Bridge. Barrage

C was an earthen barrage located immediately upstream of Flaggy Bridge (on R353). Barrage D was constructed with rock boulders immediately downstream of Flaggy Bridge (on the R353).

Barrages A, B and C were constructed by the wind farm civil contractor under the instruction of Galway County Council (GCC) engineers and co-operation of ESB. The Wind Farm Project directed the construction of Barrage D.

Barrages A, C and D were no longer in place by early December 2003. Barrage B was removed in September 2005.

2.7.3.3 Access Track at T68

The boulders utilised for the reconstruction of the access track were sourced from Borrow Pit No 3 within the wind farm site. The dimensions of the sandstone boulders used in the construction varied from 0.3 to 1.0m in diameter. Pipes were installed at various points along the access track section for drainage purposes.

2.7.3.4 Access Track betweenT23-T70

The boulders for construction of the access track were sourced from Borrow Pit 3 within the wind farm site. The dimension of the sandstone boulders used in the construction of the containment barrage varied from 0.3 to 1.2m in diameter. As noted in 2.6.7.4 a small berm approximately 300mm high carrying services buried in concrete was provided on the upslope side of the access track.

Pipes were installed at various points along the access track for drainage purposes.

2.7.3.5 Access Track to Barrage 1

A new section of unpaved, hardcore surfaced track was constructed to link the reinstated road which is located on top of Barrage 1 back to the pre-existing Coillte track on the western side of the slide.

Tree felling was completed along the route of this road to allow its construction.

2.7.3.6 Barrage 1

The boulders for construction of the access Barrage 1 were sourced from a borrow pit opened up adjacent to the barrage location. The barrage was constructed of coarse fill founded on mineral soil. The maximum dimension of the sandstone/conglomerate boulders used in the construction of the barrage varied from 0.6 to 1.3m in diameter. The boulders used in the parapet wall on the barrage are up to 2.0m in diameter. A sump approximately 3m deep was excavated on the upslope side of the barrage for drainage purposes.

2.7.3.7 Barrage 2

An access track approximately 300m long was constructed from an existing Coillte access track to the location for Barrage 2 using rock sourced from Borrow Pit/Quarry 3 on the wind farm site. Rock used for constructing Barrage 2 was sourced from the borrow pit adjacent to Barrage 1. Drainage pipes were installed in the upper part of this embankment.

2.7.3.8 Barrage 3

The barrage comprised competent boulders placed within a stream section. The maximum dimension of the boulders used in the construction of the containment barrage range from 0.9 to 2.5m. The boulders for Barrage 3 were sourced from the Coillte borrow pit /Quarry adjacent to Barrage 1.

2.7.3.9 Barrage 4

The barrage comprised competent boulders placed within a stream section. The maximum dimension of the boulders used in the construction of the containment barrage ranged from 1.0 to 2.1m.

2.7.3.10 Repository Areas related to Peat Slide

There were three repository areas developed as a result of the peat slide- (i) at Barrage 2, (ii) at Barrage 3 and (iii) the Black Road Bridge to contain the peat, silt and sand arisings from construction of barrages, material removed from behind the barrages and from the peat slide and adjacent lands. The arisings were transferred to the repository locations and earthen bunds formed around sections of the repositories to contain peat.

2.7.3.11 Drainage Diversions

Drains were diverted away from both sides of the site of the peat slide and upstream of it on the wind farm site. This was achieved by digging new drains in the weeks following the initial slide. These diverted drains ultimately join up within the same river sub-catchment a short distance downstream of the peat slide area. The work was carried out over a few days from the 30th October 2003. Where new drainage was constructed in a wooded area, minor tree felling was carried out to create a corridor of sufficient width to allow an excavator to excavate the drain. A watercourse downstream of the peat slide area was also re-routed just upstream of the Black Road bridge around displaced peat on private land. Approximately 1.2ha of tree felling was required in order to gain access for the diversion drain.

Silt traps were provided whilst the works were being undertaken.

2.7.4 Construction Phase 2 Activities

At the outset, it is noted that the construction methodologies were modified to ensure that no further instability occurred on the wind farm site. Further detailed site investigations were undertaken and a detailed geotechnical design and certification process was put in place for the Phase 2 construction works. Details of the site investigations and geotechnical measures are described in Chapter 10-Lands, Soils and Geology.

2.7.4.1 Construction Phase 2-Felling of Forestry

Wind Farm Site: Clear felling recommenced in the second half of 2004 and continued until mid 2005.

Overhead Line: Felling re-commenced in July 2004 and continued until mid 2005.

Agannygal Substation: There was localised felling at the sub-station and along the route of the upgraded forestry road. The first activities at this site included the felling of forestry by Coillte. This process was carried out in a similar manner to that described for the main wind farm site.

2.7.4.2 Construction Phase 2-Wind Farm Access Roads

Additional geotechnical investigations were undertaken along the routes of the remaining tracks in advance of construction activity.

In terms of the method of track construction, the placement of felled trees (obtained from the tree felling activities on the site) along the length of the new track onto the undisturbed peat surface was specified by geotechnical specialists as a requirement for the remaining floating roads. The regulation layer of crushed rock was placed on top of the mat of placed trees, then the geogrid and then a top layer of approximately 500mm depth of crushed rock. The crushed rock used was sourced from the on-site borrow pits. These roads were capped with imported fine material similarly to the other constructed roads.

It is noted that as a precautionary measure, it was decided to omit Turbine 16 and the access tracks at T16 and from T15 and T17 towards T16 due to unsuitable ground conditions at these locations.

2.7.4.3 Construction Phase 2-Turbine Foundations

As previously noted, following the peat slide, parts of the construction methodology were modified for Phase II construction.

Modifications to the methodology of construction included:

- Additional geotechnical investigations of the soil, visual walkover inspections and studies of existing drainage at each base were completed in advance of construction activity.
- Where necessary new localised drains were formed prior to commencement of excavation.
- All the excavated material was transferred to designated peat repositories within the site as it was excavated. These on-site peat repository areas were specifically selected following extensive geotechnical investigations as areas where excavated material could be permanently placed to a depth of up to 1m deep.

2.7.4.4 Construction Phase 2-Hardstanding Areas

Following recommencement of construction after the peat slide, the excavation for hardstanding was completed at the same time as the excavation for the remaining turbine bases. All arisings were transported directly to specified peat repositories within the site and precautionary peat stabilising rock reinforcement lines continued to be placed on the down slope sides of excavations in deep peat prior to excavation commencing.

2.7.4.5 Anemometer Masts

The two anemometer masts are steel lattice structures supported on reinforced concrete foundations of dimensions 5.7m x 5.7m x 0.5m.

The foundations were constructed to a minimum depth of 1.8m below the proposed ground level and the foundations were backfilled with Boulder Clay to provide a minimum cover of 1.3m on the top of the foundations. The excavation works were carried out using long-reach tracked excavators operating on the floating road adjacent to the excavation. The excavated peat was transported to a designated repository area within the wind farm site.

2.7.4.6 Construction Phase 2-Borrow Pits/Quarries

Pre-works assessments were undertaken prior to rock blasting. As a precautionary measure, during periods of rock blasting after the peat slide, vibration monitoring was carried out at a number of locations remote to the borrow pit, inside the site, to monitor any vibrations in the surrounding area.

2.7.4.7 Reinstatement of Borrow Pits

Borrow Pits 1 and 2 were fully backfilled with peat arisings from construction activities elsewhere on the site.

Borrow Pit 3 has been partially backfilled with peat and mineral soil. This borrow pit has been permanently fenced off.

2.7.4.8 Spoil Management-Wind Farm site

For the second phase of construction in 2004/2005 significant risk mitigation measures were implemented for the management and disposal of material excavated from the remaining turbine excavations and from the crane hardstanding areas. All of the peat and glacial till was segregated for separate disposal. The glacial till was disposed of in the on-site Borrow Pits/Quarries and all of the peat and some mineral soil was disposed of in designated peat repositories on the site. The peat repositories were located on flat or gently sloping ground (<3°) away from any areas of elevated risk with regard to peat instability.

2.7.4.9 Wind Farm Underground Services

Cables: Electrical cables were installed by excavating open trenches in the peat adjacent to the site roads. The excavated material was temporarily side cast and then the excavated material was used to backfill the trenches after cables were laid.

The machinery used for these works included:

- 2 x 13.5ton 360^0 excavators with wide tracks
- 1 x telescopic front loader
- Tractor & cable drum holder

Where cables crossed drains, crossing points were designed to ensure the undisrupted flow of the drain, while adequately protecting the cables. Safety warning tape was placed within the trench during backfilling and a series of marker posts were installed on the surface along the trench routes.

For trenches in peat the cables were direct buried with sand surround placed in the trench for the final sections runs to the substation.

Site Drainage: As part of the foundation design drainage was installed at turbine bases. This consisted of a buried land drain around the perimeter of the turbine base. The outlet of this land drain was constructed to an open drainage channel, directed to one of the existing main drains within the site.

Some new drainage was installed alongside site access tracks.

2.7.4.10 Turbine Assembly and Installation

Mobile cranes were used to lift the heavy components of the turbines into place. A 300ton and 60ton mobile crane were typically used for turbine erection activities.

Erection of the turbines involved transporting all of the turbine components to the turbine sites, including the steel tower sections, the hub, the rotor blades and the nacelle. The components were transported along the floating roads using standard trucks and low-loader articulated lorries and temporarily stored on the hardstands prior to erection. The mobile cranes that were used to erect the turbines also travelled

along the floating roads to the turbines. The mobile cranes were operated on the granular hardstanding areas for all the heavy lifting work required to erect the turbines.

2.7.4.11 Derrybrien Substation

Construction of the Derrybrien Substation compound commenced on 13th October 2003 with the initial stripping of the overlying peat. After 3 days this work ceased in parallel with the overall work suspension that was put in place following the peat slide. Works recommenced in December 2004 after the construction works had resumed at the wind farm site.

Peat was excavated from the compound location and transferred directly by on-site dumper trucks to a peat repository area, which had been designated and approved by the geotechnical specialists on behalf of the EPC contractor. This repository was located within the site on the west side of the road between T24 and T25.

The level hardstanding for the substation was constructed by excavating into the gently sloping ground on the north side of the substation site and by placing engineered fill material on the downslope side. The entire compound was then capped with crushed rock granular fill material from Borrow Pit No.3, with a hardcore surfacing imported from nearby quarries.

The foundations for the control building, the electrical equipment steelwork and transformer within the compound comprise reinforced concrete pads or plinths supported on the granular rockfill or the underlying firm or stiff glacial till. The compound hardstanding is capped with hardcore surfacing.

During the construction of the control building and electrical transmission and transformer components on the site, construction traffic generally comprised standard concrete trucks, small mobile cranes, and trucks with loader cranes for transporting materials, equipment, cherry pickers and mobile elevated work platforms (MEWP) to the site. The largest load was from the 80-tonne step-up transformer, which was transported to the site on a specialised 28.5 m long multi-axle articulated truck and low-loader transporter. The transformer was transported to the site in a single supervised and scheduled trip along a defined access route. All of the construction traffic was mobilised to the substation via the floating road network.

