

Appendix 4.1

Landowner Consents





COMHAIRLE CHONTAE LAOISE LAOIS COUNTY COUNCIL

Comhairle Chontae
Laoise
Áras an Chontae
Port Laoise
Contae Laoise
R32 EHP9

Laois County Council
Áras an Chontae
Portlaoise
County Laois
R32 EHP9

T: (057) 8664000
F: (057) 8622313
corpaffairs@laoiscoco.ie
www.laois.ie

Jim Hughes
Fehily Timoney and company
Core House
Pouladuff Road
Cork
T12 D773

December 19th 2019

TO WHOM IT MAY CONCERN

In Accordance with the provisions OF Article 22(2)(g) of the planning and Development Regulations 2001, as amended, Laois County Council hereby gives its written consent to make the planning application.

ADRIAN BARRETT,
Senior Engineer,
Road Design Office, Laois County Council,
Áras an Chontae, JFL Avenue,
Portlaoise, R32 EHP9.

Tá Fáilte Romhat
Gnó a Dhéanamh
as Gaeilge



TO:
The Planning Department
Laois County Council
Áras an Chontae,
JFL Ave.,
Portlaoise,
Co. Laois
R32 EHP9

Date: 9th January 2020

Dear Sirs,

Re: **Planning Application by Statkraft Ireland Limited
Proposed Renewable Energy Project at Forest Upper, Tinnahinch.**

We, Mary Dunphy and Kevin Dunphy confirm that we are the owners of the lands identified on the map attached to this letter and we are aware of and consent to the application by Statkraft Ireland Limited for planning permission for a renewable energy project on lands at Forest Upper, Tinnahinch, County Laois.

The proposed works are described in the plans and particulars which are to be submitted with the planning application. We confirm that we have been shown the proposed turbine locations on a map.

We confirm that we are aware of the proposed project, the potential benefits of the proposed project and the potential impacts of the proposed project including those relating to visual, noise and shadow flicker. We are supportive of the development of the project.

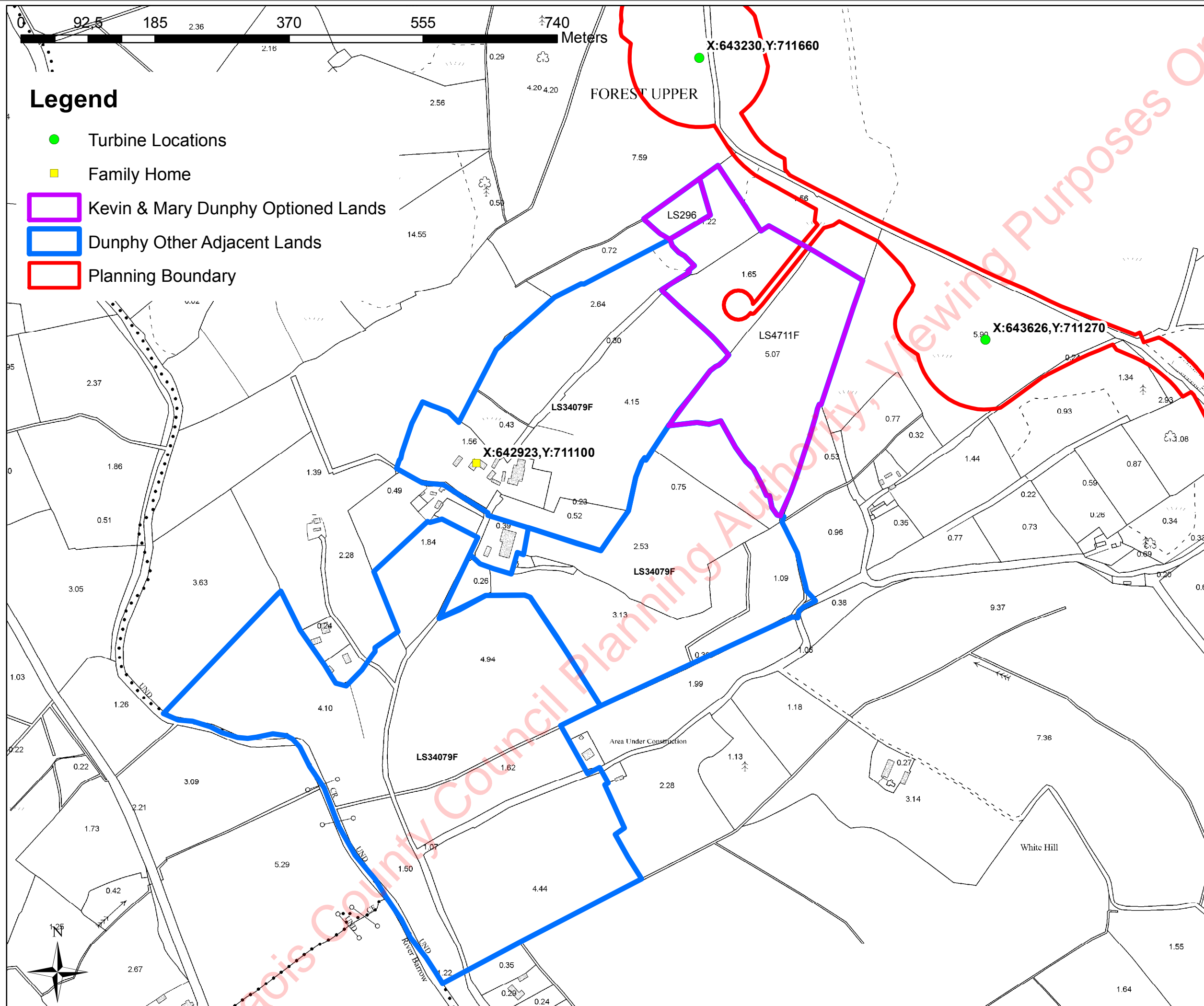
Yours sincerely,

Mary Dunphy

Mary Dunphy

Kevin Dunphy

Kevin Dunphy



Legend

- Turbine Locations
- Family Home
- Kevin & Mary Dunphy Optioned Lands
- Dunphy Other Adjacent Lands
- Planning Boundary

Legend

Folio Number:

LS4711F

LS296

LS34079F

Landowner:

Mary & Kevin Dunphy

TITLE OF FIGURE:

Mary & Kevin Dunphy

Figure 1

Rev A

DATE:

30/01/2020

SCALE:

1:5 000 @ A3



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TO:

The Planning Department
Laois County Council
Áras an Chontae,
JFL Ave.,
Portlaoise,
Co. Laois
R32 EHP9

Date: 4th February 2020

Dear Sirs,

Re:

**Planning Application by Statkraft Ireland Limited
Proposed Renewable Energy Project at Forest Upper, Tinnahinch.**

I, Helen Gorman as legal personal representative in the estate of Liam Gorman deceased for the lands registered to Liam Gorman as identified on the maps attached to this letter, am aware of and consent to the application by Statkraft Ireland Limited for planning permission for a renewable energy project, as legally agreed by Liam Gorman and Statkraft Ireland Limited, on lands at Forest Upper, Tinnahinch, County Laois.

The proposed works are described in the plans and particulars which are to be submitted with the planning application. I confirm that I have been shown the proposed turbine locations on a map.

I confirm that I am aware of the proposed project, the potential benefits of the proposed project and the potential impacts of the proposed project including those relating to visual, noise and shadow flicker. I am supportive of the development of the project.

Yours sincerely,

Helen Gorman

Helen Gorman



Signed Helen Gorman:

Helen GORMAN

Legend

Folio Number:

LS26700F

Landowner:

Helen Gorman

TITLE OF FIGURE:

Helen Gorman

Figure 1

Rev A

DATE:

08/01/2020

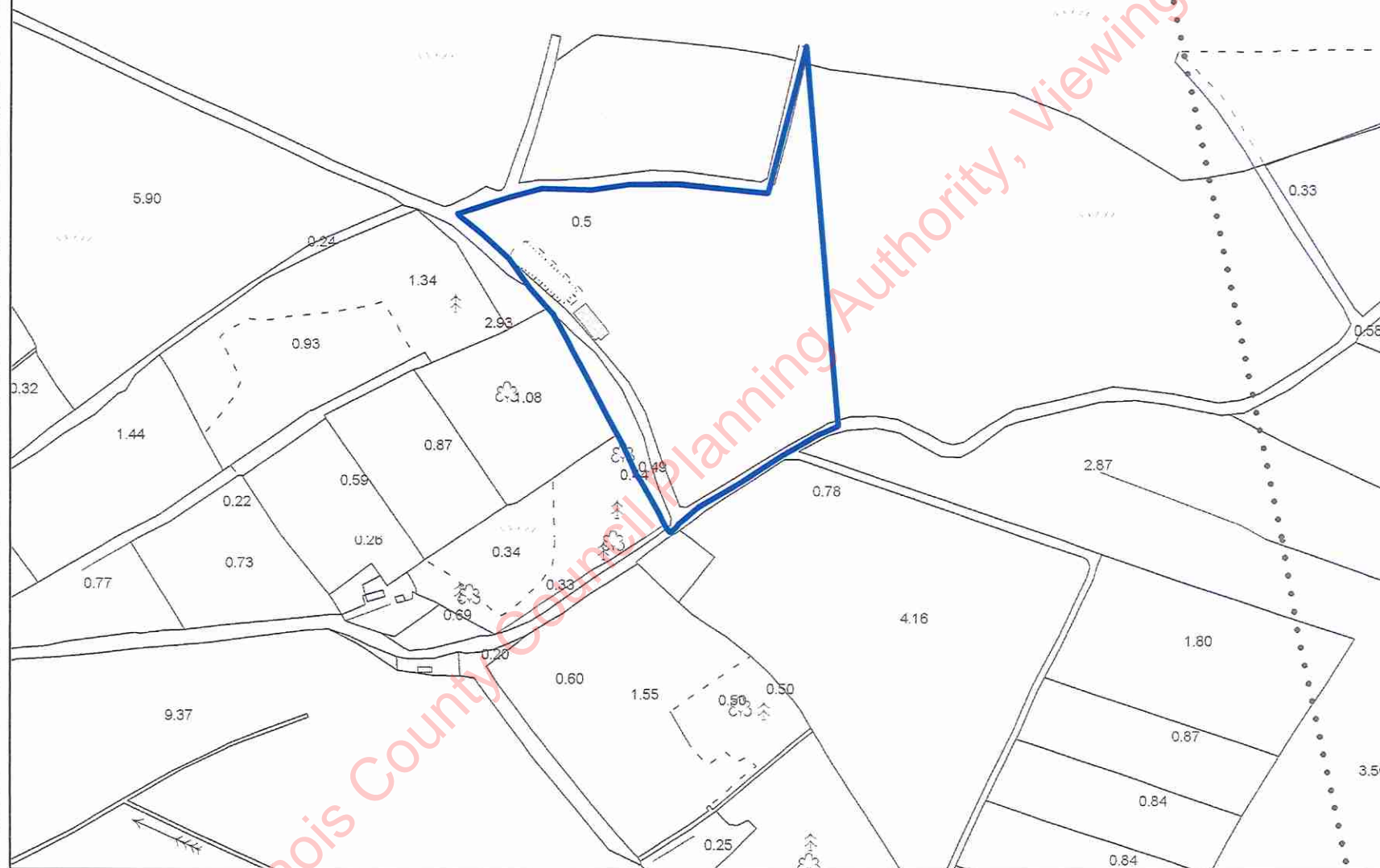
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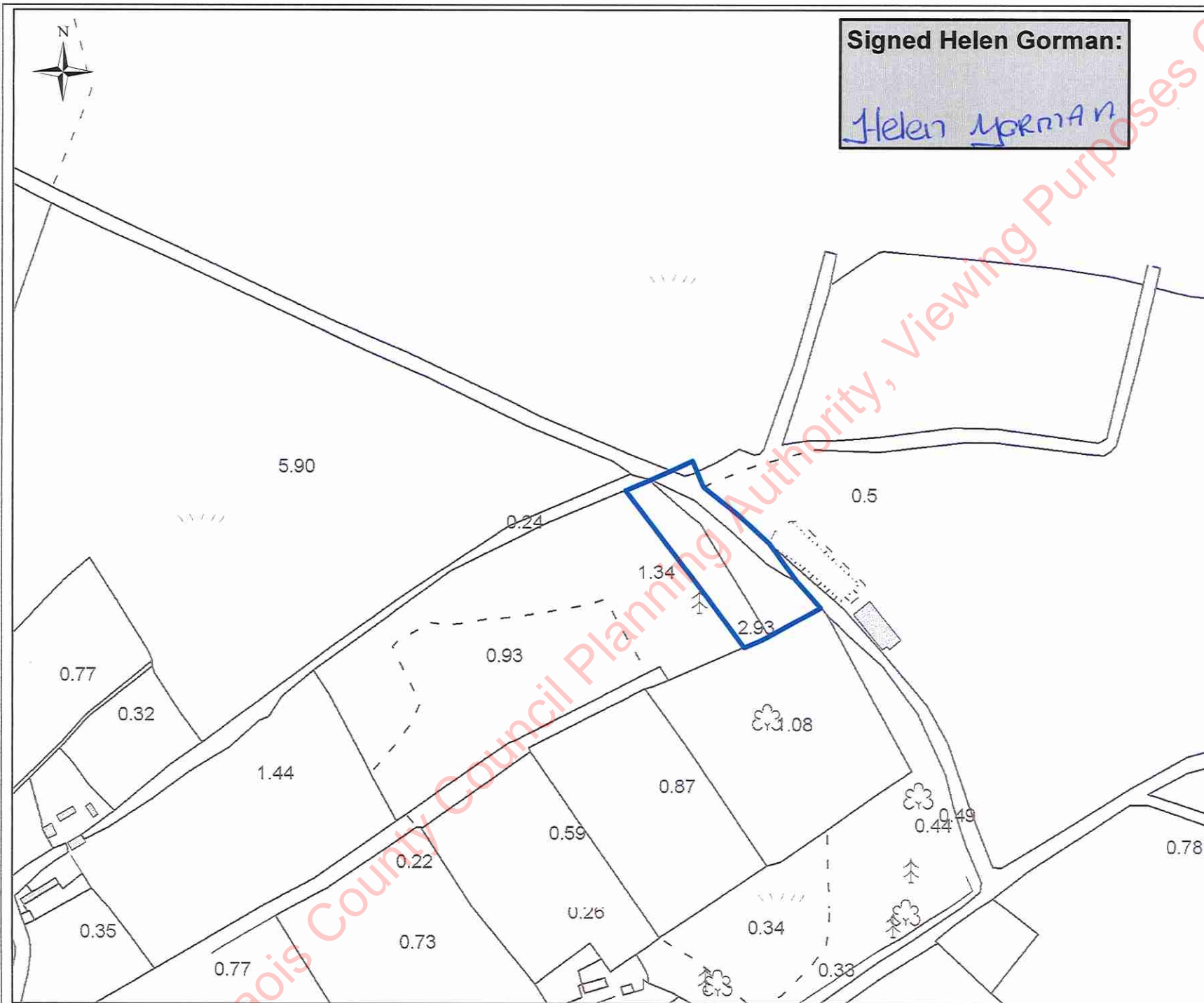
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Signed Helen Gorman:

Helen Gorman

Legend

Folio Number:

LS4711F

Landowner:

Helen Gorman

TITLE OF FIGURE:

Helen Gorman

Figure 1 Rev A

DATE: 08/01/2020

SCALE: 1:2 000 @ A3

 **Statkraft**

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TO:

The Planning Department
Laois County Council
Áras an Chontae,
JFL Ave.,
Portlaoise,
Co. Laois
R32 EHP9

Date: 9th January 2020

Dear Sirs,

Re:

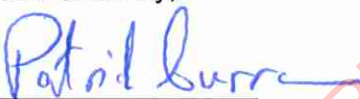
**Planning Application by Statkraft Ireland Limited
Proposed Renewable Energy Project at Forest Upper, Tinnahinch.**

I, Pat Curran confirm that I am the owner of the lands identified on the map attached to this letter and I am aware of and consent to the application by Statkraft Ireland Limited for planning permission for a renewable energy project on lands at Forest Upper, Tinnahinch, County Laois.

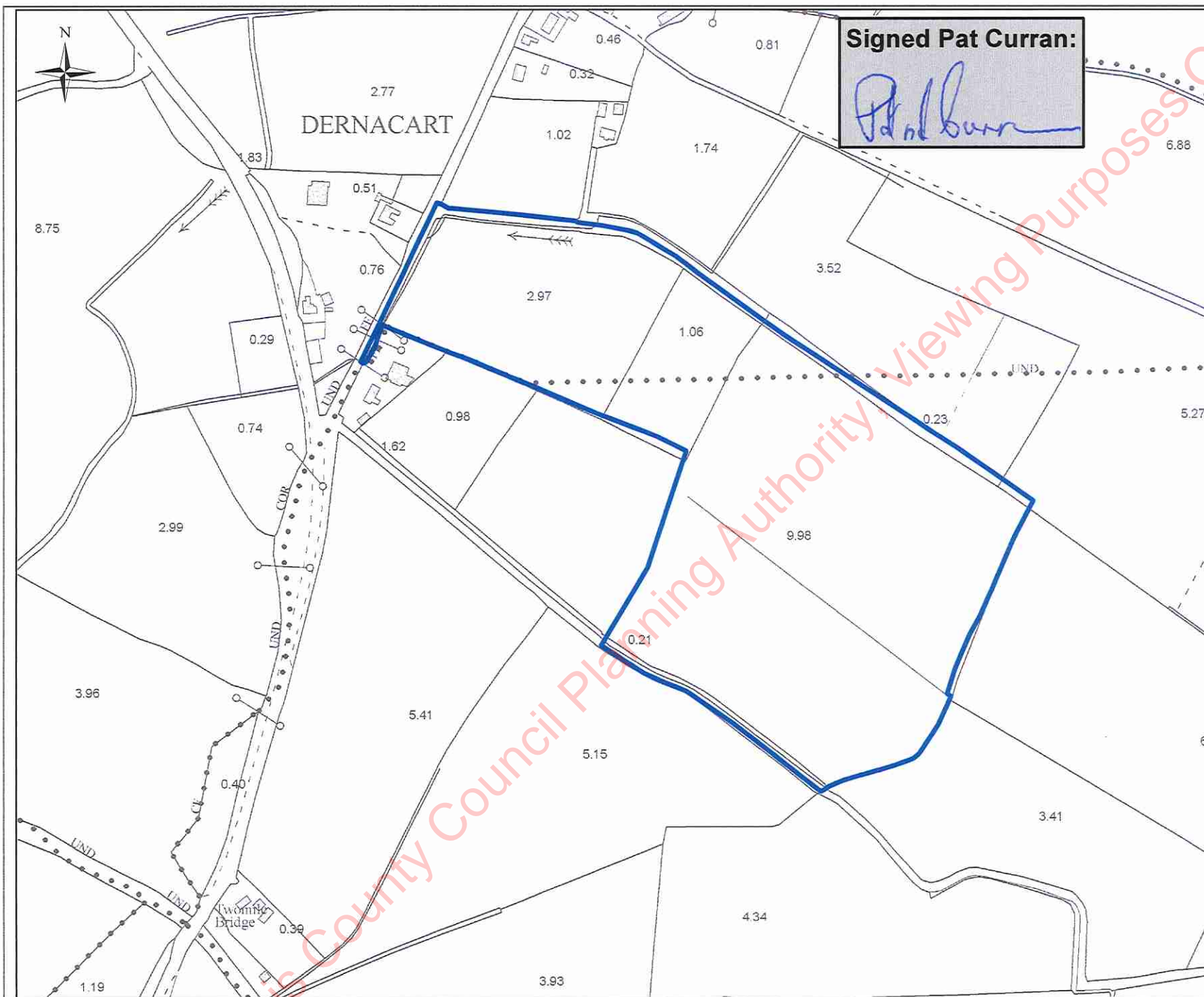
The proposed works are described in the plans and particulars which are to be submitted with the planning application. I confirm that I have been shown the proposed turbine locations on a map.

I confirm that I am aware of the proposed project, the potential benefits of the proposed project and the potential impacts of the proposed project including those relating to visual, noise and shadow flicker. I am supportive of the development of the project.

Yours sincerely,



Pat Curran



Signed Pat Curran:

Legend

Folio Number:
LS4711F

Landowner:
Pat Curran

TITLE OF FIGURE:

Pat Curran

Figure 1 Rev A

DATE: 07/01/2020

SCALE: 1:3 000 @ A3

 **Statkraft**

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TO:

The Planning Department
Laois County Council
Áras an Chontae,
JFL Ave.,
Portlaoise,
Co. Laois
R32 EHP9

Date: 9th January 2020

Dear Sirs,

Re:

**Planning Application by Statkraft Ireland Limited
Proposed Renewable Energy Project at Forest Upper, Tinnahinch.**

I, Christopher Gorman confirm that I am the owner of the lands identified on the maps attached to this letter and I am aware of and consent to the application by Statkraft Ireland Limited for planning permission for a renewable energy project on lands at Forest Upper, Tinnahinch, County Laois.

The proposed works are described in the plans and particulars which are to be submitted with the planning application. I confirm that I have been shown the proposed turbine locations on a map.

I confirm that I am aware of the proposed project, the potential benefits of the proposed project and the potential impacts of the proposed project including those relating to visual, noise and shadow flicker. I am supportive of the development of the project.

Yours sincerely,



Christopher Gorman

Signed Christopher Gorman:

Christopher Gorman

Legend

Folio Number:

LS4711F

Landowner:

Christopher Gorman

TITLE OF FIGURE:

Christopher Gorman

Figure 1

Rev A

DATE:

08/01/2020

SCALE:

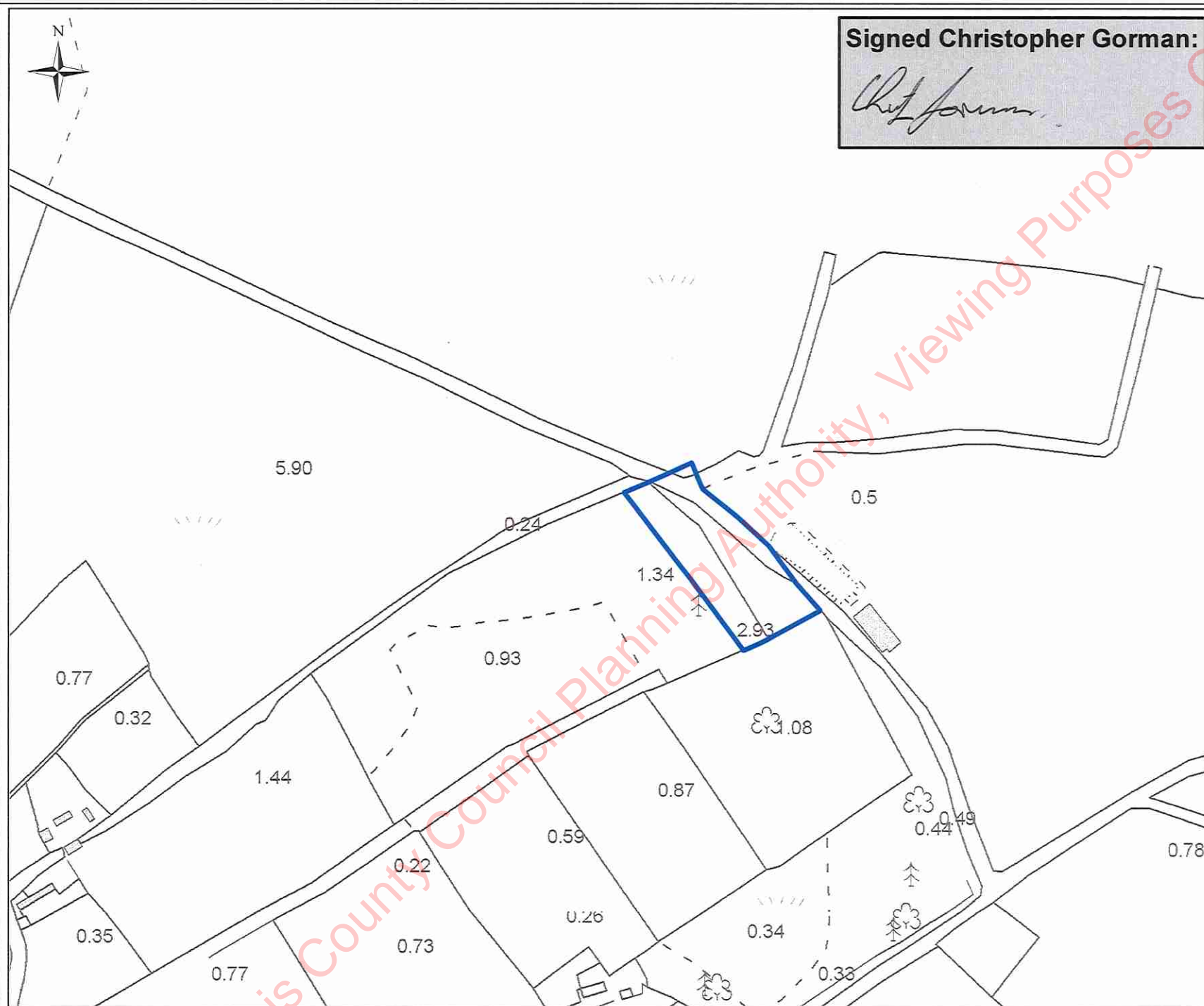
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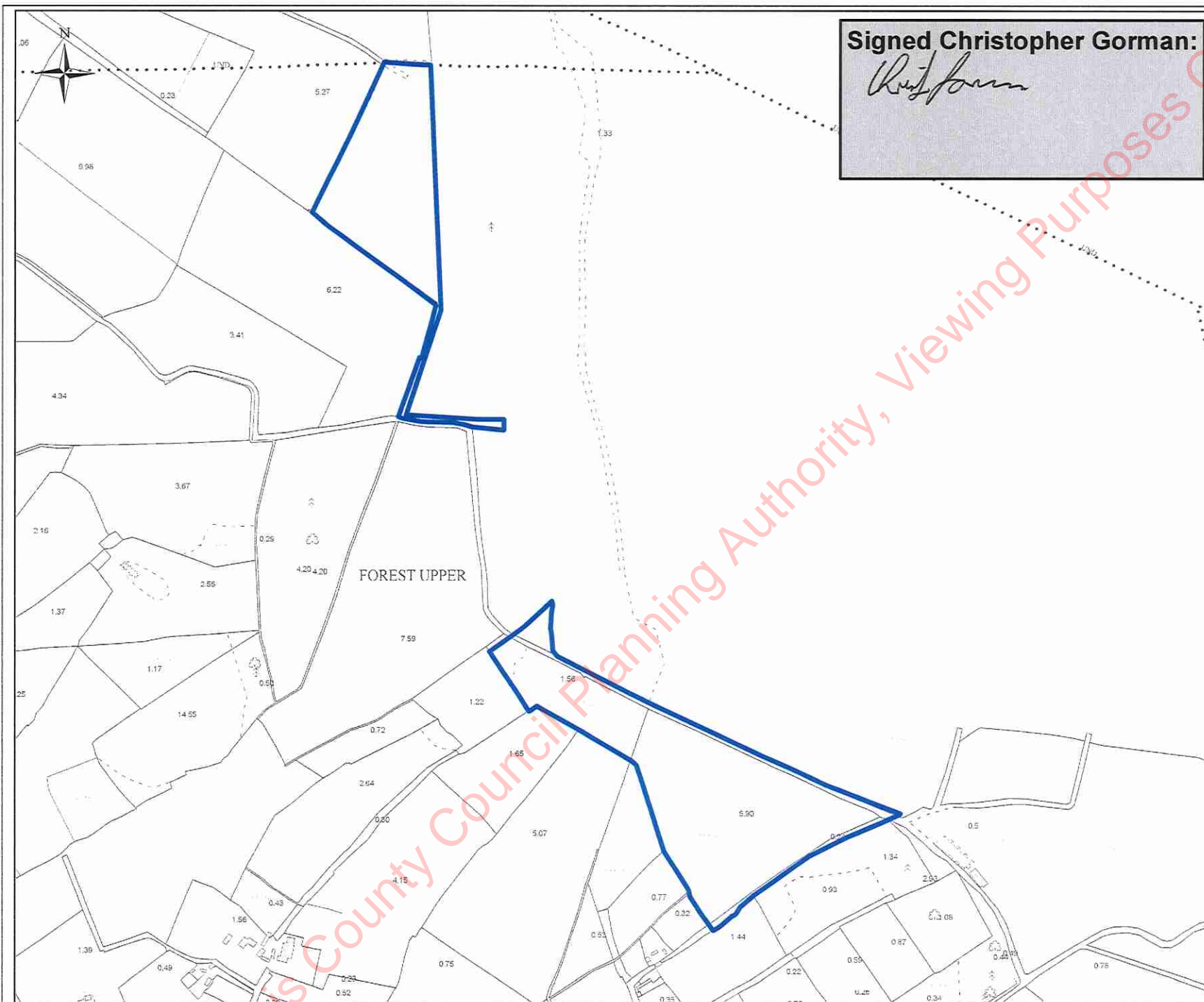


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Signed Christopher Gorman:

Christopher Gorman

Legend

Folio Number:
LS26731F

Landowner:
Christopher Gorman

TITLE OF FIGURE:

Christopher Gorman

Figure 1

Rev A

DATE:

07/01/2020

SCALE:

1:5 000 @ A3



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TO:

The Planning Department
Laois County Council
Áras an Chontae,
JFL Ave.,
Portlaoise,
Co. Laois
R32 EHP9

Date: 9th January 2020

Dear Sirs,

**Re: Planning Application by Statkraft Ireland Limited
Proposed Renewable Energy Project at Forest Upper, Tinnahinch.**

We, Peter Curran and John Curran confirm that we are the owners of the lands identified on the map attached to this letter and we are aware of and consent to the application by Statkraft Ireland Limited for planning permission for a renewable energy project on lands at Forest Upper, Tinnahinch, County Laois.

The proposed works are described in the plans and particulars which are to be submitted with the planning application. We confirm that we have been shown the proposed turbine locations on a map.

We confirm that we are aware of the proposed project, the potential benefits of the proposed project and the potential impacts of the proposed project including those relating to visual, noise and shadow flicker. We are supportive of the development of the project.

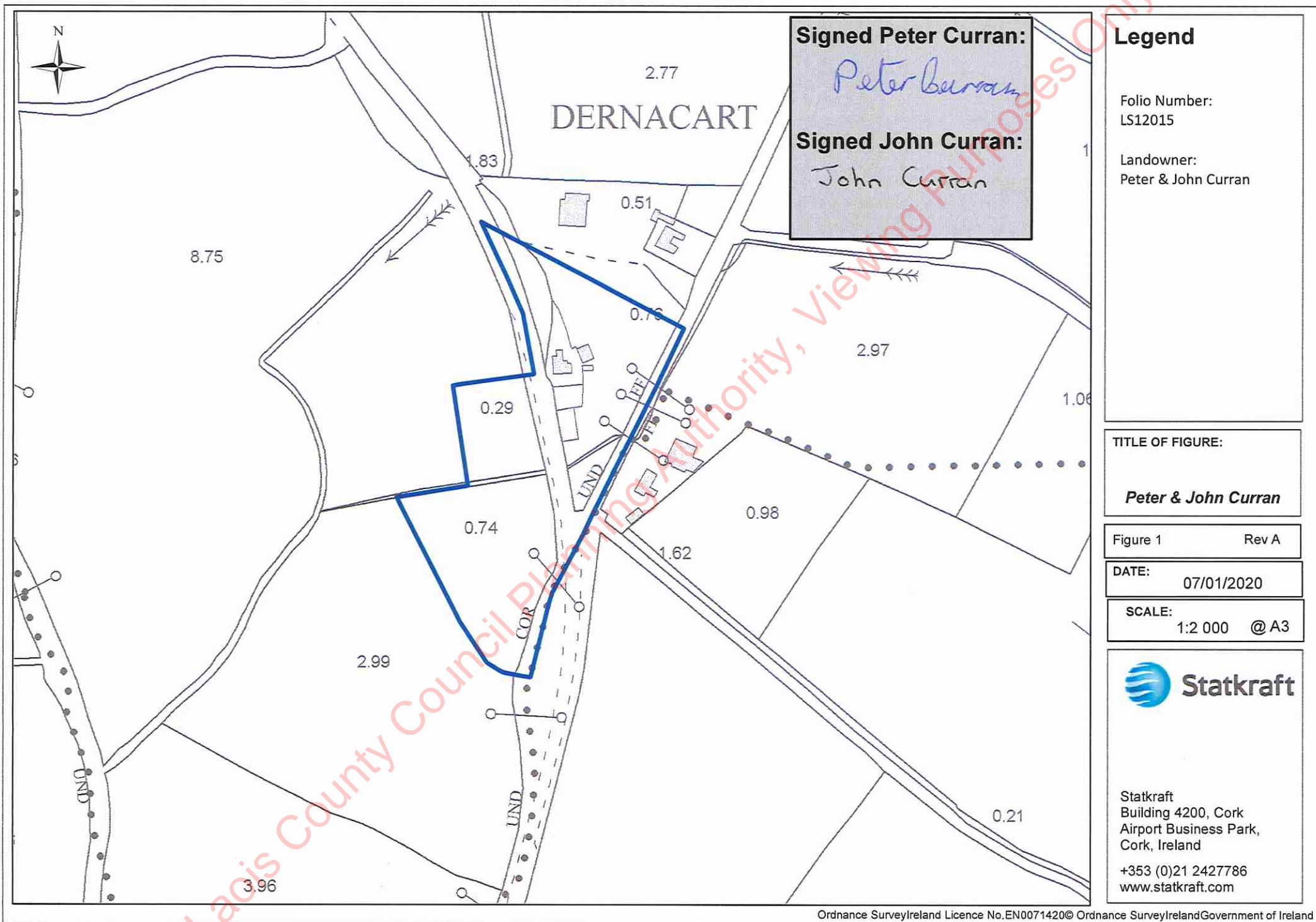
Yours sincerely,



Peter Curran



John Curran



TO:

The Planning Department
Laois County Council
Áras an Chontae,
JFL Ave.,
Portlaoise,
Co. Laois
R32 EHP9

Date: 9th January 2020

Dear Sirs,

**Re: Planning Application by Statkraft Ireland Limited
Proposed Renewable Energy Project at Forest Upper, Tinnahinch.**

I, James Conroy confirm that I am the owner of the lands identified on the map attached to this letter and I am aware of and consent to the application by Statkraft Ireland Limited for planning permission for a renewable energy project on lands at Forest Upper, Tinnahinch, County Laois.

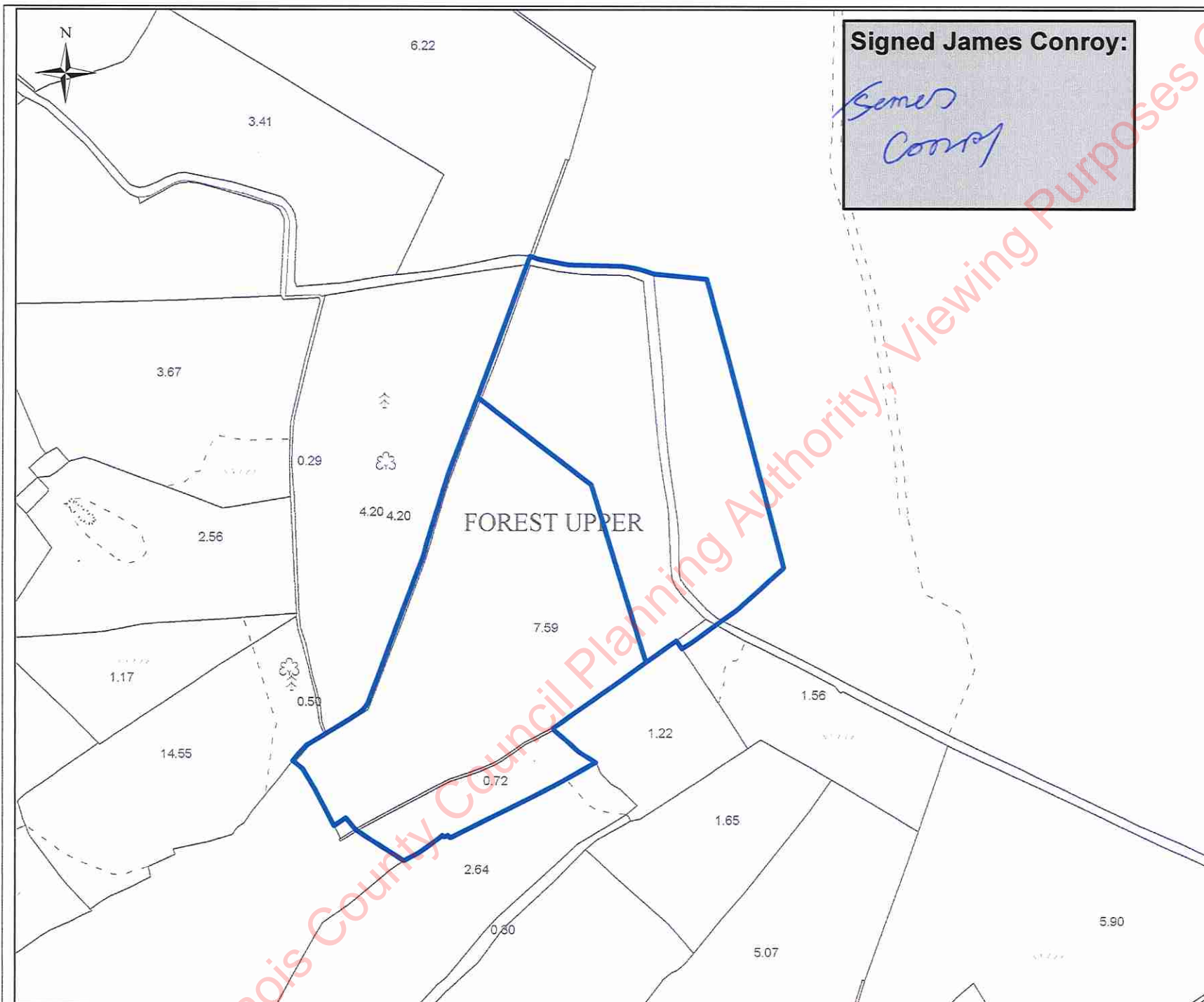
The proposed works are described in the plans and particulars which are to be submitted with the planning application. I confirm that I have been shown the proposed turbine locations on a map.

I confirm that I am aware of the proposed project, the potential benefits of the proposed project and the potential impacts of the proposed project including those relating to visual, noise and shadow flicker. I am supportive of the development of the project.

Yours sincerely,



James Conroy



Signed James Conroy:

James Conroy

Legend

Folio Number:
LS32079F
LS4711F

Landowner:
James Conroy

TITLE OF FIGURE:

James Conroy

Figure 1

Rev A

DATE:

07/01/2020

SCALE:

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TO:

The Planning Department
Laois County Council
Áras an Chontae,
JFL Ave.,
Portlaoise,
Co. Laois
R32 EHP9

Date: 9th January 2020

Dear Sirs,

Re:

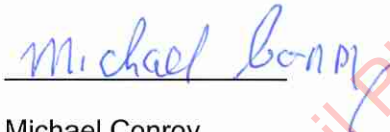
**Planning Application by Statkraft Ireland Limited
Proposed Renewable Energy Project at Forest Upper, Tinnahinch.**

I, Michael Conroy confirm that I am the owner of the lands identified on the map attached to this letter and I am aware of and consent to the application by Statkraft Ireland Limited for planning permission for a renewable energy project on lands at Forest Upper, Tinnahinch, County Laois.

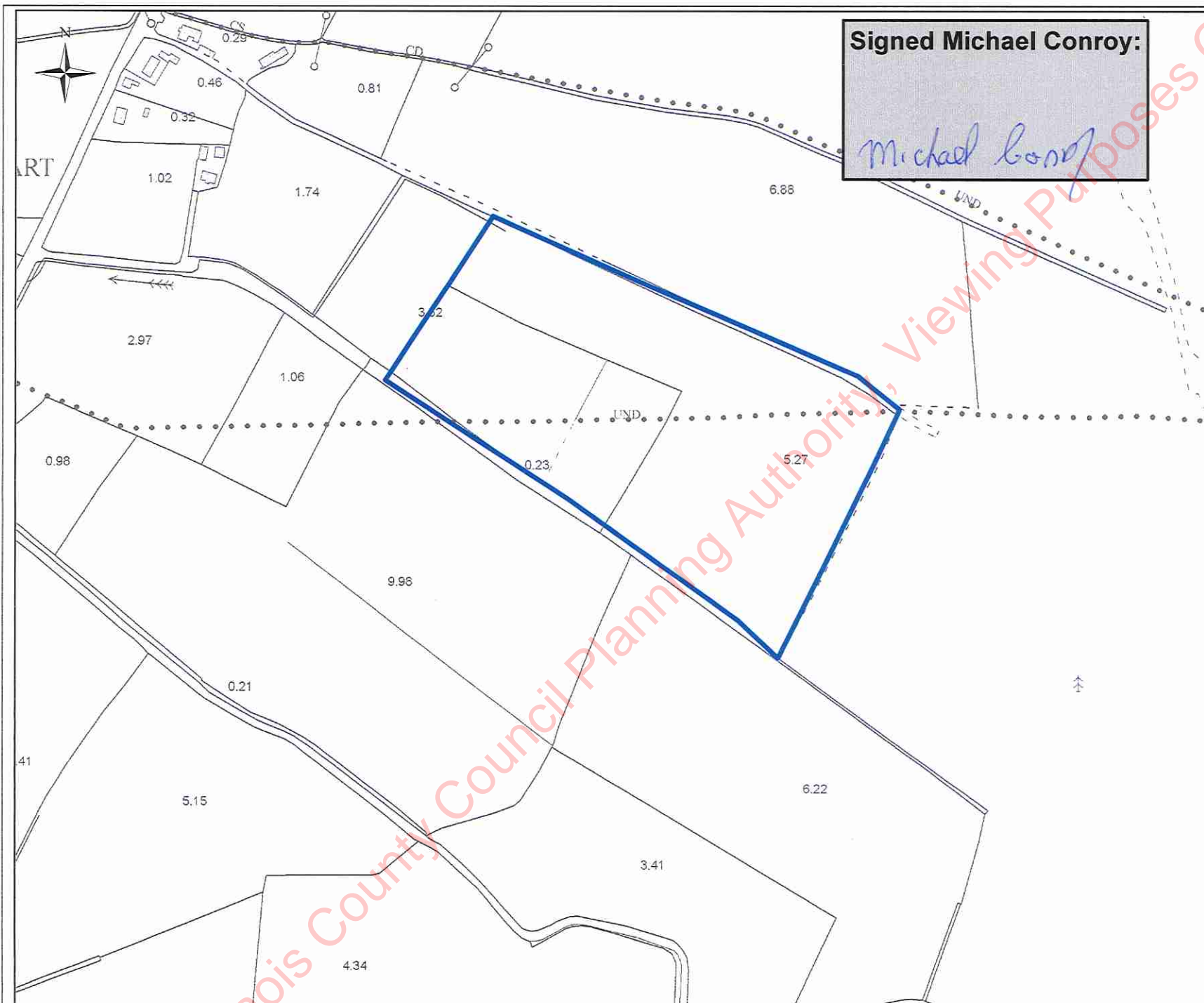
The proposed works are described in the plans and particulars which are to be submitted with the planning application. I confirm that I have been shown the proposed turbine locations on a map.

I confirm that I am aware of the proposed project, the potential benefits of the proposed project and the potential impacts of the proposed project including those relating to visual, noise and shadow flicker. I am supportive of the development of the project.

Yours sincerely,



Michael Conroy



Signed Michael Conroy:

Michael Conroy

Legend

Folio Number:
LS4711F

Landowner:
Michael Conroy

TITLE OF FIGURE:

Michael Conroy

Figure 1

Rev A

DATE:

07/01/2020

SCALE:

1:3 000 @ A3



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TO:

The Planning Department
Laois County Council
Áras an Chontae,
JFL Ave.,
Portlaoise,
Co. Laois
R32 EHP9

Date: 9th January 2020

Dear Sirs,

**Re: Planning Application by Statkraft Ireland Limited
Proposed Renewable Energy Project at Forest Upper, Tinnahinch.**

I, Eddie Dunne confirm that I am the owner of the lands identified on the map attached to this letter and I am aware of and consent to the application by Statkraft Ireland Limited for planning permission for a renewable energy project on lands at Forest Upper, Tinnahinch, County Laois.

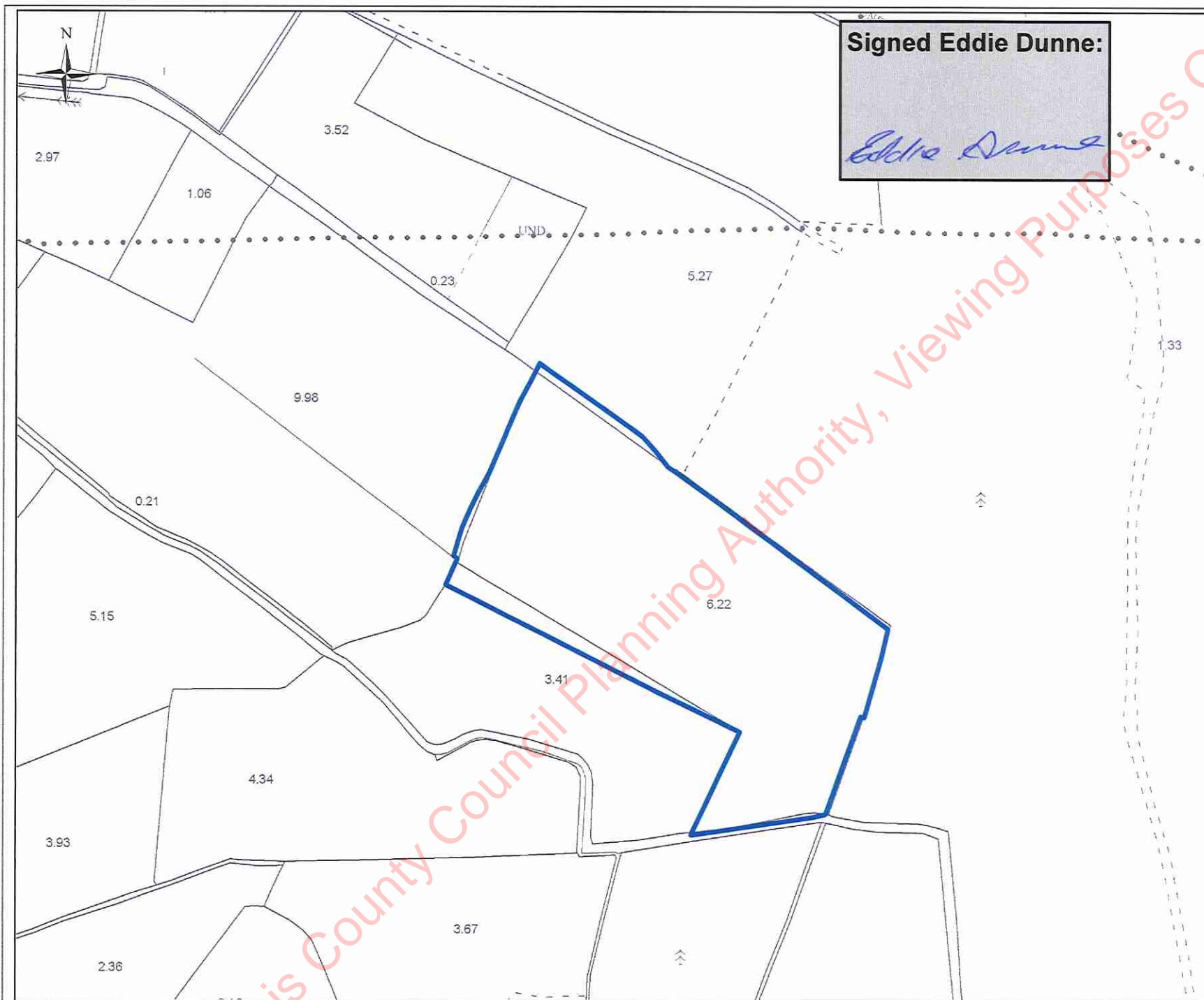
The proposed works are described in the plans and particulars which are to be submitted with the planning application. I confirm that I have been shown the proposed turbine locations on a map.

I confirm that I am aware of the proposed project, the potential benefits of the proposed project and the potential impacts of the proposed project including those relating to visual, noise and shadow flicker. I am supportive of the development of the project.

Yours sincerely,



Eddie Dunne



Signed Eddie Dunne:

Eddie Dunne

Legend

Folio Number:
LS4711F

Landowner:
Eddie Dunne

TITLE OF FIGURE:

Eddie Dunne

Figure 1

Rev A

DATE:

07/01/2020

SCALE:

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Airport Business Park,
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TO:

The Planning Department
Laois County Council
Áras an Chontae,
JFL Ave.,
Portlaoise,
Co. Laois
R32 EHP9

Date: 9th January 2020

Dear Sirs,

Re:

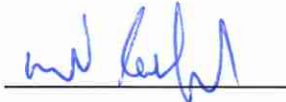
**Planning Application by Statkraft Ireland Limited
Proposed Renewable Energy Project at Forest Upper, Tinnahinch.**

We, Mark Rochford and Bernard Rochford confirm that we are the owners of the lands identified on the map attached to this letter and we are aware of and consent to the application by Statkraft Ireland Limited for planning permission for a renewable energy project on lands at Forest Upper, Tinnahinch, County Laois.

The proposed works are described in the plans and particulars which are to be submitted with the planning application. We confirm that we have been shown the proposed turbine locations on a map.

We confirm that we are aware of the proposed project, the potential benefits of the proposed project and the potential impacts of the proposed project including those relating to visual, noise and shadow flicker. We are supportive of the development of the project.

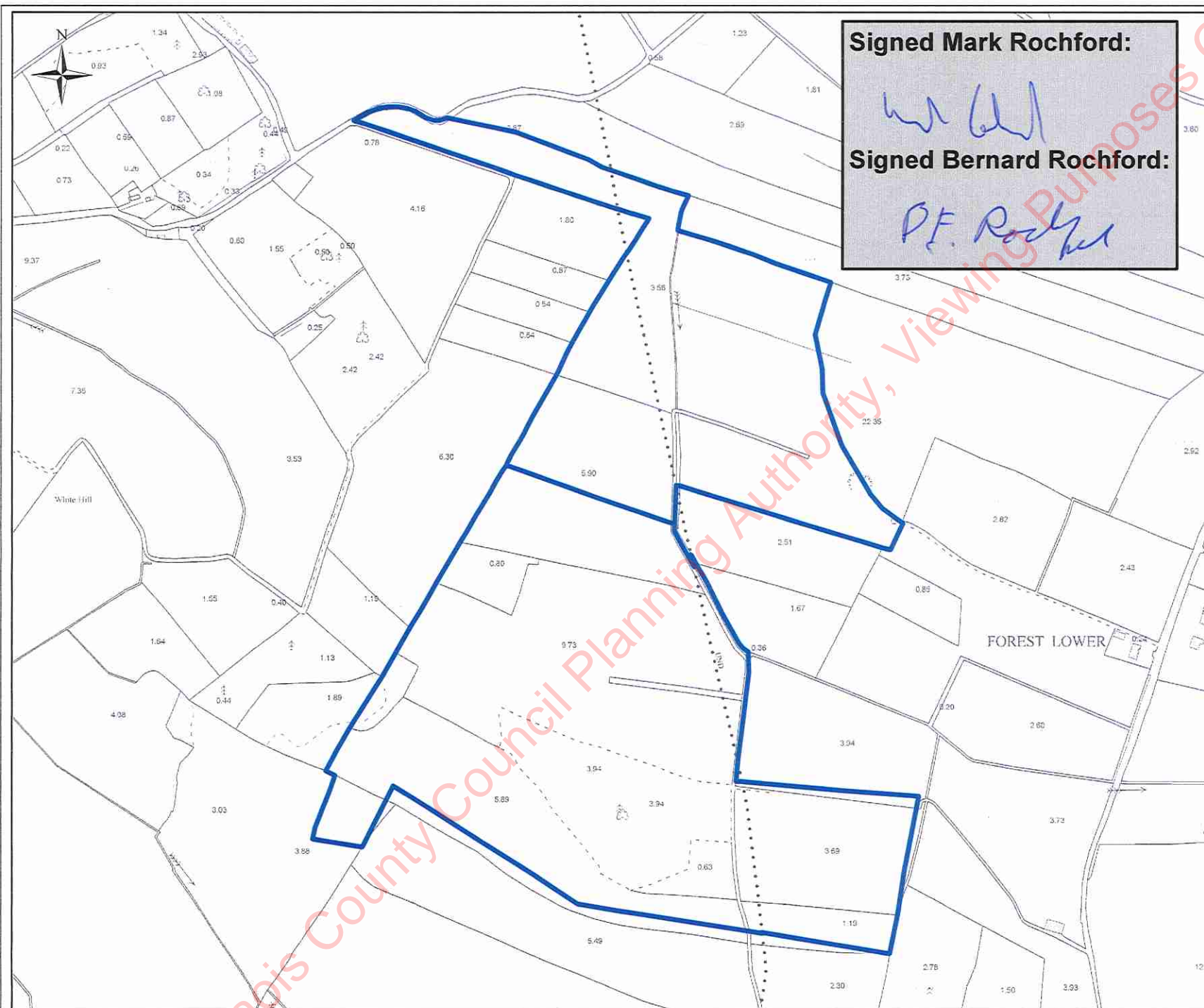
Yours sincerely,



Mark Rochford



Bernard Rochford



Signed Mark Rochford:

[Signature]

Signed Bernard Rochford:

P.F. Rochford

Legend

Folio Number:
LS13638F
LS13639F

Landowner:
Mark & Bernard Rochford

TITLE OF FIGURE:

Mark & Bernard Rochford

Figure 1

Rev A

DATE: 07/01/2020

SCALE: 1:5 000 @ A3



Statkraft
Building 4200, Cork
Airport Business Park,
Cork, Ireland

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TO:
The Planning Department
Laois County Council
Áras an Chontae,
JFL Ave.,
Portlaoise,
Co. Laois
R32 EHP9

Date: 9th January 2020

Dear Sirs,

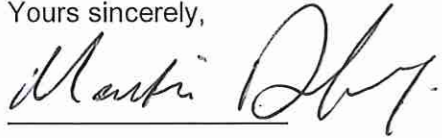
Re: **Planning Application by Statkraft Ireland Limited
Proposed Renewable Energy Project at Forest Upper, Tinnahinch.**

I, Martin F. Delaney confirm that I am the owner of the lands identified on the map attached to this letter and I am aware of and consent to the application by Statkraft Ireland Limited for planning permission for a renewable energy project on lands at Forest Upper, Tinnahinch, County Laois.

The proposed works are described in the plans and particulars which are to be submitted with the planning application. I confirm that I have been shown the proposed turbine locations on a map.

I confirm that I am aware of the proposed project, the potential benefits of the proposed project and the potential impacts of the proposed project including those relating to visual, noise and shadow flicker. I am supportive of the development of the project.

Yours sincerely,



Martin F. Delaney

Laois County Council Planning Authority, Viewing Purposes Only!



Signed Martin F Delaney:

Martin F Delaney

Legend

Folio Number:
LS13637F

Landowner:
Martin F Delaney

TITLE OF FIGURE:

Martin F Delaney

Figure 1

Rev A

DATE:

07/01/2020

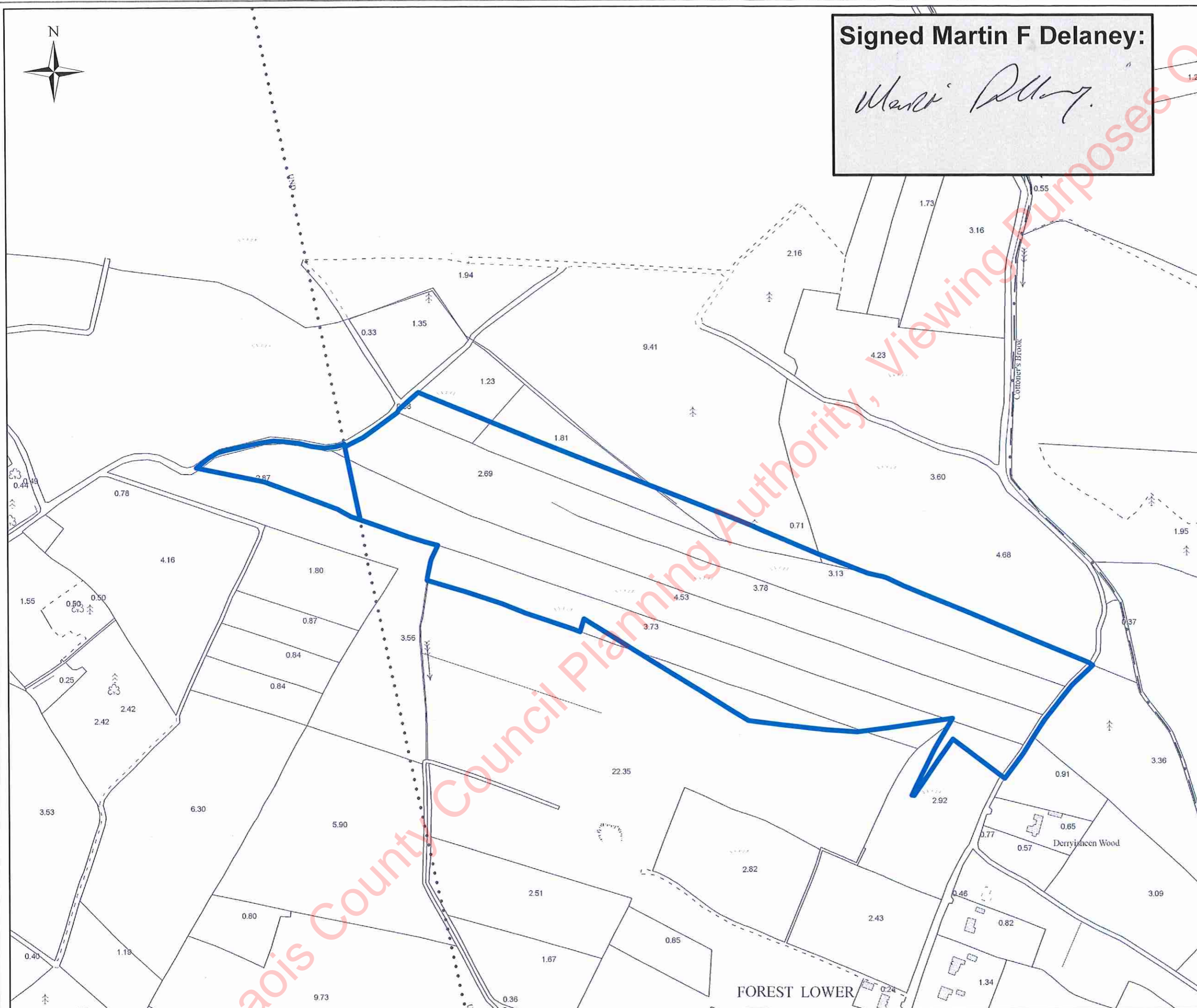
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Cork, Ireland

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TO:
The Planning Department
Laois County Council
Áras an Chontae,
JFL Ave.,
Portlaoise,
Co. Laois
R32 EHP9

Date: 9th January 2020

Dear Sirs,

**Re: Planning Application by Statkraft Ireland Limited
Proposed Renewable Energy Project at Forest Upper, Tinnahinch.**

I, Conor McNamara confirm that I am the owner of the lands identified on the map attached to this letter and I am aware of and consent to the application by Statkraft Ireland Limited for planning permission for a renewable energy project on lands at Forest Upper, Tinnahinch, County Laois.

