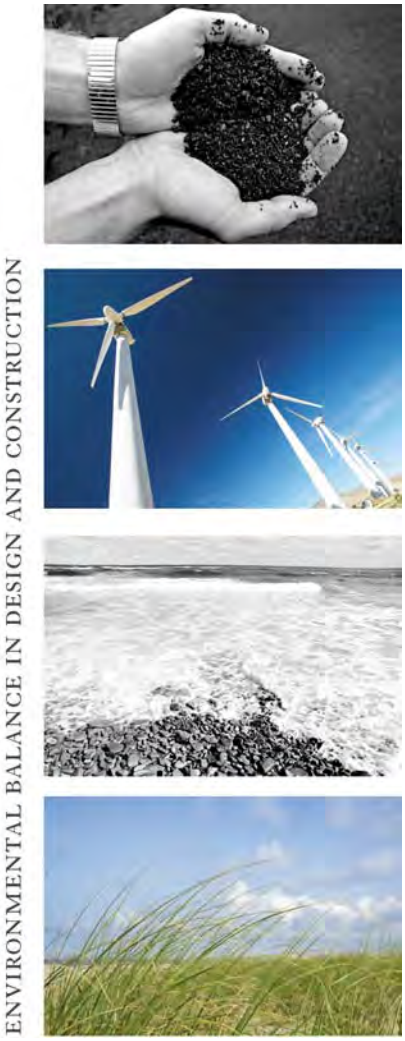


# ELEMENT POWER IRELAND LTD.

# ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED MAIGHNE WIND FARM IN COUNTY KILDARE AND COUNTY MEATH

## VOLUME 2 – MAIN EIS

## CHAPTER 2 – DESCRIPTION OF THE PROPOSED DEVELOPMENT

**MARCH 2015**

FEHILY TIMONEY & COMPANY

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# 2 DESCRIPTION OF THE DEVELOPMENT

## 2.1 Introduction

This section of the EIS describes the existing site and the main components of the proposed development and provides details on the construction, operation and decommissioning of the wind farm.

### 2.1.1 Project Background

Element Power Ireland Ltd. (Element Power) proposes to develop Maighne Wind Farm which is predominately located in north County Kildare with the exception of two turbines which are located in south County Meath. While the proposed site was originally assessed as part of the Greenwire Wind Energy Export Project, Element Power now intends to connect this project to the Irish National Grid utilising a Gate 3 connection. It is now proposed, therefore, to supply the power from Maighne Wind Farm to the Irish electricity network via a HV underground cable to either one of two existing substations located at Woodland, Co. Meath or Maynooth, Co. Kildare. Therefore this project is no longer part of the Greenwire Project.

## 2.2 Existing Environment

The proposed development consists of the erection of up to 47 no. wind turbines with a tip height of up to 169m, access tracks, a sub-station, a permanent metrological mast, borrow pits and associated works, temporary compounds as well as temporary minor alterations to the public road for the delivery of turbines to the site (turbine delivery route). The turbines are arranged in five wind farm clusters which occupy a total area of 1,244 ha. The clusters are Ballynakill (10 turbines), Windmill (3 turbines), Drehid-Hortland (21 turbines), Derrybrennan (2 turbines) and Cloncumber (11 turbines). All clusters are connected via associated underground medium voltage (MV) cables (up to 333 kV) which run predominately along the public road network linking back to a proposed sub-station on-site at Drehid. Here the power will be converted to AC up to a maximum voltage of 220kV for export to the Irish national grid via high voltage (HV) underground cables to either one of two existing substations located at Woodland, Co. Meath or Maynooth, Co. Kildare.

The wind farm clusters and associated underground cabling extend southwards from the town of Longwood in County Meath to Moyvalley, Cadamnstown, Derrinturn, Allenwood, Roberstown and Rathangan in County Kildare. The HV route option to Woodland travel northwards from the Drehid-Hortland cluster along the R402, bypassing the town on Enfield and then eastwards long the R148 to Kilcock. From here the proposed cable route travels along a number of regional roads through townlands such as Calgath, Martinstown, Jenisktown, Barstown and onto Woodland substation. The HV cable route to Maynooth travels westwards on local roads from Drehid to enter the north of the Hortlands turbine cluster. It will then be routed through the Hortlands site to the southern entrance before being routed on local roads through townlands such as Donadea, Loughtown, Graiguelin, Taghadoe to Maynooth Substation.

The landscape of the study area is almost entirely rural in nature. The predominant land uses consist of pastoral farming and some tillage on sloping, fertile and well drained ground. In flat and poorly drained lowland areas the predominant land use is rough grazing interspersed with commercial conifer plantations and some areas of unmanaged scrubland particularly around bog fringes. There are extensive areas of peatland much of which has been harvested for fuel at commercial and domestic scale. The array of sites comprising this proposed are principally contained within these flat peatland and wet farmland areas. The land use classifications as defined by the Corine 2006 landcover database are shown in Figure 2.2.

The soils present in the development area comprise Grey Brown Podzolics derived from limestone and shale glacial till with associated Gleys and Brown Earths and cutover peat. The underlying quaternary soils identified are limestone till, undifferentiated lake sediments and fluvioglacial sands and gravels. The bedrock comprises limestones and calcarerous shales.

The Maighne Wind Farm development is located across a number of river catchments. The northern part of the site drains to the River Boyne and River Blackwater. The southern part of the site drains to the River Barrow and River Nore as well as the Slate River and the Figile River. The Royal Canal lies north of the proposed development. It connects the River Liffey in Dublin with the River Shannon in Co. Longford.

The Grand Canal runs through the southern area of the proposed development, connecting the River Liffey in Dublin with the River Shannon in Co. Offaly. A feeder line from Athy and the Barrow, called the Grand Canal Barrow Line is a branch of the canal and flows just east of the Cloncumber cluster. The Ballynakill cluster is located in lands on the western side of the Royal Canal and north of the M4, the Regional road R148 and the Glash River. The River Boyne is located to the North West of the cluster with the settlement of Moyvalley to the South East. The HV cable routes transgress the additional waterbodies of the Ballycorron tributary of the River Blackwater and the main channel of the Ryewater River.

In total, there are 36 designated sites or proposed designated sites within 15km of the proposed development. Ten of these are Natura 2000 or 'European' sites. Of these 10 European sites, nine are candidate Special Areas of Conservation (cSACs) and one is designated as a Special Protected Area (SPA). A number of the cSAC sites are also designated as Natural Heritage Areas (NHA). There are 20 proposed Natural Heritage Areas (pNHAs) and four additional, designated Natural Heritage Areas (NHAs). The designated sites within 15km of the proposed site boundary are shown in Figure 2.3 overleaf. Refer to the Natura Impact Statement which accompanies this EIS and Chapter 7 Ecology for further details on this.

## 2.3 Landownership

The majority of the land is in private ownership. Twelve turbines and the proposed substation are located within land owned by Coillte. These include turbines T11, T12, T13, T14, T29, T30, T31, T32, T40, T42, T43, T44. Confirmation of the landowners consent to make the application for planning permission and to develop the proposed wind farm is contained in Appendix A of Volume 3 Appendices of this EIS.

### 2.3.1 On Site Wind Resource

A wind atlas for the area suggests an annual mean wind speed across the site of 7 - 8m/s for hub heights ranging from 75m. In addition, Element Power has two metrological masts in close proximity to most of the proposed Maighne turbines. One of the masts is located to the north east of Maighne in Kinnegad and the other is located in Moanvane to the south west. The Moanvane mast has been recording since August 2013 and the Kinnegad mast has been recording since January 2014. The wind predictions from these masts support the case that the Maighne area is suitable for a commercial scale wind farm of this size and that the tip height being requested as part of the consent for development is the appropriate size for this area. Several large rotor turbines are suitable for the site which will allow competitive tendering before the start of construction. The turbine technology being considered for the site is all proven technology manufactured by mainstream turbine suppliers.

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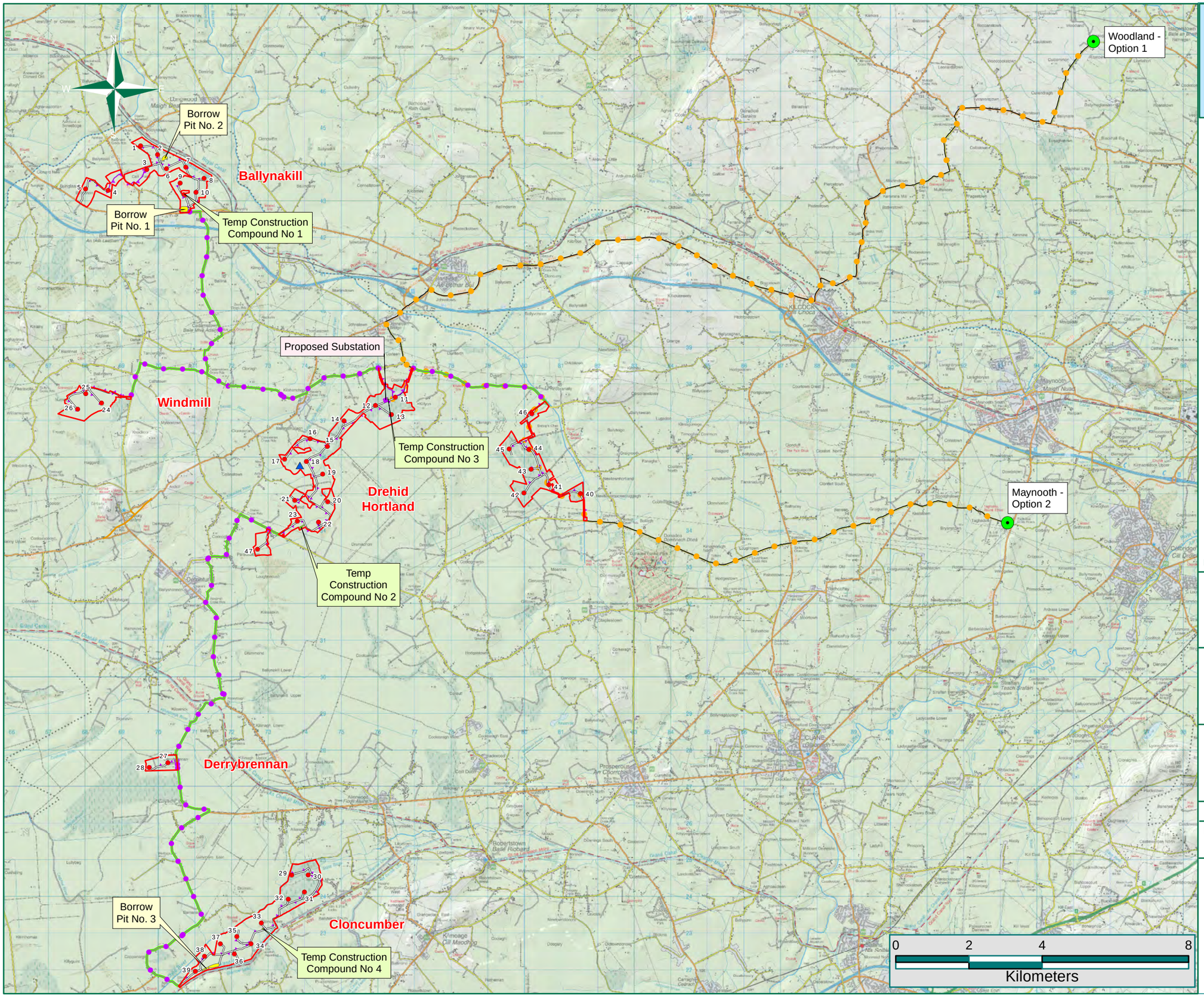


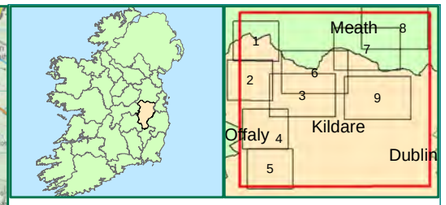


## Legend

- Turbine Location
- Wind Farm Cluster Boundary
- Proposed Borrow Pit Location
- Proposed Compound Location
- Proposed Substation Location
- Proposed Met Mast Location
- Indicative Access Track
- MV Cable Route
- MV Cable Route (Internal to Clusters)
- Irish Grid Connection Point
- HV Cable Route

Date 25/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Site Layout Overview (Maighne)

Scale Used 1:100,000 @ A3

Figure No. 2.1.