The main support posts for palisade fencing were set in concrete and the dividing uprights were set in a concrete plinth.

Remaining surfaces around the substation were graded.

2.7.4.12 Overhead Line

Construction Access: Access was via local roads and the existing network of forestry tracks. Where required, temporary access was provided from these routes to the mast/poleset locations. In general access to timber polesets was along the OHL corridor from mast locations or existing road/track locations that intersected the

OHL corridor. Construction for access to masts consisted of removal of tree stumps/brush peat (less than 1m typically) to competent material to allow access for tracked excavators, dumpers and a rough terrain crane.

Two mast locations further away from pre-existing access tracks were accessed as follows:

- AM24, located north of the Owendalulleegh River in Coillte forestry in Derrybrien East was accessed from the existing Coillte track to the south which entailed crossing the Owendalulleegh river at an existing ford crossing. Consultation was undertaken with Shannon Regional Fisheries Board (SRFB) in advance of the crossing.
- AM38 was accessed along the OHL corridor from the Agannygal Substation side. Peat depths were up to 5m along the route. In order to provide access in this area existing trees were felled and placed to form a 'floating road' mat of timber on the OHL corridor. No excavation took place to form the access.

Excavation under 400kV line: The 110kV line route crossed an existing 400kV line. Earthworks were necessary at this location to lower the ground below the 110kV line to maintain required clearances (**Figure 2.9: Location of Grid Connection and Ancillary Works**).

Mast Construction: Mast construction consisted of the excavation to competent material at each of the 4 No tower legs. Large diameter concrete pipes were used as permanent form work and the base portion of the steel mast was assembled and its 4 legs placed into these concrete pipes which were then filled with concrete to form the permanent foundation. Once the concrete gained strength the foundation was backfilled, the remainder of the two mast sections were assembled and lifted into place using an all-terrain crane and bolted to the previous installed section.

Poleset Installation: Poles were transported to location by truck and then excavator to final installation point. Foundations varied according to ground conditions, in some locations where the depth of competent material was deeper than the embedment of the pole, stone and/or timber sleepers were used to strengthen the foundation and timber sleepers were used to fill to the correct level and support poles for stability. A greater number of timber sleepers were used to support polesets in deep peat.

Stringing of Overhead Line Conductor: Conductor stringing was carried out once the steel masts and polesets had been installed. All-terrain vehicles were used to access the OHL locations and to pull lines to allow the conductor to be pulled from mast to mast. Where the OHL crossed public roads, temporary goalpost or H frames were used to support the conductor etc. over the road so that safe access could be maintained on the public roads.

2.7.4.13 Agannygal Substation

Construction works commenced in Autumn 2004.

Felling of Forestry: The first activities at the site included the felling of forestry by Coillte. This process was carried out in a similar manner to that described for the wind farm site.

Access and Haul Routes: Access to Agannygal Substation was via an existing Coillte forestry road, which connected a local public road (Unnamed Local Road A) and a new access road to the substation. Access entailed the following:

a) Existing Coillte Track: This section of pre-existing unstoned track (approximately 2900 m in length) was already constructed down to mineral soil. The track was widened to 3.5 m and stoned with Cl. 804 road material to bring it up to the necessary load bearing capacity. A bend along the track was eliminated in order to facilitate construction traffic. A small amount of felling was required to allow this construction.
b) Substation Access Road: This section of new road construction (approx.138m long, 3.5m wide) runs from the public roadway up to the Agannygal Substation compound. This roadway was constructed on an area of newly felled forestry. The surface was finished with Cl 804 stone material.

Earthworks: Following tree felling, earthworks were completed to form a level site in advance of the construction activities. A 72m x 52m levelled earth platform was constructed by cutting into the existing ground by up to 2.5m. Excess excavated material from this cutting activity was used to create an earth embankment around the external perimeter of the sub-station on three sides (approximately 2m high).

Once the earthworks were complete, the construction activities for the sub-station building and compound were carried out.

Construction works: The foundations for the control building, the electrical equipment steelwork and transformer within the compound comprise reinforced concrete pads or plinths supported on the granular rockfill or the underlying firm or stiff glacial till. The compound hardstanding is capped with hardcore surfacing.

During the construction of the control building and electrical transmission and transformer components on the site, construction traffic generally comprised standard concrete trucks, small mobile cranes, and trucks with loader cranes for transporting materials, equipment, cherry pickers and mobile elevated work platforms (MEWP) to the site.

2.7.4.14 Wind Farm Project Commissioning

The commissioning phase included the local testing and inspection of each turbine and its ancillary devices, the cabling between each turbine and Derrybrien Substation. This commissioning followed a strict safety process where firstly “cold”

commissioning checks were tested (with no live parts), followed by "hot" commissioning checks (with live plant and equipment).

At the end of the commissioning process there was a reliability run for the wind farm, which consisted of a 240 hour test period to prove the correct operation of the installation.

2.8 Operation & Maintenance Activities 2006-2020

2.8.1 Overview

The operation and maintenance of the wind farm in the period between March 2006 and mid 2020 comprised the following:

- Power generation
- Maintenance/repair of the turbines
- Maintenance/repair of the substation and control building
- Maintenance/repair of the access tracks
- Cables and Ducting
- Drainage
- Miscellaneous

2.8.2 Staffing

The Operation and Maintenance (O&M) sub-contractor, Vestas, has a maintenance crew of 4-6 technicians stationed full-time on the site for operation and maintenance of the turbines. A site manager is based at the site part-time.

2.8.3 Power Generation

The wind farm has been operating continuously since it was commissioned in early 2006. The installed capacity of the wind farm is 59.5MW.

The output of the wind turbines is primarily determined by the wind resource and installed turbines technology on site. Since operation commenced the average annual capacity factor has been approximately 25% and the annual capacity factor is expected to be approximately 25%-26% for the remainder of its operation life. This means that over the course of a year, on average each turbine produced 25% of the amount of electricity it could theoretically produce if it was working at maximum output at all times throughout the year.

The annual capacity factor is somewhat lower than would have been expected because of *inter alia* the blocking effect of nearby forestry.

Nonetheless, the wind farm has been a reliable source of renewable energy since it was commissioned.

2.8.4 Wind Farm Activities

2.8.4.1 Maintenance/Repair of Turbines

Routine maintenance works and repair works were carried out on the turbine mechanical and electrical systems, which typically involved:

- Cleaning/maintenance of the clutch, gear box and mechanical systems in the turbine nacelle.
- Repairs to the electrical equipment.
- Cleaning/repairs to the turbine blades and rotor systems.
- Sealing the earth wire hole through the flange of the turbine base can to prevent groundwater ingress.
- Sealing the internal joint between concrete base and steel tower (e.g. T9, T10, T35)

The maintenance work was carried out on-site at the turbine. The technicians travel to and from the turbines along the site access tracks in standard commercial vehicles. Elevated access for personnel to the nacelle and rotor systems is via a winch system or a mobile elevated work platform (MEWP) such as a cherry picker operating from the adjacent crane hard standing area.

Occasionally more substantial works were required to replace broken or malfunctioning mechanical or electrical components in the nacelle and rotor hub such as the gearbox, bearings, electricity generation systems or turbine blades. Between 2005 and 2018 based on the site maintenance records, the majority of the major repairs were related to the gearbox and generator systems, which needed to be replaced a total of 84 times at 55 turbines. At 15 of the turbines the gearbox or generator had to be replaced on more than one occasion. A further 14 major repairs or replacements have been recorded at 12 turbines.

Cranes are utilised for certain maintenance activities.

2.8.4.2 Derrybrien Substation

Routine cleaning, maintenance and repair works were carried out annually on the electrical components of the substation and control building, including the transformers, capacitors, and circuit control systems. These works were carried out directly on the granular hard-standing area of the substation by specialist sub-contractors.

2.8.4.3 Site Access Tracks

General maintenance: Throughout the operation of the wind farm routine access track maintenance and repair works have been undertaken.

Remedial works: In 2014, improvement works were carried out on the floating roads (over approximately 6km) which comprised the placing of geogrid reinforcement followed by approximately 150mm crushed rock capping material and 10mm granular blinding along road surface.

Minor works to repair large potholes were also carried out at selected locations along sections of the road network. The potholes were filled with Class 6F2 granular capping material using an 18-tonne rubber-tyred excavator. The fill material imported to the site was stockpiled on the crane hard standings and brought to the locations of the localised repairs using the 9-tonne dumper.

The 2014 road improvement works included remedial works to improve and widen the existing floating road over culverts at Turbines T10, T24, T35, T50, T66 where the existing road was too narrow and where the side slope down into the drainage channel was too steep, which posed a health and safety risk to vehicles using the road.

2.8.4.4 Drainage

Periodic inspections of the site between 2005 and 2020 were undertaken to assess maintenance requirements for short and long-term stability. The resultant drainage works undertaken related to maintenance of drainage around turbines and general site drainage.

Minor drainage works were carried out by hand. More substantial works were carried out by mechanical excavation with a wide-tracked 13-tonne low ground bearing pressure excavator suitable for working directly on the peat.

The majority of the drainage improvement works were carried out within 6 years of completion of the wind farm (i.e. up to 2011). A major drainage maintenance programme was completed on the site in 2011.

Since 2011, inspections have only resulted in only minor repair works to the drainage network, which indicates that maintenance requirements for the site drainage are at a residual level.

2.8.4.5 Cables and Ducting

General Maintenance: Between September 2005 and 2020 the only maintenance work that was carried out on the installed cables was the maintenance of adequate backfill cover to cables in cable trenches.

Upgrade Works 2017: In September 2017, as part of an upgrade to the turbine control systems, approximately 7.6km of new 12 core single-mode fibre-optic cable was installed on the site to improve the response of communication signals between the turbine controllers and the central control system. The total length of ducting was approximately 2.55km. A mole plough was used to bury the ducts directly in the peat at a depth of 0.5-0.6m with a warning tape overhead without having to open up a trench. At the 5 road crossings the 50mm ducting was fed through a 75mm diameter galvanized pipe that was pushed horizontally through the peat under the floating roads to avoid having to open up a trench in the roads

2.8.4.6 Cutting back of tree regrowth

As previously noted, some small trees have begun to re-establish naturally on the site where the trees were felled during construction. Therefore, cutting back of tree regrowth was carried out in 2018 using specialist low ground bearing pressure forestry machine suitable for operating directly on the peat. The cut trees were left in place on the site.

The methodology adopted for the cutting back of tree growth was as follows:

1) Cutting works were undertaken using a 10-tonne low ground pressure machine so as to be minimally invasive.
2) The excavator had a saw head attachment rather than a digging bucket.
3) All of the trimmed vegetation was cut and left in place on the peat slopes with no additional handling, which minimises machine movements and loading on the peat.

