

ELEMENT POWER IRELAND LTD.

**ENVIRONMENTAL IMPACT STATEMENT FOR THE
PROPOSED MAIGHNE WIND FARM, COUNTY KILDARE
AND COUNTY MEATH**

VOLUME 1 - NON-TECHNICAL SUMMARY

MARCH 2015



ELEMENT POWER IRELAND LTD.

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

VOLUME 1 - NON-TECHNICAL SUMMARY

Rev. Nr.	Description of Changes	Prepared by:	Checked by:	Approved by:	Date:
1	Issue to Client	ME/MT	TPR TPR	CO'D LAD	31.03.15

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1 INTRODUCTION

Fehily Timoney & Company (FTC) was appointed by Element Power Ireland Ltd. to prepare the EIS and application for consent to An Bord Pleanála for the proposed Maighne Wind Farm development. The proposed location of the development is outlined in Figures 1.1 and 1.2.

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. 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 cables 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 for export to the Irish national grid via high voltage underground cables to either one of two existing substations located at Woodland, Co. Meath or Maynooth, Co. Kildare.

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 substation at Drehid 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.

The majority of the turbines are located within County Kildare with two turbines from the Ballynakill cluster within County Meath.

The wind farm clusters and associated underground medium voltage cabling extend southwards from the town of Longwood in County Meath to Moyvalley, Cadamnstown, Derrinturn, Allenwood, Robertstown and Rathangan in County Kildare. The high voltage route option to Woodland (option 1) travels northwards from the Drehid-Hortland cluster along the regional road (R402 – Enfield to Carbury), bypassing the town on Enfield and then eastwards long the R148 (Dublin to Kinnegad) 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 high voltage cable route to Maynooth (option 2) 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. **While both of these high voltage cable routes are assessed as part of the planning documentation, only one of these potential high voltage cable routes will be constructed, with Eirgrid determining the preferred location.**

1.1 Applicant – Element Power Ireland Ltd

Element Power Ireland Ltd. is owned by Element Power, a global renewable energy company that develops, acquires, builds and operates utility-scale wind and solar power projects. Element Power is present in 16 countries and has 71 megawatts of renewable energy generation in operation and approximately 9,000 megawatts of energy generation projects in development.

Element Power Ireland Ltd. (Element Power) has an established track record in wind energy in Ireland, with its Irish team based in Tullamore, Co. Offaly and Cork. This team has developed 15 wind farms in Counties Clare, Cork, Kerry, Donegal, Limerick, Waterford and Tipperary.

1.2 The Need for the Project

The need for the proposed development is driven by the following:

- EU and Ireland's legally binding obligations to limit greenhouse gas emissions
- meeting national renewable energy targets
- increasing national energy security
- provision of cost-effective clean power production
- increasing energy price stability

Under International, European Union, and Irish national policy, mandatory targets for the overall share of energy from renewable sources have been set out.

Ireland's mandatory national target is to supply 16% of its overall energy needs from renewable sources by 2020. This target covers energy in the form of electricity, heat and transport fuels. For electricity alone, Ireland has set a national target of 40% by 2020 as outlined in Ireland's National Renewable Energy Action Plan. Government policies identify the development of renewable energy, including wind energy, as a primary strategy in implementing national energy policy.

Currently over 2,647 Megawatts of installed wind generating capacity is connected to the system in the Republic of Irelandⁱ. It is estimated that approximately 3,500 megawatts to 4,000 megawatts of installed wind generating capacity will be required to meet the 40% targetⁱⁱ. In addition it is expected that wind generating capacity will also be required to offset against the heat and transport targets, both of which are expected, based on latest figures released by Sustainable Energy Authority of Ireland, to be short of their respective targets.

With a capacity of approximately 125MW, the proposed Maighne Wind Farm will help to meet this target by contributing approximately 3 - 3.5% of the total wind generating capacity required to meet the national target

1.3 Application and EIS Process

Strategic Infrastructure Development Planning Process

The Planning and Development Act 2000ⁱⁱⁱ was amended in 2006^{iv} to require applications for planning permission for major infrastructure projects to be made directly to An Bord Pleanála rather than to the local planning authority, as would have previously been the case.

In order to be classified as strategic infrastructure development, a proposed development must be of a class specified in the Seventh Schedule to the 2000 Act and meet the conditions in Section 37A(2).

The applicant commenced pre-application consultation with An Bord Pleanála in October 2014 (An Bord Pleanála reference no. 09.PC0186). At the conclusion of the process, An Bord Pleanála determined that the proposed Maighne Wind Farm development is strategic infrastructure development. All strategic infrastructure applications must be accompanied by an environmental impact statement.

1.4 Environmental Impact Statement

1.4.1 Environmental Impact Statement Methodology

Pursuant to the provisions of EU and Irish law, when a proposed development is required to be the subject of an environmental impact assessment (EIA), the developer is required to present information to the competent authority in an environmental impact statement (EIS) for examination by the competent authority (in this case An Bord Pleanála).

Thus, an EIS is required to provide information so as to ensure that the competent authority (in this instance, An Bord Pleanála) may make a reasoned conclusion on the significant effects of the project on the environment, taking into account of, *inter alia*, the information contained in the EIS.

The EIS for this project has been prepared in accordance with EIA-specific and other relevant environmental legislation, guidance and advice notes. As part of the preparation process for the EIS, there has been extensive consultation with the competent authority, prescribed bodies, the public and other interested parties.

This document is Volume 1 of the EIS and comprises a Non-Technical Summary of the information contained in the main EIS report (Volume 2). Figures are contained within Volume 2a, Volume 3 contains the Appendices and Volume 4a, 4b and 4c contains the photomontages (landscape and visual assessment).

The broad methodology framework used in the EIS includes descriptions of:

- Existing Environment
- Potential Impacts (direct, indirect and cumulative)
- Mitigation Measures
- Residual Impacts (direct, indirect and cumulative).

1.4.2 Environmental Impact Statement Structure

Given the extensive scale of the proposed Maighne Wind Farm development and conscious of the need to ensure that the EIS is readily accessible, the EIS has been structured as set out in the bullet points hereunder. The detailed information in respect of each environmental aspect is provided in the main EIS report, Volume 2, and each of those sections is dealt with in summary form in this Non-Technical Summary as follows:

- Description of the Proposed Development
- Policy
- Consultations
- Air and Climate Change
- Noise and Vibration
- Ecology
- Soils and Geology
- Hydrology
- Water Quality
- Human Environment
- Shadow Flicker
- Traffic and Transportation
- Archaeological, Architectural and Cultural Heritage
- Landscape and Visual
- Telecommunications and Aviation
- Interactions and Cumulative Impacts of the Foregoing.

1.4.3 Pre-Submission Consultations

Prior to preparing this EIS, a number of state and public agencies, individuals and telecommunications bodies were consulted to ensure that the most significant impacts were addressed during the EIA process.

Consultation through, meetings, public information days, newspaper advertisements, information booklets, emails and telephone calls, with various statutory and non-statutory consultees, the local communities and other interested parties has been maintained throughout the process. Full details of the EIS scoping and consultation are contained in Chapter 4 of the Main EIS in Volume 2.

1.5 Permission Period

A ten-year planning permission has been applied for in respect of this proposed development. The wind farm is designed to last a minimum of 30 years. 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.

1.6 Difficulties Encountered

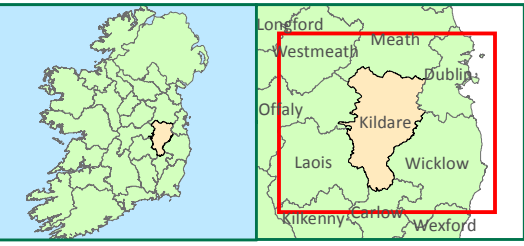
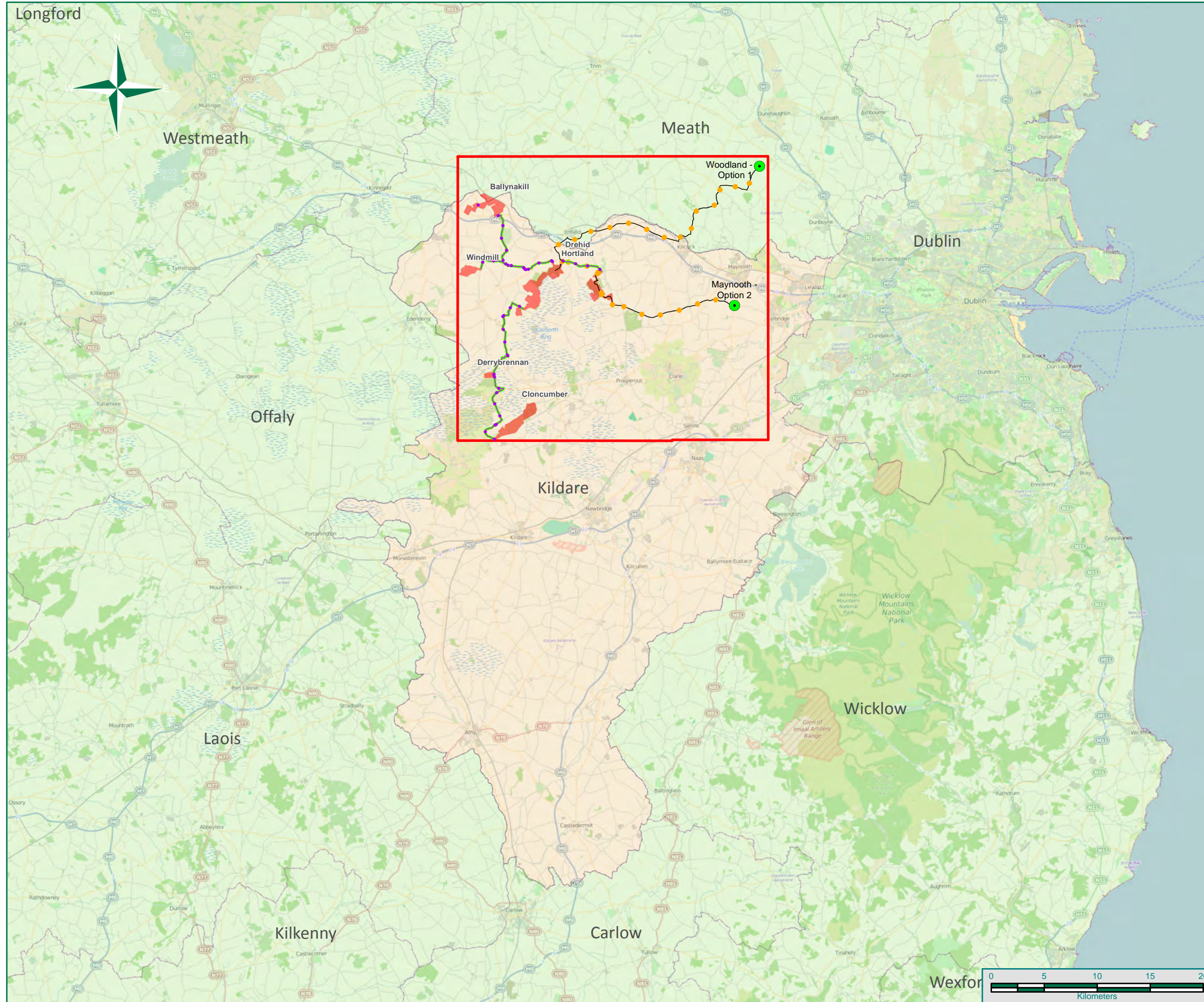
There were no technical difficulties encountered during the preparation of this environmental impact statement.

1.7 Viewing and Purchasing of the EIS

The EIS is available for download, free of charge, at www.maighnewindfarm.ie.

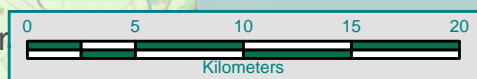
Any member of the public can view the planning application and accompanying EIS documentation, free of charge or can purchase on payment of a specified fee during normal office hours at the following locations:

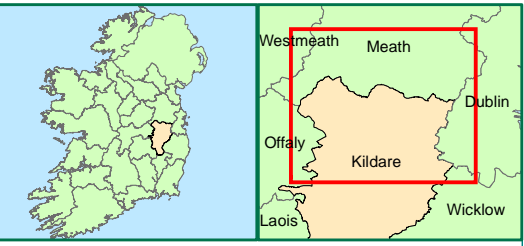
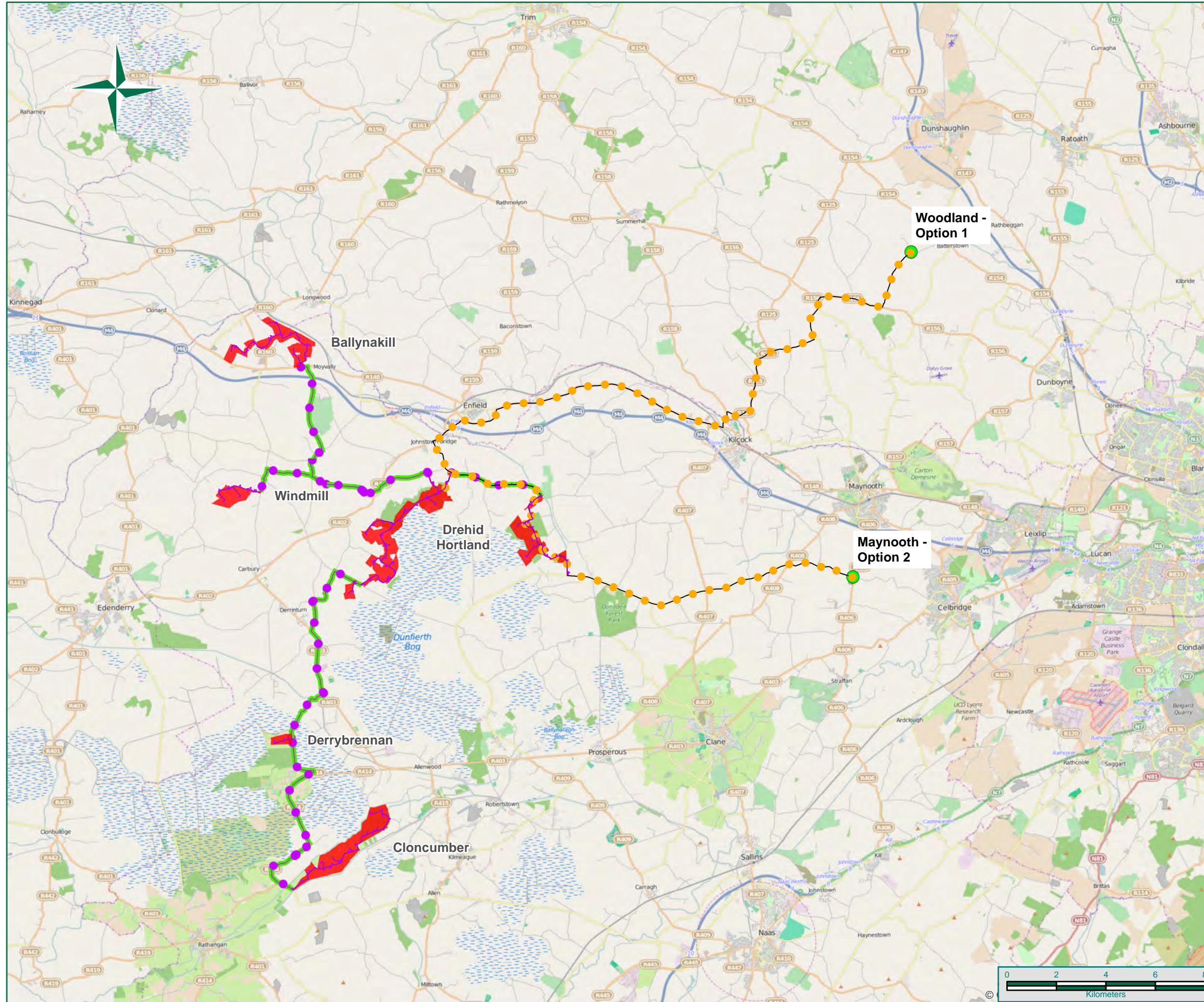
- The offices of An Bord Pleanála, 64 Marlborough Street, Dublin 1
- Kildare County Council, Planning Department, Áras Chill Dara, Devoy Park, Naas, County Kildare
- Meath County Council Planning Department, Buvinda House, Dublin Road, Navan, County Meath.



- Legend**
- Wind Farm Cluster Boundary
 - MV Cable Route
 - HV Cable Route
 - Irish Grid Connection Points

Date	13/03/2015	
Name Of Client	Element Power Ireland	
Name Of Job	Maighne Wind Farm	
Title Of Figure	Site Location with Bordering Counties Map	
Scale Used	1: 350,000 @ A3	
Figure No.	1.1	Rev A
W: www.fehilytimoney.ie , E: info@ftco.ie		





Legend

- Wind Farm Cluster Boundary
- MV Cable Route (Internal to Clusters)
- MV Cable Routes
- HV Cable Route
- Irish Grid Connection Points

Date: 25/03/2015

Name Of Client: Element Power Ireland

Name Of Job: Maigne Wind Farm

Title Of Figure: Site Location Map

Scale Used: 1: 150,000 @ A3

Figure No.: 1.2

Rev A

Date	25/03/2015	
Name Of Client	Element Power Ireland	
Name Of Job	Maigne Wind Farm	
Title Of Figure	Site Location Map	
Scale Used	1: 150,000 @ A3	
Figure No.	1.2	Rev A

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2 DESCRIPTION OF THE PROPOSED DEVELOPMENT

2.1 Proposed Development

The proposed development includes:

The proposed development will primarily consist of the following:

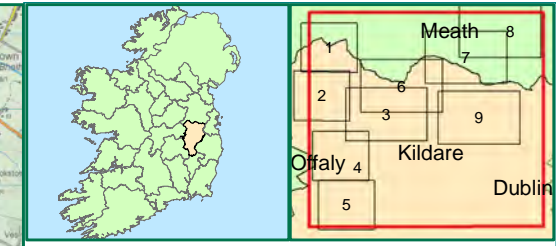
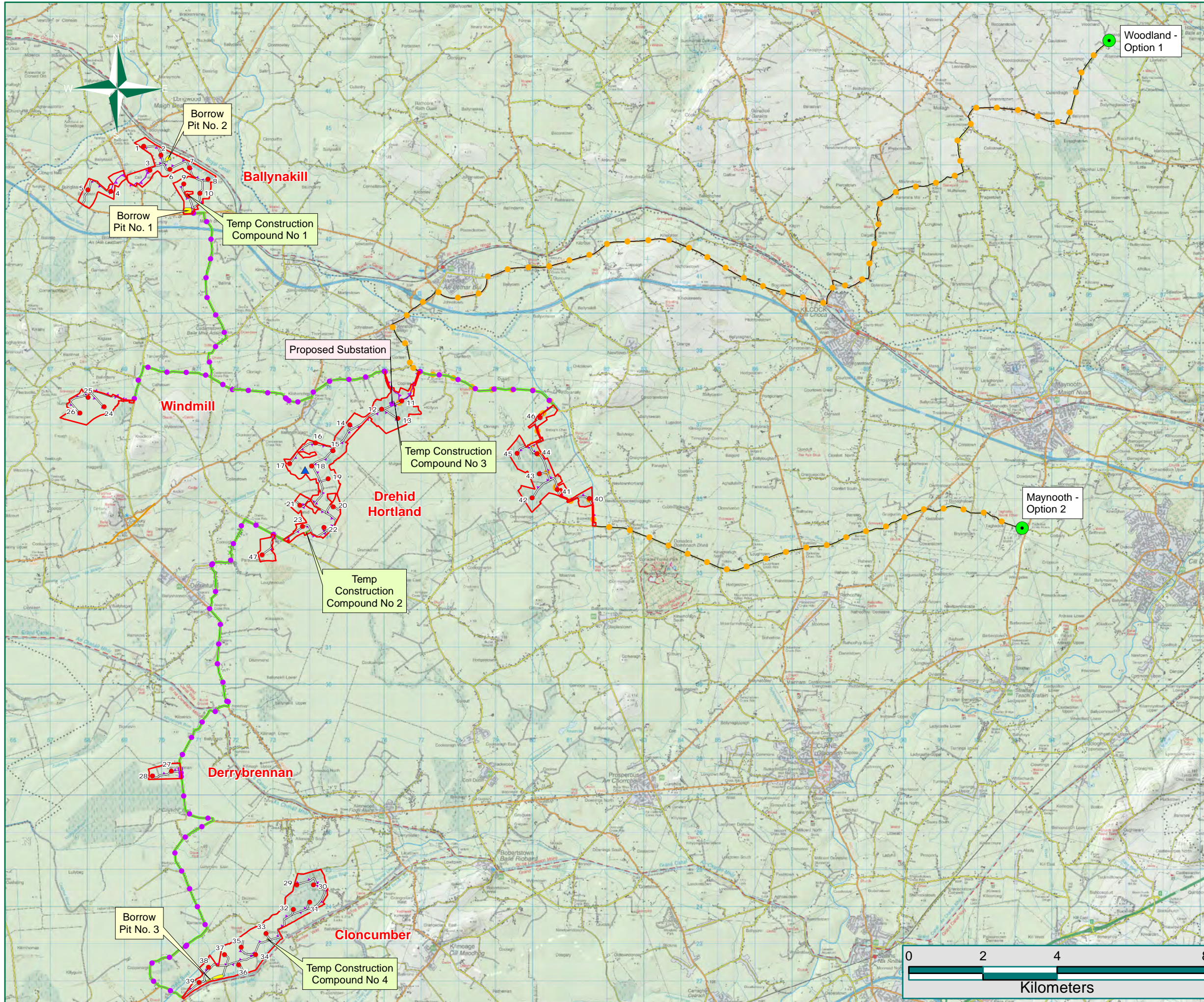
- Erection of up to 47 no. wind turbines with an overall tip height of up to 169m
- Construction of foundations and hardstanding areas in respect of each turbine
- Construction/upgrade of 9 no. site entrances from public roads
- Construction of approximately 31km of new site access tracks and associated 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 identified and evaluates 2 no. HV grid connection routes. However, only one of these routes will be constructed following the identification of the preferred connection point by the Transmission System Operator.