The proposed works are described in the plans and particulars which are to be submitted with the planning application. I confirm that I have been shown the proposed turbine locations on a map.

I confirm that I am aware of the proposed project, the potential benefits of the proposed project and the potential impacts of the proposed project including those relating to visual, noise and shadow flicker. I am supportive of the development of the project.

Yours sincerely,



Conor McNamara

Laois County Council Planning Authority, Viewing Purposes Only!



Signed Conor McNamara:

Conor McNamara

Legend

Folio Number:
LS5235F

Landowner:
Conor McNamara

TITLE OF FIGURE:

Conor McNamara

Figure 1

Rev A

DATE:

07/01/2020

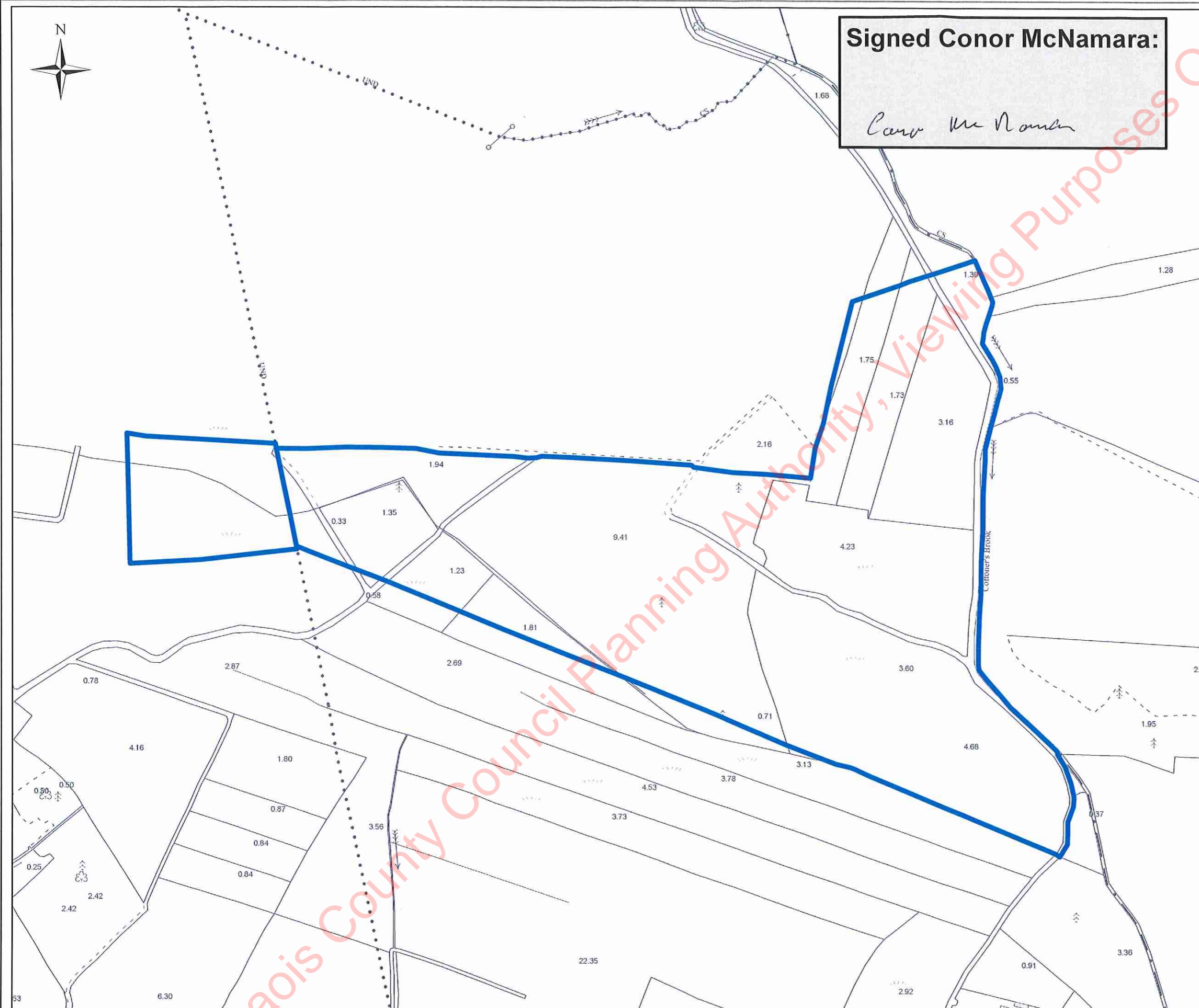
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1:5 000 @ A3



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Airport Business Park,
Cork, Ireland

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Appendix 4.2

Construction and Environmental Management Plan





ENVIRONMENTAL BALANCE IN DESIGN AND CONSTRUCTION

STATKRAFT

CONSTRUCTION AND ENVIRONMENTAL MANAGEMENT PLAN (CEMP) FOR THE PROPOSED DERNARCART WIND FARM, COUNTY LAOIS

DECEMBER 2019



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1. INTRODUCTION

1.1 General Introduction and Purpose

This document is the Construction and Environmental Management Plan (CEMP) for the proposed Dernacart Wind Farm and has been prepared by Fehily Timoney & Company (FTC) on behalf of Statkraft to accompany the EIAR for the proposed development.

The CEMP sets out the key construction and environmental management issues associated with the proposed wind farm and will be developed further at the post-planning and construction stages by the client and on the appointment of the main contractor to the project. Any adjustments to the CEMP will be carried out on the basis that they do not increase the impacts as addressed in the EIAR. In the case of any ambiguity or contradiction between this CEMP and the EIAR, the EIAR shall take precedence.

The CEMP will be updated prior to construction to take account of any amendments arising during the consenting process and relevant conditions attached to the planning permission and will be implemented for the duration of the construction phase of the project. The CEMP will be a live document and will be reviewed and updated as required. For the avoidance of doubt, all measures stipulated in this CEMP will be implemented in full.

This CEMP sets out the key environmental management issues associated with the construction, operation and decommissioning of the proposed development, to ensure that during these phases of the development, the environment is protected and impacts on the environment are minimised.

The document is divided into six sections:

- Section 1:** *Introduction* provides details on the existing site and the proposed development
- Section 2:** *Existing Site Environmental Conditions* provides details of the main existing geotechnical, hydrological, ecological and archaeological conditions onsite. These conditions are to be considered by the contractor in the construction, operation and decommissioning of this proposed development.
- Section 3:** *Overview of Construction Works*, this section provides an overview of the construction works proposed, including drainage and sediment controls to be installed.
- Section 4:** *Environmental Management Plan (EMP)*, this section outlines the main requirements of the EMP and outlines operational controls for the protection of the environment including soil management, habitat and species, site drainage control, archaeology, construction traffic, site reinstatement and decommissioning, waste management.
- Section 5:** *Safety & Health Management Plan*, this section defines the work practices, procedures and management responsibilities relating to the management of safety and health during the design, construction and operation of Dernacart Wind Farm.
- Section 6:** *Emergency Response Plan* contains predetermined guidelines and procedures to ensure the safety, health and welfare of everybody involved in the project and to protect the environment during the construction phase of Dernacart Wind Farm.

1.2 The Applicant

The applicant for the proposed project is Statkraft Ireland Ltd.

1.3 The Site

The proposed Dernacart Wind Farm is located approximately 1.8km from Mountmellick, ca. 4.6km from Cloneygowan, ca. 7km from Portarlinton and ca. 8.6km from Killeigh. The location of the proposed development is shown in Figure 1.1.

1.4 The Project

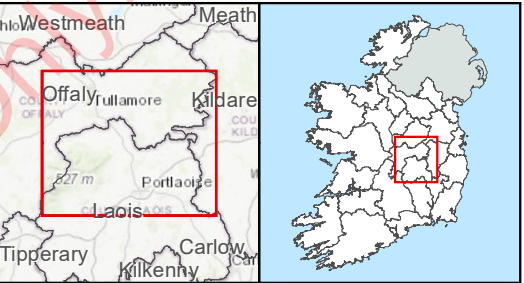
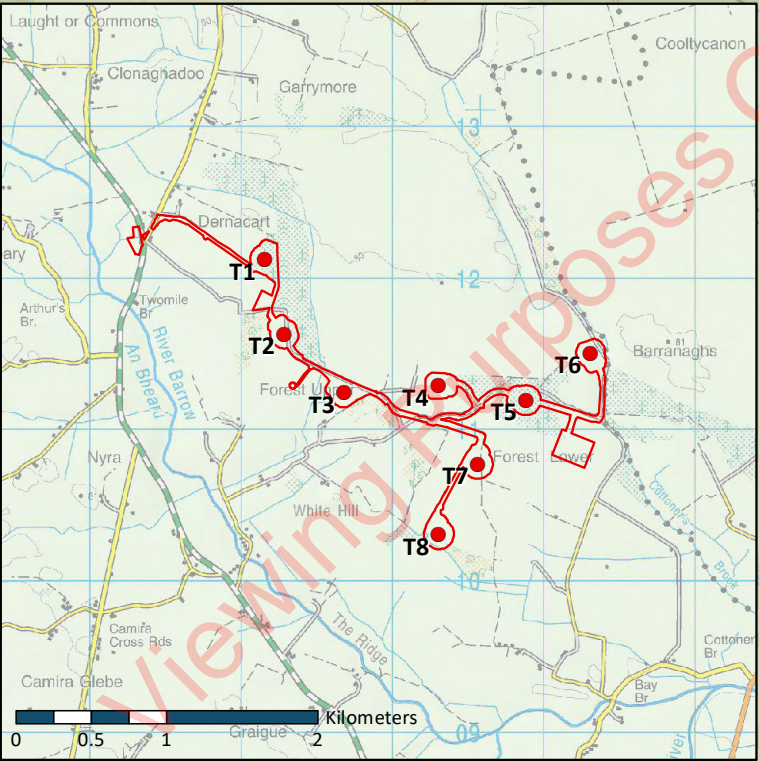
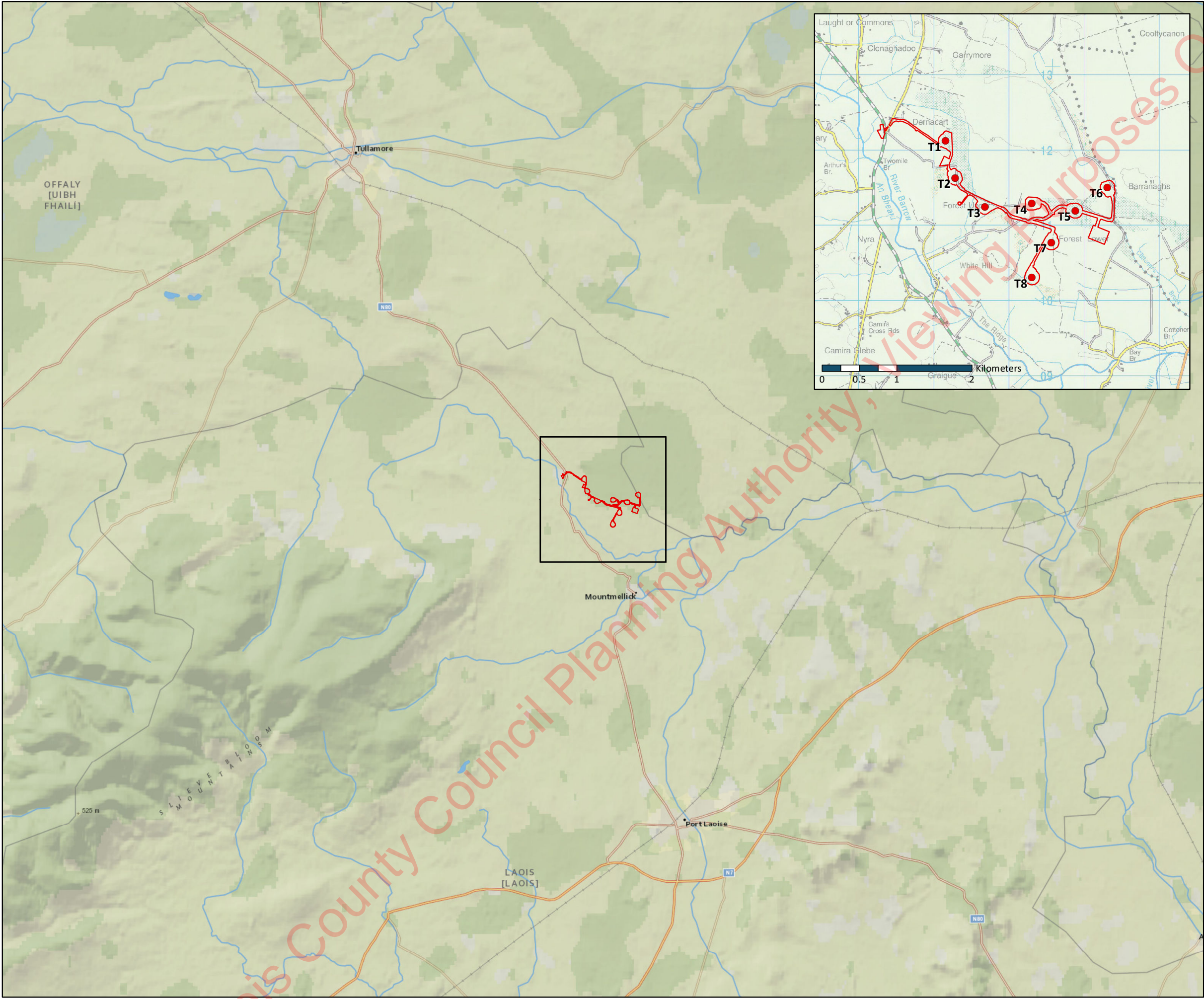
The proposed project consists of a wind farm development and all associated works within the townlands of Forest Upper, Forest Lower, Dernacart, Co. Laois. The grid connection to the national grid will be to the future proposed substation at Bracklone, near Portarlinton. Approximately 16.5km of underground cable will be required to be laid to connect the wind farm site to the national grid along the road network.

The proposed development will comprise of up to 8 no. wind turbines with a tip height of up to 185m, turbine foundations, hardstanding areas, new access tracks and upgrading of existing access tracks, 1 no. substation including control buildings, met mast, electrical and grid services equipment, underground electrical and communications cabling, drainage, sediment controls, temporary site compound, tree felling, roads, hardstands and associated works. Permission is sought for a period of 10 years and an operational life of 30 years from the date of commissioning of the entire wind farm.

A detailed description of the proposed development is outlined in Section 3.1.

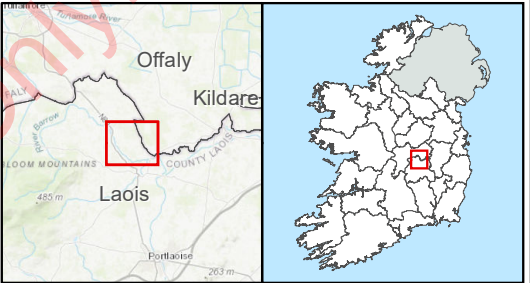
A site layout plan of the proposed project is shown in Figure 1.2.

The site is accessed from the N80, via a local road to the site entrance.



- Proposed Turbines
- Proposed Planning Boundary

TITLE:		Site Location	
PROJECT:		Dernacart Wind Farm	
FIGURE NO:		1.1	
CLIENT:		Statkraft	
SCALE:	1:150000	REVISION:	0
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- Proposed Turbines
- Proposed Met Mast
- Proposed Planning Boundary
- Study Area Boundary
- Proposed Cable Route
- Proposed Turbine Hardstanding Areas
- Proposed Substation
- Proposed Temporary Compound
- Proposed Access Tracks
 - Existing Track to be Upgraded
 - New Track

TITLE:		Proposed Wind Farm Layout	
PROJECT:		Dernacart Wind Farm	
FIGURE NO:		1.2	
CLIENT:		Statkraft	
SCALE:	1:17500	REVISION:	0
DATE:	31/01/2020	PAGE SIZE:	A3

2. EXISTING SITE ENVIRONMENTAL CONDITIONS

2.1 Existing Site Description

2.1.1 Wind Farm Site

The site of the proposed development is located in relatively low-lying lands below the 80m contour level. The landcover is classified on Corine as pastures, peat bog and coniferous forest. A tributary of the River Barrow flows through the site and to the east of the site is another tributary of the River Barrow. A bog is located to the north and east of the site and to the south and west are agricultural lands.

The proposed grid connection which will connect the on-site substation to the future proposed Bracklone substation is ca. 16.5km in length and runs predominantly along the road network.

2.1.2 Turbine Delivery Route (TDR)

Turbine deliveries will be from Dublin Port to the M6, where the turbine components will travel to Junction 5. At Junction 5 of the M6, the turbine component deliveries will exit the motorway and travel along the N52 traveling through the Ardan, Cappincur, Cloncollig and Clonminch roundabouts. At the Clonminch roundabout, the deliveries will travel along the N80 through Killeigh, then to the turn onto the L2092 to the site entrance at Dernacart.

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

Turbine deliveries will be carried out at night during off-peak times and will be done using a convoy and a specialist heavy haulage company. Turbine deliveries will also be escorted by An Garda Síochána. This will minimise the disruption to traffic and ensure the impacts of the turbine deliveries are minimised.

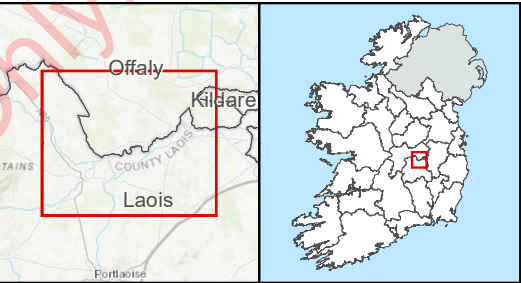
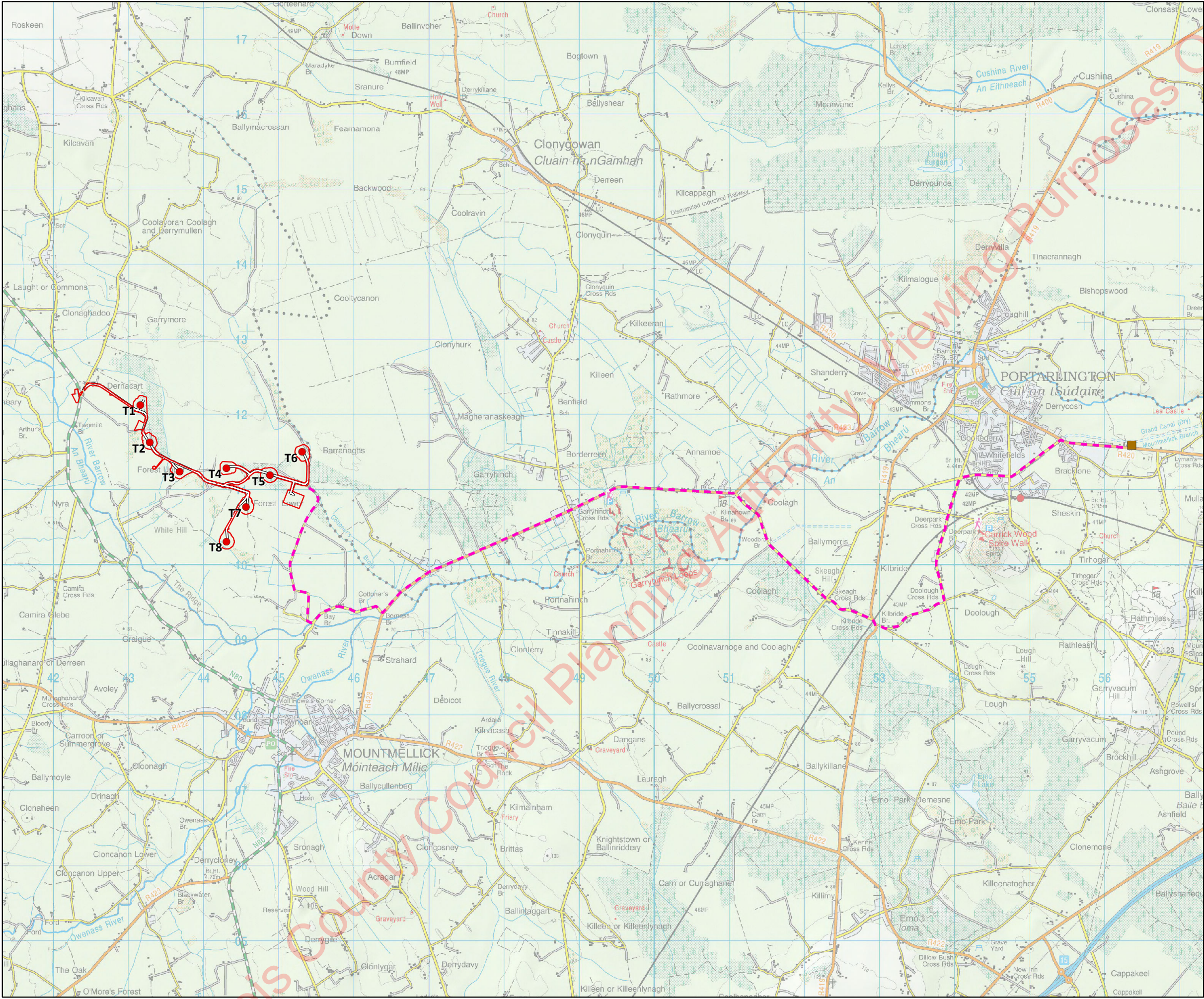
In some cases, accommodation works are required along the turbine delivery route such as hedge or tree cutting, relocation of powerlines/poles, lampposts, signage, a turning area in lands at the intersection of the N80 and the L2092 and local road widening (in the verge). Any accommodation works will be carried out in advance of the turbine deliveries, following consultation and agreement with the local authority. Road widening/accommodation works will be required at a number of roundabouts at Tullamore which will be reinstated to the satisfaction of the local authority.

At the junction between the N80 and the local road leading to the site entrance, adjacent lands are required for the turbine delivery truck to turn onto the local road. These lands are contained within the red line planning boundary. It is proposed to use a blade adaptor to minimise the land required at this location. The blade adaptor is capable of raising the blade from its horizontal position to a vertical position thus reducing the swept path/length of the load and reducing the requirements for hedge trimming/land takes etc. The blade is connected to a specially adapted motorised unit and tilted up to 60 degrees into the air and transported through the restricted area. The tilting of the blade reduces the length and thus a reduced area of land is required for the transportation of the blade.

2.1.3 Grid Connection Cable Route

Connection will be sought from the grid system operators by application to either ESB Networks or Eirgrid. It is anticipated that the project will connect via underground cable to the future proposed Bracklone substation. No overhead lines are required for this connection. The CRU introduced a new grid connection policy in April 2018 to replace the older systems of Gates and non-GPA – the Enduring Connection Policy (ECP-1: 2018 Batch). The purpose of the ECP is to provide more frequent opportunities for projects to connect to the network. A subsequent batch is envisaged as soon as reasonably practical after ECP-1 has concluded.

The proposed grid connection route is ca. 16.5km in length and will follow the existing roads to the future proposed substation at Bracklone. The proposed grid connection route is shown in Figure 2.1 below. There will be no overhead lines required for the grid connection.



- Proposed Turbines
- Proposed Future Bracklone Substation
- Proposed Planning Boundary
- Proposed Grid Connection Route
- Proposed Access Tracks

TITLE:		Grid Connection Route	
PROJECT:		Dernacart Wind Farm	
FIGURE NO:		2.1	
CLIENT:		Statkraft	
SCALE:	1:50000	REVISION:	0
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2.2 Soils, Geology and Hydrogeology

The land use across the site is predominantly made up of agricultural lands, peat bogs and forestry at various stages of their lifecycle. The typical elevations of the site are between 73m to 80mAOD.

The Quaternary Geology underlying the proposed wind farm site, as taken from the GSI online mapping, comprise:

- Cut over raised peat (Cut)
- TILL derived from Limestones (TLs)
- Gravels derived from Limestones (GLs)

The proposed wind farm site is predominantly underlain by cut over raised peat deposits. Areas of TILL derived from Limestones and pockets of deposits of Gravels derived from Limestone are located distributed through the central and southern portions of the proposed wind farm site.

The Quaternary Geology underlying the proposed grid connection, as taken from the GSI online mapping, comprise:

- Cut over raised peat (Cut)
- TILL derived from Limestones (TLs)
- Gravels derived from Limestones (GLs)
- Alluvium
- Urban sediments

The future proposed Bracklone 110 kV cable route is predominately underlain by cut over raised peat, TILL derived from limestones, and gravels derived from limestones. The urban sediments are found at the eastern section of the grid connection at the town of Portarlinton. There are small sections of alluvium located adjacent to the River Barrow.

The Geological Survey of Ireland (GSI) 1:100,000 scale bedrock geology map shows that the proposed wind farm site and associated access tracks are underlain by the Carboniferous Ballysteen Formation. The Ballysteen Formation is described as comprising bioclastic argillaceous limestone with oolitic limestones occurring through the formation.

The proposed cable route is predominately underlain by Carboniferous formations including:

- Ballysteen Formation
- Waulsortian Formation
- Allenwood Formation
- Lucan Formation

The slopes of the site are characterised by gentle slopes of between 1° and 3°. No evidence of slope instability was observed at the site and there are no historical records of landslide activity within or close to the site, on the GSI (n.d) database.

The Groundwater Vulnerability is classified by the GSI as being 'Moderate' across the majority of the proposed wind farm site becoming 'High' at the extreme east, west and south of the wind farm site. The extreme portion of the site is classified as being of 'Low' Groundwater Vulnerability.

2.3 Hydrology & Water Quality

The area proposed for Dernacart Wind Farm is situated within three waterbodies (sub-basins) catchments as defined by WFD. These waterbodies are known as:

- Barrow_030 - IE_SE_14B010300
- Barrow_040 - IE_SE_14B010500
- Cottoners Brook_010 - IE_SE_14C150500

Turbines T1 is within the Barrow_030 - IE_SE_14B010300 and Barrow_040 - IE_SE_14B010500 waterbody catchment. Turbines T5 is within the Barrow_040 - IE_SE_14B010500 and Cottoners Brook_010 - IE_SE_14C150500 waterbody catchment. Turbines T2, T3, T4, T7 and T8 are within the Barrow_040 - IE_SE_14B010500 waterbody catchment. Turbines T6 is within Cottoners Brook_010 - IE_SE_14C150500 waterbody catchment as shown on **Error! Reference source not found..**

Surface runoff from turbines T1 and T2 drains to the east to the Forrest upper stream. From there it flows for approximately 1.3 km to the south where it turns south westly towards the River Barrow. This stream rises at an elevation of 80 m OD approximately 310 m east of the turbine T1. Surface runoff from T3 drains to an unnamed tributary of Forrest upper, approximately 55 m north of the turbine.

Surface runoff from turbines T4, T5, T7 and T8 drains to White hill (W) stream. From there it flows south-easterly for approximately 2.4 km before it joins the River Barrow.

Surface runoff from turbine T6 drains to Cottoner's Brook stream as shown on Figure 2-4. It rises to an elevation of c. 74 m OD at the eastern boundary of the site and flows in south-easterly direction for approximately 2.6 km where it meets the River Barrow.

The national flood hazard mapping (available at www.floodmaps.ie) does not indicate any record of historical flooding on the wind farm as shown in Figure 2-3. Recurring flood incidents have been recorded downstream in the main channel of the Barrow River. These recurring incidents are:

- Barrow Bay Mountmellick Recurring – approximately 2.0 km southeast of the closest turbine T8
- Barrow Cottoner's Bridge Recurring – approximately 2.6 km southeast of the closest turbine T8
- Barrow Garryhinch Recurring – approximately 4.5 km east of the turbine T8

However, according to flood mapping the grid route is within the flood zone.

The proposed grid route is situated within 7 sub-basins as defined by the WFD. These sub-basins are known as:

- Cottoner's Brook_010 - IE_SE_14C150500
- Barrow_040 - IE_SE_14B010500
- Barrow_050 - IE_SE_14B010550
- Barrow_060 - IE_SE_14B010700
- Clonygowan_010 - IE_SE_14C510940
- Barrow_070 - IE_SE_14B010780
- Barrow_080 - IE_SE_14B010900

According to flood mapping the grid route is within the flood zone as shown on Figure 2-2.

Recurring flood incidents in the proximity of the grid route are listed below:

- Barrow Bay Mountmellick Recurring
- Barrow Cottoner's Bridge Recurring
- Barrow Garryinch Recurring
- Barrow Mill Island, Portarlington Recurring
- Barrow Fire Station, Portarlington Recurring
- Barrow People's Park Portarlington Recurring
- Barrow Kilnacourt, Portarlington Recurring
- Barrow Buttle Lane, Portarlington Recurring
- Barrow Br Spa Br Portarlington Recurring
- Barrow Spa Street, Portarlington Recurring
- Barrow Droughill Portarlington Recurring
- Barrow Avondale, Portarlington Recurring

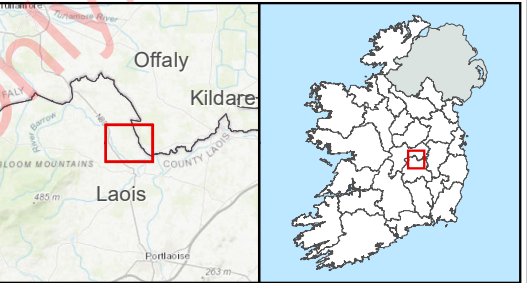
The site is not situated within any environmentally designated areas; however, surface water runoff drains into the River Barrow and River Nore SAC (002162). The Barrow River is listed as sensitive to nutrients downstream of location where Triogue River joins Barrow River.¹

Turbines are situated within three sub-basins. Greenfield runoff drains to tributaries of Barrow River. These tributaries are Forrest upper, White hill (W) stream, Forrest lower stream and Cottoner's Brook. Forestry and agriculture lands are situated south and west of the Garryinch bog peat. These lands have agricultural drains and forestry drains throughout the site.

The Forrest upper stream, tributary of the Barrow River crosses the proposed access road between turbines T2 and T3 at one location. The crossing is at an existing track southwest of the Garryinch bog peat, where it is culverted in a 1000 mm diameter concrete pipe.

Existing tracks run through the site. Some of these tracks are access tracks for bog peat and are approximately 4 m wide and made up of local sandstone/siltstone hardcore. It is proposed to utilise existing tracks in so far as possible to access the new turbines in the proposed development. The existing tracks may require strengthening and widening to achieve a track width of 5 m (minimum). The existing track drainage consists of 'over the edge' drainage to roadside drains.

¹ <https://data.gov.ie/dataset/register-of-protected-areas-nutrient-sensitive-rivers>



- Proposed Turbines
- OPW Historic Flood Points
- Proposed Planning Boundary
- Study Area Boundary
- Proposed Cable Route
- Rivers
- Proposed Turbine Hardstanding Areas
- Proposed Substation
- Proposed Temporary Compound
- PFRA/CFRAMS 1% AEP Pluvial Flood Extent
- PFRA/CFRAMS 1% AEP Fluvial Flood Extent
- Proposed Access Tracks
 - Existing Track to be Upgraded
 - New Track

TITLE:		OPW Flood Data	
PROJECT:		Dernacart Wind Farm	
FIGURE NO:		2.2.1	
CLIENT:		Statkraft	
SCALE:	1:17500	REVISION:	0
DATE:	30/01/2020	PAGE SIZE:	A3
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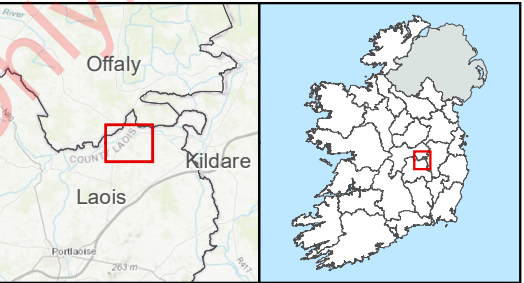




- ▲ OPW Historic Flood Points
- Proposed Cable Route
- Rivers
- PFRA/CFRAMS 1% AEP Pluvial Flood Extent
- PFRA/CFRAMS 1% AEP Fluvial Flood Extent

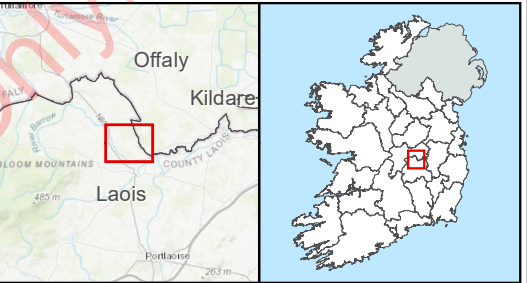
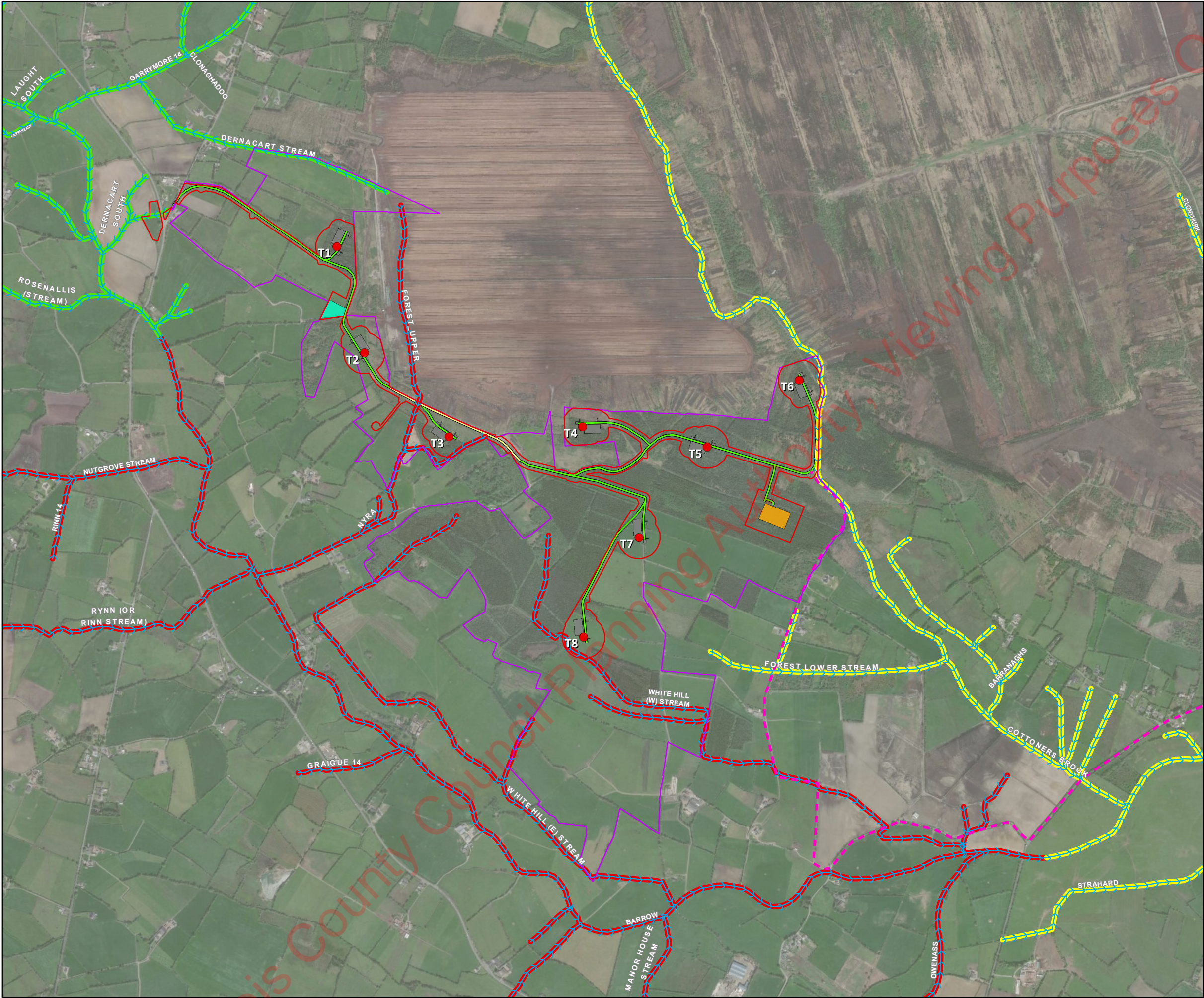
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PROJECT:		Dernacart Wind Farm	
FIGURE NO:		2.2.2	
CLIENT:		Statkraft	
SCALE:	1:17500	REVISION:	0
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- Proposed Future Bracklone Substation
- OPW Historic Flood Points
- Proposed Cable Route
- Rivers
- PFRA/CFRAMS 1% AEP Pluvial Flood Extent
- PFRA/CFRAMS 1% AEP Fluvial Flood Extent

TITLE:		OPW Flood Data	
PROJECT:		Dernacart Wind Farm	
FIGURE NO:		2.2.3	
CLIENT:		Statkraft	
SCALE:	1:17500	REVISION:	0
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- Proposed Turbines
- Proposed Planning Boundary
- Study Area Boundary
- Proposed Cable Route
- Proposed Turbine Hardstanding Areas
- Proposed Substation
- Proposed Temporary Compound
- Rivers
- Proposed Access Tracks
 - Existing Track to be Upgraded
 - New Track
- WFD Waterbodies Approved Risk 2018
 - At risk
 - Not at risk
 - Review

TITLE: WFD River Waterbodies Risk	
PROJECT: Dernacart Wind Farm	
FIGURE NO:	2.3
CLIENT:	Statkraft
SCALE: 1:17500	REVISION: 0
DATE: 30/01/2020	PAGE SIZE: A3
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2.4 Biodiversity

2.4.1 Designated Sites

2.4.1.1 Sites of International Importance

Special Areas of Conservation and Candidate Special Areas of Conservation (SACs and cSACs)

Special Areas of Conservation (cSACs) and SACs are protected under the European Union (EU) 'Habitats Directive' (92/43/EEC), as implemented in Ireland by the European Communities (Natural Habitats) Regulations, 1997.

There are three cSACs and one SAC within 15 km of the proposed development:

- Mountmellick SAC
- Charleville Wood cSAC
- Slieve Bloom Mountains cSAC
- River Barrow and River Nore cSAC

Special Protection Areas (SPAs)

Special Protection Areas (SPAs) were initially designated under Directive 79/409/EEC, The sites designated under the Directive on the Conservation of Wild Birds ('The Birds Directive') are protected as European Sites (Natura 2000 sites) under the EU 'Habitats Directive'.

There is one SPA within 15 km of the proposed development:

- Slieve Bloom Mountains SPA

AA screening and Stage 2/NIS

Mountmellick SAC, Charleville Wood cSAC, Slieve Bloom Mountains cSAC and Slieve Bloom Mountains SPA were 'screened out' within stage 1 of the AA screening process, as it was concluded beyond reasonable scientific doubt the proposed development does not have the potential to cause significant effects to these European sites.

The River Barrow and River Nore cSAC was 'screened in' due to potential for negative effects on water quality within the cSAC, which is upstream of the proposed development site. A Natura Impact Statement was prepared to address this, and mitigation measures to prevent these effects are specified therein. These measures are included below in section 4.3.3.

2.4.1.2 Sites of National Importance

Sites of National Importance in the Republic of Ireland are termed, Natural Heritage Areas (NHA) and proposed Natural Heritage Areas (pNHA). While the Wildlife (Amendment) Act 2000 has been passed into law, pNHAs will not have legal protection until the consultative process with landowners has been completed; this process is currently ongoing.

Slieve Bloom Mountains pNHA is encompassed by an SPA and cSAC and as such is assessed under these higher designations within the AA screening report.

In addition to Slieve Bloom Mountains pNHA, one NHA and three pNHAs are present within 10 km of the proposed wind farm, while a further three pNHAs are present within 10 km of the proposed grid connection route. The closest of these to the proposed wind farm is Raheen Lough pNHA (6.6 km north).

These are:

- Raheen Lough pNHA (000917)
- Clonreher Bog NHA (002357)

- Ridge of Portlaoise pNHA (000876)
- Emo Court pNHA (000865)
- Hawkswood Bog NHA (002355)
- Great Heath of Portlaoise pNHA (000881)
- Grand Canal pNHA (002104)

No potential for significant negative effects to these sites of national importance has been identified within the Ecological Appraisal. None of these sites have downstream hydrological connectivity with the proposed wind farm or grid connection.

A detailed examination of potential negative effects on the ornithological interests of Raheen Lough pNHA determined that no negative effects are likely to occur as a result of the proposed development.

2.4.2 Local Ecological Receptors

The flora and fauna present on-site and other ecological receptors in the vicinity of the proposed wind farm and cable route are described in detail in 12.3 Description of the Existing Environment in Chapter 12 Biodiversity. Potential impacts are described in 12.5 Potential Impacts on Ecology.

Mitigation measures to protect the local ecosystem including water quality, flora and fauna are included below in section 4.3.3.

2.5 Archaeological, Architectural and Cultural Heritage

There are no recorded archaeological sites within the proposed development site, whilst there are 3 no. examples within 1.5kms of the proposed site boundary which include two enclosures and a metalworking site. These recorded archaeological sites are listed in Table 2.1

There are no designated architectural heritage sites within the site boundary, although there are 4 no. protected structures located within 1.5kms of same. In addition, there are 5 no. architectural heritage features located within 100m of the proposed UGC route, four of which are listed on the RPS; and all are listed in the NIAH. The recorded sites include thatched cottages, bridges, a post-box, Church of Ireland (COI) church and houses.

Table 2-1: Recorded archaeological sites within the study area

Monument Ref.	Class	Townland	ITM	Distance from proposed development
OF033-012----	Enclosure	Barranaghs	646057, 710258	830m SE of north-eastern site boundary and 170m NE of UGC route
LA003-006----	Enclosure	Garrymore	642899, 713471	880m N of north-western site boundary
LA004-003----	Metalworking site	Townparks	645960, 709261	1355m E of south-eastern site boundary and 100m S of UGC route

Table 2-2: Excavations within the Study Area

Location	Licence Ref	Summary
Cooltedery, Co. Laois	03E1413 Martin Byrne	<p>Testing was undertaken at a proposed residential development site located in the townland of Cooltederry, Portarlinton. There is a postulated double motte-and-bailey site (SMR 5:4) in the adjacent field to the north-east of the site. It is illustrated on the 1839 OS 6-inch map, without descriptive text, but not on any subsequent editions. There are no visible surface indications of the monument.</p> <p>Five trenches were excavated by both machine and hand within the field adjacent to that in which the monuments are indicated. No features or finds of archaeological interest were uncovered. A low ridge which is bisected by the existing field boundary was found to be a natural feature.</p>
Rathleash, Co. Laois	06E0162 John Purcell	<p>Test-trenching was carried out as part of the planning schedule for a single-house development adjacent to a ringfort at Rathleash, Portarlinton. A series of trenches were excavated by mechanical digger at the house site, entrance and percolation area. No features or finds of archaeological significance were revealed.</p>

3. OVERVIEW OF CONSTRUCTION WORKS

3.1 Description of the Proposed Development

Statkraft is proposing to construct an up to eight-turbine wind farm at Dernacart, Co. Laois. The wind farm will be connected by a 110kV underground cable to the proposed Bracklone substation. The proposed development will consist of the following infrastructure:

- Erection of up to 8 no. wind turbines with an overall tip height of up to 185m
- Construction of foundations and hardstanding areas in respect of each turbine
- Construction of 1 no. site entrance from the public road
- Construction of ca. 5.8km of new site access tracks and associated drainage
- Upgrade of ca.0.89km of existing access tracks and, where required, upgrade of associated drainage
- Establishment of 1no. temporary compound and associated parking areas
- Construction of drainage and sediment control systems
- Construction of 1 no. electricity substation including:
 - 2 no. control buildings containing worker welfare facilities
 - Electrical infrastructure and grid ancillary services equipment
 - Parking
 - Fencing
 - Waste water holding tank
 - Equipment storage
 - Wind farm communications equipment
 - All associated infrastructure, services and site works including landscaping
- Installation of underground electricity cables between the proposed turbines and proposed on-site substation.
- Temporary alterations to the public road at identified locations to accommodate the delivery of turbines
- Associated site works including berms and landscaping
- Tree felling
- Peat excavation
- Installation of a permanent meteorological mast of up to 110m in height
- A 10-year planning permission is sought with a 30 year operational life from the date of commissioning of the entire wind farm.

A full description of the proposed development as per the public planning notice is as follows:

The development will consist of: up to 8 no. wind turbines with a tip height of up to 185 meters and all associated foundations and hardstanding areas; 1 no. on-site electrical substation; 1 no. temporary construction compound; all associated underground electrical and communications cabling connecting the turbines to the proposed on-site electrical substation; provision of new site access tracks and upgrading of existing access tracks and associated drainage; erection of 1 no. permanent meteorological mast of up to 110m in height; works to facilitate the delivery of turbines adjacent to the N80 within the townland of Dernacart and Forest Upper to include the laying of temporary surfacing; tree felling; and all associated site development works, ancillary works and equipment. Permission is sought for a period of 10 years and an operational life of 30 years from the date of commissioning of the entire wind farm.

3.2 Construction Period

The construction period for the entire project is estimated to take approximately 12 months.

The layout of the site lends itself to clearly defined phases (civil construction, cables, turbines, on-site substation) where the various work elements can overlap without a significant increase in local traffic movements or congestion on site. There is likely to be some overlap with civil works and turbine erection, and also with turbine erection and commissioning.

It is estimated the civil and electrical works will include the following:

- Temporary site compounds;
- Site entrances;
- New stream crossings;
- New site roads & drainage;
- Upgrade to local roads;
- Turbine foundations and hardstands;
- Electrical compound and substation building;
- Cable trenching and ducting (internal cables only);
- Cable pulling (internal cables only);
- Turbine delivery and installation;
- Testing, commissioning and energisation.

The final programme will be developed post planning in consultation with the turbine manufacturer and the main construction contractor, based on projected turbine delivery dates.

3.3 Overview of the Construction Sequence (Preliminary Only)

The construction of a wind farm project is a major infrastructural project. The construction of this project will involve many inter-related, inter-dependent and overlapping elements of a complex nature.

The following section outlines the construction methodology for the proposed development. Upon mobilisation for the construction of the development, peat excavation (where required), upgrading of existing site tracks and the provision of new site tracks will precede all other activities. Drainage infrastructure will be constructed in parallel with the track construction. Typically, this will be followed by the construction of the turbine foundations and the provision of the hardstanding areas.

In parallel with these works the on-site electrical works; sub-station and internal cable network are constructed.

3.3.1 Overview of the Construction Methodology (Preliminary Only)

Outline method statements are presented below for the key elements of the construction process. Please note that the contractor for the main construction works will, following appointment, take ownership, expand upon and generally develop these method statements to the required detail and will incorporate all planning conditions.

The proposed construction methodology is summarised under the following headings:

- Site Entrance
- Temporary Site Compounds
- Concrete Washout Area and Wheel Washing

- Upgrade of Existing Internal Access Tracks
- New Site Access Tracks
- Cable Works
- Crane Hardstands
- Turbine Foundations
- Substation Compound
- Electrical Works
- Turbine Erection

3.4.1.1 Site Entrance

Prior to the commencement of any other works, the site entrance will be constructed. The site entrance shall be designed in accordance with TII design standard DN-GEO-03060: Geometric Design of Junctions, TII, June 2017.

Site entrances will be secured and locked when not in use. Where required, the entrances will be controlled by flagmen to assist traffic movements.

3.4.1.2 Temporary Site Compounds

During the construction phase, it will be necessary to provide temporary facilities for construction personnel. The location of the temporary site compound is shown on Figure 1-2. A layout plan is shown in Planning drawings P1892-1700-0003.

Facilities to be provided in the temporary site compound will include the following:

- | | |
|--|-------------------------------|
| • site office, of Portacabin type construction | • employee parking |
| • portaloo | • bunded fuel storage |
| • bottled water for potable supply | • contractor lock-up facility |
| • a water tanker to supply water used for other purposes | • diesel generator |

The main compound will also include the following:

- canteen facilities
- aggregate stores
- storage shed

The compound will be constructed as follows:

- The area to be used as the compound will be marked out at the corners using ranging rods or timber posts.
- Drainage runs and associated settlement ponds will be installed around the perimeter.
- Temporary, modular, containerised offices welfare units will be delivered to site using articulated lorry and lifted into place using a suitable crane.
- A concrete bunded area with an associated oil interceptor will be provided within the main compound for the storage of lubricants, oils and site generators and coalescing media oil water separator will be installed to mitigate against any hydrocarbon spillages or the contractor will have a cost container for storing oils and fuels on site.
- The compound will be fenced all round and secured with locked gates.

- Self-contained portaloos with an integrated wastewater holding tank will be used maintained by the providing contractor and removed from site on completion of the construction works. These will be located in the temporary compounds, as well as in several areas throughout the site due to the dispersed nature of the site.
- Potable water will be delivered to site in suitable canisters on a daily basis for drinking.

Upon completion of the project the compound will be decommissioned, and the material will be removed off-site for recovery or disposal by a proposed waste contractor. The hardcore stone and geo-grid will be removed from site and the area will be reinstated by backfilling with the material arising during excavation, landscaping with topsoil as required.

3.4.1.3 Concrete Washout Area and Wheel Washing

All concrete will be delivered to site via ready-mix trucks from a local supplier.

Concrete washout will be carried out in a dedicated area of the temporary compound or at a designated washout pit on site. Only the washing of chutes will be permitted. Every concrete truck delivering concrete to the site must use the concrete washout facility prior to leaving the site. Chutes will be washed out at the designated area with a settlement lagoon provided to receive all run-off.

The concrete wash-out area will be constructed as follows:

- The topsoil and subsoil, if necessary, will be stripped out and placed adjacent to the temporary compound area
- An impermeable membrane will be installed directly onto the subsoil, and or subsoil, to form the impermeable concrete wash-out settlement lagoon
- A designated truck wash-down concrete apron shall be constructed next to this settlement lagoon
- Impermeable lined drains will direct the wash-out flow to the wash-out settlement lagoon
- The residual liquids and solids will be disposed of off-site at an appropriate licenced waste facility.

Upon completion of the projects the concrete wash-out area and settlement lagoon will be decommissioned by removing the impermeable membrane and backfilling the area with the material arising during excavation. The removed material will be recovered or disposed off-site at an appropriate facility.

Wheel wash facilities will be located at the site entrance to reduce construction traffic fouling public roads. Each wheel wash will come with an additional water tank which will be filled regularly. These units will be self-contained and will filter the waste for ease of disposal. Waste will be removed from each unit and from site by a proposed contractor.

3.4.1.4 New Site Access Tracks

Drainage runs, and associated settlement ponds will be installed. All site tracks will be designed taking account of the loadings required by the turbine manufacturer and will consist of a compacted stone structure.

New roads within the site will be excavated or floated depending on ground conditions. Floating roads are constructed without excavating the existing ground. They will consist of a layer of combined geotextile and geogrid laid directly on the existing surface. Layers of stone will then be placed on top with additional geogrid reinforcement as required. A layer of compacted CI 804 material will be placed on top to provide a suitable running surface.

It is anticipated that the stone required for the construction of the internal access roads will be sourced from quarries in the vicinity.

The majority of tracks on the site will be constructed using the traditional track construction and best practice construction methods from suitable load bearing strata. This system will consist of either one or two layers of stone depending on the load bearing capacity of the base layer.

Where the underlying layer is mineral subsoil, two layers of stone are used; a stone capping layer and running layer. In areas where the load bearing layer is rock, the capping layer is omitted, and the running layer is installed directly onto the rock surface.

Track construction details are likely to be as follows:

- Establish alignment of the new site tracks from the construction drawings and mark out the centrelines with ranging rods or timber posts.
- The access tracks will be of single-track design with an overall width of approximately 4.5m-5m. There will be some local widening on the bends, junctions and around Turbine Foundations for the safe passage of large vehicles. All bends have been designed to suit the requirements of the delivery vehicles.
- All machinery shall work within the construction corridors that will be indicated on the contract drawings. Vehicle movement will be restricted to site access tracks and agreed haul routes.
- Topsoil/subsoil will be stripped back to required levels. All material will be banded and stored separately. Section 4.3.2 contains an Soil Management Plan which details the storage and movement of materials on site.
- The soil will be excavated down to a suitable formation layer of either firm subsoil or rock.
- Well-graded granular fill will be spread and compacted in layers to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be decided by the Site Manager based on the characteristics of the material and the compaction plant to be used.
- Batters will have a slope of between 1:1 and 1:5 (depending on depth and type of material) and will be left as cut to re-vegetate naturally with local species.
- Passing bays for vehicles during construction period and temporary laydown areas for turbine components on the access roads

In the event that floating roads are required, typically, the track formation will consist of a minimum 500mm hardcore on geo-textile membrane. The likely construction methodology for newly constructed tracks will be as follows:

- The formation will be prepared to receive the geotextile membrane.
- Stone will be placed and compacted in layers to minimum 500 mm depth.
- A drainage ditch will be formed, within excavated width, along sides of the track.
- Surplus excavated material will be placed along the side of the track where suitable and dressed to blend in with surrounding landscaping and partially obscure sight of the track.

3.4.1.5 Upgrade of Existing Internal Access Tracks

It is proposed to utilise the existing road network as much as possible within the site. It will be required to widen existing agricultural and forestry tracks on site by up to 1.5 m to 4.5m, with some additional local widening at bends in the tracks. This will involve the slight re-location of existing roadside swales to allow for widening.

Some of the existing piped stream/drain crossings will need to be extended due to the widening of the tracks.

Existing agricultural and forestry drains will be retained along their existing routes and only slight diversions are anticipated to be required to provide for track widening.

Existing track upgrades shall follow the same outline methodology as for new access tracks.

The typical road construction details of new and upgrades to existing access tracks are detailed on planning application drawing P1892-0400-0003 and P1890-0400-0010.

3.4.1.6 Watercourse Crossings

There will be one existing stream crossing which will require replacement of the existing culvert with a bottomless culvert. The locations of the stream crossing is shown on planning application drawing P1892-0100-0008.

A Section 50 application will be required to obtain the consent of the OPW for the design of the new culvert crossing. The IFI will also be consulted at the detailed design stage.

3.4.1.7 Small Watercourse Crossings

Minor drains such as manmade agricultural, forestry and bog drains will be crossed using 450mm diameter pipes. All other existing stream and drain crossings will be left in place and extended where required to match the existing structure where it is proposed to widen the road. Existing stream crossings will be protected using silt fencing.

Some drain clearing will be required at existing crossings, where they have become blocked, to maintain the continuity of flows. These existing pipes may need replacing if they are found to be in a collapsed state.

For a typical drain/minor watercourse crossing using a piped culvert, the following outline methodology will be used.

- The access track construction will finish at least 10m from the nearside bank of the drain.
- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the measures outlined in Section 4 of this CEMP.
- Pipe culvert installation will only take place during dry periods.
- The bed of the drain will be prepared using a mechanical digger and hand tools to the required levels in accordance with the design.
- A bedding layer will be laid in the base of the watercourse using Class 6 aggregate material and blinding to the desired levels in accordance with the design.
- The pipe is laid in one lift or in sections using a crane in accordance with an approved lift plan.
- Bedding material is placed and compacted around the pipe to the desired levels in accordance with the design.
- Where appropriate an 500mm of suitable bedding material in the form of clean round gravel between 10-100mm diameter, shall be laid in the base of the pipe in accordance with the recommendations set out in *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Watercourses* from Inland Fisheries Ireland.
- The pipe is covered using compacted Class 6N fill material in accordance with the design up to the levels required by the access track sub formation.
- Rock armour headwalls will be constructed where necessary to protect pipe ends and the base of slope embankments on either side of the track.
- The access track construction continues over the crossing in accordance with the methodology outlined in Section 3.4.1.4.
- For small drain crossings, pipes of suitable diameter will be laid directly into the bed of the drain.

3.4.1.8 Cable Works

The specification for cable trenches will vary slightly depending on cable voltage, location and existing land use. Typical cable trench construction details can be found on drawing P1892-0400-0004. Typical Grid Connection Trench Details, which shows typical construction details for electricity cables in public roads and beside internal site access tracks.

All electrical and fibre-optic cabling on site between the wind turbines and the substation building will be buried in trenches approximately 0.6m wide by 1.2m deep located directly adjacent to the internal tracks.

Internal site cables will be ducted.

The following describes the outline construction methodology for cable installation works inside the wind farm site.

For direct buried cables, the following outline methodology shall apply:

- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the measures outlined in Section 4 of this CEMP.
- The line of the cable trench will run beside the site access tracks.
- The ground will be excavated using a mechanical digger. The top layer of soil will be removed and placed to one side. It will be used for landscaping the top of the backfilled cable trench following the laying of the cables. The remaining subsoil, excavated to the required depth, will be placed separately and used as backfill.
- Safe ladder access/egress to trenches will be provided into the trench.
- The cables will be laid directly onto a bed of suitable material, free from sharp stones and debris*.
- A suitable material will be placed over the top of the cables to protect them during backfilling*.
- Warning tape and plates will be installed by hand in accordance with the trench design and ESBN specifications and the engineer's design.
- On completion, the ground will be reinstated, and marker posts will be positioned at agreed centres to the side of the trench highlighting the presence of cables below.
- Trenches will vary in width depending on the number of cables in the circuit. Where there is more than one set of cables they will be separated as per cable manufacturers and ESB/ EirGrid requirements.
- Where cables need to cross access tracks, suitable cable ducts will be used to protect the cables. The typical method of construction involves the contractor initially excavating the trench to the specified depth and laying high density polyethylene (HDPE) ducting in the trench in a surround of CBM (cement bound material). A rope will be inserted into the ducts to facilitate cable-pulling later. The as-constructed detail of the cable duct locations will be carefully recorded. Cable marker strips will be placed at a specified distance above the ducts and the two communication ducts will also be laid. An additional layer of cable marker strips will be laid above the communication ducts and the trench back-filled.
- Small jointing pits will be located along the route of the trench which will be left open until jointing takes place. A protective handrail/ barrier will be placed around each pit for health and safety reasons.
- Once the cables are joined and sealed the jointing container will be removed and the cables at the joint-bay locations will be back-filled in the same manner as the rest of the cable trench.
- The cables will be terminated on the switchgear terminals at each turbine location and at the substation switchboard. Ducts will be cast into each foundation to provide access for the cables into the turbine. Likewise, at the substation, ducts will be cast through the building foundation to provide access for the cables.
- There are no existing buried services expected within the site however the appointed contractor will be responsible for carrying out pre-construction survey ahead of construction. Prior to commencement of the works, records of services such as watermains, sewers, gas mains and other power cables will be obtained from the relevant service providers.

Cable detection tools, ground penetrating radar and slit trenches will be used, as appropriate, to find the exact locations of existing services. The final locations of the cable trenches will be selected to minimise conflicts with other services.

- Trenches where ducts are laid will be back filled every evening. During excavation works signage will be erected local to the works warning of the dangers.

Where ducting is required within the wind farm site, tasks marked by an asterisk (*) in the above methodology will be replaced by the following steps:

- Ducts will be placed into trench manually, having been delivered to road side embankment/verge areas by way of tractor and pipe trailer and then offloaded by hand.
- Approved bedding material will be used to surround the ducts and delivered straight from a concrete truck or by skid steer at tight points along the route.
- Approved fill material will be compacted at the base, again above the power cable ducting as per the engineer's design.
- Exposed duct ends will be capped.
- A 12mm Draw rope will be blown through the ducting at later date.