In 2018 cutting back of tree regrowth was carried out for a distance of 10 metres either side of the site access track along the top turbary road from Turbines T27 to T44, Turbines T26 to T70, Turbine T3 to T5 and Turbine T1 to T2.

2.8.4.7 Energy demand/usage

There is no rural electricity network in the immediate vicinity of the wind farm. The 20kV/415volt electricity supply to the wind farm is from the house transformer in Derrybrien Substation. There is a back-up diesel generator at Derrybrien Substation.

The substation is not metered, so electricity usage information is not available.

2.8.4.8 Waste Management

The nature of wind farm operations is such that it does not have significant potential for generating large amounts of waste. Only small amounts of waste are generated on site. Waste is managed by the turbine contractor Vestas.

The main items of waste and their sources are set out in **Table 2.14**.

Table 2.14: Typical waste arisings-operational phase

Waste	EWC Code[25]	Source	Typical Quantities
Commercial waste	20 03 01	General waste	One to four 12 cubic yard (cy) collections /month

[25] European Waste Code

Waste	EWC Code[25]	Source	Typical Quantities
Dry recyclables	15 01	Packaging	One to four 12 cubic yard (cy) collections /month
Oil contaminated material	15 02 02*[26]	Oily rags, filter materials etc.	500 kg/year
Waste Oil	13 02 08*	Gearboxes	2500 litres/year
Oil filters	16 01 07*	Replacement of oil filters	700 kg/year

All wastes have been and are managed in accordance with applicable legislation.

The sampling, testing and replacement of oil from the main gearbox is undertaken as required. Oil filters are replaced at regular intervals.

2.8.5 Grid Connection

2.8.5.1 OHL

Routine inspection and maintenance of the overhead line components are undertaken as required. Cutting back of tree regrowth along the OHL was carried out along the OHL route in 2018 and 2019. Access was via existing forestry tracks.

The works were carried out using a 10 tonne wide-tracked excavator with a saw head attachment. The trees were cut but not extracted and cut material was left in place on the ground.

2.8.5.2 Agannygal Substation

Scheduled inspections in Agannygal substation are undertaken by ESB Networks and maintenance/works are undertaken as required.

Examples of scheduled maintenance activities undertaken include:

- Inspection and maintenance of electrical equipment
- Statutory servicing of fire extinguishers
- Grass cutting and weed treatments
- Clearing of gutters and drains

Examples of unscheduled maintenance include:

- Rust/corrosion works
- Repairs to fence and compound

[26] Asterisk* indicates hazardous waste

- Repairs to burglar alarms
- Adjustments to line earth disconnects

2.8.6 Works related to peat slide

2.8.6.1 Barrages

Maintenance activities undertaken in relation to offsite measures were limited to the clearance of debris from behind barrages.

Barrages 1 and 2 were last cleared of debris in June 2007 and the cleared debris essentially comprised silt. A small quantity of silt i.e. less than $2m^3$ was removed from a silt trap behind Barrage 1 in February 2009. Since the commencement of wind farm operations, the lower two barrages namely Barrages 3 and 4 have not needed to be cleared as accumulated debris was not evident.

2.8.6.2 Peat Repositories

Inspections of the peat repositories were undertaken in the period 2006-2020. There has been no maintenance required in relation to the peat repositories.

2.8.6.3 Road/Bridge Works

There has been no maintenance required in relation to offside roads and bridges.

Galway County Council undertook limited maintenance on the Black Road in 2012 at the request of the Wind Farm Project. The road condition had deteriorated due to usage unconnected to wind farm activities. The works required were carried out over a couple of days.

2.8.7 Residues and Emissions

2.8.7.1 Overview

The residues and emissions associated with Project operation are divided into the following categories:

- **Water**: Surface water and wastewater discharges from Derrybrien and Agannygal Substations as set out in subsections 2.6.5.6, 2.6.5.12 and 2.6.6.3
- **Air:** Refer to subsection 2.8.7.2.
- **Noise:** Refer to subsection 2.8.7.3.
- **Lighting-:** Refer to subsection 2.8.7.4.
- **Waste:** Refer to subsection 2.8.4.8.

2.8.7.2 Air and Greenhouse Gas Emissions

Carbon Saved: The operation of Derrybrien Wind Farm reduces adverse climate change effects by offsetting the production of carbon dioxide through use of renewable sources for generating electricity.

SF_6: Switchgear is designed to be leak free. However, there was an accidental release of SF_6 from the outdoor switchgear at Derrybrien Substation in 2015. This comprised the initial loss of 8.1kg SF_6 from the switchgear pipework. Repair of the switchgear was undertaken, and the switchgear was refilled with SF_6. The initial repair to the switchgear failed and there was a further 8.1kg of SF_6 lost. Thereafter the switchgear was replaced. There has been no further loss of SF_6.

Electromagnetic Radiation (EMF) sources:

In common with all electrical equipment, the turbines and other equipment associated with a wind farm emit electromagnetic radiation. Such emissions for the type of machine in use are very low in the immediate vicinity of the machine and almost non-existent at any distance from it.

The turbine generators at Derrybrien Wind Farm are located inside the turbine nacelle, which are situated at between 47-49m above ground and result in little or no EMF at ground level.

The transformers located within Derrybrien Substation are the main EMF generation sources within the wind farm site.

All electrical connections from the turbines to Derrybrien Substation are by underground cables, which generate negligible EMF.

EMF is also generated from 110kV overhead transmission lines. Electric and magnetic fields reduce in strength rapidly with distance from the source. For a power transmission overhead line the electric field is strongest directly beneath the line where the conductors carrying electricity are nearest the ground, typically near the middle of the span between two adjacent support structures. By moving away from a power line the strength of the electrical field decreases rapidly.

The current ICNIPR (International Commission on Non-Ionising Radiation Protection (https://www.icnirp.org/), a non-governmental organisation which is recognised by the World Health Organization) Guidelines for electric fields are 5kV/m and for magnetic flux density are 100uT. The maximum electric field strength at ground level 30m from the centre of the110 kV line of 0.077kV/m is well below the ICNIRP guideline as is the magnetic flux density of 0.2uT

2.8.7.3 Noise Emissions

Operating windfarms generate noise from the wind turbine generators and from the transformer associated with the substation. Wind turbine generator noise occurs mainly from the movement of the turbine blades passing through the air and

producing a swishing sound which varies with the rotational speed of the blades. It can also occur from the turbine machinery.

Guidance in relation to acceptable levels of noise from wind farms is contained in the documents Department of the Environment, Heritage and Local Government "Wind Energy Development Guidelines" and Department of Trade & Industry (UK) Energy Technology Support Unit (ETSU) publication "The Assessment and Rating of Noise from Wind Farms" (1996). turbine noise is too low to allow a recommendation. The operational noise of the wind farm at Noise Sensitive Locations (dwellings) in the area around the wind farm has been assessed against the acceptable levels of noise contained in the Guidance in Chapter 5, both for the Derrybrien wind farm itself and cumulatively with the Sonnagh old windfarm. No exceedance of the noise guidelines has been identified.

2.8.7.4 Lighting

Wind Turbines: Aviation lights are provided on nine turbines, specifically T1, T18, T26, T44, T46, T47, T52, T61 and T65.

There are 4 light standards within the Derrybrien Substation compound.

There are 6 light standards within the Agannygal Substation compound.

2.8.8 Risk of Accidents

The wind turbine model used at Derrybrien Wind Farm has a proven track record of safe operation. According to Vestas, the company has erected more V52 wind turbines than any other turbine on its portfolio-approximately 1500 turbines worldwide.

Peat stability risk assessments have been undertaken for the project operation phase. The probability of a peat slide occurring at the wind farm site ranges from negligible to low for operational and maintenance phase activities. (Tables 10.3 & 10.4, Chapter 10 Soils, Geology and Land). Geotechnical inspections of the site are undertaken periodically to monitor site as part of maintenance activities.

As previously described, the wind farm site is located within an area in which there are large concentrations of forestry and therefore forest fires are a potential risk in the wider area.

2.8.9 Safety Management

Derrybrien Wind Farm operates a Safety Management System (SMS) which is certified in accordance with OHSAS 18001. An Emergency Plan is in place to deal with incidents and emergencies, which identifies hazards associated with the project and sets out procedures in the event of accidents.

There are procedures in relation to accidents, lone working, persons falling into water, forest/gorse fire, fire in wind turbine towers and in the event of a landslide.

Contact details are provided for emergency services, including the local authority and An Garda Síochána.

2.8.10 Environmental Management

Derrybrien Wind Farm operates an Environmental Management System (EMS) for the wind farm site which is certified in accordance with ISO 14001.

2.9 Operation/Maintenance Activities 2020-end operation

The scope of operation and maintenance activities that were carried out on the wind farm between 2005 and 2020 is representative of the nature of activities that will be carried out on the site between 2020 and end of operation in 2040. No further major improvement or permanent upgrade works are planned for the site infrastructure between 2020 and decommissioning. Therefore, the site activities over that period will be limited to ongoing reactive or preventative maintenance and repair of the existing infrastructure and cutting back of tree regrowth. The methodologies that will be adopted for carrying out the site activities between 2020 and end of operation will be the same as that which have been successfully used for similar activities between 2006 and 2020.

As previously noted, some small trees have begun to re-establish naturally on the site where the trees were felled during construction.

The methodology for cutting back of tree regrowth will be as per 2.8.4.6 and will comply with relevant Forest Service Guidelines.

2.10 Decommissioning

2.10.1 Overview

Decommissioning is the final closing down of the project when it has reached the end of its useful operational life.

The envisaged operating life of the wind farm is approximately 35 years from initial project operation i.e. to 2040. At the end of the operational life, the options are that the site would be repowered (turbines replaced and or reconfigured) to a greater or lesser extent or decommissioned. If repowering is considered in the future this would be subject to a new consent and Environmental Impact Assessment procedure and would be determined in the light of policy applicable at the time.

2.10.1.1 Wind Farm site

Decommissioning of the wind farm will involve the removal of the above ground elements of the wind farm and will entail:

- De-energising of the site which will involve initially high voltage (HV) disconnection followed by low voltage (LV) disconnection of turbines.
- Controlled dismantling of turbines (blades, nacelle, and tower) and masts.
- Removal of sub-station building and equipment
- Removal of de-energised underground LV cables, electrical control systems and ducts

It is not proposed to replant the wind farm site with trees although natural regrowth of previously felled areas will likely continue.

The duration of the decommissioning phase is expected to be approximately 24 months.

The following elements of the windfarm will be left in place after decommissioning:

- The reinforced concrete turbine bases;
- All of the site access tracks including the floating roads on the peat and site entrance;
- The crane hardstanding areas adjacent to the turbines;
- The hardstanding area for the substation, contractor's compound and control building;
- The site drainage network;
- The on-site peat repository/storage areas from construction stage; and
- The borrow pits.