We are aware that the Department of the Environment, of Heritage and Local Government (DoEHLG) Wind Energy Development Planning Guidelines are currently being revised. The turbine layout as presented can comply with the proposed draft Guidelines with respect to proposed noise and shadow flicker limits.

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. The wind turbines that will be installed on site will be conventional three-blade turbines, that will be geared to ensure the rotors of all turbines rotate in the same direction at all times. For the purposes of carrying out the various appraisals in this environmental impact statement, 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. Whatever the final turbine choice it will not exceed the level of impacts assessed and determined in this EIS.

Figure 2.1 indicates the proposed layout of the overall development, while Figures 2.1.1 – 2.1.9 indicate the layout of each cluster along with the cable routes.



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

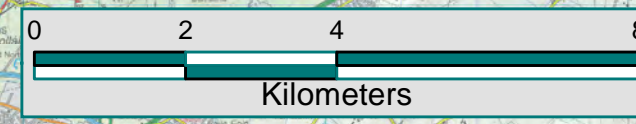
Name Of Client: Element Power Ireland

Name Of Job: Maighne Wind Farm

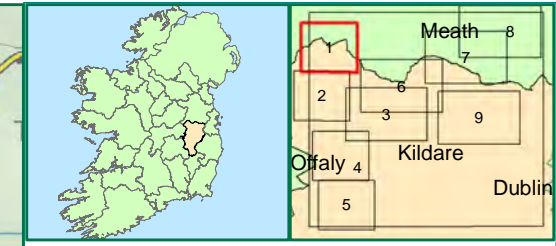
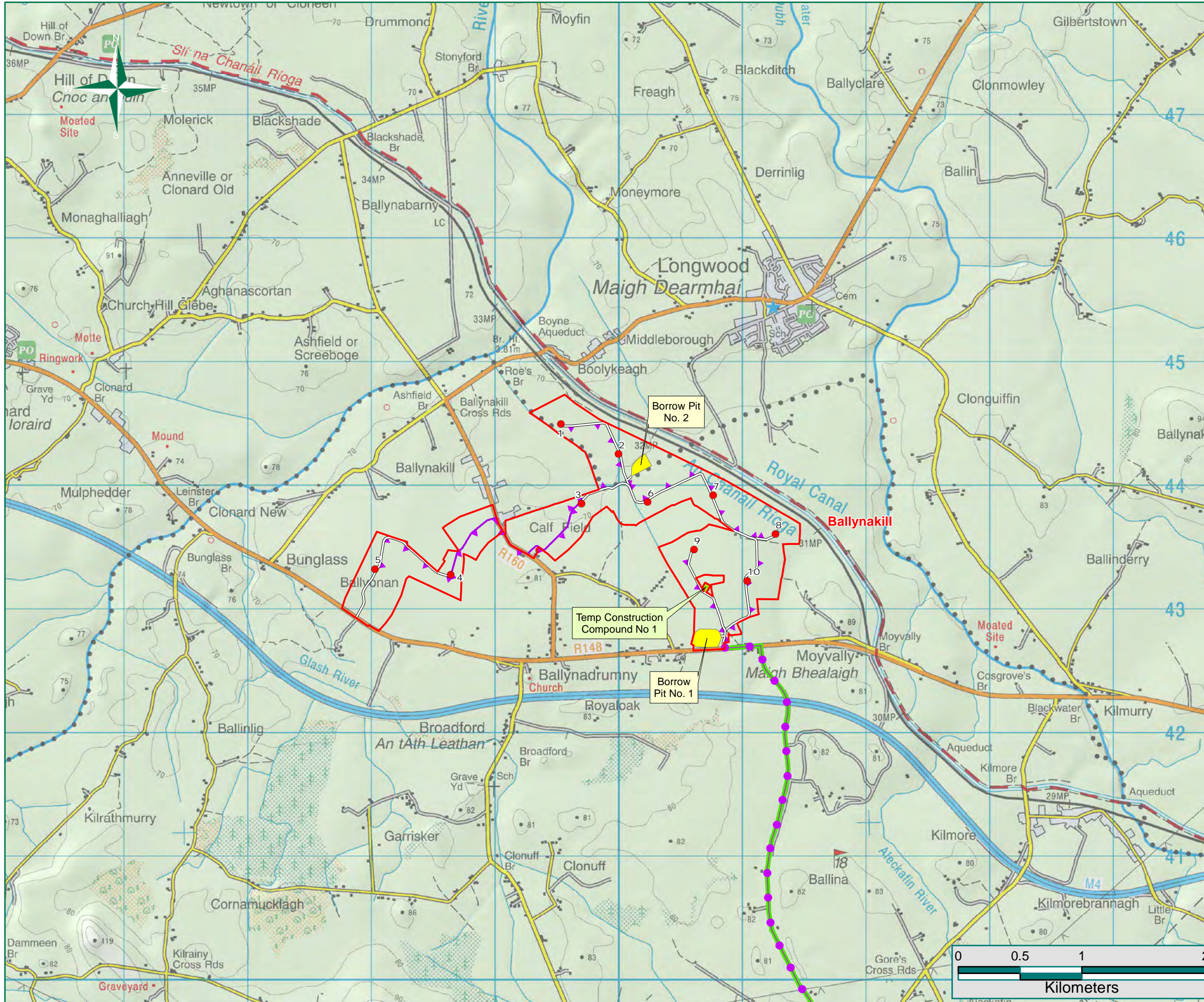
Title Of Figure: Site Layout Overview (Maighne)

Scale Used: 1: 100,000 @ A3

Figure No.: 2.1. Rev A



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Legend

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

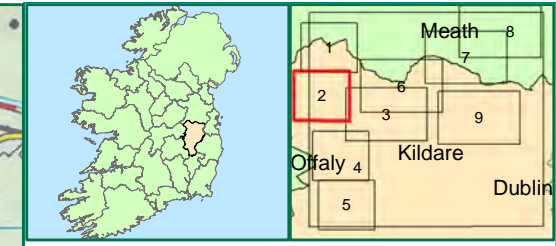
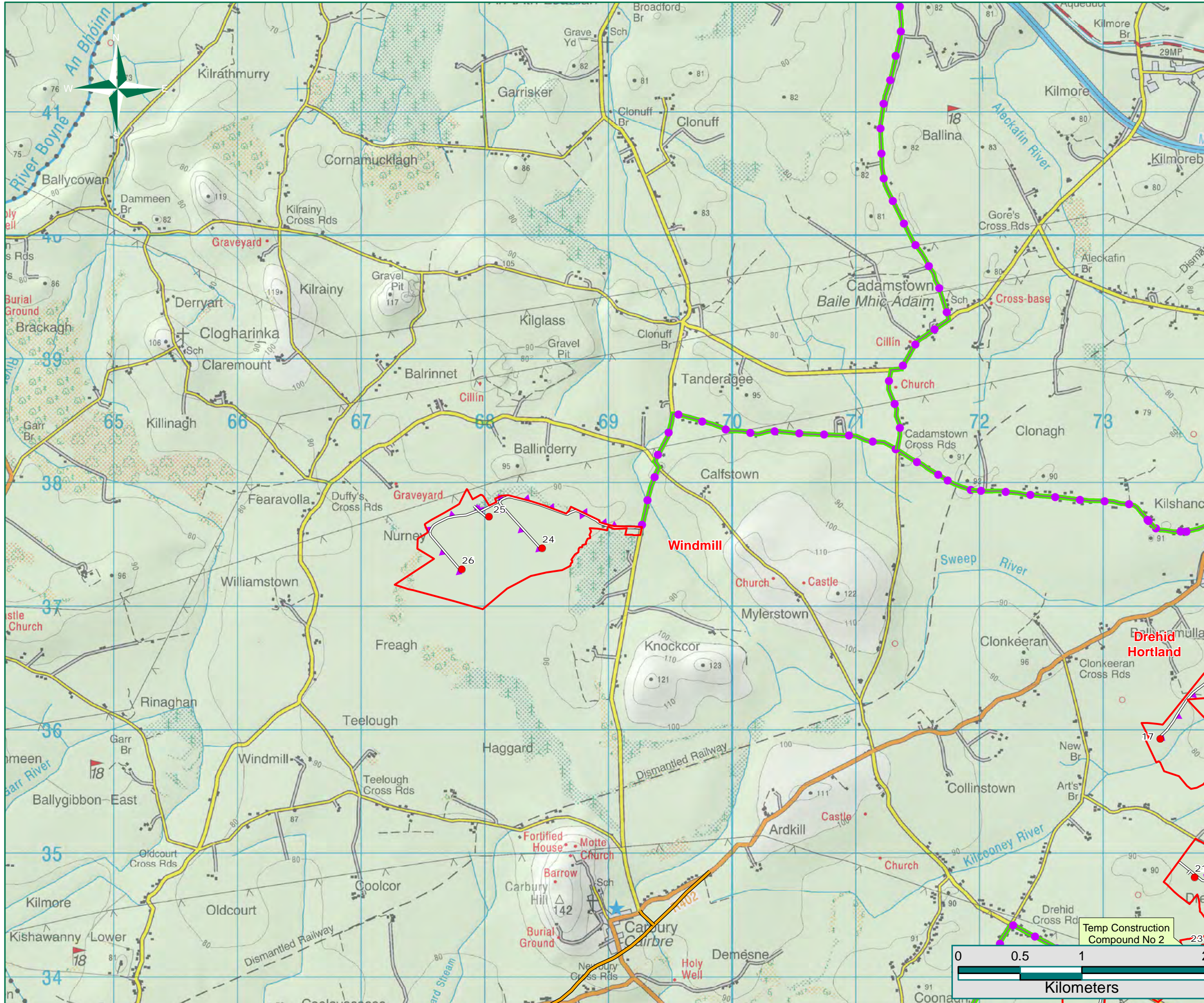
Date	25/03/2015	
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Name Of Job	Maighne Wind Farm	
Title Of Figure	Site Layout Submap 1 of 9 (Ballynakill)	
Scale Used	1:30,000 @ A3	
Figure No.	2.1.1	Rev A

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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
Rev	A

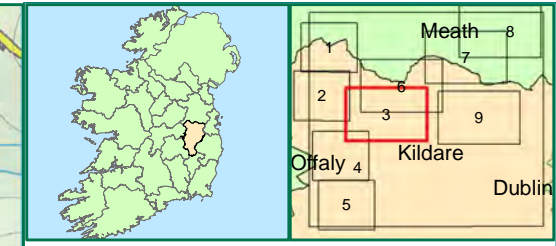
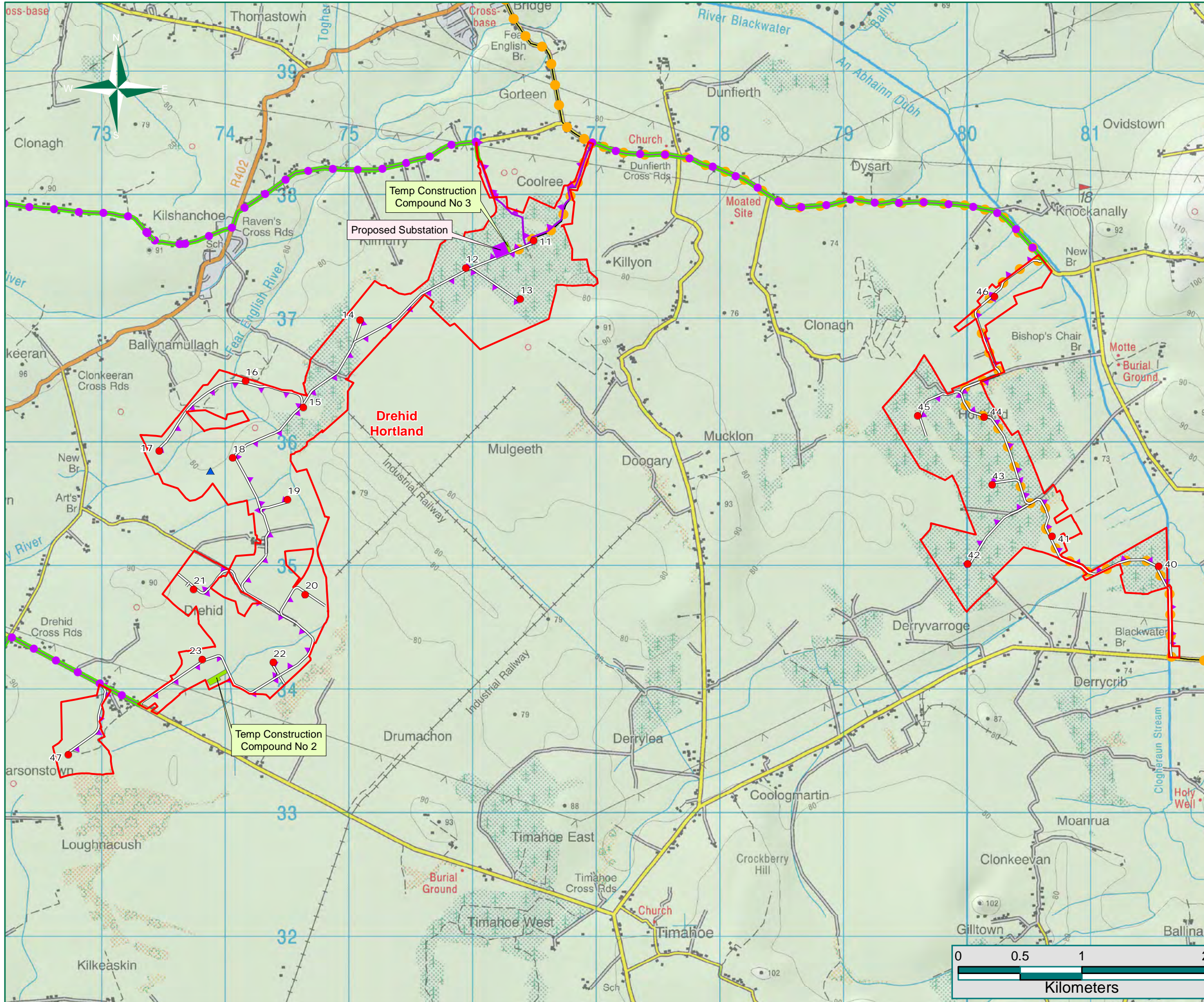
Date	25/03/2015
Name Of Client	Element Power Ireland
Name Of Job	Maighne Wind Farm
Title Of Figure	Site Layout Submap 2 of 9 (Windmill)
Scale Used	1:30,000 @ A3
Figure No.	2.1.2
Rev	A

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Legend

- Turbine Location
- Wind Farm Cluster Boundary
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- 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

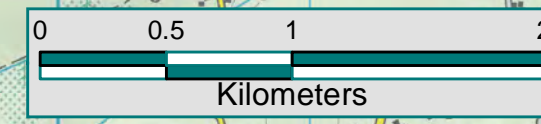
Name Of Job: Maighne Wind Farm

Title Of Figure: Site Layout Submap 3 of 9 (Drehid Hortland)