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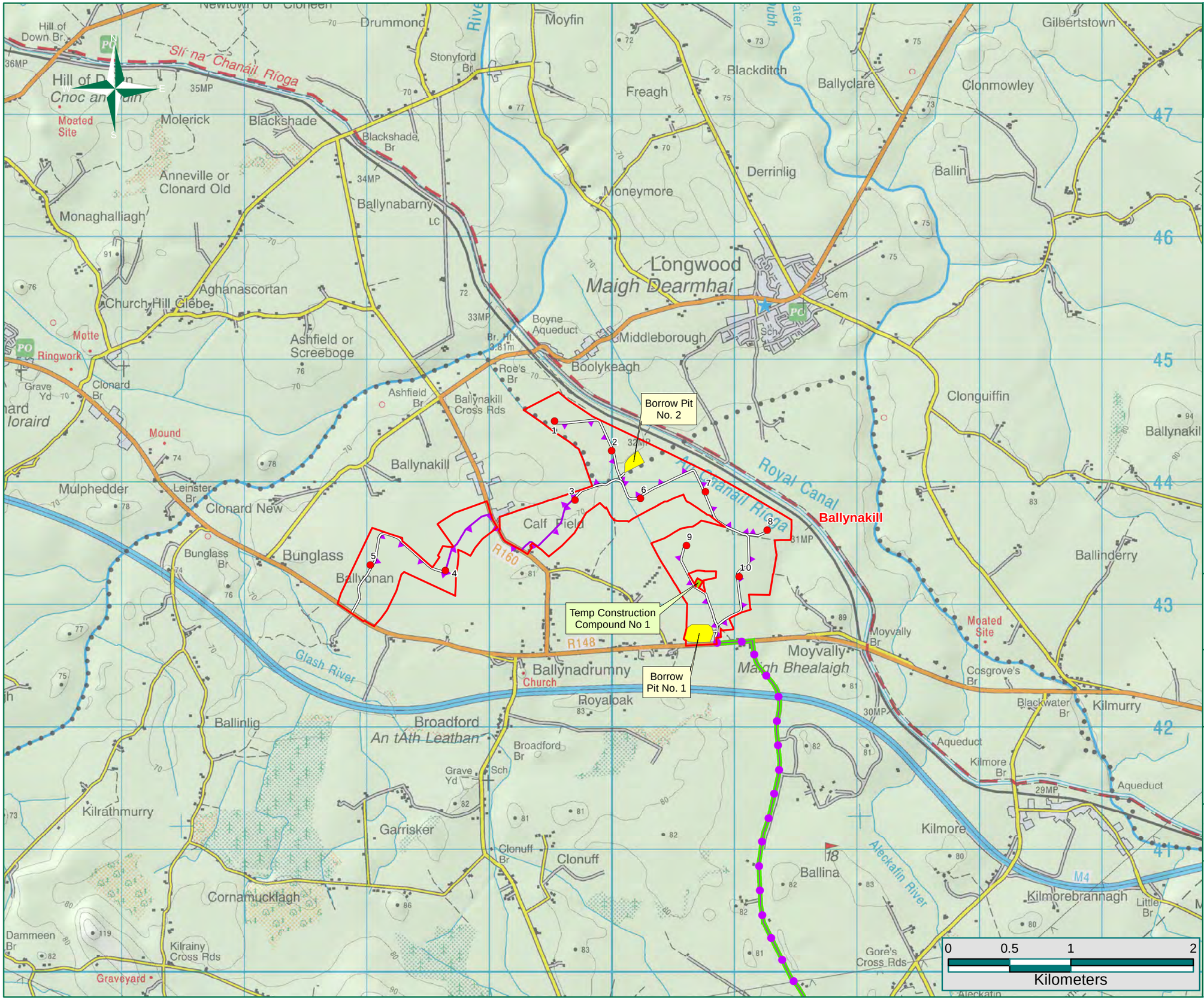


## Legend

- Turbine Location
- Wind Farm Cluster Boundary
- Proposed Borrow Pit Location
- Proposed Compound Location
- Proposed Substation Location
- Indicative Access Track
- MV Cable Route
- MV Cable Route (Internal to Clusters)
- Irish Grid Connection Point

Date 25/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Site Layout
Submap 1 of 9 (Ballynakill)

Scale Used 1:30,000 @ A3

Figure No. 2.1.1

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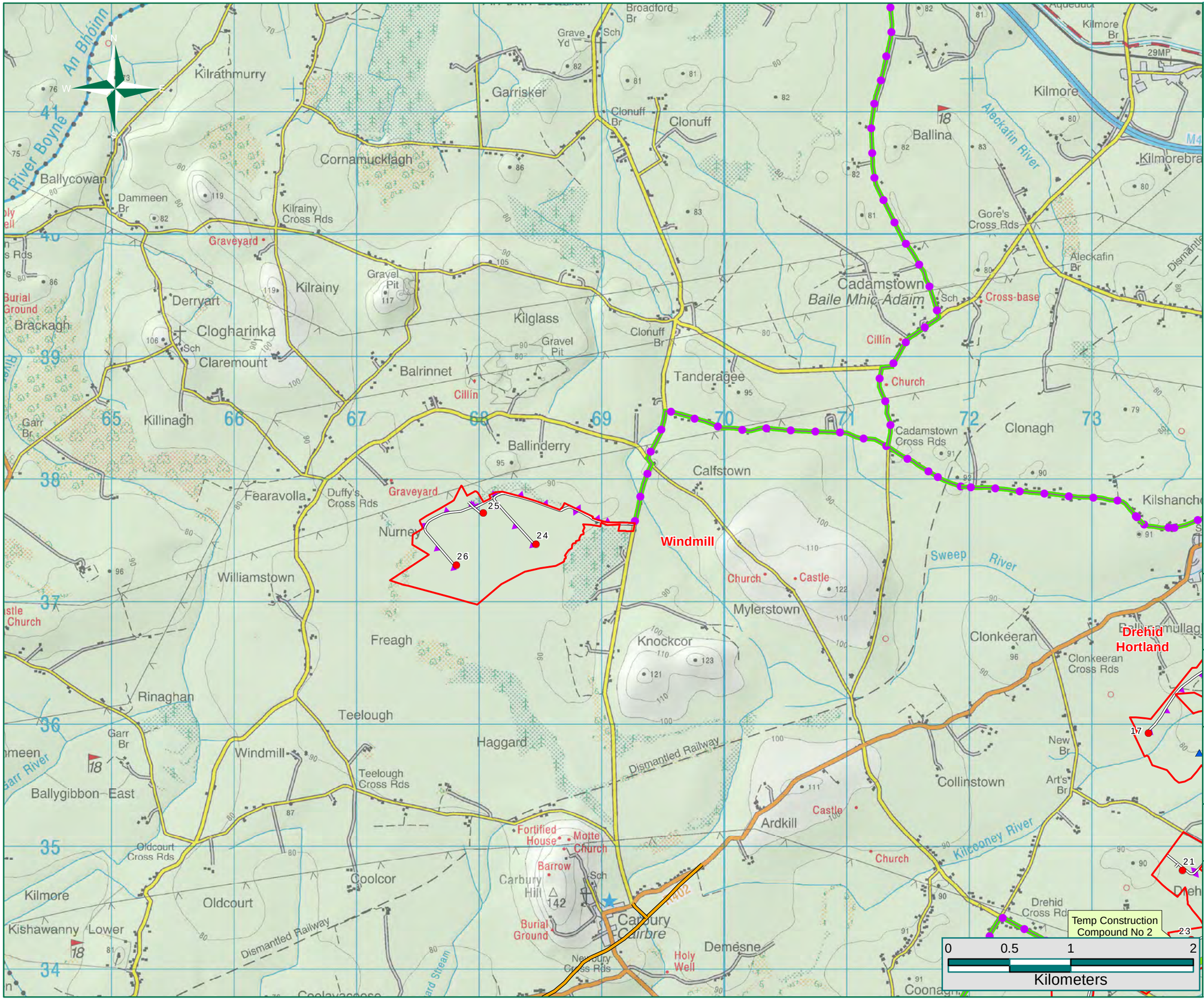


## Legend

- Turbine Location
- Wind Farm Cluster Boundary
- Proposed Borrow Pit Location
- Proposed Compound Location
- Proposed Substation Location
- Proposed Met Mast Location
- Indicative Access Track
- MV Cable Route
- MV Cable Route (Internal to Clusters)
- Irish Grid Connection Point

Date 25/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Site Layout
Submap 2 of 9 (Windmill)

Scale Used 1:30,000 @ A3

Figure No. 2.1.2

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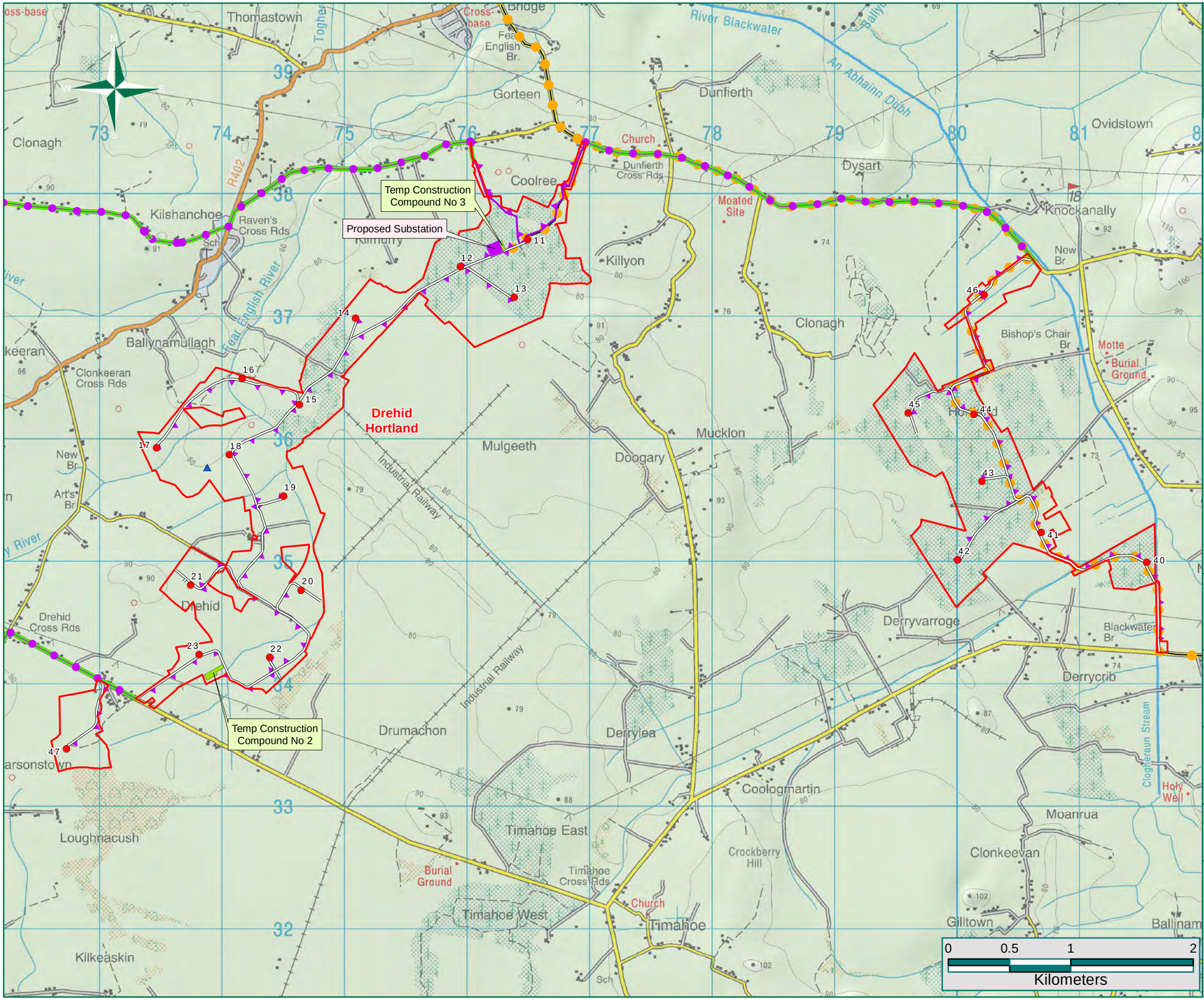


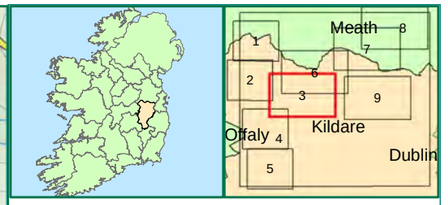


## Legend

- Turbine Location
- Wind Farm Cluster Boundary
- Proposed Borrow Pit Location
- Proposed Compound Location
- Proposed Substation Location
- Proposed Met Mast Location
- Indicative Access Track
- MV Cable Route
- MV Cable Route (Internal to Clusters)
- Irish Grid Connection Point
- HV Cable Route

Date 25/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Site Layout
Submap 3 of 9 (Drehid Hortland)

Scale Used 1:30,000 @ A3

Figure No. 2.1.3

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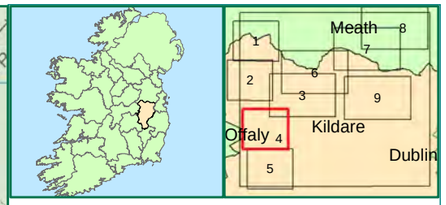


## Legend

- Turbine Location
- Wind Farm Cluster Boundary
- Proposed Borrow Pit Location
- Proposed Compound Location
- Proposed Substation Location
- Indicative Access Track
- MV Cable Route
- MV Cable Route (Internal to Clusters)
- Irish Grid Connection Point

Date 25/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Site Layout
Submap 4 of 9 (Derrybrennan)

Scale Used 1:30,000 @ A3

Figure No. 2.1.4

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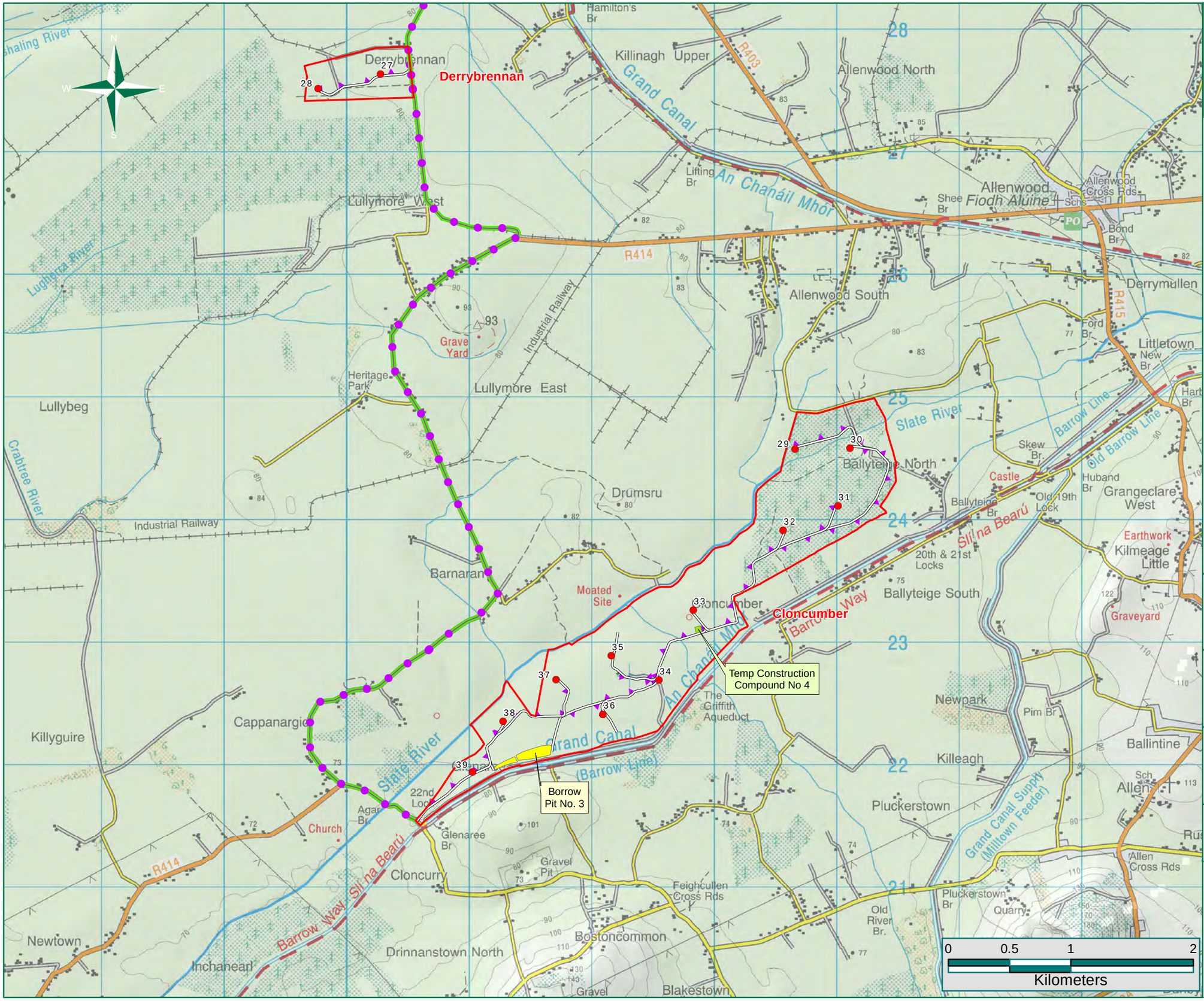