Removal of turbines, bases and substations: The turbines and masts will be dismantled by mobile cranes operating on the adjacent granular hardstanding areas, which are designed to support the crane loads on the glacial till or rock below the peat.

The substation and control buildings will also be dismantled from the hardstanding area so that there is no loading on the peat. Demolition of the control building will be carried out on the hardstand areas with mechanical demolition equipment and hydraulic breakers for the reinforced concrete foundations. There will be no blasting on the site.

It is not proposed to carry out any remedial works on any of the elements of the windfarm that will be left in place after decommissioning. However, it may be necessary to carry out temporary road widening works along the narrow turbary road between Turbines T31 and T45 to provide safe access to the mobile crane that will be used to dismantle the turbines. If this is required, then the roads will be widened temporarily using a combination of steel plates, timber and/or bog mats, as necessary to provide adequate edge support to the wheels of the crane without significantly increasing the loads on the peat.

Specialist trucks and low-loader transporters will be required to remove the heavy and oversize components of the turbines from the site. The mass and length of the main turbine components are as follows for the Vestas V52/850 turbine:

- Nacelle: 22 tonnes
- Rotor: 10 tonnes
- Rotor Blades (26 m) 1.9 tonnes
- Mast (Hub Height 49 m): 55 tonnes

The mast will be split into sections so that the mass of each load will be less than 30 tonnes, and the axle load on the transporters will be limited to a maximum of 12 tonnes/axle so that they can travel on the national road network in Ireland.

All demolition waste will be removed from the site. SF_6 switchgear from the substation and any oil containing equipment will be carefully removed in compliance with applicable legislation. Wind turbines and components will be reused or recycled where possible. All waste will be managed in accordance with applicable legislation.

Removal of Cables and Ducting: The removal of cables and ducting will entail the following:

- Remove all of the below-ground LV electrical cables and fibre-optic cables
- Cables to be extracted by winching from crane hardstanding areas where possible, otherwise by excavating open trenches along the cable routes using low ground bearing pressure tracked excavators working directly on the peat
- Ducting below the site access roads to be removed by mechanical excavator when removing the roads
- Transport all of the cables and ducting off-site for disposal and/or recycling in a suitably licensed landfill.

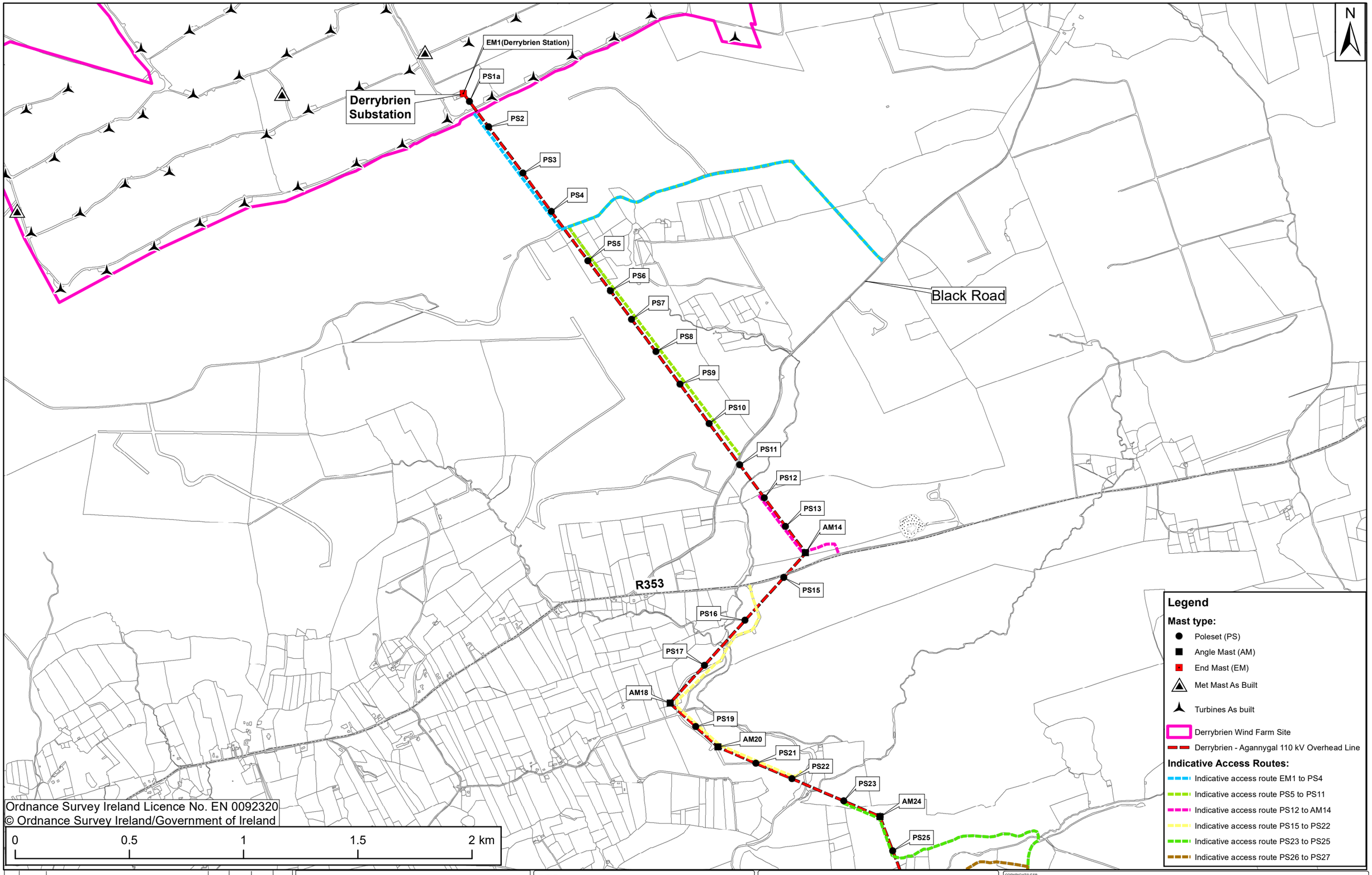
2.10.1.2 OHL

At the end of the project operations (envisaged 2040), the overhead line would also be decommissioned which would entail the removal of the OHL infrastructure between the Derrybrien and Agannygal substations. Foundations will be left in situ and pole sets and masts will be cut at base. Potential access routes for decommissioning works have been identified and these will be subject to detailed design. (**Figure 2.27: Overhead Line-Indicative Decommissioning Access Routes (Sheet 1 of 2)** and **Figure 2.28: Overhead Line-Indicative Decommissioning Access Routes (Sheet 2 of 2)**).

The existing forestry access tracks typically comprise a 3m wide track constructed of crushed rock which has been founded on the mineral soil underlying the peat. Minor upgrades of sections of these tracks may be required.

The OHL poles and mast elements will be removed from site for reuse and if necessary, disposal in accordance with the relevant legislation.

It is not proposed to replant the route of the overhead line with trees although natural regrowth of previously felled areas will likely continue.



REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP
0	05/05/20	Issued for substitute consent	E.O'S	E.O'S	M.B	R.O'D

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PROJECT: **Derrybrien Wind Farm Project**

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PRODUCTION UNIT: **Civil & Environmental Engineering**

DRAWING TITLE:

Figure 2.27 - Derrybrien - Agannygal OHL - Indicative Decommissioning Access Routes (Sheet 1 of 2)

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	M. Brides	R. O'Donovan	28/07/2020

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DRAWING NUMBER: **QS-000280-01-D460-003-027-000**

N

PS22
PS23
AM24
PS25
PS26
PS27
PS28
PS28a
PS29
INT30
PS31
PS32
PS33
AM34
PS35
PS36
PS37
AM38
PS39
PS40
EM41
Agannygal Substation
EM1 (Agannygal - Shannonbridge OHL)
EM1 (Agannygal - Ennis OHL)

Legend

Mast type:

- Poleset (PS)
- Intermediate Mast (INT)
- Angle Mast (AM)
- End Mast (EM)
- Derrybrien - Agannygal 110 kV Overhead Line

Indicative Access Routes:

- Indicative access route PS15 to PS22
- Indicative access route PS23 to PS25
- Indicative access route PS26 to PS27
- Indicative access route PS28 to PS31
- Indicative access route PS32 to AM34
- Indicative access route PS35 to PS37
- Indicative access route AM38 to EM41
- 110 kV Overhead Line
- 400 kV Overhead Line
- Agannygal Substation

0 0.25 0.5 1 1.5 2 Kilometers

REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP
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PRODUCTION UNIT: **Civil & Environmental Engineering**

DRAWING TITLE:

Figure 2.28 - Derrybrien - Agannygal OHL - Indicative Decommissioning Access Routes (Sheet 2 of 2)

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	M. Brides	R. O'Donovan	30/07/2020

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DRAWING NUMBER: **QS-000280-01-D460-003-028-000**

2.10.1.3 Decommissioning of Agannygal Substation

The decommissioning of Agannygal Substation will involve the removal of the above ground elements of the substation and will entail:

- De-energising of the electrical equipment in site
- Removal of sub-station building and equipment

The decommissioning and removal of all equipment is anticipated to take approximately 12 weeks. The removal of the substation building will take approximately 2 weeks.

The hardstanding area for the substation and control building will be left in place after decommissioning as will the access road to the site.

The substation and control building will be dismantled from the hardstanding area. Demolition of the control building will be carried out on the hardstand areas with mechanical demolition equipment and hydraulic breakers for the reinforced concrete foundations. There will be no blasting on the site.

All demolition waste will be removed from the site. Substation equipment will be reused or recycled where possible. All waste will be managed in accordance with applicable legislation.

2.10.1.4 Ennis-Shannonbridge Line reinstatement

When the Derrybrien-Agannygal 110kV Overhead Line is ultimately removed, reinstatement of the Ennis-Shannonbridge 110kV Overhead Line will be required, involving the re-conductoring of the OHL span at Agannygal Substation.

The full section of line between angle masts will be wheeled and re-tensioned (approximate length 1.3km). Refer to **Figure 2.29 Ennis-Shannonbridge Line Span Reinstatement**)

Stringing equipment utilised will comprise 4x4 vehicles, puller – tensioners, teleporters, stringing wheels, conductor drums, compressor & head, transit vans, chains and other small tools, drum stands and drum carriers. It is estimated that the work would take less than a month to undertake.