3.4.1.9 Crane Hardstands

All crane pads and associated splays will be designed taking account of the loadings provided by the turbine manufacturer and will consist of a compacted stone structure in accordance with the detailed engineering designs and employer's requirements.

All crane pads will be formed on a suitably stiff layer and the finished crane pad surface will provide a minimum bearing capacity of up to 260kN/m². Where excavations beyond 5m below ground level are required to reach a suitable bearing, pile foundations may be required. Piles used for turbine foundations are either pre-cast driven piles or bored piles. Pile length is site-specific but tend to be approximately 12 m to 20 m long.

Crane pad and associated splay formation will consist of either 1 or 2 layers of suitable fill material depending on the properties of the underlying load bearing layer. Where the underlying layer is soft soil, 2 layers of suitable fill formation are used and the stone capping layer. In areas where the load bearing layer is rock, the capping layer is omitted, and the running layer is installed directly onto the rock surface however it is not likely this will be the case at this site.

The crane hardstands will be constructed in one of two following ways:

- Typical excavation method;
- Piled hardstand method.

It is unlikely that a piled construction method will be required for the hard standings.

The typical excavation method can be summarised as follows:

Typical Excavation Method:

- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the measures outlined in Section 4 of this CEMP.
- Establish alignment of the hardstands from the construction drawings and mark out the corners with ranging rods or timber posts.
- Drainage runs and associated settlement ponds will be installed.
- The excavated material will be stored close to the hardstand. Topsoil and subsoil stockpiles will be formed, and the side compacted to prevent silt run off during heavy rain or air bourn dust during dry periods.
- The soil will be excavated down to a suitable formation layer of either firm clay or rock.
- Suitable granular fill will be spread and compacted in layers to provide a homogeneous running surface.
- Batters to have a slope of between 1:1 and 1:5 (depending on depth and type of material) and will be left as cut to re-vegetate naturally with local species.

Piled Hardstand Method:

This system involves:

- Construction of the founded hard standing as per the above methodology.
- Piles will be positioned to match the outrigger pads of the turbine crane and as agreed with the turbine supplier. Geotechnical analysis of the site investigation information will dictate the type of pile to be used. There are several methods however the most likely will either be pre-cast driven piles and auger bored piles.
- A reinforced concrete pad will be constructed on top of the piles. Shuttering will be used lined with polythene and an antibleeding admixture used to prevent any concrete leachate.

3.4.1.10 Turbine Foundations

The wind turbine foundations will be constructed using standard reinforced concrete construction techniques and will be designed as either:

- Submerged foundation design.
- Non-Submerged Foundation design.

Turbine foundations will be designed to Eurocode Standards. Foundation loads will be provided by the wind turbine supplier, and factors of safety will be applied to these in accordance with European design regulations. The turbine will be anchored to the foundation as per the turbine manufacturer's guidelines which will be incorporated in the civil foundation design. The shape and size of the foundation can vary in size and shape to approximately 22m in diameter.

Ideally, a suitable bearing stratum is encountered within 3m from ground surface so that the turbine foundation can be finished at / near existing ground level.

The turbine foundations will be constructed as follows:

Standard Excavated Reinforced Concrete Base:

- a) The extent of the excavation will be marked out and will include an allowance for trimming the sides of the excavation to provide a safe working area and slope batter.
- b) The excavated material will be stored at agreed locations close to the base. Topsoil and subsoil stockpiles will be formed, and the side compacted to prevent silt run off during heavy rain or air bourn dust during dry periods. The subsoil material will be used as backfill and the topsoil will be used for landscaping around the finished turbine post construction.
- c) No material will be removed from site and storage areas will be stripped of vegetation prior to stockpiling in line with best working practises.
- d) Around the perimeter of the foundation formation a shallow drain will be formed to catch ground water entering the excavation. The drain will direct the water to a sump if required where it will be pumped out to a settlement pond away from the excavation.
- e) A layer of concrete blinding will be laid approximately 75mm thick directly on top of the newly exposed formation, tamped and finished with a screed board to leave a flat level surface. If required, geogrid and soil replacement will be laid according to the foundation design, followed by placement of the concrete blinding layer.
- f) If soil replacement is required, the aggregate used must be tested and approved by the project geotechnical engineer.
- g) High tensile steel reinforcement will be fixed in accordance with the designer's drawings & schedules. The foundation anchorage system will be installed, levelled and secured to the blinding using steel box section stools.
- h) Ductwork will be installed as required, and formwork erected around the steel cage and propped from the backside as required.

- i) The foundation anchorage system will be checked both for level and line prior to the concrete being installed in the base.
- j) Concrete will be placed using a concrete pump and compacted using vibrating pokers to the levels and profile indicated on the construction drawings.
- k) Upon completion of the concreting works the foundation base will be covered from the elements that could cause hydration cracking and or delay setting in any way.
- l) Steel shutters will be used to pour the upper plinth section.
- m) The foundation will be backfilled with a cohesive material, where possible using the material arising during the excavation and landscaped using the top-soil set-aside during the excavation. The suitability of backfill material is to be approved by the project geotechnical engineer.
- n) A gravel footpath will be formed from the access track to the turbine door and around the turbine for maintenance.
- o) Earthing Grid for the foundation to be installed at the same time as the steel reinforcement for the foundation.

Reinforced Concrete Piled Foundations:

It is envisaged that an allowable ground bearing pressure to comply with the design and specification of the standard shallow turbine foundation design should be attained however, should piling be required the following will apply.

Follow Items (a) to (c) as above, then for piled foundations:

Auger bored piles will be used for piled foundations.

- A piling platform for the piling rig will be constructed. This can be done in two ways depending on the bearing capacity of the underlying soil.
 - The first method is to lay geo-textile on the existing surface and a stone layer will then be placed on top of the geo-textile by an excavator and compacted in order to give the platform sufficient bearing capacity for the piling rig.
 - The second method is to excavate the soils to a suitable intermediate mineral subsoil and backfill to the formation level.
- The piling rig, fitted with an auger, will then bore through the soft material with a sleeve fitted around the auger to prevent the sidewalls of the peat from collapsing. The borehole is then extended to a suitable depth into the subsoil/bedrock.
- When the auger and the sleeve are removed high tensile steel cages will be lowered into the boreholes. These steel cages will extrude above the level of the top of the concrete pile.
- As the auger is removed concrete is pumped into the borehole.
- Reinforcing steel on the top of the pile will tie to the foundation base steel.

Base construction is then undertaken as per items (e) to (n) above.

3.4.1.11 Substation Compound

The compound surrounding the substation will measure approximately 128m x 80m as shown in planning application drawing P1892-1700-0001. The compound will include a substation building which will be divided into the wind farm control building and the switchgear housing. The buildings main functions is to provide housing for switchgear, control equipment and monitoring equipment necessary for the proper functioning of the substation and wind farm.

The building will be constructed by the following methodology:

- The area of the control buildings and compound will be marked out using ranging rods or wooden posts and the vegetable soil stripped and removed to the nearby storage area for later use in landscaping. No material will be removed from site and storage areas will be stripped of vegetation prior to stockpiling in line with best working practises.
- Drainage runs and associated settlement ponds will be installed
- The dimensions of the Building and Compound area will be set to meet the requirements of EirGrid/ESB and the necessary equipment to safely and efficiently operate the wind farm.
- The foundations will be excavated down to the level indicated by the designer and concreted.
- The blockwork walls will be built up from the footings to DPC level and the floor slab constructed, having first located any ducts or trenches required by the follow on mechanical and electrical contractors.
- The blockwork will then be raised to wall plate level and the gables & internal partition walls formed. Scaffold will be erected around the outside of the building for this operation.
- The concrete roof slabs will be lifted into position using an adequately sized mobile crane.
- The wooden roof trusses will then be lifted into position using a telescopic load all or mobile crane depending on site conditions. The roof trusses will then be felted, battened, tiled and sealed against the weather.

The remainder of the substation compound will be brought up to the agreed formation and approved stone imported and graded to the correct level as per the detail design. Equipment plinths will be marked out, excavated and constructed using in-situ reinforced concrete or pre-cast concrete. Provision will be made in each plinth for earth connection.

Following the construction of the equipment plinths an earth mat will be installed throughout the compound. This will be connected to each plinth and the buildings as per the electrical earth protection design.

3.4.1.12 Electrical Works

Substation Fit Out and Switchgear Installation

The substation will have a domestic electrical system including lights, sockets, fire alarm and intruder alarm. The high voltage switchgear is typically installed through the following method.

- The switchboard units are delivered to site on a truck and unloaded using a forklift, front end loader or HIAB crane.
- Suitable task specific RAMS and lifting plans will be in place prior to the commencement of all works.
- The switchgear will be unloaded on to a concrete plinth directly outside the substation building.
- The units will be moved inside the substation building using a hand driven forklift and positioned over the internal trench supports, prepared previously.
- The switchgear is then secured as per manufacturer's instructions, typically by bolting directly to steel support bars over the trench.
- The building is fitted out with small light and power and ancillary wind farm control equipment such as SCADA computer, remote telemetry units, metering etc.

All equipment and fittings are then connected, wired tested and commissioned in accordance with the Electrical Contractor's commissioning plan.

The equipment will be decommissioned in the reverse of the above, removed from site, dismantled and disposed of in an approved manner.

Transformers

- The turbine transformers will be placed directly onto the turbine foundation upon delivery to site, prior to the installation of the turbine towers.
- The transformers will be of the sealed type and will be inspected for any damage prior to offloading. It is likely that the units will be installed using a small mobile all-terrain crane and will be tested, commissioned and energised by suitably trained and authorised persons.
- The accessible sections of the transformer will be protected within an enclosure which shall be locked at all times displaying appropriate warning signs.

The units will be decommissioned in the same manner, removed from site and disposed of by a company certified to handle such materials. This specialist company will also dispose of any oil or residual waste products.

- Transformers and ancillary plinth-mounted equipment required in the substation compound will be delivered to site and unloaded directly in place by HIAB crane or similar.
- Suitable task specific RAMS and lifting plans will be in place prior to the commencement of all works and adequate hard standings will be provided prior to delivery to facilitate safe unloading.

3.4.1.13 Turbine Erection

The turbine will be supplied and installed with a blade tip height up to 169m. The turbines will be delivered in sections to the site as follows:

• Foundation anchors	x	1
• Towers	x	3/4
• Blades	x	3
• Hub	x	1
• Nacelle	x	1
• Switchgear Components	x	1

A lift plan will be developed for each turbine location detailing the storage positions for each component, crane size and lifting sequence. It is anticipated that each turbine will take 3 to 4 days to erect with two cranes set up at each turbine - one main crane and a tailing/ support crane. The support crane will assist in the assembly of the main crane and also in the initial lift of the tower sections and hub and blade assembly. Components will be delivered using specially adapted heavy load trailers set up specific to the turbine supplier requirements. Upon completion of the erection, all sections will be tightened to the correct torque and the internal fit out of the turbine undertaken. Finally, the turbines will be commissioned and tested.

3.4.1.14 Grid Connection

The following describes the outline construction methodology for cable installation works along the grid connection route (within the road corridor) between the wind farm onsite substation and the future proposed Bracklone substation:

- Agreement will be sought from local authorities with respect to the location of trenches on roads to ensure no damage is caused to storm-water drains, water-mains or other services. All drain and culverts affected by the works are to be re-instated to the satisfaction of the Local Authorities. Particular care will be taken in order to minimise disruption to local residents and public road users.
- The location of the cable route will be set out by GPS (RTK enabled) equipment in accordance with the design drawings prepared for the site.
- Prior to any construction works commencing, a pre-commencement road survey will be carried out on the public roads in the vicinity of the works. The area where excavations are planned will be surveyed with a cable-avoiding scanning tool, by a person trained in Location of Underground Services. Location equipment to be calibrated within the previous 12 months.

- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the measures outlined in Section 4 of this CEMP.
- Traffic management measures will be implemented prior to works commencing in accordance with the construction stage TMP and measures outlined in Section 4 of this CEMP.
- Overhead lines will be identified and overhead clearance limiting measures will be put in place at the start of each day. Machinery will also include automatic limiters to safeguard against interaction with overhead lines.
- Underground services may be encountered during the trenching works the locations and depth of these underground services the locating of these services will include the reviewing of service drawings, investigations along the trenching route, and consultation with the various service providers.
- All environmental buffer zones shall be identified and set out prior to construction works advancing. Where necessary a stock proof timber post and wire fence shall be erected to establish these areas and thus prevent the entry of contractor's plant within these buffers during construction works. It is noted that the majority of the cable route is in the public road corridor and given that the majority of the cable is likely to be contained within the verge, extensive adherence to buffer zones is unlikely.
- The cable infrastructure will follow the existing road infrastructure where possible. Cables will be laid underground using standard trenches, with pre-excavation drainage works in place prior to trench excavation.
- Where possible, trenching will take place outside the carriageway in public road verges and private land. In areas where the cable trench route runs within a public road carriageway, temporary reinstatement of the road surface will be carried out at the end of the working day to allow safe re-opening of the road for public traffic. See below for sequence of works for temporary road reinstatement.
- A 360-degree excavator will first remove the top layer from the route along the roadside and load onto a haulage truck, this material will be recycled, then the excavation of trench will commence, and a trained spotter will be used to assist machine operators while reversing or when their visibility becomes restricted.
- Trench to be dug to agreed drawing specifications. All plant and stored material will be kept a safe distance back from the trench edges.
- No open trench will be left unattended. Pedestrian barrier protection will be provided to protect the public in urban areas, pedestrian barriers will be erected to prevent unintentional entry occurring by the open trench. Cones and or barriers will be used on rural roads to maintain a safety zone at the single lane closure.
- Safe ladder access/egress to trenches will be provided into the trench.
- Ducts will be placed into trench manually, having been delivered to road side embankment/verge areas by way of tractor and pipe trailer and then offloaded by hand.
- Approved bedding material will be used to surround the ducts and delivered straight from a concrete truck or by skid steer at tight points along the route.
- Approved fill material will be compacted at the base, again above the power cable ducting as per the engineer's design.
- Warning tape and plates will be installed by hand in accordance with the trench design and ESBN specifications.
- Backfill materials will be delivered to site in tipper trucks and offloaded at agreed designated set down areas where it will be either loaded into site dumpers or a stoning cart then brought to trench area that requires being backfilled. Main material deliveries such as ducting and pre-cast joint bay sections will be to the temporary site compound and moved to the work area as required.
- Backfill materials will be compacted using suitable compaction equipment to prevent future settlement as per NRA Specification for Roadworks.
- Hand digging will be used when within 500mm of any known existing services.
- Trenches where ducts are laid will be back filled every evening. During excavation works signage will be erected local to the works warning of the dangers.
- Exposed duct ends will be capped.

- Spoil will be disposed of at a licenced facility
- Unauthorised access will be monitored and prevented.
- A 12mm Draw rope will be blown through the ducting at later date.
- The trench and the working strip will be reinstated to the satisfaction of the local authority and TII standards for public roads.
- Where the trench strip passes through agricultural land, the surface will be reinstated to the area's pre-existing condition.

Horizontal Directional Drilling (HDD) Under Existing Structure

It is proposed that for the crossings of watercourses along the grid connection that HDD be used within the road surface. This reduces the potential for impacts on watercourses and stream banks.

The process will involve setting up a small tracked drilling rig on one side of the watercourse, within the public road corridor, and at least 10m back from the stream bank.

A shallow starter pit will be excavated at the point of entry and shall be located at a sufficient distance from the watercourse to achieve a minimum clearance depth below the bed of the watercourse.

A pilot hole will be bored as per the agreed alignment and shall be tracked and controlled using a transmitter in the drill head. By tracking the depth, position and pitch of the drill head the operator can accurately steer the line of the drilling operation. Typically, the drilling operation is lubricated using a fluid. When the pilot hole has been drilled to the correct profile, its diameter is increased if necessary to match the external diameter of the cable duct. The flexible plastic ducting is then pulled through the pre-drilled hole and sealed at each end until required for cable installation.

Minimum environmental protection measures to be implemented on site shall include the following:

- A site-specific drilling design, risk assessment and method statement shall be prepared by the contractor prior to the works.
- If drilling fluids are required, a biodegradable fluid such as CLEARBORE shall be used rather than Bentonite.
- HDD operations to be limited to daytime hours and conditions when low levels of rainfall are forecast.
- The depth of the bore shall be at least 3m below the bed of the watercourse.
- Visual inspection to take place at all times along the bore path of the alignment.
- A field response plan to minimize loss of returns of drilling fluid and actions to restore returns shall be provided.
- Silt fences will be constructed around proposed work areas prior to commencement of works.
- No refuelling will take place within 50m of the watercourse or any sensitive habitats.
- Pre-construction surveys shall take place at drilling sites to flag any sensitive species occurring.
- A qualified biological monitor will be onsite for the duration of the drilling operation.

The depth of the bore shall be at least 3m below the level of the public road and stream bed. A detailed survey of buried services within the public road will be carried out by the contractor prior to commencement of the operation. The council will be made aware in advance of the operation and invited to oversee the activity.

The locations of the launch and reception pits will be adequately spaced from the carriageway to ensure the bore is at such depth as not to conflict with the drainage or surface of the motorway or associated embankments.

Installation of Joint Bays and Link Box Chambers

- Setting out and location of services will be carried out in the same manner as for trench excavations.
- Traffic management to be set up as per the construction stage traffic management plan.

- A tracked excavator will be used for the excavation of the joint bay pits in accordance with detailed design drawings.
- Tractor/dump trailer and or tipper truck shall be used to remove excavated spoil from work area. Spoil shall be removed to a licensed waste facility.
- A watchman will be used to assist machine operators while reversing or when their visibility is restricted.
- Where joint bays are located, the excavation shall be adequately protected with fencing with signage erected, warning of deep excavation.
- Safe ladder access/egress to excavation shall be in place, ladder to be footed at the base and tied at the top.
- Base materials will be placed by the excavator from a truck in the base of the excavation.
- Precast chamber sections will arrive on site via articulated lorries accompanied by a crane truck. The crane truck will load each unit separately from the articulated truck.
- The precast units will be transported to site and a flatbed trailer and a truck mounted crane will lift the section into position.
- A lift plan /DJSP will be required for all Joint Bay installations.
- When the joint bays are in place, the sections will be back filled using approved fill material and the road surface will be reinstated using cold tar/surface dressing.
- Unauthorised access will be monitored and prevented.



Plate 3-1: Typical Installation and Temporary Reinstatement of Joint Bay

Temporary Reinstatement of Excavations

- Hot works permit to be issued for the area of works for the area to be reinstated.
- A grader (if required), Roller and mini-patch plainer will be delivered to site by low-loader, 2 - in - 1 Tar - and Chipper or patch sprayer will be driven to site.
- A mini patch plainer will be attached to a skid steer and will plane a fresh cut line along the verge of the trench.
- The trench fill material will be graded to shape the trench to match the existing camber of the carriageway and compacted using a drum roller.
- The Tar - and - Chipper will make first pass, of one meter wide.
- Once the bitumen emulsion and chips have been dispensed from the 2- in 1 Tar and chipper and the drivers cab is clear of the area, the roller will follow and compact the chips into the emulsion.
- If the 2 - in - 1 - Tar - and - Chipper is not been used, a towable emulsion sprayer will be used. This process involves the towable sprayer been towed by a pickup truck, and an operative spraying the trench area by means of a lance from the unit.
- The emulsion is heated up to 70°C, the operator will wear protective overalls, heat resistant gloves and eye protection.
- The emulsion is sprayed out to cover the existing trench fill where a follow up crew will spread surface dressing chips over the sprayed area at a safe distance of 5m from the lance.
- Compaction will then take place by a drum roller.
- Both the 2 - in - 1 - Tar - and - Chipper and towable sprayer will have internal diesel burners, with no exposed naked flame.
- Delay set macadam may also be required on busier roads, 75mm of delay set shall be placed within the trench at the end of each working day, by means of skid steer and trench reinstatement bucket and compacted.



Plate 3-2: Towable Sprayer for Temporary Reinstatement

3.4 Construction Working Hours

Likely Construction hours:

7:00am – 7:00pm (Monday – Friday inclusive)

7:00am – 1:00pm (Saturday)

The working day may extend occasionally at times when critical elements of work need to be advanced for instances such as:

- Turbine foundation base concrete pours commence early in mornings
- Oversized turbine component deliveries (i.e. blades, nacelles and towers) typically happen at night to minimise traffic nuisance and in line with any typical abnormal load license conditions imposed by the various relevant granting Local Authorities.
- Turbine erection may also occasionally occur outside of typical working times in order to take advantage of low wind periods.

4. ENVIRONMENTAL MANAGEMENT PLAN

4.1 Introduction

This Environmental Management Plan (EMP) defines the work practices, environmental management procedures and management responsibilities relating to the construction of the proposed Dernacart Wind Farm.

This EMP describes how the Contractor for the main construction works will implement a site environmental management system (EMS) on this project to meet the specified contractual, regulatory and statutory requirements and environmental impact statement mitigation measures. This plan will be further developed and expanded following the grant of planning and appointment of the Contractor for the main construction works. Please note that some items in this plan can only be finalised with appropriate input from the contractor who will actually carry out the main construction works and once the planning conditions attached to any grant of planning are known. It is the contractor's responsibility to implement an effective environmental management system to ensure that the environmental requirements for the construction of this project are met.

All site personnel will be required to be familiar with the environmental management plan's requirements as related to their role on site. The plan describes the project organisation, sets out the environmental procedures that will be adopted on site and outlines the key performance indicators for the site.

- The EMP is a controlled document and will be reviewed and revised as necessary.
- A copy of the EMP will be located on the site H&S notice board.
- All employees, suppliers and contractors whose work activities cause/could cause impacts on the environment will be made aware of the EMP and its contents.

This section includes the mitigation measures to be employed by the contractor and client during the construction, operation and decommissioning of the proposed development as per the Environmental Impact Assessment Report.

4.2 Project Obligations

In the construction of the proposed Dernacart Wind Farm there are a number of environmental management obligations on the developer and the contractor. As well as statutory obligations, there are a number of specific obligations set out in the Wind Farm EIAR. These obligations are set out below. The CEMP which will be produced by the main contractor following appointment will incorporate these obligations. All obligations within this CEMP shall be included in the Contractor's CEMP in addition to the EIAR requirements and planning conditions. The contractor and all of its sub-contractors are to be fully aware of and in compliance with these environmental obligations.

4.2.1 EIA Obligations

The EIAR identified mitigation measures that will be put in place to mitigate the potential environmental impacts arising from construction of the project. These mitigation measures are set out in Section 4.3 and in the accompanying EIAR.

4.2.2 Planning Permission Obligations

All planning conditions associated with the project's planning permission shall be adhered to. All pre-commencement planning conditions shall be discharged fully by the project owner prior to site start.

4.2.3 Felling Licence

Any tree felling and vegetation clearance will be carried out outside of the bird nesting season (March 1st to August 31st inclusive).

Felling of coniferous forestry is required within and around the wind farm infrastructure to accommodate the construction of some turbine foundations, hard stands, crane pads, access tracks and substation. The estimated maximum area of coniferous tree felling required is ca. 18ha, which will be subject to agreement with the Forest Service prior to construction.

Tree felling will be the subject of a Felling Licence from the Forest Service and will be in accordance with the conditions of such a licence. A Limited Felling Licence will be in place prior to any felling works commencing on site. The licence will include the provision of relevant replant lands to be planted in lieu of the proposed tree felling on the site.

To ensure a tree clearance method that reduces the potential for sediment and nutrient runoff, the construction methodology will follow the specifications set out in the Forest Service Forestry and Water Quality Guidelines (2000) and Forest Harvesting and Environmental Guidelines (2000).

Before any harvesting works commence on site all personnel, particularly machine operators, will be made aware of the following and will have copies of relevant documentation, including:

- The felling plan, surface water management, construction management, emergency plans and any contingency plans;
- Environmental issues relating to the site;
- The outer perimeter of all buffer and exclusion zones;
- All health & safety issues relating to the site.

4.2.4 Other Obligations

The developer and/or contractor for the main construction works will liaise directly with the County Council and An Garda Síochána in relation to securing any necessary permits to allow the works to take place including for example (non-exhaustive list):

1. Commencement notice
2. Special Permits in relation to oversized vehicles on public roads
3. Temporary Road Closures (if required)
4. Road Opening Licence (if required)

The developer will also liaise closely with the local residents, especially homeowners and landowners along the local access routes in relation to works and all reasonable steps will be taken to minimise the impact of the development on such persons. Local farmers will be consulted should any of the works affect the integrity of fences and the like and appropriate and sensible mitigation measures will be agreed.

4.3 Environmental Management Programme

4.3.1 Air Quality

Construction Stage Impacts

The principal source of potential air emissions during the construction of the proposed wind farm will be dust arising from earthworks, tree felling activities, trench excavation along cable routes, construction of the new access tracks, the temporary storage of excavated materials, the movement of construction vehicles, loading and unloading of aggregates/materials and the movement of material around the site.

Dust emissions arise when particulate matter becomes airborne making it available to be carried downwind from the source. Dust emissions can lead to elevated PM₁₀ and PM_{2.5} concentrations and may also cause dust soiling. The amount of dust generated and emitted from a working site and the potential impact on the surrounding areas varies according to:

- The type and quantity of material and working methods
- Distance between site activities and sensitive receptors
- Climate/local meteorology and topography

The proposed Dernacart Wind Farm would be considered a moderate construction site. This would result in soiling effects which have the potential to occur up to 50m from the source, with PM₁₀ deposition and vegetation effects occurring to 15m from the source.

Construction vehicles and plant emissions have the potential to increase concentrations of compounds such as NO₂, Benzene and PM₁₀ in the receiving environment.

It is not predicted that an air quality impact will occur due to traffic at the proposed development as the impacts will fall below the screening criteria set out in the UK DMRB guidance (UK Highways Agency 2007), on which the TII guidance is based.

Plant and machinery such as generators, excavators etc. will be required at various stages of the construction works. These will be relatively small units which will be operated on an intermittent basis. Although there will be an emission from these units, given their scale and the length of operation time, the impacts of emissions from these units will be negligible.

Operational Phase Impacts

Once the proposed wind farm development is constructed there will be no significant direct emissions to atmosphere. A diesel generator will be located at the substation; however, this will only be operated as a back-up/emergency power supply. The operational phase of the wind farm will result in positive impacts on air quality due to the displacement of fossil fuels as an energy source.

Decommissioning Stage Impacts

In terms of decommissioning, there will be truck movements associated with removing the turbines from the wind farm resulting in vehicular emissions and also dust. However, the number of truck movements would be significantly less than the construction phase and would potentially result in a slight temporary impact.

Construction Stage Mitigation Measures

This includes for the following mitigation measures during the construction phase of the proposed wind farm relevant to air quality:

- The internal access roads will be constructed prior to the commencement of other major construction activities. These roads will be finished with graded aggregate;

- A water bowser will be available to spray work areas (wind farm and grid connection route) and haul roads, especially during periods of excavations works coinciding with dry periods of weather, in order to suppress dust migration from the site;
- All loads which could cause a dust nuisance will be covered to minimise the potential for fugitive emissions during transport;
- Gravel will be used at the site exit point to remove any dirt from tyres and tracks before travelling along public roads;
- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- The access and egress of construction vehicles will be controlled to designated locations, along defined routes, with all vehicles required to comply with onsite speed limits;
- Construction vehicles and machinery will be serviced and in good working order;
- Wheel washing facilities will be provided at the entrance/exit point of the proposed development site;
- The developer in association with the contractor will be required to develop and implement a dust control plan as part of the CEMP (this CEMP will be updated by the Contractor). This plan will address aspects such as excavations, haul roads, temporary stockpiling and restoration works. The plan will be prepared prior to any construction activities and will be established and maintained through the construction period.
- Sensitive receptors within 100m of the proposed development and along haulage routes entering the site; and dwellings directly adjacent to the cable route construction that experience dust soiling, where appropriate, and with the agreement of the landowner, will have the facades of their dwelling cleaned if required should soiling have taken place;
- Ensure all vehicles switch off engines when stationary – no idling vehicles; and
- Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the contractor by ensuring that emissions from vehicles are minimised through regular servicing of machinery.

Operational Phase Mitigation Measures

As the operation of the wind farm will have positive impacts on air quality, mitigation measures are considered unnecessary.

Decommissioning Stage and Mitigation Measures

Mitigation measures for the removal of turbines would be similar as per the construction phase with respect to dust control and minimisation. If Laois County Council requires the removal of access tracks from the wind farm as part of decommissioning, dust mitigation measures similar to those undertaken for the construction phase will be put in place to reduce any dust nuisance. In terms of the underground grid cable, this will be left in situ and so no impacts are envisaged.

4.3.2 Noise and Vibration

Construction Stage Impacts

The noise impact for construction works traffic would be mitigated by generally restricting movements along access routes to the standard working hours and exclude Sundays, unless specifically agreed otherwise. For example, during turbine erection, an extension to the working day may be required, i.e. 05:00 to 21:00, but this would be necessary only on a relatively small number of occasions. If turbine deliveries are required at night it will be subject to agreement with the relevant planning authority and it would be ensured that vehicles on local roads do not wait outside residential properties with their engines idling, and that the local residents will be informed of any activities likely to occur outside of normal working hours.

The construction works associated with the preparation of the wind turbine foundations are expected to have a slight impact and temporary in duration. The construction works associated with the installation of the wind turbines are expected to have a slight impact and temporary in duration.

The construction of the substation building will occur during the construction phase of the proposed development. This has the potential to impact residential properties east of the site.

The construction works will be progressed in the following phases:

- Site clearance and Preparation
- Preparation and pouring of foundations and floor areas
- Preparation of hardstanding areas
- Erection of blockwork/ installation concrete slabs
- General Construction including installation of electrical and mechanical plant

The works associated with the construction of the substation are expected to have a slight impact and temporary in duration.

Each turbine will be connected to the on-site electricity substations via an underground medium voltage electricity cable. The cable route will follow the proposed access tracks between each turbine. The main on-site substation is at Forest Lower and a buried cable is proposed to connect to the proposed future Bracklone substation. The grid connection cable will travel along public roads. The grid connection works will be carried out over a 10-month period and 'rolling road closures' will be implemented, whereby the site will progress each day along a road, which will have the effect of reducing the impact for residents. In general, there is potential for temporary elevated noise levels due to the grid connection works. However, these works will be for a temporary duration at a particular property (i.e. less than 3 days) and where the works are to occur over an extended period at a particular property, a temporary barrier or screen will be used to reduce noise level below the noise limit. The works are expected to have a significant temporary impact.

Operational Phase Impacts

Noise predictions were performed for the 8-wind turbine layout modelling GE 5.3 158 wind turbines for a range of standardised 10m height wind speeds from 3 m/s up to 7 m/s (to cut-out²). Receptors within the 35 dB L_{A90} noise contour of the turbines were modelled. Several of the receptors were identified as commercial/farm buildings, unoccupied derelict buildings, or caravans or mobile homes and these have not been considered as part of the impact assessment and were not assessed against the derived daytime and night-time noise levels.

Table 8.15 of the EIAR presents predicted noise levels at the 9 nearest noise sensitive locations to the proposed development. The predicted noise levels at all receptor locations are presented in Appendix 8.2. Note: the predicted noise levels are for a worst-case scenario with noise sensitive receptors downwind of the proposed wind farm. In practice, receptor locations will not be downwind of all wind turbines and the actual noise levels will be lower than those presented in Table 8.15 and Appendix 8.2 of the EIAR.

Table 8.15 of the EIAR also presents derived daytime and night-time noise limits at each of these locations. The predicted noise levels are below the daytime and night-time noise levels at all wind speeds. However, new sources of noise will be introduced into the soundscape and it is expected that there will be a long-term slight to moderate significance of impact for dwellings within the 35 dB L_{A90} study area with a moderate significance of impact on the closest dwellings to the proposed wind farm.

Noise will be produced by the transformer located in the substation. The noise level is likely to depend on the load on the transformer which is dependent on the wind speed (as the wind turbines producing more energy in high wind speeds). The predicted noise levels at the nearest dwellings to the substation is 34.5 dB L_{Aeq} at receptors H96. It should be noted that rating levels below about 35 dB L_{Aeq} are very low (see Section 8.3.3.3), and therefore the noise emissions at the nearest noise sensitive locations are not considered to be significant. The significance of impact from the substation at the nearest noise sensitive location is expected to be not significant.

Decommissioning Stage Impacts

Upon decommissioning of the proposed wind farm, the wind turbines would be disassembled in reverse order to how they were erected. All above ground turbine components would be separated and removed off-site for recycling.

² Noise emissions from the wind turbines plateau at wind speeds above 7 m/s

Turbine foundations would remain in place underground and would be covered with earth and reseeded as appropriate. These activities would be undertaken during daytime hours, and noise, which would be of a lesser impact than for construction, will be controlled through the relevant guidance and standards in place at the time of decommissioning.

Site access tracks could be in use for purposes other than the operation of the wind farm by the time the decommissioning of the project is to be considered, and therefore it may be more appropriate to leave the site access tracks in situ for future use. If the roads were not required in the future for any other useful purpose, they could be removed where required. This would involve removing hard core material and placement of topsoil. The impact is expected to be less than that during the construction stage.

It is proposed that the underground cable will be cut back, and it will remain in-situ. The works associated with the cutting back of the underground cable will have a negligible impact.

Construction Stage Mitigation Measures

The predicted noise levels from onsite activity from the proposed development are generally below the noise limits in BS 5228-1, except for a potential exceedance at H4 during the preparation of the access road and hardstanding construction works near the site entrance. The dominant noise sources are the tracked excavator and the dozer. Where activity is to occur near dwelling H4, the simultaneous use of plant will be limited and the percentage on-time reduced to ensure compliance with the 65 dB $L_{Aeq,1hr}$ noise limit.

No other exceedances are anticipated from onsite construction works. The construction works on site would be carried out in accordance with the guidance set out in BS 5228:2009+A1:2014, and the noise control measures set out in the Construction Environmental Management Plan (CEMP). Proper maintenance of plant will be employed to minimise the noise produced by any site operations. All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the project. Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.

The noise impact for construction works traffic will be mitigated by generally restricting movements along access routes to the standard working hours and exclude Sundays, unless specifically agreed otherwise. For example, during turbine erection, an extension to the working day may be required, i.e. 05:00 to 21:00, but this would be necessary only on a relatively small number of occasions. If turbine deliveries are required at night it will be ensured that vehicles on local roads do not wait outside residential properties with their engines idling, and that the local residents will be informed of any activities likely to occur outside of normal working hours.

The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 07:00 hours and 19:00 hours Monday to Friday and 07:00 - 13:00 hours on Saturdays. However, to ensure that optimal use is made of fair-weather windows, or at critical periods within the programme, it could occasionally be necessary to work outside these hours. Any such out of hours working would be agreed in advance with the local planning authority.

Consultation with the local community is important in minimising the likelihood of complaints and therefore construction will be undertaken in consultation with the local authority as well as the residents being informed of construction activities through the Community Liaison Officer.

With mitigation measures, the construction and decommissioning noise levels are likely to be below the relevant noise limit of 65 dB $L_{Aeq,1hr}$ for operations exceeding one month, and therefore construction noise impacts are not considered to be significant. However, there is potential for temporary elevated noise levels due to the instatement of sections of the internal access road and grid connection works. However, these works will be over an extended period but the potential impact at any particular receptor will be for a short duration (i.e. less than 3 days). Where the works at elevated noise levels are required over an extended period, a temporary barrier or screen will be used to reduce noise levels below the noise limit where required.

The noise impact will also be minimised by limiting the number of plant items operating simultaneously where reasonably practicable.

Operational Phase Mitigation Measures

The predicted noise impact from the proposed development is below the daytime and night-time noise limits and no mitigation measures are required.

Decommissioning Stage and Mitigation Measures

The noise impact for construction works traffic would be mitigated by generally restricting movements along access routes to the standard working hours and exclude working on Sundays, unless specifically agreed otherwise with the local authority.

The decommissioning works, which will be at a lower impact than construction works, will be carried out in accordance with the policies and guidance required at the time of the works, and restricted to normal working hours, typically 07:00-19:00 hours Monday to Friday and 07:00 - 13:00 hours on Saturdays.

4.3.3 Outline Biodiversity / Flora and Fauna Management Plan

Mitigation measures are described below which will avoid, reduce and where possible, offset likely significant impacts arising in relation to ecology from the construction, operation and decommissioning of the site. These mitigation measures shall be implemented in full unless otherwise agreed with the planning authority.

4.3.3.1 Objectives

The primary objectives of the management plan over the construction, operation and reinstatement phases of the project are as follows:

- Promote the conservation of habitats on site through the establishment of management and/or mitigation;
- Provide management and mitigation for aquatic habitats and water quality;
- Provide management and mitigation for avifauna;
- Provide management and mitigation for bats and terrestrial mammals;
- Monitor the usage of the wind farm site by birds post construction;
- Monitor for any collision by birds at the wind farm site post construction;
- Monitor for any collision by bats at the wind farm site post construction.

4.3.3.2 Mitigation by Avoidance and Design

The following measures have been undertaken at the planning stage of the project to reduce effects on designated sites through avoidance and design:

- The hard-standing areas of the wind farm has been kept to the minimum necessary (to allow for the accommodation of a number of different turbine manufacturer specifications), including all site clearance works to minimise land take of habitats and flora. A minimum buffering distance of 50m applies between the turbines and the watercourses;
- The increase in the rate of runoff along the route of the site access roads and hard-standings areas will be mitigated by the proposed drainage system which includes provision of stilling ponds to reduce concentration of suspended solids in the runoff from these areas. This has been further mitigated by avoidance through design, in the utilisation of existing tracks and existing drainage systems where possible;
- Larger turbines have been utilised to minimise the number of turbines and therefore, reducing the overall construction work;

- All cabling for the project is to be placed underground; this significantly reduces collision risk to birds over the lifetime of the wind farm and is in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt and Langston, 2006);
- Care has been taken to ensure that sufficient buffers are in place between wind farm infrastructure and hydrological features such as rivers and streams. Access roads were the exception to the rule in that stream crossings will have to take place (there is only a requirement for one culvert to be replaced) however, wherever possible, existing stream and river crossings have been utilised;
- Any works in or around watercourses will adhere to best practice as per NRA guidance where possible;
- The grid connection routes have been selected with cognisance to ecological features. The cable route will utilise existing roads and verges, thereby minimising landtake of potentially sensitive habitats. Cables are to be placed underneath public roads or in the verge where possible to avoid effects on roadside hedgerows; and
- To avoid instream and bankside works, the installation of the underground cable at stream crossings will be achieved by horizontal directional drilling within the road corridor.

4.3.3.3 *Mitigation measures to prevent/reduce negative effects on River Barrow and River Nore SAC*

The mitigation measures detailed in the accompanying NIS to protect the River Barrow and River Nore SAC are included below in 4.1.

Table 4-1: Details of Mitigation Measures for Proposed Development (pre-construction) (as specified in NIS)

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring scheme to prevent mitigation failure
Mitigation Measures to be Implemented Prior to Construction				
1.	Appointment of suitably qualified Ecological Clerk of Works (ECoW)	Ensure successful implementation of mitigation measures	High probability of success	Site inspections to monitor efficacy of mitigation measures
2.	Prior to the construction phase the Construction Environmental Management Plan (CEMP) will be finalised. This plan will outline the mitigation measures to be implemented during the construction phase of the project.	This measure will reduce the risk of sediment runoff or pollutants reaching the waterways within the catchment of the proposed development site and the introduction of invasive species/biohazards. This in turn will avoid adverse effects on the River Barrow and River Nore SAC.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works. High probability of success.	A suitably qualified person will be appointed for felling works.
3.	A suitably qualified Environmental Manager will be appointed to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process. The operations management of the subject development will include regular monitoring of the drainage system and maintenance as required.	This measure will ensure successful implementation of mitigation measures and reduce the risk of sediment runoff or pollutants reaching the waterways within the catchment of the proposed development site and the introduction of invasive species/biohazards. This in turn will avoid adverse effects on the River Barrow and River Nore Sac.	Mitigation measures will be implemented by the Client through the mechanism of its contract with the Contractor awarded the contract to construct the wind farm.	Site inspections to monitor efficacy of mitigation measures

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring scheme to prevent mitigation failure
			All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works. High probability of success.	

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring scheme to prevent mitigation failure
4.	<p>Silt traps and silt fencing measures for the proposed wind farm development are described in the outline CEMP (See Appendix F) and will be put in place in advance of works as construction progresses across the site.</p> <p>Silt fencing will be erected at the location of stream crossings along the cable route and within the wind farm site.</p> <p>Trees will be felled away from aquatic zones where possible. Branches, logs or debris will not be allowed to accumulate in aquatic zones and will be removed as soon as possible. Additional silt fencing will be erected along the banks of any streams at the location of the proposed tree felling to provide additional protection to the watercourses, where necessary.</p>	<p>This measure will reduce the risk of sediment runoff reaching waterways within the catchment of the proposed development site. This in turn will avoid adverse effects on the River Barrow and River Nore SAC.</p>	<p>Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success.</p>	<p>A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.</p> <p>Maintenance will be in accordance with CIRIA C697 (SuDS and Maintenance Manual).</p>

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring scheme to prevent mitigation failure
5.	Settlement ponds will be put in place where necessary, in advance of works as construction progresses across the site.	<p>The settlement ponds have a diffuse outflow and will mitigate any increase in run-off. This will prevent sediment reaching the waterways within the catchment of the proposed development site.</p> <p>This in turn will avoid adverse effects on the River Barrow and River Nore SAC.</p>	<p>Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success.</p>	<p>A suitably qualified person will be appointed to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.</p> <p>Maintenance will be in accordance with CIRIA C697 (SuDS and Maintenance Manual).</p>

Table 4-2: Details of Mitigation Measures for Proposed Development (construction phase) (as specified in NIS)

Mitigation Measures to be Implemented During Construction				
No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring scheme to prevent mitigation failure
1.	All personnel working on site will be trained in pollution incident control response. An emergency response plan will be prepared which will ensure that appropriate information will be available on site outlining the spillage response procedure and a contingency plan to contain silt. A regular review of weather forecasts of heavy rainfall is required, and a contingency plan will be prepared for before and after such events. A record will be kept of daily visual inspections of drains, silt ponds, etc onsite and weekly inspections of streams which receive flows from the proposed development, during the construction phase.	This measure will reduce the risk of sediment runoff or pollutants reaching the waterways within the catchment of the proposed development site. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success.	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.

Mitigation Measures to be Implemented During Construction				
No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring scheme to prevent mitigation failure
2.	<p>The conceptual site drainage has been designed to complement existing overland flow and existing bog, agricultural and forestry drainage. The drainage design will be developed in full at the detailed design stage.</p> <p>A three-stage treatment train (swale – settlement pond – diffuse outflow) is proposed where required to retain and treat the discharges from hard surface areas.</p>	<p>This measure will reduce the risk of sediment runoff or pollutants reaching waterways within the catchment of the proposed development site. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.</p>	<p>Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success..</p>	<p>A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.</p>
3.	<p>Wet concrete operations are not required for this site within or adjacent to watercourses. However, if wet concrete operations are required, a suitable risk assessment will be completed prior to works being carried out and strategically located concrete washout areas will be provided. Pre-cast concrete will be used whenever possible to reduce the risk to all forms of aquatic life.</p>	<p>This measure will reduce the risk of sediment runoff or pollutants reaching the waterways within the catchment of the proposed development site. This in turn will avoid adverse effects on the River Barrow and River Nore SAC.</p>	<p>Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success.</p>	<p>A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.</p>

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring scheme to prevent mitigation failure
4.	Where imported materials are used in road construction, these are to be such as not to be liable to become crushed by vehicular movement, and lead to discharge of fine particulates to downstream receiving waters. A layer of compacted CI 804 material will be placed on top to provide a suitable running surface	This measure will reduce the risk of sediment runoff reaching the waterways within the catchment of the proposed development site. This in turn will avoid adverse effects on the River Barrow and River Nore SAC.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success.	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.
5.	Drains around hard-standing areas will be shallow to minimise the disturbance to sub-soils. Cross-drains of 225 mm diameter will be provided to prevent a risk of clogging to crossings conveying flows from bog drains, agricultural drains and forestry drains across the access roads.	Reduce the rate of runoff from hard surfaces, reduce concentration of suspended solids in collected runoff. This will limit silt/contaminant laden runoff reaching the waterways within the catchment of the proposed development site. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success..	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring scheme to prevent mitigation failure
6.	Interceptor cut-off drains will be provided where required on the upslope side of the site access roads. These interceptor drains will discharge diffusely over land.	Reduce the rate of runoff from hard surfaces, reduce concentration of suspended solids in collected runoff. This will limit silt/contaminant laden runoff reaching the waterways within the catchment of the proposed development site. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success.	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.
7.	Roadside swales will serve to attenuate any increase in surface water runoff, where required.	Reduce the rate of runoff from hard surfaces, reduce concentration of suspended solids in collected runoff. This will limit silt/contaminant laden runoff reaching the waterways within the catchment of the proposed development site. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success.	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.

Mitigation Measures to be Implemented During Construction				
No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring scheme to prevent mitigation failure
8.	The routes for the proposed access tracks are laid out to follow existing tracks where practicable. Site access roads have been laid out to reduce the longitudinal slope of roadside drains and to follow natural flow paths where possible. Where roadside drains are laid at slopes greater than 2%, check dams will be provided, as necessary. This is unlikely to occur as the site is relatively flat.	Reduce the rate of runoff from hard surfaces, reduce concentration of suspended solids in collected runoff. This will limit silt/contaminant laden runoff reaching the waterways within the catchment of the proposed development site. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success.	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.
9.	Where agricultural tracks, bog tracks and forestry tracks will be used to access the development, the roadside drains alongside these roads will be cleared of obstructions. Should it be found that debris and vegetation are impeding flows. Silt traps will be provided at regular intervals, as necessary.	Clearing of drains will prevent obstructions and localised flooding during periods of high rainfall. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success.	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.

Mitigation Measures to be Implemented During Construction				
No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring scheme to prevent mitigation failure
10.	Wheel wash facilities will be located at the site entrance to reduce construction traffic fouling public roads. The wheel wash will come with an additional water tank which will be filled regularly. These units will be self-contained and will filter the waste for ease of disposal. Waste will be removed from each unit and from site by a permitted contractor.	This measure will reduce the risk of sediment runoff or pollutants reaching the waterways within the catchment of the proposed development site. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success..	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.
11.	Prior to leaving the site, every truck delivering concrete to the site must wash the chute only to a lined and closed pit.	This measure will reduce the risk of sediment runoff or pollutants reaching the waterways within the catchment of the proposed development site. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success.	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.

Mitigation Measures to be Implemented During Construction				
No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring scheme to prevent mitigation failure
12.	Any other diesel, fuel or hydraulic oils stored on site will be stored in bunded storage tanks – the bund area will have a volume of at least 110 % of the volume of such materials stored.	This measure will reduce the risk of sediment runoff or pollutants reaching the waterways within the catchment of the proposed development site. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success..	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.
13.	Refueling of plant during construction will only be carried out at designated refueling station locations on site. No refueling will take place within 50m of the stream zone or any sensitive habitats.	This measure will reduce the risk of pollutants reaching the waterways within the catchment of the proposed development site. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success.	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.
14.	Appropriate spill control equipment, such as oil soakage pads, will be kept within the construction area and in each item of plant to deal with any accidental spillage.	This measure will reduce the risk of pollutants reaching the waterways within the catchment of the proposed development site. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success.	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.

Mitigation Measures to be Implemented During Construction				
No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring scheme to prevent mitigation failure
15.	Portaloos and/ or containerised toilets and welfare units will be used to provide toilet facilities for site personnel. Sanitary waste will be removed from site via a licenced waste disposal contractor.	This measure will reduce the risk of sediment runoff or pollutants reaching the waterways within the catchment of the proposed development site. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success.	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.
16.	Daily visual inspections of drains, silt ponds, etc onsite and weekly inspections of streams will be performed during the construction period to ensure suspended solids are not entering the streams and rivers alongside the work area, to identify any obstructions to channels, and to allow for appropriate maintenance of the existing roadside drainage regime. If excessive suspended solids are noted, construction work will be stopped, and remediation measures will be put in place immediately.	This measure will reduce the risk of sediment runoff or pollutants reaching the waterways within the catchment of the proposed development site. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success.	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring scheme to prevent mitigation failure	
17.	Major construction works including concrete pours onsite will be timed to occur outside periods where heavy rainfall would be expected. A regular review of weather forecasts of heavy rainfall is required, and the contractor is required to prepare a contingency plan for before and after such events. Horizontal directional drilling operations to be limited to periods of low rainfall.		Will mitigate against erosion and the production of silt laden run-off. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success.	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.

Mitigation Measures to be Implemented During Construction				
No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring scheme to prevent mitigation failure
18	Standing water, which could arise during excavations, has the potential to contain a high concentration of suspended solids as a result of the disturbance to soils. This water will be pumped into the site drainage system (but not directly into settlement ponds), which will be constructed at site clearance stage, in advance of excavations for the turbine bases, as necessary.	To protect against the ingress of water or erosion and resulting silt runoff. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success.	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.
19	Drains around hard-standing area will be shallow to minimise the disturbance of sub soil.	To protect against silt runoff. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success.	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.
20	Excavated material will be re-used on-site material as possible for berms etc. Surplus material will be removed from the site to an appropriately licensed or permitted facility or may also be removed in accordance with Article 27 of the European Communities (Waste Directive) Regulations 2011 (S.I. 126 of 2011). There will be no stockpiling of excavated material. A setback distance of at least 50m from watercourses will be adhered to when storing temporary spoil. No spoil stockpiles will be left on site after construction.	This measure will reduce the risk of sediment runoff or pollutants reaching the waterways within the catchment of the proposed development site. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success.	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.

Mitigation Measures to be Implemented During Construction				
No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring scheme to prevent mitigation failure
21.	<p>Any contaminated soils will be handled, removed and disposed of in accordance with statutory requirements for the handling, transportation and disposal of waste. In particular, the following measure will be implemented:</p> <ul style="list-style-type: none"> Contaminated material will be left in-situ and covered, where possible until such time as WAC (Waste Acceptance Criteria) testing is undertaken in accordance with recommended standards and in-line with the acceptance criteria to a suitably licenced landfill or treatment facility. This will determine firstly the nature of the contamination and secondly the materials classification i.e. inert, non-hazardous or hazardous. 	Prevent the further contamination of soils prevent contaminated soil run-off. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success.	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.

Mitigation Measures to be Implemented During Construction				
No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring scheme to prevent mitigation failure
	Such materials will be excavated, transported by a contractor with a valid waste collection permit and recovered/disposed of at an appropriate facility.			
22.	The area of the proposed works will be kept to the minimum necessary, including all site clearance works, to minimise disturbance to habitats and flora. In this case, the footprint of the proposed development has been kept to the minimum necessary, including the use of layout design methods to minimise excavation works.	Prevent leachate from tree felling and excavations entering nearby waterbodies. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm.	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.

Mitigation Measures to be Implemented During Construction				
	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring scheme to prevent mitigation failure
23.	No disturbance to habitats or flora outside the proposed development area will occur. All works and temporary storage of material will be restricted to the immediate footprint of the development, which will be wholly within the development site boundary. Designated access points will be established within the site and all construction traffic will be restricted to these locations.	This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success.	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.
24.	Brash mats will be topped up in sections when they become heavily used or worn. Where damage or serious rutting has started to occur, extraction will be suspended immediately. Relocation of the extraction rack or additional brash will be used to remedy the situation.	To avoid acting as a conduit for surface water flows. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success.	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.

Mitigation Measures to be Implemented During Construction				
	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring scheme to prevent mitigation failure
25.	Culverts will be sized in accordance with CIRIA C689 Culvert Design and Operation Guide, the Office of Public Works (OPW) guidance and the guidance provided by IFI in the design of the proposed stream crossings. A Section 50 Application will be prepared for the replacement of the existing crossing over the Forrest Upper stream to obtain the consent of the OPW at detailed design stage.	This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by the Client through the Contractor awarded the contract to construct the wind farm in combination with competent supervisory staff overseeing the works. High probability of success..	A suitably qualified person will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process. Maintenance will be in accordance with CIRIA C697 (SuDS and Maintenance Manual).

Table 4-3: Details of Mitigation Measures for Proposed Development (operational phase) (as specified in NIS)

Mitigation Measures during the Operational Phase				
No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring scheme to prevent mitigation failure
1.	On site quarterly inspections of the erosion and sediment control measures will be required until one year post construction and yearly thereafter during the operational phase.	This measure will reduce the risk of sediment runoff or pollutants reaching the waterways within the catchment of the proposed development site. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by a suitably qualified person appointed by the asset manager. High probability of success.	A suitably qualified person will be appointed by the asset manager to ensure the effective operation and maintenance of drainage and other mitigation measures during the operational process.
2.	During the operation phase, oils will be required for cooling the transformers giving rise to the potential for oil spills within the site. Risks of potential oil leakage and pollutions draining to the watercourse from the installed transformer is mitigated with transformer interceptor bund wall.	This measure will reduce the risk of sediment runoff or pollutants reaching the waterways within the catchment of the proposed development site. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by a suitably qualified person appointed by the asset manager. High probability of success.	A suitably qualified person will be appointed by the asset manager to ensure the effective operation and maintenance of drainage and other mitigation measures during the operational process.
3.	Access to the site will be limited using a gate to prevent illegal dumping on the site and use of off-road vehicles etc. This is unlikely to be an issue however given that a large portion of the proposed development lands are privately owned.	This measure will reduce the risk of sediment runoff or pollutants reaching the waterways within the catchment of the proposed development site. This in turn will avoid adverse effects on the River Barrow and River Nore SAC downstream.	Mitigation measures will be implemented by a suitably qualified person appointed by the asset manager. High probability of success.	A suitably qualified person will be appointed by the asset manager to ensure the effective operation and maintenance of drainage and other mitigation measures during the operational process.

Mitigation Measures during the Decommissioning Phase			
Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring scheme to prevent mitigation failure
All construction phase mitigation will be implemented during the decommissioning phase			

4.3.3.4 Construction Stage Mitigation Measures -Flora and Fauna

Project Ecologist

It is recommended that a Project Ecologist/Ecological Clerk of Works (ECoW) with appropriate experience and expertise will be employed for the duration of the construction phase to ensure that all the mitigation measures outlined in relation to the environment are implemented. The Project Ecologist/ECoW will be awarded a level of authority and will be allowed to stop construction activity if there is potential for significant adverse ecological effects to occur.

Habitats and Flora

The area of the proposed works will be kept to the minimum necessary, including all site clearance works, to minimise disturbance to habitats and flora. In this case, the footprint of the proposed development has been kept to the minimum necessary, including the use of layout design methods to minimise excavation works.

No disturbance to habitats or flora outside the proposed development area will occur. All works and temporary storage of material will be restricted to the immediate footprint of the development, which will be wholly within the development site boundary. Designated access points will be established within the site and all construction traffic will be restricted to these locations.

Management of the Spread of Non-native Invasive Species

According to Invasive Species Ireland (ISI) invasive non-native species are the second greatest threat (after habitat destruction) to worldwide biodiversity. Invasive species negatively impact Ireland's native species; changing habitats and ultimately threatening ecosystems which impacts on biodiversity as well as economics as they are costly to eradicate.

Halting the spread of non-native invasive species can be achieved via prevention, containment, treatment and eradication (ISI, 2017).

Prevention

Giant hogweed was recorded at two locations within the site (two linear growths bordering conifer plantation to the south of the west-east access track leading towards T7 and T8). These growths are outside the footprint of the proposed development, c. 350m from the nearest infrastructure and c. 250m from the proposed wind farm site boundary.

As such based on the current extent of giant hogweed within the study area, there is no possibility of interaction with works.

A pre-construction survey will be carried out to confirm giant hogweed has not spread to any areas in or near the wind farm site. If this is the case, no further action is required. Mapping using GPS equipment will be carried out to document its location.

In the event giant hogweed has spread from its current location in the intervening period and threatens to interact with proposed works, further action will be required:

Containment, Treatment, Eradication

- The extent of giant hogweed will be mapped and marked out prior to any works commencing on-site.
- An invasive species management plan will be produced based on the results of the pre-construction survey
- Cordoning off the area – this shall include a buffer of 5m surrounding the area of infection to ensure that seeds are not be transported to other sections of the site.
- No machinery or personnel shall be allowed within this restricted area. Similarly, there shall be no storage of materials within or adjacent to this restricted area.

- There shall be no vegetation clearance or trimming within the cordoned area (except where undertaken in accordance with an invasive species management plan) as this can lead to the species recolonising other areas via the wind, water if displaced into drains, or soil and vegetation attached to machinery, vehicles or personnel.
- No soil or vegetation shall be removed from this area unless it is securely contained and is transported under licence to a suitably licenced facility for treatment.
- Informing all site staff through toolbox talk as part of site inductions.
- Any new sightings of the species shall be relayed to construction staff and the developer via the project ecologist/ECOW. These areas shall follow the same protocol as described above.
- Reporting sighting(s) to the NPWS and NBDC and liaising with to the NPWS.

Mammals (excluding bats)

An ecologist will supervise areas where vegetation, scrub and hedgerow removal will occur prior to and during construction as appropriate (e.g., an ecologist may be required during some clearance works of areas where vegetation is too dense to check beforehand). This will ensure that any site-specific issues in relation to wildlife not currently present (e.g. Badger setts) on site will be reconfirmed prior to commencement of works so as to allow appropriate mitigation measures to be put in place.

In the event that an issue arises, the NPWS will be updated, consulted with and the relevant guidelines will be implemented as appropriate (e.g. NRA guidelines).

Construction operations within the proposed Dernacart Wind Farm will take place predominantly during the hours of daylight to minimise disturbances to faunal species at night. Some works along the cable route and wind farm site may occur at night but the project ecologist/ECOW shall limit night-time works to sections of the route / site which avoid sensitive features (e.g. mature treelines).

Pine Marten

Where possible felling of trees in forestry areas will be limited to time periods outside which Pine Martens may have young in dens (March and April). If this is unavoidable then areas to be clear felled will be surveyed in advance by a suitable qualified ecologist to determine whether any occupied Pine Marten dens are present. A necessary license under the wildlife act will be applied for should any sites have to be disturbed.

Red Squirrel

Where possible any required felling of trees in forestry areas will be limited to time periods outside which Red Squirrel may have young in dreys (peak period January to March). If this is unavoidable then areas to be clear felled will be surveyed in advance by a suitable qualified ecologist to determine whether any occupied dreys are present. A license under the Wildlife Act will be sought as necessary.

Badgers

A pre-construction mammal survey will be undertaken within the footprint of the development in order to reconfirm the existing environment as described in the EIAR and, in the event that a badger sett should be encountered at any point, then NPWS will be informed and NRA *Guidelines for the Treatment of Badgers Prior To the Construction of National Road Schemes* will be followed.

A number of badger setts including an active sett were present within the site boundary area during surveys, and there are records of badger in the local area. Badgers can move between setts regularly and may also excavate new setts within their territory. As such there is potential for the layout and status of the badger setts onsite to change in the intervening period between planning and construction stages.

If planning permission is granted and a derogation/disturbance licence is required, the NPWS will be consulted with and a derogation/disturbance licence will be sought in order to implement mitigation measures prior to construction.