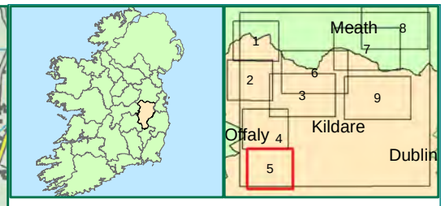


## Legend

- Turbine Location
- Wind Farm Cluster Boundary
- Proposed Borrow Pit Location
- Proposed Compound Location
- Proposed Substation Location
- Indicative Access Track
- MV Cable Route
- MV Cable Route (Internal to Clusters)
- Irish Grid Connection Point

Date 25/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Site Layout
Submap 5 of 9 (Cloncumber)

Scale Used 1:30,000 @ A3

Figure No. 2.1.5

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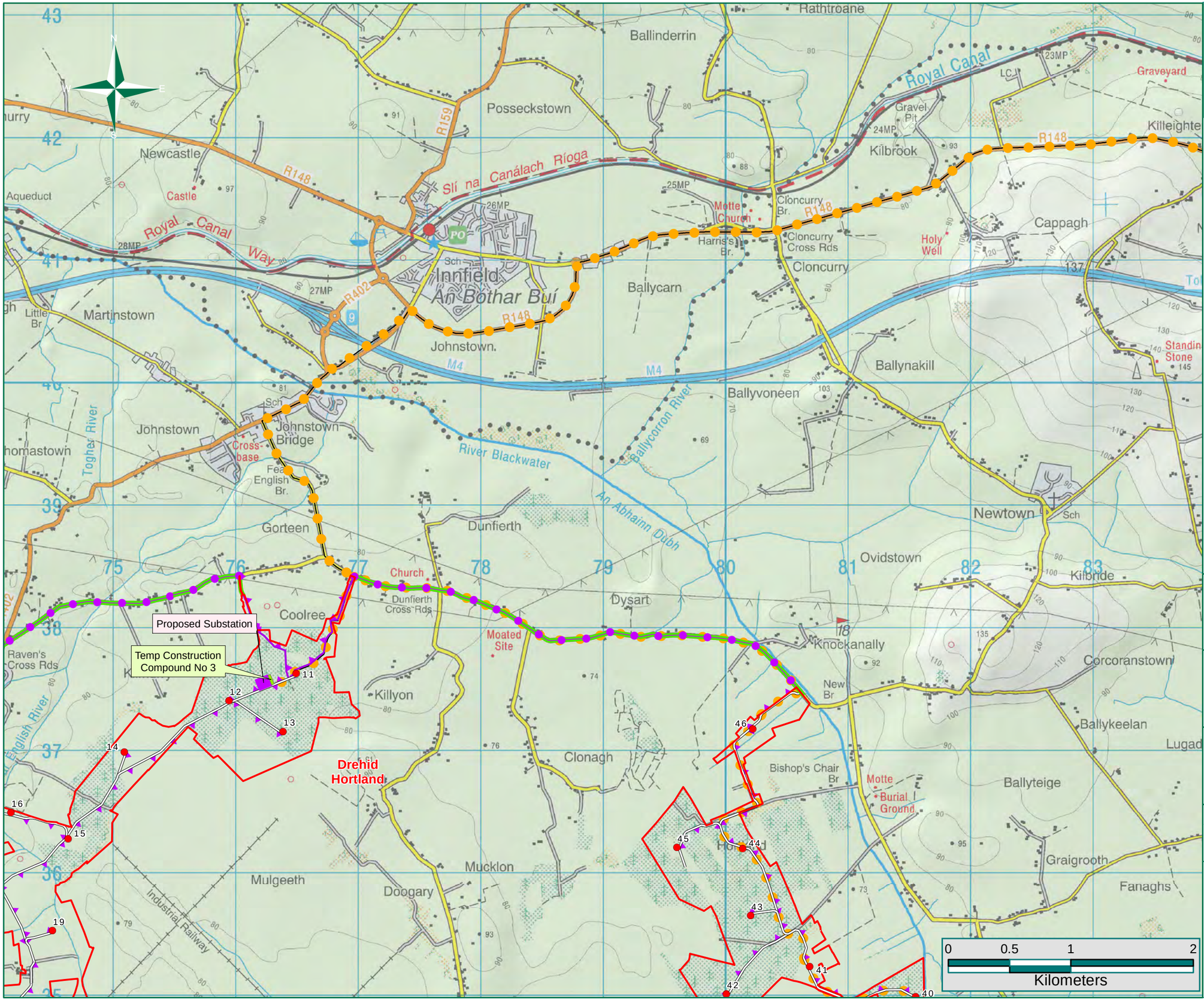


## Legend

- Turbine Location
- Wind Farm Cluster Boundary
- Proposed Borrow Pit Location
- Proposed Compound Location
- Proposed Substation Location
- Indicative Access Track
- MV Cable Route
- MV Cable Route (Internal to Clusters)
- Irish Grid Connection Point
- HV Cable Route

0 0.5 1 2
Kilometers

Date 25/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Site Layout
Submap 6 of 9 (Cable to Woodland)

Scale Used 1:30,000 @ A3

Figure No. 2.1.6

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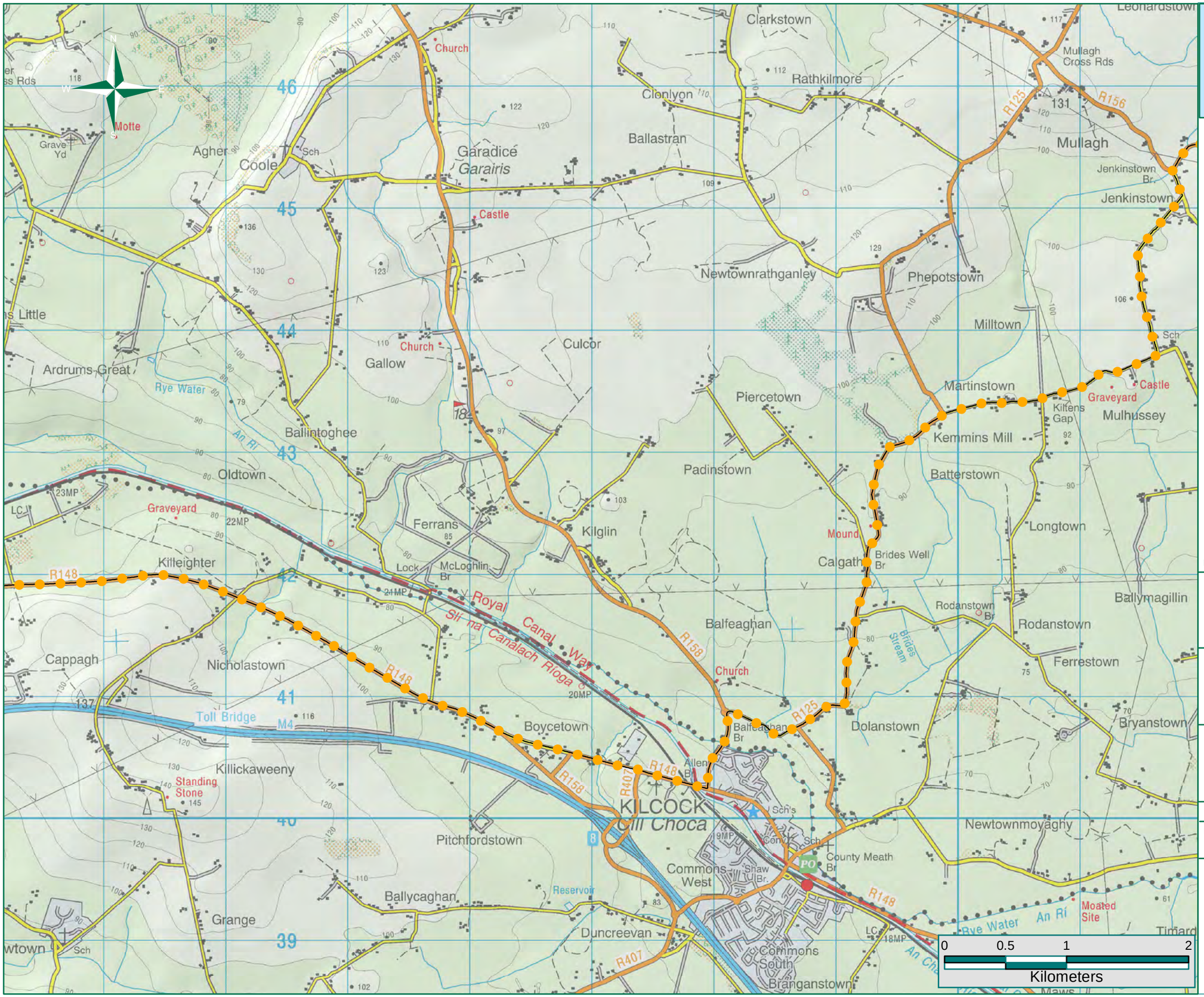


Date 25/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Site Layout
Submap 7 of 9 (Cable to Woodland)

Scale Used 1:30,000 @ A3

Figure No. 2.1.7

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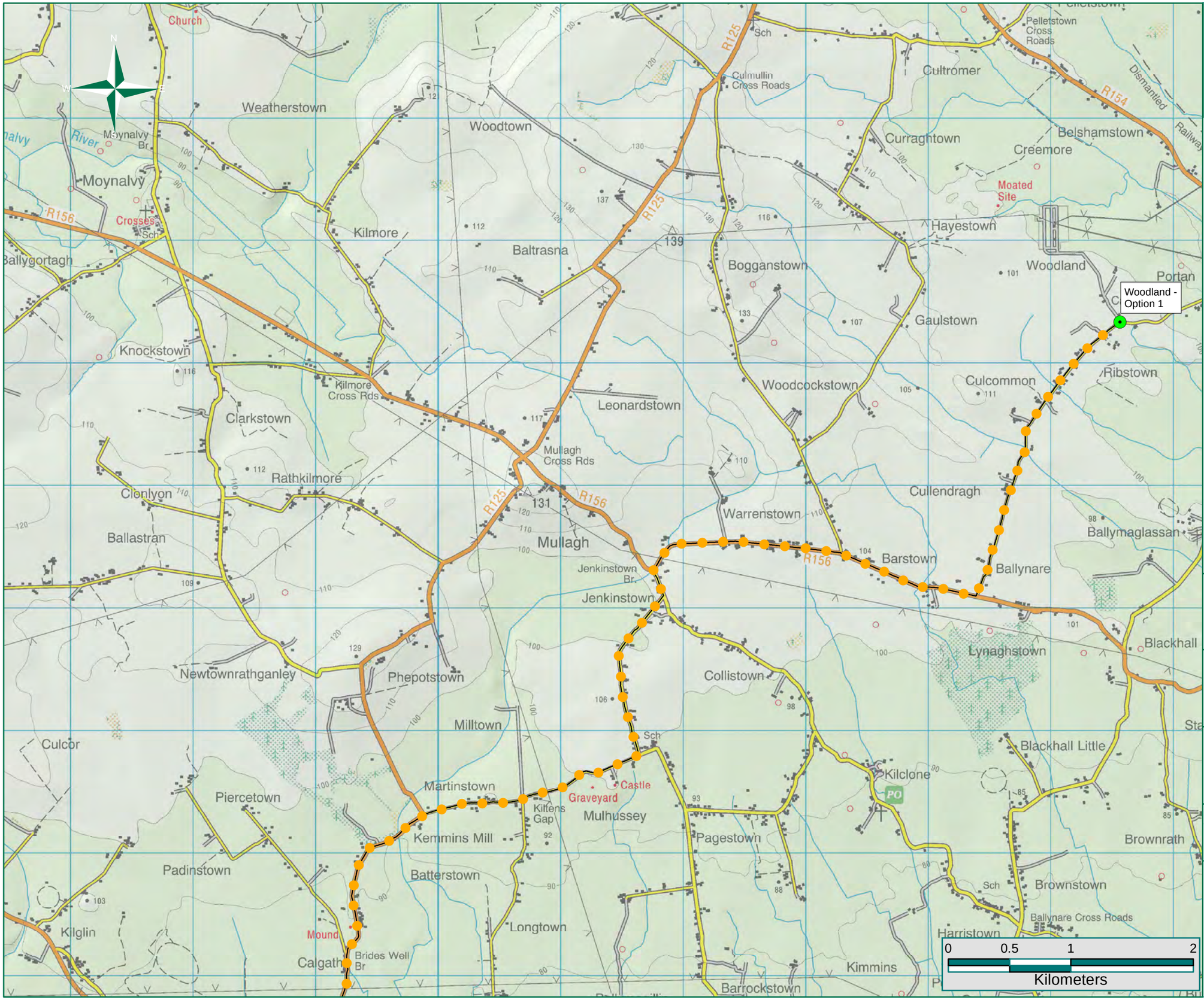


Date 25/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Site Layout
Submap 8 of 9 (Cable to Woodland)