N

Please Note:
Structures on reinstated Ennis – Shannonbridge Line renumbered (sequentially from Ennis Substation)

Line span to be restrung between Angle Mast 195 and Angle Mast 201

Ennis-Shannonbridge (Galway West)

End masts within Agannygal Substation to be removed during substation decommissioning

195 196 197 198 199 200 201

Legend

- Mast
- Poleset
- Ennis-Shannonbridge 110 kV Line

0 55 110 220 330 440 Meters

1:1,000

0 10 20 40 60 80 Meters

Rev	Revision Description

Purpose of Issue - Preliminary unless indicated

Tender ☐ Client Approval ☐ Construction ☐ As-built ☒ Revised ☐

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PROJECT: **Derrybrien Wind Farm Project**

PRODUCTION UNIT: **High Voltage Engineering**

DRAWING TITLE:
Figure 2.29
Decommissioning Phase: Ennis - Shannonbridge OHL span reinstatement

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVED DATE
GMM	GMM	GB	RO'D	MAY 2020

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DRAWING NUMBER — SHEET REV
QS-000280-01-D460-003-029-000

2.10.1.5 Measures associated with peat slide

It is proposed that Barrages 3 and 4 will be removed, subject to the approval of Inland Fisheries Ireland. It is proposed that the barrage material would be brought to Borrow Pit 3 on the wind farm site.

The travel distance for removal of materials from Barrage 3 to Borrow Pit 3 is approximately 7.5km.

The travel distance for removal of materials from Barrage 4 to Borrow Pit 3 the proposed designated storage area is approximately 7.8km.

As set out in Section 2.6.7, it is envisaged that the following will remain in place into the future and therefore will not be removed:

- Access track at T68 – within the wind farm site
- Access track between T23 and T70 – within the wind farm site
- Barrage 1 and associated access track
- Barrage 2 & associated repository area and associated access track
- Repository area at Barrage 3
- Repository area at the Black Bridge

2.10.1.6 Methodology for removal of Barrages 3 & 4

The following construction sequence is given for the removal of the barrages.

Preparatory work

- For each of the barrages to be decommissioned, works shall be undertaken after at least 4-5 days of dry weather and during a period when further dry weather is expected, during the spring / summer months or as per agreed with IFI. The works at each barrage are expected to last no more than one week.
- In-stream works shall be carried out in accordance with the “Guidelines on Protection of Fisheries during Construction Works in and adjacent to Waters”. Contact shall be made with Inland Fisheries Ireland prior to works commencing including agreement of methodology.
- Each watercourse shall be blocked upstream of the works area using sand bags and a timber weir and the remaining water shall be over pumped. The pump will be bunded and located away from the watercourse and have a silt bag on its outlet. A tight mesh will be fitted on the suction hose before pumping commences. Water will be discharged to vegetation, preferably on the downstream side of the barrage.
- As any vehicular access to Barrages 3 and 4 from the nearest roads will be over very soft peatland, bog mats will be used for at least the final approach to the barrages.
- The presence of overhead lines close to the location of Barrage 3 will need to be considered when vehicles are accessing and removing the barrages.

- Any retained debris up against the barrage on the upstream side should be removed prior to removal works commencing on the actual barrage. The debris should be removed for a distance of 3 – 5 m upstream of the upslope toe of the barrage.
- For removing the retained debris from the upstream side of the barrage, for Barrages 3 and 4 the excavator may need to access and position itself on the upstream side of the barrage. However, if feasible it is preferable that a long-reach excavator remove debris from a distance outside the banks of the watercourse so as to avoid the risk of unnecessary destabilisation of the banks.
- The debris upslope of the barrage will be trimmed to a stable configuration, so the debris is stable following the removal of the barrage. A stable configuration will vary depending on the type of debris. The debris is likely to comprise peat, clay/silt and sand and possibly fragments of rock. The following guidance on slope configuration is given for the anticipated types of debris:

  -Peat – 1 (v): 3 – 5 (h) depending on ground conditions encountered

  -Clay/Silt/Sand – 1 (v): 2 (h)

Barrage Removal Work

- Excavation will commence at the top of one end of the barrage and progress over its full width in one direction laterally before moving to the next ‘layer’ below.
- Low ground pressure tracked dumpers will be reversed up to and positioned behind the excavator for filling. Appropriate measures such as bog mats shall be in place to manage the accumulation of silt arising from the movement of plant. A rigid-body self-loading lorry will be positioned at the access point to the barrages on the public road. From here the dumper contents shall be loaded into the lorry for removal to the designated disposal location.
- The barrages are constructed of highly permeable material that allow the passage of water but prevent the passage of peat/landslip debris. Material to be removed from the barrages are likely to comprise well-graded coarse rocks/boulders from about 300 mm up to typically 1,200 mm.
- Where fine-packing material is situated between the boulders, this shall be removed with care prior to the heavier armoured elements (if possible)
- Excavation works will continue to the base layer of the barrage over the full width of the watercourse profile. The base layer will be left in place, particularly outside the banks of the river, until potential erosion arising from their removal is assessed by an engineer on site.
- Where an existing watercourse profile/channel passes through the location of the barrage, the natural profile of the watercourse and neighbouring banks will be preserved by matching the reclaimed channel section as closely as possible with the upstream and downstream channel sections.

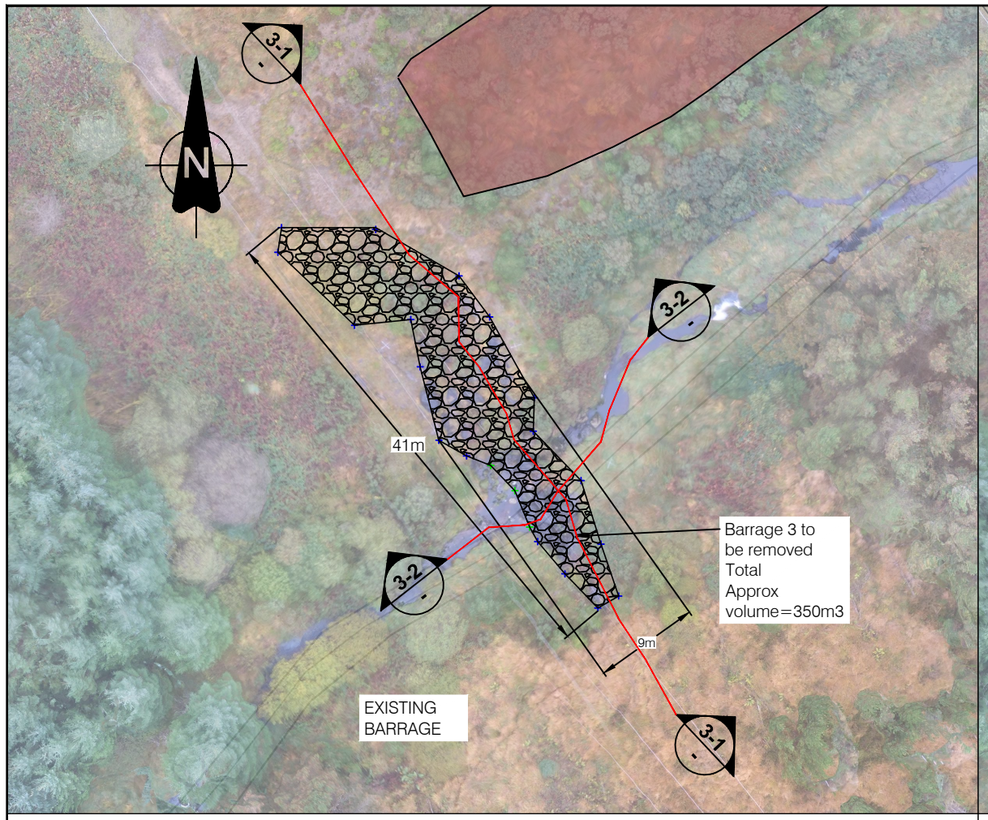
- Temporary stockpiling of rock upon removal from Barrages 3 and 4 will be required due to access restrictions in these areas. The rock should be stockpiled adjacent to the barrage in an accessible location for loading and transporting to a designated location for storage.
- All material (either debris from the landslip or rock from the barrage) requiring removal from the barrages will be loaded separately for transporting to the designated storage locations.

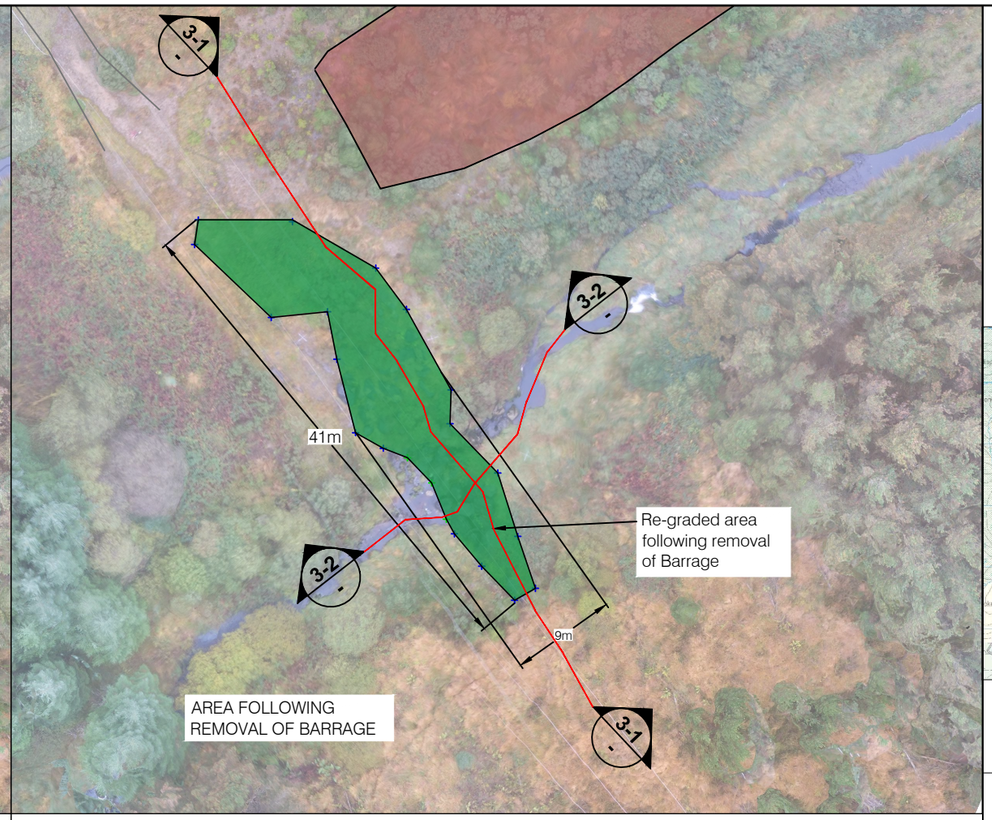
Post-Removal

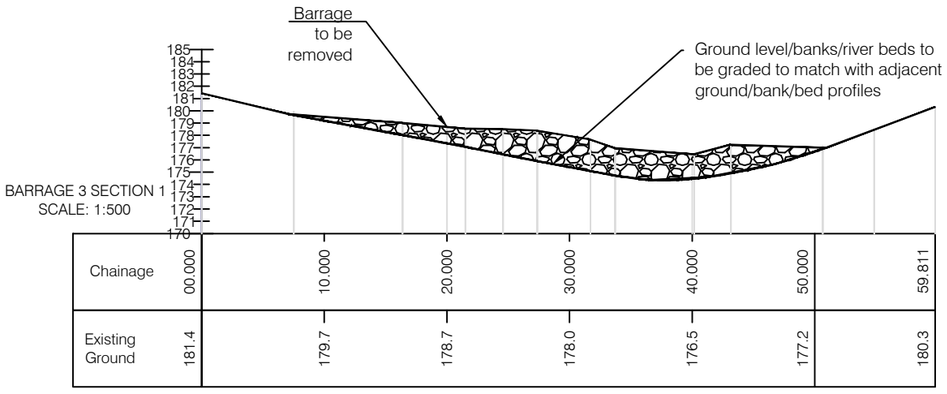
- Boulders removed from the barrages can be placed at their natural angle of repose (circa 40 to 60 degrees) within designated storage locations. The manner in which material is placed within the storage area will depend on site conditions at these locations.
- Debris removed from the barrages will likely require a retainment bund solution to prevent debris run-off and to ensure stability of the stored material within the designated storage areas. The retainment bund could be formed from the rock removed from the barrages or an alternative suitable material.
- Upon completion of these decommissioning works, the weir and sand bags will be removed slowly to prevent a surge in the river. Silt fences shall be installed on the stream-side of the banks and the other side spread with grass-seed to encourage re-vegetation.