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Figure No.: 2.1.3

Rev: A

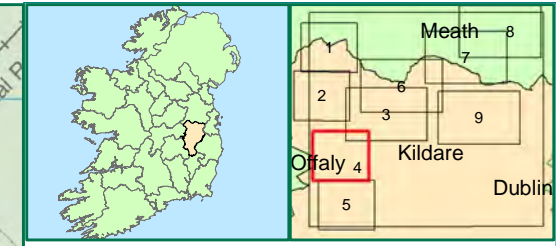
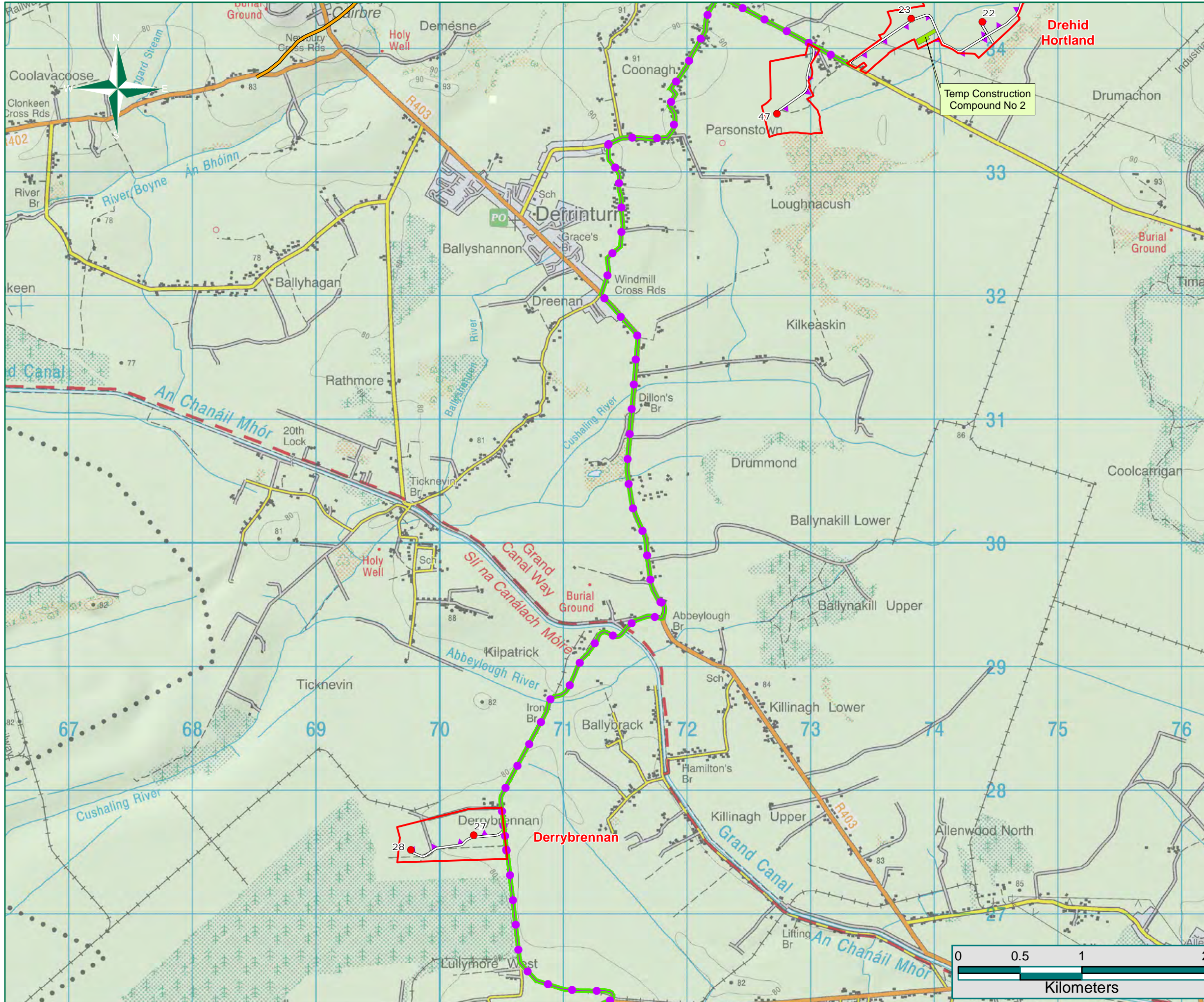


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Legend

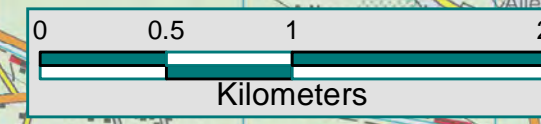
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- ▲▲▲ MV Cable Route (Internal to Clusters)
- Irish Grid Connection Point

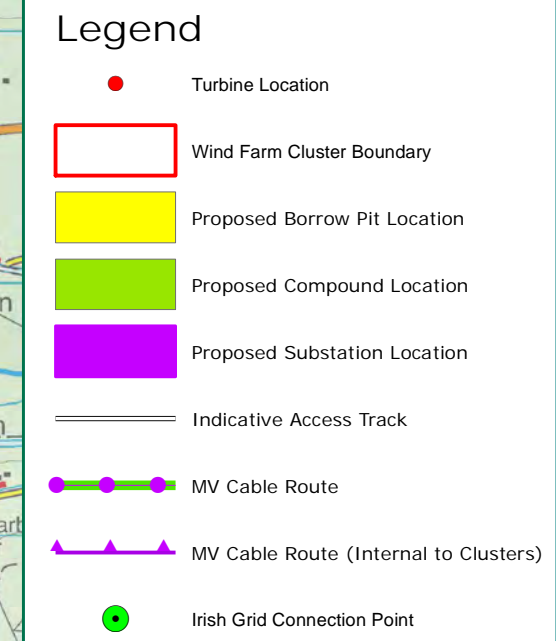
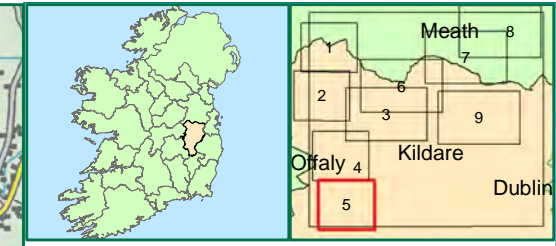
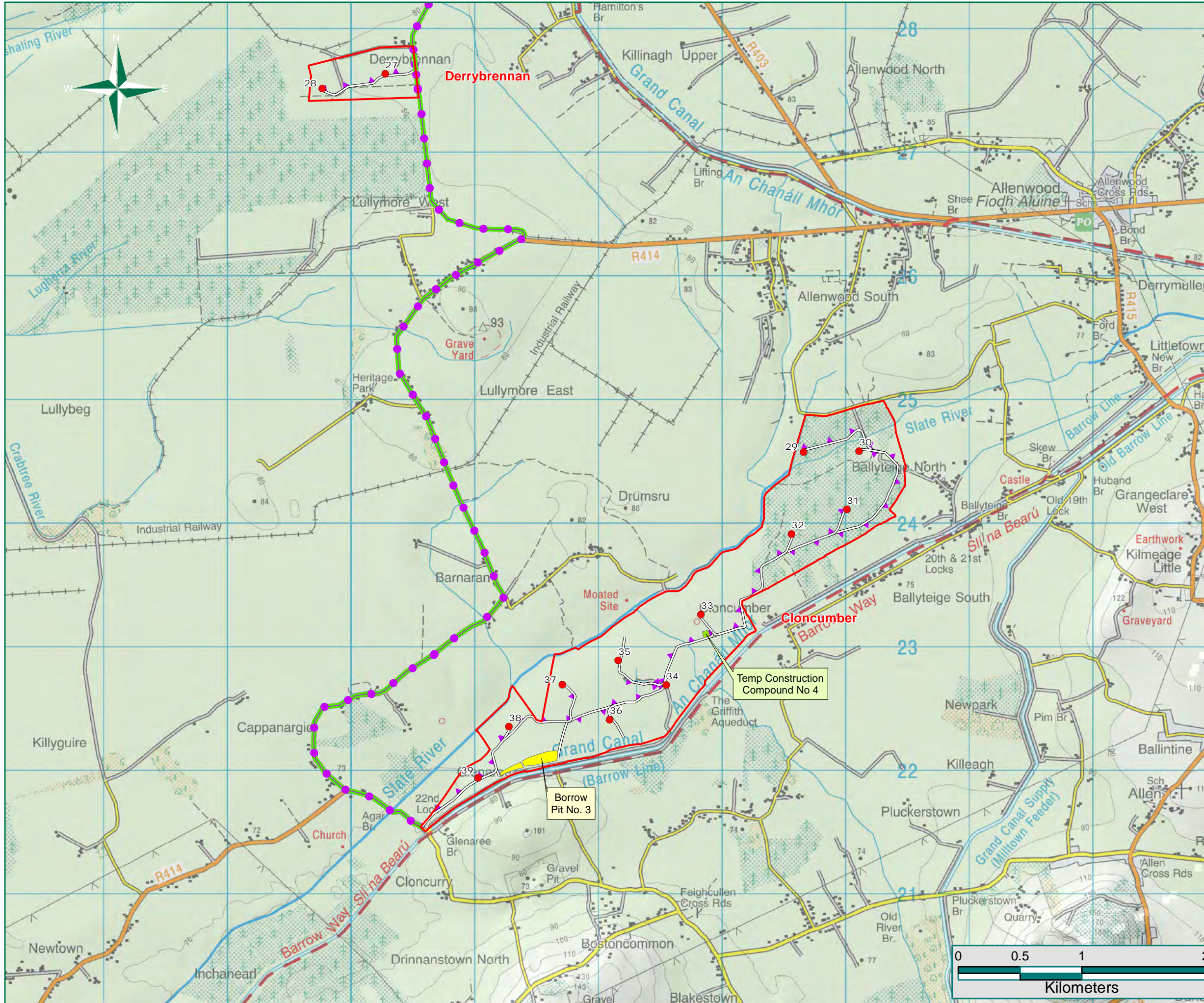
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Name Of Client	Element Power Ireland	
Name Of Job	Maighne Wind Farm	
Title Of Figure	Site Layout Submap 4 of 9 (Derrybrennan)	
Scale Used	1:30,000 @ A3	
Figure No.	2.1.4	Rev A

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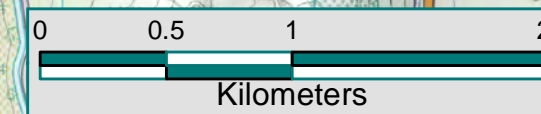
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Name Of Job	Maighne Wind Farm	
Title Of Figure	Site Layout Submap 5 of 9 (Cloncumber)	
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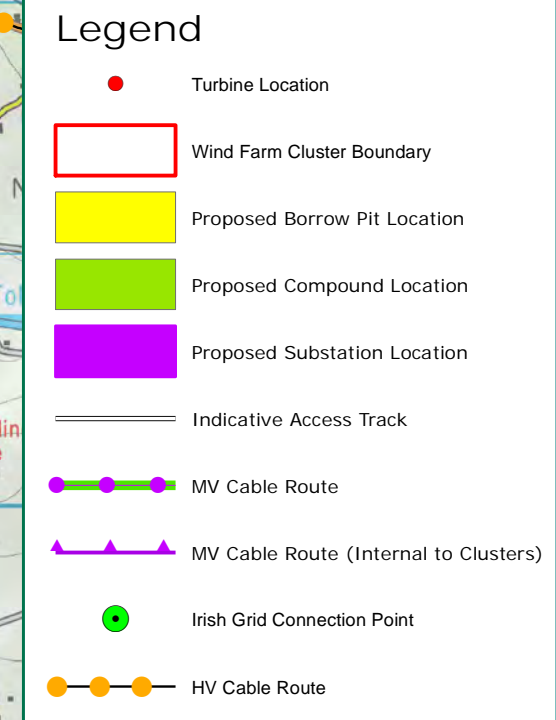
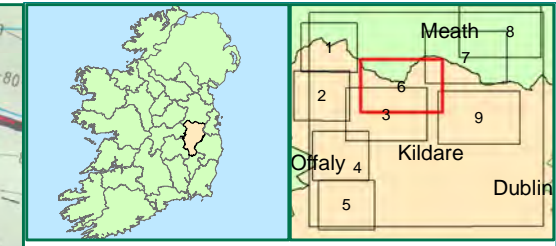
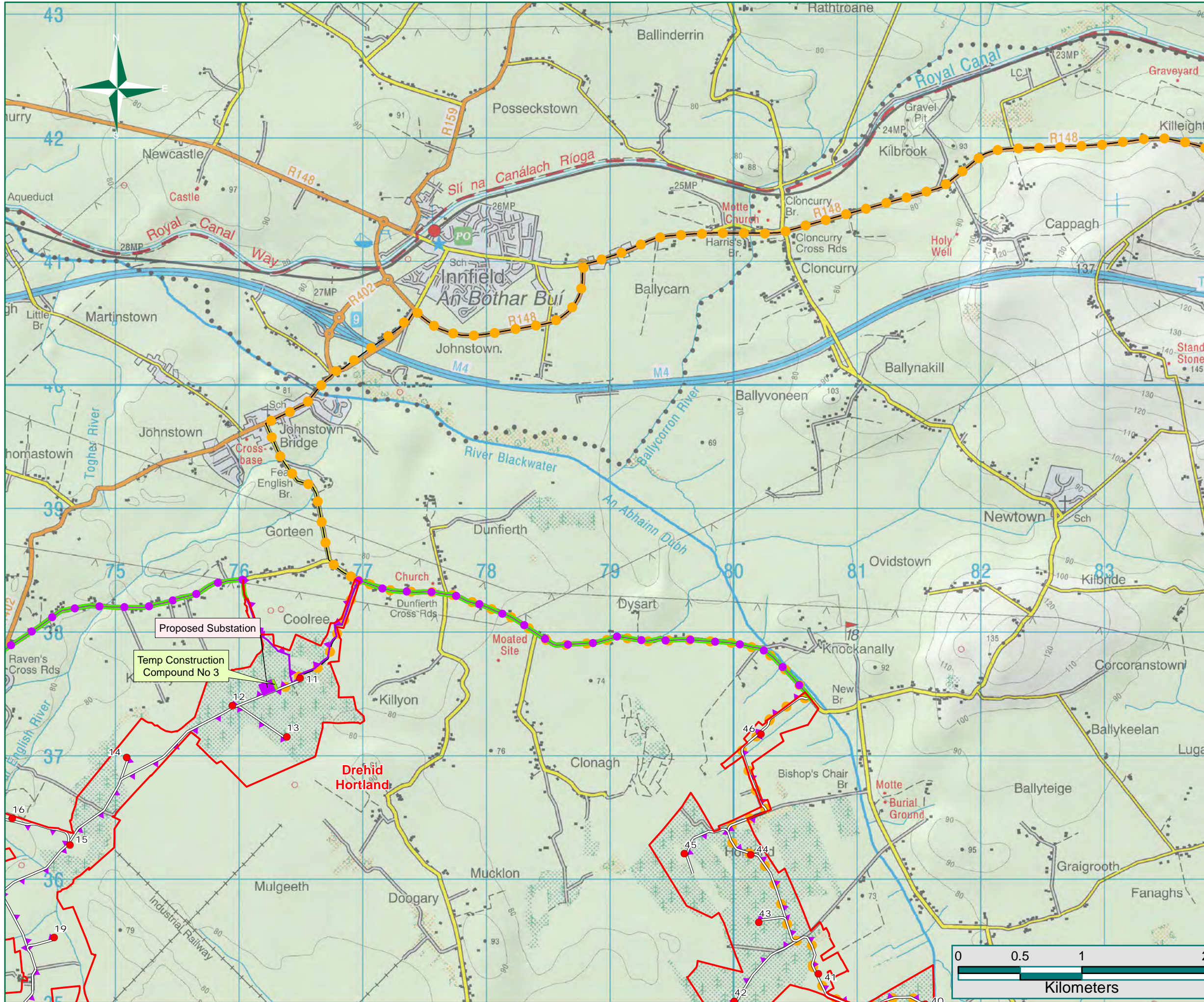
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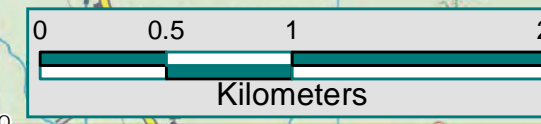
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Name Of Client	Element Power Ireland	
Name Of Job	Maighne Wind Farm	
Title Of Figure	Site Layout Submap 6 of 9 (Cable to Woodland)	
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Figure No.	2.1.6	Rev A