Scale Used 1:30,000 @ A3

Figure No. 2.1.8

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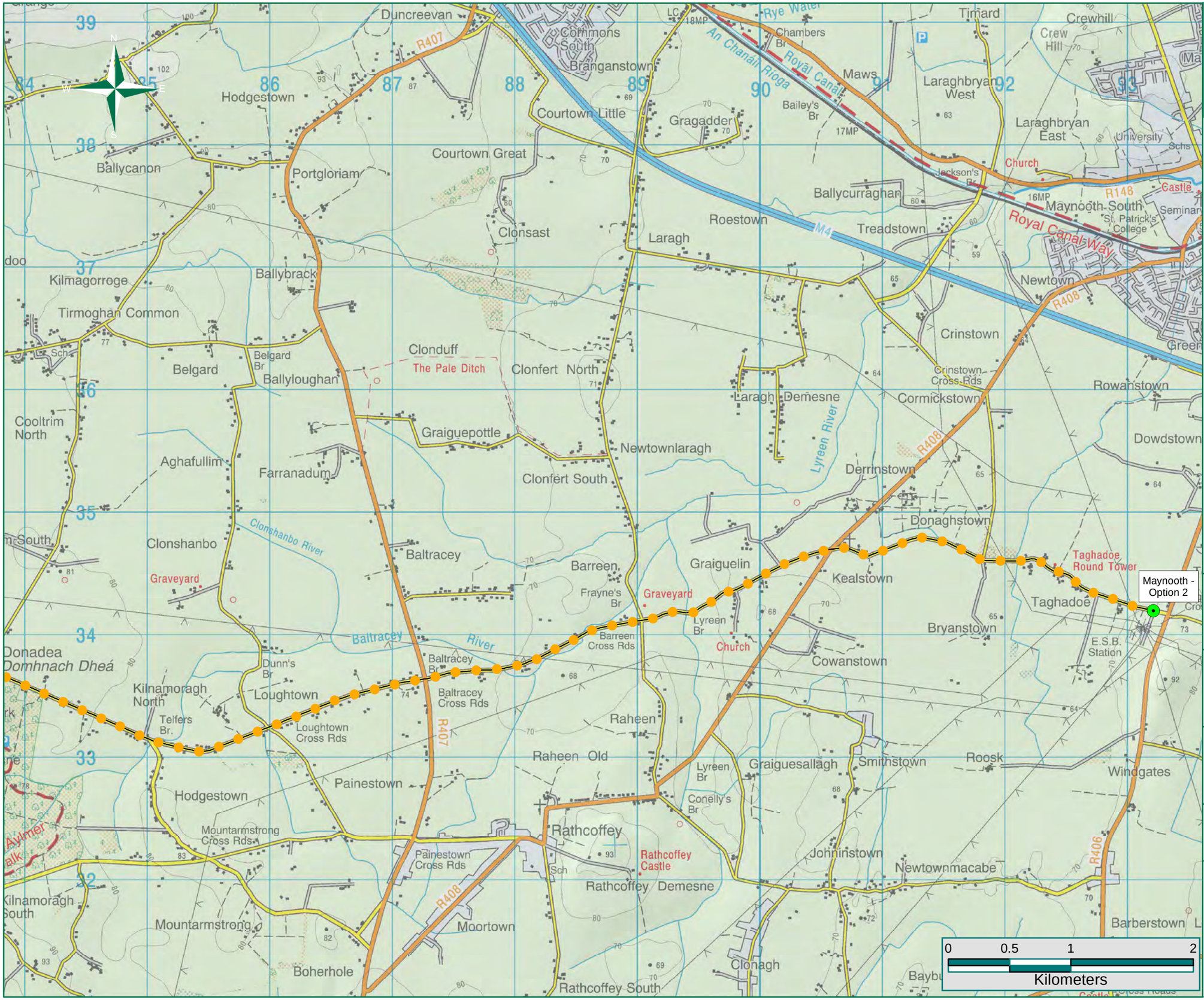


## Legend

- Proposed Borrow Pit Location
- Proposed Compound Location
- Proposed Substation Location
- Indicative Access Track
- MV Cable Route
- MV Cable Route (Internal to Clusters)
- Irish Grid Connection Point
- HV Cable Route

Date 25/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Site Layout
Submap 9 of 9 (Cable to Maynooth)

Scale Used 1:30,000 @ A3

Figure No. 2.1.9

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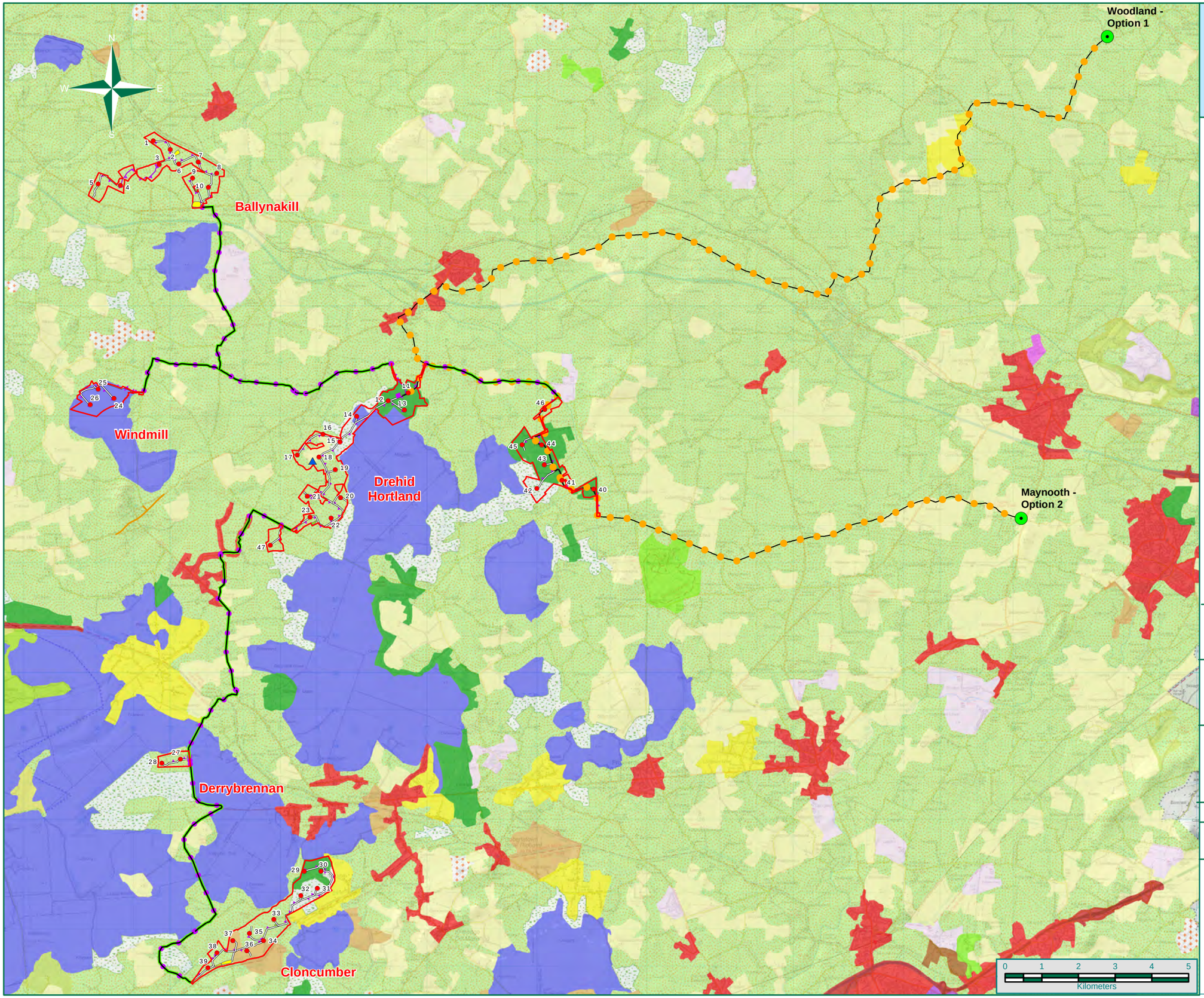
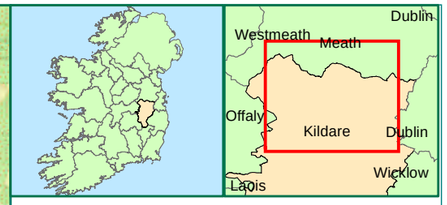
R:\Map Production\2014\LE14\731\04\Workspace\EIS MAPS\Chapter 2 Site Layout\LE14 731 04 _ Figure 2.2 Corine Land Use.mxd






## Legend

- Turbine Location
- Wind Farm Cluster Boundary
- Proposed Borrow Pit Location
- Proposed Compound Location
- Proposed Substation Location
- Proposed Met Mast Location
- Indicative Access Tracks
- MV Cable Route
- MV Cable Routes (Internal to Windfarm Clusters)
- Irish Grid Connection Point
- HV Cable Route

### *Corine Landcover Type*

- 112 Discontinuous urban fabric
- 131 Mineral extraction sites
- 142 Sport and leisure facilities
- 211 Non-irrigated land
- 231 Pastures
- 242 Complex cultivation patterns
- 243 Land principally occupied by agriculture with areas of natural vegetation
- 311 Broad-leaved forest
- 312 Coniferous forest
- 313 Mixed forest
- 324 Transitional woodland scrub
- 412 Peat bogs

Date 25/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

CORINE Land Use

Scale Used 1:100,000 @ A3

Figure No. 2.2

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R:\Map Production\2014\LE14\731\04\Workspace\EIS MAPS\Chapter 2 Site Layout\LE14 731 04 _ Figure 2.3 DesignatedAreasWithin15km Map.mxd



N
W
E
S

River Boyne and River Blackwater SPA
River Boyne and River Blackwater SPA
River Boyne and River Blackwater SPA
River Boyne And River Blackwater - SAC
Trim PNHA
Mount Hevey Bog - SAC
Mount Hevey Bog NHA PNHA
Molerick Bog NHA
Ballynabarny Fen PNHA
Rathmoylan Esker PNHA
Woodland - Option 1
Ballynakill
Ballina Bog PNHA
Rye Water Valley/Carton - SAC
Rye Water Valley/Carton PNHA
Royal Canal PNHA
Windmill
Drehid Hortland
Black Castle Bog NHA
Carbury Bog NHA
Maynooth - Option 2
Donadea Wood PNHA
Liffey Valley PNHA
The Long Derries, Edenderry - SAC
The Long Derries, Edenderry PNHA
Hodgestown Bog NHA
Ballynafagh Lake PNHA
Grand Canal PNHA
Ballynafagh Lake - SAC
Ballynafagh Bog PNHA
Ballynafagh Bog - SAC
Cloncumber
Liffey At Osberstown PNHA
Kilteel Wood PNHA
Slade Of Saggart And Crooksling Glen PNHA
Mouds Bog - SAC
Mouds Bog NHA PNHA
Curragh (Kildare) PNHA
Pollardstown Fen - SAC
Pollardstown Fen PNHA
River Barrow And River Nore - SAC

## Proposed Natural Heritage Areas

000128 Liffey Valley
000211 Slade Of Saggart And Crooksling Glen
000390 Ballina Bog
000391 Ballynafagh Bog
000392 Curragh (Kildare)
000395 Mouds Bog NHA
000396 Pollardstown Fen
000557 Rathmoylan Esker
000925 The Long Derries, Edenderry
001357 Trim
001387 Ballynafagh Lake
001391 Donadea Wood
001394 Kilteel Wood
001395 Liffey At Osberstown
001396 Liffey Bank Above Athgarvan
001398 Rye Water Valley/Carton
001573 Ballynabarny Fen
001584 Mount Hevey Bog NHA
002103 Royal Canal
002104 Grand Canal

## Special Areas of Conservation

000391 Ballynafagh Bog
000396 Pollardstown Fen
000925 The Long Derries, Edenderry
001387 Ballynafagh Lake
001398 Rye Water Valley/Carton
002162 River Barrow And River Nore
002299 River Boyne And River Blackwater
002331 Mouds Bog
002342 Mount Hevey Bog

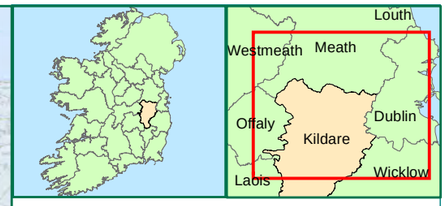
## Special Protection Areas

004232 River Boyne and River Blackwater SPA

## Natural Heritage Areas

000570 Black Castle Bog NHA
001388 Carbury Bog NHA
001393 Hodgestown Bog NHA
001582 Molerick Bog NHA

MV Cable Route (Internal to Clusters)




## Legend

Turbine Locations
Wind Farm Cluster Boundary
15km Buffer
MV Cable Route (Internal to Clusters)
MV Cable Routes (External to Clusters)
HV Cable Route
Irish Grid Connection Points
Proposed Natural Heritage Areas
Natural Heritage Areas
Special Protection Areas
Special Areas of Conservation