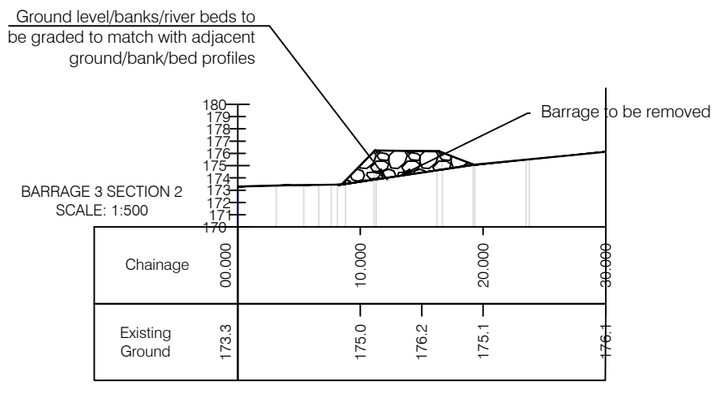
Refer to **Figure 2.30: Barrage 3-Decommissioning**.

Refer to **Figure 2.31: Barrage 4-Decommissioning**.







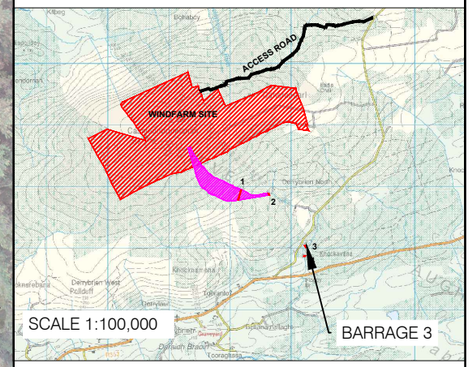


LEGEND

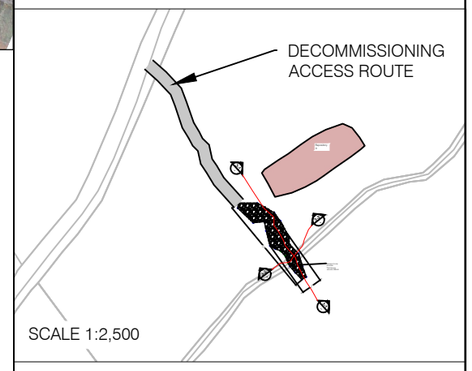
Stone Barrage

Re-graded Barrage area

KEY PLAN



DECOMMISSIONING ACCESS ROUTE-BARRAGE 3



Decommissioning Plan For Barrage:

1. Reference chapter 2 for details of removal works plan

Rev	Date	Revision description	Drn.	Prod.	Ver.	App.
0	07.05.20	Issued for substitute consent	LMcM	LMcM	MB	ROD

Purpose of issue - Preliminary unless indicated

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Client Gort Windfarms Ltd

Project Derrybrien Wind Farm Project

Contract

Drawing title

Figure 2.30
Decommissioning-Removal of Barrage 3

Production unit Civil & Environmental Engineering

Drawn	Produced	Verified	Approved	Approval date
LMcM	LMcM	M.Brides	P.Kavanagh	07.05.2020
Client ref.		**No. of sheets** 1	**Size** A3	**Scale** 1:500

Drawing number QS-000280-01-D460-003-030-000 | SHEET | REV

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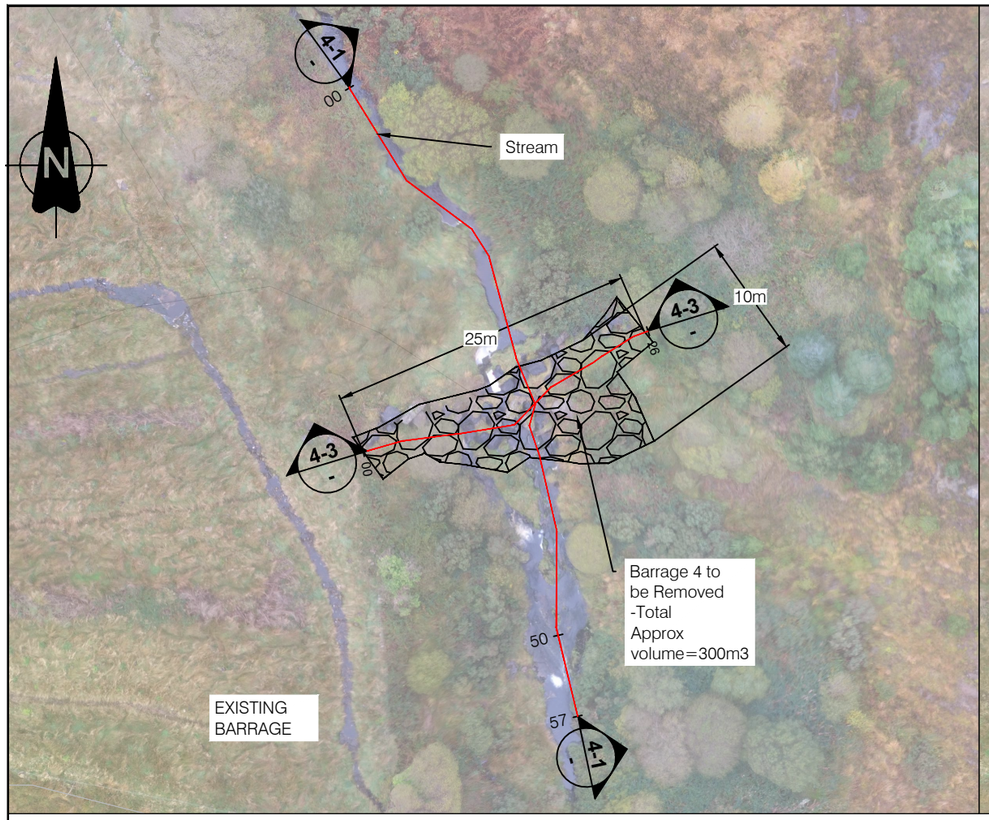
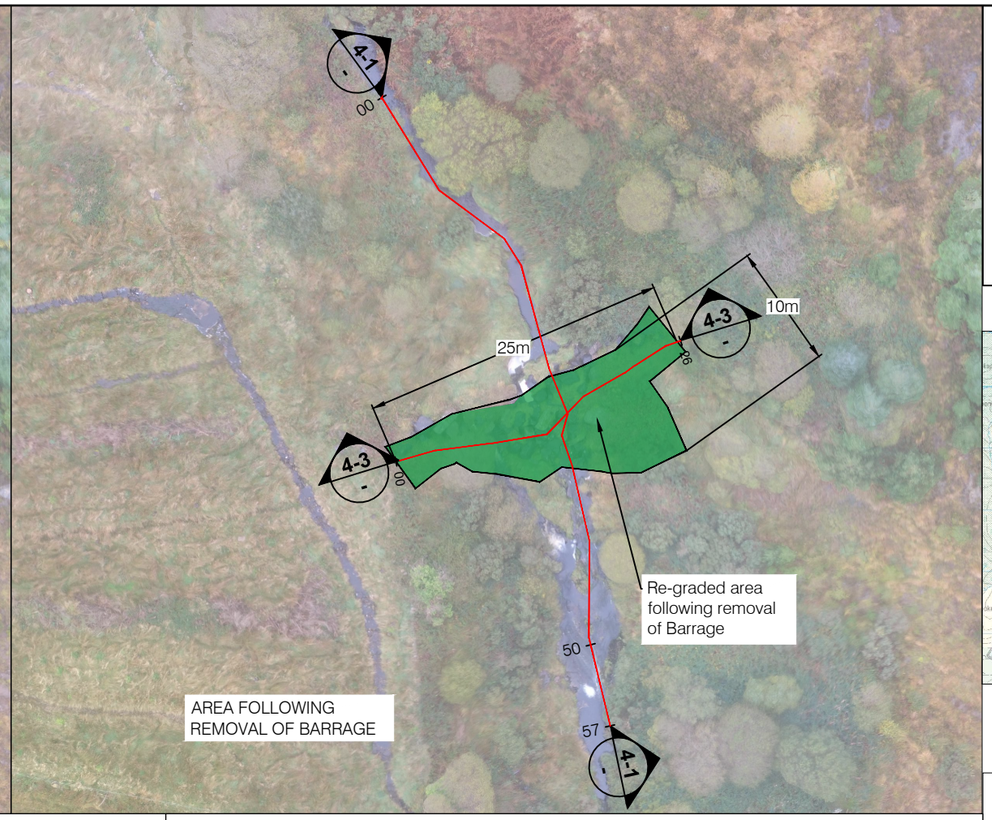