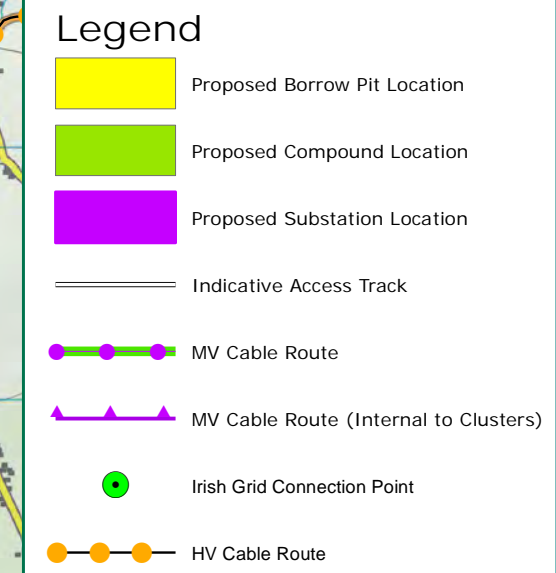
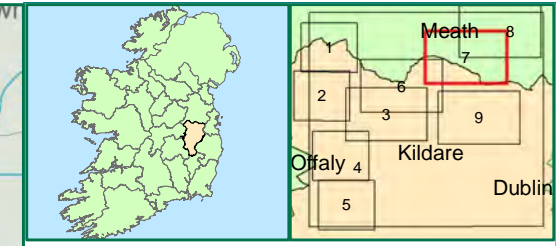
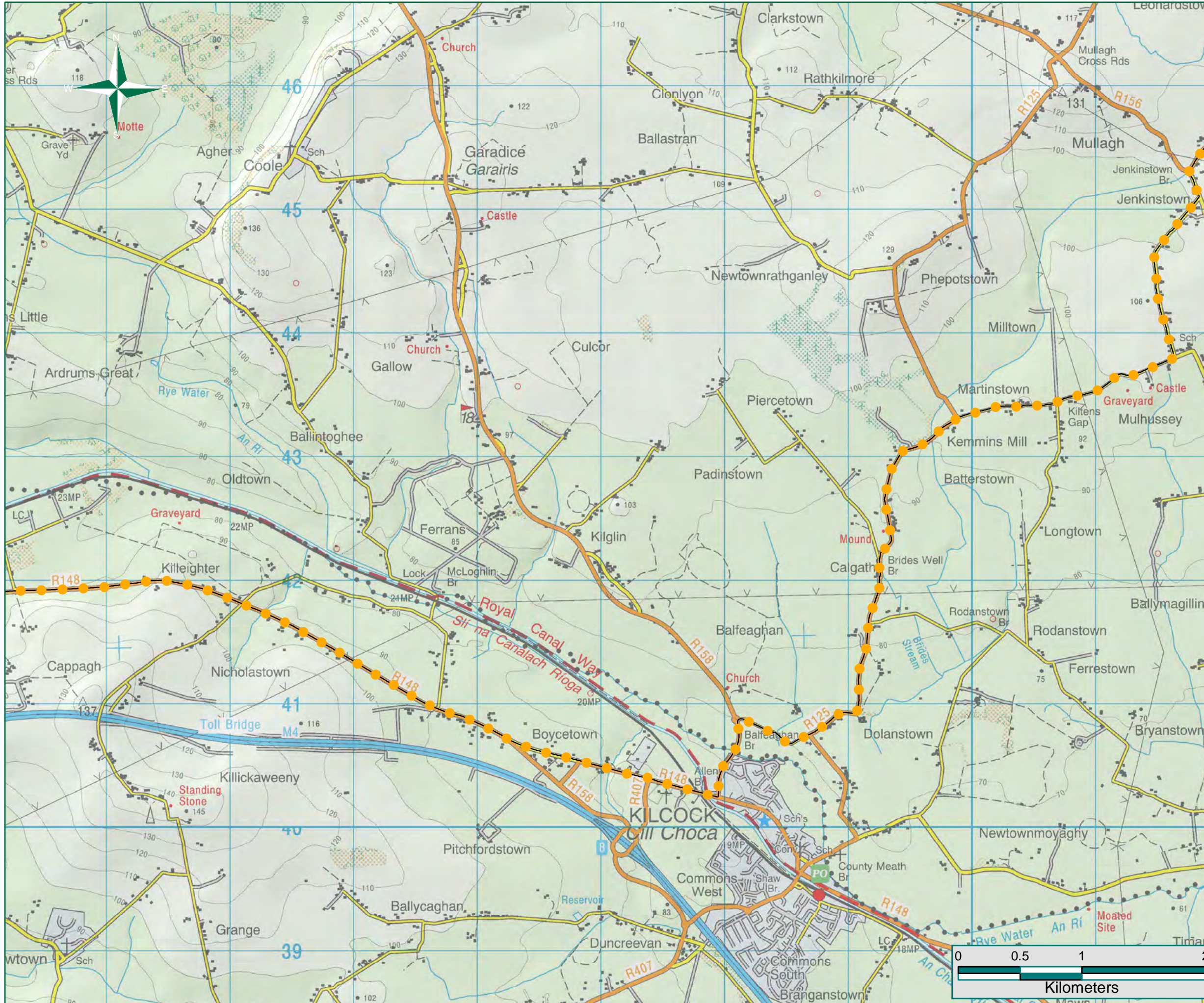
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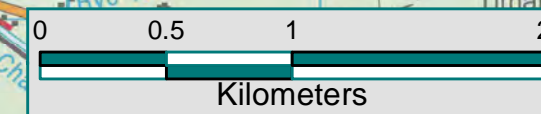
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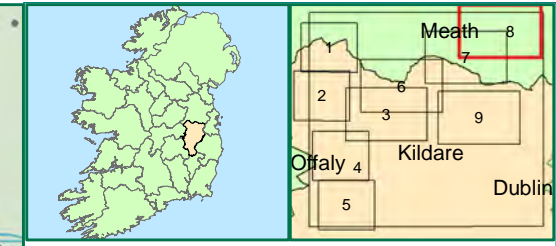
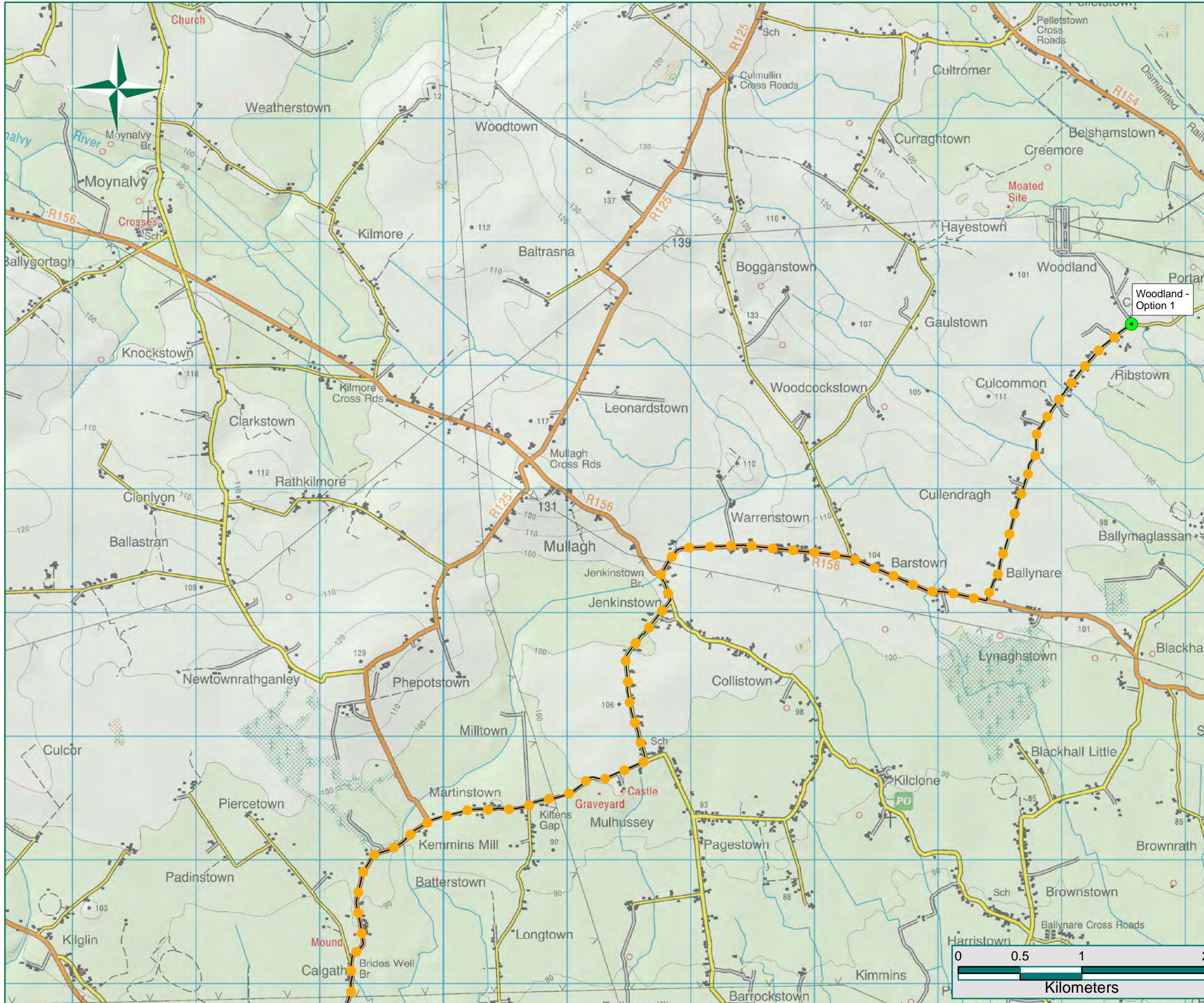
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Legend

- 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

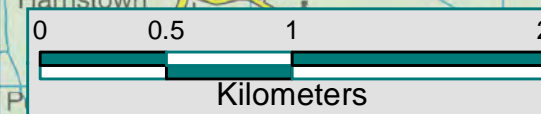
Date	25/03/2015	
Name Of Client	Element Power Ireland	
Name Of Job	Maighne Wind Farm	
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Figure No.	2.1.8	Rev A

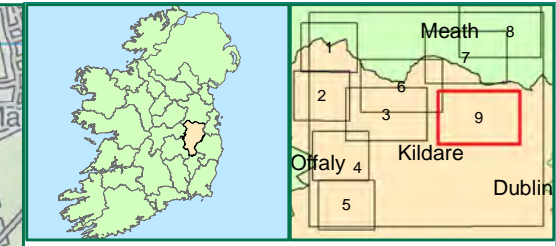
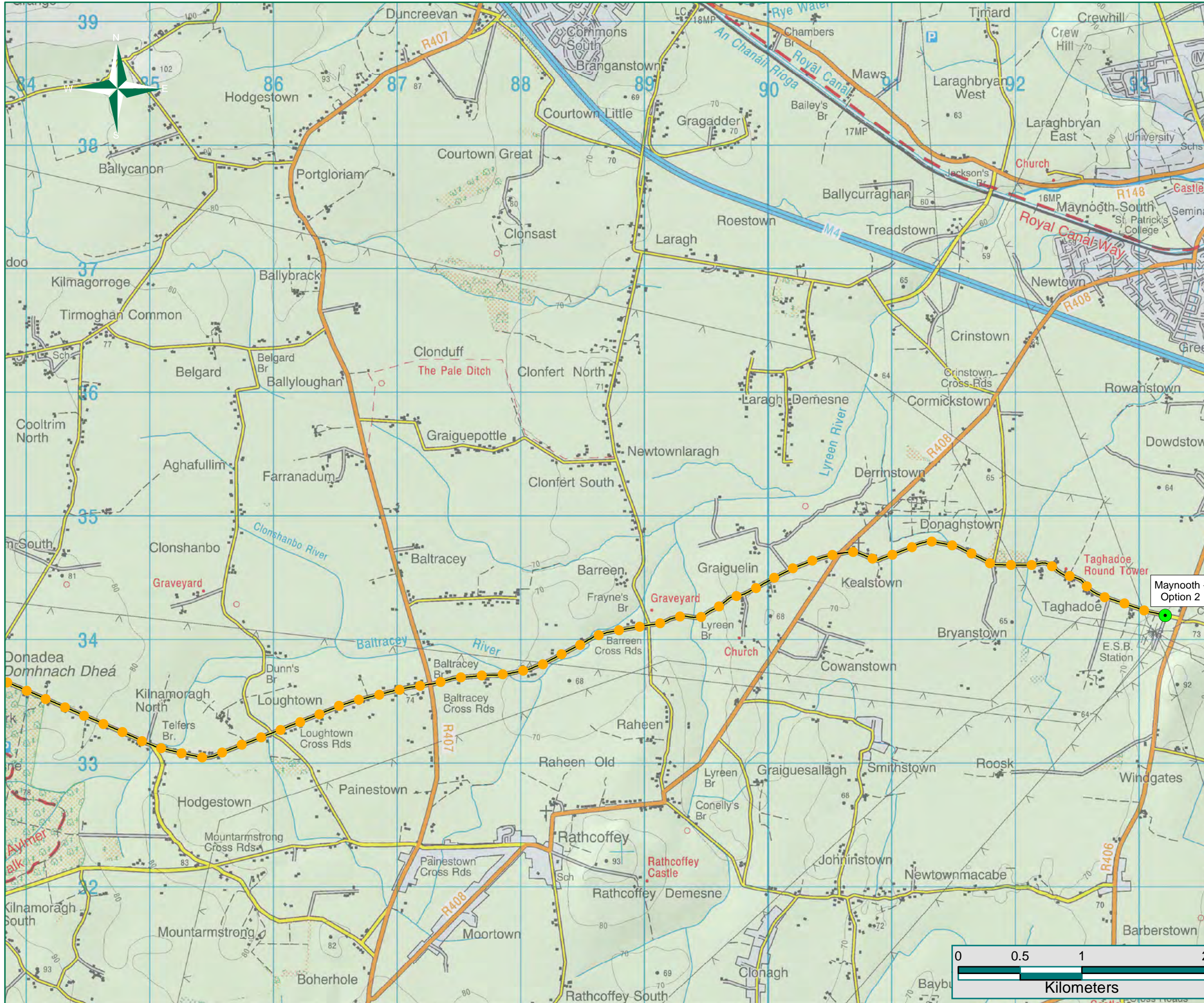
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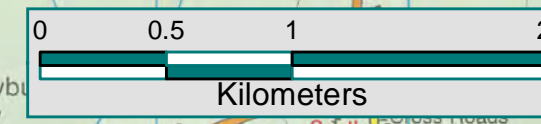




Legend

- 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	Rev A



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2.2 Project Design and Construction

2.2.1 Construction Programme & Phasing of Works

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

The provision of site entrances along with the upgrading of existing site tracks, the provision of new site tracks and tree felling will precede all other activities. Drainage infrastructure will be constructed in parallel with the track construction to ensure that any rainfall generated run-off from the site is collected and managed in an appropriate manner.

These works will be followed by the construction of the turbine foundations and the provision of the hardstanding areas upon which the turbines will be installed. In parallel with these works, the on-site electrical works such as the laying of the medium voltage cables underground in trenches between each turbine, the construction of the proposed on-site electricity substation at Drehid as well as the laying of underground medium voltage and high voltage cabling off site along public roads will be completed.

The turbines will be delivered to each cluster along a pre-defined route referred to as the turbine delivery route. This route will require temporary works at 23 locations to facilitate the oversized nature of these loads.

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

2.2.2 Tree Felling

Approximately 63ha of tree felling will be required to accommodate 18 no. turbines (T11, T12, T13, T14, T15, T16, T17, T27, T28, T29, T30, T31, T32, T40, T42, T43, T44, T45), a number of access tracks and the proposed substation at Drehid. This felling will occur within discrete locations in the Drehid-Hortland, Derrybrennan and Cloncumber clusters. All tree felling will require a Felling Licence from the Forest Service which will be in place prior to works commencing on site.

While re-planting will take place, some areas will not be replanted following construction of the wind farm. These include:

- 66m radius around each turbine located in forestry (approximately 1.3ha at each turbine)
- 33m wide corridors for access tracks
- 20m buffer surrounding the substation at Drehid (approximately 1.9ha)
- 20m of dimension of hardstandings
- 33m wide corridor for cables.

2.2.3 Cable Installation

The linear and repetitive nature of the cable installation in the public roadway is similar to the works required to provide other utility infrastructure such as water, drainage, gas, telecoms and electricity. The proposed trench will be laid by a number of 'crews' working separately along the length of the cable routes. Each works site will be fenced off from the public.

Conventional pipe laying techniques called 'open cut trenching' will be used for the majority of the cable route. This is a standard method for the laying of electrical cables and has been used throughout Ireland.

Open cut trenching involves the following:

- Set up of Traffic Management Plan
- Establishment of a safe working zone with barriers which will only be accessible to authorised personnel
- Saw cutting the carriageway
- Breaking out the surface with an excavator
- Excavation of a trench to the required depth to accommodate the cable

- Removal of the excavated material directly to awaiting vehicles for transport to an appropriate facility (in agreement with the local authorities)
- Laying of the cable
- Backfilling of the trench and re-instatement of the road

It is proposed that the trenches will be backfilled and temporarily reinstated each evening, ensuring minimum disruption to pedestrians, home owners and businesses. All works within the public roadway will require road opening licence(s) from either Kildare County Council and/or Meath County Council, which will be applied for if planning permission is obtained. The licence(s) will specify the permitted hours of construction. It is anticipated that the majority of construction works will be carried out during daytime hours, however evening and weekend working will also be required at some locations.

In more difficult locations, such as the crossings of rivers/streams and the M4 motorway, alternative construction techniques will be used. These are known as trenchless techniques and they allow the installation of the cable below the ground (and below the bed of the river/stream) with minimal excavation.

The cable route sections within each cluster boundary will generally be backfilled using sand (or a similar material) and the excavated material, however the cable sections within the roadway will be backfilled using cement bound material. This backfill material will be delivered directly to each works site on an as needed basis. Therefore, there will be no requirement for the stockpiling of materials along the routes.

A marker tape will be installed above each cable to notify third parties of its presence. It is proposed to begin to permanently reinstate the surface of the trench to its former condition, or otherwise as agreed with the relevant local authority, once the cable is laid.

2.2.4 Construction materials

Construction material for site tracks and hardstanding areas will be largely sourced within the site from three proposed borrow pits. Two of these borrow pits are to be located within the Ballynakill cluster while the other is located in the most southern cluster – Cloncumber. The excavated material will be transported along a defined haul route to the Drehid-Hortland, Windmill and Derrybrennan clusters. Excavators will remove the material from these sites and blasting will not be required.

Temporary topsoil storage areas will be provided within each landholding to prevent the spread of any soil borne diseases between landholdings. The stockpiles will be covered and subsequently used for landscaping purposes within that landholding only.

Other materials, such as subsoil and rock, will be temporarily stored adjacent to the proposed borrow pits and will be beneficially re-used in their reinstatement. It is proposed to begin reinstating the borrow pits as soon as practicable following the excavation of turbine foundations, access tracks etc. No permanent stockpiles of material will remain after construction and no clean surplus soil or rock is proposed to be removed from the wind farm.

Wastes (such as timber, metals, cardboard/paper) arising from the construction, operation or decommissioning of the wind farm will be separated at source and stored in dedicated bins/areas. All wastes generated during the construction phase will be transported by contractors holding a current waste collection permit to appropriate facilities for recycling and/or disposal. Waste generated from the servicing and maintenance of the wind farm e.g. lubricating oils, cooling oils, packaging waste from spare parts or equipment, unused paint etc. will be removed from site by each contractor.

2.3 Operation, Maintenance and Decommissioning/Reinstatement

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 on a 24-hour basis, 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.

On decommissioning, cranes will disassemble the turbines. All the major component parts are bolted together, so this is a relatively straightforward process. It is proposed that the internal site access tracks and turbine foundations are left in place as removal of this infrastructure would result in considerable disturbance to the local environment, however this will be subject to agreement with Kildare and Meath County Councils and the landowner.

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.

2.4 Site Selection and Alternative Layouts for the Proposed Development

Alternative Sites and Site Selection

An extensive site selection process was undertaken which considered a number of alternative options for the wind farm development. This included consideration of alternative locations on a National, Regional and local level against a number of environmental and infrastructural considerations including:

- Avoidance of environmentally designated sites
- Cumulative impacts with other connected and contracted wind farms
- Proximity to potential grid connection points on the existing Irish national electrical grid system
- Areas open to consideration under County Development Plans
- Low population density
- Access to the site
- Wind speeds
- Constructability
- Available land banks

The process culminated in the Midlands region emerging as a potentially suitable location for a proposed wind farm development which was then subject to further detailed analysis. 21 sites were identified as potential locations for wind turbines across three counties, namely Offaly, Kildare and Meath. As the overall objective was to identify a wind farm with an output up to 125 Megawatts, these sites were further refined against some or all of the criteria set out above, resulting in the preferred layout of Maighne wind farm, which is now the subject of the environmental impact statement.

Cable Route Selection

The scope of cable route selection for the Maighne Wind Farm development involved the identification of cable routes to connect the individual wind farm clusters to the proposed sub-station at Drehid and in turn connect to the EirGrid network, either at the existing Maynooth or Woodland sub-stations.

A number of alternatives were considered in the design and selection of routes for the electricity cabling. These included:

- Underground versus overhead cables
- Use of existing infrastructure in the area such as road and rail
- Regional roads versus local roads
- Use of 'off-road' locations for the accommodation of cable infrastructure

The preferred option, which is the subject of this environmental impact statement, was to underground all cables for this development, to route the sections of the high voltage cable through the cluster sites where possible and to route along regional roads and with minimal routing along bog rampart roads where possible.

Alternative Layouts

A number of alternative layouts were considered as part of the design of each wind farm cluster. This included the:

- Location of turbines within each cluster
- Turbine height
- Access track routes
- Cable routing within each cluster and along public roads
- Haul routes

The main factors that contributed to the consideration of alternative layouts for each of these elements include:

- Landscape and visual impacts
- Archaeology and cultural heritage issues
- Ecological aspects
- Consultation with the statutory bodies
- Turbine spacing

Alternative Technologies

Other forms of renewable energy developments include bioenergy, offshore wind, wave and tidal energy developments. While all renewable energy developments have a role to play in helping Ireland meet its targets there is no single form of renewable energy which is expected to meet the targets on its own.

Dr Brian Motherway, Chief Executive, SEAI recently stated that “converting the Moneypoint generation station from coal to biomass would solve Ireland’s renewable energy issues is misinformed and risks creating false hopes”. It is widely acknowledged that wind energy will contribute the vast bulk of this target.

The large scale deployment of renewables required to meet targets can only be met by a large portion of the target being met by the development of onshore wind farms.

3 POLICY AND LEGISLATION

3.1 Global Policy

Under the Kyoto Protocol, Ireland has a legally binding target to limit greenhouse gas emissions by at least 20% by 2020 compared to 1990 levels. The Environmental Protection Agency has stated (May 2014)¹, that current projections indicate that Ireland is not on track to a low-carbon economy and "*under the best case scenario, greenhouse gas emissions will remain relatively static up to 2020*".

3.2 EU Directives and Policies

A European Union Directive on the 'Promotion of the Use of Energy from Renewable Sources'^v establishes the rules for achieving 20% of EU energy consumption from renewable sources by 2020 and a 20% cut in greenhouse gas emissions by 2020, known as the 20:20:20 plan. Ireland's national target for the share of energy from renewable sources in 2020 is 16%.

3.3 Irish Energy & Environment Policies

National energy and environmental policy guidance makes specific reference to the development of renewable energy projects in the following:

- National Spatial Strategy (2002-2020)
- Green Paper – Towards a sustainable Energy Future for Ireland (2006)
- White Paper – Delivering a Sustainable Energy Future for Ireland (2007)
- National Renewable Energy Action Plan
- Strategy for Renewable Energy 2012-2020
- Renewable Energy Feed in Tariff (REFIT)
- Green Paper on Energy Policy in Ireland (2014)
- National Climate Change Strategy 2007-2012
- Ireland's Greenhouse Emission Projections 2013-2030
- Regional Planning Guidelines for the Greater Dublin Area.