0 3 6 9 12
Kilometers

Date 25/03/2015

Name Of Client
Element Power Ireland

Name Of Job
Maighne Wind Farm

Title Of Figure
Designated Areas within 15km of Proposed Development

Scale Used 1: 220,000 @ A3

Figure No. 2.3

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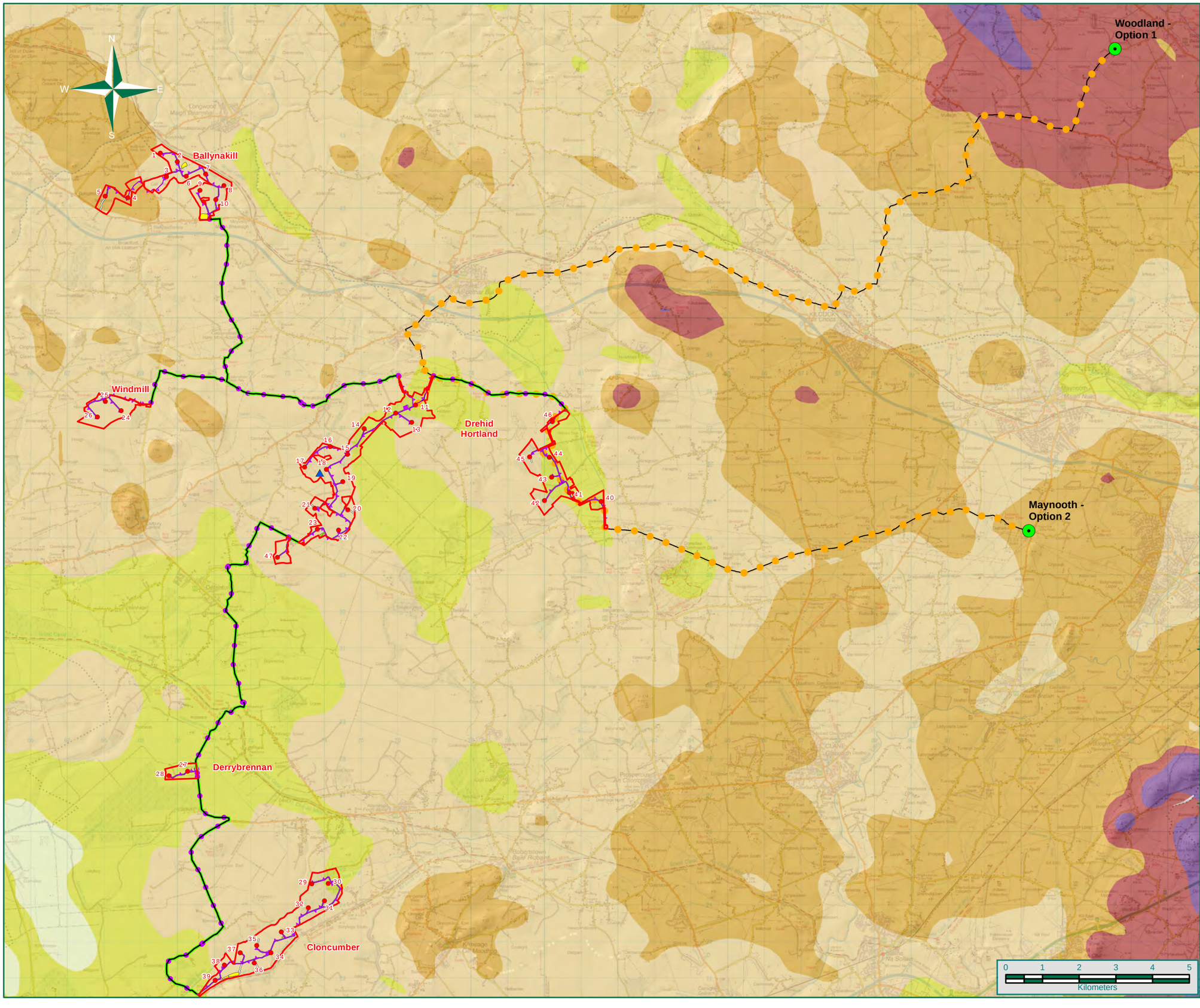
R:\Map Production\2014\LE14\731\04\Workspace\EIS MAPS\Chapter 2 Site Layout\LE1473104_Figure 2.4 On Site Wind Resources.mxd







## Legend

- Proposed Turbine Location
- Wind Farm Cluster Boundary
- Proposed Borrow Pit Location
- Proposed Compound Location
- Proposed Substation Location
- Proposed Met Mast Location
- Indicative Access Track
- MV Cable Route (Internal to Clusters)
- MV Cable Route (External to Clusters)
- Irish Grid Connection Point
- HV Cable Route

**Wind Speeds 75m (m/s)**

- 4.000000 - 6.000000
- 6.000001 - 7.000000
- 7.000001 - 7.250000
- 7.250001 - 7.500000
- 7.500001 - 7.750000
- 7.750001 - 8.000000
- 8.000001 - 9.000000
- 9.000001 - 14.000000

Date 25/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

On-site Wind Resource

Scale Used 1:100,000 @ A3

Figure No. 2.4

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## 2.4 Proposed Development

The proposed development will primarily consist of the following:

- Erection of up to 47 no. wind turbines with an overall tip height of up to 169m
- Construction of foundations and hardstanding areas in respect of each turbine
- Construction/upgrade of 9 no. site entrances from public roads
- Construction of approximately 31km of new site access tracks and associated drainage
- Upgrade of approximately 10km of existing access tracks and, where required, upgrade of associated drainage
- Excavation of 3 no. borrow pits
- Establishment of 4 no. temporary construction site compounds and associated parking areas
- Construction of drainage and sediment control systems
- Construction of 1 no. electricity substation (which will operate at a voltage up to 220kV) including:
    - 2 no. control buildings containing worker welfare facilities
    - electrical infrastructure
    - parking
    - fencing
    - appropriate landscaping
- Installation of approximately 75km of medium voltage (MV) underground cabling (which will operate at a voltage up to 33kV) between the proposed turbines and proposed on-site substation. Approximately 36km will be laid within the public roadway
- Installation of high voltage (HV) underground cabling (which will operate at a voltage up to 220kV) between the proposed on-site substation and either the existing substation at Woodland, Co. Meath (totalling approximately 29km, of which approximately 28km will be laid within the public roadway) or the existing substation at Maynooth, Co. Kildare (totalling approximately 23km, of which approximately 17km will be laid in the public roadway)
- Installation of joint bays along the cable route
- Installation of underground communication cables
- Installation of a permanent meteorological mast up to 100m in height
- Temporary alterations to the public road at identified locations to accommodate the delivery of turbines
- Associated site works including landscaping
- Tree felling
- Peat excavation.

Whether the connection point to the national electricity transmission grid will be located at the Woodland or Maynooth substations will be determined by EirGrid plc, which is the statutory Transmission System Operator. Accordingly, the documentation submitted with this application for permission identifies and evaluates 2 no. HV grid connection routes (which will operate at a voltage up to 220kV). The 2 no. HV grid connection cable routes included in this application will connect the proposed Maighne Wind Farm on-site substation to either one of two existing substations located at Woodland, Co. Meath or Maynooth, Co. Kildare. However, only one of these routes will be constructed following the identification of the preferred connection point by the Transmission System Operator.

### 2.4.1 Turbine Layout

Figure 2.1 shows the proposed development layout within the five interconnected clusters. This layout reflects the outcome of the iterative design process. Further detail on the design philosophy, constraints and alternative layouts is detailed in Appendix C of Volume 3 of the EIS Appendices.

Turbines are referenced from T1 up to T47 and are distributed amongst the five clusters as follows:

**Table 2.1: Clusters**

| Cluster Name | No. of Turbines |
|---|---|
| Ballynakill | 10 |
| Windmill | 3 |
| Drehid Hortland | 21 |
| Derrybrennan | 2 |
| Cloncumber | 11 |

The co-ordinates in ITM of each turbine are detailed in the tables below:

### Table 2.2: Ballynakill Turbine Co-ordinates

| Turbine ID | ITM_X_Coor | ITM_Y_Coor |
|---|---|---|
| T1 | 669469 | 744518 |
| T2 | 669934 | 744277 |
| T3 | 669636 | 743875 |
| T4 | 668579 | 743299 |
| T5 | 667965 | 743346 |
| T6 | 670172 | 743889 |
| T7 | 670700 | 743942 |
| T8 | 671205 | 743629 |
| T9 | 670546 | 743503 |
| T10 | 670977 | 743250 |

### Table 2.3: Dehid-Hortland Turbine Co-ordinates

| Turbine ID | ITM_X_Coor | ITM_Y_Coor |
|---|---|---|
| T11 | 676429 | 737651 |
| T12 | 675881 | 737430 |
| T13 | 676322 | 737179 |
| T14 | 675025 | 737010 |
| T15 | 674567 | 736303 |
| T16 | 674100 | 736517 |
| T17 | 673401 | 735952 |
| T18 | 673994 | 735895 |
| T19 | 674439 | 735556 |
| T20 | 674583 | 734792 |
| T21 | 673678 | 734832 |
| T22 | 674325 | 734242 |
| T23 | 673750 | 734266 |
| T40 | 681485 | 735017 |
| T41 | 680622 | 735262 |
| T42 | 679941 | 735038 |
| T43 | 680139 | 735678 |
| T44 | 680074 | 736225 |
| T45 | 679536 | 736234 |
| T46 | 680157 | 737199 |
| T47 | 672665 | 733496 |

### Table 2.4: Windmill Turbine Co-ordinates

| Turbine ID | ITM_X_Coor | ITM_Y_Coor |
|---|---|---|
| T24 | 668401 | 737494 |
| T25 | 667970 | 737750 |
| T26 | 667750 | 737323 |

**Table 2.5: Derrybrennan Turbine Co-ordinates**

| Turbine ID | ITM_X_Coor | ITM_Y_Coor |
|---|---|---|
| T27 | 670213 | 727662 |
| T28 | 669705 | 727544 |

**Table 2.6: Cloncumber Turbine Co-ordinates**

| Turbine ID | ITM_X_Coor | ITM_Y_Coor |
|---|---|---|
| T29 | 673597 | 724603 |
| T30 | 674046 | 724610 |
| T31 | 673946 | 724139 |
| T32 | 673499 | 723939 |
| T33 | 672765 | 723287 |
| T34 | 672485 | 722719 |
| T35 | 672097 | 722917 |
| T36 | 672028 | 722439 |
| T37 | 671644 | 722720 |
| T38 | 671213 | 722382 |
| T39 | 670963 | 721968 |

We are aware that the DoEHLG Wind Energy Development Planning Guidelines are currently being revised. The choice of turbine will not impact on the compliance with the draft requirements with respect to proposed noise and shadow flicker limits.

### 2.4.2 Turbines

#### *2.4.2.1 Turbine Description*

The proposed turbines will have a tip height of up to 169m. Detailed drawings, which accompany the planning application, show a typical turbine that may be used for this development, however, the exact make and model of the turbine will be dictated by the economics and energy production efficiencies of various turbines on the market at the procurement stage, but will not exceed the maximum size envelope set out within the development description (i.e. “tip height of up to 169 metres”). Examples of candidate turbines for this development are shown in the table below.

**Table 2.7: Examples of Candidate Turbines for this Development**

| Turbine | Rating (MW) | Rotor Diameter (m) |
|---|---|---|
| GE 2.75 | 2.75 | 120 |
| Vestas V112 | 3 – 3.3 | 112 |
| Nordex N131 | 3 | 131 |
| Siemens SWT113 | 3 – 3.2 | 113 |
| Enercon E126 | 4.2 | 126 |

Modern wind turbines from the main turbine manufacturers have evolved to share a common appearance and other major characteristics with only minor cosmetic differences differentiating one from another. For the purposes of carrying out the various appraisals a rotor diameter of 120m and a hub height of 109m (from ground level) have been utilised.

However the exact combination of rotor diameter and hub height will be dictated by the final selection of the turbine make and model for maximum efficiency of wind energy production.

The turbine will be of the generic three bladed, tubular tower model with horizontal axis. The rotor blades are bolted to the central hub, which is connected to a gearbox located in the nacelle. The nacelle holds the following turbine components:

- generator
- electrical components
- control unit

A glass fibre reinforced polyester or similar hood covers the nacelle. This is sound insulated, ensuring minimal noise emissions. Earthing and isolation protect all components from lightning strikes.

#### *2.4.2.2 Turbine Blades*

The blades of a modern turbine are typically made of glass fibre reinforced polyester. They typically turn at between 3 and 24 revolutions per minute depending on wind speed and make of turbine.

A typical turbine begins generating electricity at a wind speed of 2 to 4m/s depending on turbine type, with rated power generation at wind speeds of approximately 9 to 17m/s. The turbines usually shut down at wind speeds greater than 25m/s, although some machines are designed to operate at up to 30m/s. The yaw mechanism turns the nacelle and blades into and out of the wind. A wind vane on the nacelle controls the yaw mechanism. Blades are pitched to match the wind conditions.

#### *2.4.2.3 Turbine Tower*

The tower of the turbine is a conical steel tube, with multiple paint finish. It is generally delivered to site in four to five sections. The first section is bolted to the steel base, which is cast into the concrete foundation.

The shape and size of the foundation can vary in size and shape up to approximately 25m x 25m, and the depth is typically 1–2m depending on site specific geotechnical conditions. The upper sections of the tower are bolted to the lower ones in sequence. The base of the towers is typically around 4-5m in diameter, tapering to approximately 2-3m, where it is attached to the nacelle. The first floor of the tower is approximately 2-3m above ground level. It is accessed by a galvanised steel staircase and a steel hatch door which will be kept locked except during maintenance. The exact details of the turbine tower will be dictated by the final selection of the turbine make and model for maximum efficiency of wind energy production.

#### *2.4.2.4 Turbine Transformer*

The turbine will have a transformer located within the tower. The turbine will generate electricity at approximately 660volts, depending on the machine chosen. The turbine transformer will step up the voltage to a maximum of 33kV to reduce electrical losses on the cabling connector circuits that connect to the site substation.

#### *2.4.2.5 Turbine Colour*

The turbines have a multiple coating to protect against corrosion. They are coloured off-white or light grey to blend into the sky background. This minimises visual impact, as recommended by the following guidelines on wind energy development:

- Wind Energy Development – Planning Guidelines (2006), Department of the Environment, Heritage and Local Government
- The Influence of Colour on the Aesthetics of Wind Turbine Generators, ETSU W/14/00533/00/00
- PAN 45, The Scottish Office Environment Department
- PPG22, Department of the Environment - Welsh Office
- Technical Advice Note 8, Welsh Assembly, 2005

## 2.4.3 Access Tracks and Hardstandings

### *2.4.3.1 Turbine Delivery Route (TDR)*

It is likely that the port used will be Dublin. An assessment on the turbine delivery route has been carried out by Exceptional Load Services (ELS), and is contained in Appendix K1 of Volume 3. The Turbine Delivery Route (TDR) report details and explains the alterations needed to transport all turbine components between the port of entry and the site entrances. Due to the oversize nature of wind turbine components, standard road designs are often not suitable for the load to pass. Areas such as junctions, roundabouts and bends on local, regional and national roads are often not physically capable of allowing a components such as 60m Blades, 5m wide tower sections to pass without some alterations. Most alterations involve the temporary removal of street furniture, or removing the grass from a verge and replacing with stone however others could require more extensive work such as alterations to bridges etc.

A point on the delivery route that needs to be upgraded is known as a node point. There are 23 no. node points on the TDR routes to Maighne Wind Farm. These are:

- 10 no. nodes are under Kildare County Council (2 nodes under NRA control)
- 2 no. nodes under Meath County Council (2 nodes under NRA control)
- 9 no. nodes involve private landowners
- 1 no. node involves Waterways Ireland
- 2 no. nodes involve BnM (Derrybrennan Entrance and exit for Cloncumber).