Setts within the footprint of proposed infrastructure would require (following evacuation if active) controlled destruction under ecological supervision, while setts within tree felling buffers and in close proximity to the development would require temporary hard-blocking and exclusion for the duration of construction works to ensure that badgers potentially occupying these setts during construction works are not injured.

No hard-blocking or sett exclusions will be undertaken during the badger breeding season (December-June inclusive).

Construction of an artificial sett will be undertaken in consultation with NPWS in the case that sufficient alternative setts are not available due to hard blocking of setts near the development footprint.

A report detailing evacuation procedures, sett excavation and destruction, and any other relevant issues will be submitted to the NPWS, in fulfilment of the wildlife licence conditions.

Vegetation clearance

There is the potential for setts to be discovered during vegetation clearance works. Care will need to be taken during this early stage of the development and a competent ecologist will be required on-site for these works. If setts are discovered all works within 30m of the sett shall cease including vegetation clearance. NPWS shall be contacted and a derogation/disturbance licence shall be sought. An activity survey shall be carried out to assess the potential for the sett to be used by badgers.

Measures to prevent the injury of badgers during proposed mitigation measures

In the event that a badger is found injured during the proposed mitigation measures, it is important to realise that injured badgers will be frightened and can be very dangerous. They are strong animals and are not used to being handled, so no attempt will be made to touch an injured badger, as this could result in workers being bitten. NPWS shall be contacted along with ISPCA and potentially a vet specified by NPWS capable of treating the species.

Bats

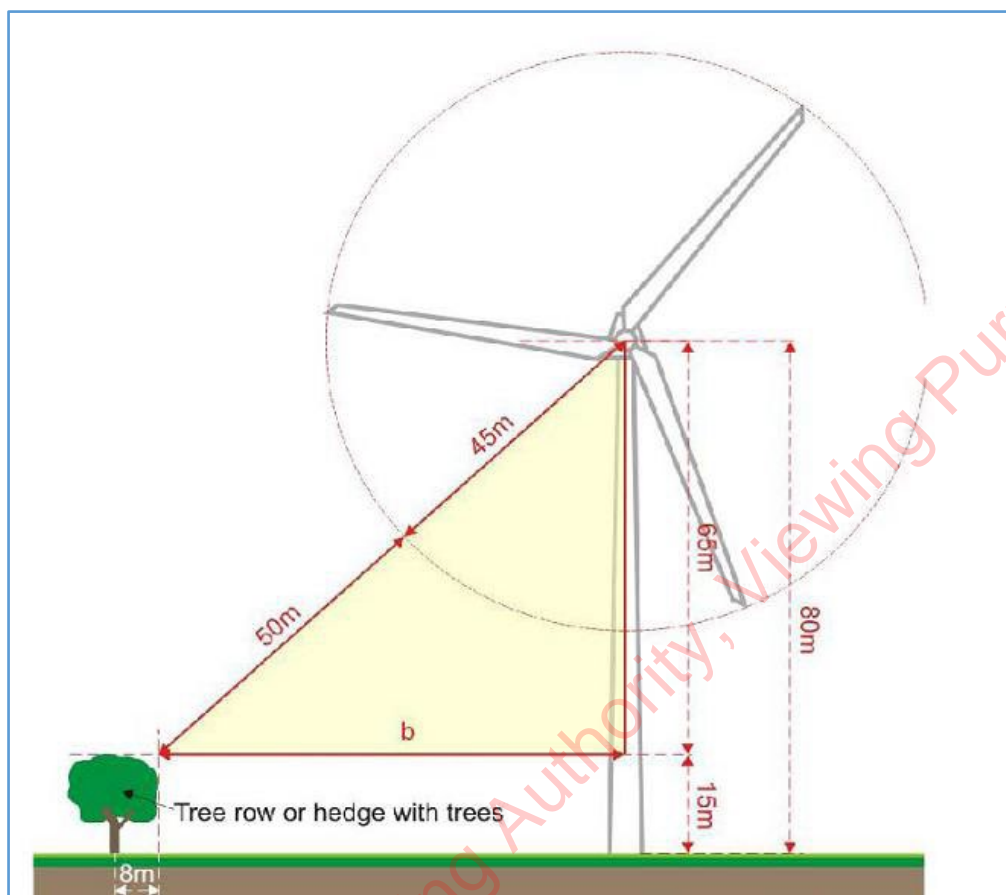
According to SNH (2019) guidance:

"The Eurobats guidance recommends a 200m buffer around woodland areas. There is, however, currently no scientific evidence to support this distance in the UK and it is recommended that a distance of 50m between turbine blade tip and nearest woodland (or other key habitat features such as wetlands etc.) is adequate mitigation in most, lower risk situations. Exceptionally, larger buffers may be appropriate, e.g. near major swarming and hibernation sites. The longevity of wind farms should also be taken into account and the maximum growth, or management, of woodland and other relevant habitat features considered in their planning.

A 50 m buffer distance should be applied as a basic standard mitigation measure for all bat species occurring at proposed wind farms, including all key-holed sites, which may present an increased risk of bat collisions (section 6.2). In practice, the 50m buffer should be applied universally, irrespective of whether curtailment is also considered necessary. Some higher risk species, notably the high-flying ones such as noctules and Leisler's bats frequently fly in open areas however and this form of mitigation is unlikely to be effective for these".

These distances were taken into account during the design phase of the proposed Dernacart Wind Farm Development.

The following formula was used to calculate the required felling buffer for each turbine (taking into account the height of surrounding woodland/plantations at each turbine location):



$$b = \sqrt{\{(50 + bl)^2 - (hh - fh)^2\}}$$

where:

b = the distance on the ground between the edge of the canopy and the turbine (m)

bl = blade length (m)

hh = hub height (m)

$$b = \sqrt{\{(50 + 85)^2 - (100 - fh)^2\}}$$

Note: **fh** for each turbine location is given in column 3 of Table 12-59 below

Note: 85m is the maximum proposed blade length, which may not be used in the final design. As such this assessment using this dimension represents the 'worst case scenario'. Therefore, felling buffers may decrease if changes in turbine dimensions alter the calculation.

Each of the proposed locations of the 8 turbines was surveyed and the bat activity findings recorded informed the application of the 50m blade tip buffer described above at all 8 proposed turbine locations. Surrounding habitats, height of surrounding trees and felling buffer calculated using the above equation are included in Table 4.4 below.

To minimize risk to bat populations, a buffer zone is recommended around any treeline, hedgerow, woodland feature, into which no part of the turbine should intrude.

The buffers recommended for each turbine is presented in Table 4.4 and range from 95m to 99m depending on the heights of vegetation present. Where the boundary of the proposed development does not allow for this buffer distance, it is recommended that monitoring during the construction phase (1 year) using static units at specific turbines is undertaken to determine if the bat activity levels change due to the changes in the site. This should be reviewed prior to operation of turbines where the buffer cannot be achieved to determine if curtailment is required during operation.

Table 4-4: Assessment of potential turbine/bat conflict zones (based on maximum proposed turbine blade length 85m)

Turbine number	Habitats Requiring Felling	Surrounding Tree/Hedgerow Height (fh/m)	Felling Buffer Radius (m)
1	Conifer plantation	6 m	96.9 m
2	Hedgerow	5 m	95.9 m
3	Conifer plantation	5 m	95.9 m
4	Conifer plantation/ Birch woodland	6 m	96.9 m
5	Conifer plantation	8 m	98.7 m
6	Conifer plantation/ Birch woodland	6.5 m	97.4 m
7	Conifer plantation/ Hedgerow	9 m	99.7 m
8	Conifer plantation	9 m	99.7 m

Existing vegetation will be cleared around all 8 turbines to provide a vegetation-free buffer zone around each turbine. The minimum distance has been taken into consideration for felling of conifer plantation around wind turbines. All buffers will be maintained throughout the lifetime of the wind farm.

The following mitigation measures for bats are recommended:

- An ecologist/ECOW will supervise areas where vegetation, scrub and hedgerow removal will occur prior to and during construction as appropriate (e.g., ecologist may be required during some clearance works of areas where vegetation is too dense to check beforehand). This will ensure that any site-specific issues in relation to wildlife not currently present (e.g., Bat roost locations) on site will be discovered prior to commencement of works to allow appropriate mitigation measures to be put in place. In the event that an issue arises, the NPWS will be informed and the relevant guidelines will be implemented as appropriate (e.g. NRA guidelines).
- Construction operations within the wind farm site will take place during the hours of daylight where possible to minimise disturbances to faunal species at night. Some works along the cable route and wind farm site may occur at night but the project ecologist/ECOW shall limit night-time works to sections of the route / site which avoid sensitive features (e.g. mature treelines).
- No upgrading works to bridge structures will be required as part of the proposed development. Bridges offer potential bat roosting habitat for bats and will be in accordance with best practice guidelines and statutory procedures. Should any required works be identified in the future, the bridge shall require a preconstruction survey to assess if a bat roost is present and any mitigation measures carried out to mitigate the potential impact to bats must be conducted under the terms of an appropriate NPWS wildlife derogation licence.

- In addition, the following specific mitigation measures for bats are also now recommended:

Removal of deciduous trees

Any mature broadleaved trees that are to be removed, will first be surveyed for bat presence by a suitably experienced specialist. If bats are found, an application for a derogation licence should be made to the *National Parks and Wildlife Service* to allow its legal removal. Such trees should ideally be felled in the period late August to late October, or early November, in order to avoid disturbance of any roosting bats as per *National Roads Authority* guidelines (NRA 2006a and 2006b) and also to avoid the bird breeding seasons. The site is dominated by conifer trees and young birch trees which offer low value roosting habitat for bats.

For any mature ivy-covered trees offering potential roosting habitat the felling of these should be completed by mid-November at the latest as bats roosting in trees are very vulnerable to disturbance during their hibernation period (November – April).

Alternatively, a pre-felling roost survey could be carried out of mature ivy-covered trees prior to felling after this time. Trees with ivy (*Hedera helix*) cover, once felled, should be left intact onsite for 24 hours prior to disposal to allow any bats beneath foliage to escape overnight.

Retention of trees

Several species of bats roost in trees. Treelines and mature trees that are located immediately adjacent to the line of proposed haul roads or are not directly impacted will be avoided and retained intact. Overall impacts on these areas will be reduced through modified design and sensitivity during construction. Any trees and treelines along approach roads and planned site access tracks will be retained unless felling is unavoidable. Retained trees should be protected from root damage by machinery by an exclusion zone of at least 7 metres or equivalent to canopy height. Such protected trees will be fenced off by adequate temporary fencing prior to other works commencing.

Compensation for loss of commuting routes

Linear features such as hedgerows and treelines serve as commuting corridors for bats (and other wildlife). Mitigation measures are recommended to compensate for the loss of these features that are used by bats as commuting routes. These measures will also compensate for habitat loss and provide continuity in the landscape.

Severed linear features such as hedgerows and treelines will be reconnected where feasible with saplings to compensate for the loss of treelines and hedgerows currently used by bats. Native species of Irish provenance should be used as they support more insect life than non-native varieties.

Habitat retention, replacement and landscaping

Habitat replacement and landscaping could compensate for or add to the wildlife value of the area and also provide areas of aesthetic as well as wildlife interest. In general, best practice design should aim to retain the quality of the landscape where possible and ensure its protection within the landscaping programme. Existing hedgerows and treelines, semi-natural scrub or semi-natural grasslands will be retained where feasible and incorporated into the landscaping. Disturbed areas will be allowed to recolonise naturally.

Lighting restrictions

In general, artificial light creates a barrier to bats so lighting should be avoided where possible. Where lighting is required, directional lighting (i.e. lighting which only shines on work areas and not nearby countryside) will be used to prevent overspill. This can be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvers and shields to direct the light to the intended area only. It is understood that flashing red aviation lights will be provided on perimeter turbines. These will not negatively impact bats (Bennett and Hale 2014).

Kilnahown Bridge

A pre-works survey (torch/endoscope inspection and/or emergence survey) will be undertaken during the bat activity season (April-September inclusive) to reconfirm if the bridge remains in active use as a roost.

If bats are present a derogation licence will be sought from NPWS to allow works to proceed in a manner which minimises disturbance and ensures no bats are harmed.

Pre-construction Surveys

It is recommended that if three years lapse from between planning-stage surveys in 2019 and installation of the wind turbines, it will be necessary to repeat one season of surveys during the activity period (EUROBATS, 2014). Surveys completed for this report concluded in 2019. Therefore, a review should be undertaken no later than Spring 2023. Future survey work should be completed according to best practice guidelines available.

Avifauna

Subject to other environmental concerns (e.g., run-off), the removal of vegetation and scrub as well as trimming of trees along the TDR will be undertaken outside of the bird breeding season (March 1st to August 31st inclusive). This will help protect nesting birds. Where this is not possible under special circumstances, a pre-felling survey shall be undertaken prior to felling, trimming, etc of vegetation and shall be subject to approval with the local authority.

This in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt, A. L. & Langston, R. H., 2006).

Construction operations will take place during the hours of daylight to minimise disturbances to roosting birds, or active nocturnal bird species. This is in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt and Langston, 2006). Limited operations such as concrete pours, turbine erection and installation of the grid cable may require night-time operating hours; these will be determined and supervised by the project ecologist/ECOW.

Toolbox talks will be undertaken with construction staff on disturbance to key species during construction. This will help minimise disturbance. This in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt and Langston, 2006).

Sections of hedgerow scheduled for removal and/or trimming and containing mature trees suitable for nesting barn owls will be surveyed prior to construction for occupancy by owls. Should owls be present then minimum protection zones as outlined in published guidance will be adhered to for the period of construction or until breeding has ceased (Shawyer, C.R., 2011).

Due to published impacts during construction on breeding snipe and woodcock and the assessment of significance, areas known to have had breeding snipe territories will be re-surveyed prior to the commencement of construction in order to reconfirm if the findings of the surveys carried out pre-consent remain accurate. If construction works commence in these areas of the site during the breeding season, an exclusion zone of 500 m will be placed around any recorded nest sites April to June, to reduce the possibility of disturbing birds during critical periods of the breeding season, as per published literature (Pearce-Higgins *et al.*, 2012). The implementation of this measure will be monitored by the project ecologist/ECOW.

Re-instated hedgerows will be planted with locally sourced native species. This will result in habitat enhancement for local species of conservation importance such as meadow pipit. This is in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt and Langston, 2006).

Kingfisher: Implement mitigation measures outlined in Chapter 13 'Lands, Soils and Geology and Chapter 14 'Hydrology and Water Quality' of this EIAR, and Aquatic Ecology Mitigation, section 12.6.1.11 below, to minimise and prevent the identified indirect effects to water quality.

Merlin: Prior to scheduled commencement of construction; nest baskets suitable for merlin will be placed in suitable locations (such as isolated trees on high bog or trees within forestry compartments which are in clearings) as these are often preferred nest locations. Locations chosen shall be >500m from proposed turbines; this is to encourage any birds scoping territories to take up nest sites suitably removed from turbines.

A reconfirmatory survey (March) will be conducted of the proposed turbine locations to assess any evidence of merlin activity or taking up new territories. Should any new merlin nests be recorded, works at these locations will be restricted to outside the breeding season (April-July) or until chicks are deemed to have fledged (following monitoring).

Mitigation Measures for Tree Felling

A total area of 18.4 ha (17.43 ha of conifer plantation, 0.54 ha of mixed broadleaved woodland, 0.26 ha of bog woodland and 0.13 ha of mixed broadleaved/conifer plantation) or 13.5 % of the wooded habitats within the study area shall be lost due to the felling of trees. The proposed area of tree felling will be limited to:

- Areas adjacent to/surrounding turbines T1, T3, T4, T5, T6 and T8 so that the required infrastructure can be facilitated at these locations;
- Minimal trimming along existing access tracks to ensure that the widened footprint of these access tracks can be accommodated;
- Corridors along the proposed new access tracks to ensure that the footprint of these can be accommodated;
- Area surrounding the proposed on-site substation at Dernacart.

This tree felling will be the subject of a Felling Licence (17.43 ha of conifer plantation, 0.54 ha of mixed broadleaved woodland, 0.26 ha of bog woodland and 0.13 ha of mixed broadleaved/conifer plantation) from the Forest Service and will be in accordance with the conditions of such a licence. The planting of trees in replant lands is considered in the replanting impact assessment (Appendix 4.3).

To ensure a tree felling method that reduces the potential for sediment and nutrient runoff, the construction methodology will follow the specifications set out in the Forest Service Forestry and Water Quality Guidelines (2000) and Forest Harvesting and Environmental Guidelines (2000).

Before any felling commences on site all personnel, particularly machine operators, will be made aware of the following and will have copies of relevant documentation, including:

- The surface water management plan, the construction environmental management plan and any contingency plans;
- Environmental issues relating to this project and the site of the proposed development;
- The outer perimeter of all buffer and exclusion zones; and
- All health & safety issues relating to the site.

The harvester represents the first point of contact between machinery and the ground and therefore the layout of the extraction racks is critical. The layout of extraction racks or routes will be designed to:

- Avoid streams or other watercourses;
- Be as short as possible;
- Avoid any areas of poor crop or bare areas; and
- Generally, extract to access tracks with the extraction racks laid out at right angles to the road to prevent water flowing down wheel ruts.

The felling buffer around T3 overlaps an un-named tributary stream of the Forest Upper stream. In order to minimise impacts to this watercourse during felling, vehicle use within 10m of the stream will be limited to that required to extract felled timber. As such the following constraints will apply:

- Mechanical felling will be limited to areas within the reach of the harvesting machine while its wheels/tracks remain outside the 10m buffer
- Any felling outside this buffer zone (including the south-eastern bank) will be carried out by chainsaw operatives

- When removing felled timber, the collecting tractor will minimise the time spent within the 10m buffer, and limit intrusion on the buffer by using the longest reach possible.
- If trees felled on the opposite bank cannot be collected mechanically without damaging the bank, these should be left in place (to be cut by chainsaw and removed by hand if trees enter the stream).

Brash management will include the immediate removal of loosed material. In addition, dense, fresh brash mats will be utilised in order to minimise soil damage, erosion and sedimentation during felling.

These will be designed and installed to protect the underlying soil from damage and will be maintained throughout the felling operation. Their purpose is to prevent breaking of the ground surface thus preventing silt or nutrient run-off.

Brash mats will be topped up in sections when they become heavily used or worn. Where damage or serious rutting has started to occur extraction will be suspended immediately. Relocation of the extraction rack or additional brashing will be used to remedy the situation.

Extraction routes will be as short as possible and will avoid the crossing of watercourses. Trees will be felled away from aquatic zones. Branches, logs or debris will not be allowed to accumulate in aquatic zones and will be removed immediately to mitigate against nutrient losses, particularly phosphorus. Additional silt fencing will be erected along the banks of any streams at the location of the proposed tree felling to provide additional protection to the watercourses in this area. To ensure a tree clearance method that reduces the potential for sediment and nutrient runoff, the construction methodology will follow the specifications set out in the Forest Service Forestry and Water Quality Guidelines (2000) and Forest Harvesting and Environmental Guidelines (2000).

The brash will be bundled and recovered from the site as felling progresses in a process known as forest residue recovery. Double-wheeled machinery and corduroy rafts (close poling) will be used as necessary to maximise the recovery of brash and where the bearing capacity of the ground is poor. Extraction and cutting will be suspended during and following heavy rainfall periods.

As outlined above, felling will be conducted to accommodate infrastructure and will be limited to the criteria set out in Chapter 4 – Description of the Development. No significant increase in the rate of run-off is anticipated as a result of felling nor is the risk of downstream flooding or sedimentation due to erosion increased.

Lights on Turbines

It appears that the lighting on top of wind turbines may effect the likelihood of bats colliding with turbines. Research on this topic, which is reviewed in Powelsland (2009), indicates that intermittent lighting is less likely to cause species to collide with turbines. The use of "white lights" on the turbines will be avoided as these can attract night flying birds such as migrants, and insects, which in turn can attract bats. Certain turbines will be illuminated with medium intensity fixed red obstacle lights of 2000 candelas where required by the IAA. It is recommended that lighting will be fitted with baffles to ensure that the light is directed skywards and will not be discernible from the ground.

4.3.3.5 Construction Phase Mitigation Measures- Water Quality

Mitigation by Design

During the iterative design process for the proposed Dernacart Wind Farm Development, cognisance was taken of the locations of existing watercourses in the vicinity of the site. To reduce the potential impacts on these watercourses a minimum buffer of 50m from watercourses has been adopted for all new site tracks where possible that run parallel to a watercourse, and a minimum buffer of 50m will be provided between temporary stockpiles and the nearest watercourse.

Where existing tracks are present cable routes will be installed in these corridors. Where new site access tracks to turbines are required, the cable will be laid in or on the edge of those tracks.

One existing crossing (EXC1) within the proposed wind farm site will be upgraded to carry a widened access road. This upgrade will be implemented by removal of the existing pipe culvert and replacement with a precast bottomless box culvert (1m depth x 4.5m width).

The proposed grid connection cable will be laid in or at the edge of existing public roads.

Watercourses will be crossed via directional drilling along the grid connection route at the following points:

- Culvert over the Forrest lower stream, tributary of the Cottoner's Brook stream
- Culvert over White(W) Hill stream, tributary of the River Barrow
- Culvert/Arch Bridge over White(W) Hill stream, tributary of the River Barrow
- Bridge over Cottoner's Brook stream, tributary of the River Barrow
- Bridge over Clonygowan stream, tributary of the River Barrow
- Bridge over Unknown stream, tributary of the River Barrow
- Bridge over Rathmore stream, tributary of the River Barrow
- Bridge over River Barrow

There is a potential impact during construction in the absence of mitigation measures of sediment run-off in surface water from the ground surface surrounding the cable trench. This potential impact is avoided by laying the cable in existing roadways for the majority of the route.

The potential for sediment ingress carried by surface runoff resulting from works near watercourse crossings also exists; this will be reduced by the setback of drill entry points for directional drilling, and general water quality protection measures such as silt fencing as outlined below.

The upgrade of EXC1 within the proposed wind farm site will require a section 50 licence to obtain consent of the OPW for the design of the stream crossing at EXC1. The IFI will also be consulted at the detailed design stage. Standard water quality measures as detailed below will be used in addition to any specific mitigation required by IFI.

Proposed Mitigation Measures for the Construction Stage of the project

Under Section 173 of the Fisheries (Consolidation) Act, 1959, it is an offence to '*obstruct the passage of the smolts or fry of salmon, trout, or eels or injure or disturb the spawn or fry of salmon, trout or eels or injure or disturb any spawning bed, bank or shallow where the spawn or fry of salmon, trout or eels may be*'.

Under Section 3 of the Local Government (Water Pollution) Act, 1977 (as amended by Sections 3 and 24 of the 1990 Act) it is an offence to cause or permit any polluting matter to enter waters.

Section 171 of the Fisheries (Consolidation) Act 1959 creates the offence of throwing, emptying, permitting or causing to fall onto any waters deleterious matter. Deleterious matter is defined as any substance that is liable to injure fish; to damage their spawning grounds; or the food of any fish; or to injure fish in their value as human food; or to impair the usefulness of the bed and soil of any waters as spawning grounds or other capacity to produce the food of fish.

Under the European Community (Surface Water) Regulations, 2009, it is noted under Part III, Section 33 that '*Failure to achieve good ecological status, or where relevant, good ecological potential or to prevent deterioration in the status of a body of surface water resulting from new modifications or alterations to the physical characteristics of a surface water body, or failure to prevent deterioration of a body of surface water from high status to good status resulting from new sustainable human development activities shall not be a breach of these Regulations when all the following conditions are met:*

- (1) *All practicable steps are taken to mitigate the adverse impact on the status of the body of surface water.*
- (2) *The reasons for those modifications or alterations are specifically set out and explained in the river basin management plan required under Article 13 of the 2003 Regulations and the objectives are reviewed every six years.*

- (3) *The reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives established by Article 28 of these Regulations are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development, and*
- (4) *The beneficial objectives served by these modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option'.*

It is therefore imperative that no significant impacts (direct, indirect or cumulative) occur on the streams on the site or the downstream catchment areas during the construction, operation of decommissioning phases of the proposed wind farm project.

Proposed drainage measures to reduce and protect the receiving waters from the potential impacts during the construction of the proposed development are as outlined in Section 14.7 Chapter 14 Hydrology and Water Quality. These include measures to prevent runoff erosion from vulnerable areas and consequent sediment release into nearby watercourses to which the proposed development site discharges. The mitigation measures proposed to reduce potential direct and indirect impacts from the construction of the turbine foundations and associated infrastructure and impacts from the turbine delivery route, cable route and grid connection route are outlined below.

This section should be read in conjunction with the aquatic ecology assessment (Appendix 12.6). It is recommended that a geotechnical study also be carried out in advance of the work by personnel of suitable qualification in order to assess the risk of a landslide that could block / and or pollute watercourses in the study area.

The Construction Method Statement will be distributed and discussed with all parties involved in the construction of the wind farm site (including any sub-contractors) in order to protect aquatic conservation interests within the study area. The Surface Water Management Plan will set out measures to avoid siltation, erosion, surface water run-off and accidental pollution events which all have the potential to adversely affect water quality within the site during the construction phase. The Surface Water Management Plan and detailed method statements for watercourse crossings will include preparatory works on the site, including installation of silt fences and bunds. The preparatory work including assessment of existing bridge crossings will be undertaken in advance of any excavations on the site. A sealed silt fence will be placed at both sides of the crossing points and to a minimum of 10m upstream and downstream of each crossing at both sides of the road. All measures provided for the protection of aquatic ecology and fisheries within the proposed development site, in addition to the mitigation measures for water quality protection as detailed in the outline Surface Water Management Plan in this CEMP will ensure effective protection of aquatic ecological interests downstream of the proposed development, particularly the habitats of salmon, lamprey and white-clawed crayfish. The method statement for stream crossings follows the guidelines is based on the following documents:

- 'Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes' (NRA, 2008a).
- IFI (2016) Guidelines on Protection of Fisheries during Construction Works in and adjacent to waters.
- 'Maintenance and protection of the inland fisheries resource during road construction and improvement works. Requirements of the Southern Regional Fisheries Board' (Kilfeather, 2007); and
- 'Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites' (Murphy, 2004).

All access tracks will be designed to minimise excavation on the site and reduce the risk of sediment runoff. Swales for turbine bases and hard standings will be constructed. It is not expected that overland flows will be obstructed to any great extent as a result of the layout of the wind farm, however where required, interceptor channels will collect overland flows on the upslope side of the access tracks and hard standing areas. The interceptor channels will cross the access tracks in cross-drains which will be provided at regular intervals.

- The increase in the rate of runoff along the route of the site access roads and hard-standings areas will be mitigated by the proposed drainage system which includes provision of stilling ponds to reduce concentration of suspended solids in the runoff from these areas.

This has been further mitigated by avoidance through design, in the utilisation of existing tracks and existing drainage systems where possible.

- Stilling ponds with a diffuse outflow detail will be put in place in advance as construction progresses across the site. Erosion control and retention facilities, including stilling ponds will be regularly maintained during the construction phase. The three-stage treatment train (swale – stilling pond – diffuse outflow) proposed to retain and treat the discharges from hard surface areas as a result of the development will reduce any risk of flooding downstream.
- Where haul roads pass close to watercourses, silt fencing will be used to protect the streams. Silt traps will also be provided at outfalls from roadside swales to existing drains. Silt traps will be kept upstream of outfalls to allow a buffer zone to the outfall.
- A suitably qualified person will be appointed by the developer to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process. The operations management of the subject development will include regular monitoring of the drainage system and maintenance as required.
- Standing water, which could arise in excavations, has the potential to contain an increased concentration of suspended solids as a result of the disturbance to soils. Water will be pumped into the site drainage system (including stilling ponds), which will be constructed at site clearance stage, in advance of excavations for the turbine bases.
- Drains around hard-standing area will be shallow to minimise the disturbance of sub soil.
- The developer will ensure that erosion control, namely silt-traps, silt fencing and swales are regularly maintained during the construction phase.
- Interceptor cut-off drains will be provided on the upslope site of the access roads to prevent the mixing of overland flows with the drainage for the proposed development. These interceptor drains will discharge diffusely over land to avoid concentration of runoff. The roadside drains will therefore only carry the site access road runoff and so avoid carrying large volumes of water and concentrating flows.
- Cross drains of 450 mm will be provided to prevent a risk of clogging for drainage crossings and conveying flow from agricultural drains and forestry drains over access track roads.
- Roadside swales will serve to attenuate any increase in surface water runoff.
- Where new cross-drains are proposed on this site to convey surface water from roadside swales to outfalls, these will be sized at a minimum of 225 mm diameter to avoid blockages.
- Silt fencing will be erected at the locations of the drain crossings for the duration of the construction period.
- Site access tracks roads have been laid out to reduce longitudinal slope of roadside drains where possible. Where roadside drains are laid at slopes greater than 2%, check dams will be provided. This will reduce effective slope and runoff velocities and any consequent potential for erosion.
- Where agricultural tracks and forestry roads will be used to access the development, the roadside drains alongside these roads will be cleared of obstructions, should it be found that debris and vegetation are impeding flows.
- Any other diesel, fuel or hydraulic oils stored on site will be stored in bunded storage tanks – the bund area will have a volume of at least 110 % of the volume of such materials stored.
- Refueling of plant during construction will only be carried out at designated refueling station locations on site.
- Prior to leaving the site, every truck delivering concrete to the site must wash the chute only to a lined pit provided at each turbine location.
- Silt fencing will be erected at the location of stream crossings along the cable route.
- Cables will be installed in trenches adjacent to the site access roads, or laid within the access road line, where required. Trenches will be excavated during dry periods where possible in short sections and left open for minimal periods, to avoid acting as a conduit for surface water flows.
- The temporary storage of excavated material on site will be placed at least 50 m from watercourses.
- Wet concrete operations are not required for this site within or adjacent to watercourses. However, if wet concrete operations are required, a suitable risk assessment will be completed prior to works being carried out and strategically located concrete washout areas will be provided.
- Portaloo's and/ or containerised toilets and welfare units will be used to provide toilet facilities for site personnel. Sanitary waste will be removed from site via a licenced waste disposal contractor.

The following mitigation measures are proposed for the grid connection construction stage:

- Weather warnings will be monitored, and no construction will take place during extreme events to mitigate against potential flooding.
- Mitigation measures will be provided where surface water flows may be temporarily prevented from reaching gullies during trench excavation. Typical mitigation measures will include the provision of temporary overground surface water channels using sand bagging for example to divert flows to downstream gullies.
- Trenches will be excavated during dry periods where possible in short sections and left open for minimal periods, to avoid acting as a conduit for surface water flows.
- Any excavated material will be used in the reinstatement of the cable trenches subject to approval. Surplus material will be removed from the site to an appropriate facility. There will be no stockpiling of excavated material.
- All excavated soil material will be managed on site in accordance with this CEMP.
- Silt fencing will be provided around any exposed areas to prevent the ingress of suspended solids into adjacent watercourses. These mitigation measures will prevent surface water contamination and will prevent subsequent flows of contaminated water into watercourses.
- Additional protection will be provided in the form of silt fencing downslope where required during construction, to further ensure that there is no impact from the development to streams and rivers downslope of the site.
- Daily visual inspections of drains and streams will be performed during the construction period to ensure suspended solids are not entering the streams and rivers alongside the work area, to identify any obstructions to channels, and to allow for appropriate maintenance of the existing roadside drainage regime. If excessive suspended solids are noted, construction work will be stopped, and remediation measures will be put in place immediately.

As discussed in Section 14.3.6 Chapter 14 Hydrology and Water Quality the grid cable route crosses seven watercourses. The proposed crossing method is horizontal directional drilling (HDD). Proposed mitigation measures are listed below:

- An Environmental Engineer with a "stop work" authority will be engaged to monitor the construction phase of the development when the water crossing is being undertaken.
- The working area around the bridge/culvert crossings will be fenced off prior to the commencement of works to avoid damage to bankside habitat
- Siltation of watercourses will be mitigated using silt traps and by avoiding operating within watercourses where feasible
- Watercourses will be visually inspected
- Should increase levels of siltation be recorded within the watercourses during the course of the construction phase, the environmental auditor will seek to halt construction works until the source of the pressure can be found and remediated
- Surplus material will be removed from the site to an appropriate facility. There will be no stockpiling of excavated material. A setback distance of at least 20 m from watercourses will be adhered to when storing temporary spoil
- Prior to any works taking place near water courses the Inland Fisheries Ireland will be consulted
- Construction works onsite will be timed to occur outside periods where heavy rainfall would be expected
- Silt traps will be regularly maintained during the construction phase. All personnel working onsite will be trained in pollution incident control response.
- Appropriate signage will be place along the proposed route outlining the spillage response procedure and a contingency plan to contain silt. A regular review of weather forecasts of heavy rainfall is required, and the contractor is required to prepare a contingency plan for before and after such events
- HDD operations to be limited when low levels of rainfall are forecast.
- Visual inspection to take place at all times along the bore path of the alignment.
- Silt fences will be constructed around proposed work areas prior to commencement of works.

- No refueling will take place within 50m of the stream zone or any sensitive habitats.
- During the drilling process, a mixture of a natural, inert and fully biodegradable drilling fluid will be used.

The Site Drainage Management Plan shall be finalised in accordance with this outline plan following the appointment of the contractor for the main construction works.

Proposed Mitigation Measures for Replant Lands

The replanting impact assessment can be seen in Appendix 4.3. Mitigation will be provided in accordance with the Forestry and Water Guidelines provided by The Forest Service. Careful mapping of existing site drainage and vulnerabilities (wet ground, preferential flow paths) prior to planting will be carried out and the appropriate drainage design and management will be employed. This includes the provision of collector drains which will disperse drainage water with low velocity through sediment traps. fencing will be erected where deemed to be required by the Environmental Clerk of Works or the Drainage Engineer.

Site preparation for replanting will be carefully managed to prevent loss of silt and sediment conveyed in surface water run-off to receiving waters.

This reduces potential sources of sediment and reduces the risk of sediment and sediment bound nutrient run-off from the site to neutral impact.

Replanting will be undertaken in accordance with the Forestry and Water Quality Guidelines and the Forestry and Archaeological Guidelines.

Proposed Mitigation Measures for the Construction of Watercourse Crossings

The existing pipe culvert (EXC1) will be replaced with a pre-cast bottomless concrete culvert in order to allow a more natural hydromorphology to establish on the Forest Upper stream bed at the crossing point. This will minimise interference with the bed of the channel.

The use of a bottomless culvert will not damage fish habitat or create blockages to fish and macroinvertebrate passage. This section of stream is not considered to be a key ecological receptor; however, this culvert type will be used as a precaution.

Proposed Mitigation Measures during Construction for the Cable Route and temporary alterations for the Turbine Delivery Route

Silt fencing will be erected at the location of stream crossings along the cable route. Silt curtains and floating booms will also be used where deemed to be appropriate, in consultation with IFI and this will be assessed separately at each individual location.

As set out in the Turbine Delivery Route Assessment presented in Appendix 10.2, there will be mainly minor works required along the Turbine Delivery Route. Works at Nodes 1-4 require tracks through grassed roundabout islands (GA2) and street furniture removal. Node 5 requires an area of load bearing at the edge of Clonminch Roundabout and street furniture removal. Hedge trimming to reduce the level of the southern hedgerow to 1m above road level is required at Node 6 at Moneyquid along the N80. The turning area near the site entrance (Node 7) requires scrub clearance and placement of load bearing surface on agricultural grassland. Once deliveries are completed the areas/boundaries will be reinstated.

4.3.3.6 Other Fauna

In the event that construction is required to proceed during the breeding seasons of common frog/smooth newt, translocation will be undertaken where active breeding ponds/drains are within the development footprint. Protection of existing hydrological conditions where breeding ponds/drains are adjacent to or within the zone of influence (i.e. could be impacted by drainage works elsewhere) are required. In the event that the hydrology of existing breeding areas within the zone of influence cannot be maintained, translocation to suitable receptor sites can be used.

Amphibian fencing will be erected to prevent re-entry to areas which have been evacuated and any areas which could be occupied by amphibians during the construction period.

4.3.3.7 Operational Phase Mitigation Measures

Habitats and Flora

Implement mitigation measures outlined in Chapter 13 'Land, Soils & Geology' and Chapter 14 'Hydrology and Water Quality' of the EIAR, to ensure that there will be no contamination of water bodies due to siltation or contaminated run-off during the operational phase.

Wheel washes, draining to silt traps will be implemented at the site entrance to prevent the possible spread of any invasive species. The location of the giant hogweed south of the access track to T7 and T8 shall be resurveyed annually (until two consecutive years with no records onsite are achieved) to monitor if any spread occurs.

To prevent the spread of *Montbretia Crocosmia x crocosmiiflora* from the replant lands site, the entire stand will be excavated and buried at a depth of at least 2m, incinerated or disposed to a licensed facility. Regular follow up treatment with appropriate herbicide will be required for up to 2 years to control re-growth from corms.

The spread of Snowberry *Symphoricarpos albus* from the replant lands site will be prevented spraying with a strong glyphosate-based herbicide, which must be applied when the plant is in full leaf (late-spring, or summer). Several applications may be required, and care will be taken to avoid non-target species (cowslips, violets and other woodland flora may occur nearby). Where the plant must be removed to enable clearance works, the entire stand will be excavated and buried at a depth of at least 2m, incinerated or disposed to a licensed facility.

Aquatic Ecology (Water Quality)

The operational wind farm will have a negligible effect on aquatic ecological interests and fisheries, as there are no further potential impacts on surface water run-off or watercourses within the site. During the operation phase, oils will be required for cooling the transformers giving rise to the potential for oil spills within the site. However, the transformers will be banded to over 110 % of the volume of oil within them.

It is not envisaged that maintenance will involve any significant impacts on the hydrological regime of the area. Weekly inspections of the erosion and sediment control measures on site will be required during the construction period, followed by quarterly inspections during the 1st year post-construction. Yearly inspections will be carried out thereafter.

Avifauna

A post construction monitoring programme is to be implemented at the subject site in order to confirm the efficacy of the mitigation measures; the results of this will be submitted annually to the competent authority and NPWS. Published guidance on assessing the impacts of wind farms on birds from English Nature and the Royal Society for the protection of birds recommends the implementation of an agreed post development monitoring programme as a best practice mitigation measure (Drewitt and Langston, 2006).

In addition, published recommendations on swans and wind farms (Rees, 2012) suggests that systematic post construction monitoring; adapted to quantify collision, barrier and displacement, be conducted over a period of sufficient duration to allow for annual variation or in combination effects. The following individual components are proposed.

- 1) Fatality Monitoring (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction)- A comprehensive fatality monitoring programme is to be undertaken following published best practice; the primary components are as follows:
 - a. Initial carcass removal trials to establish levels of predator removal of possible fatalities.

This is to be done following best recommended practice and with due cognisance to published effects such as predator swamping, whereby excessive placement of carcasses increases predator presence and consequently skews results (Shawn *et al.*, 2010). No turbines which are used for carcass removal trials are to be used for subsequent fatality monitoring. Carcass removal trials shall be continued for the duration of fatality searches.

- b. Turbine searches for fatalities are to be undertaken following best practice (Fijn *et al.*, 2012 and Grunkorn, 2011) in terms of search area (minimum radius hub height) and at intervals selected to effectively sample fatality rates based on carcass removal rates (e.g. 1 per month). To be conducted during years 1, 2, 3, 5, 10 and 15 post construction to allow for annual variation and cumulative effects. Dependant on results further monitoring to be agreed with NPWS.
- c. A standardised approach with a possible control group and/or variation in search techniques such as straight line transects/ randomly selected spiral transects/ dog searches will be undertaken. This will provide a means of robustly estimating the post construction collision fatality impact (if any).
- d. Recorded fatalities to be calibrated against known predator removal rates to provide an estimate of overall fatality rates.

Reports will be submitted to the competent authority and NPWS following each round of surveys.

- 2) Flight Activity Survey (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction) - A flight activity survey is to be undertaken during the summer and winter months to include both Vantage Point and hinterland surveys as Per SNH (2017) guidance:
 - a. Record any barrier effect i.e. the degree of avoidance exhibited by species approaching or within the wind farm (Drewitt and Langston, 2006). Target species to be all raptors and owls, all wild goose and duck species, all swan species and all wader species.
 - b. Record changes in flight heights of key receptors post construction.

Reports will be submitted to the competent authority and NPWS following each round of surveys. This survey is to be conducted during years 1, 2, 3, 5, 10 and 15 post construction to allow for annual variation and cumulative effects. Dependant on results further monitoring requirements will be agreed with NPWS.

- 3) Monthly Wildfowl Census (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction). A monthly wildfowl census, following the methods utilised for the baseline survey, is to be repeated on a monthly basis during the winter period.

This aims to:

- a. Assess displacement levels (if any) of wildfowl such as swans post construction
- b. Assess overall habitat usage changes within the vicinity of the Dernacart Wind Farm Development post construction.

This survey is to be conducted during years 1, 2, 3, 5, 10 and 15 post construction to allow for annual variation and cumulative effects. Dependant on results further monitoring requirements will be agreed with NPWS. Reports will be submitted to the competent authority and NPWS following each round of surveys.

- 4) Breeding Bird Survey (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction). A breeding bird survey (moorland breeding bird and Common Bird Census), following methods used in the baseline survey to be repeated yearly between early April to early July. This aims to:
 - a. Assess any displacement effects such as those recorded on breeding birds. Overall density of breeding birds to be annually recorded.
- 5) Breeding Wader Survey (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction). A breeding bird survey, following methods used in the baseline survey to be repeated yearly April-May-June.

Both of the above surveys are to be conducted during years 1, 2, 3, 5, 10 and 15 post construction to allow for annual variation and cumulative effects. Dependant on results further monitoring requirements will be agreed with NPWS.

Bats

Feathering of Blades

Turbines should operate in a manner which restricts the rotation of the blades as far as is practicably possible below the manufacturer's specified cut-in speed. This is usually achieved by feathering the blades during low wind speeds; the angle of the blades is rotated to present the slimmest profile possible towards the wind, ensuring they do not rotate or 'idle' when not generating power.

Turbine blades spinning in low wind can kill bats, however bats cannot be killed by feathered blades which are not spinning (Horn *et al.*, 2008). The feathering of turbine blades combined with increased cut-in speeds have been shown to reduce bat fatalities from 30% to 90% (Arnett *et al.*, 2008, 2011; Baerwald *et al.*, 2009).

As such, the feathering of blades to prevent 'idling' during low wind speeds is recommended for all turbines.

Cut-in Speeds/Curtailment

Increasing the cut-in speed above that set by the manufacturer can reduce the potential for bat/turbine collisions. A study by Arnett *et al.*, (2011) showed a 50% decrease in bat fatality can be achieved by increasing the cut-in speed by 1.5 m/s.

Species with elevated risk of collision (Leisler's bat, soprano and common pipistrelle) in particular would benefit from increasing the cut-in speed of turbines, as dictated on a case-by case basis depending on the activity levels recorded at each turbine.

Cut-in speeds should be increased during the bat activity season (April-October) or where temperatures are optimal for bat activity to 5.5 m/s from 30 minutes prior to sunset and to 30 minutes after sunrise at turbines where surveillance shows high bat activity levels for High and Medium-Risk species and/or if bat carcasses are recorded.

The duration required depends on the level of mitigation required for each individual turbine i.e. a full bat activity season or only spring and autumn (duration will be determined by the first year of surveillance).

An assessment of static data gathered during operational surveillance should be completed using the online analysis tool Ecobat as recommended by SNH (2019) or other equivalent as dictated by up-to date standards and practices.

Where required, cut-in speeds restrictions should be operated according to specific weather conditions:

1. When the air temperature is greater than 7°C (as bat activity does not usually occur below this temperature).
2. Generally, bat activity peaks at low wind speeds (<5.5m/s). As such, it has been shown that curtailing the operations of wind turbines at low wind speeds can reduce bat mortality dramatically, particularly during late summer and the early autumn months.

Modern remotely-operated wind turbines allow cut-in speeds to be controlled centrally/automatically, facilitating an operation regime designed to minimise harmful impacts to bats.

Due to the elevated levels of bat activity at T2, T3, T4, T5, T7 and T8, increased cut-in speeds may be required at these locations. Intensive surveillance over the first 3 years of operation is necessary to determine if this is required. If, following the first year's surveillance, Leisler's bat activity increases above the baseline and remains consistently high at high-risk locations and carcass searches indicate fatalities are occurring, increased cut-in speeds should be implemented immediately.

For all other turbines, operation without cut-in speed limits carried out in parallel with 3 years of surveillance is necessary to determine if increased cut-in speeds are required at any turbine locations.

If curtailment is implemented, its effectiveness needs to be monitored in order to determine whether it is working effectively (i.e. the level of bat mortality is considered to be incidental), and (b) whether the curtailment regime can be fine-tuned so that turbine down-time is minimised while ensuring the regime remains effective in preventing casualties (SNH, 2019).

Buffer zones

The vegetation-free buffer zones around the identified turbines will be managed and maintained during the operational life of the development.

Due to mitigation by design, turbines are proposed to be sited at a suitable separation distance from trees and trees or vegetation are to be removed to ensure a woodland-free buffer zone.

The immediate surroundings of individual turbines should be managed and maintained so that they do not attract insects (i.e. the concentration of insects in the wind turbine vicinity should be reduced as much as possible, but not such that insect abundancies affected elsewhere on the site). This should be achieved through physical management of habitats without the use of toxic substances.

The radius of each buffer zone as determined by the height of surrounding vegetation is listed below in Table 4.5. **Note- these buffers are calculated based on the maximum proposed blade length** and as such anticipate the worst-case scenario and provide a robust assessment and adequate mitigation. If different turbine dimensions are used, felling buffers may decrease.

Table 4-5: Vegetation Free Buffer Zones for Bats (based on maximum proposed blade length of 85m)

Turbine number	Felling Buffer Radius (m)
1	96.9 m
2	95.9 m
3	95.9 m
4	96.9 m
5	98.7 m
6	97.4 m
7	99.7 m
8	99.7 m

Monitoring of mitigation measures

The success of the implemented mitigation measures for bats on the project should be monitored for a period of three years after construction and appropriate measures taken to enhance these if and where required. A recommended schedule for monitoring is given in Table 4.6.

Bat fatality monitoring

Whilst no significant residual impacts on bats are predicted, the proposed development could provide an opportunity to gain baseline data on bat/turbine interaction and it is recommended that the scheme be monitored for bat fatalities for the first three years of operation. A comprehensive onsite avian fatality monitoring programme is to be undertaken following published best practice. This fatality monitoring programme should be extended and duplicated for bat fauna.

The primary components of the bird mortality programme are outlined below, and an assessment of bat mortality would essentially follow the same methodology.

- a) Carcass removal trials to establish levels of predator removal of possible fatalities. This should be done following best recommended practice and with due cognisance of published effects such as predator swamping, whereby excessive placement of carcasses increases predator presence and consequently skews results. No turbines which are used for carcass removal trials should be used for subsequent fatality monitoring.
- b) Turbine searches for fatalities should be undertaken following best practice in terms of search area (minimum radius hub height) and at intervals selected to effectively sample fatality rates as determined by carcass removal trials in (a) above.
- c) A standardised approach with a possible control group and/or variation in search techniques such as straight line transects/ randomly selected spiral transects/ dog searches will be undertaken. This will provide a means of robustly estimating the post construction collision fatality impact (if any).
- d) Recorded fatalities should be calibrated against known predator removal rates to provide an estimate of overall fatality rates.

Lights on Turbines

It appears that the lighting on top of wind turbines may effect the likelihood of bats colliding with turbines. Research on this topic, which is reviewed in Powelsland (2009), indicates that intermittent lighting is less likely to cause species to collide with turbines. The use of "white lights" on the turbines will be avoided as these can attract night flying birds such as migrants, and insects, which in turn can attract bats. Certain turbines will be illuminated with medium intensity fixed red obstacle lights of 2000 candelas where required by the IAA. It is recommended that lighting will be fitted with baffles to ensure that the light is directed skywards and will not be discernible from the ground.

Table 4-6: Monitoring schedule recommended for bat mitigation measures

Mitigation measure	Monitoring required	Description	Duration
Newly planted hedgerows and treelines	Ensure viable growth of planting	Planted material shall be checked periodically over the growing season to remove dead material. Any dead material shall be replaced within the same season with viable stock according to age/height restrictions already specified in mitigation.	From time of planting to 1 year post construction
Bat boxes and tubes	Monitor bat use	Bat boxes and tubes to be placed at locations at remove from wind farm as determined by project ecologist/ECOW. These shall be examined by a licensed bat specialist according to NPWS recommendations. Records should be submitted to <i>Bat Conservation Ireland</i> for inclusion in its bat distribution database. Re-site if necessary. Annual cleaning required if well used by bats or if used by birds. Replacement if damaged/lost.	From mounting to 3 years post construction.
Mortality study	Fatality monitoring	Corpse searches beneath turbines to assess the impact of operation on bats.	From initial operation conducted during years 1, 2, 3, 5, 10 and 15 post construction.

Table 4-7: Summary of Operational-phase Mitigation Measures for Bats

High Level Bat Mitigation – Leisler's bats Applies to all turbines <i>(note: application of curtailment is pending further monitoring.)</i>	High Level Bat Mitigation – Other species Applies to T2, T3, T4, T5, T7 & T8	Moderate-High Level Bat Mitigation Applies to T1	Moderate Level Bat Mitigation Applies to T6
Operate the wind turbines in a manner that reduces the movement of the blades below the cut-in speed (e.g. by feathering the blades).	Operate the wind turbines in a manner that reduces the movement of the blades below the cut-in speed (e.g. by feathering the blades).	Operate the wind turbines in a manner that reduces the movement of the blades below the cut-in speed (e.g. by feathering the blades).	Operate the wind turbines in a manner that reduces the movement of the blades below the cut-in speed (e.g. by feathering the blades).
<p>Monitoring the first three years of operation to determine bat activity levels post construction.</p> <p>Review the results of monitoring at individual High Risk turbines after Year 1.</p> <p>Determine if curtailment is required. Operate the wind turbine from 30 minutes prior sunset to 30 minutes after sunrise at a cut-in speed of 5.5 m/s during specified weather conditions and during the active bat season (April to October).</p> <p>Operate wind farm with specific cut-in speeds from Day 1 of Year 2, if required, and review after surveillance/monitoring is completed.</p>	<p>Monitor the first 3 years of operation to determine bat activity levels post construction.</p> <p>If bat activity levels/monitoring results deem necessary, then implement cut-in speeds (coupled with carcass search results).</p> <p>If deemed required implement curtailment. Operate the wind turbine from 30 minutes prior sunset to 30 minutes after sunrise at a cut-in speed of 5.5 m/s during specified weather conditions and during the active bat season (April to October).</p>	<p>Put in a monitoring programme for the first year of operation to ensure that bat activity is at a low level in vicinity of these turbines.</p> <p>Review monitoring results to determine if further bat mitigation measures are required.</p>	<p>Put in a monitoring programme for the first year of operation to ensure that bat activity is at a low level in vicinity of these turbines.</p> <p>Review monitoring results to determine if further bat mitigation measures are required.</p>
<p>Undertake a carcass search for 3 years post operation of the wind farm to determine whether a higher cut-in speed of the blades is required.</p> <p>Review after Year 1 along with bat activity monitoring.</p>	<p>Undertake a carcass search for 3 years post operation of the wind farm to determine whether a higher cut-in speed of the blades is required.</p>	<p>Undertake a carcass search for 3 years post operation of the wind farm to determine whether a higher cut-in speed of the blades is required.</p>	<p>Undertake a carcass search for 3 years post operation of the wind farm to determine whether a higher cut-in speed of the blades is required.</p>

High Level Bat Mitigation – Leisler's bats Applies to all turbines <i>(note: application of curtailment is pending further monitoring.)</i>	High Level Bat Mitigation – Other species Applies to T2, T3, T4, T5, T7 & T8	Moderate-High Level Bat Mitigation Applies to T1	Moderate Level Bat Mitigation Applies to T6
Clear and maintain buffer zone free of woodland/trees within 50m of turbine blade tips.	Clear and maintain buffer zone free of woodland/trees within 50m of turbine blade tips.	Clear and maintain buffer zone free of woodland/trees within 50m of turbine blade tips.	Clear and maintain buffer zone free of woodland/trees within 50m of turbine blade tips.
Maintain immediate area around the wind turbines in a manner that does not attract insects.	Maintain immediate area around the wind turbines in a manner that does not attract insects.	Maintain immediate area around the wind turbines in a manner that does not attract insects.	Maintain immediate area around the wind turbines in a manner that does not attract insects.

Proposed Water Quality Mitigation Measures for Maintenance of the Wind Farm

It is not envisaged that the maintenance period will involve any significant impacts on the hydrological regime of the area. Further, the maintenance of the wind farm will incorporate effective maintenance of the drainage system.

The maintenance regime will include inspecting the following:

- drains, cross-drains and culverts for any blockages
- outfalls to existing field drains and watercourses
- existing roadside swales for any obstructions
- swales and stilling ponds
- progress of the re-establishment of vegetation

The maintenance regime will also include implementing appropriate remedial measures as required after the above inspections and testing the water quality at the outfalls at appropriate intervals.

Maintenance will be in accordance with CIRIA C753 (The SuDS Manual). Monitoring will be undertaken as outlined in Section 14.7.3, Chapter 14 Hydrology and Water Quality.

Proposed Mitigation Measures for Maintenance of the Wind Farm

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- swales and stilling ponds
- progress of the re-establishment of vegetation

The maintenance regime will also include implementing appropriate remedial measures as required after the above inspections and testing the water quality at the outfalls at appropriate intervals.

Maintenance will be in accordance with CIRIA C753 (The SuDS Manual). Monitoring will be undertaken as outlined in Section 14.7.3, Chapter 14 Hydrology and Water Quality.

Decommissioning Stage Mitigation Measures

The same mitigation measures will apply for the decommissioning phase as for the construction phase.

4.3.4 Outline Soil Management Plan

This Outline Soil Management Plan has been prepared for the development of the proposed Dernacart Wind Farm. This plan should be read in conjunction with the Wind Farm EIAR. The Soil Management Plan shall be finalised in accordance with this outline plan following the appointment of the contractor for the main construction works.

It is intended where possible, to maintain an earthworks balance on site, with all excavated material re-used within the site where possible and minimising the need for removal of any materials for off-site disposal. This will minimise the amount of construction traffic on local roads and reduce the need for off-site disposal. This will in turn lead to the reduction of noise and dust associated with construction traffic.

Site Risk Assessment

The preliminary site-specific hazards have been identified for this site in Table 4.8 below. The hazards should be re-assessed prior to the commencement of construction on the site and these hazards should be communicated to all personnel entering the site. No site personnel should enter lands outside the scope of the project. The construction areas must be secured from public access at all times.

Table 4-8: Site Specific Ground Hazards

Site Specific Hazards	
Dernacart Wind Farm	<ul style="list-style-type: none"> • Excavations (risk of falling) • Ground stability • Materials storage

Daily Preparation during the Implementation of the Soil Management Plan

The Geotechnical Engineer appointed by the contractor should conduct regular meetings with the Construction Management Team to discuss the phasing of soil management as the work progresses. The focus of these meetings will be on establishing an operational drainage system in advance of the progression of the works.

Particular regard will be taken of daily weather conditions and long-range forecasts. The Drainage Engineer should have the authority to suspend the works if weather conditions are deemed too extreme for the effective protection of receiving watercourses. Mitigation measures to protect receiving watercourses will be put in place as directed by the Drainage Engineer in advance of extreme forecasts.

Personnel Qualifications and Key Contacts

All those carrying out work on site must have a Solas/FÁS Safe Pass Card. All works must be supervised by a competent supervisor. Workers must be adequately trained in the tasks they are required to carry out. The key contact names and contact details should be supplied to all personnel entering the site. All site staff should be informed of the emergency procedures for the site. The Geotechnical Engineer should be contacted if there are any issues with soil/rock stability or other materials management issues.

Construction Stage Impacts

The main characteristics of the proposed Dernacart Wind Farm that could impact on land, soils, and geology are:

- Tree Felling
- Earthworks
- Slope stability
- Construction of internal access roads and hardstands
- Turbine foundation construction
- Internal cabling and grid connection

Direct impacts to the existing geological regime associated with the construction phase of the proposed development are:

- Soil compaction may occur due to movement of construction traffic. This will occur particularly within areas of highly compressible soft deposits which are left in-situ during the construction phase. This could lead to an increase in surface water runoff due to reduced infiltration of rainfall and subsequently to an increase in erosion of overburden deposits left in-situ.
- The use of plant and machinery during construction will require the storage and use of fuels and oils. Their storage and use present potential for spills and leaks which could contaminate underlying exposed soils.
- Concrete works required for the turbine foundations will typically require excavations and concrete pours requiring placement of blinding, shutters, reinforcement for final concrete pour.
- During construction, imported engineering fill and excavated soils will be exposed in excavations and in temporary stockpiles. These soils will be subject to erosion by wind and rain which could deposit silt in streams with an indirect impact on water quality.
- Parts of the site are used for commercial forestry, 18 ha of which will be felled for the construction of the wind farm. Felling will involve the use of heavy felling machinery, which could result in soil erosion. These activities are carried out under a licencing and approval system administered by the Department of Agriculture, Food and the Marine (Forest Service), which include conditions requiring environmental controls.

Direct impacts to the existing hydrogeological regime associated with the construction phase of the proposed development are:

- Potential for groundwater pollution from the removal of overburden (Peat and Glacial TILL) deposits. The aquifer underlying the study area is rated as having 'Moderate' to 'High' vulnerability to groundwater pollution within the proposed wind farm site. The proposed grid connection route traverses areas of 'Moderate' to 'High' vulnerability with an area of 'Extreme' vulnerability is recorded at the eastern extent of the grid connection. It is proposed to remove the overlying Peat and Glacial TILL deposits as outlined in the proposed design. The vulnerability of the aquifer to groundwater pollution particularly during construction stage will be increased as overburden is removed thus reducing the level of protection from groundwater pollution.
- Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer. Soil erosion as a result of exposure of soils in open excavations and temporary storage of excavated materials represents a potential impact to the underlying groundwater aquifer. From the removal of additional aquifer material during construction stage it is considered the risk posed to groundwater quality is increased from the infiltration of silt laden surface water runoff run-off during construction phase earthworks.
- Potential for contamination to groundwater from spills/leakages during construction phase earthworks. The use of construction plant and associated refuelling and storage of fuels and hydrocarbons with potential for spills or leaks could result in contamination of the underlying aquifers.
- Reduction in groundwater levels from dewatering of excavations as required during the construction stage if high groundwater is encountered.

This impact is most likely during the excavation of deeper turbine foundations at the proposed development. There are no groundwater supply wells recorded in the vicinity of proposed turbine locations. It is considered that other excavations associated with the substation, temporary compound and grid connection trenches will not extend into the underlying bedrock aquifers.

Upon completion of the construction phase, it is considered that groundwater levels will revert to the pre-construction situation when there is no longer a requirement to control groundwater levels.

Operational Phase Impacts

Very few potential direct impacts are envisaged during the operational phase of the wind farm. These include:

- Some construction traffic may be necessary for the maintenance of turbines which could result in minor accidental leaks or spills of fuel/oil; and
- The grid transformer in the substation and transformers in each turbine may be oil cooled. There is potential for spills / leaks of oils from this equipment resulting in contamination of soils and groundwater.

The magnitude of these potential impacts, prior to mitigation, is considered to be of slight significance.