The Irish power system is undergoing its most significant change in the last 50 years. From less than 1% in the year 2000, Ireland's own renewable target to supply 40%^{vi} of all electricity to consumers by 2020, is in line with and supersedes government and EU targets which aim to achieve 20% of all energy from renewable sources by 2020. It is estimated that wind energy will provide up to 90% of the renewable energy required to meet this target.

Ireland has doubled the connected renewable generating capacity over the past three years and according to the Irish Wind Energy Association, the Republic of Ireland's total installed wind energy capacity is 2,263 megawatts generated from over 188 wind energy developments in 23 counties^{vii}.

¹ <http://www.epa.ie/newsandevents/news/previous/2014/name,54166,en.html#.VPRk74dybrc>

3.4 Kildare County Development Plan 2011 -2017

The policies and objectives of Kildare County Council on renewable energy development are contained in Chapter 8 Energy and Communications. As outlined in Section 8.1 Energy Background, “Kildare County Council is committed to developing a more diverse range and combination of energy sources”.

Section 8.5.1 - Wind Energy, states that:

“In general, areas in close proximity to grid connections and outside designated heritage sites may be suitable locations for the provision of wind energy. It is recognised however that certain areas, which are suitable for the exploitation of large-scale renewable energy, may also coincide with the county’s designated sensitive and scenic areas.”

While County Kildare does not have a wind energy strategy, relevant energy policy objectives are summarised in Table 3.3 below.

Table 3.1: Extracts from the Kildare County Development Plan 2011 - 2017

Policy/ Objective	Description
Policy ER 2	To support regional, national and international initiatives for limiting emissions of greenhouse gases through energy efficiency and the development of renewable energy sources which make use of the natural resources in an environmentally acceptable manner.
Policy ER 7	To provide energy conservation and efficiency measures and facilitate innovative building techniques that promote energy efficiency and use of renewable energy sources in accordance with national policy and guidelines.
Policy WE 1	To have regard to the Department of the Environment, Heritage and Local Government Guidelines for Planning Authorities on Wind Energy Development (2006) in assessing all planning applications for wind farms.
Policy WE 2	To encourage the development of wind energy in suitable locations in an environmentally sustainable manner and in accordance with Government policy.
Policy WE 3	To ensure that the assessment of wind energy development proposals will have regard to: <ul style="list-style-type: none"> • the sensitivity of the landscape • the visual impact on protected views, prospects, scenic routes, as well as local visual impacts • the impacts on nature conservation designations, archaeological areas and historic structures, public rights of way and walking routes • local environmental impacts, including noise and shadow flicker • the visual and environmental impacts of associated development such as access roads, plant and grid connections • the scale, size and layout of the project, any cumulative effects due to other projects • the impact of the proposed development on protected bird and mammal species.
Objective ENO 1	To examine the possibility of designating appropriate areas of the county as being suitable for the production of wind energy.
Objective ENO 2	To prepare and implement an Energy Strategy, as a support to a structured response to energy cost changes and to work with central government to reduce market volatility. This could then assist community stakeholders and the renewable energy sector to cooperate in developing appropriate projects of sufficient scale with a stable demand and thereby attract employment investment.

3.5 Meath County Development Plan 2013 - 2019

Chapter 8 of the Meath County Development Plan 2013-2019 outlines policies and objectives relevant to renewable energy. These are outlined in Table 3.2.

Table 3.2: Extracts from the Meath County Development Plan 2013 - 2019

Policy	Description
Policy EC POL 1	To facilitate energy infrastructure provision, including the development of renewable energy sources at suitable locations, so as to provide for the further physical and economic development of Meath.
Policy EC POL 2	To support international, national and county initiatives for limiting emissions of greenhouse gases through energy efficiency and the development of renewable energy sources which makes use of the natural resources of the county in an environmentally acceptable manner, where it is consistent with proper planning and sustainable development of the area.
Policy EC POL 3	To encourage the production of energy from renewable sources, such as from biomass, waste material, solar, wave, hydro, geothermal and wind energy, subject to normal proper planning considerations, including in particular, the potential impact on areas of environmental or landscape sensitivity and Natura 2000 sites.
Policy EC POL 4	To support the National Climate Change Strategy and, in general, to facilitate measures which seek to reduce emissions of greenhouse gases.
Policy EC POL 13	To ensure that energy transmission infrastructure follows best practice with regard to siting and design particularly to ensure the protection of all important recognised landscapes.
Policy EC POL 20	To encourage the development of wind energy, in accordance with Government policy and having regard to the Landscape Characterisation Assessment of the County and the Wind Energy Development Guidelines (2006).
Policy EC POL 21	To support the preparation of a study on wind energy potential by local authorities jointly in the GDA.
Objective EC OBJ 1	To ensure that all plans and projects associated with the generation or supply of energy or telecommunication networks will be subject to an Appropriate Assessment Screening and those plans or projects which could, either individually or in-combination with other plans and projects, have a significant effect on a Natura 2000 site (or sites) undergo a full Appropriate Assessment.

4 SUMMARY OF THE EXISTING ENVIRONMENT

This section outlines the existing environment of the proposed development area.

4.1 Air and Climate Change

There are four air quality zones defined for Ireland, with the site for the proposed wind farm located in Zone D (Rural Ireland) where air quality is generally good. The long-term climatic conditions for the area have been derived from the nearest Met Eireann weather station at the Casement Aerodrome which indicates average mean temperatures of 9.7 degrees Celsius, monthly wind speeds of 10.7m/s and 3.7 daily sunshine hours.

4.2 Noise and Vibration

The proposed Maighne Wind Farm Development is set within a rural environment, comprising forestry and agricultural activities although there is also commercial activity associated with commercial peat harvesting and the operation of a landfill site in the area. Baseline noise measurements were carried out at 22 measurement locations surrounding the proposed wind farm, in order to derive appropriate noise limits according to the Department of the Environment, Heritage and Local Government DoEHLG *Wind Energy Planning Guidelines*.⁸

4.3 Ecology

The landscape of north Kildare is strongly influenced by the Bog of Allen resulting in a mixture of various habitats from improved agricultural farmland to raised bog, cutover bog and forestry in various stages of its lifecycle. Of the five proposed clusters of turbines, two (Ballynakill and Cloncumber) are located in improved agricultural land, with the remaining clusters bordering historical or existing areas of raised bog. The majority of these bogs have been exploited for resources such as peat extraction or forestry and this is reflected in the habitats within which the proposed turbines are to be placed. The overall area is drained by a number of rivers, primarily the Boyne and Blackwater, the River Slate and the Figile River.

While the wind farms sites were selected in order to avoid environmentally designated areas, there are a number of wildlife conservation areas, designated under European Union Directives, found within 15km of the proposed development. These number 10 in total, of which one is designated for birds and called a "Special Protection Area" or SPA; a further nine sites are designated for habitats of importance and called "Special Areas of Conservation" or SAC's. An appraisal of the potential impacts on these sites, called a Natura Impact Statement (or NIS) accompanies this EIS. There are also 20 "Natural Heritage Areas" or NHA's within the hinterland of the site; these are designated under a legal provision in the Irish Wildlife Act and often overlap those sites designated under European Union directives.

The habitats found within the proposed development largely reflect the nature of the ongoing land use. Habitats of higher ecological importance include treelines and hedgerows, which are important for birds and mammals in that they serve as corridors for movement, and provide shelter and resources; water features such as streams, drains and rivers which, in addition to acting as corridors, provide aquatic habitats for mammals such as Otter, Fish such as Salmon and Trout; Woodland (including both bog woodland and also general broadleaf woodland) which as a habitat provides shelter for mammals such as Foxes, Badgers and birds such as Woodcock; and cutover bog, which though degraded from its original condition still provides habitats such as scrub and grades into semi-natural grassland in some cases, which provides a rich diversity of plant species.

Significant habitats found within or near the proposed development include raised bog, which is found adjacent to the Windmill cluster and close to the Drehid-Hortland cluster. Further surveys were carried out on some of these raised bog habitats to determine whether higher quality or "priority habitats" existed. A small area of actively forming bog is found to the south of the proposed Windmill cluster, within the larger expanse of high bog present. At Drehid-Hortland the priority habitat "active raised bog" was found in two locations.

These exist as remnant areas of previously larger areas which have been impacted by long term extraction of peat and its associated drainage. Due to their importance however direct impacts on these habitats have been avoided through the design of the proposed development.

In terms of birdlife the proposed development hosts an assemblage of species typical of many of the habitats present. General farmland species and birds of open countryside such as Chaffinch, Blackbird, Robin, Wren, Song Thrush, Meadow Pipit and Woodpigeon dominate the winter hedgerows and fields, likewise during the breeding season however these species are added to by migratory species such as Chiffchaff, Swallow, Whitethroat and Willow Warbler. During the winter species such as Redwing and Fieldfare arrive in good numbers from Scandinavia. Cuckoo was recorded within the Windmill, Cloncumber, Derrybrennan and Drehid-Hortland clusters during the breeding season and favours the less intensively managed lands. Skylark was recorded breeding in suitable habitat at Windmill, Cloncumber and Drehid-Hortland and the scarce Whinchat was found just outside the red line boundary in the south eastern portion of the Drehid-Hortland cluster.

Wintering species of higher conservation concern, found to use the proposed development site, included Golden Plover and Whooper Swan. Golden Plover was found at four of the five proposed turbine clusters during the winter. Whooper Swan was found in low numbers in the Lullymore-Cloncumber area and small family parties were noted using fields at Cloncumber and south of the proposed Derrybrennan cluster. Lapwing were found at Derrybrennan in winter and also in wet fields near the Hortland section of the proposed Drehid-Hortland cluster.

Breeding species of higher conservation concern recorded included Lapwing, Snipe and Woodcock. Lapwing was found to breed within the proposed Cloncumber cluster and Woodcock is found throughout the proposed development in suitable habitat, mainly deciduous woodland skirting the edge of larger cutaway bogs but also possibly stream valleys and rides within larger conifer plantations. Snipe was found breeding in wet grassland and also on cutaway bogs.

In terms of birds of prey, Buzzard was recorded from almost all sites and Kestrel was found to breed just outside the proposed Derrybrennan cluster. Peregrine was noted flying through the proposed development at various clusters; these are likely to be birds breeding outside the proposed development. Evidence of Merlin was recorded to the west of the Hortland portion of Drehid-Hortland (offsite). During the winter months Hen Harriers were monitored at a number of known roosts sites within the hinterland of the proposed development. Hen Harrier was recorded on site at Drehid-Hortland on one occasion and on a number of occasions from surveys conducted during the winter months just south of Derrybrennan. No roosts are located within the proposed development boundary. Barn Owl surveys were carried out but no occupied nest sites were located.

Mammals recorded include Badger, which was found at a number of sites and recorded evidence included Setts; Otter, found at Drehid-Hortland along the Fear English and Blackwater rivers and also at Cloncumber along the Slate River and Pine Marten, recorded near Derrybrennan and likely to occur in suitable habitat elsewhere. Other mammal species such as Irish Hare and Red Fox occur throughout and Red Squirrel is likely to occur.

In relation to Bats, Common and Soprano pipistrelles were the most commonly recorded species onsite and were common along hedgerows, treelines and the edges of forests throughout the area. Brown long-eared bat was encountered in several areas also. Leisler's bat, which forages over agricultural landscapes, scrub and woodland as well as urban areas, was widespread across the area. Daubenton's bat, which forages over open water, was observed on the Grand Canal at Cloncumber and along the River Boyne.

4.4 Soils and Geology

The soils of the proposed development are dominated by peat and sand and gravel deposits at variable depth. Cutover peat was encountered at all clusters except Ballynakill and was a maximum depth of 4m within the Windmill cluster. The bedrock of the area is predominantly limestone and shale while the topography within the Maighne Wind Farm development is generally flat or gently sloping.

4.5 Hydrology

The area proposed for the Maighne Wind Farm development is located across a number of river sub-catchments (also known as waterbody catchments):

- The northern sections of the proposed development drain to the River Boyne and its tributaries, including the River Blackwater. This includes turbines T1 – T26 and T40 - T46 as well as the proposed electrical substation at Drehid
- The southern sections of the proposed development drain to the River Barrow and its tributaries, including the Slate River. This includes turbines T27 – T39 and T47.

The turbine delivery route and the cable routes will cross a number of the same waterbody catchments as the turbines in addition to some further waterbody catchments of the River Boyne, the River Liffey and the River Tolka.

Flood records indicate that flooding has occurred at two locations some 2.5km downstream of the proposed development; at Newtown and at Knockanally in the floodplain of the River Blackwater to the north east of the site and in the floodplain of the Slate River to the south west of the site.

In addition, the Office of Public Works has produced indicative flood mapping which assist in the preliminary assessment of flood risks to or from a proposed development. With respect to the Maighne Wind Farm development, a number of the proposed internal access tracks cross indicative floodplains (Flood Zone A). Turbines T1, T29, T30, T34 and T40 are also shown to be located within or skirting a 'Flood Zone A' area.

Existing drainage in the proposed development area includes agricultural drainage ditches, bog drains, forest drains and stream courses running through the site. Some of the proposed access routes follow existing farm and forest tracks, which vary between 3.0m and 4.5m wide. The existing tracks typically drain 'over the edge' into adjacent fields or into roadside, bog or forestry drains. Streams and drains are generally piped across existing farms, bog and forestry tracks in pipes varying in size.

4.6 Water Quality

Monitoring data is collected at a number of locations on rivers in the vicinity of the proposed development by statutory agencies. This includes the River Blackwater, River Boyne, River Glash, Figile River, Slate River, Cloncumber Stream, River Rye Water, Dunboyne Stream, Clonshanbo River and the Lyreen River. Supplementary monitoring was conducted as part of this EIS on the River Glash, Fear English River, Cushaling River, Mulgeeth Tributary, Abbeylough River, River Slate and the River Blackwater. Nationally, surface water is classified as 'High', 'Good', 'Moderate', 'Poor' and 'Bad'. The results of the monitoring data reviewed as part of this EIS indicate that the surface water quality in the vicinity of the proposed development ranges from 'Bad' to 'Good' with elevated concentrations of some chemicals arising from the presence of local peat soils in the area as well as indicating possible pollution sources such as farming activities and/or septic tanks.

Groundwater well supply is abundant in the proposed development area, particularly in more rural locations outside of the bigger towns and villages. Nationally, groundwater quality is either classified as 'Good' or 'Poor', with the groundwater bodies underlying the proposed development area being of 'Good' status.

Groundwater vulnerability, is the term used to represent the geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. The Geological Survey of Ireland classifies the groundwater bodies underlying the site as ranging from 'high' to 'moderate'.

There is one Source Protection Zone within the proposed development area, located at Johnstown, south of Enfield. Parts of this zone occur within the Drehid-Hortland cluster boundary. This source protection zone consists of a groundwater well field which was installed by Kildare County Council in the early 2000's with the intention to abstract groundwater as a drinking water supply. This well field was not subsequently developed.

4.7 Human Environment

The existing human environment is discussed under the following headings:

- Socio-Economics
- Land Use
- Recreation, Amenity and Tourism
- The Bloodstock Industry
- Health and Safety
- Material Assets

4.7.1 Socio-Economics

The proposed Maighne Wind Farm development extends from the town of Longwood in County Meath to Moyvalley, Cadamnstown, Derrinturn, Allenwood, Robertstown and Rathangan in County Kildare. A total of 618 occupied dwellings were identified within 1km of the proposed turbines.

The high voltage cable route option to the existing electricity substation at Woodland travels northwards from the Drehid-Hortland cluster along the R402 (section from Enfield to Carbury), bypassing the town on Enfield and then eastwards along the R148 (Dublin to Kinnegad) to Kilcock. From here the proposed cable route travels along a number of regional roads through townlands such as Calgath, Martinstown, Jenisktown, Barstown.

The high voltage cable route option to the existing electricity substation at Maynooth travels westwards from the southern entrance to the Hortland portion of the Drehid-Hortland cluster onto local roads through townlands such as Donadea, Loughtown, Graiquelin, Taghadoe to Maynooth substation.

The Moyvalley Hotel and Golf Resort is located 1.15km south of the Ballynakill cluster and the Hamlet Court Hotel situated at Johnstown Bridge, is 1.9km north of the Drehid-Hortland cluster.

There are a number of primary and secondary schools within 2km of the wind farm clusters namely; Longwood, Clogharinka, Kilshanroe, Derrinturn, Ticknevin (Carbury), Johnstown Bridge, Timahoe West and Scoil Naomh Fintina Vocational School. Beyond this there are national and secondary schools located at Prosporous, Rathangan, Clane and Enfield. Mulhussey National School, located between the R125 (Dolanstown to Martinstown) and the R156 (Dunboyne to Mullingar), north of Kilcock is located along the proposed underground cable route to Woodland.

4.7.2 Land Use

The proposed development is located in an area where land uses are dominated by peat bogs, forestry and agriculture.

4.7.3 Recreation, Amenity and Tourism

In 2013, approximately 381,000 overseas tourists visited the Midlands East region, contributing approximately €116.1 million to the local economy. Of this, 168,000 visited County Kildare, while 122,000 visited County Meath.

Tourist attractions in the vicinity of the proposed development include; the Great Plains of the Curragh, the Barrow Way, the Curragh Military Museum, the Bog of Allen Centre and Lullymore Heritage Park to name just a few. In County Meath the Boyne Valley, which includes the UNESCO World heritage site at Brú na Boinne attracts significant numbers of visitors each year.

There is a long tradition of horse racing in Counties Kildare and Meath with fixtures held regularly at Punchestown, Naas and the Curragh, Fairyhouse, Navan and Bellewstown. As well as horse racing, Punchestown and Fairyhouse host several music events.

The Irish National Stud, located some 11.2km from the nearest turbine T39 within the Cloncumber cluster, plays an active role in the development and promotion of Irish bloodstock and is one of the country's leading attractions. The National Stud also houses the Japanese Gardens and the Horse Museum.

The towns, villages and parishes in the surrounding areas have sports, recreational and community facilities including Rathangan GAA, Ballyteague GAA, Allenwood Celtic AFC, Carbury Hot Rod Track, and Saint Kevin's G.F.C. There are a number of golf clubs including:

- Moyvalley Hotel & Golf Resort - approximately 1.7km from the Ballynakill cluster
- Woodlands Golf Club - approximately 5.5km from the Ballynakill cluster
- Highfield Golf and Country Club approximately 2.6km from the Windmill cluster
- Edenderry Golf Club - approximately 4.4km from the Windmill cluster.

Many of the rivers and streams draining the area are important for angling and water sports, including the Blackwater, the Slate and the Boyne Rivers and their tributaries.

The Royal Canal, Grand Canal and the Barrow Way occur adjacent to the proposed development. Sections of the Royal Canal occur adjacent to the Ballynakill cluster while a section of the Grand Canal is located adjacent to the Cloncumber cluster. National waymarked trails have been established adjacent to both the Grand Canal and Barrow Way.

4.7.4 The Bloodstock Industry

There are 22 studs within 5km of the proposed Maighne Wind Farm development with three of these located approximately 1km from a proposed turbine location. These include The Stables in Drimsru, Drumachon Stud, Keelogue House Stud, Parsonstown Stud and Riverside Stable Yard. There are no equestrian facilities within the boundary of the windfarm clusters.

4.7.5 Health and Safety

Health and safety issues on farmed land are routine for such lands.

In addition, the proposed Windmill cluster is located on lands owned and operated by Clairstone Ltd., a private milling peat company.