The TDR route is illustrated in Figure 2.9.

### *2.4.3.2 Internal Access Tracks*

Access to the proposed turbines will be via the existing and proposed internal site track network as shown in Figure 2.5 and the accompanying planning drawings.

The proposed internal site track layout will permit access for vehicles during the construction phase, for maintenance during the operation phase and for vehicles to decommission the turbines at the end of the life of the development.

Existing access tracks have been utilised where possible for the proposed development. Approximately 10km of existing site tracks will be upgraded as appropriate and approximately 31km of new track are proposed at the site.

All access tracks will be approximately 4.5m wide along straight sections and wider at bends as required. The tracks will be finished with a well graded aggregate. The drainage system will be installed adjacent to the internal access tracks.

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 Clause (Cl) 804 material will be placed on top to provide a suitable running surface.

Floating roads will generally be constructed where the depth of peat/soft clay is in excess of 1m or as other site conditions dictate. Detailed geotechnical site investigations will be undertaken post receipt of planning permission to determine if floating roads are required on sections of the internal road network.

All other access tracks will be constructed by excavating the existing ground to a competent stratum and building up with compacted stone to the required levels. A layer of compacted Cl 804 material will be placed on top to provide a suitable running surface. These access tracks will generally be constructed where the depth of peat/soft clay is shallow (less than 1m), where the vertical alignment is in cut or where the slope of the existing ground precludes the use of floating roads.

It is anticipated that the stone required for the construction of the internal access roads will be sourced from internal borrow pits as well and from the importation of material from a number of existing pits located locally.

Geotechnical investigations carried out to date, indicate that there is suitable material in three borrow pits at the following cluster locations:

- Ballynakill – two locations
- Cloncumber – one locations

This preliminary evaluation will be confirmed prior to commencement of construction by way of detailed site investigation. Once the roads are constructed, the top surface will then receive a surface layer of imported limestone to give a clean hardwearing running surface for the delivery of turbines.

Access tracks through forestry will require tree felling. Felled trees can be used to construct floating roads. Terram and geotextile are placed on top of felled trees and a layer of hardcore used on top.

#### *2.4.3.3 Hardstandings*

A hardstanding area of approximately 30m x 50m with a couple of small additional set down areas is detailed at each turbine location under this application, as shown on the accompanying planning drawings. This area will accommodate a main crane and an assist crane during the assembly of the turbine, as well as during maintenance during the operation of the wind farm. The area of the hardstanding provided is deemed suitable for the assembly of a turbine with the proposed dimensions. A temporary set down area of up to 10m x 60m will be required for the blade set down area for each turbine.

### 2.4.4 Substation

An electricity substation is proposed in the Drehid cluster as shown in Figure 2.6, in order to provide a connection point between the wind farm and EirGrid's network. The connection voltage from the wind farm maybe at 110kV or up to 220kV depending on Eirgrids final design optimisation of the connection method, both of which are considered HV. The proposed substation layout has been designed to accommodate either an 110kV or up to 220kV connection type, with the final footprint likely to be smaller if the connection voltage is at 110kV.

The HV substation will be an outdoor Air Insulated Switchgear (AIS) type and will consist of main HV plant items (transformer, Harmonic filter & HV cable and associated switchgear bays) that will be connected by elevated tubular aluminium busbars. A sealed holding tank will be provided for wastewater outside the substation fence.

The dimensions of the substation will be approximately 112.5m x 85m and it will accommodate the following main equipment:

1. Independent Power Producer (IPP), i.e. the wind farm, control building including 33kV indoor switchroom: This will consist of a single storey masonry building with a pitched roof. The building will contain a meeting room, a small workshop/spares room, a relay room to house control cabinets, a WC and a 33kV indoor switchroom
2. HV/33kV Transformer: The main transformer will increase the voltage from 33kV to the specified HV. It will be an oil immersed type transformer with cooling fans and an oil storage tank. The transformer and the oil storage tank will be bunded
3. EirGrid control building: The EirGrid control building will consist of a meeting room, a relay room, a small office and a WC
4. Harmonic filtering equipment: Harmonic filtering equipment may be required to supress non system voltages generated by the HV cable connection to either Woodland or Maynooth substation. This will be subject to further system studies as the project develops
5. HV Air Insulated Switchgear (AIS) transformer switchgear bay: The switchgear bay consists of disconnector switches, circuit breakers and measuring equipment and allows the transformer to be isolated from the rest of the substation
6. HV AIS cable switchgear bay: The switchgear bay consists of disconnector switches, circuit breakers, measuring equipment and cable terminations and allows the cable to be isolated from the rest of the substation
7. HV Harmonic Filter switchgear bay: The switchgear bay consists of disconnector switches, circuit breakers and measuring equipment and allows the harmonic filter to be isolated from the rest of the substation

8. HV Double busbar: The busbar consists of three elevated aluminium tubes and is supported along its length by vertical insulators mounted on steel supports.
9. Lightning protection masts: High level lightning protection masts will be required around the substation in order to prevent lightning strikes from damaging the HV equipment. Lightning protection rods may also be installed high on the gable ends of the control buildings to protect the equipment within these buildings
10. Diesel Generator: A diesel generator will be required to provide back-up electricity supply to the control rooms and site lighting. The generator will be bunded
11. Ancillary equipment (house transformers, lighting, telecoms aerials/receiver dishes, cooling fans and similar items, metering equipment, power quality equipment) as may be required by ESB/EirGrid for the operation of the wind farm and substation
12. Permanent parking.

The substation will be surrounded by a 2.4m high steel palisade fence and internal fences will also be provided to segregate different areas within the main substation. Two internal roads will be required in the substation as these will be required to transport heavy items of plant such as the transformer. The entire footprint of the substation will be on an impermeable hardstanding and with a sealed drainage system. Drainage of the substation is discussed further in Chapter 9 - Hydrology.

There will be two access gates to the substation to allow separate access for IPP and EirGrid.

Lighting will be required on site and this will be provided by lighting poles located around the substation and exterior wall mounted lights on the control buildings.

A sealed holding tank will be provided outside the substation fence line so that it can be maintained without requiring access to the substation. The holding tank will be serviced by a permitted contractor.

A rainwater harvesting system will be used for toilet flushing within each Control Building. The capacity of the storage tank was calculated in accordance with the 'Intermediate Approach' advocated in BS 8515 to provide the lesser of 5% of the annual rainwater yield, based on the effective area of the roof or 5% of the annual water demand, based on the sanitary facilities to be serviced by the rainwater harvesting system. The estimated capacity of the storage tanks required is 3.32$m^3$ each. A JFC Over ground Storage Tank, capacity 5,400 litres, 2.0m diameter x 2.3m high or similar will be provided.

Transmission towers and gantries will not be required as the connection to EirGrid's preferred substation location (either Maynooth or Woodland) will be via underground cabling. The substation, which is located in existing forestry, will be screened with appropriate planting, which will be agreed with Kildare County Council.

Document Path: R:\Map Production\2014\LE14\731\04\Workspace\EIS MAPS\Chapter 2 Site Layout\LE14 731 04 _ Figure 2.5 Internal Site Road Network.mxd



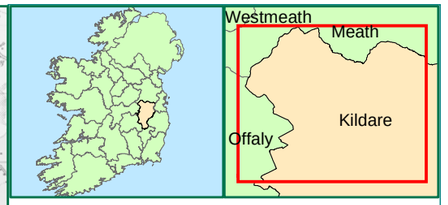
Ballynakill

Windmill

Drehid
Hortland

Derrybrennan

Cloncumber




## Legend

- Turbine Location
- Wind Farm Cluster Boundary
- Proposed Compound Location
- Proposed Borrow Pit Location
- Proposed Substation Location
- Proposed Met Mast Location

**Indicative Access Tracks**

- Existing Access Track
- Proposed Access Track

0 1.5 3 6

Kilometers

Date 19/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Internal Site Road Network

Scale Used 1: 90,000 @ A3

Figure No. 2.5

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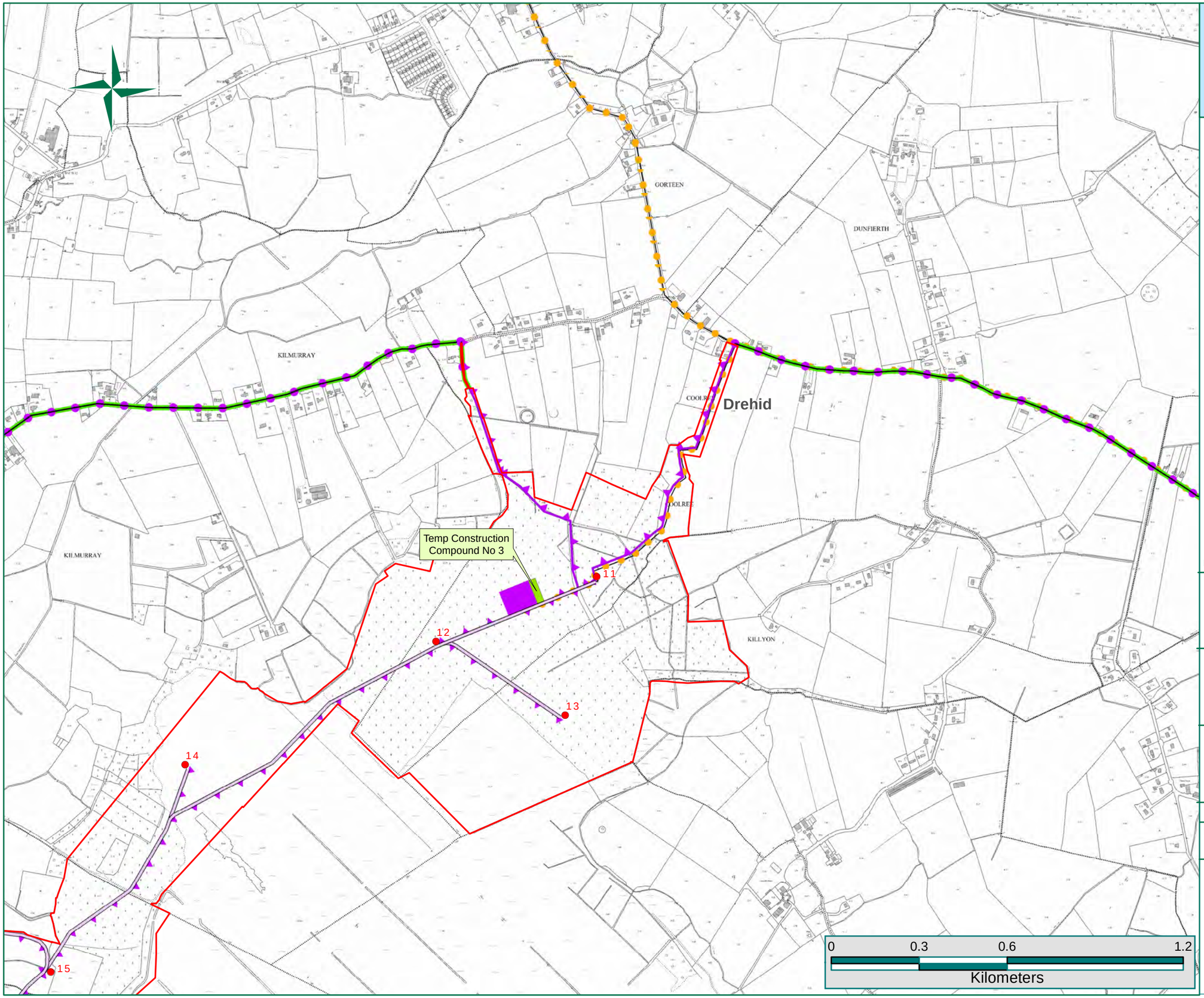
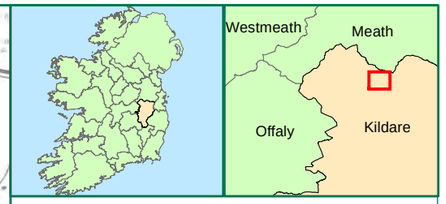
R:\Map Production\2014\LE14\731\04\Workspace\EIS MAPS\Chapter 2 Site Layout\LE14 731 04 _ Figure 2.6 Sub Station Location.mxd






## Legend

- Proposed Turbine Location
- Wind Farm Cluster Boundary
- Proposed Compound Location
- Proposed Borrow Pit Location
- Proposed Substation Location
- Proposed Met Mast Location
- Indicative Access Track
- MV Cable Routes
- MV Cable Routes (Internal to Windfarm Clusters)
- Irish Grid Connection Point
- HV Cable Route

Date 19/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Sub Station Location

Scale Used 1:12,500 @ A3

Figure No. 2.6

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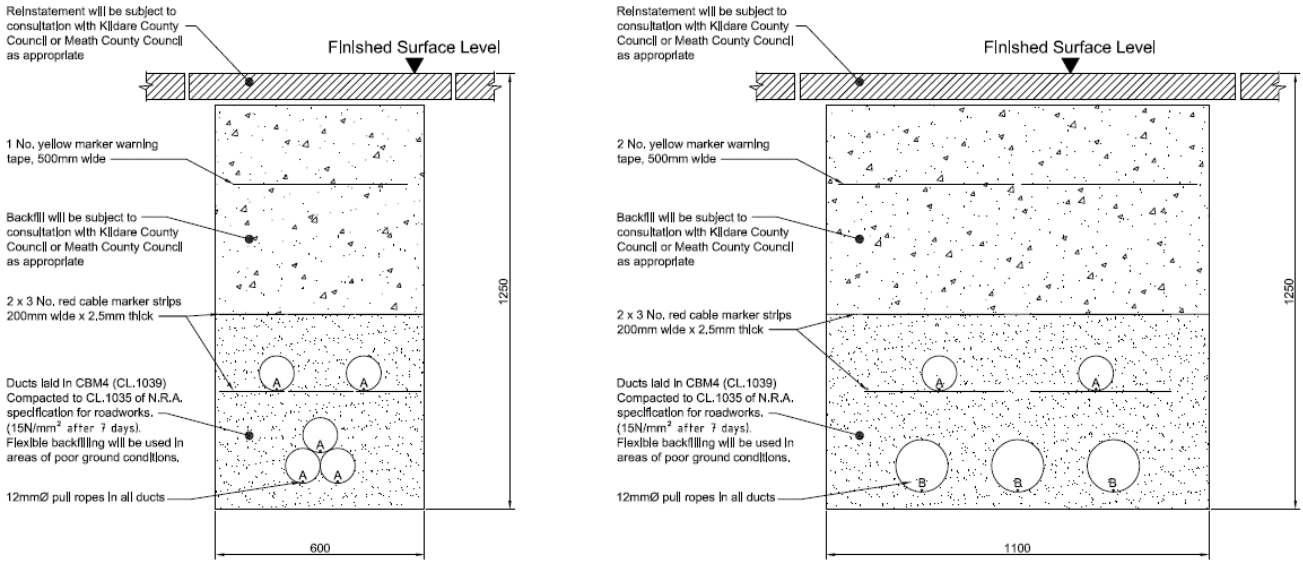
### 2.4.5 MV and HV Electrical Cabling

Underground electrical cables will connect the wind turbines to the proposed new substation as part of the Maighne Wind Farm site and to the existing EirGrid substation at either Maynooth or Woodland. Details are:

- the cable circuits between the wind turbines and the Drehid substation will transmit electricity at 33kV (defined as medium voltage and abbreviated as MV)
- the cable circuit to be laid between Drehid substation and the Maynooth or Woodland substation will transmit electricity either at 110kV or 220kV (defined as high voltage and abbreviated as HV)
- communication cables, for control purposes, will be laid alongside the electricity cables

The proposed MV cable routes are indicated in Figure 2.1.