Decommissioning Stage Impacts

The potential impacts associated with decommissioning will be similar to those associated with construction but of reduced magnitude. During decommissioning, it may be possible to reverse or at least reduce some of the impacts caused during construction by rehabilitating construction areas such as turbine bases, hardstanding areas, the substation and site compound. This will be done by covering with topsoil to encourage vegetation growth and reduce run-off and sedimentation.

Construction Stage Mitigation Measures

With regard to the proposed development, detailed design and best practice will be implemented as follows:

- The proposed development will be designed in accordance with best practice
- The works will be designed and checked by geotechnical and civil engineers, suitably qualified and experienced in excavation and earthworks design and construction methodologies.
- Any excavation and construction related works will be subject to a design risk assessment at detailed design stage to evaluate risk levels for the construction, operation and maintenance of the works. Identified impacts will be minimised by the application of principles of avoidance, prevention and protection. Information on residual impacts will be recorded and relayed to appropriate parties
- A method statement for each element of the works will be prepared by the Contractor prior to any element of the work being carried out.
- Given that the works comprise a significant proportion of excavation and earthworks, suitably qualified and experienced geotechnical personnel will be required on site to supervise the works.
- The Contract will require programming of the works such that earthworks are not scheduled during severe weather conditions. Where such weather is forecast, suitable measures will be taken to secure the works.

The development will be constructed in a phased manner to reduce the potential impacts of the development on the Land, Soils and Geology at the site. Phased construction reduces the amount of open, exposed excavations at any one time.

One of the primary mitigation measures employed at the preliminary design stage is the minimisation of volumes of excavated Peat and Glacial TILL deposits to be exported off site. Excavated overburden Peat and Glacial TILL will be retained for site and reused as far as possible.

This will include:

- Use of suitable site won material (Glacial TILL) general fill in the construction of access tracks, hardstands and in reinstatement around turbine foundations; and
- Surplus peat and glacial TILL will be re-used on site in the form of landscaping and berms.

Surplus glacial TILL deposits excavated during the course of the works will be temporarily stored in a level area adjacent to the construction phase excavations prior to reuse.

Some temporary stockpiles (not exceeding 2 m in height) of material will be necessary adjacent to the excavation areas prior to reinstatement, however no long-term stockpiles of material will remain after construction and no surplus/waste soil or rock will be removed from the proposed development site.

To mitigate against the compaction of soil at the site, prior to the commencement of any earthworks, the work corridor will be pegged, and machinery will stay within this corridor so that peatland / soils outside the work area is not damaged. Excavations will then be carried out from access tracks, where possible, as they are constructed in order to reduce the compaction of soft ground. Where works are undertaken on existing peat deposits low ground pressure or wide tracked excavators will be used to strip the peat.

To mitigate against erosion of the exposed soil or rock, all excavations will be constructed and backfilled as quickly as possible. Excavations will stop during or prior to heavy rainfall events. To mitigate against possible contamination of the exposed soils and bedrock, refueling of machinery and plant will only occur at designated refueling areas.

Soil excavated from trenches along the proposed grid connection route will be taken to a licenced facility for disposal or recycling where required. If feasible, the upper layers of tarmac and asphalt will be excavated separately to the lower engineered fill layers. The lower engineered fill layers will be reused. The tarmac / asphalt layers will be taken to a licenced facility for disposal or recycling.

All temporary cuts/excavations will be carried out such that they are stable or adequately supported. Gravel fill will be used to provide additional support to temporary cuts/excavations where appropriate. Unstable temporary cuts/excavations will not be left unsupported. Where appropriate and necessary, temporary cuts and excavations will be protected against the ingress of water or erosion.

Peat stability monitoring program and appropriate instrumentation may be required where deeper in-situ peat deposits occur. The requirement and proposed location of monitoring instrumentation will be identified prior to construction works commencing on site.

Interceptor drains will be installed prior to any construction works commencing. Temporary settlement ponds and silt management measures will be installed to mitigate against sediment run-off as required. Further assessment of potential impacts to surface water discharges during the construction phase are discussed in Chapter 14, Hydrology of this EIAR.

The potential impact from silt laden surface water runoff from increased erosion of exposed overburden deposits will be assessed at site-specific locations particularly at new and existing drainage locations where earthworks are proposed.

To minimise the impact to surface water quality, existing peat bog drainage will be maintained outside the immediate site area, and where appropriate additional site drainage and settlement ponds will be installed as required prior to construction activities. Silt fencing will be installed in new and existing drainage and monitoring of water quality undertaken during the construction phase.

Final drainage will be constructed following the completion of these activities with silt fencing maintained until such time as a vegetation cover has become established.

Storage tanks, used to store fuel for the various items of machinery, will be self-contained and double-walled. Refuelling of construction vehicles will be carried out from these tanks or from delivery vehicles at designated refuelling areas.

Specific mitigation measures relating to the management of hydrocarbons are as follows:

- Fuels, lubricants and hydraulic fluids for equipment used on the construction site will be carefully handled to avoid spillage;
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained, and the contaminated soil removed from the site and properly disposed of;
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling; and
- Appropriate spill control equipment, such as oil soakage pads, will be kept within the construction area and in each item of plant to deal with any accidental spillage.

With regard to slope stability issues, detailed design best practice will be implemented as follows:

- The works will be designed and supervised by a suitably qualified and experienced geotechnical engineer or engineering geologist, and hydrologist or drainage engineer;
- Peat stability monitoring program and appropriate instrumentation may be required where deeper in-situ peat deposits occur. The requirement and proposed location of monitoring instrumentation will be identified prior to construction works commencing on site. Excavation works will be monitored by suitably qualified and experienced geotechnical engineer;
- The programming of the works (by the Contractor) will be such that earthworks are not scheduled to be carried out during severe weather conditions. Where such weather is forecast, suitable measures will be taken to secure the works;
- Prior to the placement of peat in the proposed berms the existing ground conditions will be inspected by a suitably qualified and experienced geotechnical engineer or engineering geologist to ensure there is no potential for ground instability from the peat placement activities; and
- All temporary cuts/excavations will be carried out such that they are stable or adequately supported. Gravel fill will be used to provide additional support to drains where appropriate. Unstable temporary cuts/excavations will not be left unsupported. Where appropriate and necessary, temporary cuts and excavations will be protected against the ingress of water or erosion.

To mitigate against the increased vulnerability of the underlying aquifer to groundwater pollution, all excavations will be constructed and backfilled as quickly as possible. Excavations will stop during or prior to heavy rainfall events. To mitigate against possible contamination of the underlying, refueling of machinery and plant will only occur at designated refueling areas.

The dewatering of the foundation excavations is not expected to cause interference with domestic wells in the area, due to large offset distances to known wells, relatively shallow depths of excavation and temporary short-term nature of dewatering, if required.

The GSI database is however not complete; it is probable that there are other wells in addition to those in the GSI databases, but are generally associated with houses, the offset to which from the turbines is a minimum of 500 m. If, however, in the unlikely event of a domestic well being impacted by the wind farm, an alternative supply will be provided – either a connection to mains water will be provided or a replacement well will be drilled.

The GSI holds records of groundwater wells in the vicinity of the proposed grid connection route. However, trenches are shallow (1.2 m deep) and will only be open for a short period. Depending on the ground conditions, presence of services, traffic management required, weather conditions, etc., the rate of installation of cable ducting would vary between 50 m and 100 m per day. Dewatering is therefore unlikely to be required and no impacts on wells is envisaged.

Cable trenches could provide preferential pathways for groundwater and contaminant movement. To avoid the cable trenches becoming preferential pathways, clay plugs (or other low permeability material) will be installed at intervals along the trench to stop / inhibit water movement.

Operational Phase Mitigation Measures

It is not envisaged that the operation of the proposed development will result in significant impacts on the geological and hydrogeological regimes within the study area, as there will be no further disturbance of overburden post-construction.

The main potential residual impact during the operation phase would be the risk to groundwater from contamination from spills. Due to the reduced magnitude of the impacts, no additional mitigation measures are required for the maintenance and operation of the wind farm, over and above those incorporated into the design of the substation transformer, which will be bunded to protect soils against accidental leakages of oil.

Decommissioning Stage Mitigation Measures

Mitigation measures applied during decommissioning activities will be similar to those applied during construction where relevant.

Some of the impacts associated with reinstatement of the site (excavation of turbine bases, access tracks etc.) will be avoided by leaving these in place where possible. The Irish Wind Energy Association (IWEA) (11) states that when decommissioning a wind farm *"the concrete bases could be removed, but it may be better to leave them under the ground, as this causes less disturbance"*. It is proposed to leave the access tracks in-situ at the decommissioning stage. IWEA also state that *"it may be best"* to leave site tracks in-situ depending on the size and geography of the development.

It is considered that leaving the turbine foundations, access tracks and hardstanding areas in-situ will cause less environmental damage than removing and recycling them. Removal of this infrastructure would result in considerable disruption to the local environment in terms of increased sedimentation, erosion, dust, noise, traffic and an increased possibility of contamination of the local water table. However, if removal is deemed to be required by the respective local authority all infrastructure will be removed with mitigation measures similar to those during construction being employed.

4.3.5 Outline Surface Water & Site Drainage Management Plan

This Outline Site Drainage Management Plan should be read in conjunction with the EIAR/EIS. The Site Drainage Management Plan shall be finalised in accordance with this outline plan following the appointment of the contractor for the main construction works.

Site Risk Assessment

The preliminary site-specific hazards have been identified for this site in Table 4.9 below. The hazards should be re-assessed prior to the commencement of construction on the site and these hazards should be communicated to all personnel entering the site. No site personnel should enter lands outside the scope of the project. The construction areas must be secured from public access at all times.

Table 4-9: Site Specific Hazards

Site Specific Hazards	
Dernacart Wind Farm	<ul style="list-style-type: none"> • Stilling ponds (risk of drowning) • Wet marshy ground • Watercourse crossings

Daily Preparation during the Implementation of the Site Drainage Management Plan

The Drainage Engineer appointed by the contractor should conduct regular meetings with the Construction Management Team to discuss the phasing of construction and drainage as the work progresses.

The focus of these meetings will be on establishing an operational drainage system in advance of the progression of the works. Particular regard will be taken of daily weather conditions and long-range forecasts.

The Drainage Engineer should have the authority to suspend the works if weather conditions are deemed too extreme for the effective protection of receiving watercourses. Mitigation measures to protect receiving watercourses will be put in place as directed by the Drainage Engineer in advance of extreme forecasts.

Personnel Qualifications and Key Contacts

All those carrying out work on site must have a Fás/Solas Safe Pass Card. All works must be supervised by a competent supervisor. Workers must be adequately trained in the tasks they are required to carry out.

The key contact names and contact details should be supplied to all personnel entering the site. All site staff should be informed of the emergency procedures for the site. The Drainage Engineer should be contacted if there is an accidental spillage or break out of silt on the site.

Construction Stage Impacts

During the construction period, the development has the potential to lead to impacts on hydrology and water quality unless appropriate mitigation is applied.

Tree felling, new site access roads, turbine hard-standing areas, the on-site sub-station and other new, hard surfaces have the potential to contribute to an increase in run-off.

A detailed description of the potential construction stage impacts can be found in Chapter 14 of the EIAR.

The main sources of potential increase in sediment to surface water which could potentially arise during tree felling and construction activity include:

- Increased sediment loading of streams from personnel and traffic activities.
- Standing water in excavations could contain an increased concentration of suspended solids as a result of the disturbance of the underlying soils.
- Haul roads passing close to watercourses could allow the migration of silt laden runoff into watercourses.
- Silt carried on the wheels of vehicles leaving the site could be carried onto the public road.
- Tree felling could lead to an increase in sediment and nutrients in the surface water runoff, if the brash is left in place in the riparian buffer zones.
- Small diameter cross-drains could lead to blockages and consequent flooding and concentration of flows.
- Suspended solids could potentially lead to siltation and physical effects on flora and fauna in aquatic habitats.
- Refueling activities could result in fuel spillages.
- There is the potential for fuel spill/leaks from storage tanks which will be stored on site for plant machinery
- Sanitary waste could lead to contamination of receiving waters and groundwater.
- The removal of the vegetated material will also lead to an increase in the rate of runoff along the route of the site access roads and hardstanding areas. This increase in the rate of runoff could lead to a minor increase in flooding downstream.
- Inappropriate site management of excavations could lead to loss of suspended solids to surface waters.
- Inappropriate management of the excavated material could lead to loss of suspended solids to surface waters.
- Inappropriate management of the drainage of material storage areas could lead to loss of suspended solids to surface waters.

- Blockage of cross-drains could lead to consequent flooding and concentration of flows.
- Overland flow entering excavations could increase the quantity of surface water to be treated for sediment removal.
- Overland flows entering roadside drains could result in a concentration of flows and subsequent erosion of drains
- Grid connection and internal cable trenches could act as a conduit for surface water flows.
- The velocity of flows in roadside drainage could cause erosion in steeply sloping roadside drains.
- Flows from the new drainage system could be impeded, should blockages occur in the existing roadside drains.
- Open bodies of water and saturated ground present a risk to the safety of site personnel and the public.
- The construction of new infrastructure has the potential to obstruct existing overland flow.
- A blockage in the proposed roadside drains could allow a break out of silt laden runoff to reach adjacent watercourses or streams.
- Wet concrete could lead to contamination of receiving waters and groundwaters
- Inappropriate management of spoil heaps could result in accidental break outs of silt on site leading to the loss of suspended solids to surface waters
- Proposed roadside drains on the uphill side of new roads will have to convey all of the contributing runoff from the land above resulting in large drains being required in certain areas and mixing of overland flow with runoff from construction works. This would reduce the efficiency of any proposed stilling ponds.

The following potential impacts could result from the construction activities related to grid route installation and watercourse crossings:

- Cable trench could act as a conduit for surface runoff
- Excavated soil could be mobilised in the surface water runoff during an extreme rainfall event
- Inadequate storage of fuels and oils could lead to contamination of surface water
- The excavation of trenches for cable laying, and the launch and reception areas for directional drilling, could lead to silt laden surface water run-off
- Silt carried on the wheels of vehicles could be carried onto the public roads
- Refuelling activities could result in fuel spillage
- Suspended solids drained to watercourse could potentially lead to siltation and physical effect on flora
- Works leading to erosion of the river banks/bed could negatively impact on the fisheries habitat.

Operational Phase Impacts

Due to the insignificance of the increase in runoff from the development, the grassing over the drainage swales, and the non-intrusive nature of site operations, there is a negligible risk of sediment release to the watercourses during the operational phase.

Decommissioning Stage Impacts

The potential impacts associated with decommissioning will be similar to those associated with construction but of reduced magnitude.

There would be increased trafficking and an increased risk of disturbance to underlying soils at the Dernacart Wind Farm, during the decommissioning phase, in this instance, leading to the potential for silt laden runoff entering receiving watercourses from the wheels of vehicles.

During decommissioning, it may be possible to reverse or at least reduce some of the impacts caused during construction by rehabilitating construction areas such as turbine bases, hardstanding areas, the substation and site compound. This will be done by covering with topsoil to encourage vegetation growth and reduce runoff and sedimentation.

Other impacts such as possible soil compaction and contamination by fuel leaks will remain but will be of reduced magnitude. However, as noted in the Scottish Natural Heritage guidance on restoration and decommissioning of onshore wind farms (SNH, 2013) reinstatement proposals for a wind farm are made approximately 30 years in advance, so within the lifespan of the wind farm, technological advances and preferred approaches to reinstatement are likely to change. It is therefore *'best practice not to limit options too far in advance of actual decommissioning but to maintain informed flexibility until close to the end-of-life of the wind farm'*.

Grid connection cables will be left in the ground, therefore no potential impacts during decommissioning stage are likely to occur.

Drainage of Wind Farm during the Construction and Operation Phases

Sustainable Drainage Systems (SuDS)

Where possible, sustainable drainage systems, in the form of grassed swales will be used to drain the permitted development. The grassed swales will serve to slow down the velocities of flows draining the hardcore surfaces of the hardstanding areas and the access tracks.

The grassed swales will also treat the surface water run-off, removing some of the sediment borne contaminants. These grassed swales will serve to detain flows and reduce the velocities of surface water flows. The swales will be typically 0.15 m in depth with a bottom width of 0.9 m and side slopes of 1 in 3. The swales will be constructed in accordance with CIRIA C698 Site Handbook for the Construction of SUDS.

Site drainage, including silt traps and stilling ponds, will be put in place in parallel with or ahead of the construction, such that excavation for new infrastructure will have functional drainage in the place.

The stilling ponds will remain in place during construction phase. The stilling ponds will drain diffusely overland, over existing vegetated area, within the site boundary.



Figure 4-1: Typical Grassed Swale along access track

The drainage system including stilling ponds will remain operational and will be utilised for the decommissioning phase to treat any surface water from exposed areas as a result of decommissioning at the site. During decommissioning the turbine base, hardstanding areas and access tracks should remain in place and be covered with local soil/topsoil to minimise disturbance to soils. Removal of this infrastructure would result in considerable disruption to the local environment in terms of increased sedimentation, erosion, dust, noise, traffic and an increased possibility of contamination of the local water table. However, if removal is deemed to be required all infrastructure will be removed with mitigation measures similar to those during construction being employed.

The drainage system outlined below provides for a multi-stage treatment train of the discharges from the permitted development, as recommended in the SUDS manual:

- grassed swales removing some of the sediment borne contaminants
- stilling ponds providing retention and treatment of discharges
- diffuse outflow from stilling ponds providing for further retention and settlement of suspended solids by reducing the velocities of flows and increasing the flow path of discharges
- continuation of flows by natural flow paths over vegetated areas and via existing drains before entering the watercourse, providing further retention and treatment of discharges.



Figure 4-2: Typical Swale draining to Stilling pond

Drainage of Temporary Site Compound

Drains around the hard-standing areas of the site compound will be in the form of shallow grassed swales to minimise the disturbance to sub-soils.

Surface water runoff from the compound will be directed through a Class 1 Full Retention Oil Interceptor before discharge to the 'dirty' water drainage system for the site. This dirty water drains to a stilling pond before final discharge over land.

During the construction phase, it will be necessary to provide bottled water for potable supply for the construction personnel. A water tanker will supply water used for other purposes.

Portaloo and/ or containerised toilets and welfare units with storage tanks will be used to provide toilet facilities for site personnel during construction.

All portaloo units located on site during the construction phase will be operated and maintained in accordance with the manufacturer's instructions and will be serviced under contract with the supplier. All such units will be removed off-site following completion of the construction phase.

Drainage of Overland Flows

Existing overland flow channels will be maintained, and cross-drains provided in the access tracks to allow continuity of flow. Where required, on the upslope side of new sections of access track and hardstanding areas, overland flows will be intercepted in channels. The flow will then be discharged diffusely over vegetated areas. Cross-drains will be provided where required at a minimum of 200m intervals. The roadside drains will therefore only carry the site access track run-off. This will ensure that there will be no mixing of clean and dirty water and will avoid a large concentration of flows. Thus, erosion risks will be reduced and the quantity of water requiring treatment will be minimised.

Drainage of Site Access Tracks

Proposed new tracks and turbine hard standing areas will be drained as per the existing drainage system via roadside swales with stilling ponds at the end of the swale.

These grassed swales will serve to detain flow and reduce the velocities of surface water flows. The swales will be typically 0.15 m in depth with a bottom width of 0.9 m and side slope of 1 in 3. The swales will be constructed in accordance with CIRIA C698 Site Handbook for the Construction of SuDS.

Where roadside drains are laid at slopes greater than 2%, check dams will be provided. This will reduce effective slope and runoff velocities and any consequent potential for erosion.

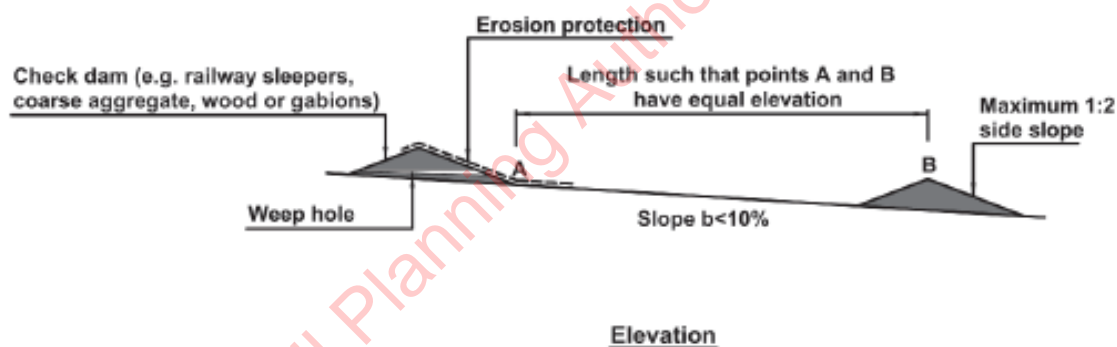


Figure 4-3: Typical Check Dam Details

Site drainage, including silt traps and stilling ponds, will be put in place in parallel with or ahead of the construction, such that excavation for new infrastructure will have functional drainage in the place.

The stilling ponds will remain in place during construction phase. The stilling ponds will drain diffusely overland, over existing vegetated area, within the site boundary.

Silt fencing will be provided at strategic locations to further protect watercourses during the construction phase.



Figure 4-4: Typical Silt Trap across Grassed Swale

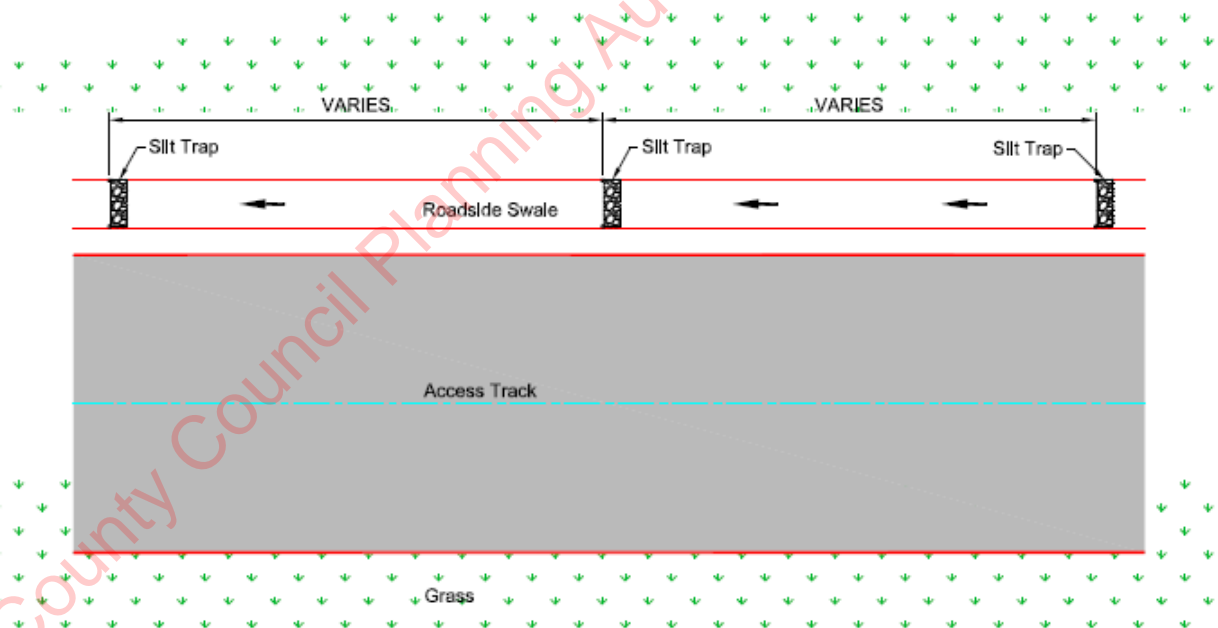


Figure 4-5: Plan of Silt Trap in Swale

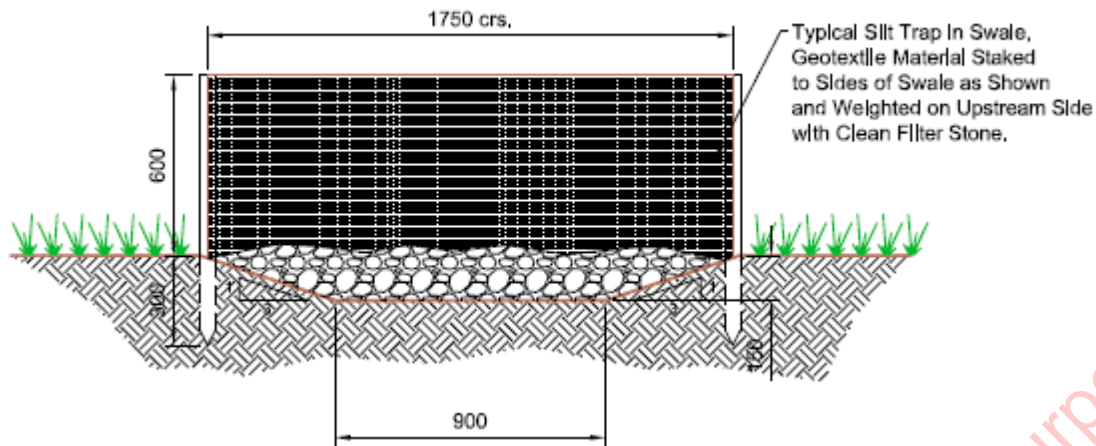


Figure 4-6: Typical Silt Trap Details

Drainage of Turbine Bases and Hardstanding

The excavations for turbines will be pumped into the site drainage system (including stilling ponds), which will be constructed at site clearance stage, in advance of excavations for the turbine bases.

As discussed above, the new turbine hard-standing areas will be drained via shallow swales with suitably designed stilling ponds. The stilling ponds will remain in place following the construction period.

If cross-drains are required to convey the drainage across the hardstanding area, the diameters will be suitably designed in advance.

Drainage of Cable Trenches

Cables running throughout the wind farm site will be installed in trenches adjacent to site access tracks, where possible. Cable trenches will be excavated using a mechanical excavator and the excavated materials placed in small bunds adjacent to the trenches for back filling.

The seed bank is to be retained for placing back as the top layer of backfill to the trench, to aid successful restoration of vegetation in disturbed areas.

Cable trenches will be excavated during dry periods where possible, in short sections and left open for minimal periods, to avoid acting as a conduit for surface water flows. Clay bunds will be constructed at up to 10m intervals within the cable trench.



Figure 4-7: Typical Backfill over Cable Trench

Drainage of Substation

It is proposed to drain the substation using shallow swales, with a stilling pond at the end of the swale run. The stilling pond will remain in place following the construction period.

At the upslope side of the substation interceptor drains will be installed.

Procedure for Dewatering of Excavations

Standing water, which could arise in excavations, has the potential to contain an increased concentration of suspended solids as a result of the disturbance to soils. Water in the excavations for turbines will be pumped into the site drainage system which will be constructed at site clearance stage, in advance of excavations for the turbine bases.

Drainage of Stockpiled Material

During the construction period, the excavated material will be used to reinstate the turbine bases.

All excavations shall be constructed and backfilled as quickly as possible. Excavation will stop during or immediately after heavy rainfall.

Excavation will precede the turbine base construction, cable trench and access track construction. Soil will be excavated and replaced with granular fill where required. Excavation will be carried out from access tracks where possible in order to reduce the compaction of topsoil.

During the construction period, spoil heaps from the excavations for the turbine bases will be stored temporarily. These temporary spoil heaps will be covered if required and surrounded by silt fences to filter sediment from the surface water run-off from excavated material.

Surplus soil or rock excavated during the course of the works will be used on site in the form of landscaping including low berms, where appropriate. No spoil stockpiles will be left on site after construction is completed.

Material will only be stockpiled on the site where there will be immediate backfilling of the excavation with the excavated material e.g. cable laying etc., or material will be stockpiled temporarily at the excavation point ready for collection off site. In an emergency such as flash flooding, these spoil heaps will be covered and surrounded by silt fences to filter sediment from the surface water run-off from excavated material.

It should be noted that any stockpiling will be short-term and temporary and will occur only within the site boundary as the construction proceeds. The site drainage system will be put in place prior to excavation, therefore the discharge routes from any temporary stockpiling will be via the site drainage system as detailed in the planning drawings. A minimum buffer of 50m will be provided between temporary stockpiles and the nearest watercourse. There will be no permanent or long-term stockpiling of material on the site.

Reinstated areas and berms will by preference re-vegetate naturally, and further measures will be undertaken in the form of erosion control matting, for example, if deemed to be required.

Watercourse Crossings

Existing crossings EXC1 over the Forrest Upper stream will be reconstructed. It is proposed to replace the EXC1 with a bottomless culvert. The collector cable is proposed to be put in the access roads over the culvert.

A Section 50 application will be required to obtain the consent of the OPW for the design of the stream crossing at EXC1. The IFI will also be consulted at the detailed design stage.

Minor drains such as manmade agricultural and forest drains will be crossed using 450 mm diameter pipes.

Where cross drains are to be provided to convey the drainage across the track, the recommended sizes of these cross drains are 225 mm diameter pipes.

Silt Protection Controls (SPCs) are proposed at the location of the drain crossings. It is recommended that the SPCs will consist of a minimum of silt traps containing filter stone and filter material staked across the width of the swales and upstream of the outfall to any watercourse.

Climate Change

To accommodate the effect of future climate change in Ireland, the 100-year peak flow values for stream crossing designs should be multiplied by 1.2 to obtain the design 100-year flood value for the crossing.

Wash Down from Concrete Trucks and Cement Mixers

Concrete washout will be carried out in a dedicated area of the temporary compound or at a designated washout pit on site. Only the washing of chutes will be permitted. Every concrete truck delivering concrete to the site must use the concrete washout facility prior to leaving the site. Chutes will be washed out at the designated area with a settlement lagoon provided to receive all run-off.

An adequately designed settlement lagoon will be provided to receive all run-off from the concrete wash down area. Regular inspections of the wash down areas and associated settlement lagoons shall be carried out and adequate records kept.

The settlement lagoon shall be lined using a 1mm LLDPE impermeable liner. A sump will be provided at this location which will collect the wash water from the concrete trucks. The excavated material will be kept on site for reinstatement following the construction period.



Figure 4-8: Typical Lined Settlement Lagoon for Concrete Washout Facility

During construction, wash water and any solids in the sump will be removed periodically to an appropriate licensed facility. The sump can be emptied daily if required. Following construction, any solids, the liner, and any remaining wash water in the sump will all be removed to an appropriate licensed facility for disposal. The sump will then be reinstated.

Mitigation Measures for Flooding

Stilling ponds are to be provided as part of the drainage system for the wind farm. The stilling ponds, together with the swales, will serve to reduce velocities in the surface water run-off draining from the access tracks and hardstanding areas and will provide retention of the flows. This will also mitigate any increase in the risk of flooding.

Mitigation Measures for Pollution Control to Protect Water Quality in Downstream Receptors

All personnel working on site will be trained in pollution incident control response. An emergency response procedure is prepared herein which will ensure that appropriate information will be available on site outlining the spillage response procedure and a contingency plan to contain silt.

Silt Protection Controls (SPCs) are proposed at the location of watercourse crossings and where haul roads pass close to watercourses, silt fencing will be used to protect the streams.

Silt traps will also be provided at outfalls from roadside swales to existing drains. Silt traps will be kept upstream of outfalls to allow a buffer zone to the outfall. Additional silt fencing will be kept on site in case of an emergency break out of silt laden run-off.

Stilling ponds will be put in place in advance as construction progresses across the site. The stilling ponds with a diffuse outflow detail will mitigate any increase in run-off and treat suspended solids in the surface water run-off. Erosion control and retention facilities, including stilling ponds will be regularly maintained during the construction phase.

The three-stage treatment train (swale – stilling pond – diffuse outflow) proposed to retain and treat the discharges from hard surface areas as a result of the development will reduce any risk of flooding downstream. In the unlikely event of accidental break out of silt, this will be dealt with in the Emergency Response Procedures, included herein.

All stockpile material will be bunded adequately and protected from heavy rainfall to reduce silt run-off, where necessary.

Adequate security will be provided to prevent spillage as a result of vandalism.

Drains around hard-standing areas will be shallow to minimize the disturbance to sub-soils.

Suitably sized cross-drains will be provided for drainage crossings to convey flows from agricultural drains and forestry drains across the access tracks, to prevent a risk of clogging.

Tracks will be capped as soon as practicably possible to cover exposed subsoils and as such reduce the concentration of suspended solids in the run-off.

All open water bodies adjacent to proposed construction areas will be protected by fencing, including the proposed stilling ponds.

Additional protection will be provided in the form of silt fencing downslope where required and at existing stream crossings during construction, to further ensure that there is no impact from the development to streams and rivers crossing the site.

During the construction period an emergency facility will be provided to control the discharge from the stilling ponds. This will mitigate the risk of any accidental spillage on site affecting watercourses.

Where haul roads pass close to watercourses, silt fencing will be used to protect the streams. Silt traps will also be provided at outfalls from roadside swales to existing drains. Silt traps will be kept upstream of outfalls to allow a buffer zone to the outfall.

Refuelling of plant during construction will be carried out at the temporary compound, which will be located a minimum of 50m from any watercourse. The station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. In addition to the above, onsite re-fuelling of machinery will be carried out 100m from watercourses using a mobile double skinned fuel bowser. The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site or at the designated refuelling area and will be towed by a 4x4 jeep to designated re-fuelling areas near to where machinery is located but at distances of greater than 100m from watercourses. Drip trays and spill kits will be kept available on site, to ensure that any spills from vehicles are contained and removed off site.

Concrete washout will be carried out in a dedicated area of the temporary compound or at a designated washout pit on site. Only the washing of chutes will be permitted. Every concrete truck delivering concrete to the site must use the concrete washout facility prior to leaving the site. Chutes will be washed out at the designated area with a settlement lagoon provided to receive all run-off.

Any diesel, fuel or hydraulic oils stored at the temporary site compound will be bunded. The bund capacity will be sufficient to contain 110% of the tank's maximum capacity.

Vehicles entering the site should be in good working order, free from leakage of fuel or hydraulic fluid. No concrete wash out is permitted on the site, only wash down of chutes. During construction concrete and wet concrete will be kept out of all watercourses and drains.

A wheel wash will be provided at the site entrance draining to a silt trap to avoid any silt laden run-off flowing on to the public road and entering roadside drains.

These units will be self-contained, with waste removed from site by a licensed waste disposal company. Additional silt fencing will be kept on site in case of an emergency break out of silt laden run-off.

Portaloos and/or containerised toilets and welfare units will be used to provide toilet facilities for site personnel during construction. Sanitary waste will be removed from site via a licenced waste disposal contractor.

Silt fencing will be erected at the location of stream crossings along the cable route. Silt curtains and floating booms will also be used where deemed to be appropriate, in consultation with IFI and this will be assessed separately at each individual location.

Emergency Silt Control and Spillage Response Procedures

All personnel working on site will be trained in pollution incident control response. An emergency response plan will be prepared which will ensure that appropriate information will be available on site outlining the spillage response procedure and a contingency plan to contain silt. A regular review of weather forecasts of heavy rainfall is required, and a contingency plan will be prepared for before and after such events. A record will be kept of daily visual examinations of watercourses which receive flows from the permitted development, during and for an agreed period after the construction phase. Procedures for particular accidental spillages, from leaking or damaged fuel lines or a break out of silt are outlined below.

Oils, Fuels and Site Vehicles

Refuelling of plant during construction will be carried out at the temporary compound, which will be located a minimum of 50m from any watercourse. The station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. In addition to the above, onsite re-fuelling of machinery will be carried out 100m from watercourses using a mobile double skinned fuel bowser. The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site or at the designated refuelling area and will be towed by a 4x4 jeep to designated re-fuelling areas near to where machinery is located but at distances of greater than 100m from watercourses. Drip trays and spill kits will be kept available on site, to ensure that any spills from vehicles are contained and removed off site.

Details of tests to be carried out on Storage tanks to a recognised standard together with a secondary containment system to provide at least 110% of the maximum tank capacity are as follows:

All tank and drum storage areas shall, as a minimum, be bunded, either locally or remotely, to a volume not less than the greater of the following:

- a. 110% of the capacity of the largest tank or drum within the bunded area; or
- b. 25% of the total volume of substance which could be stored within the bunded area.

Detail of oil spill protection measures adjacent to a watercourse are outlined above. Procedures for particular accidental spillages, from leaking or damaged fuel lines are outlined below.

Accidental spillage from leaking or damaged fuel lines

Emergency drip trays and spill kits will be kept available on site for use in emergencies to ensure that any spills from vehicles are contained and removed off site.

Each refuelling station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site.

In the event of pollution or potential risk of pollution Laois County Council will be informed immediately. In the case of water pollution in addition to the Local Authority, Inland Fisheries Ireland should also be informed immediately.

In the event of an accidental spillage from leaking or damaged fuel lines, the spillage will be cleaned up with absorbent material e.g. sand or turf mould and placed in a designated bunded location while awaiting removal offsite to a licensed facility.

In the event of an emergency, the stilling ponds will provide a temporary holding area for any accidental spills on site as it will be possible to block off the outflow from these ponds for a limited period.

Accidental break out of silt

A suitably qualified person will be appointed by the developer to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process. The operations management of the wind farm will include regular monitoring of the drainage system and maintenance as required.

Additional silt fencing will be available on site for use in emergencies.

An emergency preparedness and response procedure are required to prevent environmental pollution incidents.

Maintenance of Site Drainage System

The drainage system for the wind farm should be maintained regularly to keep it operating effectively. The maintenance should include the following:

- inspection and maintenance of swales;
- inspecting cross-drains for any blockages;
- inspecting stilling ponds and outfalls;
- inspecting the stream crossings and piped crossings for obstructions;
- inspecting the progress of the re-establishment of vegetation;
- implementing appropriate remedial measures as required after the above inspections.

Construction Stage Mitigation Measures

Long range weather forecasts should be examined, and the construction phases planned taking cognisance of expected weather conditions. Regular meetings should be held to re-assess construction phases with weather conditions as the project progresses.

Regular meetings should be held between the Drainage Engineer appointed by the contractor and the contractor's Project Manager. The planning of traffic routes through the site should be agreed in advance, in order to plan appropriate construction drainage management.

The mitigation measures proposed to reduce potential direct, indirect and turbine delivery route and cable route impacts are outlined below.

- The increase in the rate of runoff along the route of the site access roads and hard-standings areas will be mitigated by the proposed drainage system which includes provision of stilling ponds to reduce concentration of suspended solids in the runoff from these areas. This has been further mitigated by avoidance through design, in the utilisation of existing tracks and existing drainage systems where possible.
- Stilling ponds with a diffuse outflow detail will be put in place in advance as construction progresses across the site. Erosion control and retention facilities, including stilling ponds will be regularly maintained during the construction phase. The three-stage treatment train (swale – stilling pond – diffuse outflow) proposed to retain and treat the discharges from hard surface areas as a result of the development will reduce any risk of flooding downstream.
- Where haul roads pass close to watercourses, silt fencing will be used to protect the streams. Silt traps will also be provided at outfalls from roadside swales to existing drains. Silt traps will be kept upstream of outfalls to allow a buffer zone to the outfall.
- A suitably qualified person will be appointed by the developer to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process. The operations management of the subject development will include regular monitoring of the drainage system and maintenance as required.
- Standing water, which could arise in excavations, has the potential to contain an increased concentration of suspended solids as a result of the disturbance to soils. Water will be pumped into the site drainage system (including stilling ponds), which will be constructed at site clearance stage, in advance of excavations for the turbine bases.

- Drains around hard-standing area will be shallow to minimise the disturbance of sub soil.
- The developer will ensure that erosion control, namely silt-traps, silt fencing and swales are regularly maintained during the construction phase.
- Interceptor cut-off drains will be provided on the upslope site of the access roads to prevent the mixing of overland flows with the drainage for the proposed development. These interceptor drains will discharge diffusely over land to avoid concentration of runoff. The roadside drains will therefore only carry the site access road runoff and so avoid carrying large volumes of water and concentrating flows.
- Cross drains of 450 mm will be provided to prevent a risk of clogging for drainage crossings and conveying flow from agricultural drains and forestry drains over access track roads.
- Roadside swales will serve to attenuate any increase in surface water runoff.
- Where new cross-drains are proposed on this site to convey surface water from roadside swales to outfalls, these will be sized at a minimum of 225 mm diameter to avoid blockages.
- Silt fencing will be erected at the locations of the drain crossings for the duration of the construction period.
- Site access tracks roads have been laid out to reduce longitudinal slope of roadside drains where possible. Where roadside drains are laid at slopes greater than 2%, check dams will be provided. This will reduce effective slope and runoff velocities and any consequent potential for erosion.
- Where agricultural tracks and forestry roads will be used to access the development, the roadside drains alongside these roads will be cleared of obstructions, should it be found that debris and vegetation are impeding flows.
- Any other diesel, fuel or hydraulic oils stored on site will be stored in bunded storage tanks – the bund area will have a volume of at least 110 % of the volume of such materials stored.
- Refueling of plant during construction will only be carried out at designated refueling station locations on site.
- Prior to leaving the site, every truck delivering concrete to the site must wash the chute only to a lined pit provided at each turbine location.
- Silt fencing will be erected at the location of stream crossings along the cable route.
- Cables will be installed in trenches adjacent to the site access roads, or laid within the access road line, where required. Trenches will be excavated during dry periods where possible in short sections and left open for minimal periods, to avoid acting as a conduit for surface water flows.
- The temporary storage of excavated material on site will be put at least 50 m from watercourses.
- Wet concrete operations are not required for this site within or adjacent to watercourses. However, if wet concrete operations are required, a suitable risk assessment will be completed prior to works being carried out and strategically located concrete washout areas will be provided.
- Portaloo's and/ or containerised toilets and welfare units will be used to provide toilet facilities for site personnel. Sanitary waste will be removed from site via a licenced waste disposal contractor.

All of the mitigation measures detailed above will ensure that the water quality status of the receiving waterbodies is not affected by the proposed development.

The following mitigation measures apply to the grid cable installation:

- Weather warnings will be monitored, and no construction will take place during extreme events to mitigate against potential flooding.
- Mitigation measures will be provided where surface water flows may be temporarily prevented from reaching gullies during trench excavation. Typical mitigation measures will include the provision of temporary over ground surface water channels using sand bagging for example to divert flows to downstream gullies.
- Trenches will be excavated during dry periods where possible in short sections and left open for minimal periods, to avoid acting as a conduit for surface water flows.

- Any excavated material will be used in the reinstatement of the cable trenches subject to approval. Surplus material will be removed from the site to an appropriate facility. There will be no stockpiling of excavated material.
- All excavated soil material will be managed on site in accordance with this CEMP.
- Silt fencing will be provided around any exposed areas to prevent the ingress of suspended solids into adjacent watercourses. These mitigation measures will prevent surface water contamination and will prevent subsequent flows of contaminated water into watercourses.
- Additional protection will be provided in the form of silt fencing downslope where required during construction, to further ensure that there is no impact from the development to streams and rivers downslope of the site.
- Daily visual inspections of drains and streams will be performed during the construction period to ensure suspended solids are not entering the streams and rivers alongside the work area, to identify any obstructions to channels, and to allow for appropriate maintenance of the existing roadside drainage regime. If excessive suspended solids are noted, construction work will be stopped, and remediation measures will be put in place immediately.

As previously discussed, the grid cable route crosses 7 watercourses. The proposed crossing method is horizontal directional drilling (HDD). Proposed mitigation measures are listed below:

- An Environmental Engineer with a "stop work" authority will be engaged to monitor the construction phase of the development when the water crossing is being undertaken.
- The working area around the bridge/culvert crossings will be fenced off prior to the commencement of works to avoid damage to bankside habitat
- Siltation of watercourses will be mitigated using silt traps and by avoiding operating within watercourses where feasible
- Watercourses will be visually inspected
- Should increase levels of siltation be recorded within the watercourses during the course of the construction phase, the environmental auditor will seek to halt construction works until the source of the pressure can be found and remediated
- Surplus material will be removed from the site to an appropriate facility. There will be no stockpiling of excavated material. A setback distance of at least 20 m from watercourses will be adhered to when storing temporary spoil
- Prior to any works taking place near water courses the Inland Fisheries Ireland will be consulted
- Construction works onsite will be timed to occur outside periods where heavy rainfall would be expected
- Silt traps will be regularly maintained during the construction phase. All personnel working onsite will be trained in pollution incident control response.
- Appropriate signage will be placed along the proposed route outlining the spillage response procedure and a contingency plan to contain silt. A regular review of weather forecasts of heavy rainfall is required, and the contractor is required to prepare a contingency plan for before and after such events
- HDD operations to be limited when low levels of rainfall are forecast.
- Visual inspection to take place at all times along the bore path of the alignment.
- Silt fences will be constructed around proposed work areas prior to commencement of works.
- No refueling will take place within 50m of the stream zone or any sensitive habitats.
- During the drilling process, a mixture of a natural, inert and fully biodegradable drilling fluid will be used.

Operational Mitigation Measures

Tree felling will be undertaken prior to the construction of site access tracks and hard-standing areas. The area of proposed felling is small relative to the overall area and is expected to develop a vegetation ground cover relatively quickly. Thus, no significant increase in the rate of runoff is anticipated as a result of felling nor is the risk of downstream flooding or sedimentation due to increased erosion.

Tree felling will be the subject of a felling license from the Forest Service and to the conditions of such a license. A Limited Felling License will be in place prior to works commencing on site.

To ensure a tree clearance method that reduces the potential for sediment and nutrient runoff, the construction methodology will follow the specifications set out in the Forest Service Forestry and Water Quality Guidelines (2000) and Forest Harvesting and Environmental Guidelines (2000).

Trees will be felled away from aquatic zones where possible. Brash mats will be used as necessary on any off-road harvesting routes, removed and replenished if they become worn. Branches, logs or debris will not be allowed to accumulate in aquatic zones and will be removed as soon as possible.

The main potential hydrological impact of the development is an increase in runoff from a storm event to the existing land drain, due to the change in land use resulting in an increase in impermeable ground conditions. Due to the insignificant increase in potential runoff from the site, there should be negligible release of sediment to the watercourses post-construction. The insignificant increase in runoff is mitigated with the drainage system. The drainage system will be left in situ during operational phase.

When operational, the development will have a negligible effect on surface water quality as there will be no further disturbance of soils post-construction.

During the operation phase, small quantities of oil will be used in cooling the transformers associated with the facility. There is therefore a potential for small oil spills. Risks of potential oil leakage and pollutions draining to the watercourse from the installed transformer is mitigated with transformer interceptor bund wall.

It is not envisaged that the maintenance period will involve any significant impacts on the hydrological regime of the area. The maintenance of the development will incorporate effective maintenance of the drainage system.

The maintenance regime will include inspecting the following:

- Drains, cross-drains and culverts for any blockages
- Outfalls to existing field drains and watercourses
- Existing roadside swales for any obstructions
- Swales and stilling ponds
- Progress of the re-establishment of vegetation.

The maintenance regime will also include implementing appropriate remedial measures as required after the above inspections and testing the water quality at the outfalls at appropriate intervals. Visual inspections will be undertaken during the maintenance period in accordance with maintenance schedule in CIRIA C753.

Outline Water Quality Monitoring Plan

A monitoring programme will be established to ensure that the water quality is maintained. The details of this programme are outlined below. This programme will ensure that designed measures are working to ensure water quality is not affected.

Daily visual inspections of drains and outfalls will be performed during the construction period to ensure suspended solids are not entering the streams and rivers of the site, to identify any obstructions to channels, and to allow for appropriate maintenance of the drainage regime. If excessive suspended solids are noted, construction work will be stopped, and remediation measures will be put in place immediately.

Visual inspections will be continued during the operational period until satisfactory vegetation is established on site at intervals to be agreed with Laois County Council/IFI.

A detailed water quality monitoring programme will be undertaken during the construction phase of the proposed development, in addition to the visual inspections outlined above, so as to ensure the effective implementation of the proposed mitigation measures. Field measurements and grab samples will be taken at suitable locations, which will be decided prior to the construction phase commencing.

The field measurements will be recorded at the site and will include measurement of the following parameters, electrical conductivity ($\mu\text{S}/\text{cm}$), pH, temperature ($^{\circ}\text{C}$) and dissolved oxygen (mg/l). The field measurements will be taken on a weekly basis during the site clearance and earthworks stage of the construction period.

Following this stage, the measurements will be taken on a monthly basis during construction, unless otherwise directed by the planning authority or Inland Fisheries Ireland (IFI).

Trigger values can be defined based on the pre-construction monitoring results however maximum guideline values are provided in the table below:

Water Quality Monitoring Parameters

Parameter	Maximum Guideline Value
Conductivity ($\mu\text{S}/\text{cm}$)	1000
Turbidity (NTU)	20
pH	$6.0 < \text{pH} < 9.0$
Dissolved Oxygen (% saturation)	80 – 120 %
Total Suspended Solids (mg/l)	25
Total Ammonia ($\text{mg}/\text{l N}$)	0.14 (95%ile)
Nitrite (NO_2) (mg/l)	0.5
Nitrate ($\text{mg}/\text{l N}$)	2.7 (95%ile)
Molybdate Reactive Phosphorus ($\text{mg}/\text{l P}$)	0.075 (95%ile)
Total Phosphorus ($\text{mg}/\text{l P}$)	0.5
Chloride (mg/l)	250

The grab samples will be taken on a monthly basis during the site clearance and earthworks stage of the construction period. Following this stage, the samples will be taken on a quarterly basis, unless otherwise directed by the planning authority or IFI.

Decommissioning Stage and Mitigation Measures

In the event of decommissioning of the Dernacart Wind Farm, the access tracks may be used in the decommissioning process. Mitigation measures applied during decommissioning activities will be similar to those applied during construction stage.

It is proposed that turbine foundations and hardstanding area should be left in place and covered with local soil/topsoil at decommissioning stage. Removal of this infrastructure would result in considerable disruption to the local environment in terms of an increased possibility of sedimentation, erosion and of contamination of the local water table. It is considered that leaving the turbine foundations, access tracks and hardstanding areas in-situ will cause less environmental damage than removing them.

Grid connection cables will be left in the ground, therefore no potential impacts during decommissioning stage are likely to occur. Hence no mitigation measures are required.

4.3.6 Outline Archaeological Management Plan

This outline plan details archaeological requirements. For information on architectural heritage, please refer to Chapter 15 of the EIAR.

Construction Stage Impacts

There are no identified likely significant effects on the designated archaeological resource pertaining to the study area or the proposed development site (windfarm and UGC route). There are no recorded archaeological sites within the proposed construction areas, and, due to intensive land improvement works throughout the windfarm area and road carriageway construction (often with deep drainage ditches) along the UGC route, the overall archaeological potential to reveal sub-surface archaeological features is low. However, there is still a possibility of encountering archaeological finds/remains throughout the area during the construction phase. Such potential features shall be subject to direct negative impact, of high magnitude, although the value/sensitivity potential of the sub-surface archaeological resource is unknown, it is considered to be of **potential slight/moderate** significance of effect. It should be noted that a programme of licenced archaeological testing at pre-planning stage is, in this case, not deemed beneficial to facilitating impact assessment (or formulating an appropriate mitigation strategy) on the unknown archaeological resource. The proposed site has been significantly improved (indicating extensive ground disturbance) and is of low archaeological potential; and there are several large portions of areas currently forested and inaccessible thereby inhibiting a conclusive overall site-based test.

Operational Phase Impacts

Following the construction phase for the proposed windfarm development, including the UGC route; the operational phase is considered to have **no likely or significant effects** on the archaeological heritage resource. Any identified construction phase impacts shall be fully mitigated in advance and/or during on-site works.

Construction Stage Mitigation Measures

There are no identified likely significant effects on the designated archaeological resource pertaining to the study area or the proposed development site (windfarm and UGC route). The overall archaeological potential of the windfarm area (incl. a small land parcel proposed for the turbine delivery route to the west of the site boundary) is considered low, however, given the scale of the proposed development there is still a possibility of encountering archaeological finds/remains throughout the area during the construction phase. As such, a programme of archaeological monitoring shall be undertaken by a suitably qualified archaeologist, during all ground reduction works/topsoil stripping associated with the proposed windfarm hardstands/turbine locations, turbine delivery haul routes, access tracks, temporary compound and sub-station, and specifically including the north-eastern land-based area (adjacent Turbine 6) which is sited adjacent the minor watercourse of Bornass/Cottoner's Brook (it is noted that there are no other riverine environments present within the proposed windfarm site). Such an archaeological monitoring programme, given both the low archaeological potential and presence of heavily forested areas within the proposed windfarm site, is considered an appropriate archaeological mitigation strategy in this regard.

The proposed UGC route shall traverse predominantly along the verge of the existing road network throughout the study area. These areas are often bounded by heavy hedge/tree growth and deep ditches. There is one portion of the route at the western extent, where it exits the windfarm site and traverses to Cottoner's Bridge. This area is adjacent to the environs of a recorded findspot (saddle quern), a recorded metalworking site and an enclosure site. In addition, direction drilling is proposed for bridge crossing points (under the riverbed(s)), at Cottoner's Bridge (minor watercourse – Bornass/Cottoner's Brook) and at Kilnahown Bridge (River Barrow). Riverbanks are considered locations that have higher potential for sub-surface archaeological finds or features; however, the entry and exit points for the directional drilling shall be located within the road surfaces immediately before and after the river crossings (and adequately beyond any bridge structures themselves), with no ground disturbance on the riverbanks. As such, the area at the western extent of the UGC shall be subject to archaeological monitoring during the construction phase, whilst there shall not be a requirement for archaeological mitigation at the in-road directional drilling entry/exit points for the river crossings.

Given the construction method of in-road directional drilling beneath riverbed(s), where applicable, there is no underwater archaeological impact associated with the proposed windfarm development (including UGC route), and as such, no mitigation measures are deemed necessary.

In the event of an archaeological find or feature being discovered during the construction phase works, the archaeologist shall evaluate, characterise and determine the extent of the remains.

Thereafter an agreed mitigation framework including a Method Statement and Programme of Works shall be required in order to adequately preserve and/or record the archaeological resource, with consultation from the National Monuments Service (NMS). Whilst determination is being sought to mitigate the find/feature, the area shall be appropriately buffered with temporary fencing and an adequate works exclusion zone created in order to minimize any potential indirect damage during the site works.

Operational Phase Mitigation Measures

Should there be a presence of sub-surface archaeological finds/features exposed during the construction phase, such items shall be fully mitigated by means of preservation *in situ* and/or preservation by record. Such potential locations will be fully recorded, mapped and appropriately demarcated at construction stage, which shall also facilitate appropriate site measures and protocols for any future site maintenance works that may be required.

Decommissioning Stage and Mitigation Measures

No impacts are predicted during the decommissioning phase. As such, no mitigation is required.

4.3.7 Waste Management Plan

It will be the objective of the Developer in conjunction with appointed contractor to prevent, reduce, reuse and recover as much of the waste generated on site as practicable and to ensure the appropriate transport and disposal of residual waste off site. This is in line with the relevant National Waste Management Guidelines and the European Waste Management Hierarchy, as enshrined in the Waste Management Act 1996, as amended.

Any waste generated during the development construction phase will be collected, source separated and stored in dedicated receptacles at the temporary compounds during construction.

This Outline Construction Waste Management Plan has been prepared for the proposed Dernacart Wind Farm in line with the "Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects" (2006) as published by the Department of the Environment, Community and Local Government and supported by the Eastern-Midlands Region Waste Management Plan 2015-2021.

The Outline Waste Management Plan shall be finalised in accordance with this outline plan following the appointment of the contractor for the main construction works and will take cognisance of the replacement plan for the Eastern and Midlands Region. This plan should be read in conjunction with the EIAR.

Assignment of Responsible Personnel

It will be the responsibility of the contractor for the main construction works (when appointed) to nominate a suitable site representative such as a Project Manager, Site Manager or Site Engineer as Waste Manager who will have overall responsibility for the management of waste. The waste manager will have overall responsibility to instruct all site personnel including sub-contractors to comply with on-site requirements. They will ensure that at an operational level that each crew foreman is assigned direct responsibility.

Waste Generated

It is envisaged that the following categories of waste will be generated during the construction of the project:

- municipal solid waste (MSW) from the office and canteen
- construction and demolition waste
- waste oil/hydrocarbons
- paper/cardboard
- timber
- steel

A fully authorised waste management contractor will be appointed by the Contractor prior to construction works commencing. This contractor will provide appropriate receptacles for the collection of the various waste streams and will ensure the regular emptying/and or collection of these receptacles.

Waste Minimisation/Reduction

All efforts will be made by site management to minimise the creation of waste throughout the project. This will be done by:

- material ordering will be optimised to ensure only the necessary quantities of materials are delivered to site
- material storage areas will be of a suitable design and construction to adequately protect all sorted materials to ensure no unnecessary spoilage of materials occurs which would generate additional waste
- all plant will be serviced before arriving on site. This will reduce the risk of breakdown and the possible generation of waste oil/hydrocarbons on site
- all operators will be instructed in measures to cut back on the amount of wastage for trimming of materials etc. for example cutting of plywood, built into the amount ordered
- educating foremen and others to cut/use materials such as ply wisely for shutters etc.
- prefabrication of design elements will be used where suitable to eliminate waste generation on site
- where materials such as concrete are being ordered, great care will be practiced in the calculation of quantities to reduce wastage.

Waste Reuse

When possible, materials shall be re used onsite for other suitable purposes e.g.

- re-use of shuttering etc. where it is safe to do so
- re-use of rebar cut-offs where suitable
- re-use of excavate materials for screening, berms etc.
- re-use of excavated material etc. – where possible will be used as suitable fill elsewhere on site for the new site tracks, the hardstanding areas and embankments where possible.

Waste Recycling & Recovery

In accordance with national waste policy, source separation of recyclable material will take place. This will include the provision of receptacles for the separation and collection of dry recyclables (paper, cardboard, plastics etc.), biological waste (canteen waste) and residual waste.

Receptacles will be clearly labelled, signposted and stored in dedicated areas.

The following sourced segregated materials container will be made available on site at a suitable location:

- timber
- ferrous metals
- aluminium
- dry mixed recyclables
- packaging waste
- food waste.

The materials will be transported off-site by a licensed contractor to a proposed recovery centre and these materials will be processed through various recovery operations.

Waste Disposal

Residual waste generated on-site may require disposal. This waste will be deposited in dedicated receptacles and collected by the licensed waste management contractor and transported to an appropriate facility. All waste movements will be recorded, of which records will be held by the waste manager on-site.

Contaminated Material

Any contaminated soils will be handled, removed and disposed of in accordance with statutory requirements for the handling, transportation and disposal of waste. In particular, the following measures will be implemented:

- Contaminated material will be left in-situ and covered, where possible until such time as WAC (Waste Acceptance Criteria) testing is undertaken in accordance with recommended standards and in-line with the acceptance criteria at a suitably licenced landfill or treatment facility. This will determine firstly the nature of the contamination and secondly the materials classification i.e. inert, non-hazardous or hazardous,
- If the material is deemed to be contaminated, consultation will take place with the respective local authority and/or EPA on the most appropriate measures. Such materials will be excavated, transported by a contractor with a valid waste collection permit and recovered/disposed of at an appropriate facility.

Training

Copies of the project waste management plan will be made available to all relevant personnel on site. All site personnel and sub-contractors will be instructed about the objectives of the Plan and informed of the responsibilities that fall upon them as a consequence of its provisions.

It will be the responsibility of the contractors appointed (Waste Manager) to ensure that all personnel are made aware of their responsibilities under the plan via a toolbox talk or otherwise.