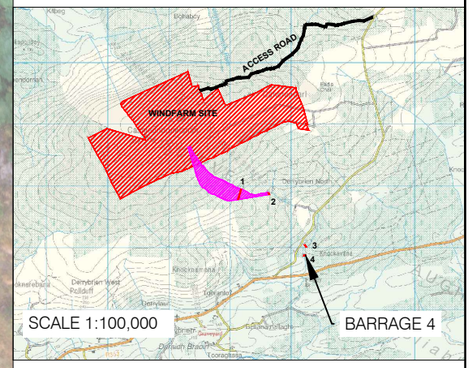


LEGEND

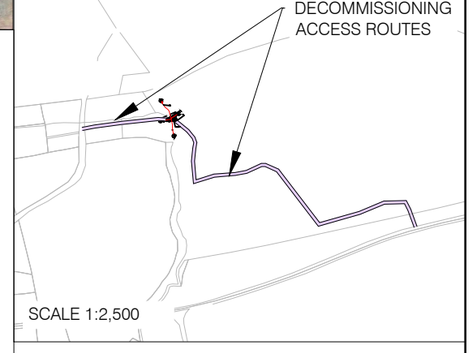
Stone Barrage

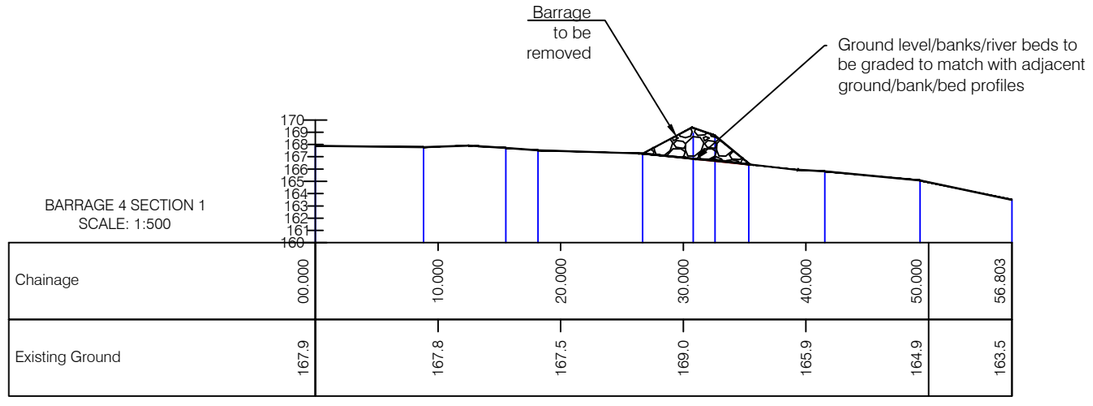
Re-graded Barrage area

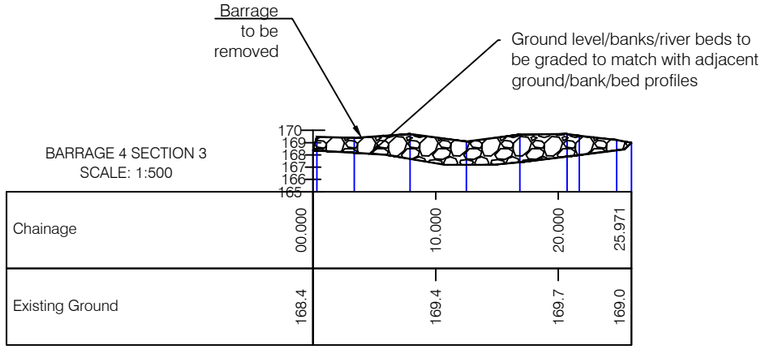
KEY PLAN



DECOMMISSIONING ACCESS ROUTE-BARRAGE 4







Decommissioning Plan For Barrage:

1. Reference chapter 2 for details of removal works plan

Rev.	Date	Revision description	Drn.	Prod.	Ver.	App.
0	07.05.20	Issued for substitute consent	LMcM	LMcM	MB	ROD

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Client: Gort Windfarms Ltd

Project: Derrybrien Wind Farm Project

Contract:

Drawing title: Figure 2.31 Decommissioning-Removal of Barrage 4

Production unit: Civil & Environmental Engineering

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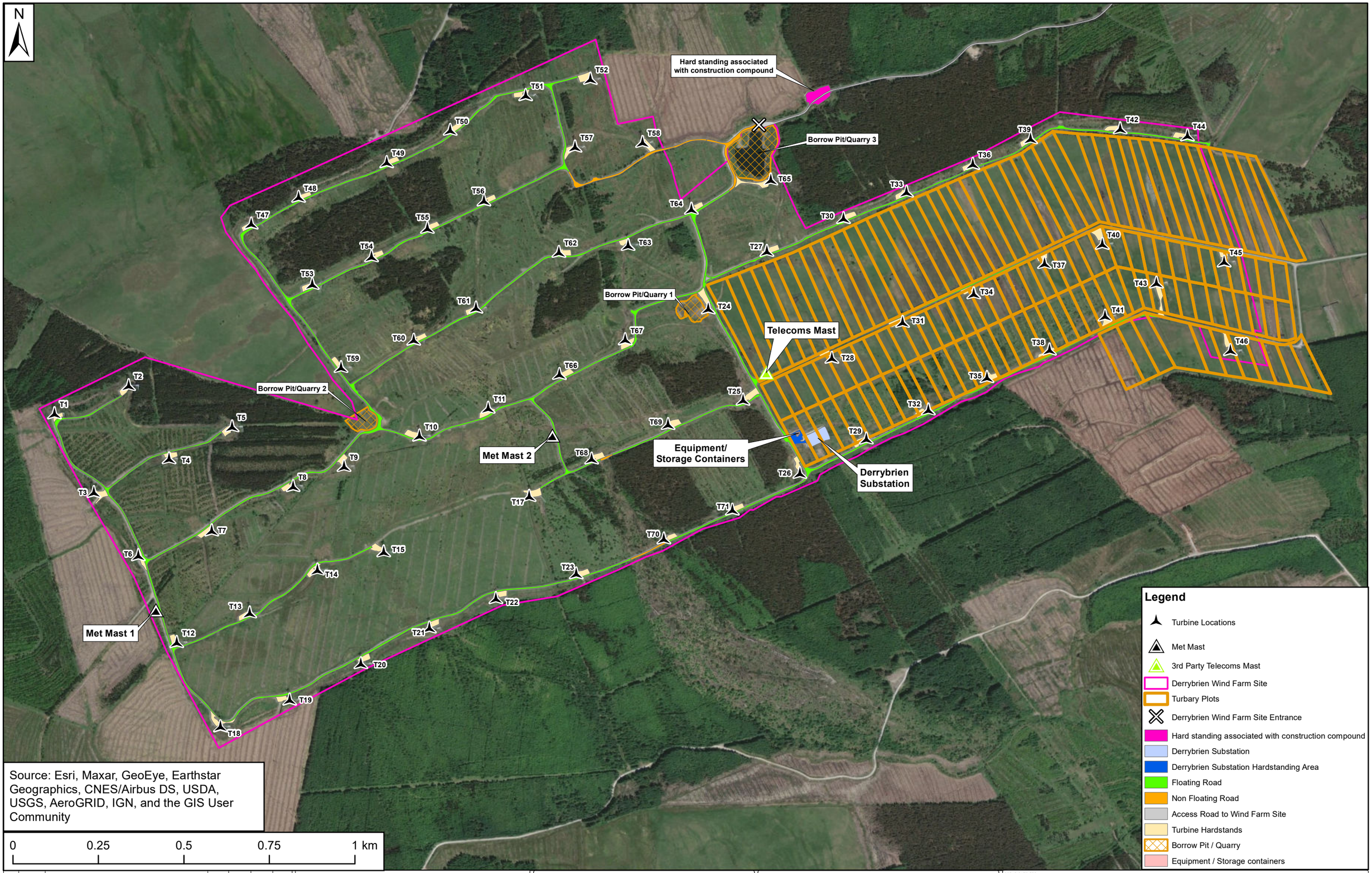
2.10.2 Residues and Emissions

During decommissioning, the expected residues and emissions are divided into the following categories:

- **Water**: surface water drainage emanating from the Project site associated with decommissioning activities
- **Air:** dust generated by vehicle movements across the site
- **Noise:** noise from plant and activities
- **Lighting:** Task lighting
- **Waste:** Decommissioning waste from wind farm which will largely be suitable for reuse. The decommissioned masts and turbines shall be removed from the site for reuse or recycling

2.10.3 Safety Management

All decommissioning works will be carried out under appropriate supervision. Works will be carried out by experienced contractors using appropriate and established safe methods of construction. All requirements arising from statutory obligations including the Safety, Health and Welfare at Work Act and associated regulations will be met in full.



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PROJECT: **Derrybrien Wind Farm Project**

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PRODUCTION UNIT: **Civil & Environmental Engineering**

DRAWING TITLE:

Figure 2.32 - Location of Turbary within and immediately adjacent to wind farm site

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E.O'Shea	E.O'Shea	P.Kavanagh	J.McLoughlin	04/08/2020

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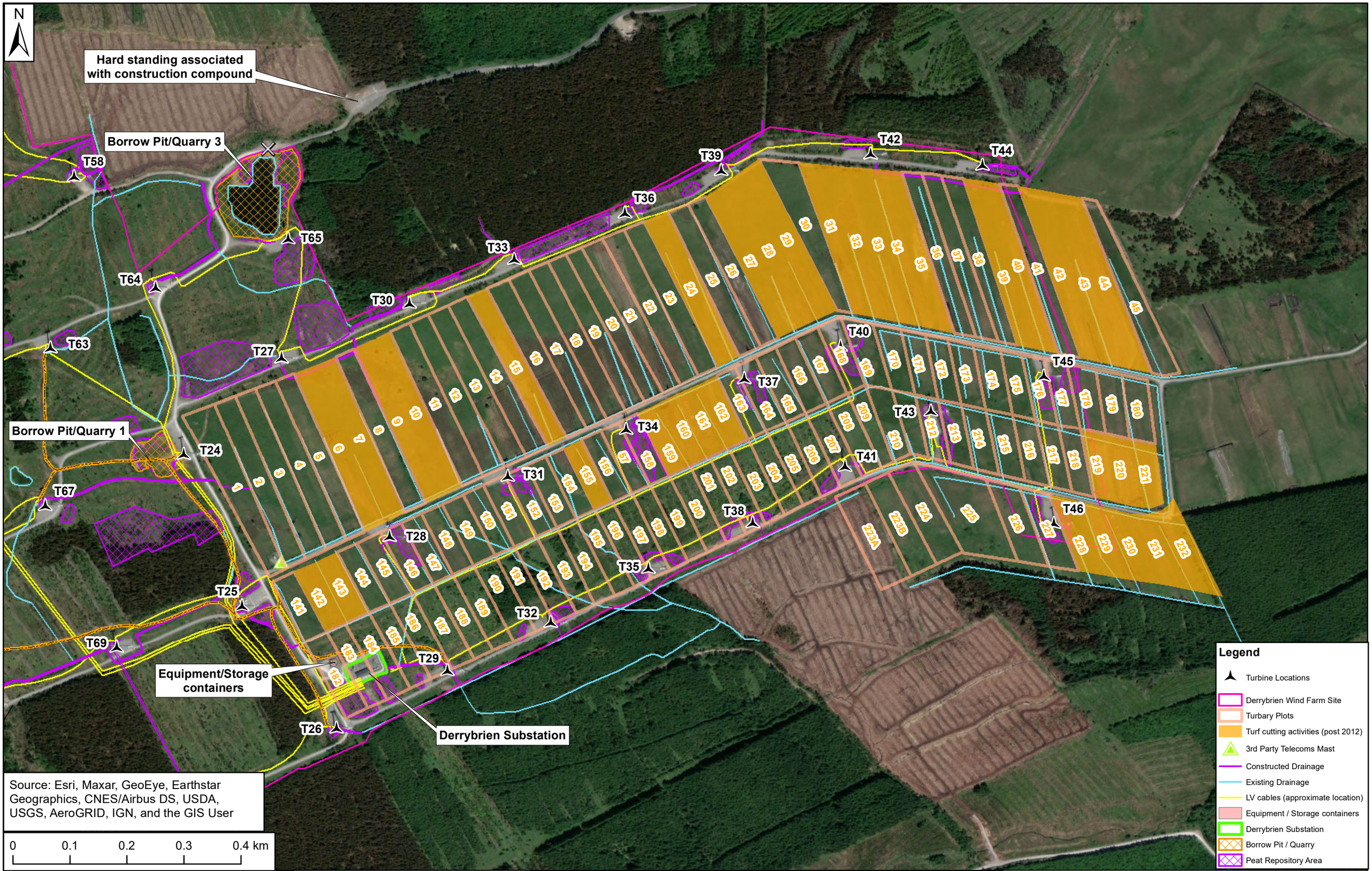
DRAWING NUMBER: **QS-000280-01-D460-003-032-000**