The electricity will be transmitted as a three-phase power supply so there will be three individual conductors (or individual cables) in each cable circuit. The three conductors will each be laid in separate ducts which will usually be laid in a trefoil formation but may also be laid in a flat formation. Plate 2.1 illustrates typical cable trench details.




Cable Ducts in Trefoil Formation

Cable Ducts in Flat Formation

**Plate 2.1: Typical Cable Trench Details**

The specification for the cables and cable-laying will be in accordance with ESB requirements for the 33kV cables (ESB specifications for 38kV cable-laying will apply) and EirGrid requirements for the 110kV or 220kV circuit. The typical width of a cable trench with a trefoil formation will be 600mm, a flat formation would require a wider trench width. The depth of cover to the ducts carrying the electric cables will usually be 950mm to the top of the upper duct in public roadways and grassed areas. However in certain instances, for example when crossing a bridge with shallow cover, a shallower depth could be utilised. In those circumstances, the particular design will be agreed with ESB or EirGrid as appropriate and in consultation with the relevant local authority. Additional cable protection measures such as steel plates or reinforced concrete cover may be required. Cables laid within the wind-farm sites will be laid at a depth of 1100mm to the top of the upper duct in field locations. The diameter of the ducting will be selected to suit the cross sectional areas of electrical cables and is likely to fall between 100mm and 200mm diameter.

For simplicity, each cable circuit is referred to as a cable in the remainder of this document.

### *2.4.5.1 Joint Bays*

Joint bays are the locations where individual lengths of cables will be joined. As part of the detailed design, joint bay locations will be selected to maximise the lengths of cables, following consideration of cable design issues, the space requirements for cable drums and cable pulling equipment as well as the impact on local residents and road users. The joint bay, for cables laid within the public road, will also normally be located within the public road or adjacent to it. The relevant County Council will be consulted regarding the final selected joint-bay locations.

A joint bay will be constructed in a pit. The bay typically will be approximately 6m by 2.5m by 2m deep. A reinforced concrete slab will be constructed in the bay to accommodate the jointing enclosure.

Communication chambers, which are similar to small manholes, will also be installed at the joint bay locations to facilitate the connection of the fibre-optic communication cables.

### *2.4.5.2 MV and HV Cable Installation*

In advance of construction, detailed desk studies and site investigations will be carried out to find the optimal location to place the cables within the public roads.

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. It is desirable that a minimum separation distance of 300mm will be maintained with existing services where the cables are to be laid near or crossing existing services. Usually the new cables will be laid below existing services.

When the cable ducts and joint-bays are ready, the cable drums will be delivered to the site. A cable drum will be positioned at the rear of a joint bay. A cable winch will be positioned at the next joint bay and the cables will be pulled through the ducting using a steel wire and cable winch.

Once the cables are installed the separate lengths will be joined at the joint bays. An open-bottomed jointing container or tent will be lowered on top of the concrete slab, constructed in the joint bay, and the cable jointed within the jointing container in a clean dry environment designed to prevent contamination of the cable-joint.

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.

*Estimates of Quantities & Backfill*

The estimate of backfill quantities for the cable trenches in the public road is as follows:

*Quantity of CBM4 (surround to cables)*

- MV Routes: 26.189 km x (0.6m wide x 0.59m deep) = 9,270 $m^3$ (Trefoil)
- MV Routes: 5.0 km x (1.1m wide x 0.59m deep) = 3,245 $m^3$ (Flat formation)*
- HV Route Maynooth: 16.32 km x (0.6m wide x 0.59m deep) = 5,777 $m^3$
- HV Route Woodland: 28.21 km x (0.6m wide x 0.59m deep) = 9,987 $m^3$

*Quantity of Backfill (material subject to consultation with KCC/MCC)*

- MV Routes: 26.189 km x (0.6m wide x 0.55m deep) = 8,642 $m^3$ (Trefoil)
- MV Routes: 5.0 km x (1.1m wide x 0.55m deep) = 3,025 $m^3$ (Flat formation)*
- HV Route Maynooth: 16.32 km x (0.6m wide x 0.55m deep) = 5,385 $m^3$
- HV Route Woodland: 28.21 km x (0.6m wide x 0.55m deep) = 9,309 $m^3$

*Cables are, in general, laid in a 'trefoil' formation with an allowance of 5km for cables to be laid in a 'flat' formation

For cables occurring within the windfarm clusters the final design of the cables between the turbines and the nearest public road and/or the Maighne substation at Drehid will be either be ducted or be direct buried except where they cross trafficked areas, in which case the cable will be ducted. The line of the cable trench will run beside the site access roads until it exits to the public road.

The ground will be trenched typically using a mechanical digging machine. 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. The cables will be laid directly onto a bed of suitable material, free from sharp stones and debris. A suitable material will be spread over the top of the cables to protect them during backfilling. The cables will be backfilled to EirGrid/ESB standard specification for LV/MV installations. 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 electric cables below.

*Water-Course Crossings*

The cable routes cross a number of small watercourses. A number of different options will be employed to lay the cable ducts across these watercourses. In some instances, the cable-ducts will be laid within the bridge or culvert structure, which carries the road across the watercourse, when there is sufficient space within the structure. Alternatively, where practical to do so, trenchless crossing techniques will be employed to cross streams. This will particularly apply for watercourses identified in mapping published by the Environmental Protection Agency.

i. Horizontal Directional Drilling (HDD)

This is a widely-used method of installing underground pipes and cables whereby a surface-launched drilling rig is used to drill in an underground arc beneath the watercourse, with minimal impact on the surrounding area. HDD involves:

- a surface launched drilling rig to drill a pilot bore under the ground surface
- pre-reaming of the bore to enlarge the diameter whilst injecting drilling fluid to aid the removal of cuttings from the borehole
- pulling the reamer through the bore with the ducting attached, installing the duct underground

A detector system is installed at the drill head which is calibrated to a tracking system, so the operator would always know the exact position of the drill-head and can steer the drill-head as required.

**Plate 2.2: Horizontal Directional Drilling under the River Blackwater in County Cork, August 2014**

ii. Alternative Trenchless Option

This involves digging two pits, an entrance pit and a receiving pit, on either side of the watercourse. The two pits are then connected by ducts underground, installed either by a drilling or pipe-ramming method, without disturbing the watercourse above.

A drill rig or pipe-ramming device, depending on the ground conditions, is set up in the launch pit and is used to either drill or ram a pipe through to the reception pit.

Where drilling is the selected option, an auger bore rig is set up in the launch pit and using a drilling technique pulls a sleeve through to the reception pit. In cases of pipe-ramming, pneumatic percussive blows are used to drive a pipe through the ground. The leading edge of the pipe is usually left open and the spoil then removed by auger, compressed air or water jetting. The ducts for the cables are then placed within the pipe.

In contrast to the HDD, this technique requires a larger excavation depending on the vertical clearance required to the watercourse but can be readily implemented to cross under the short stream crossings which are present along the cable-routes.

When these options are not feasible, the cables may be laid by excavating a trench and laying the cable ducts in the bed of the water-course. Detailed engineering assessment, as well as consultation with the relevant authorities, will inform the selection of the technique to be used to cross water-courses.

*Canal Crossings*

The MV cable route from Cloncumber will cross the Grand Canal in the location of Derrybrennan at Kilpatrick Bridge. It is likely that Kilpatrick Bridge, which is on a haul route for the project, will be upgraded as part of the project. In this case, the cable will be accommodated within the bridge structure as part of the upgrading works.

If the bridge is not upgraded, then the cable will be installed under the canal at this location using a trenchless technique such as the horizontal directional drilling methodology described above. A detailed technical analysis will be completed in advance of the works to ensure the integrity of the canal and there will be full consultation with Waterways Ireland and Bord na Móna in this regard.

The HV cable route to Woodland will cross the Royal Canal at Allen Bridge, immediately west of Kilcock. Allen Bridge consists of an arch structure supporting the central part of the R148 road with modern structures, incorporating bridge-beams on concrete abutments, on both the north and south sides. It is proposed to accommodate the cables within the bridge beams on the southern side, either supported by the beams themselves or by building a new support spanning the canal between the abutments. Again there will be a detailed technical analysis as well as consultation and agreement with Waterways Ireland in advance of completing the works.

*Crossing of the M4 Motorway*

Two crossings of the M4 motorway are planned for the project, namely an MV crossing adjacent to the L5006 at Moyvalley and the HV cable route to Woodland will cross adjacent to the R402 between Johnstown Bridge and Enfield. Consideration was given to trying to accommodate the cables in the over-bridges which span the motorway but it would not be possible to provide sufficient cover to the cables if placed within the over-bridges. Accordingly trenchless techniques such as horizontal directional drilling will be used at both locations. There is sufficient room available to accommodate the necessary equipment. The cables will be laid at sufficient depth below the motorway to stay below the motorway drainage and without impacting on the road foundations. There will be a detailed technical analysis as well as consultation and agreement with the National Roads Authority and the PPP Company Eurolink in advance of completing the works.

*Rail Crossings*

The HV cable to be routed to Woodland will cross the Dublin - Sligo rail line west of Kilcock, adjacent to the proposed crossing of the Royal Canal at the same location. There is an arch structure over the rail-line on the south side of the road (with a layby/picnic area overhead) and a modern bridge then supports the road over the railway.

It is proposed to cross the rail line over the arch structure. This may require build-up of the layby area to accommodate the cables, particularly in the centre of the arch. The cable will be installed by adding to the existing stone wall to leave space and protection for the cables above the bridge structure. There will be a detailed technical analysis as well as consultation and agreement with Iarnród Éireann in advance of completing the works.

*Traffic Management*

A careful approach will be taken to planning the works to ensure minimal impacts on motorists, road users and the general public. Where the road is wide enough, construction will be undertaken while maintaining one lane open. In these locations, detailed traffic management plans will be put in place, in consultation with the relevant County Council as appropriate, to provide a safe working environment for road users and construction workers.

On narrower roads it will be necessary to close the road. Road closures will be subject to the applicable statutory processes. Road closures will be facilitated by the good network of roads in the area. 'Rolling road closures' will be implemented, whereby the site will progress each day along a road, which will have the effect of reducing the length of time that the road is closed and consequently reducing the impact for road users and local residents. Traffic is discussed in more detail in Chapter 13 – Traffic and Transportation.

### 2.4.6 Borrow Pits

While existing site tracks have been utilised as much as possible in the design of the proposed wind farm, additional stone aggregate will be required to upgrade existing site tracks, for the construction of new site tracks and for use during the construction of turbine bases and hardstanding areas.

To reduce the importation of this rock material, 3 no. borrow pit locations have been identified within the site. Two of these pits are located in the northern cluster – Ballynakill, with one in the southern cluster of Cloncumber.

The proposed borrow pits will cover an approximate total surface area of approximately 73,000m$^2$ with a proposed maximum depth of 4 -5m below current ground level. Excavators will remove the material from the pits and there will be no requirement for blasting.

On completion of construction, the borrow pit will be reinstated with surplus mineral soils excavated from the site. This is discussed in further detail in Chapter 8 - Soils and Geology.

It is anticipated that approximately 198,500m$^3$ of the approximately 292,500m$^3$ of aggregate required for the construction of the internal access roads, hardstandings, turbine bases, compounds, internal cable trenches etc. will be sourced from internal borrow pits, with the remaining volume sourced locally from quarries in the area.

### 2.4.7 Drainage

The drainage system will be constructed alongside all internal access tracks, hardstands, substation and temporary construction compounds. The drainage system for the existing tracks and roads will largely be retained. Where the roads require widening, this will involve the re-location of existing roadside swales to allow for widening.

Proposed new access 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 run. The stilling ponds will remain in place following construction where feasible. The stilling ponds will drain diffusely overland, over existing vegetated areas, within the site boundary. Further details on the hydrology and drainage are contained in Chapter 9 Hydrology.

### 2.4.8 Permanent Meteorological Mast

It is proposed to construct a permanent meteorological monitoring mast to ensure that the wind resources at the site are measured. The proposed met mast will be 100m in height and will be located within the Drehid-Hortland cluster as indicated on Figure 2.1.3.

### 2.4.9 Temporary Material Storage Areas

Due to the possibility of soil-borne diseases, all topsoil recovered from each farm property will remain on the same property. These stockpiles will be covered and where required, temporary silt fences will be put in place. This topsoil will subsequently be re-used for landscaping and will also be used for reinstatement purposes around turbines bases and hardstandings.

Where a property also includes a borrow pit, some of the topsoil will also be used in the reinstatement and re-vegetation of the borrow pit. Subsoil and surplus/unsuitable rock material from the excavations within the clusters will be used for the backfilling/reinstatement of the borrow pits. Some temporary stockpiling of material may be necessary and these will generally be located adjacent to the borrow pits, where possible. No permanent stockpiles of material, however, will remain after construction and no surplus soil or rock is proposed to be removed from the wind farm.