4.3.8 Outline Traffic Management Plan

This document is the Construction Traffic Management Plan (TMP) for the proposed Dernacart Wind Farm, Co. Laois. The Construction Traffic Management Plan shall be finalised in accordance with this outline plan following the appointment of the contractor for the main construction works and the turbine supply contract.

Please note that some items in this plan can only be finalised with appropriate input from the contractor who will actually carry out and schedule the works. Furthermore, it is appropriate that the Project Supervisor Construction Stage (PSCS), when appointed, should have an active role in the preparation/review of the Traffic Management Plan.

This plan should be read in conjunction with Chapter 10 of the EIAR.

The contractor is required to prepare the necessary Site-Specific Traffic Management Plans prior to the construction works commencing in accordance with Chapter 8 of the Traffic Signs Manual and subject to load permits.

The contractor will be responsible for the implementation of all agreements between the developer and Laois County Council with the objective that the transportation needs for the proposed development will have a minimal impact on the road network and local communities.

As with any construction development project, the transport of materials onto the site will give rise to increased traffic and associated impacts. However due to the very nature of construction these impacts will be temporary.

Construction traffic will require regular access to the site at varying times throughout the construction phase.

The aim of this TMP is to put in place procedures to manage traffic effectively on site and in the immediate vicinity of the proposed development, to ensure the continued movement of traffic on the public roads and to minimise disturbance during transportation of materials particularly oversize loads.

The correct implementation of this TMP will ensure that appropriate procedures are in place to minimise any effects on the safety and movement of the general public.

Prior to the commencement of construction, the TMP will be reviewed by the main contractor (and any sub-contractors) and will be updated as necessary.

General Traffic Management Measures

General measures that shall be addressed in the TMP shall include:

1. **Traffic Management Coordinator** - A dedicated competent Traffic Management Coordinator will be appointed for the duration of the project and this person will be the main point of contact for all matters relating to traffic management on the project.
2. **Road to be used and not used** - The final TMP will clearly identify those roads that will be used to access this project and those roads that are not to be used. The appointed contractor will propose the haul routes for construction once they have confirmed the quarries to be used during construction. In some cases, An Garda Síochána and the roads authority may direct/agree that certain roads cannot be used for laden HGV's but can be used for LGV's or unladen HGV's.
3. **Proposals for one-way systems on local roads** - in acknowledgement of the fact that some of the local roads are relatively narrow and generally not conducive to 2-way construction traffic movements, a system of one-way construction traffic movements will be implemented for sub-sections of the wind farm construction works which will temporarily use the local road network. Confirmatory details of these traffic plans will be agreed in advance of construction of these sub-sections of the wind farm with the Roads Authority.
4. **Road Pre-and Post-Construction Condition Survey** - A pre-condition survey will be carried out on all public roads that will be used in connection with the works to record the condition of the road before the works commence. A post construction survey will also be carried out after the works are completed. The specification and timing of the surveys will be agreed with Laois County Council's roads authority. Joint surveys shall be undertaken if the roads authority so requires/agrees.
5. **Road Reinstatement** - As agreed with Laois County Council, all roads will, upon completion of the construction works, be expeditiously reinstated to their pre-works condition or better and to the satisfaction of the relevant Roads Authority. If, during the course of the construction works, some of the roads used in connection with the development are damaged then these roads will be made good to the satisfaction of the Roads Authority without delay.
6. **Site Inductions** - All workers will receive a comprehensive site induction which will include, as appropriate, a section on traffic management and clear guidance on the routes to be used/not used.
7. **24 Hour Emergency Phone Number** - A 24-hour emergency phone number will be maintained for the duration of the construction works and the number will be noted on temporary signage at each works area (for cable works) and at the site entrance at a minimum.
8. **Orderly Traffic Management** - All necessary temporary traffic management will be planned and executed in accordance with best practice, including Chapter 8 of the Traffic Signs Manual as published by the NRA/Department of Transport.
9. **Letter Drops** - Subject to agreement with the planning authority, a letter drop will be carried out to notify members of the public living near the proposed site/route/roadworks where necessary, to advise them of any particularly significant upcoming traffic-related matters e.g. temporary lane/road closure (if required) or delivery of turbine components at night.
10. **Clear signage** - A system of clear signage relating to the project, both temporary and permanent will be agreed with the planning authority. These signs will also identify those roads to be used (and not to be used) for accessing the site in line with the objectives of the TMP.
11. **Wheel washing facilities** - temporary wheel washing facilities will be located at the site entrance, subject to agreement with the planning authority, to prevent soil/dirt from being transported onto the public road network.

12. **Road sweepers** will be utilised where required to maintain the public roads in a clear condition, and this will apply especially during the earthworks stages of the project.
13. **The site entrance** will be secured and locked when not in use. Where required, the entrance will be controlled by flagmen to assist traffic movements.

Mitigation Measures –Turbine Delivery Route

14. **Programme of Deliveries** – As agreed with Laois County Council, a programme of deliveries will be submitted to Laois County Council in advance of deliveries of turbine components to site. The programme will include details of the dates and times of each turbine component delivery along with the weight of each load, the route to be taken and details on support vehicles.
15. **Reinstatement** – Any areas affected by the works to facilitate turbine delivery will be fully reinstated to their original condition.
16. **Consultation** with the local authorities should be included in the contractor's traffic management plan to manage turbine component deliveries where necessary.
17. **Detailed Structural Surveys of Crossings** - Visual inspections indicate that all existing crossings along the TDR between the M4 and the proposed site entrance are capable of safely carrying the expected loads. Where required structural surveys of selected crossings along the TDR can take place during the detailed design phase prior to commencement.

Mitigation Measures –Cable Works

18. **Road Opening Licence** - The road works associated with the cabling will be undertaken in line with the requirements of a road opening licence as agreed with Laois County Council and Offaly County Council.
19. **Route Proving** – in advance of the main cabling works, 'route proving' will be carried out to define the precise alignment of the cables to be laid. This route proving process will include slit trenching with the aim of avoiding, where possible, existing services in the road. This step will allow for the cabling works to be carried out as expeditiously as possible thereby minimising the impact on road users.
20. **Maintain local access during diversions and road closures** – reasonable access to local dwellings, farms and businesses will be maintained at all times during any road closures associated with the cable works. The details of this will be agreed with the Roads Authority in advance of the works in consultation with the local residents in so far as is practicable.

The network of local roads in the area will be used for traffic diversions for local traffic in order to expedite the works and limit the duration of the impact owing to the cabling works.
21. **Road Cleanliness** – Appropriate steps will be taken to prevent soil/dirt generated during the trenching works from being transported on the public road. Road sweeping vehicles will be used to ensure that the public road network remains free of soil/dirt from the site.
22. **Temporary Trench Reinstatement** - Trenches on public roads, once backfilled, will be temporarily reinstated without delay to the satisfaction of the Roads Authority.
23. **Surface Overlay after Trench Reinstatement** – Following temporary reinstatement of trenches on public roads, and subject to agreement with the Roads Authority, sections of public roads along which the cable route travels will receive a surface overlay.
24. **Haul Route Interface** - Aggregate imported to the wind farm site from indicative quarry locations would be managed where possible to not coincide with the grid connection works.

Mitigation Measures – Operational Phase

No mitigation measures required.

Mitigation Measures – Decommissioning

All decommissioning works are to be carried out in accordance with a decommissioning plan (including details of traffic management) to be agreed with the planning authority in advance of the works.

Construction Staging

The approximate period of construction for completion of the total scheme is estimated to take 12 months. Once the bulk civil works are completed, grid connection works will take place, followed by an element of testing and commissioning of the wind farm and substation. It is anticipated that traffic associated with this element of the works will be minimal, with between 2 and 4 crew vans accommodating the movement of staff to and from the site.

The construction of Dernacart Wind Farm will generally include a sequence of distinct construction activities:

- Construction of main road access, site entrances and amenity trail.
- Initial installation of on-site access tracks and fence lines.
- Development of the construction compounds and other temporary works.
- On-site tracks and drainage.
- Preparation of crane hard standings.
- Construction of foundations.
- Installation of cabling within wind farm
- Installation of Wind Turbine Generators (WTGs).
- Met mast construction.
- Installation of cabling, substation and control building.
- Grid connection works.
- Land reinstatement.

Construction Plant and Vehicles

The typical construction plant and vehicles used as part of the construction of a wind farm site are as follows (non-exhaustive):

- Hydraulic Excavators
- Dump Trucks
- General construction delivery vehicles (e.g. steel reinforcement bar, electrical components etc.)
- Concrete trucks and pumps
- Cranes of various lifting capacities (up to 1000 tonnes)
- Oversized articulated delivery vehicles (for turbine component transport)
- Site Jeeps (off-road 4x4 all purpose vehicles)
- Private vehicles of those employed on site for the construction phase

It should be noted however that final selection of construction plant and vehicles may vary depending on suitability, availability, contractor's choice, etc.

Plant operators will be responsible for the upkeep and maintenance of construction plant and vehicles, ensuring good working order prior to use. Should emergency maintenance need to be carried out on site, this will be carried out at a designated area away from sensitive receptors and will ensure that a spill kit is nearby.

The hours of construction activity will be limited to avoid unsociable hours as per Section 8.5 (d) of the code of practice for BS 5228: Part 1: 1997.

Construction operations shall generally be restricted to between 07:00 hours and 19:00 hours Monday to Saturday. It should be noted that it may be necessary to commence turbine base concrete pours earlier due to time constraints incurred by the concrete curing process.

Work on Sundays or public holidays will only be conducted in exceptional circumstances or in an emergency. Additional emergency works may also be required outside of normal working hours as quoted above.

Construction commencement dates are yet to be confirmed at this stage; these will be made known to the Planning Authority by way of formal Commencement Notice.

Construction Compounds

There is one temporary construction compound.

Consultation and Notification

An Garda Síochána

Following the appointment of the successful contractor for this project, this Outline Transport Management Plan shall be finalised following the appointment of the contractor for the main construction works. The contractor will liaise directly with An Garda Síochána in relation to the plan and any concerns/requirements they have will be incorporated in to the plan. This may include details in relation to the escorting of oversized loads.

The necessary permits (including approved route permits) will be applied for and obtained from An Garda Síochána.

County Council

The contractor will liaise directly with the County Council in relation to the plan and any concerns/requirements they have will be incorporated in to the plan. The contractor will also liaise with other local authorities, as necessary, along the final turbine delivery route.

The necessary permits (including standard permits) will be applied for and obtained from the relevant local authorities.

Local Residents

The following measures will be used to communicate the necessary information to the households along the local road to be used as a haul road:

- (a) Information signs will be erected in advance of the construction/transportation works.
- (b) A flyer drop will be carried out to advise households along the local road leading to the site in relation to the programme of construction works and especially in relation to oversized load movements.
- (c) Contact details for a Liaison Officer will be provided so that any concerns can be easily channelled to the Developer.

Complaints will be entered into the site complaints log and the relevant site environmental officer will arrange to meet with those affected. The situation will be acted upon immediately and reviewed by the Project Manager.

Emergency services

In the event of an emergency the emergency services will be contacted at 999 or 112.

Key Personnel and Responsibility

Once prepared and agreed with Laois County Council and An Garda Síochána the contractor will implement the project specific Traffic Management Plan (TMP).

Please note that some items in this plan can only be finalised with appropriate input from the contractor who will carry out and schedule the works. Furthermore, it is appropriate that the Project Supervisor Construction Stage (PSCS), when appointed, should have an active role in the preparation/review of the Traffic Management Plan.

Typically, the following members of the contractors' staff will have responsibility for adherence to the TMP as follows:

Traffic Management Coordinator	<p>The Traffic Management Coordinator will be responsible for maintaining regular contact with An Garda Síochána, Laois County Council, the statutory bodies and the client concerning traffic control, interference with services and co-ordination of crossings at roads, rivers and railways.</p> <p>The Transport Management Coordinator will contact the relevant bodies in relation to method statements prior to the work taking place. The Transport Management Coordinator will be responsible for instructing the Construction Manager, Foreman and all other personnel on the information in the agreed method statement prior to the work commencing and ensuring that the method statement is adhered to.</p> <p>The Transport Management Coordinator will be responsible for ensuring that the Traffic Management Plan will be implemented in full.</p>
Safety Officer	<p>The Safety Officer will be responsible for implementing all safety requirements detailed in the Project Safety Plan. Ensure that all operatives receive site safety induction prior to commencing work on site. They will ensure that all plant, particularly lifting equipment, on site has the relevant certification and are checked regularly by a competent person. The Safety Officer will carry out safety audits and checks on a regular basis and amend procedures where necessary.</p>
Construction Manager	<p>The Construction Manager will be responsible for overall supervision of the operations to ensure they are constructed in a safe and efficient manner. They will ensure that sufficient resources are available to meet the programme and that the necessary information is provided to the appropriate staff.</p>
Foreman	<p>The Foreman is responsible for ensuring that the crew carry out the work in accordance with the method statement and contract specifications and drawings using good working practices in a safe manner. The will supervise construction personnel ensuring their competence. He will check all plant and equipment on a regular basis ensuring it is maintained and in good working order.</p>

Wind Turbine Generator Deliveries

A detailed turbine delivery route assessment has been carried out for the project which can be found in Appendix 1 of this CEMP.

The components of up to 8 no. Wind Turbine Generators (WTG's) will be transported by road to the proposed development for on-site assembly, using the access route outlined in the above Turbine Delivery Route Assessment Report.

Wind turbine component deliveries, cranes and all large plant associated with turbine installations will use the turbine delivery route.

Restricted Public Road Use by Construction Traffic

The local authority may impose restrictions on the use of some local roads. These will be agreed in liaison with Laois County Council prior to construction and will be outlined in this section, as well as specific signage requirements for construction works.

Materials will be delivered to site where possible via the indicative haul routes shown in Figure 10.5 of the EIAR.

Road Closures, Diversions and Safety Measures for Road Crossings

It is envisaged that road closures will be necessary for the carrying out portions of the cable trenching, with the majority of the proposed cable trenching taking place within the road corridor. The consent of Laois County Council will be required and the necessary road diversions together with the appropriate signage will be put in place. As there is a good network of local roads, it is anticipated that there are a number of options available for diverting traffic which will allow flexibility during this process of construction and maintain local access at all times during this element of the works.

It is proposed to maintain local access at all times during this element of the works. It is proposed that all access points (domestic, business, farm) are considered when finalising the temporary road closures and diversions. Diversion signage should also be included.

Safety measures for road users adjacent to deep excavations, such as temporary concrete barriers should be detailed for Trenchless Road Crossings in advance of construction and agreed with the County Council.

Road Cleaning

Public roads shall be kept free of mud, dust, spillages and debris from the construction site, construction plant or haulage vehicles. Any necessary measures shall be put in place at the site entry/exit points.

Carriageway/ Road Reinstatement

It is anticipated that the proposed haul routes will be capable of accommodating the construction traffic associated with the project. After the main contractor is appointed and the haul routes are agreed with Laois County Council. In the event that there are concerns around the structural capacity of a road on a proposed haul route, a structural survey shall be carried out to determine suitability of the existing roads to carry the loading. Where the structural survey indicates that a proposed haul route is not in a suitable condition, details of any upgrading works required shall be submitted to Laois County Council for approval. The developer shall upgrade the road or junction in advance of haulage operations.

A pre-condition survey of haul routes, consisting of a video survey and photographs shall be carried out and a copy submitted to Laois County Council. Any damage caused to the road shall be repaired to its previous condition, to the satisfaction of Laois County Council. Any defects that appear during the haulage period shall be rectified by the project owner.

Íarnród Éireann Cable Crossings and Safety Measures

There are three railway crossings as part of the grid connection. The applicant will liaise with Irish Rail with regard to their requirements.

Additional Information and Mitigation Measures

Turbine Delivery Route

The TDR has been considered and chosen following route analysis by Stakraft. The TDR selection report entitled 'Dernacart Wind Farm Route Assessment' is provided in Appendix 1 and is referred to hereunder as the "TDR Report".

The report identifies all alterations needed at bends and junctions required for turbine component delivery to the Dernacart Wind Farm.

The selection of the TDR has been undertaken to eliminate as far as possible and minimise any disruption to the road network to facilitate the delivery of wind turbine generators from the port of delivery to the site.

Due to the oversized nature of the wind turbine components, some alterations will be required along the route. These points along the route are termed Node Points and there are 2 Node Points along the TDR.

Node 1 – at the junction of the L2092 and the N82, lands have been acquired to allow turning for the delivery truck.

The appointed contractor will undertake adequate traffic management when performing these works to minimise impacts on local road users. Boundaries will be reinstated, and hedge planting undertaken as required following delivery of the turbine components.

- Programme of Deliveries – As agreed with Laois County Council, a programme of deliveries will be submitted to Laois County Council in advance of deliveries of turbine components to site. The programme will include details of the dates and times of each turbine component delivery along with the weight of each load, the route to be taken and details on support vehicles.
- Reinstatement – Any areas affected by the works to facilitate turbine delivery will be fully reinstated to their original condition.
- Consultation with the local authorities should be included in the contractor's traffic management plan to manage turbine component deliveries where necessary.
- Detailed Structural Surveys of Crossings - Prior to commencement of works on site, a structural survey of crossings along the TDR between the M6 and the site entrance be carried out by a suitably qualified engineer.

Cable Works

- Road Opening Licence - The road works associated with the cabling will be undertaken in line with the requirements of A road opening licence as agreed with Laois County Council.
- Maintain local access during diversions and road closures – reasonable access to local dwellings, farms and businesses will be maintained at all times during any road closures associated with the cable works. The details of this will be agreed with the Roads Authority in advance of the works in consultation with the local residents in so far as is practicable. The network of local roads in the area will be used for traffic diversions for local traffic in order to expedite the works and limit the duration of the impact owing to the cabling works.
- Road Cleanliness - Appropriate steps will be taken to prevent soil/dirt generated during the trenching works from being transported on the public road. Road sweeping vehicles will be used to ensure that the public road network remains free of soil/dirt from the site.
- Temporary Trench Reinstatement - Trenches on public roads, once backfilled, will be temporarily reinstated without delay to the satisfaction of the Roads Authority.
- Surface Overlay after Trench Reinstatement – Following temporary reinstatement of trenches on public roads, and subject to agreement with the Roads Authority, sections of public roads along which the cable route travels will receive a surface overlay.
- Haul Route Interface - Aggregate imported to the wind farm site from indicative quarry locations would be managed where possible to not coincide with the grid connection works.

Haul Routes

The indicative haul route, as presented on Figure 10.5 of the EIAR, shows the routes that will be taken by most construction traffic to the wind farm from indicative quarry locations.

The proposed site entrance design is shown on planning application drawing P1892-0101-0001.

At the site entrance, sightlines of 160m are achieved in both directions at a setback distance of 3m and is designed in accordance with TII guidelines (DN-GEO-03060). Advance signage will be provided on the local road in both directions to alert road users to the presence of HGVs and the proximity of the construction site.

Minor roadside hedgerow trimming, and some limited tree removal will be required immediately to the east and west of the proposed entrance in order to maintain the above-mentioned sightlines. The proposed design has been developed with an "X" distance of 3m which is the allowable relaxed standard for new accesses on regional and local roads.

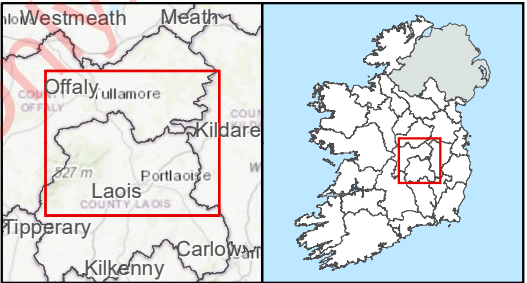
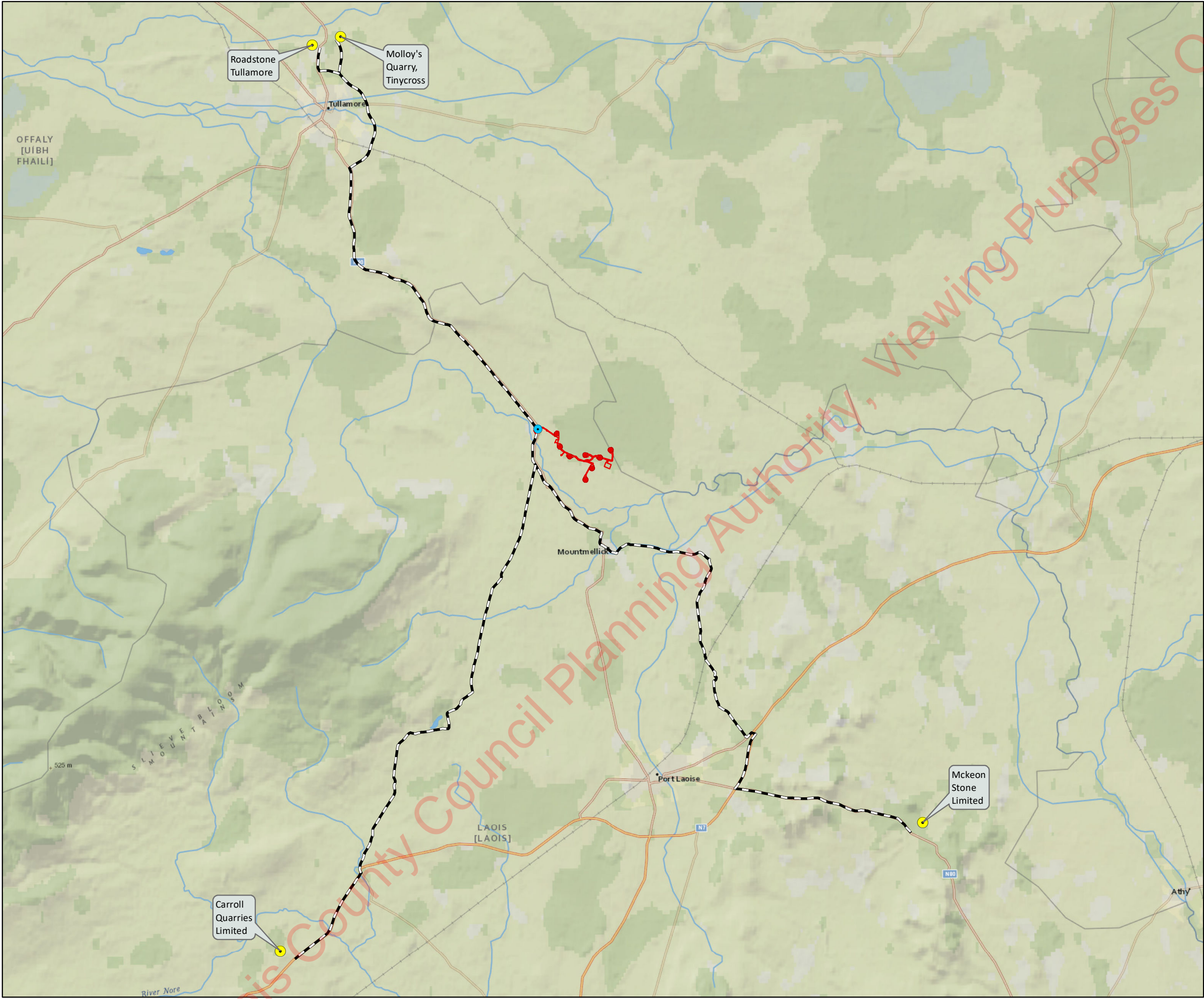
The internal road layout of the wind farm has been designed to ensure connectivity between various parts of the wind farm without the need to use existing local roads. The design of this internal road network and the connectivity it provides will significantly reduce the need to use local roads during the construction of the proposed wind farm.

Operational Stage Impacts and Mitigation

There will be no significant operational stage traffic impacts associated with the proposed development.

Decommissioning Stage

On decommissioning, the adoption of and adherence to a decommissioning plan which will include traffic management proposals will ensure that the residual impacts on traffic and transport at the decommissioning stage will not be significant.



- Quarries
- Proposed Site Entrance
- Proposed Turbines
- Proposed Planning Boundary
- Potential Haul Routes

TITLE:		Potential Haul Routes	
PROJECT:		Dernacart Wind Farm	
FIGURE NO:		4.9	
CLIENT:		Statkraft	
SCALE:	1:150000	REVISION:	0
DATE:	30/01/2020	PAGE SIZE:	A3

4.4 Environmental Management Team - Structure and Responsibility

A preliminary organisation chart is included in Figure 4-10. Revisions to the project organisation chart shall be controlled independently of this plan following the appointment of the Contractor for the main construction works.

The Contractor's Project Manager will be responsible for the delivery of all elements of the Environmental Management Plan.

The Contractor's Project Manager will retain all responsibility for issuing, changing and monitoring the Environmental Management Plan throughout.

4.5 Training, Awareness and Competence

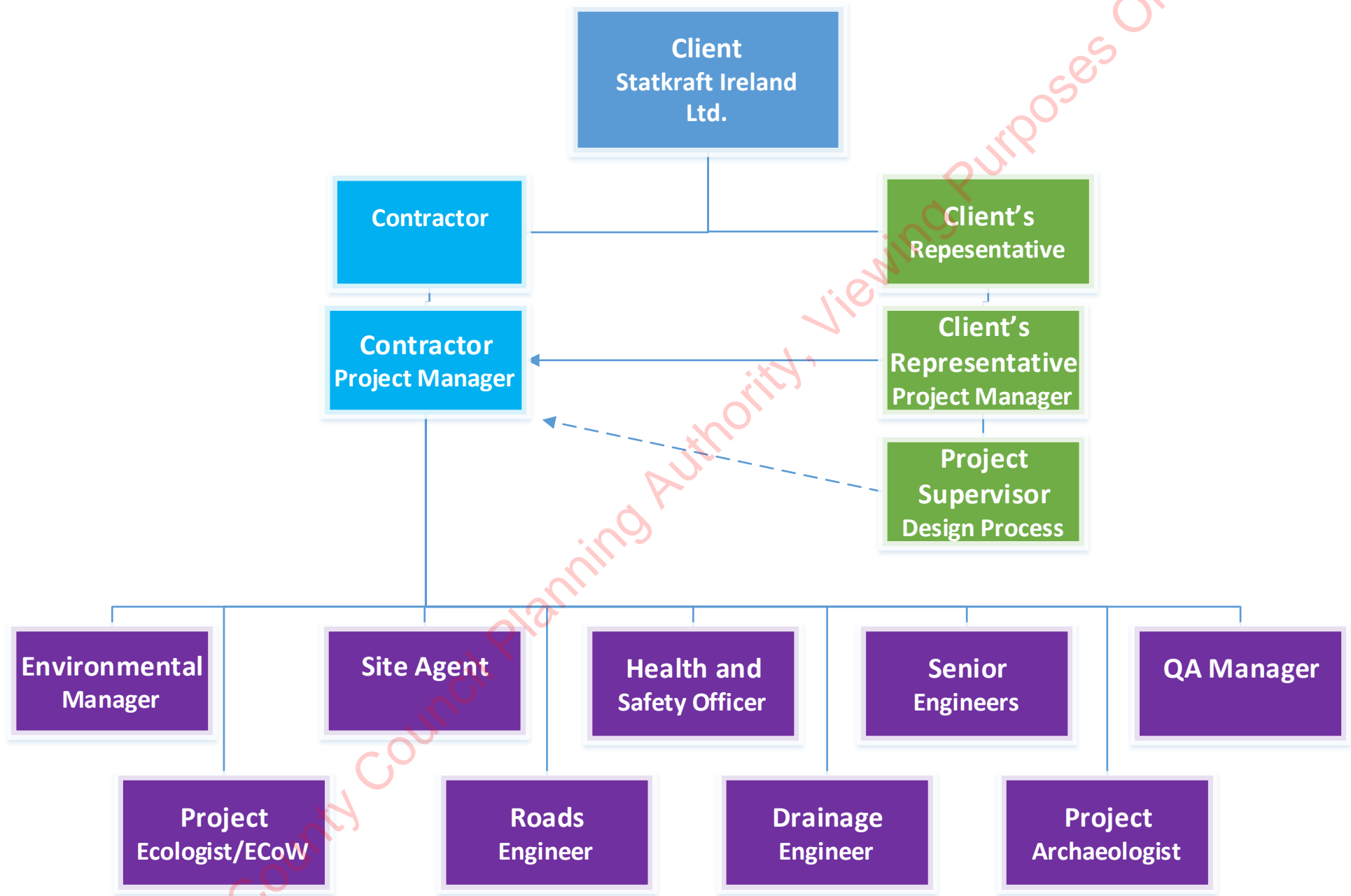
All site personnel will receive environmental awareness information as part of their initial site briefing. The detail of the information should be tailored to the scope of their work on site.

The contractor for the main construction works may decide to conduct the environmental awareness training at the same time as Health and Safety Training (often referred to as Site Inductions).

This will ensure that personnel are familiar with the environmental aspects and impacts associated with their activities, the procedures in place to control these impacts and the consequences of departure from these procedures.

The CEMP will be posted on the main site notice board during the project. The environmental performance at the site is on the agenda of the monthly project management meetings for the project.

Elements of the CEMP will be discussed at these meetings including objectives and targets, the effectiveness of environmental procedures etc. Two-way communication will be encouraged by inviting all personnel to offer their comments on environmental performance at the site.



4.6 Environmental Policy

The contractor is responsible for preparing and maintaining an Environmental Policy for the site. The policy should be appropriate to the project, commit to continuous improvement and compliance with legal requirements and provide a framework for objectives and targets. This will be communicated to all site personnel and will be available on site notice boards.

4.7 Register of Environmental Aspects

The contractor is responsible for preparing and maintaining a *Register of Environmental Aspects* pertaining to the site. This register will identify the environmental aspects associated with activities onsite and determine which aspects have or can have a significant impact on the environment.

4.8 Register of Legislation

The contractor is responsible for preparing and maintaining a register of key environmental legislation pertaining to the site. This register will reference all current environmental legislation and will be inspected, reviewed and updated regularly to ensure compliance.

4.9 Objectives and Targets

Objectives and targets are required to be set to ensure that the project can be constructed and operated in full accordance with the EIAR, planning conditions and legislative requirements, with minimal impact on the environment.

Environmental objectives are the broad goals that the contractor must set in order to improve environmental performance. Environmental targets are set performance measurements (key performance indicators or KPI's) that must be met in order to realise a given objective.

The contractor will set objectives based on each significant environmental impact. Key objectives are likely to include the following:

- To ensure that the rivers and streams are not negatively impacted by construction works.
- To ensure that humans are not negatively impacted by dust generated by construction works.
- To ensure that humans are not negatively impacted by noise or vibration generated by construction works.
- To ensure that impacts to habitats and wildlife are minimised during works.
- To ensure that a waste management plan for this site will be fully implemented.
- To ensure that the visual impact during the construction work is minimised.
- To ensure Dernacart Wind Farm is constructed in compliance with the EIAR and planning conditions

Performance in relation to each of these objectives will be reviewed on a regular basis by means of inspections, audits, monitoring programmes, etc.

4.10 Non-Conformance, Corrective and Preventative Action

Non-Conformance Notices will be issued where there is a situation where limits associated with activities on the project are exceeded, or there is an internal/external complaint associated with environmental performance.

Non-Conformance is the situation where essential components of the EMS are absent or dysfunctional, or where there is insufficient control of the activities and processes to the extent that the functionality of the EMS in terms of the policy, objectives and management programmes, is compromised. A Non-Conformance register should be controlled by the contractor.

The EMS and all its components must conform to the EMP, objectives and targets and the requirements of the ISO 14001 management standard.

In the event of non-conformance with any of the above, the following must be undertaken:

- Cause of the non-compliance;
- Develop a plan for correction of the non-compliance;
- Determine preventive measures and ensure they are effective;
- Verify the effectiveness of the correction of the non-compliance;
- Ensure that any procedures affected by the corrective action taken are revised accordingly.

Responsibility must be designated for the investigation, correction, mitigation and prevention of non-conformance.

4.11 EMS Documentation

The Contractor is required to keep the following documentation in relation to the environmental management of the project (as a minimum):

- Construction Environmental Management Plan for Dernacart Wind Farm
- Register of Environmental Impacts
- Register of Planning Conditions
- Monitoring Records
- Minutes of Meetings
- Training Records
- Audit and Review Records

All of these documents and records are to be available for inspection in the site office. The documentation shall be up to date and shall be reviewed on a regular basis with revisions controlled in accordance with the site quality plan.

4.12 Control of Documents

The Contractor will establish, implement and maintain a procedure to control CEMP documents and records so they are clearly identifiable, organised, current, easily located and revised when necessary.

5. SAFETY & HEALTH MANAGEMENT PLAN

5.1 Introduction

This Safety and Health Management Plan (SHMP) defines the work practices, procedures and management responsibilities relating to the management of health and safety during the design, construction and operation of the Dernacart Wind Farm and shall be read in conjunction with the Preliminary Safety & Health Plan prepared for the project by the Project Supervisor for the Design Process. The Safety and Health Management Plan shall be finalised in accordance with this outline plan following the appointment of the contractor for the main construction works.

This SHMP describes how the contractor for the main construction works will implement a site safety management system (SMS) on this project to meet the specified contractual, regulatory and statutory requirements, environmental impact statement mitigation measures and planning conditions. It is the contractor's responsibility to implement an effective safety management system to ensure that the developer's safety requirements for the construction of this project are met.

All site personnel will be required to be familiar with the requirements of the safety management plan as related to their role on site. The plan describes the project organisation and sets out the health and safety procedures that will be adopted on site.

- The Safety and Health Plan is a controlled document and will be reviewed and revised as necessary.
- A copy of the Safety and Health Plan will be located on/near the site H&S notice board.
- All employees, suppliers and contractors whose work activities cause/could cause impacts on the environment will be made aware of the SHMP and its contents.

5.2 Project Obligations

The construction of the Dernacart Wind Farm will impose numerous safety management obligations on the developer, designer and contractor. As well as statutory obligations, there are a number of specific obligations set out in the EIAR and in the planning conditions for the proposed wind farm. These obligations are set out below. The contractor for the main construction works and all of its sub-contractors are to ensure that they are fully aware of and in compliance with these safety obligations.

5.2.1 EIA Obligations

EIAR obligations are described in Section 4.2.1.

5.2.2 Planning Permission Obligations

Planning permission obligations will be fully outlined in the Contractor's CEMP.

5.2.3 Statutory Obligations

The Safety, Health and Welfare at Work Act 2005 and the Safety, Health and Welfare at Work (Construction) Regulations 2013 place a responsibility on the Developer as the "Client", the Designer, the Project Supervisors and the Contractor.

The Client must:

- Appoint a competent and adequately resourced Project Supervisor for the Design Phase (PSDP)
- Appoint a competent and adequately resourced Supervisor for the Construction Stage (PSCS)
- Be satisfied that each designer and contractor appointed has adequate training, knowledge, experience and resources for the work to be performed,

- Co-operate with the project supervisor and supply necessary information
- Keep and make available the safety file for the completed structure
- Provide a copy of the safety and health plan prepared by the PSDP to every person tendering for the project
- Notify the Authority of the appointment of the PSDP.

Designers must:

- Identify any hazards that their design may present during construction and subsequent maintenance
- Eliminate the hazards or reduce the risk
- Communicate necessary control measures, design assumptions or remaining risks to the PSDP so they can be dealt with in the safety and health plan
- Co-operate with other designers and the PSDP or PSCS
- Take account of any existing safety and health plan or safety file
- Comply with directions issued by the PSDP or PSCS.

The PSDP must:

- Identify hazards arising from the design or from the technical, organisational, planning or time related aspects of the project
- Where possible, eliminate the hazards or reduce the risks
- Communicate necessary control measure, design assumptions or remaining risks to the PSCS so they can be dealt with in the safety and health plan
- Ensure that the work of designers is coordinated to ensure safety
- Organise co-operation between designers
- Prepare a written safety and health plan for any project and deliver it to the client prior to tender
- Prepare a safety file for the completed structure and give it to the client.

The PSCS must:

- Co-ordinate the identification of hazards, the elimination of the hazards or the reduction of risks during construction
- Develop the Safety and Health Plan initially prepared by the PSDP before construction commences
- Co-ordinate the implementation of the construction regulations by contractors
- Organise cooperation between contractors and the provision of information
- Co-ordinate the reporting of accidents to the Authority
- Notify the Authority before construction commences
- Provide information to the site safety representative
- Co-ordinate the checking of safe working procedures
- Co-ordinate measures to restrict entry on to the site
- Co-ordinate the provision and maintenance of welfare facilities
- Co-ordinate arrangements to ensure that craft, general construction workers and security workers have a Safety Awareness card, e.g. Safe Pass and a Construction Skills card where required
- Co-ordinate the appointment of a site safety representative where there are more than 20 persons on site
- Appoint a safety adviser where there are more than 100 on site
- Provide all necessary safety file information to the PSDP
- Monitor the compliance of contractors and others and take corrective action where necessary;
- Notify the Authority and the client of non-compliance with any written directions issued.

The Contractor must:

- Co-operate with the PSCS
- Promptly provide the PSCS with information required for the safety file
- Comply with directions of the project supervisors
- Report accidents to the Authority and to the PSCS where an employee cannot perform their normal work for more than 3 days
- Comply with site rules and the safety and health plan and ensure that your employees comply
- Identify hazards, eliminate the hazards or reduce risks during construction
- Facilitate the site safety representative
- Ensure that relevant workers have a safety awareness card and a construction skills card where required
- Provide workers with site specific induction
- Appoint a safety officer where there are more than 20 on site or 30 employed
- Consult workers with site specific induction
- Monitor compliance and take corrective action.

Consequently, at all stages of the project there are statutory requirements for the management of safety, health and welfare of all involved in or affected by the development. As previously outlined this CEMP and specifically the Safety and Health Management Plan addresses key construction management issues associated with the proposed wind farm. This plan will be developed further at the construction stage, on the appointment of the Contractor for the main construction works.

5.2.4 The Management of Health and Safety during the Design Process

Fehily Timoney & Company (FTC) has been appointed Project Supervisor for the Design Process (to prepare the Environmental Impact Assessment Report and planning application for the proposed Dernacart Wind Farm development) and is competent to fulfil this role in accordance with the Safety, Health and Welfare at Work (Construction) Regulations, 2013. Health and safety are a major priority for FTC and FTC adopts health and safety practices that are an inherent part of a safe and sustainable business. FTC's objective is to provide a safe and healthy work environment for all and to meet our duties to clients, contractors and members of the public.

It is FTC's policy to comply fully with all health and safety legislation, in particular the Safety, Health and Welfare at Work Act, 2005, Safety, Health and Welfare at Work (General Application) Regulations 2007, and the Safety, Health and Welfare at Work (Construction) Regulations 2013.

FTC has developed in-house procedures to ensure, so far as is reasonably practicable, that all projects:

- are designed to be capable of being constructed to be safe/ without risk to health;
- can be operated and maintained safely and without risk to health during use; and
- comply in all respects, as appropriate, with the relevant statutory enactments and instruments.

These procedures include effective risk management procedures involving the identification and evaluation of risks and the development of mitigation measures to eliminate (where possible) or reduce those risks during the life-cycle of the project. The FTC team is committed to health and safety and shares responsibility for managing risk at all stages of a project.

All work by FTC is undertaken in a competent and efficient manner taking account of the general principles of prevention to safeguard the safety, health and welfare of construction & maintenance workers and other third parties.

The FTC procedures for the management of safety during the design process are outlined in the in-house procedure "Health and Safety Requirements in Design Projects" and is adhered to on all design projects.

The purpose of this procedure is to define the requirements for the management of health & safety during design projects, to ensure compliance with The Safety, Health and Welfare at Work (Construction) Regulations 2013.

The procedure includes standard forms which are used to communicate health and safety considerations within the design team and also guidelines which develop the company's health and safety procedure and outline the company's responsibilities for health and safety during the design process.

The procedure addresses health and safety issues at all stages of a project, from the preliminary design through to commissioning and operation. By establishing a chain of responsibility each party is clear on their role and obligations from a health and safety perspective. Risk assessments are carried out, at preliminary and detailed design stages by every discipline involved in the design. Each risk assessment is prepared by the designers and reviewed by the Health and Safety Facilitator for the project.

Risk assessments are used to identify hazards and assess risk at all stages during the life of the project including the construction & maintenance stages.

A Designers Safety File shall be kept and maintained during the design. All design criteria adopted, and safety & health information required for the Safety File shall be kept in this file which is the pre-cursor to the Safety File. The information required from the Contractor/ PSCS for inclusion in the Safety File is specified at tender stage in the Preliminary Safety and Health Plan.

This information from the PSCS & Contractor(s) and the Designers Safety File is used to compile the Safety File in the latter stages of a contract and formally issued to the Client on completion of the contract.

FTC promotes a collaborative approach to health and safety on site where the Client, PSDP, Designers, Contractors and PSCS co-operate with each other and share information. Joint site safety audits and/or walk-downs are carried out as part of this collaboration and safety is monitored and addressed on site on an ongoing basis. The regular safety meetings are held to document this ongoing co-operation, get an overview of works currently in hand onsite and about to commence and share information.

5.2.5 The Preliminary Safety and Health Plan

In accordance with the requirements of the Safety, Health & Welfare at Work (Construction) Regulations 2013 a Preliminary Safety & Health Plan will be required as part of the design process. This plan will be further developed by the PSCS on appointment and maintained as a live document during construction and commissioning of the development.

The safety and health plan is required to include the following information:

- a general description of the project;
- details of other work activities taking place on site;
- works involving particular risks;
- the timescale for the project and the basis on which the time frame was established;
- conclusions drawn by designers and the PSDP having taken into account the General Principles of Prevention and any relevant Safety and Health Plan or Safety File;
- the location of electricity water and sewage connections so as to facilitate early establishment of welfare facilities.

In accordance with the PSDP's procedures the Preliminary Safety & Health Plan for the proposed Dernacart Wind Farm development should include the following sections and subsections to ensure the PSCS is aware of the health and safety issues at tender stage and enable them to price accordingly:

Preamble:

- 1 General Project Information:
 - 1.1 Title
 - 1.2 Description of Project
 - 1.3 Employer
 - 1.4 Designers / Other Consultants
 - 1.5 Project Supervisor Design Process
 - 1.6 Drawings, Specifications and Other Documents
 - 1.7 Intended Contract Commencement Date
 - 1.8 Intended Contract Completion Date
 - 1.9 Basis for Contract Duration
 - 1.10 Restrictions on Working Hours
 - 1.11 Notification of Project
 - 1.12 Termination of the PSCS Appointment
- 2 The Existing Environment:
 - 2.1 Site Location
 - 2.2 Relevant Adjoining Land Uses
 - 2.3 Site Restrictions
 - 2.4 Restrictions on Access
 - 2.5 Hazardous Area Classification
 - 2.6 Existing Services
 - 2.7 Ground Conditions
 - 2.8 Existing Hazards
 - 2.9 Liaison with Statutory Bodies
- 3 Other Work Activities:
 - 3.1 Other Contracts Which May Affect Work
 - 3.2 Occupation of Site
 - 3.3 Building Activities
 - 3.4 Other Work Activities
 - 3.5 Emergency Procedures in Place on Site
- 4 Particular and Residual Risks:
 - 4.1 Works Which Puts Persons at Work at risk
 - 4.2 Work Which Puts Persons at Risk from Chemical or Biological Substances
 - 4.3 Work with Ionising Radiation
 - 4.4 Work near High Voltage Power Lines
 - 4.5 Work Exposing Persons at Work to the Risk of Drowning
 - 4.6 Work on Wells, Underground Earthworks and Tunnels
 - 4.7 Work Carried Out by Divers at Work Having a System of Air Supply
 - 4.8 Work Carried Out in a Caisson with a Compressed Air Atmosphere
 - 4.9 Work Involving the Use of Explosives
 - 4.10 Work Involving the Assembly or Dismantling of Heavy Prefabricated Components
 - 4.11 Work Involving Hazardous Material
 - 4.12 Residual Risks

- 5 Additional Information:
 - 5.1 Existing Documents
 - 5.2 Site Possession
 - 5.3 Site Rules
 - 5.4 Site Specific Safety Objectives
 - 5.5 Phasing of Works
 - 5.6 Permits / Authorisation Required
 - 5.7 Maintenance
 - 5.8 Continuing Liaison
 - 5.9 Specific Recommendations
- 6 Information Required for Safety File:
 - 6.1 Information Required for Safety File from PSCS

5.2.6 The Management of Health and Safety during the Construction Phase

The selection criteria for the Contractor for the works will be based on the ability to construct the works in a manner that will not endanger the safety, health and welfare of any parties and competence to fulfil the role of PSCS.

The contract will be awarded on the basis of assessment of the candidates against relevant health and safety criteria including experience of similar projects, knowledge of the construction processes involved and training of their management and staff who will be involved in carrying out the works.

5.2.7 The Construction Stage Safety and Health Plan

In accordance with the requirements of the Safety, Health & Welfare at Work (Construction) Regulations 2013 the preliminary Safety & Health Plan prepared by the PSDP will be further developed by the PSCS before the commencement of the construction work and updated on a regular basis during the construction phase of the project.

The document will include the following sections and subsections to ensure the management of health and safety during the construction phase of the project:

1. Description of Project:
 - project description and programme details
 - details of client, PSDP and PSCS, designers
 - main contractor and other consultants
 - extent and location of existing records and plans
 - arrangements for communicating with Contractors, PSDP and others as appropriate
2. Communication and Management of the Work:
 - management structure and responsibilities
 - safety and health goals for the project and arrangements for monitoring and review of safety and health performance
 - arrangements for:
 - regular liaison between parties on site
 - consultation with the workforce
 - the exchange of design information between the Client, Designers, Project Supervisor for the Design Process, Project Supervisor Construction Stage and Contractors on site
 - handling design changes during the project

- the selection and control of contractors
 - the exchange of safety and health information between contractors
 - security, site induction, and on-site training
 - welfare facilities and first aid
 - the production and approval of risk assessments and method statements
 - the reporting and investigation of accidents and other incidents (including near misses)
 - site rules
 - fire and emergency procedures
3. Arrangements for Controlling Significant Site Risks:
- safety risks
 - services, including temporary electrical installations
 - preventing falls
 - work with or near fragile materials
 - control of lifting operations
 - dealing with services (water, electricity and gas)
 - the maintenance of plant and equipment
 - poor ground conditions
 - traffic routes and segregation of vehicles and pedestrians
 - storage of hazardous materials
 - dealing with existing unstable structures
 - accommodating adjacent land use
 - other significant safety risks
 - health risks:
 - removal of asbestos
 - dealing with contaminated land
 - manual handling
 - use of hazardous substances
 - reducing noise and vibration
 - other significant health risks

The construction stage safety and health plan will be maintained on site by the PSCS and will be communicated to all relevant parties on an ongoing basis through inductions, site safety meetings and tool box talks etc. as required.

6. OUTLINE EMERGENCY RESPONSE PLAN

6.1 Introduction

This chapter of the CEMP presents an Outline Emergency Response Plan for the proposed development. The Emergency Response Plan shall be finalised in accordance with this outline plan following the appointment of the contractor for the main construction works and following detailed design development.

This outline Emergency Response Plan contains predetermined guidelines and procedures to ensure the safety, health and welfare of everybody involved in the project and to protect the environment during the construction phase of Dernacart Wind Farm. This outlines the immediate response to an emergency or disaster situation and will be developed by the main construction works contractor and PSCS as part of their construction stage Safety and Health Plan.

An emergency is any disruptive or harmful event that endangers people, environment, property or assets. Emergencies can be small, as in a fire contained by employees using firefighting equipment or large, as in a disaster resulting from a storm.

In the context of the Dernacart Wind Farm, examples of Emergency Response Plan emergency events are:

- medical emergency
- explosion
- overheated equipment
- chemical and fuel spill
- fire
- loss of power
- vehicle incidents

Example sources of emergency or disaster events are:

- unstable/inappropriate stockpiles on site
- faulty or incorrect use of equipment
- falls from height
- smoking
- storm/adverse weather
- power failure
- fuel spill
- road failure
- serious vehicle collisions or overturning

6.2 Emergency Response Plan

An emergency response plan deals with the immediate physical effects of a disaster and outlines the initial response.

6.2.1 Emergency Response Liaison

The contractor/PSCS will designate an individual to serve as the Emergency Response Liaison for this project. The emergency response liaison will coordinate the emergency response for the duration of any emergency at or nearby the project site.

Laois County Council, An Garda Síochána and the HSE Ambulance Co-ordinator will be provided with the construction programme and the onsite contact information from the Emergency Response Liaison prior to construction.

The Emergency Response Liaison will be immediately reachable at all times during project construction. The Liaison will coordinate with the above agencies to establish emergency procedures for access to and within the site in the event of an emergency.

6.2.2 Reporting Emergencies

In the event of fire, storm, flood, serious injury or other emergency, contact:

ALL ON SITE EMERGENCIES DIAL 999

6.2.3 Designated Responder

A map depicting tower locations with the emergency meeting point will be furnished to Laois County Council Fire Department and HSE ambulance co-ordinators.

Upon arrival on the scene, the senior EMS Officer will set up the incident command structure. The Emergency Response Liaison and all contractor's personnel will cooperate with directions of the incident commander and assist as directed.

The nearest emergency services, ambulance and Accident & Emergency (A&E) facilities are:

Service:	Contact Details:	
Accident & Emergency (A&E)	Midland Regional Hospital	(057) 86 213 64
Ambulance Service	Dial 112 or 999	
Fire Services	Dial 112 or 999	
Garda Station	Mountmellick Garda Station	(057) 862 4140
District HQ:	Portlaoise Garda Station	+353 57 867 4122
Divisional HQ:	Portlaoise Garda Station	+353 57 867 4122

Each member of the contractor's site team who are First-Aid and Cardiopulmonary Resuscitation (CPR) trained personnel will be identifiable with a hard hat sticker indicating their training.

6.2.4 Emergency Alarm

The emergency alarm will be raised on site as soon as an emergency situation is detected, the alarm will be identified (contractor to check those that apply):

	Air Horn		Radio		Voice		Hand Signals		Siren
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6.2.5 Emergency Reporting

In the event of an emergency the nearest supervisor with radio equipment/mobile phone will be notified. The degree of emergency will be reported to the Emergency Response Liaison who will contact the Emergency Services and request the appropriate emergency service.

6.2.6 Medical Protocol

In the event of a major medical emergency, the emergency centre (999) will be notified and an ambulance and emergency medical team will respond to the scene. All major medical cases require professional (ambulance) transportation. In the event of a minor medical case, the affected employee can be transported via company vehicle in the escort of a foreman or site engineer (with first aid training).

6.2.7 Emergency Response

Upon notification, the Emergency Response Liaison will respond to the emergency scene and manage emergency operations:

1. Assess hazards and make the area safe – If you cannot enter the area without risking your safety, don't do it, call the Emergency Services immediately and wait for them. If you think you can safely enter the area, look around the emergency scene for anything that can be dangerous or hazardous to you, the casualty, or anyone else at the scene. Bystanders can help with making the area safe. First aid kits will be available on site. Operators that have been first aid/CPR/AED trained will be listed on site and easily identifiable by a hard hat sticker.

2. Take charge of the situation – if you are the first-aid provider on the scene act fast. If someone is already in charge, briefly introduce yourself and see if that person needs any help. If there is any chance the casualty could have a head or spinal injury, tell them not to move.

3. Get Consent – always identify yourself as a first-aid provider and offer to help. Always ask for consent before touching a conscious adult casualty and always ask for consent from a parent or guardian before touching an unconscious or conscious child or infant. With an unconscious adult casualty consent is implied as it is generally accepted that most people want to live. Remember to protect yourself first by wearing gloves and eye protection.

4. Assess Responsiveness – is the casualty conscious or unconscious? Note their response while you are asking them for their consent. If they respond, continue with the primary survey, and if they don't respond, be aware that an unconscious casualty is or has the potential of being a breathing emergency.

5. Call out for help – this will attract bystanders. Help is always useful in an emergency situation. Someone can be called over to phone for medical help. Others can bring blankets if needed, get water, etc. a bystander can help with any of the following:

- Make the area safe.
- Find all the casualties.
- Find the first aid kit, or any useful medical supplies.
- Control the crowd.
- Call for medical help.
- Help give first aid, under your direction.
- Gather and protect the casualty's belongings.
- Take notes, gather information, be a witness.
- Reassure the casualty's relatives.
- Lead the ambulance attendants to the scene of the emergency.
- Notify Emergency Services as soon as you can. Either send a bystander or call yourself.

In the event of a major medical emergency the Emergency Response Liaison, as the person-in-charge of the emergency scene, will dispatch someone to the site access point nearest the emergency scene to direct and lead arriving outside responders to the emergency scene. The designated meeting point will be agreed prior to the commencement of construction. Emergency personnel will be met at this meeting point communicated by management during the 999 call. The emergency personnel escort will use the hazard lights on their vehicle, so they are easily identified.

6.2.8 Escape and Evacuation Procedure

Dependent upon the degree of the emergency and if safe to do so, employees will evacuate to the designated assembly area where the designated wardens shall account for all employees and determine if anyone still remains within the emergency scene.

Should a wild land fire or peat slippage occur, and the designated assembly area is compromised other locations will be designated as secondary assembly areas.

6.2.9 Tower Rescue Procedure

In the event personnel are trapped or injured in an elevated tower position the following protocol will be initiated:

1. The Emergency protocol will be initiated
2. Emergency Response Liaison will be notified
3. Tower Rescue Team will be activated and respond to the scene
4. Outside medical and Rescue Teams will be notified and respond to the scene.

Tower Rescue Procedure:

1. Upon learning of an emergency, the on-scene foreman shall assess the emergency and ascertain its degree, location and the extent of any injuries.
2. Upon confirming that an emergency exists the on-scene foreman notifies the Emergency Response Liaison and the project Office.
3. Upon notification of the emergency the Emergency Response Liaison shall notify senior project supervision and the local emergency centre (999) of the emergency.
4. The Emergency Response Liaison shall inform the dispatcher of the location, tower number, the degree of the emergency and the extent of injuries.

6.2.10 Prevention of Illness/Injury Due to Weather/Elements

1. All employees will have access to shelter and heat in the event of inclement weather.
2. Employees will have access to at least a litre of water at all times.
3. High wind warnings and weather forecast will be discussed every morning with the crews. Weather conditions and forecast will be monitored regularly by management.
4. No Employee will work alone. A buddy system will be used so employees can contact a supervisor in case of an emergency.

6.2.11 Environmental Emergency Procedure

An emergency preparedness and response procedure is required to prevent environmental pollution incidents. Emergency Silt Control and Spillage Response Procedures are included in Section 4.3.3 of this Outline CEMP.

Suitable spill kits and absorbent material for dealing with oil spills will be maintained on site. In the event of pollution or potential risk of pollution the Local Authority should be informed immediately.

In the case of water pollution in addition to the Local Authority, Inland Fisheries Ireland should also be informed immediately.

6.2.12 Emergency Response Plan – Haul Routes

Emergency Response Procedure relating to transportation of plant, equipment and materials to site to be developed by the main contractor during the construction phase of the wind farm.

Laois County Council Planning Authority, Viewing Purposes Only

Appendix 1

Turbine Delivery Report (TDR Report)



Dernacart Wind Farm

Route Assessment

M6 (Kilbeggan) to Site



Route Selection and Assessment

14/05/2019



Exceptional Load Services Ltd, Ballymoyle, Arklow, Co Wicklow, Ireland

T: +353-402-31229. E. permits@wide-loads.com

Customer	Statkraft Building 4200 Cork Airport Business Park Cork Ireland. T12 D23C
Delivery address	Dernacart, Mountmellick, Co Laois.
Survey Date	14/05/2019
Survey Personnel	Edwin Sunderland, ELS John Webb, ELS
Load Dimensions	88 x 4.5 x 4.5 x 65t
Route Surveyed	M6 (J5) – N52 – Tullamore – N80 – to site
Route Distance	28km
Route Assessment Criteria	<p>This route was surveyed and assessed on 14/05/2019 for transport of Wind Turbine Components from the National road network at Kilbeggan to WTG site at Baybridge, Mountmellick.</p> <p>Assessment based on moving a convoy of three loads overnight in a single movement.</p>
Route Requirements	<p>The route from Kilbeggan passes through three Local Authority areas and will require permits from each one (Westmeath, Offaly & Laois)</p> <p>Enabling works will be required at a number of points along the route.</p>

Proposed Route

M6 (J5) – N52 – Tullamore
– N80 – to site



Figure 1. Route Map

Proposed Route M6 – R401

M6 (J5) – N52 – Tullamore
– L2025 – N80 – to site

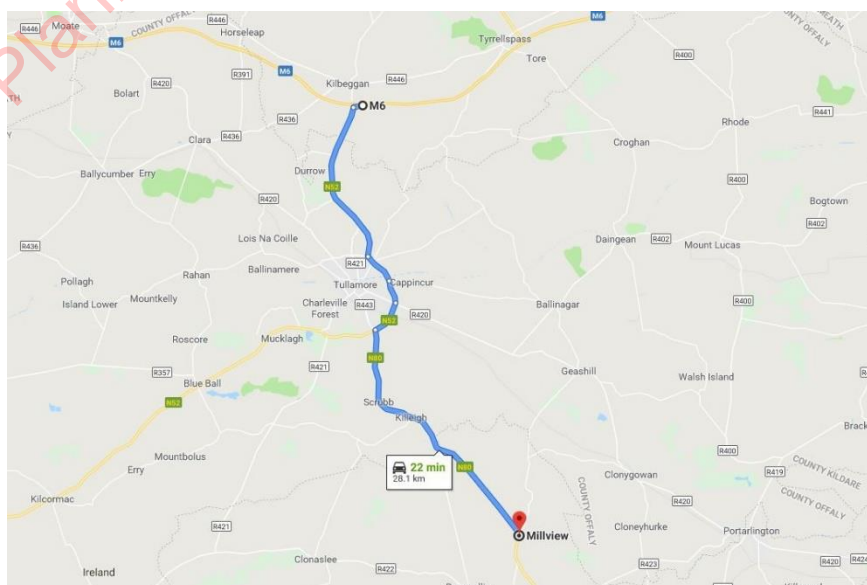


Figure 2 Surveyed Route Map

Area 1. M6 Exit (J5)

M6 – N52 South Roundabout

This roundabout will require a track cut through and over-sail area cleared of all street furniture



Figure 3.

Area 1.

M6 – N52 South Roundabout

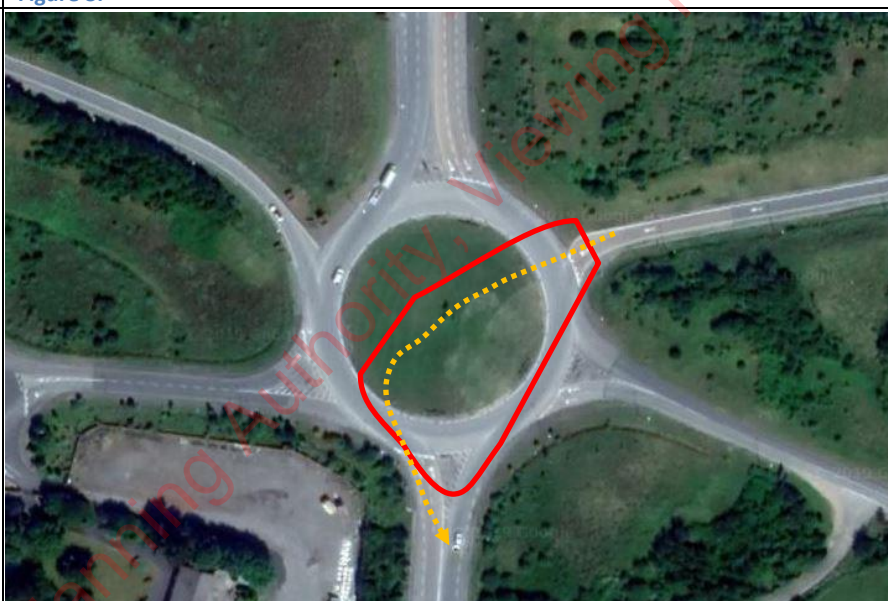


Figure 4. M6 – N52 Roundabout

Area 2. Ardan Roundabout

The proposed option for this roundabout is to build a track 5.5m wide through the centre. This will cause least disruption to regular traffic and will not require removal of any street lighting.