Health and safety issues associated with Coillte lands are associated with the interaction of the public (who use the land for recreation) with commercial forestry activities. These issues are addressed in Coillte's forest management plans.

4.7.6 Material Assets

Non-renewable Resources

There are a number of quarries and pits in the vicinity of the proposed Maighne Wind Farm Development. The closest is located approximately 0.9km north of T1 at Windmill.

Bord na Móna operates turf/peat extraction in the townlands of Parsonstown, Loughnacush, Kilkeaskin, Drumond, Timahoe West, Coolcarrigan, Killinagh Lower and Killinagh Upper, Carbury, Drehid, Hortland and Derrybrennan in County Kildare which are in the vicinity of the Derrybrennan, Drehid-Hortland and Cloncumber clusters.

Renewable Resources

There are a number of existing and permitted wind farms/turbines in the vicinity of the proposed development. The closest are in counties Westmeath and Offaly as outlined below which indicates the locality is viable for wind development:

- Crowinstown Wind Farm, a 3 turbine permitted wind farm at Devlin, Co. Westmeath approximately 19.7km north-north-west of the proposed development

- Dryderstown Wind Farm, a 1 turbine wind permitted farm at Devlin, Co. Westmeath approximately 20.8km north west of the proposed development
- Mountlucas Wind Farm, a 28 turbine existing wind farm at Derrylesk, Co. Offaly approximately 17km west of the proposed development
- Yellow River Wind Farm, a 32 turbine permitted wind farm at Rhode, Co. Offaly approximately 10.5km west of the proposed development.

Utilities

Existing utilises in the area include electricity transmission infrastructure, water mains, gas pipelines etc. Proposed utility infrastructure include Eirgrids North-South 400kV interconnector project between the electricity networks of Ireland and Northern Ireland which includes approximately 140km of overhead electricity interconnection development. This electricity infrastructure will run from a proposed substation at Turleenan, Co. Tyrone, to the existing Woodland 400kV substation, in Co. Meath which is one of the proposed connection points for the high voltage cable route from the Maighne Wind Farm development.

4.8 Shadow Flicker

There is currently no shadow flicker arising from activities within the site of the proposed wind farm development. A total of 994 buildings (including occupied and unoccupied dwellings and permitted dwellings that are not yet constructed) are located within 10 rotor diameters (1,200m) of a proposed turbine.

4.9 Traffic and Transportation

The proposed Maighne Wind Farm development, is located close to the M4 motorway with Junction 9 Enfield being the closest motorway junction to the proposed development. One of the wind farm clusters (Ballynakill) is located north of the motorway while the other clusters are located to the south of the motorway. The area is generally not served by national roads but rather by a network of regional roads and local roads. The regional roads serving the area include the R146 (old N4 west of Enfield), the R402 (section from Enfield to Carbury), the R403 (section from Carbury through Derrinturn towards Allenwood) and the R414 (section from Allenwood towards Rathangan).

Two potential high voltage cable routes are considered in this EIS. The existing roads environment along HV cable route Option 1 (from the proposed Drehid Substation to Woodland County Meath) consists of both local roads and some regional roads. HV cable route Option 2 follows the route of local roads from the proposed Drehid Substation to the existing substation in Maynooth. Only one option will be constructed.

4.10 Archaeology, Architectural and Cultural Heritage

The proposed development is sited within the easternmost extent of the Bog of Allen with the exception of the northernmost Ballynakill cluster, which is located in low-lying lands between the Rivers Boyne and Blackwater.

There are approximately 114 protected structures and 282 recorded archaeological monuments (RMP sites) and complexes within a 3km radius of the proposed development. There are two archaeological sites that are considered national monuments within a 5km radius i.e. Carbury Hill and Lullymore Monastic Complex and three castle sites in Donore in Co. Meath to the north, Grange West and Carrick Castle to the west. Significant accessible sites in the wider landscape in hilltop locations within 30km include; Croghan Hill Complex, Co Offaly; Trim Castle, Co Meath; Hill of Ward (Tlachta), Co Meath; Kildare Round Tower, Co Kildare and the Rock of Dunamase, Co Laois.

There are two UNESCO candidate world heritage sites within a 30km radius. These are the Tara Complex (located c.25km northeast in County Meath) and Dún Ailinne (located c.17km to the southwest).

Archaeological monitoring and surveying of Bord na Mona activity in the bogs that lie in the study area has shown that the now mostly forested bogs where some of turbines are proposed have the potential to previously unrecorded archaeological features.

Historically there have been substantial changes to the landscape within which the turbines are proposed. For example in the eighteenth century the Royal and Grand canals brought with them infrastructure such as bridges, locks, forges and accompanying bogland drainage which made the bogland accessible. In the nineteenth century the advent of the railway, and subsequent extensive extraction of the midland bogs by Bord na Mona brought with it industrial structures and associated development of settlement. All these factors have contributed to change within the character of this landscape over time and have formed the modern day landscape of Kildare.

Alteration to this landscape continues with the expansion of commuter belt settlements from the large towns and Dublin city and by the development of afforestation, quarrying and improvement of the road network and the development of industries in the area.

4.11 Landscape and Visual

4.11.1 Landscape Baseline

The landscape baseline represents the existing landscape context and is the scenario against which any changes to the landscape brought about by the proposal will be assessed. This also includes reference to any relevant landscape character appraisals and the current landscape policy context.

The landscape of the study area is predominantly flat to mildly undulating with occasional isolated hills and crests of low hills scattered throughout. The foothills of the Wicklow Mountains emerge in the south-eastern extents of the study area and along with the foothills of the Slieve Bloom Mountains to the south-west, these provide the only noticeable sense of containment.

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 wind energy proposal are principally contained within these flat peatland and wet farmland areas.

A Landscape Character Assessment was prepared for County Kildare in 2004 and is incorporated into the current Development Plan as Appendix 3. Landscape policy is dealt with in Chapter 14 of the main document entitled Landscape, Recreation and Amenities. There are considered to be four major landscape character types; Uplands; Lowland Plains and Boglands; Transitional Lands; and, River Valleys and Water Corridors.

Fifteen geographically distinct landscape character areas are derived from the main landscape character types. All of the proposed turbines (except the two in Meath) are spread between two of these, which include the 'North-western Lowlands' and the 'Western Boglands'. The 'Grand Canal', 'Northern Hills' and 'Chair of Kildare' hills are each considered to be a distinct landscape character area in their own right and, as described above, there are proposed turbines in relatively close proximity to each of these Landscape Character Areas.

The Meath County Development Plan also incorporates a Landscape Character Assessment which indicates the two turbines within the Ballynakill cluster (turbines T1 and T2) are fully contained within the 'Lowland Areas' and 'Central Lowlands'. This area is described as having a low potential to accommodate wind farms but a medium potential to accommodate underground services.

4.11.2 Visual Baseline

Whilst a 20km radius study area is recommended for the purposes of the landscape and visual assessment by the Wind Energy Development Guidelines (2006), a 30km radius study area has been used in this instance in the interests of thoroughness. The visual baseline for this wind farm proposal establishes both the nature of visibility within the study area and the important receptor locations from which the development might be viewed.

Zone of Theoretical Visibility (ZTV) maps provide the basic form of computer generated mapping that determine which parts of the landscape within a given study area will have a potential view of a development, but not accounting for screening by the likes of vegetation or buildings. In simple terms, preparing a ZTV map is like placing a can of spray paint at the top of each turbine. Whatever parts of the 'naked' (without vegetation) landscape get painted, have a potential view of that turbine. In this instance, given the lowland context of the proposed wind farm and the vegetation patterns in this area, further analysis of the nature of visibility was considered necessary.

In this instance determining the nature of visibility relied on the use of a sequence of both traditional and advanced forms of mapping and analysis. These included:

1. Zone of Theoretical Visibility (ZTV) mapping
2. Theoretical Visual Intensity (TVI) mapping
3. Route Screening Analysis (RSA)
4. Canal Screening Analysis.

Even though the computer generated ZTV map indicates relatively comprehensive visibility of turbines from throughout the study area, the Route Screening Analysis showed a much lower degree of visibility would occur in reality. It also shows that there will rarely be views of more than 10 turbines at once. Instead it will be much more common to have views of less than 5 turbines from within the central study area.

64 no. viewpoints were selected to represent the range of viewers and viewing locations within the study area. 26 no. of these are designated scenic views from the various counties contained within the study area, but with the majority from Kildare and Meath. Overall, views within the study area tend to be of two types. They are either broad elevated views from hilltops over a lowland rural landscape, or they are strongly contained views from within that lowland rural landscape. Photomontages depicting the proposed development within the view from each of the 64 no. viewpoints can be seen in Volume 4 of the EIS.

4.12 Telecommunications and Aviation

4.12.1 Telecommunications & Television

The rotating blades of a wind turbine can occasionally cause interference to forms of electro-magnetically communications including:

- Satellite
- RADAR
- Cellular radio
- Aircraft instrument landing systems
- Air traffic control
- Terrestrial microwave links
- Television broadcasts.

In addition, it is possible that houses in the immediate vicinity of the turbines could require some remedial measures in relation to television reception.

A data gathering exercise was carried out to establish the locations of all known telecommunications services in the vicinity of the wind farm. The following organisations have provided information regarding existing telecommunications links in the area:

- RTÉ
- Meteor Mobile Communications Ltd. (Mosaic)
- O₂ Ireland (Mosaic)
- Vodafone (Netshare)
- Three (Netshare)
- BT Communications Irelands Ltd
- Irish Broadband/Imagine
- Eircom
- UPC Ireland Ltd
- Ripplecom
- ESB Telecoms
- TowerCom Ltd
- Aptus Broad Band

4.12.2 Aviation

Any application for wind turbines or obstacle development requires the potential impact on civilian and military aviation operations and air safeguarding near the proposed sites to be considered. With respect to the proposed Maighne Wind Farm development, the five proposed wind farm clusters are all located within what is referred to as Class G uncontrolled airspace. Within Class G airspace, any aircraft can enter and transit the airspace without Air Traffic Control (ATC) clearance and are subject only to a small set of mandatory rules. In addition, a number of the clusters are located beneath Class C Controlled Airspace of the Dublin Control Area, however the Irish Aviation Authority (IAA) has not raised any concerns relating to the development of the Maighne Wind Farm clusters nor the developments closer to the Dublin Control Area. Lastly the proposed clusters are located within a Military Operating Area and beneath a Restricted Area. Civil aircraft can operate within the Military Operating Area without requiring ATC permission and are unrestricted, up to 4,500 feet. The Restricted Area, when active on weekdays between notified times, is restricted for use by Military aircraft, however entry by civilian aircraft within these periods is possible, with prior permission from Air Traffic Control at Casement Aerodrome.

5 THE MAIN IMPACTS OF THE DEVELOPMENT & THEIR MITIGATION

5.1 Air and Climate Change

The principal sources of air emissions will be limited to the construction phase of the proposed wind farm. These will include dust emissions arising from activities such as soil stripping and earthmoving, trench excavation along cable routes, construction of the new access tracks, excavation and backfill of borrow pits, and the movement of material around the site. It is not possible to eliminate the emission of dust from a construction site entirely, nevertheless a number of effective control measures will be implemented which will substantially reduce the impact on neighbouring residents, businesses and surrounding land uses.

Emissions of compounds such as nitrogen dioxide, particulates and carbon monoxide will be generated from construction vehicles and plant and machinery such as generators, excavators etc. required at various stages of the construction works. Plant and machinery 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 from these emissions will be negligible. Similarly, an assessment of emissions from construction vehicles indicates that their impact too is negligible.

Once the proposed wind farm development is operational there will be no significant direct emissions to atmosphere. While a diesel generator will be located at the substation, this will only be operated as a back-up/emergency electricity supply.

From an operational perspective, the proposed development will have positive impacts on both air quality and climate change. The displacement of emissions of greenhouse gases from other less clean forms of energy generation, will not only assist Ireland in meeting its renewable energy targets and obligations but also indirectly assist in the battle against climate change. For example, it is estimated that a potential output of 125MW for Maighne Wind Farm development will result in the net displacement of 190,000 tonnes of carbon dioxide per annum.

5.2 Noise and Vibration

An assessment of the noise impact of the development has been carried out to consider its construction, operation and de-commissioning including the proposed sub-station.

Appropriate criteria for the assessment of construction/decommissioning noise, operational noise from the turbines and operational noise from the substation have been taken from published guidance and used to inform the assessment process.

Measurements of existing baseline noise level have been carried around the site and used to inform the operational noise limits at affected properties.

It is identified that only access track construction and activities at proposed borrow pits will have the potential to result in construction noise impact above the relevant noise criterion level. The impact of access track construction will be of relatively short duration, as far as it affects on any specific property, so only the activity at the proposed borrow pits was considered further. The output from the appraisal indicated that given that the borrow pits are located at least 120 metres from residential properties, there will no exceedance of relevant noise level criteria.

Predictions of operational noise have been carried out for a candidate turbine, in line with good practice recommendations published by the UK Institute of Acoustics. The results of this appraisal were compared with the derived noise limits, with exceedances found for some properties. These identified turbines will, however, be operated in various noise reduced modes wherein they are operated at reduced rotational speed, and hence with reduced power output, to give lower noise output when required.

The proposed substation at Drehid has the potential to give rise to noise emissions. However the appraisal conducted as part of this EIS indicates that during typical operational conditions, noise levels at the nearest residential locations are not considered to be significant.

Specific mitigation for construction and decommissioning activities will consist of restricting working hours and deliveries, consultation with the local community and the implementation of a construction environmental management plan. Specific mitigation for operational noise will depend on the final turbine model chosen for installation at the site and the best way of achieving the noise limits with least effect on energy generation. Nonetheless the relevant noise limits will not be exceeded.

Residual impacts for both construction/decommissioning noise and operational noise will be the audibility of both at levels which will depend on activity on site (in the case of construction/decommissioning), wind speed (in the case of operational noise) and wind direction.

5.3 Ecology

An appraisal of the possible impacts on ecology was carried out using information collected from initial desk studies, in addition to data collected over 2 years of field surveys. A number of measures were undertaken to avoid impacts on specific habitats, species or designated sites by way of avoidance through design. This included minimising the hardstand area of the development so as to reduce land take of habitats, the direct avoidance of sites protected under EU directives, the placement of cabling underground (a significant avoidance measure as overground cabling would increase collision risk to birds) and the utilisation of buffers along waterways, where possible, to avoid impacts on aquatic habitats.

Examples of cluster specific mitigation through avoidance include the removal of turbines from the proposed Derrybrennan cluster to avoid impacts on breeding Lapwing and Marsh Fritillary (a species of butterfly) habitat nearby, the re-alignment of a road at Ballynakill to avoid impacts on a Sand Martin colony, and the movement both of a turbine and the location of the substation at Drehid-Hortland so as to avoid impacts on active raised bog nearby. A Project Ecologist will be appointed to oversee all works and the implementation of mitigation measures during construction, operational and decommissioning phases.

No direct impacts are predicted on designated nature conservation sites such as SPA's and SAC's. The potential does exist for indirect impacts via impacts on water quality. This is primarily related to increased run off and the risk of silt laden waters affecting habitat quality downstream of the proposed development. This would have a knock on effect on aquatic species such as Salmon and Otter which often form the main conservation interest for these sites. These effects will be mitigated by the implementation of the measures outlined in Chapter 7 Ecology, Chapter 9 Hydrology, Chapter 10 Water Quality and in the accompanying Natura Impact Statement. The implementation of these measures will result in no significant effects on the integrity of the designated sites within 15km of the proposed development.

Direct impacts may possibly occur on two NHA's, namely the canals found within the proposed development area. This is as a result of bridge modifications possibly being required at a canal bridge at Derrybrennan, but also the cable crossing of a canal along the proposed cable route. Possible impacts due to the underground crossings of canals will be mitigated by the implementation of a contingency plan, as outlined in this EIS.

Impacts on habitats are mainly those due to land take during the construction of the proposed windfarm. This is primarily land take for the hardstand areas of the turbines and associated access tracks themselves but also the removal of trees for turbine locations in forestry and the removal of small areas of hedgerows to accommodate access tracks. Indirect impacts may also occur such as a reduction in habitat quality as a result of increased drainage or changes in water quality supporting those habitats. Impacts on water quality will be mitigated through the provision of silt fencing and other measures as outlined in the hydrology and water quality chapter.

The most likely potential impact on receiving watercourses and aquatic habitats arises indirectly via impacts affecting water quality, such as accidental releases of silt laden runoff, as a result of accidental spillage of cement or hydrocarbons stored on site impacting upon water quality, or from effluent spillages from welfare facilities within the temporary construction compounds. In general the proposed wind farm may impact on watercourses through the alteration of drains, silt run-off and pollution events. These could impact on fish and fisheries as well as other aquatic animals. A general summary of the mitigation measures to mitigate and avoid impacts on watercourses are outlined in Sections 5.5 and 5.6 of this non-technical summary.

Direct impacts on populations of butterflies such as Marsh Fritillary are not predicted.

Impacts on birds include disturbance to birds during the construction of the proposed wind farm. There is evidence that some species such as Snipe may be significantly affected by disturbance during their breeding season, however disturbance to most species should result in minimal effects. The timing of works is also important as disturbance to species may be dependent on the season within which they occur typically at the site. Collision risk to birds has been assessed and in most cases is of low significance given the predicted height of the appraised rotor envelope (50-170m). Barrier effect, which is when a wind farm acts as a barrier to either daily commutes of birds or larger scale migratory movements, has also been assessed in particular in relation to species such as Whooper Swan with no significant effects. No barrier effect is predicted for species such as Hen Harrier, which have winter roosts in the vicinity of the proposed development, and the wind farm is unlikely to act as a barrier to those species which habitually fly at heights lower than the predicted rotor envelope. Cumulative impacts on birds have been assessed and no significant impacts are predicted when the proposed development is combined with other known developments in the area. The general orientation of the clusters and distances between individual turbines should avoid significant energy expenditure to migrating birds.

Tree removal and clearance of any other vegetation likely to hold high numbers of nesting birds will take place outside of the bird breeding season *i.e.* not during the period of March to August inclusive where possible. This includes hedgerow and scrub removal in addition to hedgerow trimming along turbine delivery routes and proposed cable routes. This will help protect nesting birds.

Construction operations will take place during the hours of daylight to minimise disturbances to roosting birds, or active nocturnal bird species. This in line with best practice recommendations for mitigation measures in regard to birds and wind farms. Limited operations such as concrete pours and turbine erection may require night time operating hours; these will be supervised by the project ecologist.

Toolbox talks will take place with construction staff on disturbance to key species of birds during construction. This will help minimise disturbance.

In relation to breeding Lapwing all turbine locations in suitable breeding habitat will be surveyed for breeding Lapwing prior to construction. Should any be present at exact turbine locations, then no works shall be undertaken during the period April-June to allow breeding to progress.

Due to published impacts during construction on breeding Snipe the following restrictions shall apply; areas known to have had breeding Snipe territories will be re-surveyed prior to the commencement of construction. An exclusion zone of 500m shall be placed around recorded nest sites April to June, to reduce the possibility of disturbing birds during critical periods of the breeding season.

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 complied with.

Measures will be implemented to ensure invasive species are not introduced into the site, this includes wheel washes and measures recommended by the National Roads Authority.

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) at Drehid-Hortland. Additional compensatory nest boxes shall be provided at Derrybrennan in the event construction works disturb breeding Kestrel.