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PROJECT: Derrybrien Wind Farm Project

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PRODUCTION UNIT: Civil & Environmental Engineering

DRAWING TITLE:

Figure 2.33 - Indicative location of turf cutting activities (post 2012)

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	P.Kavanagh	J.McLoughlin	04/08/2020

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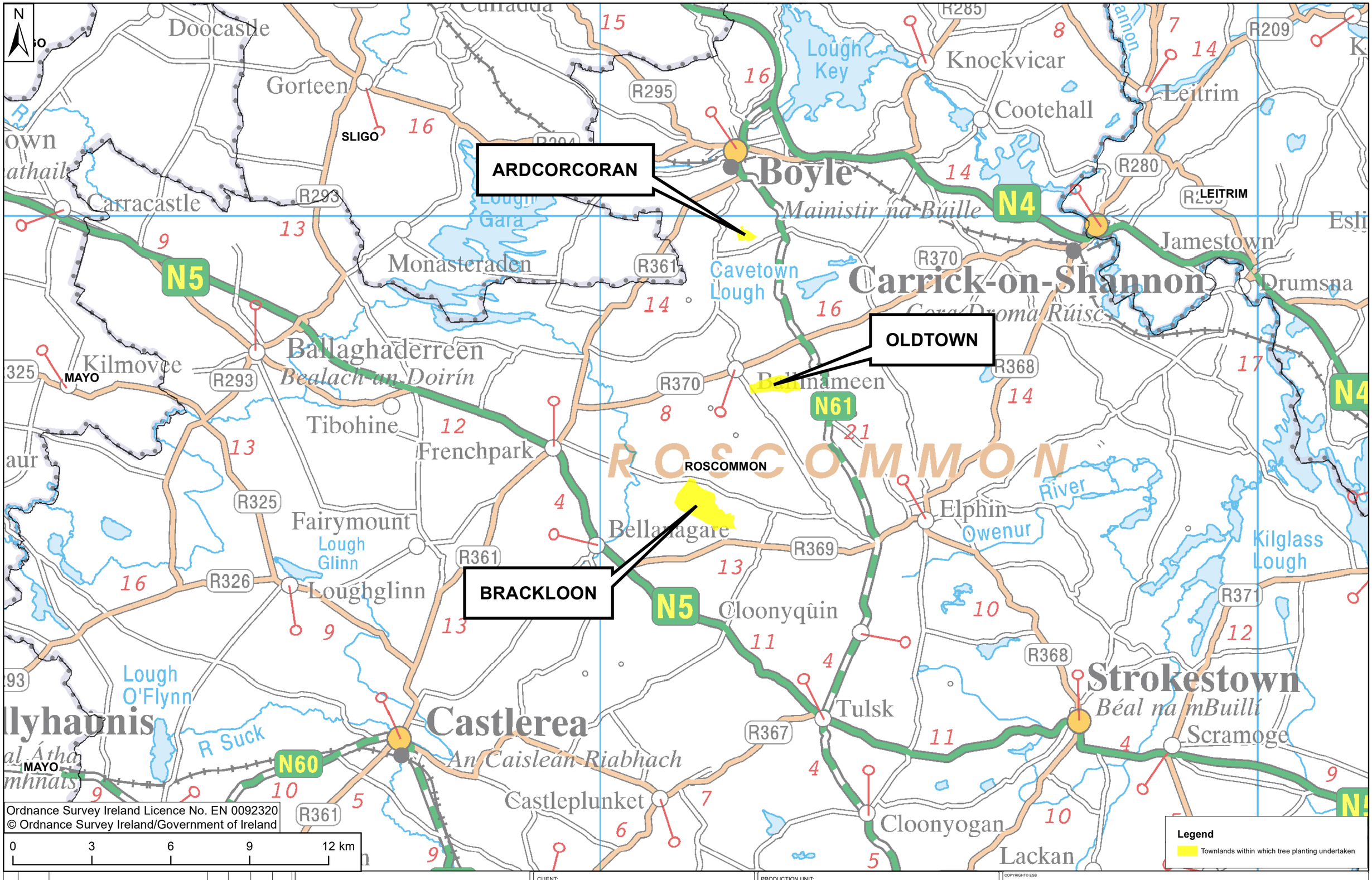
DRAWING NUMBER: QS-000280-01-D460-003-033-000



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0	09/07/20	Issued for substitute consent	E.O'S	E.O'S	P.K	C.H

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PROJECT: Derrybrien Wind Farm Project

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DRAWING TITLE: **Figure 2.34 - Location of tree planting in lieu of forestry felled for Project - County Roscommon**

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	P.Kavanagh	C.Hamilton	09/07/2020

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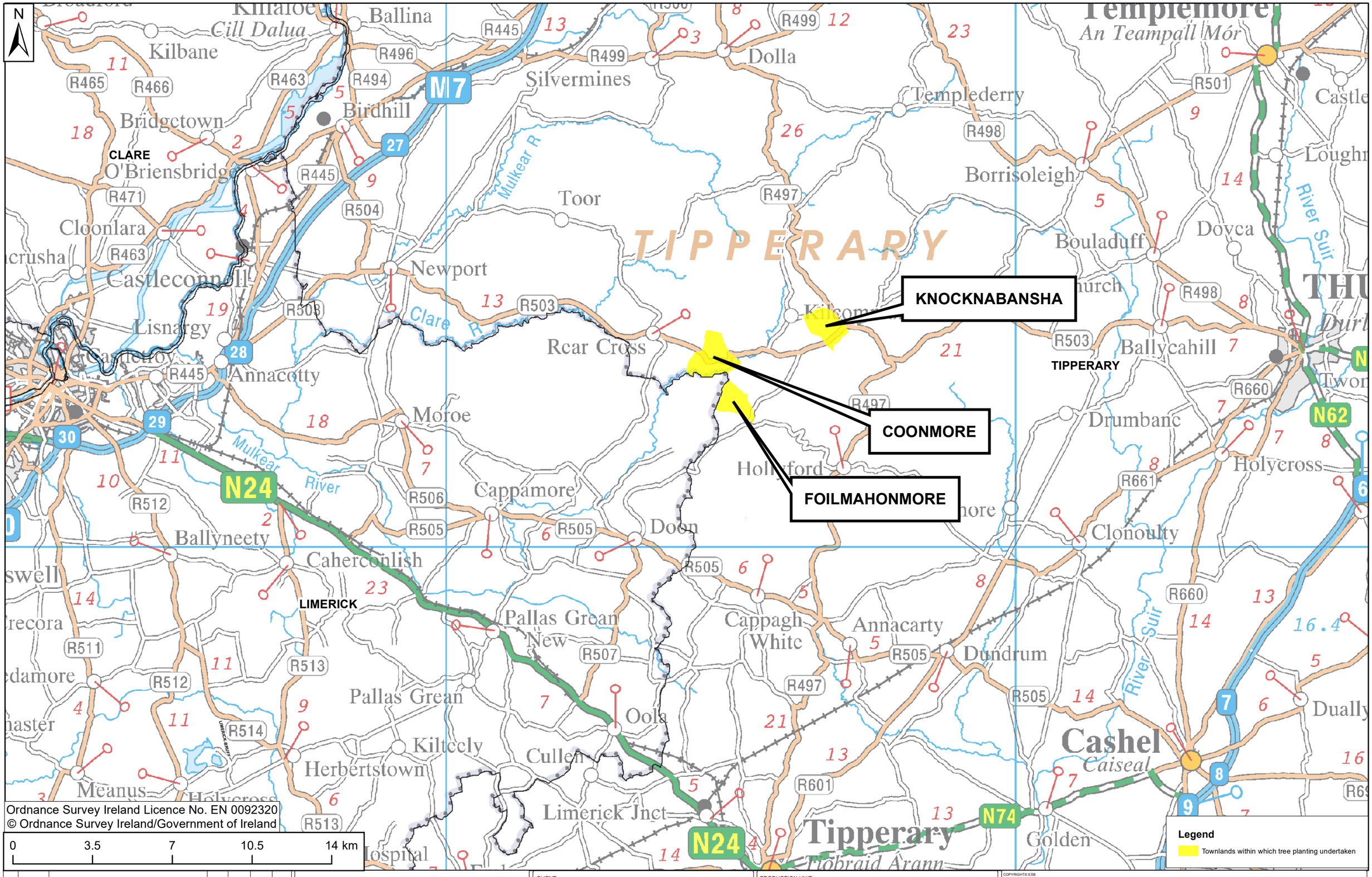

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0 3.5 7 10.5 14 km

Legend

Townlands within which tree planting undertaken

REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP
0	09/07/20	Issued for substitute consent	E.O'S	E.O'S	P.K	C.H

PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

CLIENT APPROVAL ☐ PLANNING ☒ TENDER ☐ CONSTRUCTION ☐ AS-BUILT ☐

Energy for generations

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CLIENT: **Gort Windfarms Ltd**

PROJECT: **Derrybrien Wind Farm Project**

CONTRACT:

PRODUCTION UNIT: **Civil & Environmental Engineering**

DRAWING TITLE: **Figure 2.35 - Location of tree planting in lieu of forestry felled for Project - County Tipperary**

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	P.Kavanagh	C.Hamilton	09/07/2020

CLIENT REF.	NO. OF SHEETS	SIZE	SCALE
00-00	00-00	A3	1:150,000

DRAWING NUMBER: **QS-000280-01-D460-003-035-000**

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Appendices

Appendix 2.1 Wind Farm Details

Appendix 2.2 Grid Connection Details

Appendix 2.3 A3 Figures

Figures are contained in Vol 2 Section 3