Street Furniture should be removed from roundabout entry and exit for each move.



Figure 5. Ardan Roundabout

Area 2. Ardan Roundabout

The proposed option for this roundabout is to build a track 5.5m wide through the centre. This will cause least disruption to regular traffic and will not require removal of any street lighting.

Street Furniture should be removed from roundabout entry and exit for each move.



Figure 6. Ardan Roundabout

Area 3. Cappincur Roundabout

Due to overall length of blades this roundabout is best negotiated by way of a straight through track.

A limited amount of Street Furniture should be removed from roundabout entry and exit for each move.



Figure 7.

Area 3. Cappincur Roundabout

A 'Grasscrete' or stoned loadbearing track, 5m wide through the centre island is recommended as it offers the safest, fastest and least disruptive method of getting through this junction. Street furniture removal is minimal and would not involve any street lighting



Figure 8. Cappincur Roundabout

Area 4. Cloncollig Roundabout

This roundabout has the same characteristics as the previous (Cappincur) and is best traversed on right side via a track through the centre island.



Figure 9.

Area 4. Cloncollig Roundabout

A 'Grasscrete' or stoned loadbearing track, 5m wide through the centre island is recommended as it offers the safest, fastest and least disruptive method of getting through this junction. Street furniture removal is minimal and would not involve any street lighting

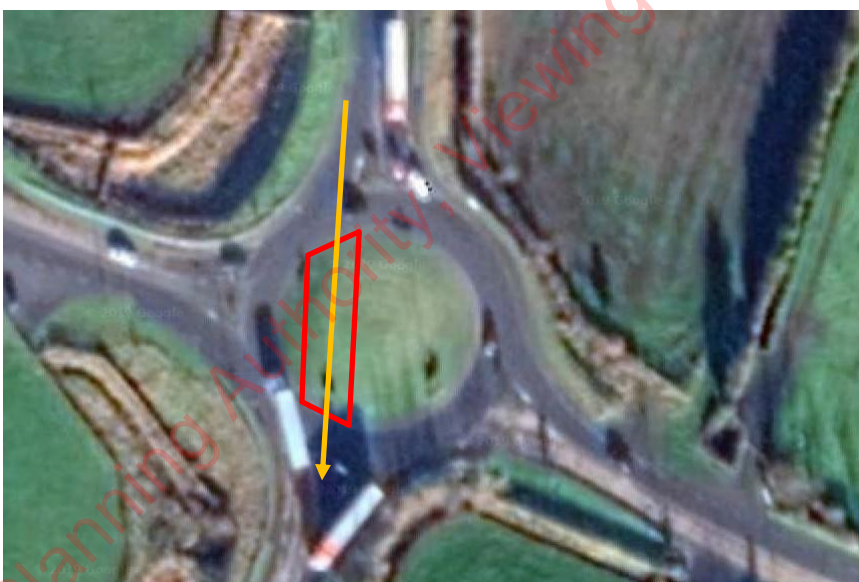


Figure 10.

Area 5.0. Clonminch Roundabout. (Left onto N80)

This area should be cleared of all street furniture and fences for mid over-sail.



Figure 11.

**Area 5.0. Clonminch Roundabout.
(Left onto N80)**

Depending on available land on the inside of the curve a small load bearing section may be required on the centre island.
All street furniture should be removed from both splitter islands.



Figure 12.

**Area 5.0. Clonminch Roundabout.
(Left onto N80)**

This area should be cleared and made load bearing for truck headroom up to street lamp.



Figure 13.

Area 6 N80. Right Curve

This right curve will require oversail on the right.
Hedge should be trimmed down to 1m over road level for 40m through point of bend.
No load bearing required.



Figure 14. N80. Right Curve.

Area 6 N80. Right Curve

This right curve will require oversail on the right.
Hedge should be trimmed down to 1m over road level for 40m through point of bend.
No load bearing required.



Figure 15

Area 7. N80 – L2092 Junction

Loads will need to turn locally to gain access to the L2092.



Figure 16. N80 – L2092 Junction

Area 7. N80 – L2092 Junction

This area is required for turning loads to enter the L2092

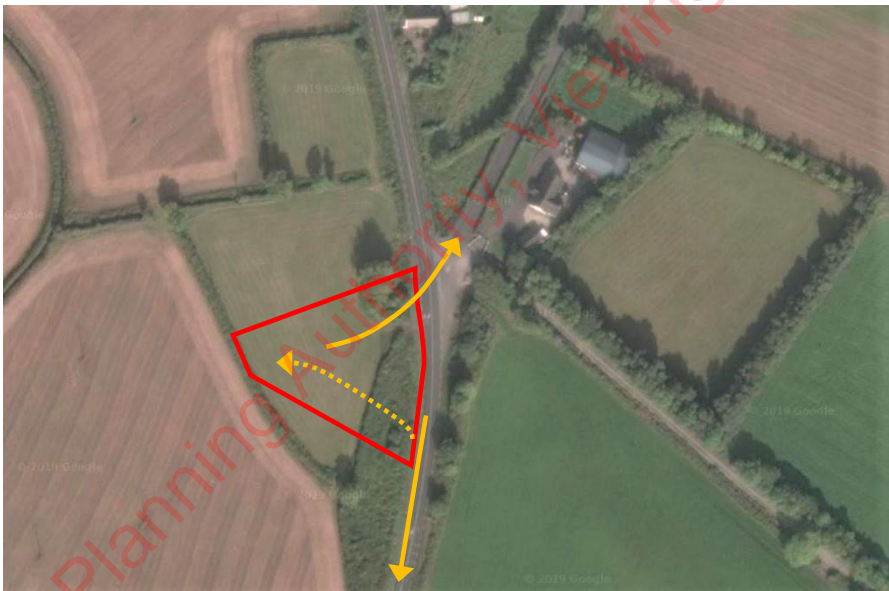


Figure 17. N80 – L2092 Junction

Area 8. Site Entrance

Site entrance should be constructed in accordance with Turbine Suppliers specifications

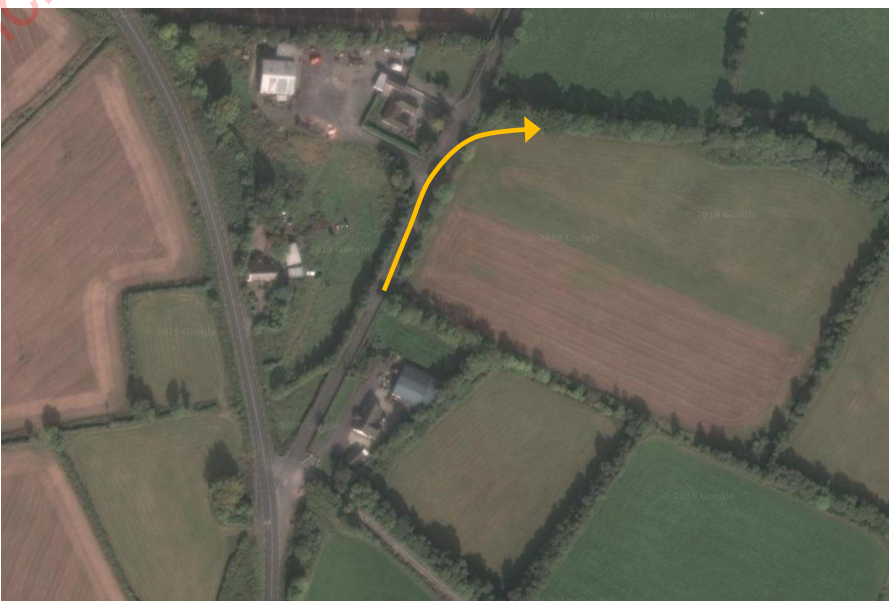


Figure 18. L2092 Site Entrance

Conclusions	<p>This route if modified as per above report would be suitable for movement of wind turbine blades up to 84m and tower sections on Tower Clamp Adapters.</p> <p>A vegetation corridor of W5.50m x H5.00m is required.</p> <p>A trial run is essential</p> <p><i>Edwin Sunderland</i> 12/07/2019</p>
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Revision Record		
Date	Author	Description
12/07/19	Edwin Sunderland	Report. (Rev 0)

Appendix 4.3

ESB Specification

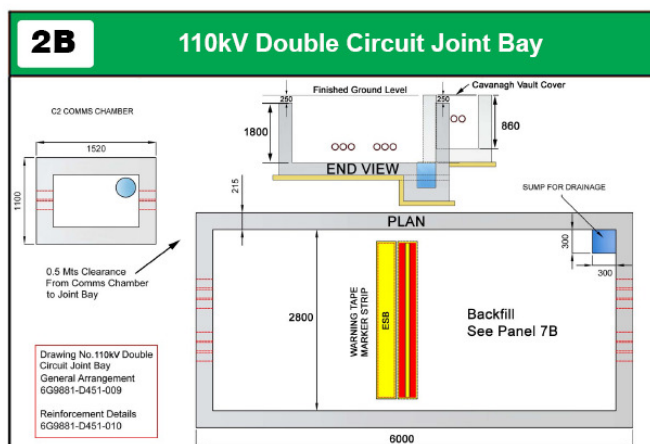
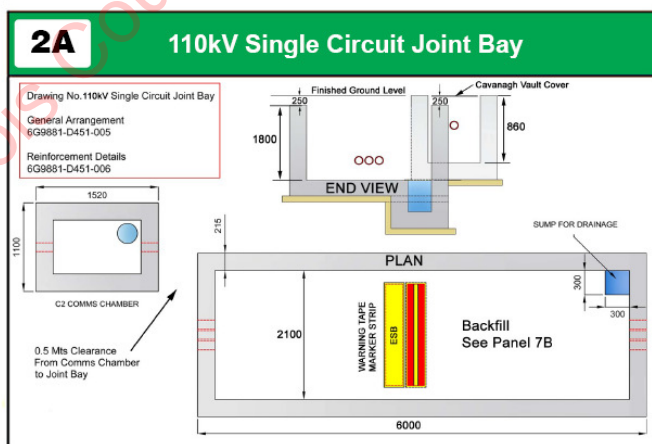
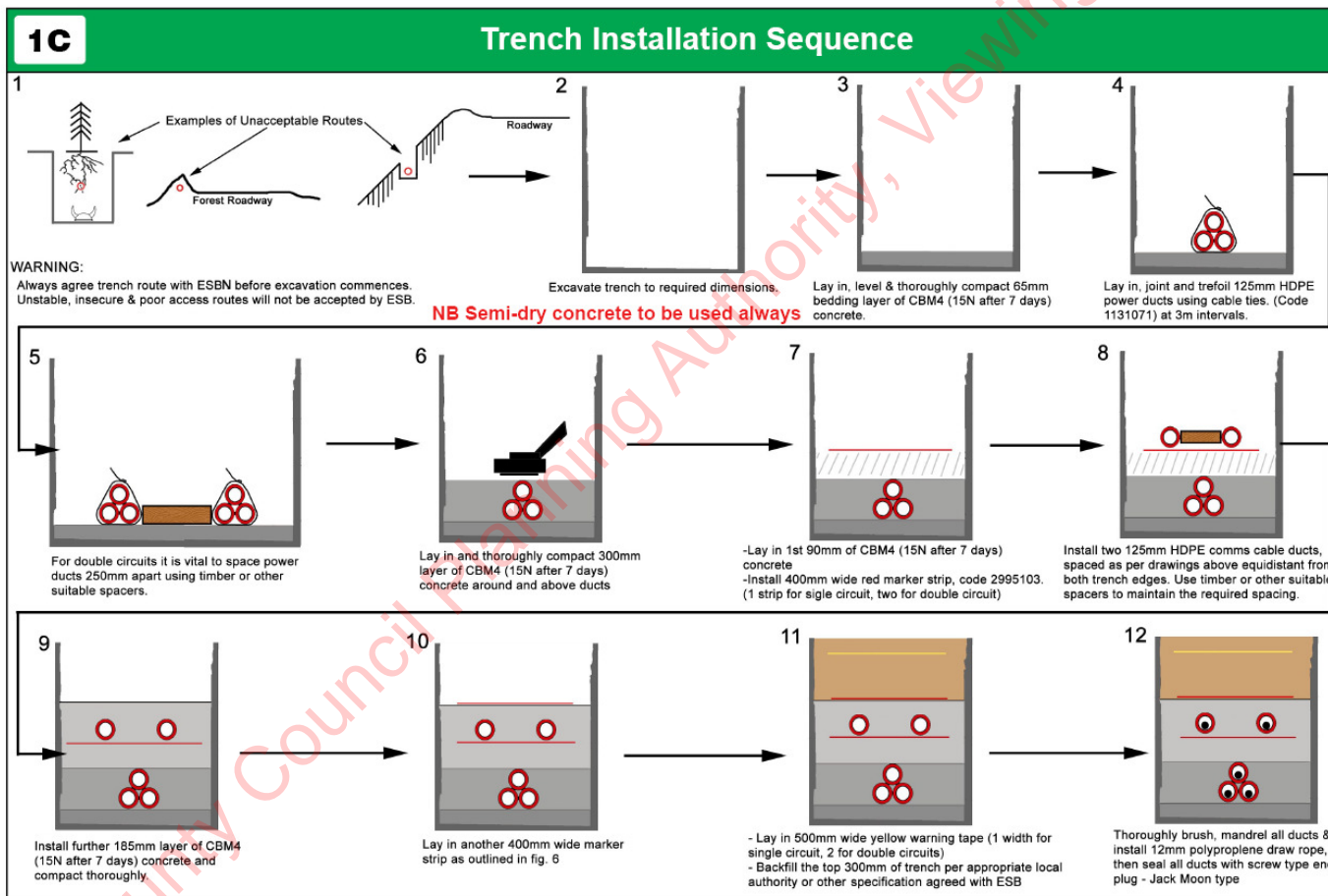
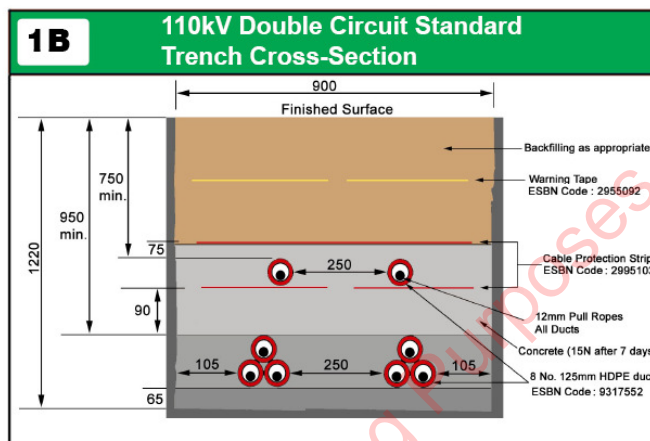


Note 3 : All materials (ducts, marker tapes/strips, duct surrounds, mandrels and brushes) must be ESB approved materials

Note 3 : All materials (ducts, marker tapes/strips, duct surrounds, mandrels and brushes) must be ESB approved materials



Approved:



Networks Ducting/Cabling (Minimum Standards)

Note 1 : ESB Networks reserves the right not to accept ducting which does not conform to these standards and dimensions

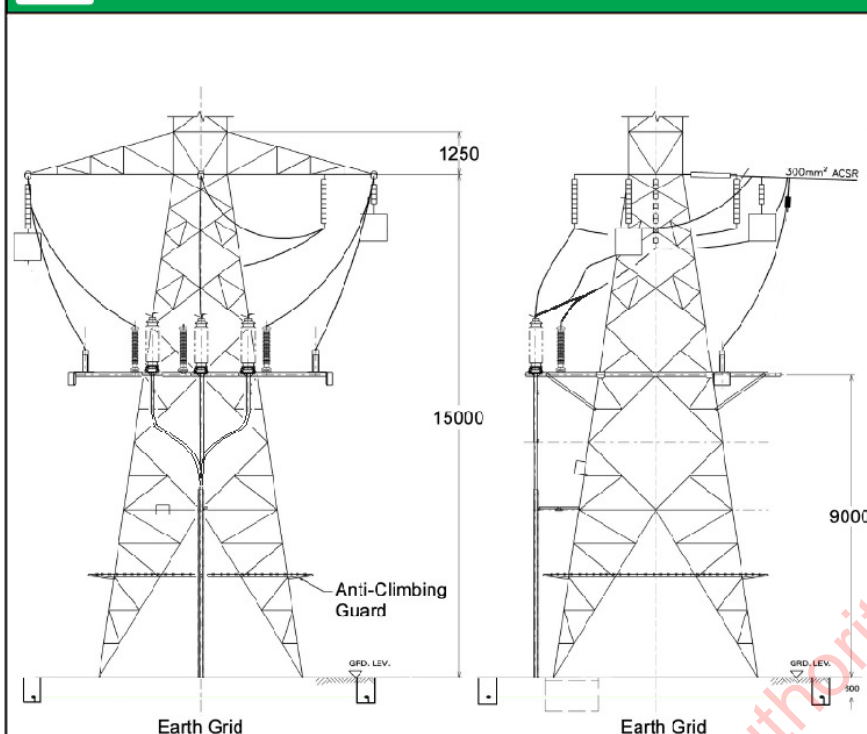
Note 2 : Refer to ESB Networks for Specific job Specification. These instructions do not apply to LV/MV/38kV/220kV cable

Note 3 : All materials (ducts, marker tapes/strips, duct surrounds, mandrels and brushes) must be ESB approved materials



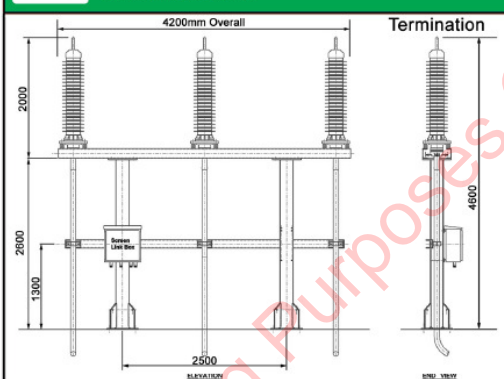
3A

110kV Cable End Mast Termination



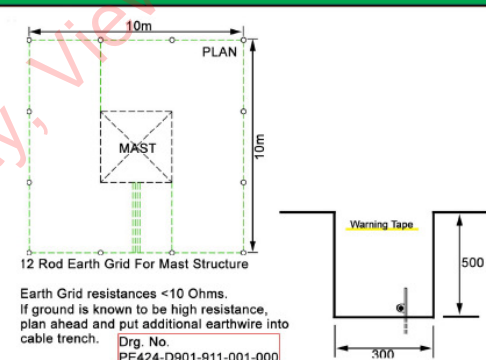
3B

Typical 110kV Termination Arrangement for Substations



3C

Earth Grids



4A

Obligation of Duct Installer to Minimise the Number and Severity of Duct Bends

The duct installer must minimise the number and severity of preformed bends in ground with obstructions and other utility service crossings by opening ground 15m ahead of backfilled duct, wherever practical to do so. This safety obligation, which may require use of steel plating, allows the duct installer to pick the least bendy duct route through utility crossings and obstructions. Otherwise, numerous sharp unrecorded duct route deviations will be present making cable installation considerably more difficult and less safe for the cable installer.



4B

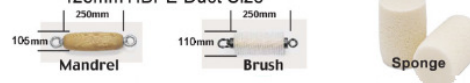
Standard for Brushing, Mandrelling, Roping and End-Capping of 110kV Ducts

All Ducts must be:

- Thoroughly brushed and mandrelled to prove ducts against debris /excessive deflection
- Roped using 12mm polypropylene rope with certified safe breaking load of 1.5 tons – all rope joints to be properly spliced and PVC taped over. Approved Supplier Silver Strand Buncrana Donegal, ph (074) 9382503 - 500m drum lengths available to minimise splicing/coil handling
- Sealed using endcaps against grit and water getting into them
- NB: Replace mandrels once mandrel wear indicators or grooves are worn down
- Replace brushes once brush diameter falls 5mm below dimensions in table below
- Approved endcaps, both disposable and reusable types, are available from suppliers of approved ESN ducting
- Approved ESN Mandrel and brush suppliers:

Brandon Agencies, Rathnew, Co Wicklow: Phone 0404 20500 (Brushes & Mandrels)
IS Varian, Greenhills Industrial Estate, Walkinstown, Dublin 12: Phone: 01-4501150 (Brushes Only)
Clydesdale UK Phone 0044 1234 855 855 (Brushes & Mandrels)
Tynagh Network Systems, Loughrea, Co Galway: Phone: 091 842206 (Brushes & Mandrels)

125mm HDPE Duct Size



4C

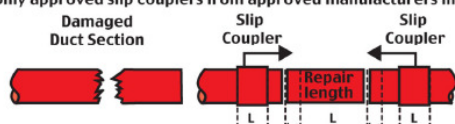
Approved ESN ducting for 110kV cables

- Use only solid wall high impact resistance ESN approved HDPE red ducting to IS 370 colour standard and ESN specification 16113 (7.1mm minimum wall thickness) Discoloured or unidentified ducting not acceptable. All duct material must be approved by ESN Networks.
- Lightweight flexible corrugated twinwall ducting is not acceptable to ESN irrespective of manufacturer
- Current approved HDPE Duct and duct bend manufacturers are:
Lynplast (bend fittings only), Uponor-Radius Systems, Wavin, Quality Plastics, Emelle

4E

Repair of Existing Ducts

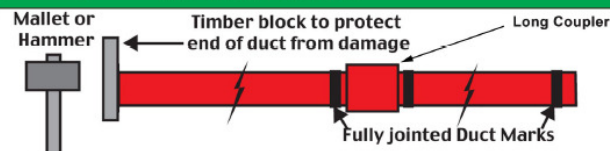
Use only approved slip couplers from approved manufacturers in section 4C



- Cut out damaged section of duct and ensure all cut surfaces are square and free from sharp edges
- Slide, position and centre the repair couplers on the centering marks

4D

Specification for Duct Jointing for 110kV Cables



All ducts to be securely jointed by tapping against timber board on each duct until the black depth insertion mark is reached
Always smear duct lubricant on coupler rubber ring

4F

Sealing of Ducts

All ducts to be permanently sealed at both ends of duct run
Ducts to be temporarily sealed during installation using endcaps provided with each bale

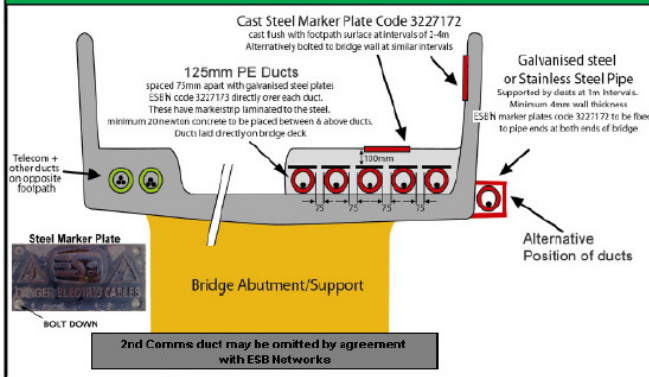


Standard Specification for ESB 110kV Networks Ducting/Cabling (Minimum Standards)

Note 1 : ESB Networks reserves the right not to accept ducting which does not conform to these standards and dimensions
 Note 2 : Refer to ESB Networks for Specific job Specification. These instructions do not apply to LV/MV/38kV/220kV cable
 Note 3 : All materials (ducts, marker tapes/strips, duct surrounds, mandrels and brushes) must be ESB approved materials



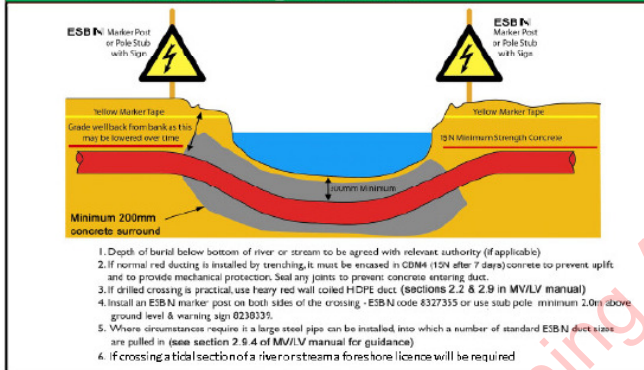
5A Bridge Crossings: Restricted Footpath Designs



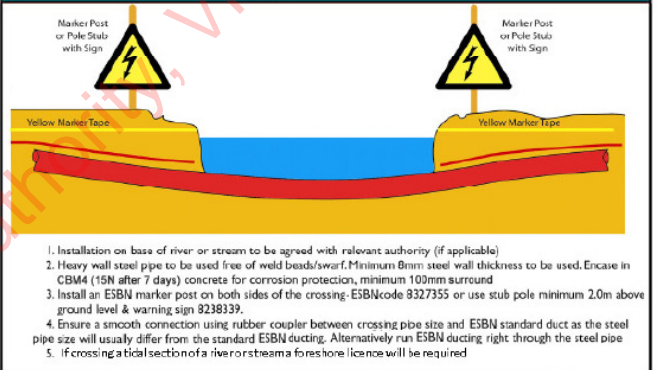
5B Bridge Crossings: Restricted Footpath Designs

1. The design must be agreed with the bridge authority. Position in footpath is preferred.
2. Minimum cover over ducts on footpath 100mm.
3. Where duct cover is >600mm, marker strip 75mm above ducts and marker tape (300mm below surface) + steel surface markers suffice
4. Red ducting is not suitable for cable run external to bridges.
5. Where possible galvanised steel/stainless steel piping should be used, all joints must be free of weld burrs on inside. Alternatively heavy duty 10mm wall thickness black HDPE material with cast steel marker plates attached must be used to permanently warn of presence of electric cable.

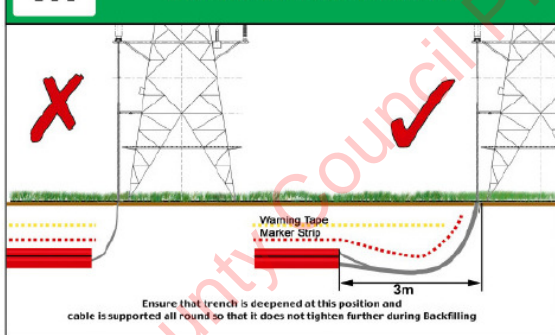
6A River/Stream Crossings: Standard Where Burial/Drilling IS Possible



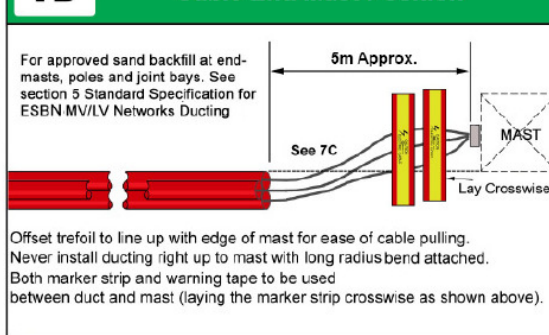
6B River/Stream Crossings: Standard Where Burial/Drilling IS NOT Possible



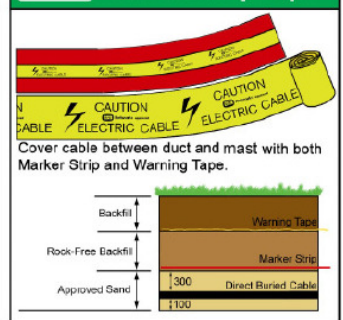
7A Cable End Mast Position



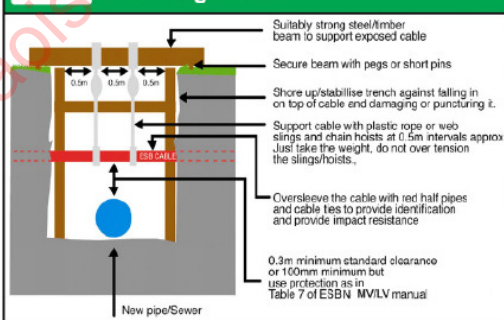
7B Cable End Mast Position



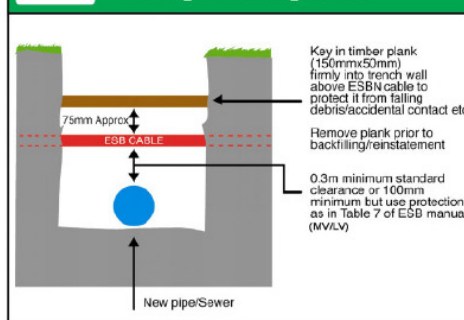
7C Cable End Mast - Marker Strip/Tape



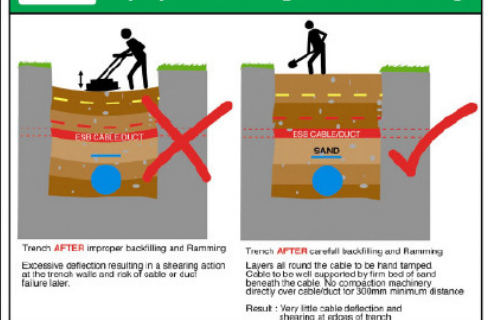
8A Supporting ESBN Cables/Ducts During Trenching Works



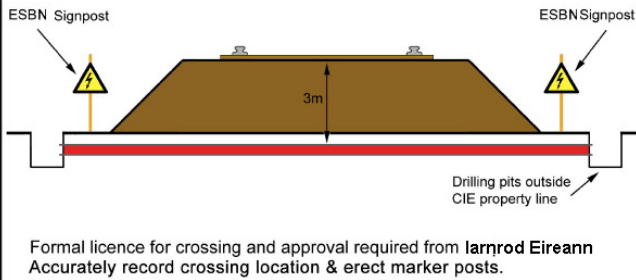
8B Supporting ESBN Cables/Ducts During Trenching Works



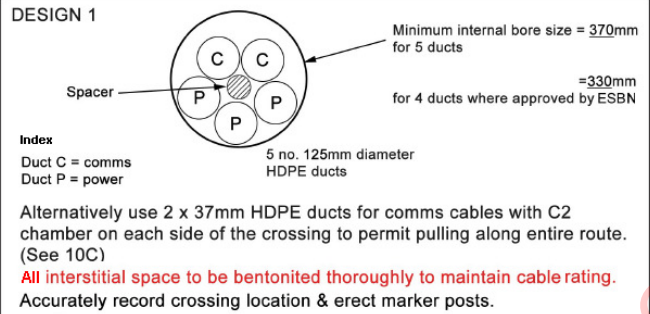
9 Avoidance of Cable Damage Due to Improper Backfilling at Cable Crossings



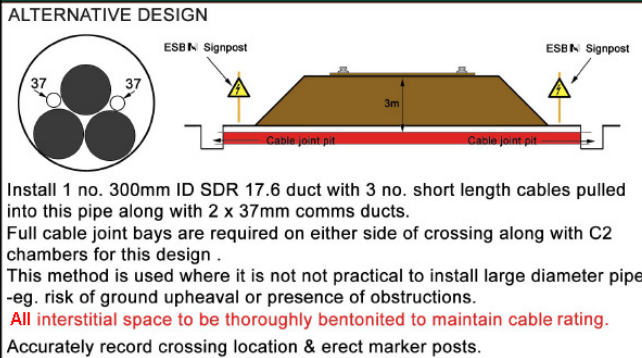
10A 110kV Railway Crossing Details



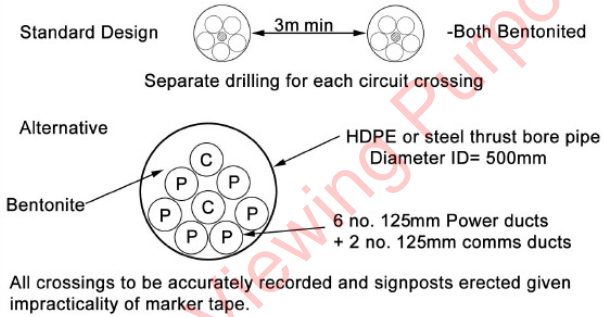
10B Typical Directional Drill/Thrust Bore Duct Bore Details



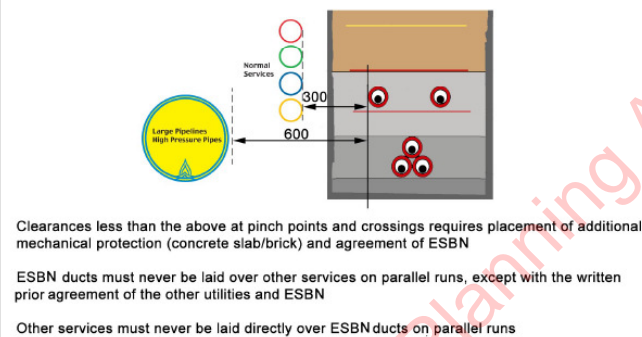
10C Typical Directional Drill/Thrust Bore Duct Bore Details



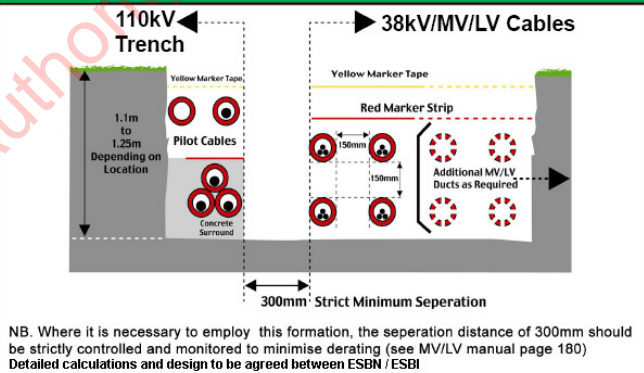
10D Typical Double Circuit Bore Crossing



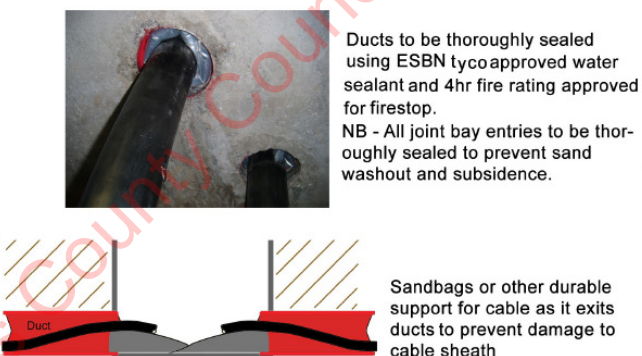
11 Minimum Standard Clearances to Other Services



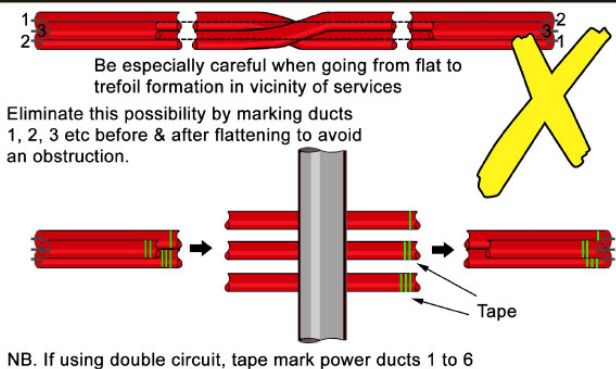
12 Combined 110kV & 38kV Cable Runs



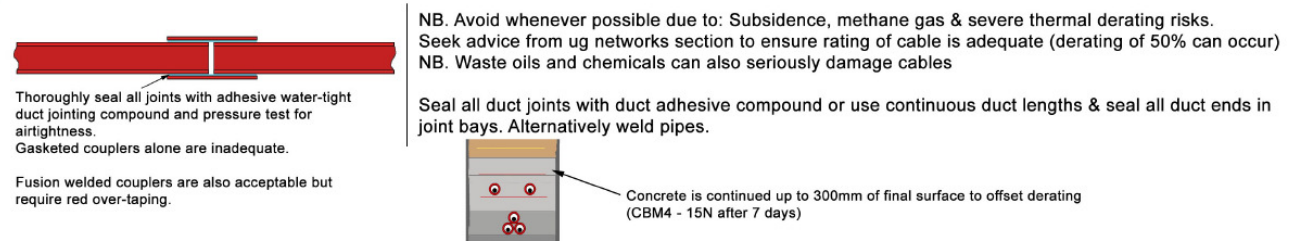
13 Sealing and Protection of 110kV Cables Once they Exit Ducts



14 Duct Crossovers Are Not Allowed



15 Crossing Dumps/Contaminated Ground



Appendix 4.4

Replant Lands Assessment



STATKRAFT

DERNACART WIND FARM

REPLANTING ASSESSMENT

DECEMBER 2019



CONSULTANTS IN ENGINEERING
& ENVIRONMENTAL SCIENCES

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1 INTRODUCTION

Statkraft proposes to construct a wind farm ca. 1.8km from Mountmellick, County Laois. The proposed wind farm will comprise of up to 8 no. turbines. The project anticipated that connection of the proposed wind farm will be to the future proposed Bracklone 110kV Substation via underground cable. The proposed grid connection has been assessed as part of this EIAR but will form part of a separate planning permission application.

The wind farm development is proposed in the following townlands:

- Forest Upper, Forest Lower, Dernacart, Co. Laois

Fehily Timoney and Company (FT) prepared a planning application together with an EIAR and a Natura Impact Statement (NIS) and these will be submitted to Laois County Council.

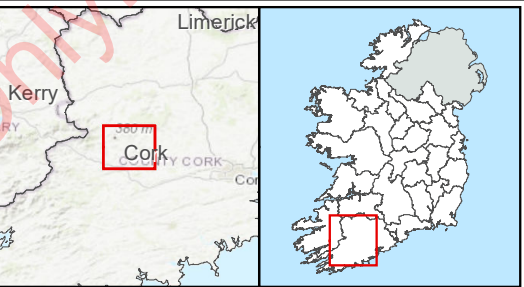
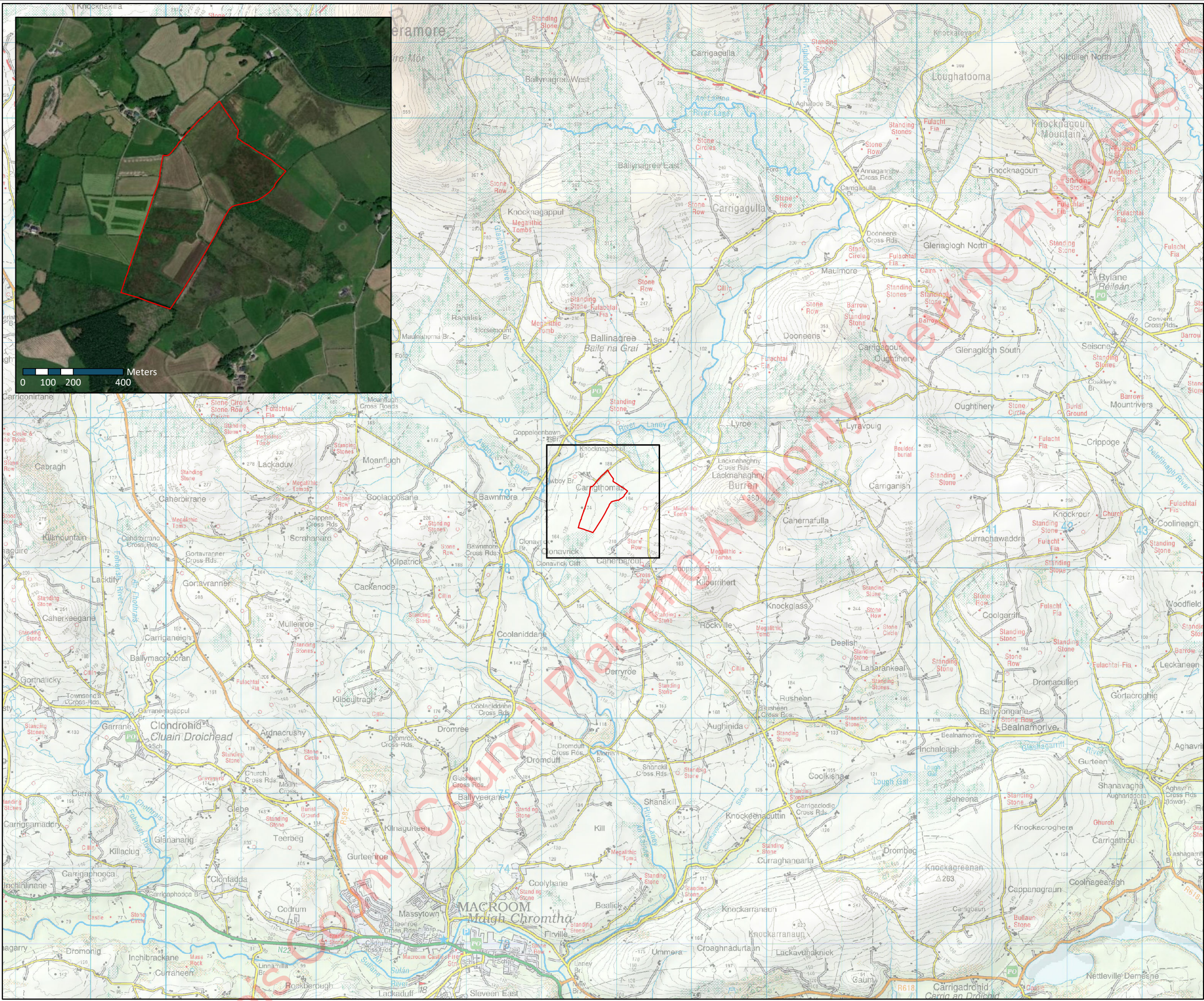
As part of the wind farm project, felling of forestry is required at the site.

1.1 Background to the Report

Replacement replanting of forestry can occur in the Ireland subject to licence in compliance with the Forestry Act 1946 as amended. The consent for such replanting is covered by statutory instrument (S.I.) 558 of 2010 European Communities (Forest Consent and Assessment) Regulations 2010 as amended. This legislation provides for development of afforestation and forest road construction projects which require adherence to and compliance with the Environmental Impact Directive (85/337/EEC) if the afforestation is likely to have a significant effect on the environment, insofar as it applies to forestry development.

As part of the application and as described in EIAR Volume 2 Chapter 4 Description of the Proposed Development, it was determined that felling of approximately 18ha of coniferous forest would be required to develop the Dernacart Wind Farm with a requirement to replant the same area.

This report assesses the replant lands at Carrigthomas, Macroom, Co. Cork. The size of the site is 23.99ha and Figure 1.1 illustrates the location of the site.



Replant Lands

TITLE:		Site Location	
PROJECT:		Dernacart Wind Farm	
FIGURE NO:		1.1	
CLIENT:		Statkraft	
SCALE:	1:50000	REVISION:	0
DATE:	12/12/2019	PAGE SIZE:	A3

2 REPLANTING REQUIREMENTS AND LANDS

The felling of approximately 18Ha of coniferous forestry at the Dernacart Wind Farm site is fully described and appraised in EIAR Volume 2 Chapter 4 (Description of the Proposed Development) and within the assessment chapters of the EIAR submitted with the planning application. There are no further appraisal requirements for felling and this report will be solely concerned with replanting of lands and assessment of same.

2.1 Replanting Requirements

Replacement replanting of forestry can occur in Ireland subject to licence in compliance with the Forestry Act 1946 as amended. The consent for such replanting is covered by statutory instrument (S.I.) 558 of 2010 European Communities (Forest Consent and Assessment) Regulations 2010 as amended. This legislation provides for development of afforestation and forest road construction projects which require adherence to and compliance with the Environmental Impact Directive (85/337/EEC) if the afforestation is likely to have a significant effect on the environment, insofar as it applies to forestry development

The lands assessed in this report lands have previously received technical approval by the Forest Service for afforestation. To afforest any land where the area involved is greater than 0.1Ha requires the approval of the Minister under the 2010 regulations. The application for approval is known as Pre-Planting Approval-Form 1 and is subject to the following procedures:

- The application is referred to the relevant Forest Service inspector for assessment and recommendations;
- If there are any environmental considerations identified, the application is referred to the relevant external body, e.g. National Parks and Wildlife Services, National Monuments Service, Regional Fisheries Boards, Local Authorities, etc. for consideration;
- If the proposed development is greater than 25 hectares, the application is referred to the relevant Local Authority;
- If the site is greater than 2.5 hectares, the application is advertised on the Department's website;
- If the site is greater than 50 hectares an Environmental Impact Assessment and planning permission are required.

The area of the proposed replant lands is not greater than 50 hectares, therefore it is not required to carry out a mandatory EIA or obtain planning permission for replanting.

2.2 Proposed Afforestation Techniques

Planting of the proposed replant lands will be carried out in accordance with the Forest Service best practice guidance. Adherence to these guidelines, described below, will minimise potential effects on the environment.

- 'Code of Best Forest Practice – Ireland'
- 'Forestry and Water Quality Guidelines' (2000)
- 'Forestry and the Landscape Guidelines' (2000)
- 'Forestry and Archaeology Guidelines' (2000)
- 'Forestry Biodiversity Guidelines' (2000)
- 'Forestry Protection Guidelines' (2002)
- 'Forestry Harvesting and Environmental Guidelines' (2000)

Planting will be carried out as described in 'Forestry Schemes Manual' (Forest Service, 2011), which provides guidance in relation to cultivation, stocking, spacing, plant handling, planting dates, fertiliser application, fencing, fire, and weed control. Specific conditions set out in the Forest Service Technical Approvals for each site will also be adhered to.

Drainage systems will be developed for each site comprising collector, interceptor and cut-off drains in accordance with Forestry Schemes Manual. A description of each drain type is set out below.

Collector Drains

Collector drains collect water from mound drains, plough furrows, mole drains, etc. and discharge via sediment traps and/or an interceptor drain. Collector drains are excavated to a depth not greater than 10-15cm below the depth of mound drains. Where collector drains have to be extended into erodible material, 'mini' silt traps are placed appropriately by deepening the drains in places.

Interceptor Drains

Interceptor Drains are constructed along the edges of aquatic buffer zones, i.e. areas where forest operations are curtailed and which are managed for environmental protection and enhancement. Interceptor drains collect the discharge channels from the drainage sub-catchment and allow it to overflow into the buffer zone. In most cases, slope will allow for drainage channels to taper out or be connected to an interceptor drain rather than enter the buffer zone. However, on flat sites, or those with low slopes, it will be necessary to connect drains into the aquatic zone. This may be done only where it will not result in sediment or any pollutants entering the aquatic zone.

Cut off drains

Cut off drains are constructed immediately up slope of a site and are designed to direct water away from the site.

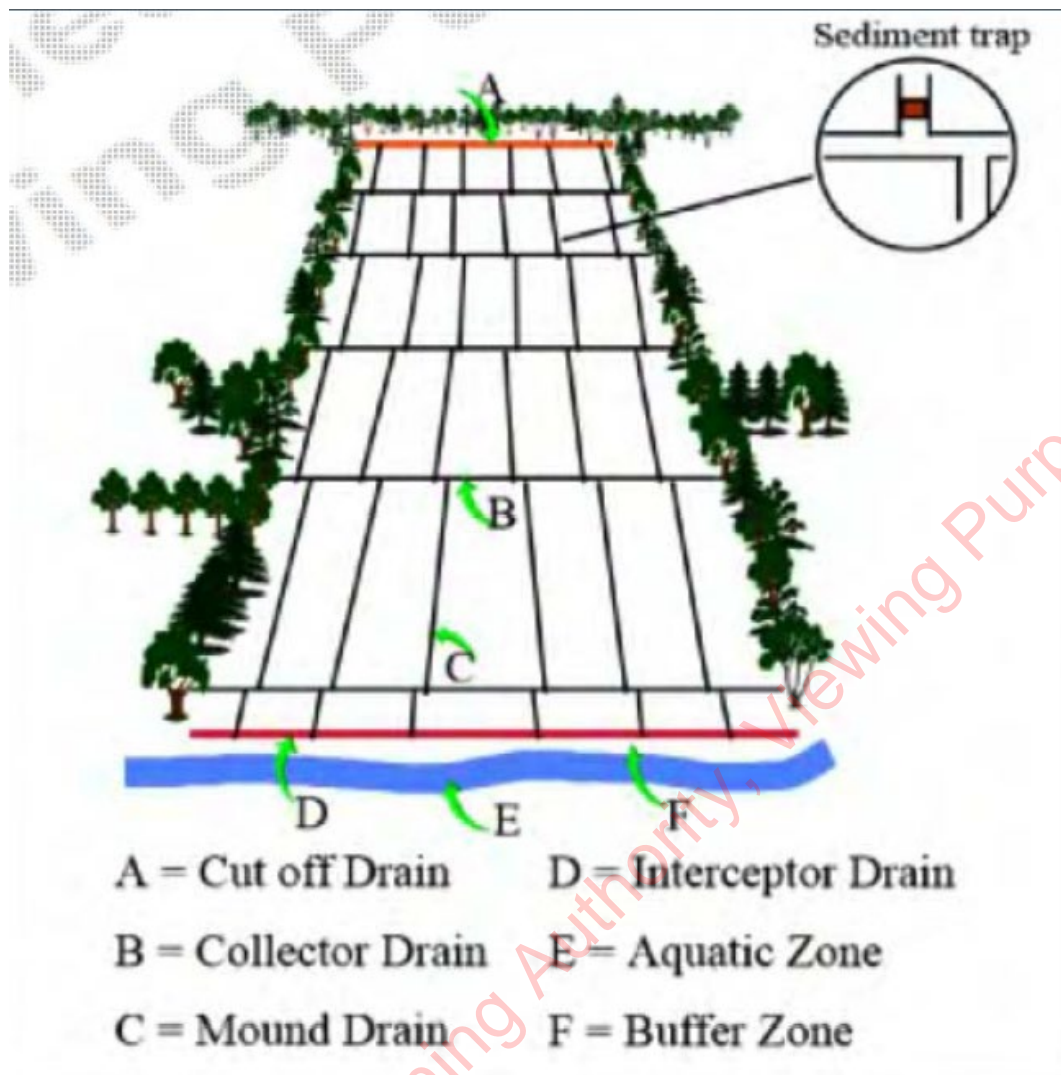


Figure 2-1: Standard forestry Drainage (Forestry Schemes Manual)

Species

The species to be planted at the site are detailed in the technical approval document from the Forestry Service (Sitka Spruce and Alder) – refer to Appendix 1.

2.3 Proposed Replanting Land

A potential replanting site has been identified at the townlands of Carrigthomas, Macroom, Co. Cork. This site has Forest Service Technical Approval for replanting. If these replant lands become unavailable, other similarly approved lands will be acquired for replanting should the proposed wind farm receive planning permission.

The replant lands are located in the townland of Carrigthomas, approximately 8.5km north of Macroom, Co. Cork. The site location is presented in Figure 1-1.

Table 2-1: Proposed Replant Lands and Replant Areas

Site	County	Available Replant Area, ha
Carrigthomas	Cork	23.99ha

The total approved area for afforestation is 23.99ha.

3 RELEVANT POLICIES AND GUIDELINES

3.1 Relevant National Policy

3.1.1 Forests, Products and People: Ireland's Forest Policy – A Renewed Vision (2014)

This document was published by the Department of Agriculture, Food and Marine in 2014. It contains strategic goals and recommendations of the Forest Policy Review Group.

The Strategic goal is stated as:

"Develop an internationally competitive and sustainable forest sector that provides a full range of economic, environmental and social benefits to society and which accords with the Forest Europe definition of sustainable development."

It highlights the important role that forestry is playing in terms of the economy, environmental and society. Forests now account for 10.5% of the land area of Ireland with a strong forest growth rates compared to other European countries.

The importance of forests' contribution to climate change mitigation is also described in this report. Irish Kyoto-eligible forests will sequester about 4.8 million tonnes of carbon dioxide (CO₂) in 2020, representing between 40% and 60% of the target.

The afforestation policy outlined in the policy document aims to support transition to a low carbon economy and reach the demanding greenhouse gas emission reduction targets as well as reduce dependence on fossil fuels.

Some of the recommended policies and actions are:

- Expansion of the Forest Resource: To increase the forest area, in accordance with sustainable forest management (SFM) principles, in order to support a long term sustainable roundwood supply of 7 to 8 million cubic metres per annum. This policy aims to increase afforestation to 15,000 hectares annually.
- Management of the Resource: To ensure that the sustainable management of the forest resource in accordance with best practice thereby ensuring its capacity to provide the full range of timber and other benefits.
- Environment and Public Goods: To ensure that afforestation, management of existing forests and development of the forest sector are undertaken in a manner that enhances their contribution to the environment and the capacity to provide public goods and services.

3.1.2 Forestry Programme 2014-2020

This programme was finalised in January 2015 by the Forest Service, Department of Agriculture, Food and the Marine in accordance with European Union Guidelines on State aid for agriculture and forestry and in rural areas 2014 to 2020. The measures proposed within this programme are consistent with the 'Forests, Products and People: Ireland's Forest Policy – A Renewed Vision' report and identifies needs and measures in relation to Ireland's forest sector.

Some objectives under Measure 1: Afforestation and Creation of Woodland are:

- Increase Ireland's forest cover from 10.7% to 18% by the 2046
- Establish up to 8,290 hectares of new forests and woodlands per annum (subject to the availability of funds)
- Foster carbon sequestration and climate change mitigation.
- Provide a resource which will contribute to long-term sustainable development in the rural economy.

This measure is the most relevant to increase, on a permanent basis, Ireland's forest cover to capture carbon, produce wood resources and help mitigate emissions from agriculture.

3.1.3 Climate Action Plan 2019

One of the targets of the Climate Action Plan is to achieve 26.8 MtCO₂eq abatement through LULUCF (Land Use, Land-Use Change and Forestry) actions over the period 2021 to 2030, comprising of an average of 8,000ha per annum of newly planted forest, and sustainable forest management of existing forests (providing 21MtCO₂eq cumulative abatement).

3.2 Relevant Regional Policy

3.2.1 Regional Planning Guidelines for the South West 2010 - 2022

The guidelines note that the forestry sector comprises mainly small and medium sized privately owned farm based enterprises that provide a potentially viable area for diversification. The National Forest Inventory quantifies the productive forest area for the South West region as covering 112,190ha, with Kerry having in excess of 40,000 ha of forestry plantations. The cycle of planting over the past 15 years indicates that many private forestry plantations will be at or approaching maturity during the next decade. The Regional Bio-energy Plan for the South West shows that enhanced management of this resource is required.

3.3 Relevant County and Local Policies

3.3.1 Cork County Development Plan: 2014-2020

Cork County has a total forest area in excess of 79,188ha of forest and woodland area, or 10.5% land cover which is higher than the national average of 9%. The Cork County Development Plan 2014-2020 highlights that the sector will continue to be an important economic activity in rural areas, as well as an alternative enterprise for farmers. Sustainably managed forestry can also become an important tourism asset. The forestry industry will also play an important role in the future development of the Bioenergy sector.

The council states it will continue to support sustainable forestry development throughout the County, but acknowledges the importance of protecting sensitive areas, water supplies and fisheries and to ensure that the development is compatible with the protection of the environment and nature conservation areas.

3.4 Relevant National Guidelines

The replanting at the proposed site will be carried out in accordance with the Forest Service Guidelines described below and any further requirements resulting from the technical approvals.

3.4.1 Forest Service Guidelines

Code of Best Forest Practice – Ireland¹

The aim of the Code of Best Forest Practice is to complement on an operational level that of *Growing for the Future - A Strategic Plan for the Development of the "To develop forestry to a scale and in a manner which maximises its contribution to national economic and social well-being on a sustainable basis and which is compatible with the protection of the environment."*

¹ Part 1

<https://www.agriculture.gov.ie/media/migration/forestry/publications/codeofbestforestpractice/Code%20of%20Best%20Forest%20Prac%20Part%201.pdf>

Part 2

<https://www.agriculture.gov.ie/media/migration/forestry/publications/codeofbestforestpractice/Code%20of%20Best%20Forest%20Prac%20Part%202.pdf>

In the context of sustainable forest management, it aims to ensure that the various environmental, economic and social forest values are recognised. Most forests in Ireland are managed on a commercial basis, therefore a careful balance between measures to protect the environment and measures to maintain forest productivity are deemed necessary in this code.

Environmental Requirements for Afforestation²

The aim of the guidelines is to ensure that the establishment of new woodlands and forests is carried out so that it is compatible with the protection and enhancement of our environment. In assessing an application for afforestation, the Forest Service is required to consider potential effects across a range of issues and sensitivities. This includes in-combination effects regarding water, biodiversity, landscape, social issues, etc.

Forestry and Water Quality Guidelines³

Forestry activities have the potential to interact both positively and negatively with aquatic resources and the maintenance and enhancement of water quality is of utmost importance. These guidelines describe a range of measures intended to cover all situations relating to forestry and water quality.

Forestry and the Landscape Guidelines⁴

These guidelines set describe a range of measures that forest owners can employ in relation to the landscape, it is recognised that some may be impractical for individual forests, due to land ownership pattern, location and other set factors. Where a degree of flexibility exists, forest owners are required to implement those landscape measures which can be applied effectively to their property.

All forest workers and machine operators involved in any forest operation should be made aware of and understand the guidelines, all relevant environmental issues relating to the site, and working practices which minimise environmental disturbance.

Forestry and Archaeology Guidelines⁵

Archaeological sites and monuments are part of the national heritage. These guidelines have been developed to ensure that forest development should not disturb sites of archaeological importance. They have been compiled to assist non-archaeologists involved in forest development to identify archaeological sites, and set out the procedures which should be followed to avoid site disturbance.

Forest Biodiversity Guidelines⁶

Forests are among the most diverse and complex ecosystems in the world, providing a habitat for a multitude of flora and fauna. Ireland's forests represent an important opportunity to conserve and enhance biodiversity at both a local and national level. These guidelines are biodiversity considerations to be incorporated into all forest development, harvesting, roading and maintenance plans to consider biodiversity, habitat and nature conservation issues.

Forest Harvesting and Environmental Guidelines⁷

These guidelines address issues relating to soil conservation; the protection of water quality, archaeological sites, biodiversity and the visual landscape; the maintenance of forest health and productivity in the context of timber harvesting and forest road construction and maintenance. It therefore provides guidelines for:

- *harvest planning;*
- *harvest operation;*
- *harvest site restoration;*
- *road planning;*

² <https://www.agriculture.gov.ie/media/migration/forestry/grantandpremiumschemes/2016/EnvironmentalRequirementsAfforestationDecember121216.pdf>

³ https://www.agriculture.gov.ie/media/migration/forestry/publications/water_quality.pdf

⁴ <https://www.agriculture.gov.ie/media/migration/forestry/publications/landscape.pdf>

⁵ <https://www.agriculture.gov.ie/media/migration/forestry/publications/archaeology.pdf>

⁶ <https://www.agriculture.gov.ie/media/migration/forestry/publications/biodiversity.pdf>

⁷ <https://www.agriculture.gov.ie/media/migration/forestry/publications/harvesting.pdf>

- *road construction;*
- *machine servicing.*

Forest Protection Guidelines ⁸

These guidelines are set up to protect the forest, ensure a healthy and vigorous forest and to prevent and control damage in a correct, timely, effective and safe manner. For that purpose, forest owners and managers have an obligation to value the need for vigilance, experienced forest management and advice on site in order. Methods include the use of herbicides in controlling competing vegetation and pesticides in dealing with insects.