A comprehensive bird fatality monitoring programme will be undertaken, in line with published guidance on best practice in the implementation of mitigation measures for birds. Breeding wader surveys shall also be continued during the operational phase of the development as well as flight activity surveys to monitor interaction with the wind farm.

Bird diverters will be placed on the proposed met mast to avoid collision impacts.

Potential impacts on mammals such as Pine Marten, Red Squirrel, Red Fox and Irish Hare are mainly habitat loss related, due to land take during construction. This may result in effective habitat loss for these species. No Badger setts were located which will be disturbed during the planned construction however re-survey may be required to ensure that animals have not moved into turbine locations in the interim period since initial survey. Otters may be directly impacted due to the construction of bridges and river crossings should they cause disturbance at a breeding location (called a holt). No holts were located during surveys carried out either within the proposed turbine areas or along the proposed cable routes.

Road widening during construction will involve tree and hedgerow removal which may affect bats. Existing bridges and culverts which may be in use by bats may also require strengthening to cope with increased loads during turbine delivery or works to facilitate cable placement. New onsite haul roads will also need to be constructed resulting in the loss of vegetation which may be in use as flight path features by bats. Onsite human construction activity may also cause disturbance to these animals. During operation it is possible that Bat mortality may occur especially on higher flying species such as Leisler's Bats.

Bats commuting and foraging along onsite forest edge, treelines and hedgerows will be safeguarded by providing a 50m minimum distance buffer zone between the rotors of the planned turbines and the nearest vegetation to reduce the risk of collision and/or barotrauma. This will be maintained during the operational life of the proposed windfarm. Any mature trees, scheduled to be removed will be surveyed first by a suitably experienced bat specialist. Trees not located immediately adjacent to the line of proposed haul roads and access tracks which may be suitable for Bats will be retained.

Should any further structures be impacted by changes to the current proposed cable routes then these will be assessed for their potential to harbour bats prior to works and the findings reported. If bat use is confirmed, appropriate mitigation measures will be taken to ensure no animals are harmed. Severed linear features such as hedgerows and treelines will, where possible, be reconnected using semi-mature trees under-planted with hedgerow species to compensate for the loss of treelines and hedgerows that are currently used by bats. During operation a comprehensive bat fatality monitoring programme will be undertaken and the success of the mitigation measures monitored for a period of 3 years.

5.4 Soils and Geology

An appraisal of the proposed impacts on soils and geology (bedrock) was carried out using information collected from a desk study, site walkover and preliminary ground investigation. Ground investigations included the digging of trial pits, peat probing and in-situ testing.

The potential impacts on soils and bedrock during the construction phase are associated with activities such as the excavations and/or piling of turbine foundations, construction and upgrading of new access tracks, temporary storage, handling and transporting of soils and materials, tree felling and the excavation and backfill of the three on-site borrow pits. Such activities may result in mobilisation of existing/introduction of contaminants in the ground and may increase the extent or the degree of contamination in surrounding ground. In addition, where soils are disturbed, excavated, and/or stored during construction, they are prone to erosion by surface water runoff (mainly rainfall) which can lead to sediment laden runoff discharging to existing watercourses or existing road drainage systems.

Construction activities on areas of deep peat on unstable ground have the potential to cause slope failure resulting in loss of ground, erosion and possible injury or damage to property. A peat stability assessment was undertaken for the Windmill, Cloncumber and Drehid-Hortland clusters where the thickness of peat was greater than 0.5m deep in places. This concluded that the risks of slope instability resulting from the construction of the wind farm at these locations are low. During construction, detailed design best practice will be implemented which includes design, checking and monitoring by experienced geotechnical engineers.

One of the primary mitigation measures employed at the preliminary design stage is the minimisation of volumes of soil excavation and lengths of track and trench construction. For instance the proposed turbine locations have been carefully selected in order to minimise the length of new access tracks.

In addition, a number of best practice mitigation measures will be implemented which will result in negligible construction residual impacts on the soils and geology. Such measures include, the refuelling of vehicles and plant at the temporary construction compounds on hardstanding areas; the storage of liquids and fuels in accordance with standard requirements so as to not give rise to any environmental pollution; the removal of any contaminated material encountered off-site by a permitted waste contractor to an appropriate facility for treatment and/or disposal in agreement with the local authority; the temporary storage of topsoil within each landholding to prevent the spread of soil borne disease.

Surplus soil or rock excavated during the course of the works will be temporarily stored and covered in a level area and will be either used for reinstatement of the borrow pits or will be re-used on site in the form of landscaping within each cluster. These areas will generally be allowed to re-vegetate naturally.

5.5 Hydrology

The preliminary design of the proposed development has avoided a number of potential impacts from the outset. This includes the siting of all proposed temporary site compounds, borrow pits and new access tracks a minimum of 50m from rivers/streams. In addition, the drainage system for the existing tracks and roads will largely be retained, reducing the construction impacts in these areas.

During the construction phase, activities such as soil stripping, excavations and the temporary storage of material, have the potential to result in increased surface water run-off and sediment loading which could potentially impact local drainage patterns, cause siltation of the existing drainage network and result in localised flooding. In addition, tree felling, along with the construction of new site access tracks, turbine hardstands and other new hard surfaces will result in a minor increase in rainfall run-off from the proposed development. These minor increases will reduce however over time as vegetation is re-established on the site.

There will be eight new stream crossings required as a result of the development, in addition to four existing stream crossings.

A flood risk assessment was undertaken to examine the potential impact of an increase in flooding risk at downstream structures, arising from the increase in rainfall runoff from the proposed development as well as any impact on flood flow from the new stream crossings and the replacement bridge structure. Potential cumulative impacts from neighbouring windfarms and adjacent developments were also assessed. This assessment concluded that the proposed development will have a minimal impact on flooding risk in the surrounding area and therefore the increased risk of flooding as a result of the proposed development is negligible.

To ensure that run-off from the proposed development is managed in an appropriate and sustainable manner, the downstream conditions were first examined to determine what drainage treatment would be required within each cluster.

The operation of the drainage regime will be monitored throughout the construction and operation phases of the proposed development and following the implementation of mitigation measures the operation and maintenance activities of the wind farm will not have a significant effect on the receiving watercourses.

Following the implementation of the proposed drainage design and corresponding mitigation measures, the residual impact on sensitive downstream ecological sites as well as receiving watercourses will be negligible.

5.6 Water Quality

There is the potential for contaminated surface water run-off to arise during the construction phase, particularly in the areas of open excavation close to rivers/streams or drains where uncontrolled silt laden water has the potential to be discharged. Other potential construction impacts on water quality include the storage and disposal of any waste materials arising from construction/excavation activities; run-off from temporary stockpiled soil heaps as well as open cable trenches, tree felling; inadequate controls at refuelling and storage locations as well as inadequate management of foul wastewater in the temporary compounds.

Areas of the Drehid-Hortland cluster are located within the 'inner zone' of the Johnstown Well Field which is designated as a source protection zone. Although this proposed water supply has never been developed, consideration was given in this appraisal to any potential impacts that may arise from the location of underground cabling, access tracks and turbines (turbine T45 is in the inner zone) in this area. Avoidance of impacts by design of infrastructure in this area has been achieved through the following:

- The cable trenches in this area will be backfilled with a cement bound material which will ensure that no potential pathways to groundwater are created
- A permanent sheet pile wall, which will act as a barrier for any potential groundwater pollutants, will be installed prior to the concrete foundation construction for turbine T45 as it is located within the inner protection zone and turbine T44 which lies just outside the inner zone. Any run-off that accumulates in the excavation area will be pumped to holding tanks and tested prior to discharge under licence from Kildare County Council.

Similarly, avoidance by design has also been achieved through the establishment of a buffer zone of at least 50m from watercourses to proposed infrastructure such as turbines, new access tracks, the on-site electricity substation at Drehid, the borrow pits and site compounds.

A number of other best practice measures will be implemented to mitigate any potential impacts on water quality across the wider development. These include the use of trenchless techniques to cross a number of the rivers/streams which means that the potential environmental impact is either greatly reduced or removed altogether at these locations. Trenchless techniques allow the installation of the cable below the ground (and below the bed of the river/stream) with minimal excavation.

The control of run-off during the construction phase will be achieved through the installation of a sustainable drainage system in vulnerable areas which will manage run-off flows and contaminants. The delivery of backfill material for trenches on the public road will be on an as needed basis which will eliminate the requirement for stockpiling such material. Similarly, excavated soil from trenches will be removed directly onto awaiting trucks and removed by an authorised contractor for recovery/disposal at an appropriate facility (in agreement with the local authorities).

Refuelling of plant and machinery will be confined to the temporary construction compounds under appropriate controls and Portaloos and/or containerised toilets will be used to provide welfare facilities for site personnel during construction. Sanitary waste from these facilities will be removed from site via a licensed waste disposal contractor.

A suitably qualified person will be appointed by the developer to ensure the effective operation and maintenance of drainage and mitigation measures during the construction process. A daily visual inspections of drains will be conducted and any concerns will result in the halting of works. Automatic monitors (i.e. turbidity meters) will also be installed at a number of locations pre-construction (post-planning) to determine existing levels in rivers/streams. This monitoring will continue during the construction phase and in the unlikely event that an exceedance of pre-determined 'trigger levels' occurs, works will stop immediately and a response plan will be activated.

Following the implementation of these mitigation measures, it is considered that impacts of the construction phase on water quality within the study area can be mitigated, thus the construction residual impact is considered negligible.

When operational, the wind farm development will have a negligible effect on water quality as there will be no further disturbance of soils post construction or direct discharges to groundwater from the proposed development. Small quantities of oil are used in cooling the turbine transformers and these will be banded to prevent any accidental releases. Fortnightly visual inspections of onsite drains will continue during the operation period until satisfactory vegetation is established on site unless otherwise directed by the planning authority, Inland Fisheries Ireland (IFI) or Waterways Ireland.

During the decommissioning of the wind farm, activities will take place in a similar manner to the construction phase. While potential impacts on water quality will be similar to those of the construction phase, the magnitude of impact will be significantly lower owing to the nature of the works (i.e. limited excavations) and the established drainage system which will control any run-off generated.

5.7 Human Environment

5.7.1 Socio-Economics

Relevant construction impacts include temporary diversions to pedestrian/traffic flows, nuisance (such as dust and noise) and the visual impact of construction works. In terms of the effect on businesses along the proposed cable routes, the construction phase will lead to temporary pedestrian/traffic diversions. All of these impacts will be temporary given the duration of works outside or adjacent to properties.

The applicant has taken certain measures to negate or mitigate against the potential impact of turbines on property which include the following:

- Ensuring a separation distance of 500 metres between the centre of a turbine and any dwelling
- Sited the turbines in low lying areas which lessen the visual impact
- Any noise emanating from turbines will meet the levels recommended in guidelines for noise

It is noted from a literature review that the reports prepared to date suggest that the presence of wind farms does not devalue residential property.

There is the potential for a number of positive impacts to arise from the construction and operation of the proposed development.

During the construction phase, direct employment of up to 225 personnel as construction workers will be generated. Indirect positive impacts to the local economy from income spent by construction and operations workers in the local area will also result.

During the operation of the proposed development there will be potential for 25 direct and 25 indirect long term jobs. Similarly rates in the region of €800k to €1m per annum for the proposed wind farm will contribute significant funds to Kildare and Meath County Councils to improve services, facilities and infrastructure in the general area which will benefit people living in the area. Alternatively, this revenue may provide the local authorities scope to reduce rates for local businesses and/or property taxes for local residents.

If Maighne Wind Farm is granted permission the developer is proposing a community benefit programme which will provide direct benefits to the wider community in a tangible way. The scheme will see more than €3.5 million spent on local projects and initiatives over the lifetime of the project. These include community projects, grants for third level education and local enterprise supports.

In addition to this, the developer is proposing a "Near Neighbour Fund" which would see grants made available of up to €5,000 payable to all owner occupied homes located within one kilometre of a permitted wind turbine. This maximum amount of €5,000 can be used directly for one of two options: Option A to contribute towards electricity bills or Option B to contribute towards grants for greener homes, such as improved insulation, windows and doors, heating systems, smart metering and controls, water harvesting and recycling, resulting in direct heating or water charge savings, reducing greenhouse gas emissions and/ or home security systems. The grant approval for the participating homes lasts until all monies to the value of €5,000 have been drawn down for Option A or Option B. This initiative alone will see more than €2 million contributed directly to homes within 1km of a permitted turbine and is considered to be a significant positive impact on the socio-economic environment.

5.7.2 Land Use

The potential impact on land use within each of the clusters will be insignificant, with less than 1% of the proposed development area required for permanent infrastructure.

The proposed cable routes will be progressed in a sequential manner, with separate crews laying sections of the cables, the land take will be restricted to the fenced off working area. In all instances the minimum amount of land necessary will be taken and provisions will be made for redirecting traffic.

Upon completion of the construction phase and permanent re-instatement of the cable trenches to pre-construction condition or as agreed alternatively with the relevant local authority for sections in the road, the resultant impacts on land use will be negligible. During the operation of the proposed development, potential impacts on land use from the cables will be limited to the unlikely event of damage to the cables which would require localised excavation.

The risk of third party interference, however, with the cable is minimised as the cable routes (outside of the clusters) have been selected to pass through areas of high regulation which require a road opening licence which will control third party interference. In addition a marker tape will be placed above the cable and a concrete based backfill will be used in the trenches.

5.7.3 Recreation, Amenity and Tourism

The proposed development is not expected to have any significant impacts on recreation, amenity or tourism in the surrounding area. While two of the turbine clusters (Ballynakill and Cloncumber) run parallel and in close proximity (<500m) to the Royal Canal and Barrow Branch of the Grand Canal respectively, and the turbines will be visible from sections of the canals, this visual impact is not deemed significant.

5.7.4 The Bloodstock Industry

While there is no published scientific research specifically relating to the impact of the operation of turbines on horses there has been research into the effect of noise on horses. In 2014, Marshall Day Acoustics published *Summary of Research of Noise Effects on Animals*² which assesses specifically the impacts that varying levels of noise have on horses in three differing potential behavioural settings namely:

- Horses in stables
- Breeding mares
- Race Horses

Having assessed this existing scientific research there is no evidence to suggest that the wind farm will have a significant impact during the operational phase of the wind farm.

Day-to-day updates of construction activities, when occurring near to those facilities located closest to the turbines (equestrian facilities within 1km) will be provided to the operators of these facilities. This will include highlighting any potential activities that could lead to startling of horses in close vicinity of construction works. In addition, the developer will engage the services of an equine expert who can advise on other recommended measures during the construction period to ensure that horses will not be affected by the construction activities.

5.7.5 Health and Safety

Wind Farm Construction

The wind farm will be designed, constructed and decommissioned in accordance with the all relevant health and safety legislation and guidelines.

Wind Farm Operations

It is not anticipated that the workings of the turbines will present a danger to the public. The wind farm is designed to last a minimum of 30 years and the turbines are equipped with a number of safety devices to ensure safe operation during their lifetime. In addition, the rigorous statutory and engineering safety checks imposed on the turbines during design, construction, commissioning and operation will ensure the risks posed to humans are negligible. 24-hour remote monitoring and fault notifications are included as standard in the Turbine Operations and Maintenance Contracts. In addition to scheduled maintenance, the maintenance contracts will allow for call out of local engineers to resolve any issues as soon as they are picked up on the remote monitoring system.

Under normal conditions, access to the site and turbines is very safe for people and animals and livestock can continue to graze on the land during operation as normal.

Proposed Substation and Cables

Extremely low frequency (ELF) electric and magnetic fields (EMF) surround all things that:

- Generate (e.g. generators)
- Transmit (e.g., Substations, power lines and wiring)
- Use electricity (e.g., appliances and other devices).

The potential impact from the underground cables connecting the turbines to the proposed electricity substation and from the wind farm to the national grid connection point was therefore appraised. This found that:

"the current scientific consensus, as expressed most recently by the World Health Organization (WHO), is that research does not suggest that ELF-EMF causes any health effects at the levels typically encountered in our environments. No exposure limits have been recommended or steps to reduce our exposures".

² [http://www.epa.govt.nz/resource-management/NSP000033/NSP000033_BoD_Volume_4_31_Siiri_Wilkening_\(10_March_2014\)_Summary_of_research_of_noise_effects_on_animals.pdf](http://www.epa.govt.nz/resource-management/NSP000033/NSP000033_BoD_Volume_4_31_Siiri_Wilkening_(10_March_2014)_Summary_of_research_of_noise_effects_on_animals.pdf)

And furthermore:

“The electric and magnetic fields expected to be associated with the operation of the proposed cables fully comply with the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and European Union (EU) guidelines on exposure of the general public to ELF-EMF”.

5.7.6 Material Assets

Non-renewable Resources

The wind farm will have a permanent impact on aggregate resources owing to the construction of three borrow pits with the wind farm site. Aggregates will also be required for the backfilling of cable trenches within the road.

Existing tracks have been used as much as possible and the layout was designed to minimise the length of new track in order to reduce the requirement for such material.

Renewable Resources

This proposed development is intended to capture the renewable wind resource at the site.

Utilities Infrastructure

It is proposed to undertake slit trenching as part of the construction works which will identify existing services along the proposed cable routes. This will minimise the impact in terms of disruption or damage to existing utilities. It is not intended to divert existing services but instead where possible the cable will be laid above or below existing services. Communication with the services providers will be maintained for the duration of the construction works.

5.8 Shadow Flicker

In times of direct sunshine, wind turbine blades could occasionally cast moving shadows on residences in close proximity to the turbines. At certain times of the year, the moving shadows of the turbine blades can periodically reduce light to a room causing the light to appear to flicker. This would not generally have any effect on health or safety, but could on limited occasions present a brief nuisance effect for some neighbours if not controlled.

For shadow flicker to occur at a dwelling certain conditions must exist concurrently:

- There is sufficient sunlight to cast shadows i.e. no significant fog, mist or cloud cover
- The turbine is directly between the sun and the dwelling
- The dwelling has a window facing in the direction of the wind turbine
- There is sufficient wind speed that the turbines are operating
- The dwelling has a direct view of the turbine i.e. no screening (trees, hedges, etc.) or no obscuring features around the receivers which would minimise views of the development, and hence reduce or eliminate the potential for shadow flicker.

All five conditions outlined above must exist simultaneously for shadow flicker to occur at a dwelling. Shadow flicker does not generally have any effect on health or safety, but could on limited occasions present a brief nuisance effect for some neighbours.

Section 5.12 of the Department of the Environment, Heritage and Local Government Planning Guidelines on Wind Energy Developments (2006)⁹ recommends that shadow flicker at any dwellings or offices within 500m of turbines should not exceed 30 hours per year or 30 minutes per day. The Irish Wind Energy Association “Best Practice Guidelines for the Irish Wind Energy Industry” (2012) recommends that shadow flicker modelling be conducted for dwellings within ten rotor diameters of the nearest proposed wind turbine. A total of 994 buildings are located within ten rotor diameters of a proposed turbine and all of these buildings are included in the shadow flicker assessment.

While the results of this conservative (given that it is assumed that all five factors occur concurrently) assessment indicate that there is the potential for the annual shadow flicker guideline limit to be exceeded at 42 buildings, however specific turbine design measures will ensure that these exceedances do not occur through the automatic shutdown of turbines for the duration of the period of time during which shadow flicker conditions occur, so as to ensure that the guideline limits are not breached at any building.