### 2.4.10 Tree Felling

Felling of forestry, within private and Coillte owned lands, is required within and around the wind farm infrastructure to accommodate the construction of some turbine foundations, hard stands, crane pads, access tracks as well as the proposed substation.

The proposed areas to be felled are shown on Figure 2.8. The estimated total area of tree clearing required for the proposed wind farm will be approximately 63ha, which will be carried out at four cluster locations namely:

- Drehid-Hortland (45ha)
- Windmill (2.2ha)
- Derrybrennan (0.77ha)
- Cloncumber (15ha)

All tree felling will be subject to confirmation to and the agreement of the Forest Service of the Department of Agriculture, Food and the Marine prior to construction. The proposed method of tree felling is 'infrastructure' whereby felling will be limited to a:

- 66m radius around each turbine located in forestry
- 33m wide corridors for access tracks
- 20m buffer surrounding the substation at Drehid
- 20m of dimension of hardstandings
- 33m wide corridor for cables.

The existing plantation areas within the clusters are discussed hereunder:

*Drehid-Hortland*

Within the Drehid-Hortland cluster, a total of 45ha will be felled. This comprises approximately 35.5ha of Coillte owned lands and approximately 9.5ha of privately owned forestry.

Within the Drehid portion of the site there are two Coillte plantations namely Dunfierth and Kilmurry, where turbines T11 – T14 are proposed.

A variety of species occur within the Kilmurry plantation including, Douglas Fir, Western Hemlock, Lodgepole pine, Stika spruce, Norway Spruce and Western Red Cedar. The yield class, which is a measure of the productive potential and it is the average volume production of a crop in cubic metres ($m^3$) per year, ranges between 4 and 20.

A YC of 4 for example typically means that area has a timber yield of 4 $m^3$ per hectare per year. While planting of the area dates back to 1981, the most recent planting took place in years 2009 to 2011.

The dominant species within the Dunfierth plantation is Norway Spruce, Sitka spruce and Birch. Yield classes vary from 6 – 26.

Turbine T15 – T17 and their associated access tracks are located in private forestry.

Within the Hortland portion of the cluster turbines T40, T42, T43, T44 and the access track to T45 are located within Coillte forestry. This plantation consists of a variety of species including Douglas Fir, Western Hemlock, Lodgepole pine, Stika spruce, Oak, Norway Spruce, Birch and Western Red Cedar. The planting year varies from 1963 to 2013, with yield classes of 4 to 16. There is also private forestry areas in this portion of the site which will require felling to accommodate turbine T45.

*Windmill*

Approximately 2.2ha of privately owned forestry will be felled to accommodate access tracks in the Windmill cluster.

*Derrybrennan*

Approximately 0.77 ha of forestry will be felled to accommodate turbines T27 and T28 and their associated access tracks. This is privately owned forestry.

*Cloncumber*

Approximately 15ha of forestry will be felled within the Cloncumber cluster, all of which is owned by Coillte.

Turbines T29 – T32 along with associated access tracks are located within the Ballyteige Coillte plantation. Planting dates back from 1952 to 2012 and species include Alder, Ash, Birch, Norway Spruce, Stika spruce, and Lodgepole pine. Yield classes vary from 4 to 24.

*Approach to Tree Felling*

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. The replant lands will be properly certified as suitable for forestry by a certified forester. The replant lands will be certified to be of an appropriate yield class and soil type and recommendations as to types and amount of fertilisation required will also be provided by a certified forester at the time of applying for the felling licence.

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)[i] and Forest Harvesting and Environmental Guidelines (2000)[ii].

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.

The permanent areas not replanted will include a corridor of approximately 33m along all tracks, an area of approximately 1.3ha at each turbine locations located in forestry, plus an area around substation (approximately 1.9ha). The tree felling area proposed for Maighne Wind Farm is shown in Figure 2.8 overleaf. To increase the diversity of woodland cover within this site some planting of native tree species is proposed. These species will, in time, form areas of low-growing scrubby woodland, which will add to the overall habitat diversity of the site. Planting along the well-drained margins of roads will ensure a relatively high level of soil fertility and better drainage which is most conducive to tree growth.

Further detail on tree felling is included in Chapter 10 – Water Quality of Volume 2 of the EIS.

### 2.4.11 Peat Excavation

Excavation of peat will occur during the construction phase of the project along internal access roads (when the peat is less than 1m deep) and for turbine foundations. Due to the possibility of soil-borne diseases, all topsoil/peat recovered from any farm property will remain on the same property. Topsoil will be used for landscaping and will also be used for reinstatement purposes around turbines bases and hardstandings. Where a farm property includes a borrow pit, some of the excavated topsoil will be used to help in the reinstatement and re-vegetation of the borrow pit. Peat excavated within the Windmill cluster will be stored in a temporary storage area prior to use on-site in an existing peat milling facility.

### 2.4.12 Micrositing

The DoEHLG Wind Energy Development Guidelines provide for flexibility to be built into the planning permission for wind turbines to accommodate minor adjustments to the turbine location which may be required for geotechnical or other reasons. The extent of flexibility will be site specific but will not extend beyond 20 metres and will be moved in a direction that would maintain or lessen the changes to the environment to within the permitted limits at nearby residences. Any proposed micrositing will be agreed with the Planning Authority before commencement of construction and will not increase the impact of the turbine to what is described in the EIS.

Document Path: R:\Map Production\2014\LE14\731\04\Workspace\EIS MAPS\Chapter 2 Site Layout\LE14 731 04 _ Figure 2.8 Tree Felling Area.mxd



Ballynakill

Windmill

Drehid
Hortland

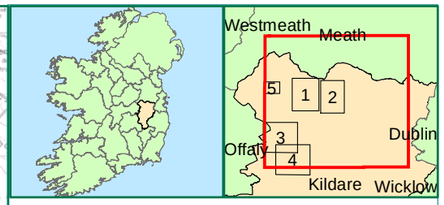
Derrybrennan

Cloncumber

Woodland -
Option 1

Maynooth -
Option 2

0 800 1,600 3,200
Meters




## Legend

- Turbine Location
- Wind Farm Cluster Boundary
- Proposed Compound Location
- Proposed Borrow Pit Locations
- Proposed Substation Location
- Proposed Met Mast Location

**Indicative Access Tracks**

- Existing Access Track
- Proposed Access Track
- MV Cable Route (External to Cluster)
- Irish Grid Connection Point
- HV Cable Route
- Areas to be Felled
- Coillte Forestry Areas
- Private Forestry Areas

| | |
|---|---|
| Date | 31/03/2015 |
| Name Of Client | Element Power Ireland |
| Name Of Job | Maighne Wind Farm |
| Title Of Figure | Tree Felling Areas<br>Maighne Overview |
| Scale Used | 1: 100000 @ A3 |
| Figure No. | 2.8. |
| Rev | A |

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R:\Map Production\2014\LE14\731\04\Workspace\EIS MAPS\Chapter 2 Site Layout\LE14 731 04 _ Figure 2.9 Turbine Delivery Route.mxd



Woodland - Option 1

Ballynakill

Windmill

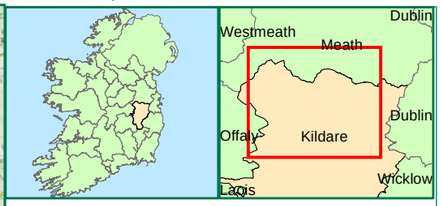
Drehid Hortland

Derrybrennan

Cloncumber

Maynooth - Option 2

The turbine delivery route will follow the re-aligned R402 route as opposed to the original route as depicted on the OS Discovery Mapping




## Legend

- Turbine Location
- Wind Farm Cluster Boundary
- Proposed Site Compound
- Proposed Borrow Pit Location
- Proposed Substation Location
- Proposed Met Mast Location
- Indicative Access
- MV Cable Route (Internal to Clusters)
- MV Cable Route (External to Cluster)
- Irish Grid Connection Points
- HV Cable Route
- Turbine Delivery Route

0 2 4 Kilometers

Date 27/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Turbine Delivery Route

Scale Used 1:100,000 @ A3

Figure No. 2.9

Rev A

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## 2.5 Project Construction

### 2.5.1 Outline CEMP

An Outline Construction and Environmental Management Plan (Outline CEMP) is contained in Appendix D of Volume 3 EIS Appendices.

The outline Construction and Environmental Management Plan sets out the key environmental management issues associated with the construction, operation and decommissioning of the proposed wind farm, to ensure that during these phases of the development, the environment is protected and any potential impacts are minimised.

The outline CEMP 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 and 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 for example soil management, waste management, site drainage management, site reinstatement & decommissioning, habitat and archaeology management, etc
**Section 5:** *Safety & Health Management Plan,* this section defines the work practices, procedures and management responsibilities relating to the management of health and safety during the design, construction and operation of the Maighne Wind Farm
**Section 6:** *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 Maighne Wind Farm

The final CEMP will be developed further at the construction stage, on the appointment of the main contractor to the project.

### 2.5.2 Construction Activities

In the event that the Board decides to grant planning permission for the proposed 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 tree felling (where required) and 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 and off-site connection works to the EirGrid substation at Maynooth or Woodland will be completed.

### 2.5.3 Temporary Site Facilities

During the construction phase, it will be necessary to provide temporary facilities for construction personnel. The location of the temporary site compounds are shown on Figure 2.1 and associated sub maps. It is proposed to have four compounds, all of which are located within individual wind farm clusters. These include 1 no. at Ballynakill off the R148, 2 No. at Drehid (1 no. off the L-5017-0 and 1 no. adjacent to the proposed substation) and 1 no. within the Cloncumber cluster.

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

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

A canteen facility will be provided at the main compound at Drehid (compound No. 2 on Figure 2.1.3). The temporary facilities will be removed on completion of the construction phase.

### 2.5.4 Site Access Tracks and Drainage

Access tracks are required to facilitate the construction of the wind farm and to maintain access to each of the turbines during operation. Drainage infrastructure will be constructed in parallel with the access track construction.

### 2.5.5 Cable Trenches

Initially the contractor will excavate cable trenches and then lay high density polyethylene (HDPE) ducting in the trench in a surround of CBM (cement bound material) in roads which have good road foundations, more flexible surrounding materials such as granular fill will be selected for cables to be laid in bog roads. 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 75mm above the ducts and the two communication ducts will also be laid in the trench. An additional layer of cable marker strips will be laid above the communication ducts and the trench back-filled. Back-filling and reinstatement in public roads will follow consultation with Kildare and Meath County Councils, as appropriate.

A similar construction methodology will apply for cable trenches laid within site access tracks. In this case the cable-ducts will generally be laid when the track is being constructed and will follow the edge of the site access tracks. The trenches within these locations will generally be backfilled using the excavated material.

**Plate 2.2: Cable Laying, Trefoil configuration**

Turbine Hard Stands

A turbine hard standing area will be constructed at the base of turbine to provide a solid area for the main installation crane that will be used to erect the turbine and for the assembly of the turbine. These measure approximately 50m X 30m.

Turbine Foundation

The base of the foundations are excavated to competent bearing strata or where this depth is excessive piling may be required. This will be determined following the detailed site investigation post permission.

Excavated soil is placed in the temporary storage areas prior to being transported to the on-site borrow pits for restorations purposes. Formwork and reinforcement are placed and the concrete poured. Once the concrete is set the earthing system is put in place and the foundation is backfilled with suitable material.

Turbine Erection

Once the turbine components arrive on site they will be placed on the hard stand and lay down areas prior to assembly. The towers will be delivered in sections and each blade will be delivered in a separate delivery. Once there is a suitable weather window the turbine will be assembled.

It is anticipated that each turbine will take 3 to 4 days to erect, depending on weather conditions, requiring two cranes at each turbine. Finally, the turbines will be commissioned and tested.

It is expected that the construction phase, including civil electrical, grid works and turbine assembly will take approximately 23 months.

### 2.5.6 Waste Management

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.

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

A permitted waste collection contractor will be appointed 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.

Article 5 of the Waste Framework Directive recognises that certain specified waste can cease to be regarded as waste and instead be a 'by-product' if it meets defined criteria. The soil excavated on site is expected to be largely uncontaminated and will be beneficially reused as a 'by-product' in the restoration of the borrow pits.

### *Waste 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.

### *Waste Disposal*

Residual waste generated on-site will require disposal. This waste will be deposited in dedicated receptacles and collected by a contractor permitted under the Waste Management (Collection Permit) Regulations 2007 as amended and transported to an appropriate facility. All waste movements will be recorded, of which records will be held by the waste manager on-site.

## 2.6 Operation and Lifespan

The turbine manufacturer or a service company will carry out regular maintenance of the turbines. Scheduled services will typically occur twice a year. The operation of the wind turbines will be monitored remotely, and a caretaker will oversee the day-to-day running of the proposed wind farm.

The expected physical lifetime of the turbine is approximately 30 years, and permission is sought for a 30 year operation period commencing after the turbines are commissioned and connected to the national grid. It should be noted that section 7.2 of the Planning Guidelines 2006[iii] includes for the following:

> *"The inclusion of a condition which limits the life span of a wind energy development should be avoided, except in exceptional circumstances."*

In this respect, the applicant requests the grant of permission is on the basis of a 30 year operational period from the date of commissioning of the wind farm.

## 2.7 Decommissioning

On decommissioning, cranes will disassemble the turbines. All the major component parts are bolted together, so this is a relatively straightforward process. The foundations and site track will be covered over and allowed to re-vegetate naturally if required. It is proposed that the internal site access tracks may be left in place, subject to agreement with Kildare County Council, Meath County Council and the relevant landowners.

The substation will remain in place as it will be under the ownership of the ESB.

Underground cables will be cut back and left in place.

A decommissioning plan will be agreed in advance of construction with Kildare County Council and Meath County Council. An outline decommissioning plan is contained in the CEMP in Appendix D of Volume 3 EIS Appendices.

## 2.8 References

[i] Forestry and Water Guidelines, Published by the Forest Service, Department of the Marine and Natural Resources, July, 2000 http://www.agriculture.ie/media/migration/forestry/publications/water_quality.pdf

[ii] Forest Harvesting and Environmental Guidelines, Published by the Forest Service, Department of the Marine and Natural Resources, July, 2000 http://www.agriculture.ie/media/migration/forestry/publications/harvesting.pdf

[iii] http://www.environ.ie/en/Publications/DevelopmentandHousing/Planning/FileDownLoad,1633,en.pdf