All of the above-mentioned guidelines set out sound and practical measures based on the principles of Sustainable Forest Management (SFM), and are based in the best available scientific information. All forest workers and machine operators involved in any forest operation should be made aware of and understand the guidelines, all relevant environmental issues relating to the site, and working practices which minimise environmental disturbance.

⁸ <https://www.agriculture.gov.ie/media/migration/forestry/publications/fsFPG.pdf>

4 IMPACT ASSESSMENT METHODOLOGY

The effect of the proposed replanting has been appraised under the following environmental headings:

- Biodiversity
- Archaeology, Architectural and Cultural Heritage
- Population and Human Health including noise, air/climate and material assets
- Land, Soils and Geology
- Hydrology and Water Quality
- Landscape and Visual

The baseline environmental conditions at each site were determined following a desktop review of publicly available information including aerial photograph and geospatial datasets. A site walkover was also carried out.

The effect of the proposed replanting before recommended mitigation measures are introduced is described under each topic. Interactions and in-combination effects with other environmental topics are also included in this evaluation.

The evaluation of the significance of the effect is also undertaken as per the EPA guidelines (EPA, 2017).

If effects are anticipated, mitigation measures are devised to minimise effects on the environment through avoidance, by reduction and by remedy.

5 ASSESSMENT OF LANDS AT CARRAIGTHOMAS, CO. CORK

5.1 Site Description

The proposed afforestation area is situated in the townland of Carrigthomas, ca. 8.5km north of Macroom, Co. Cork. The site is accessed via a local road from the N22.

The site is ca. 143m OD and is classified as pasture (code 231) on the CORINE landcover. There is forestry (code 312) to the south, natural areas (code 243) to the north, and pasture (code 231) west and east of the site.

5.1.1 Planting

Planting will be carried out by the angle notch technique. The species to be planted are Sitka spruce and Alder.

5.2 Impact Assessment

The effects associated with afforestation at the potential replanting land are assessed in the sections below, under the headings:

- Biodiversity
- Archaeology, Architectural and Cultural Heritage
- Population and Human Health including noise, air/climate and material assets
- Land, Soils and Geology
- Hydrology and Water Quality
- Landscape and Visual

Each section contains a description of the existing environment, potential effects and appropriate mitigation measures to reduce, remedy or eliminate those effects. Residual effects are also described in the cases where mitigation measures are recommended.

5.2.1 Biodiversity

5.2.1.1 Introduction

The ecological appraisal for the project was carried out by Fehily Timoney & Company (FT) on 3rd December 2019. An ecological appraisal was carried out at the site of the proposed replant lands (Carrigthomas, Macroom, Co. Cork) which included habitat and botanical surveys, as well as protected species surveys including birds and mammals. Based on the results of these studies, FT considered potential direct, indirect and cumulative effects of the proposed development on the existing ecological receptors and proposed appropriate mitigation measures to minimise these potential effects.

The purpose of this evaluation was to:

- Undertake a desktop review of available ecological data for both the receiving environment and greater area, including a review of designated sites within 15 km of each project site;
- Undertake ecological field surveys of the receiving environments;
- Identify flora and fauna present within the footprint of the replant lands;
- Evaluate the ecological significance of the receiving environments;
- Appraise the potential effects of the project on the ecology of the receiving environment;
- Consider measures to mitigate the potential negative effect(s) of the project on the ecology of the receiving environments.

5.2.1.2 Methodology

5.2.1.2.1 Desktop study

Designated Nature Conservation Sites

Nationally designated sites within 10 km of this project, such as Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) have been identified. European sites within 15km of the proposed replant lands, namely candidate Special Areas of Conservation (cSACs)⁹ and Special Protection Areas for birds (SPAs) were identified as part of this ecological assessment using the Map Viewer at www.npws.ie. These designated sites are described in Section 5.2.1.3.1.

Flora and Fauna

A desk study was carried out to collate and review available information, datasets and documentation sources pertaining to the site's natural environment. Records available on the NPWS and the National Biodiversity Data Centre websites were reviewed.

Other data sources include Ireland's Wetlands and their Waterbirds: Status and Distribution (Crowe 2005), the Atlas of Wintering Birds in Britain and Ireland (Lack, 1986), the Atlas of Breeding Birds in Britain and Ireland (Sharrock, 1976) and the Breeding and Winter Birds of Britain and Ireland Bird Atlas 2007-11 (Balmar *et al.*, 2013).

Botanical species were assessed in accordance with their occurrence on the Flora Protection Order 2015 and the Ireland Red List No. 10: Vascular Plants (Wyse *et al.*, 2016). Other sources included:

- OSI Aerial photography and 1:50000 mapping;
- National Parks and Wildlife Service (NPWS);
- The Ireland Red List No. 10: Vascular Plants (Wyse *et al.*, 2016);
- Teagasc Soil area maps;
- Bat Conservation Ireland (BCI);
- Geological Survey Ireland (GSI) area maps;
- Environmental Protection Agency (EPA) water quality data;
- Inland Fisheries Ireland; and
- South Western River Basin District (WRBD) datasets (Water Framework Directive).

5.2.1.2.2 Field survey

Habitats

The habitats in the footprint of the proposed replant lands were identified and classified, according to 'A Guide to Habitats in Ireland' (Fossitt, 2000), during a walkover survey 3rd December 2019. The dominant plant species present in each habitat type was recorded. Habitats have been appraised and evaluated according to their occurrence as protected habitats under Annex I of the EU Habitats Directive (92/43/EEC) and for their capacity to support rare, threatened and endangered species. The methodology used to assess the effect on habitats is based on NRA guidelines (2009 a and b), CIEEM guidelines and EPA guidelines. The habitat mapping exercise had regard to the 'Best Practice Guidance for Habitat Survey and Mapping' (Smith *et al.*, 2011) published by the Heritage Council.

Scientific and common names for plants follow Parnell *et al.*, (2012) and Blamey *et al.*, (1996), respectively.

Habitat boundaries and associated attribute data were mapped using desk-based GIS software, namely ArcGIS 10.4.1, which was also used to calculate habitat areas and lengths.

⁹ Note: At present many SACs in Ireland are currently 'candidate' SACs, and referred to as cSACs. The relevant Statutory Instruments for the SACs in Ireland have not yet been made, however, these "candidate" sites must still be afforded the same level of protection as if they were SACs in accordance with the Habitats Directive.

Once the baseline ecological survey and mapping was complete, a constraints map highlighting important ecological features and resources was generated, indicating areas for preclusion from the final replanting layout. The ecological constraints map was used to design planting with the least ecological effect.

Mammals

The total footprint of the proposed replant lands was walked by experienced ecologists for potential signs of mammals within the study area. As well as direct observations of mammal features such as tracks, trails, fur, droppings and shelter (setts, dreys and holts) were also recorded using GPS. Watercourse crossings within and adjacent to the proposed replant lands were surveyed for evidence of otter.

The conservation status of mammals within Ireland and Europe is assessed using one or more of the following documents; Wildlife Acts (1976 - 2010), the Red List of Terrestrial Mammals (Marnell *et al.*, 2009) and NPWS (2019) *The Status of EU Protected Habitats and Species in Ireland*.

Other

Other species of fauna including birds, invertebrates and habitats that may be of value to these species were also noted.

5.2.1.3 Existing Environment

5.2.1.3.1 Designated Nature Conservation Sites

Sites of International Importance

Special Areas of Conservation (cSACs)

Special Areas of Conservation (SACs) are protected under the European Union (EU) 'Habitats Directive' (92/43/EEC), as implemented in Ireland by the European Communities (Natural Habitats) Regulations, 1997. There are three SACs within 15km of the proposed replant lands. The full NPWS site synopses for designated areas are available on www.NPWS.ie.

Special Protection Areas (SPAs)

Special Protection Areas (SPAs) were initially designated under Directive 79/409/EEC, The Directive on the Conservation of Wild Birds ('The Birds Directive'), and are now protected as European (Natura 2000) Sites under the EU 'Habitats Directive'. There are two SPAs within 15km of the study area.

Figure 5-2 (Appendix 2) shows the location of the designated sites in relation to the project. The closest European site is Mullaghanish to Musheramore Mountains SPA which is located 3.21km from the proposed replant lands.

Sites of National Importance

Sites of National Importance in the Republic of Ireland are termed, Natural Heritage Areas (NHA) and proposed Natural Heritage Areas (pNHA). While the Wildlife (Amendment) Act 2000 has been passed into law, pNHAs will not have legal protection until the consultative process with landowners has been completed; this process is currently ongoing. One NHA and four pNHAs were recorded within 10 km of the Study Area.

Figure 5-1 (Appendix 2) shows the location of the designated sites in relation to the project. The closest designated site to the grid connection route is Lough Gal pNHA, which is located 4.59km from the proposed replant lands.

Table 5-1: European Sites within 15km of the proposed replant lands

Designated Site	Site Code	Features of Interest	Distance to replant lands (km)
Mullaghanish to Musheramore Mountains SPA	004162	Hen Harrier (<i>Circus cyaneus</i>) [A082]	3.21
The Gearagh SAC	000108	Water courses of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation [3260] Rivers with muddy banks with <i>Chenopodium rubri</i> p.p. and <i>Bidentium</i> p.p. vegetation [3270] Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91A0] Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>) [91E0] <i>Lutra lutra</i> (Otter) [1355]	7.19
The Gearagh SPA	004109	Wigeon (<i>Anas penelope</i>) [A050] Teal (<i>Anas crecca</i>) [A052] Mallard (<i>Anas platyrhynchos</i>) [A053] Coot (<i>Fulica atra</i>) [A125] Wetland and Waterbirds [A999]	7.68
Blackwater River (Cork/Waterford) SAC	002170	Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Perennial vegetation of stony banks [1220] <i>Salicornia</i> and other annuals colonising mud and sand [1310] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410] Water courses of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation [3260] Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91A0] Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>) [91E0]	10.35

Designated Site	Site Code	Features of Interest	Distance to replant lands (km)
		<i>Margaritifera margaritifera</i> (Freshwater Pearl Mussel) [1029] <i>Austropotamobius pallipes</i> (White-clawed Crayfish) [1092] <i>Petromyzon marinus</i> (Sea Lamprey) [1095] <i>Lampetra planeri</i> (Brook Lamprey) [1096] <i>Lampetra fluviatilis</i> (River Lamprey) [1099] <i>Alosa fallax fallax</i> (Twaite Shad) [1103] <i>Salmo salar</i> (Salmon) [1106] <i>Lutra lutra</i> (Otter) [1355] <i>Trichomanes speciosum</i> (Killarney Fern) [1421]	
Mullaghanish Bog SAC	001890	Blanket bogs (* if active bog) [7130]	13.73

Table 5-2: National Sites within 10km of the proposed replant lands

Designated Site	Site Code	Features of Interest	Distance to proposed replant lands (km)
Lough Gal pNHA	001067	Lough Gal is a little known lake now largely grown over by the fen at Curraghindaveagh. The plant communities include floating fen with some peat development especially in the south-west corner. Marshwort (<i>Apium inundatum</i>) and several pondweeds (<i>Potamogeton</i> sp.) occur on the lake. The present Natural Heritage Area includes an extensive area of freshwater marsh with abundant willow (<i>Salix</i> sp.) scrub invasion.	4.59
Glashgarriff River pNHA	001055	<p>The Glashgarriff River has a notable waterfall and several series of rapids.</p> <p>Sedges (<i>Carex laevigata</i>) and Eared Willow (<i>Salix aurita</i>) are characteristic of the woodland here while the rocks are generally covered by mosses or, in shady places filmy ferns (<i>Hymenophyllum</i> sp.). The waterfall was once a site for the legally protected Killarney fern (<i>Trichomanes speciosum</i>) in the last century but it has now disappeared.</p> <p>The ground flora of the woodland is moderately rich for an upland situation. Wood Anemone (<i>Anemone nemorosa</i>), Primrose (<i>Primula vulgaris</i>), Bluebell (<i>Hyacinthoides non-scriptus</i>) and the</p>	6.70

Designated Site	Site Code	Features of Interest	Distance to proposed replant lands (km)
		<p>bulbous form of Celendine (<i>Ranunculus ficaria</i>) occur.</p> <p>Otters use this site, a species listed under Annex II of the E.U. Habitats Directive as it is threatened in the E.U. Badgers also occur here, this species is internationally important in the Irish Red Data Book.</p> <p>The main landuse within the site is forestry. The woodlands and river are also used for amenity purposes and shooting.</p> <p>This site includes one of the few waterfalls in the county. The flora of ferns and non-flowering plants in the glen are of interest. The presence of two protected mammal species adds further importance to the site.</p>	
Boggeragh Mountains NHA	002447	Peatlands [4]	6.78
The Gearagh pNHA	000108	No information available	7.19
Prohus Wood pNHA	001248	<p>Birch (<i>Betula</i> sp.), Oak (<i>Quercus</i> sp.) and Holly (<i>Ilex aquifolium</i>) are frequent, with some Willows (<i>Salix</i> sp.) and Alder (<i>Alnus glutinosa</i>) beside streams. At the lower edge thickets of Blackthorn (<i>Prunus spinosa</i>) and Hawthorn (<i>Crataegus monogyna</i>) occur with some Hazel (<i>Corylus avellana</i>). Partly coppiced growing on rocky ground which slopes to the east.</p>	9.48

5.2.1.3.2 Habitats within and adjacent to Replant Site

Improved Agricultural Grassland (GA1)

The dominant habitat type within the proposed replant lands is improved agricultural grassland (GA1). This is dominated by perennial ryegrass *Lolium perenne*, with occasional common mouse ear *Cerastium fontanum*, dandelion *Taraxacum officinale* and daisy *Bellis perennis*.

Wet grassland (GS4)

There are three areas within the proposed replant lands that are areas of "poorly-drained farmland that have not been recently improved" [Fossitt (2000) description of Wet Grassland GS4]. These areas are dominated by Yorkshire fog *Holcus lanatus*, with abundant immature gorse plants *Ulex europaeus*, creeping thistle *Cirsium arvense* and soft rush *Juncus effusus*. There is also occasional lesser spearwort *Ranunculus flammula* along the margins of these areas.

Scrub (WS1)

The majority of the field boundaries within the site are comprised of scrub. This habitat is dominated by gorse *Ulex europaeus* and bracken *Pteridium aquilinum*, with abundant bramble *Rubus fruticosus* agg. There is also frequent marsh pennywort *Hydrocotyle vulgaris*. There are some sections which also include occasional goat willow *Salix caprea* and hawthorn *Crataegus monogyna*.

Hedgerow (WL1)

A hedgerow is located at the northern end of the proposed replant lands, adjacent to the access road. This hedgerow is dominated by hawthorn *Crataegus monogyna* and goat willow *Salix caprea*, with an understorey of bramble *Rubus fruticosus* agg.

Treeline (WL2)

There is a short section of treeline in the northern section of the site, comprised of several sitka spruce *Picea sitchensis*.

Drainage ditch (FW4)

There are drainage ditches surrounding most sections of the site. The majority of these are dry. There are some shallow, wet drainage ditches also.

Spoil and bare ground (ED2)

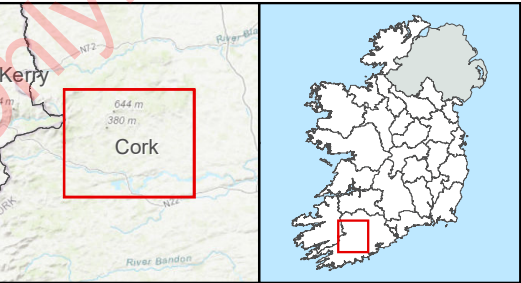
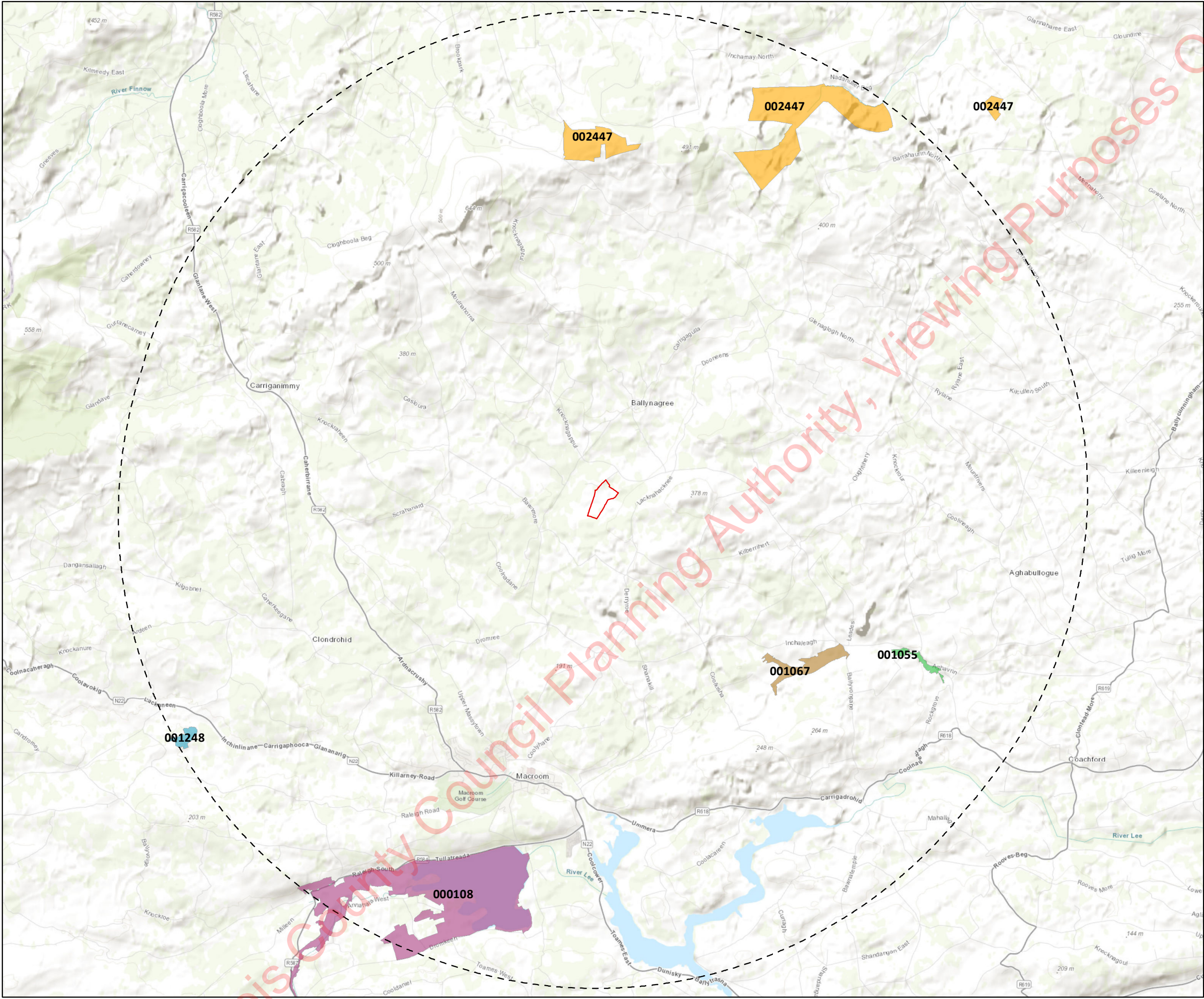
There are tracks through the centre of the site which allow access between agricultural fields within the proposed replant land area. These tracks are unpaved, with vegetation growing along the centre of some sections.

Invasive Species

Two invasive species were recorded on the site boundaries; Montbretia *Crocsmia x crocosmiiflora* and Snowberry *Symphoricarpos albus*.

Montbretia is a herbaceous perennial and can grow up to 1m in height with spikes of large, funnel-shaped orange flowers. Its principal means of spreading is vegetatively by proliferation of underground corms; as such it is at risk of being spread by the movement of soil containing corms, from which re-growth can occur. Montbretia is common and widespread across Ireland, often thriving in many country lanes. Its risk of impact on native Irish species has not been assessed by the National Biodiversity Data Centre.

Snowberry is a deciduous shrub that can grow up to 6m tall, producing small dense clusters of white flowers and white berry-like fruits. It is found in a wide variety of habitat types and spreads mainly by vegetative means through sprouting, but also by rhizomes and potentially by seeds dispersed by birds eating the fruits. Snowberry is found extensively throughout Ireland but is classified by the National Biodiversity Data Centre as having a low risk of impact on native Irish species.



- Site Boundary
- 10km Distance from Site Boundary
- Proposed Natural Heritage Area (pNHA)**
- Glasgarriiff River, 001055
- Lough Gal, 001067
- Prohus Wood, 001248
- The Gearagh, 000108
- Natural Heritage Area (NHA)**
- Boggeragh Mountains NHA, 002447



TITLE:

Natural Heritage Areas within 10km of Replant Lands

PROJECT:

DernaCart Windfarm

FIGURE NO:

5.1

CLIENT:

Statkraft

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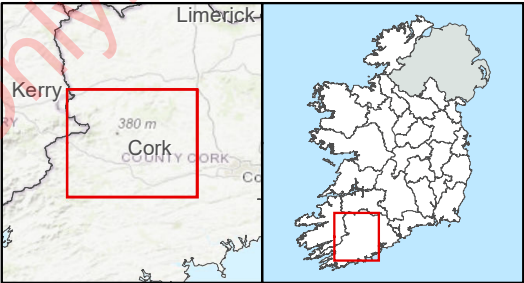
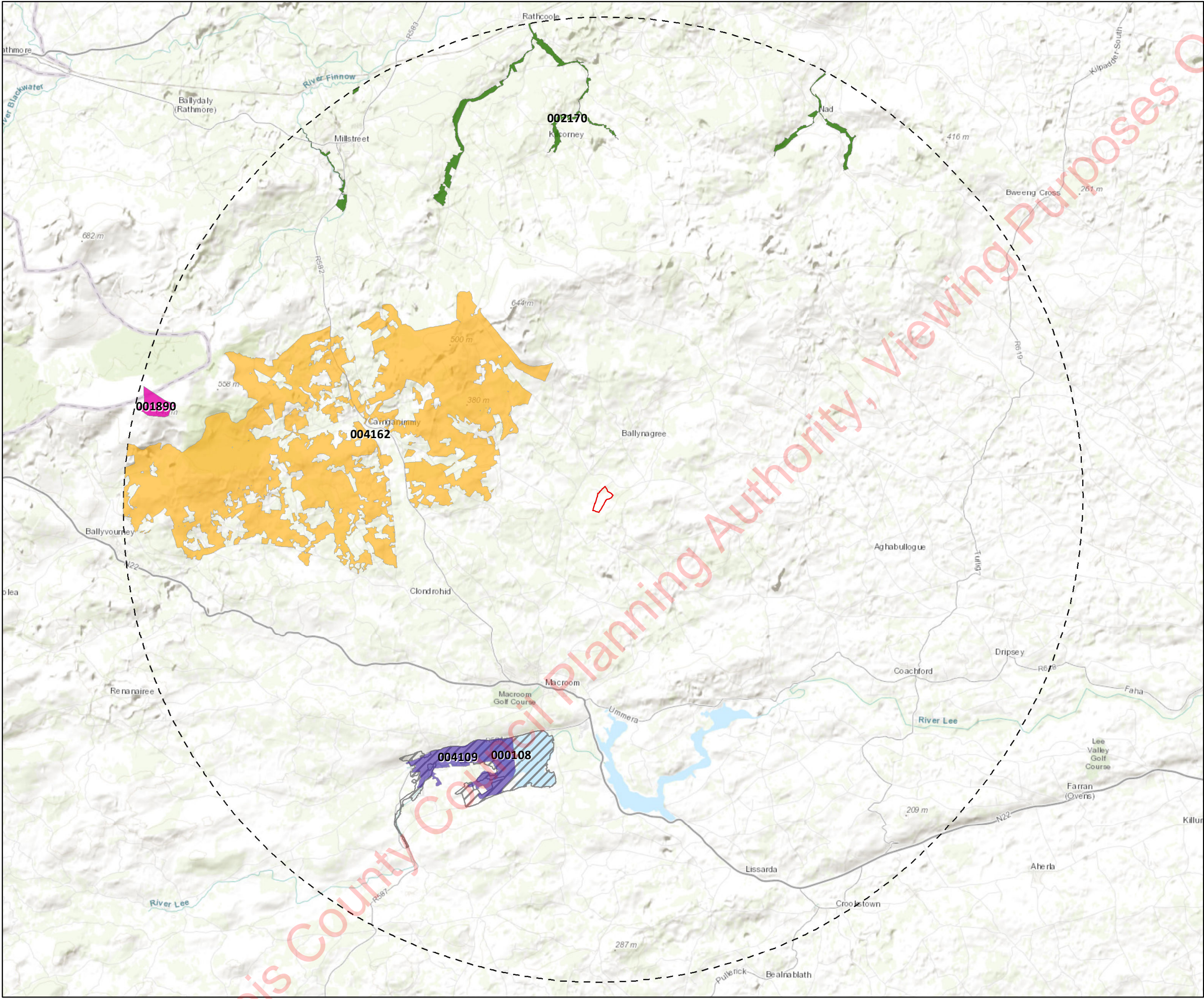
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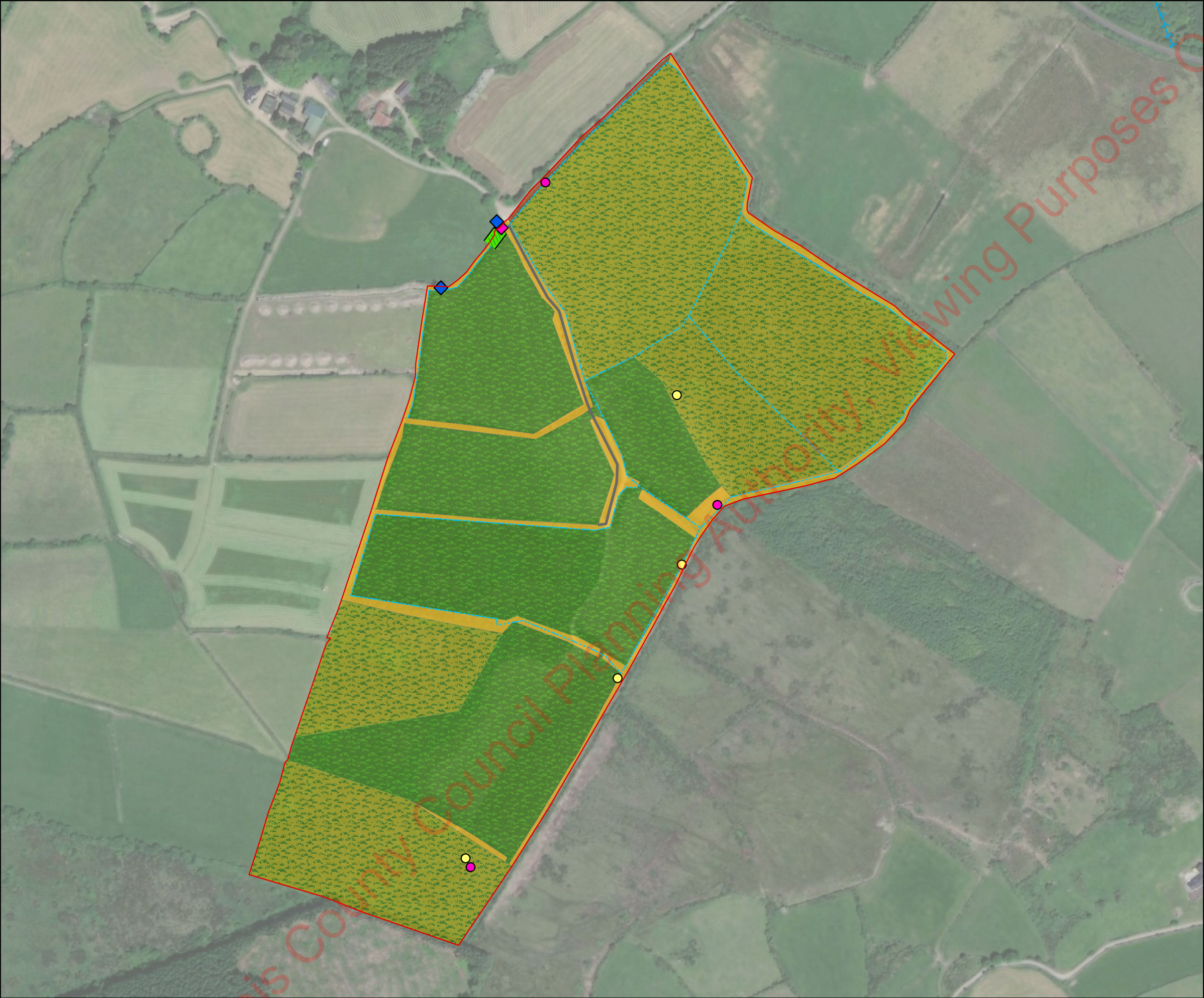
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- Site Boundary
- Special Protection Areas (SPA)**
- Mullaghanish to Musheramore Mountains SPA, 004162
- The Gearagh SPA, 004109
- Special Areas of Conservation (SAC)**
- Blackwater River (Cork/Waterford) SAC, 002170
- Mullaghanish Bog SAC, 001890
- The Gearagh SAC, 000108
- 15km Study Area

TITLE:		European Sites within 15km	
PROJECT:		Derrinacart Windfarm	
FIGURE NO:		5-2	
CLIENT:		Statkraft	
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- Site Boundary
- Rivers
- Species Recorded On-Site**
- Fox dropping
- Mammal path
- Montbretia
- Snowberry
- Habitats**
- WS1, Scrub
- WL1, Hedgerow
- GA1, Improved agricultural grassland
- GS4, Wet grassland
- WL2, Treeline
- ED2, Spoil and bare ground
- FW4, Drainage ditch

TITLE:		Habitats	
PROJECT:		Dernacart Wind Farm	
FIGURE NO:		5.3	
CLIENT:		Statkraft	
SCALE:	1:3500	REVISION:	0
DATE:	12/12/2019	PAGE SIZE:	A3

5.2.1.4 Potential Effects

5.2.1.4.1 Potential Effects to European Sites Within 15km

Direct

The proposed replant land is not situated within a European site. Thus, there will be no land take and no direct effect.

Indirect

Of the five European sites within 15 km (see Table 5-3 and Figure 5-2, none are immediately adjacent to the proposed replant lands. This criterion was used to rule out the sites lacking a hydrological connection. There is a significant distance between the proposed replant lands and Blackwater River (Cork/Waterford) SAC (002170) which is 10.35km from the proposed replant lands. However, a hydrological link is absent.

Mullaghanish to Musheramore Mountains SPA is designated for Hen Harrier, and is situated 3.22km from the proposed replant lands. During the breeding season Hen Harrier have a core foraging range of 2km from the nest site, travelling a maximum of 10km. Young forestry can positively effect hen harrier by providing foraging and breeding habitat. A medium-term, slight positive effect is envisaged as a result of the proposed afforestation.

Table 5-3: European Sites Within 10km

Site Name	Distance from Replant Lands	Hydrological Connection
Mullaghanish to Musheramore Mountains SPA	3.22	No
The Gearagh SAC	7.18	No
The Gearagh SPA	7.68	No
Blackwater River (Cork/Waterford) SAC	10.35	No
Mullaghanish Bog SAC	13.73	No

5.2.1.4.2 Potential Effects to National Sites Within 10km

Direct

The proposed replant land is not situated within a nationally designated site. Thus, there will be no land take and no direct effect.

Indirect

Of the five National sites within 10 km (see Table 5-4 and figure 5-1), all were ruled out on the due to their distance from the site, the minimal scope of works and the lack of downstream hydrological connections. No indirect effect is envisaged on national sites (pNHAs and NHAs).

Table 5-4: National Sites Within 10km

Site Name	Distance from Replant Lands (km)	Hydrological Connection
Lough Gal pNHA	4.59	No
Glashgarrieff River pNHA	6.70	No
Boggeragh Mountains NHA	6.78	No

Site Name	Distance from Replant Lands (km)	Hydrological Connection
The Gearagh pNHA	7.19	No
Prohus Wood pNHA	9.48	No

5.2.1.4.3 Potential Effects on Habitats

There were no Annex I habitat types within the study area. Due to its semi-natural character, Wet Grassland (GS4) is considered to be *Higher Value, Locally Important*. The effect of afforestation on these habitats would be a *Long-term Slight Effect* as this habitat types shall be lost but these areas of poorly drained farmland are common in the greater area and have already been subjected to some degree of improvement and disturbance, although not recently.

The Drainage Ditches (FW4) within the site are considered to be *Locally Important, Lower value*. The majority of these are dry. Those that are wet are shallow, stagnant and considered unlikely to support significant aquatic fauna, particularly those qualifying interests for the aforementioned designated sites. They may be of limited use by common frog *Rana temporaria*, and avifauna such as heron.

There is the potential for an indirect effect to this habitat due to the potential for displacement of sediment and other pollutants during the planting of trees at the site. Any effects arising from afforestation of the site would form a small percentage of the sum of similar pressures exerted by agriculture and forestry activities in the wider area. The unmitigated effect of the proposed afforestation could have a *slight* effect to this habitat. However, the implementation of standard best practice forestry guidance in relation to the planting would be required and therefore the resultant operations are likely to have minimal environmental effects.

Invasive Species

Two invasive species were recorded on the site boundaries; Montbretia *Crocsmia x crocosmiiflora*, and Snowberry *Symphoricarpos albus*.

Interaction of proposed works with Montbretia *Crocsmia x crocosmiiflora* may occur, and there exists the possibility of it being spread within the proposed site during replanting. It is likely that invasive species could affect the existing environment and habitats within the site. It is considered **possible** that prior to mitigation a **long-term slight effect** could arise as a result of invasive species.

Snowberry *Symphoricarpos albus* is located at the site entrance, and is unlikely to be disturbed. Trimming may be required to allow access to the site, but the species is spread by root disturbance only. Thus, a significant effect is not envisaged.

5.2.1.4.4 Effects on Mammals

The construction of the proposed replant areas will consist of habitat loss. These habitats are widespread in the general area, and there is good connectivity between the site and surrounding habitats. Thus, this small-scale loss of habitat will not result in a significant negative effect on the distribution of local protected mammal fauna including pine marten, pygmy shrew, Irish hare, hedgehog, bat species and wood mouse. The habitats are considered negligible for bat roosting, although linear habitats such as scrub, and hedgerows may be used for foraging and commuting. It is considered **near certain** that any unmitigated effects will be **short-term imperceptible**.

5.2.1.4.5 Effects on birds

Habitats such as scrub, hedgerow and treeline have the potential to be used by nesting birds. Where hedgerows are to be removed there is the potential for species to be disturbed and/or injured. Due to the density of these habitats on site, it is considered **near certain** that any unmitigated effects could potentially result in a **short-term significant (worst case scenario) if clearance during the bird nesting season (March-August)**.

5.2.1.5 Mitigation Measures

Watercourses

While the drainage ditches on site are not connected to surrounding watercourses, they have the potential to be used by species such as common frog *Rana temporaria*, which is protected under Wildlife Act, 1976 (as amended). Mitigation measures which will reduce the risk of entrainment of suspended solids and nutrient release into drainage ditches within the site comprise best practice methods which will be applied at the replanting site. These include:

Careful mapping of existing site drainage and vulnerabilities (wet ground, preferential flow paths) prior to planting will be carried out and the appropriate drainage design and management will be employed. This includes the provision of collector drains which will disperse drainage water with low velocity through wide (15m) vegetated buffer zones increasing the efficacy of sediment and nutrient retention across the area. Silt fencing will be erected along drainage ditches of the proposed replanting to provide additional protection to the watercourses in this area.

There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zones at planting stage.

A buffer of 15m from the drainage ditches will be maintained, following the minimum buffer zone widths recommended in the Forest Service (2000) guidance document " *Forestry and Water Quality Guidelines*".

Site preparation for replanting will be carefully managed to prevent any loss of silt and sediment conveyed in surface water run-off to receiving waters.

This reduces potential sources of sediment and reduces the risk of sediment and sediment bound nutrient run-off from the site to neutral effect.

Invasive species

To prevent the spread of Montbretia *Crocsmia x crocosmiiflora*, the entire stand will be excavated and buried at a depth of at least 2m, incinerated or disposed to a licensed facility. Regular follow up treatment with appropriate herbicide will be required for up to 2 years to control re-growth from corms.

The spread of Snowberry *Symphoricarpos albus* will be prevented spraying with a strong glyphosate-based herbicide, which must be applied when the plant is in full leaf (late-spring, or summer). Several applications may be required, and care will be taken to avoid non-target species (cowslips, violets and other woodland flora may occur nearby). Where the plant must be removed to enable clearance works, the entire stand will be excavated and buried at a depth of at least 2m, incinerated or disposed to a licensed facility.

Birds

To avoid a negative effect on nesting birds, clearance works will take place outside of the nesting season (i.e. 1st March to 31st August).

5.2.1.6 Residual Effects

With the implementation of the aforementioned mitigation measures, no residual effects are envisaged as a result of the proposed replanting.

5.3 Hydrology and Water Quality

The River Laney (EPA code: IE_SW_19L010400) is located to the north, west and south of the site. There are three monitoring stations along River Laney to the west of the site.

Water quality monitoring downstream at Coppeleenbawn Bridge (station ID: RS19L010200) was recorded as Q4 (Good) in 2016.

Potential Effects

While the process of afforestation may result in a slight alteration in the water runoff of the site, the small size of the site (23.99ha) means that any potential effects this may have would be insignificant. The afforestation will lead to an imperceptible reduction in the runoff volumes in the longer term as trees mature.

The potential effects on water quality are as described in the ecology section as potential disturbance of soil from plant and personnel movement on site causing sediment loss and/ or possible nutrient loss.

The site is of a low gradient (virtually flat) and there is a proposed 15m buffer zone between the planting and the drainage ditches on site. The predicted effect on water quality is slight prior to the implementation of mitigation measures.

Mitigation Measures

Mitigation measures which will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses comprise best practice methods which will be applied at the replanting site. These include:

Careful mapping of existing site drainage and vulnerabilities (wet ground, preferential flow paths) prior to planting will be carried out and the appropriate drainage design and management will be employed. This includes the provision of collector drains which will disperse drainage water with low velocity through wide (15m) vegetated buffer zones increasing the efficacy of sediment and nutrient retention across the area. Silt fencing will be erected along the banks of drains to the east and south of the site to provide additional protection to the watercourses in this area.

There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zones at planting stage. A buffer of 15m from the drainage ditches will be maintained, following the buffer zone widths (using a conservative 15m for a steep site) recommended in the Forest Service guidance document "Forestry and Water Quality Guidelines".

Site preparation for replanting will be carefully managed to prevent any loss of silt and sediment conveyed in surface water run-off to receiving waters.

These measures will reduce potential sources of sediment and reduce the risk of sediment and sediment bound nutrient run-off from the site.

Residual effects

The residual effect is slight and temporary during the planting stage and future harvesting stage.

5.4 Air quality and Climate

The primary land-uses within and in the vicinity of the subject site comprise agriculture and forestry. Due to the non-industrial nature of afforestation and the general character of the surrounding environment, it is expected that air quality in the existing environment is good, since there are no major sources of air pollution [e.g. heavy industry in the vicinity of the site].

The growth of forestry has no direct atmospheric emissions. There are some minor indirect emissions associated with site preparation, planting and harvesting include vehicular and dust emissions.

Based on the EPA Air Quality Zones for Ireland, the site is Zone D (rural area) as per Article 6 of the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) where air quality is good to very good based on the air quality limits set by S.I. No. 180 of 2011 – Air Quality Standards Regulations, 2011.

Potential Effects

The overall planting will not generate ongoing air emissions. On the contrary, replanted areas contribute positively in carbon sequestration and production of oxygen, thereby offsetting the production of greenhouse gases.

The use of machinery during the drainage works will result in the emission of greenhouse gases. Operations such as the transport of materials are typical examples of machinery use. This effect is considered to be imperceptible, given the insignificant quantity of greenhouse gases that will be emitted.

Mitigation Measures

All construction machinery will be maintained in good operational order while on-site, minimising any emissions that are likely to arise.

Residual effects

On balance, there will be positive effects on air and climate associated with the proposed afforestation.

5.5 Population, Human Health and Material Assets

The closest town is Macroom, Co. Cork is located c a. 8.5km to the south with a population of 3,765 in the 2016 Census.

The town of Macroom is located ca. 8.5km to the south of the site, and is located north of the Lee Valley. The planting of the site will require machinery to access the site via the main N22 road. Traffic movements would be low and would not have the potential for significant effects on traffic along the N22.

The closest residential property is located ca. 153m to the north-west of the site and so there is potential for noise disturbance during planting and subsequent harvesting.

Mitigation Measures

Best practice measures for noise control will be adhered to onsite during the planting phase of the afforestation in order to mitigate the potentially imperceptible temporary to short-term negative effect associated with this phase of the development.

The measures include:

- Noise will be controlled by prescribing that all work will be restricted to the standard construction working hours. Any work carried out outside of these hours shall be restricted to activities that will not generate noise of a level that may cause a nuisance.
- The excavator used on the site shall be well maintained and will comply with E.U. and Irish legislation in relation to noise emissions. The timing of on- and off-site movements of plant near occupied properties will be controlled.

Residual effects

Potential residual effects associated with the proposed afforestation will be imperceptible and temporary in nature and related to temporary disturbance to residents in close proximity to the site.

5.6 Geology and Soils

According to the GSI Bedrock Map, the bedrock beneath the site mainly comprises sandstone till and is underlain by a locally important aquifer which is moderately productive only in local zone. The soil is classified as Fine loamy drift with siliceous stones.

There are no geological heritage sites or recorded landslides within 2 km of the site and no mineral deposit sites (current or historic) within the proposed area.

Potential Effects

There may be a slight, temporary negative effect on soils during replanting associated with the construction of drains through the site. There will be a risk of nutrient loss during the site preparation and planting phase during afforestation.

However, the low intensity planting will be carried out by hand and in accordance with best practice forestry guidelines, so that there will be limited disturbance to the soils and no soils will be removed from site. On completion, the soils will be compacted and no loss of soil from the site is expected.

There are no likely effects due to the afforestation on the underlying geology.

Mitigation Measures

Tree planting will be carried out by hand by angle-notch planting. Any drains will be generally shallow and will be constructed in accordance with the forestry service best practice guidelines described in section 3. Soils will remain in situ at the site and will not be removed offsite.

Residual effects

There will be no residual effects on geology associated with the proposed afforestation.

5.7 Archaeology

There are three recorded archaeological sites present within the 350m of the proposed replant lands.

- Single enclosure - located c. 180m to the north (CO08474).
- Rath/Ringfort – located c. 258m to the west (CO08472)
- Rath/Ringfort – location c. 311m to the east (CO08576)

On the first edition OS six-inch map of 1837-1842, which depicts no structures or features within it, the fields within it are depicted as large, rough-pasture, with far less subdivision than currently exists. The fields were subsequently subdivided, as evidenced on the 1888-1913 25-inch OS map, which also shows a track crossing the area, connecting the local road with the proposed replant lands.

The late 19th / early 20th century many of these field boundaries have been removed, though their lines can be traced on the aerial imagery. Where boundaries have been retained, they comprise mature tree / hedgerow or drainage ditches. The track shown on the 25-inch OS map is still in situ.

No specific sites or areas of archaeological potential have been identified within the proposed afforestation area. As a greenfield area, however, the land is considered to have an inherent archaeological potential.

Agricultural practices, such as ploughing and land improvement, tend to obscure any surviving surface archaeology, thus, the presence and/or extent of the potential sub-surface archaeological resource within the site is currently unknown. As such, any measurable effect is largely indeterminable at this stage and can only be postulated as *potential* effects and *potential* significance of effects.

Should archaeological remains be encountered during the planting stage, these direct effects shall be mitigated by either preservation *in situ* (avoided) or preservation by record (fully archaeologically excavated), per consultations and agreements with NMS.

Preservation *in situ* shall allow for a negligible magnitude of effect albeit on a hitherto unknown value/sensitivity asset, resulting in a **potential not significant/imperceptible** significance of effect in the context of residual effect on the archaeological resource.

Preservation by record shall allow for a high magnitude of effect, albeit ameliorated by the creation of a full and detailed archaeological record, the results of which shall be publicly disseminated. This shall result in a **potential slight/moderate** significance of effect in the context of residual effect on the overall archaeological resource.

Mitigation Measures

Adherence to the normal standards of the Forestry and Archaeological Guidelines and archaeologically monitoring of earthmoving activity on site will be carried out. During the planting stage, a suitably qualified archaeologist will be on site to monitor the works. In the event of an archaeological find or feature being discovered during the construction phase works, the archaeologist shall evaluate, characterise and determine the extent of the remains. Thereafter an agreed mitigation framework including a Method Statement and Programme of Works shall be required in order to adequately preserve and/or record the archaeological resource, with consultation from the National Monuments Service (NMS). Whilst determination is being sought to mitigate the find/feature, the area shall be appropriately buffered with temporary fencing and an adequate works exclusion zone created in order to minimise any potential indirect damage during the site works.

Residual effects

There will be no significant residual effects on cultural heritage associated with the proposed afforestation following implementation of mitigation measures.

5.8 Landscape and Visual Effect

The current Cork County Development Plan 2014-2020 refers the reader to appendix E for details of the Landscape Character Assessment of the County. The site is located in LCA 13A Valleyed Marginal Middleground, and is described as a range of "Moorland Ridge, Rolling Farmland and Boggy Flat Valley".

There are no Protected/listed views within 1km from the site. The nearest Scenic Route is along 'roads at Mushera in the boggeragh Mountains, and roads from Mushera to Ballynagree, Lackdoha and Rylane Cross'. This is located c. 310m north of the proposed replant lands of the subject site. It is downslope of the proposed replant lands, and will therefore not be affected by the replanting.

The Carrigthomas site is best described as Rolling Fertile Farmland. The 'Forestry and Landscape Guidelines' (Forest Service, 2000) describe this landscape type as follows:

This landscape type is a man-made 'working landscape: The rolling hills are characterised by a patchwork of clearly defined fields with farmsteads and houses scattered throughout. These fields are typically under pasture or tillage. The scale of the landscape is usually relatively enclosed. Soil fertility should allow broadleaf plantations, with a potential for sylvicultural systems other than clear-felling.

The topography, vegetation and anthropological features on the land surface in an area combine to set limits on the amount of landscape that can be seen at any one time. These physical restrictions form individual areas or units known as physical units whose character can be defined by aspect, slope, scale and size. A physical unit is generally delineated by topographical boundaries and is defined by landform and landcover.

The proposed replanting site is located on elevated, relatively flat land. The site itself lies at an elevation of approximately 145m OD. The physical unit of the proposed replanting site is defined by the River Laney to the north, west, and south. It is located directly near areas of existing coniferous forestry plantation, both to the south and north of the site.

The site is approximately 153 metres from the nearest dwelling. Field boundaries are not always prominent, however the boundaries of the proposed replanting site follow the existing field patterns. Although the internal field boundaries of the site are not always obvious, they will be retained on the site where possible.

The site lies in an area with 'Low Sensitivity' which means that it will have the capacity to absorb new developments, such as afforestation, as identified in the Cork County Development Plan 2014-2020.

There are no Protected/listed views within 1km from the site. The site is surrounded by patches of forestry and pastures.

Potential Effects

The site preparation and planting phase will entail site works in terms of woody weed clearance and construction of forestry drains and will use the angle notch planting described in section 2. These activities will have a temporary neutral effect on the landscape character, which is that of a rural working landscape with a mixture of agricultural and forestry land uses. A neutral effect is a change which does not affect the quality of the environment (EPA,2002). The site clearance and replanting activities will assimilate well into the receiving environment, and are therefore classed as an imperceptible effect, i.e. an effect capable of measurement but without noticeable consequences.

The proposed replanting is to be carried out in an area where there are already existing conifer plantations among agricultural fields, and therefore the proposed replanting is not introducing a new land use but conforming to an established one. The predicted visual effect of the proposed replanting is therefore a Long Term, Imperceptible Neutral Effect.

In the operational phase, the proposed replanting will contribute to the patchwork of forestry plantations in the area. The predicted effect of the proposed replanting on landscape character is a Long Term, Imperceptible Neutral Effect.

Mitigation Measures

Mitigation measures for landscape and visuals will not be necessary. The planting method will be as per Section 2 above and mound drains will be constructed.

Residual effects

The Residual Effect on Landscape Character will be Long Term Imperceptible Neutral Effect while the Residual Effect on Visual Amenity will be Long Imperceptible Term Neutral Effect.

5.9 Cumulative Effects

The proposed Dernacart Wind Farm is not located in the same County as this replanting area but at a distance of c. 169km south west from it and will not result in cumulative effects on each other.

There is coniferous forestry located to the north and south of the site, and the cumulative effect arising from the proposed replanting in conjunction with the existing forestry plantations and future development is assessed as a Long Term, Imperceptible Neutral Effect.

5.10 Assessment Conclusions

The proposed site is located in an area of pastures and replanted forestry. The proposed afforestation may pose a positive effect in the enhancement of the landscape's distinctive character and increase the afforestation area of this region. This would contribute to the total percentage of the County's afforested area, currently at approximately 10.5% of the total area of the County. It is estimated that potential effects are neutral or positive in terms of land use and landscape effect.

The afforestation methodology is not intensive and all works and subsequent maintenance will be carried out in accordance with the various Guidelines described in Section 3.1.4 and the Technical Approvals issued by the Forest Service.

There are no permanent negative effects to the human environment and while temporary traffic effects may occur depending on the planting plan, easily implemented actions such as signage and banksmen will negate any traffic effects on the local community. There are no archaeological or architectural heritage resources in the proposed replant lands therefore there are no predicted effects on heritage.

With the implementation of Forestry and Water Quality Guidelines, particularly in managing site drainage to ensure ground disturbance is kept to a minimum, there is a low risk of significant nutrient and sediment run-off to watercourses in the area. The residual effect on ecology, hydrology and water quality are considered to be imperceptible.

Appendix 1

Technical Approval Document



KIERAN O'CONNELL

KIERAN O'CONNELL
DEEL FORESTRY LIMITED
CASTLEMATRIX
RATHKEALE
CO LIMERICK

20/02/2012

Preliminary Technical Approval Afforestation

Forest Owner	FO128303H
Contract Number	CN59014
Townland	Carrigthomas
County	Cork
Approved Area (Ha)	23.99
Fencing Length (LM)	2,390.00

This is a preliminary technical approval only and is not a grant approval. If you wish to proceed with this project you must notify the undersigned in writing within four weeks of the proposed planting date in order to receive full approval to plant and to obtain financial grant approval if applicable. You should note that the project will not be eligible for grant aid unless prior financial approval has been given in writing in advance of commencement of planting.

I refer to your application (Form 1) requesting approval of Afforestation as described above and shown on the enclosed map. Your application has been assessed and preliminary technical approval is hereby issued on the basis that the works will be undertaken in accordance with the prescription set out in Appendix A attached herewith.

As set out above, if you wish to proceed with this project, notification to this Department is required within four weeks of the proposed planting date and, at this stage, an application for financial grant approval will also be considered if submitted.

This scheme is financed by the State and payment of the grant, if financial approval is given, is subject to the following conditions:

1. Availability of funds in each financial year.
2. Submission of a fully completed and signed Form 2 (Application for Payment) and the following documents to support this application.

Valid Mandate
Statement of Costs and Invoices
TCCs
C2s
Provenance Cert
Bio-diversity Map
Certified Species Map
Fire Plan

3. Satisfactory completion of the work not later than 30/06/2013.
4. Compliance with Operational Proposals and Specifications enclosed.



Department of
**Agriculture,
Food and the Marine**

An Roinn
**Talmhaíochta,
Bia agus Mara**

5. Compliance with Departmental guidelines and requirements for Landscape, Water Quality, Harvesting, Biodiversity and Archaeology.

6. Compliance with Ecological Survey and Management Plan as submitted (applies to both elements of the Native Woodland Scheme).

7. The work is carried out by the registered company or forester specified on the original application. If it is intended to have a different company or forester undertake the work, it will be necessary to submit a new application (Form 1) to the Forest Service.

8. All applications are subject to the provisions of the penalty rules as set out in the current Afforestation Grant and Premium Scheme brochure.

9. All applications are subject to Cross Compliance checks with other grant schemes.

10. Grant payment may be subject to the netting policy of the Department of Agriculture, Fisheries and Food.

11. This approval is issued subject to the final terms and conditions of the Forest Service 2007 Grant and Premium Schemes.

12. Environmental & Silvicultural Considerations

Plant small groups of Scots pine, European Larch, oak, ash and rown where possible.,

Public Road Setback, Broadleaves 10m, Conifers 20m,

All guidelines to apply

You are required to notify the Department of Agriculture, Fisheries and Food in writing if any of the details of your application have changed.

Please feel free to contact this office, quoting your Contract Number, regarding progress of your application. LoCall 1890-200 509.

Yours sincerely

JOANNE ROBINSON
Approval Section
Forest Service

Department of Agriculture, Fisheries and Food**Operational Proposals for Approval of Afforestation**

Forest Owner Number	FO128303H
Contract Number	CN59014
Townland	Carrigthomas
County	Cork
Area Approved	23.99

All applications must be developed in accordance with detailed standards and procedures as described in the current Forestry Schemes Manual. Certain specific operational proposals particular to this application are described below. No change is permitted to these proposals and species approved unless approved in advance by the Department. The Department may insist that proposed changes constitutes a new application.

Operational Proposal Details

Drainage		
1. Drainage		Required
Fertiliser		
1. Zero		Not Entered
2. 350 Kg Granulated Rock Phosphate		Not Entered
3. 250 Kg Granulated Rock Phosphate		Yes
4. Split Application		Not Entered
5. Other Details		Not Entered
Firebreaks/Res.		
1. Firebreaks/Res		Required
Ground Prep.		
1. Woody Weed Removal		Not Entered
2. Ripping		Not Entered
3. Pit Plant		Not Entered
4. Mole Drainage		Not Entered
5. Mounding		Yes
6. Ploughing		Not Entered
9. Other Details		Not Entered
Planting Method		
1. Angle Notch		Yes
2. Pit		Not Entered
3. Machine		Not Entered
4. Slit		Not Entered
5. Other Details		Not Entered
Road Access		
1. Road Access		Provided
Standard Stocking		
1. Standard Stocking		Yes
2. Details		Not Entered
Weed Control		
1. Herbicide Control yr0		Yes
2. Herbicide Control yr1		Yes
3. Herbicide Control yr2		Not Entered
3. Herbicide Control yr4		Not Entered
4. Herbicide Control yr3		Not Entered



4. Manual	Not Entered
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Fencing Details	Stock	2390	Stock-Sheep	0
	Stock-Rabbit	0	Upgrade to Deer	0
	Deer-Rabbit	0	Deer	0
	Upgrade Existing Fence(s)	0		
	Upgrade Details: None Entered			

Species Approved

The species approved in this proposal relate to the digitised certified species map attached.

Species Approved for Afforestation

Plot	Area	GPC	Land Type	Species	Species Area	Yield Class	Mixture Type	Exclusion	Exclusion Type
1	23.99	GPC 3	CHF	ALD	2.4	12	Block		
				SS	21.59	22			

Additional Silvicultural and Environmental Conditions

In addition to the Department's environmental and silvicultural guidelines the following specific conditions apply to this proposal:

Silvicultural and Environmental Conditions

Plant small groups of Scots pine, European Larch, oak, ash and rown where possible.,
Public Road Setback, Broadleaves 10m, Conifers 20m,
All guidelines to apply



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Scale 1: 5000.0
Contract: CN59014

Certified Species Information

Contract No: CN59014

Applicant: KATHLEEN HEALY

Townland: CARRIGTHOMAS

County: C

6 " OS No: CK70

Plot No	GPC	Parcel No	GPC Area(h)	Land Use Type	Species Area	Species	Mixture Type	Excl. Area(h)	Excl. Type
1	GPC 3	24838499	23.99	CHF	23.99	SS, ALD	B	0.0	
Totals			23.99		23.99			0.0	

Remarks :

Area Surveyed By :

Species Certified By :

Date:

Date:

FORM 2: AFFORESTATION SCHEME

DETAILS OF CONTRACTOR/S USED

Contractor No. 1

Name Address	
Current Tax Clearance Certificate Provided	Yes <input style="width: 50px; height: 20px;" type="checkbox"/> No <input style="width: 50px; height: 20px;" type="checkbox"/>

Contractor No. 2

Name Address	
Current Tax Clearance Certificate Provided	Yes <input style="width: 50px; height: 20px;" type="checkbox"/> No <input style="width: 50px; height: 20px;" type="checkbox"/>

Contractor No. 3

Name Address	
Current Tax Clearance Certificate Provided	Yes <input style="width: 50px; height: 20px;" type="checkbox"/> No <input style="width: 50px; height: 20px;" type="checkbox"/>

NAME AND ADDRESS OF COMPANY TO WHICH GRANT IS MANDATED

Company Name	
Address	
Valid Mandate signed and submitted by all parties for the 1st Instalment Grant	Yes <input style="width: 50px; height: 20px;" type="checkbox"/> No <input style="width: 50px; height: 20px;" type="checkbox"/>

Maintenance Contract

Is there a 4 year maintenance contract in operation relating to this plantation?	Yes <input style="width: 50px; height: 20px;" type="checkbox"/> No <input style="width: 50px; height: 20px;" type="checkbox"/>
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COSTS OF WORKS CARRIED OUT

			GPC1		GPC2		GPC3		GPC4		GPC5		GPC6		GPC7		TOTALS
Total Area (ha) claimed per GPC			ha		ha		ha		ha		ha		ha		ha		ha
Ground Preparation	Mounding		ha	€	ha	€	ha	€	ha	€	ha	€	ha	€	ha	€	€
	Ploughing		ha	€	ha	€	ha	€	ha	€	ha	€	ha	€	ha	€	€
	Ripping		ha	€	ha	€	ha	€	ha	€	ha	€	ha	€	ha	€	€
	Scrub Clearance		ha	€	ha	€	ha	€	ha	€	ha	€	ha	€	ha	€	€
Plants			ha	€	ha	€	ha	€	ha	€	ha	€	ha	€	ha	€	€
Planting			ha	€	ha	€	ha	€	ha	€	ha	€	ha	€	ha	€	€
Fertiliser			ha	€	ha	€	ha	€	ha	€	ha	€	ha	€	ha	€	€
1st Cleaning/Spraying			ha	€	ha	€	ha	€	ha	€	ha	€	ha	€	ha	€	€
Mapping			ha	€	ha	€	ha	€	ha	€	ha	€	ha	€	ha	€	€
Fencing	Stock	m	€		€		€		€		€		€		€		€
	Stock/ Sheep	m	€		€		€		€		€		€		€		€
	Stock/ Rabbit	m	€		€		€		€		€		€		€		€
	Deer	m	€		€		€		€		€		€		€		€
Firelines		m	€		€		€		€		€		€		€		€
TOTAL DIRECT COSTS			€		€		€		€		€		€		€		€
MANAGEMENT COSTS			€		€		€		€		€		€		€		€
VAT PAID ON DIRECT COSTS			€		€		€		€		€		€		€		€
TOTAL COST			€		€		€		€		€		€		€		€

Management Costs = % of Direct Costs