5.9 Traffic and Transportation

During the c. 23 month construction stage, the proposed development will lead to a temporary increase in the amount of traffic on the road network in the vicinity of the proposed development including both light goods vehicles (LGV) and heavy goods vehicles (HGVs). This additional traffic will generally be confined to the indicative haul route presented in the main EIS which includes both local and regional roads. The delivery of the wind turbine components will require specialist haulage and the haulage of these larger components may occur (under supervision) at night in order to minimise the impact on regular road users.

The construction of both the MV and HV cable routes will involve the installation of underground ducting along the existing road network. These works will lead to temporary lane closures and temporary road closures and diversions while the works are being carried out.

During the operational stage of the proposed development, there will be very little impact on the existing road network as the development will not generate significant levels of traffic. The impacts associated with the decommissioning phase of the project will be less significant than the construction stage as some of the infrastructure may remain in place e.g. access roads and turbine foundations.

Various mitigation measures are outlined in the main EIS and these include details of how mitigation was applied during the design phase in respect of delivery routes and cable route selection. This has included taking some sections of the cable off-road. Other mitigation measures will be implemented prior to and during the construction phase including the requirement to prepare a detailed traffic management plan (TMP) which will be agreed with the roads authority and An Garda Síochána. A traffic management coordinator will be appointed in addition to other measures such as letter drops, a 24 hour emergency phone number, road pre-condition surveys, wheel washing facilities and clear signage. Cable trenches will be reinstated without delay and local roads along which the cable routes will travel will be resurfaced subject to agreement with the roads authority.

Notwithstanding the mitigation measures outlined in the EIS, the construction works will lead to a residual impact on the road network and its users. However, the construction stage impacts will be temporary and no long term impacts will result from the proposed wind farm development during the operational stage.

5.10 Archaeology, Architectural and Cultural Heritage

The modern landscape of north County Kildare is the result of processes of change and modifications over the millennia. The landscape within which the proposed Maighne Wind Farm development will be placed is generally low-lying agricultural land with a vast central area of cutover bogland. This landscape, whilst changed, contains historical and archaeological sites spanning some six-thousand years of human settlement and activity, the earliest of sites being found deep within the bogs which have been extensively milled.

The expansion and development of transport networks in the form of eighteenth century canals and nineteenth century rail links to modern motorways and link roads lead to the initial increase in dispersed settlement patterns in a landscape that may have otherwise not been accessible. The receiving cultural heritage landscape that surrounds the proposed Maighne Wind Farm has also been altered over time through the exploitation of the Bog of Allen since the 1950's. The general character is represented by modern activity such as the industrialised peat extraction of the large bogs of Timahoe and Derrybrennan/Lullymore initially, large scale afforestation, quarrying and the establishment of industrial and waste management facilities.

The Maighne Wind Farm will have no direct impacts on any UNESCO World Heritage sites, candidate World Heritage sites or on any National Monuments. Similarly there will be no direct physical impacts on the immediate curtilage or attendant grounds of protected structures, NIAH sites or features, NIAH garden survey sites or on Architectural Conservation Areas.

In summary the potential direct impacts arising from the construction and operation of the proposed development include:

- Turbine T33 will have a direct impact on the environs and immediate setting of ringfort site (RMP KD017-004) in Cloncumber townland, the ringfort itself however will not be impacted.
- The MV cable (and also the access road) between the Derrybrennan and Cloncumber clusters will run along the edge of Lullymore Bog at Lullymore West, before joining the regional road , R414. It will cross through the 'site of' a recorded road/gravel trackway in Lullymore West (RMP KD012-016).
- The proposed HV cable route to the existing Maynooth substation has the potential to impact on the environs of Taghadoe monastic site and round tower (RMP KD010-014001/005), a National Monument. The existing road (L5037) forms part of what would have been the enclosure of the site.

The level of excavation and ground disturbance for wind farms is limited when compared to other developments and the opportunity to reveal buried remains is somewhat reduced. As some of the proposed turbines lie in close proximity to potential sites and recorded monuments archaeological testing will take place in the vicinity of Turbines T6 (in Ballynakill), T47 (in Drehid-Hortland), T33 and T35 (in Cloncumber) and their access tracks/cables in advance of construction if planning permission is granted. Turbines T24, T25 and T26 (and their access tracks/cables) in the Windmill cluster will be tested, as archaeological features may survive in the bog at depths below the industrial milling that has occurred across the site. Testing will also be carried out a the line of the MV cable in the vicinity of the recorded road/gravel trackway in Lullymore West (south of the Derrybrennan cluster) and the HV cable route to Maynooth along the existing L5037 road in the vicinity of Taghadoe monastic site. All archaeological works will take place under licence to the Department of Arts Heritage and the Gaeltacht or where appropriate under ministerial consent. Should archaeological features be identified in any of these areas a suitable mitigation strategy; full excavation or preservation in situ by avoidance will be agreed with the statutory authorities.

As with any development proposed within a greenfield environment there is a potential that previously unknown below ground remains of an archaeological interest will be revealed as a result of earthmoving/excavation activity associated the development. However given the known archaeological resource and the level of alteration in this landscape through milling, afforestation, and reclamation this potential is deemed to be low, any features that might be identified are likely to be heavily disturbed or truncated. Areas of general archaeological potential have been identified in the EIS. All earthmoving works for the proposed development in these areas will be monitored under licence to the Department of Arts Heritage and the Gaeltacht. Archaeological monitoring of the HV cable and MV cable routes will also be carried out where they pass in close proximity to recorded monuments.

There will be a direct impact on two cultural heritage features. The internal access track/cable route through the Cloncumber cluster runs alongside a former nineteenth century mill race associated with Sally Mill (in Rathangan) and will have a direct impact on the feature in three locations (CH8–CH10) where it will be traversed. The Booleykeagh/Moyvally (CH5) and Ballyonan/Ballynakill (CH6) townland boundaries in the Ballynakill cluster will be crossed by the proposed internal access tracks/cable routes. These are undesignated cultural heritage features of local interest, these features will be recorded in accordance with best practice, which will include describing and photographing as part of the archaeological monitoring of earthmoving works in advance of construction.

No significant indirect impacts on the setting of archaeological, architectural or cultural heritage sites are predicted in the overall development area or in its wider environs. Indirect impacts on recorded archaeological, architectural and cultural heritage sites include a potentially moderate impact on the setting of the castle site on Carbury Hill. There will also be an indirect (visual) impact on some sites within 1km and 2km of the proposed wind farm. The visual impacts of the proposed development are discussed further in Section 5.11 of this non-technical summary.

It is considered that the cumulative impact from the development and other wind farm schemes in the wider landscape on the setting of key historic environment assets would be minimal and not significant.

5.11 Landscape and Visual

Landscape Impact Assessment (LIA) relates to changes in the physical landscape, brought about by the proposed development, which may alter its character. Visual Impact Assessment (VIA) relates to changes in the composition of views and how these are perceived by viewers.

The significance of both landscape effects and visual effects is determined on the basis of receptor sensitivity weighed against the magnitude of the impact.

5.11.1 Residual Landscape Effects

There will be physical impacts on the land cover of the site as a result of this development, but these will be relatively minor in the context of the already modified farming, forestry and peatland harvesting context and the high proportion of existing tracks that will be utilised.

In terms of effects on landscape character, the highest level of landscape impact significance is deemed to be in the mid to low range. This occurs for those landscape areas and features in the central study area that have a higher sensitivity than the typical lowland landscape that otherwise surrounds the proposal sites. These include the elevated 'Chair of Kildare Hills', the 'Northern Hills' and the canal network, which consists of the Royal Canal, the Grand Canal and the Barrow Branch.

The wider study area contains a number of high and very high sensitivity heritage landscape features. The most important of these is considered to be the Hill of Tara due to its candidate world heritage status as well as the volume of visitors it attracts. The proposal is deemed to result in a Slight-imperceptible significance of impact on the Hill of Tara, largely due to the considerable separation distance of 25km, which renders the proposal a very distant background element of the landscape setting of this heritage feature. A similar scenario occurs for the other highly sensitive landscape receptors in the outer study area as there is considered to be very limited potential for the proposed turbines to significantly influence landscape character, within an existing, anthropogenic, rural landscape context, beyond the central study area.

In respect of the landscape and wind energy policies contained within the Kildare and Meath Landscape Character Assessments, which form a part of the respective Development Plans, it is considered that the proposal is an acceptable form of development that is appropriately sited in medium and low sensitivity character units. It is also deemed to be appropriately designed in respect of the underlying broad scale land use patterns, which are most consistent with the 'Flat Peatland' and 'Hilly and Flat Farmland' landscape types in the Wind Energy Development Guidelines (2006).

Overall, it is considered that the proposed Maighne Wind Farm will not give rise to significant landscape impacts within either the central or wider study area. These will instead peak at mid to low levels within the central study area and dissipate quickly to low and imperceptible levels beyond.

5.11.2 Residual Visual Effects

Viewpoint sensitivity is considered to range widely across the study area between very high and low. Those locations at the upper end of the spectrum tend to be important heritage and tourist features that also afford vast panoramic vistas over the surrounding landscape such as the Hill of Tara, Trim Castle and the Rock of Dunamase. These tend to be located at the periphery of the study area beyond 20km of the nearest turbines. Whereas, at the lower end of the spectrum are locations that take in more typical lowland views across a more contained landscape setting that is not particularly remarkable or unique. Whilst it is acknowledged that local residents are among the most susceptible of viewers this is accounted for in the sensitivity judgements, which must also balance the value of the view on offer.

Within this study area, designated scenic views tend to be in the mid to high range in terms of sensitivity, depending on how vast the panorama is and taking account of the fact that the landscape in view is typically a productive rural one rather than a remote and naturalistic one. Aside from elevated viewpoints, other forms of designated view within the study area relate to views of elevated hills and features from within the surrounding lowland landscape and also canal views from bridges.

The magnitude of visual impacts is generally in the mid to low range due to a combination of high levels of screening, the dispersed layout of the scheme and the robust rural landscape context in view. However, there is a small proportion of views within close proximity to the larger of the proposed turbine clusters where mid to high level visual impacts are likely to occur. At these locations the nearest turbines are seen at a prominent scale within the scene and the intensity or extent of turbines is also likely to be considerable.

Only at 2 no. of the 64 no. viewpoint locations used in the appraisal are mid to high range visual impacts considered likely to occur and for slightly different reasons, albeit, they are both in close proximity to a number of turbines. This is a lower proportion of viewpoints to incur this level of impact than would typically be expected for a commercial scale wind farm appraisal, which is testimony to the robustness of the receiving visual context and the dispersed nature of the scheme.

Overall, it is not considered that the proposed wind farm will give rise to any significant visual impacts.

There is presently one existing wind farm and three permitted wind farms within the study area so wind energy development is considered to be a familiar, but not a strongly characteristic or defining feature of it. The proposed wind farm will most commonly be viewed in isolation from within the lowland context of the study area, which represents the vast majority of it. From occasional elevated vantage points within the study area, which tend to be designated as scenic views, the proposal will be commonly seen in conjunction with the permitted Yellow River Wind Farm and the existing Mount Lucas Wind Farm, which both lie to the west. Due to the considerable separation distances to these developments, there will not be any cumulative aesthetic issues arising such as turbine stacking or scale confusion. However, in some instances the skyline will be occupied by a broad array of turbines from the three schemes. This is most notable from the summit of Croghan Hill which is the most centrally located prominent viewpoint between these developments.

Overall, it is considered that the proposal will contribute to wind energy development becoming a characteristic feature of this midlands context, but it is not considered to give rise to a significant cumulative effect. Instead, this impact is deemed to be in the mid to low range.

Although the initial impression of this extensive wind energy development proposal is that a broad area of the North Kildare lowlands would be covered with tall wind turbines, which would dominate the landscape and surround its inhabitant, this landscape and visual appraisal reveals quite a different reality. That is, due to the dispersed nature of the proposal and the high degree of screening provided within the lowland landscape, this wind energy development will be perceived as a series of small to medium sized developments rather than a sprawling singular one. Rather than dominate the underlying landscape it is considered to integrate with it reflecting the organic and meandering pattern of the peatland areas that it occupies and abuts. The dispersed arrangement of the various clusters results in equally dispersed impacts. The magnitude of these impacts reflects the robustness of the receiving landscape and visual setting as well as the discretely portioned views of the scheme. Only from occasional elevated vantage points that rise out of the lowland landscape is the overall scale of the development apparent. The most sensitive of these locations are contained at significant distances from the proposal (20km+) where it will be perceived as another element within a vast, productive landscape pattern.

5.12 Telecommunications and Aviation

5.12.1 Telecommunications

Interference to a communication system can occur in two ways as follows:

- Signal scattering as a result of the obstruction presented by the blades, an effect that mimics the presence of a lower power source operating from the location of the wind turbine
- Signal obstruction as it passes through the area swept by the rotating blade

All turbines achieve the required 250m separation distance from existing masts.

Turbines within 100m of a link have been identified for further assessment in advance of construction taking into account potential discrepancies in database information and ongoing changes to the telecommunications network. Although a turbine may be within 100m of a known link, it may not necessarily cause interference. Where an operator confirmed there may be a potential conflict, it was agreed with the operator to mitigate the impact in advance of construction. It was agreed with the operators that there are a number of mitigation options that can be explored to overcome any potential telecommunication impacts and that mitigation options may be different for each service affected, depending on the type of service and the level of any interference expected.

The proposed mitigation measures will ensure that, local telecommunications are not adversely affected by the development of Maighne Wind Farm and that remedial works will be appropriate to maintain existing levels of services at a minimum. On that basis significant residual impacts are not expected.

5.12.1 Television and Radio

It is possible that houses in the immediate vicinity of the turbines could require some remedial measures in relation to television reception and radio signal. In practice, such measures are not difficult to implement, are relatively inexpensive and if necessary will be undertaken by the developer in conjunction with 2RN (formerly RTÉ NL).

2RN was consulted during the pre-planning stage, a standard protocol agreement between the developer and 2RN has been prepared and will be signed prior to the commencement of the development.

5.12.2 Aviation

The potential effects, physical obstruction or impacts to air traffic services, on the aviation interests of the Irish Aviation Authority, the Department of Defence and Clonbullogue Aerodrome were assessed. The assessment did not identify any other potentially affected aviation stakeholders. Following consultation with the Irish Aviation Authority, no objection was raised to the development, with the Irish Aviation Authority requesting only standard notification of construction and the implementation of industry accepted aviation obstacle lighting. Following consultation with the Department of Defence, adjustments to the development clusters have been made, including the removal of a significant number of turbines and a reduction in the maximum blade tip height of the remaining turbines, in order to address the Department's concerns. Therefore, appropriate charting and aviation lighting will satisfy national and international aviation notification requirements; in particular, the Irish Aviation Authority requirements in relation to aerodrome licensing, policy on land use and planning and the International Civil Aviation Organisation (ICAO) Convention.

No impact is anticipated in terms of Clonbullogue Aerodrome; the proposed clusters are located beyond the Irish Aviation Authority stipulated safeguarding criteria.

Casement Aerodrome serves as the Headquarters and operating base of the Irish Air Corps. The nearest proposed cluster, Drehid-Hortland, is located at a distance of approximately 24km from the Aerodrome (measured from the eastern grouping). Based on Irish Aviation Authority safeguarding requirements, the cluster will not breach any established safeguarding criteria for the Aerodrome.

Initial consultation with the Air Corps did not indicate any concerns with the proposed development, however as part of more recent consultation the Air Corps have raised concerns including issues highlighted in their response to the Maighne scoping document. Previous engagement and subsequent study has not revealed any Department of Defence justification for this requirement and therefore, minimal impact is anticipated in terms of Casement Aerodrome once the appropriate mitigation measures specified in Section 16.3.8 of Chapter 16 of Volume 2 of the EIS are included.

Several volumes of airspace have been defined overhead the proposed development for military operations, including Military Restricted Area EIR16, which forms part of a larger Exercise and Training Area, known as Military Operating Area (MOA)-4. The clusters are located within uncontrolled airspace, which any aircraft can enter and transit without ATC clearance and subject only to a small set of mandatory rules, with pilots ultimately responsible for their own terrain and obstacle clearance.

Analysis indicates the proposed clusters will not breach the military EIR16 Restricted Area. The Drehid-Hortland cluster may present a vertical restriction in terms of direct overflight, within the EIR16 Area's hours of operation. Direct overflight of the clusters might lead to a traffic funnelling effect (where aircraft are squeezed into a particular smaller volume of airspace).

Four of the proposed clusters are located within the lateral confines of MOA-4; however, civilian aircraft are able to enter the Area at their own discretion, up to 4,500 ft above mean sea level (amsl) and therefore no impact is anticipated. Implementation of the identified mitigation solutions will ensure pilots are able to maintain the required obstacle clearance.

The Air Corps have indicated a potential loss of navigability in the area, particularly in terms of the specified low flying Training Areas. The Cloncumber and Derrybrennan cluster centre-points are located within the boundary of the Department of Defence's unpublished low flying Training Area; however, this protection requirement is not formally documented and therefore it appears that no statutory safeguarding is applied in regard to these areas. Pilots are able to operate at their own discretion within the Training Areas, below the base of the EIR16 airspace. The effect of the proposed clusters is considered to be acceptable with the application of suitable mitigation mentioned previously.

Any potential for wind turbine-induced wake turbulence, which is instability in the air down-wind of the turbine blades and gradually diminishing downstream at a distance behind the blades, has been considered through a review of existing policy and relevant research, indicating that whilst the effects of turbine-induced turbulence remains under assessment, a significant number of aviation stakeholders continue to operate safely within close proximity to wind developments.

To reduce any potential Visual Flight Rules impacts to an acceptable and hence not significant level, proposed mitigation solutions include appropriate pilot notification and the implementation of industry standard Aviation Obstruction Lighting. Assessment clearly indicates that the implementation of appropriate industry standard and accepted best practice solutions will mitigate the stated effects of the evolved development, such that the proposed clusters will have a not significant residual effect upon civilian and military aviation receptors.

Casement Aerodrome operates a number of Instrument Flight Procedures to facilitate the safe and efficient operation of Instrument Flight Rules air traffic at the Aerodrome, where pilots are flying with reference to instruments rather than relying totally on the visual picture outside of the cockpit, typically following prescribed routes and patterns, to enable the aircraft to make a departure from or an approach to the Aerodrome, under the instruction of ATC. The Dreehid-Hortland cluster is located within the vicinity of a Casement published Instrument Flight Procedure. Should Casement Instrument Flight Rules aircraft be operating in the vicinity of this cluster, the present minimum altitude to be allocated by air traffic controllers is 1,800 ft. Depending on a site specific survey, the Cloncumber cluster and the Derrybrennan cluster may also affect this minimum altitude. This effect on Casement Aerodromes operations can be mitigated by raising the minimum surveillance and vectoring altitude by 100 ft.

6 INTERACTION OF THE IMPACTS

Direct, indirect, cumulative, and interactive impacts were considered during the siting of turbines to minimise impacts on landscape and visual, the human environment, geology and slope stability, flora and fauna, hydrology, water quality, shadow flicker and archaeological, architectural and cultural heritage. Other factors and constraints such as telecommunications requirements and the requirements of the Kildare and Meath County Development Plans were also considered.

The development has the potential to impact on various environmental aspects, and there are interactions and inter-relationships between these aspects. The EIS has considered these interactions and inter-relationships throughout the appraisal, firstly through the design of the turbine layout and cable routes to avoid impacts where possible and also in the definition of suitable mitigation measures to minimise the impacts.

In summary, based on the positive impacts of the development, and the low level of negative impacts (as mitigated, where required), it is considered that Maighne is a suitable location for a wind farm development.

7 REFERENCES

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