Appendix D

Outline CEMP

ENVIRONMENTAL BALANCE IN DESIGN AND CONSTRUCTION

ELEMENT POWER IRELAND LTD

PROPOSED MAIGHNE WIND FARM, IN COUNTY KILDARE AND COUNTY MEATH

OUTLINE CONSTRUCTION AND ENVIRONMENTAL MANAGEMENT PLAN (INCLUDING SCHEDULE OF MITIGATION MEASURES)

MARCH 2015

FEHILY TIMONEY & COMPANY

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1. INTRODUCTION

1.1 General Introduction and Purpose

Element Power Ireland Ltd. wishes to construct the proposed Maighne Wind Farm in north County Kildare and south County Meath. 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 monitoring 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 (MV) 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 up to a maximum voltage of 220kV for export to the Irish national grid via high voltage (HV) underground cables to either one of two existing substations located at Woodland, Co. Meath or Maynooth, Co. Kildare.

This document is the Outline Construction and Environmental Management Plan (CEMP) for the proposed Maighne Wind Farm and has been prepared by Fehily Timoney and Company (FTC) on behalf of the applicant on a preliminary (outline) basis to accompany the Environmental Impact Statement (EIS) for the proposed development. It sets out the key construction and environmental management issues associated with the proposed wind farm. This plan will be developed further at the post-planning and construction stages, by the client and on the appointment of the main contractor to the project. Any adjustments to the CEMP will be carried out on the basis that they do not increase the impacts as addressed in the EIS.

This document should be read in conjunction with the EIS prepared for the proposed wind farm, along with the relevant planning drawings. In the case of any ambiguity or contradiction between this Outline CEMP and the EIS, the EIS shall take precedence.

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

The document is divided into six sections:

Section 1: *Introduction* provides details on the existing site and the proposed development

Section 2: *Existing Site Environmental Conditions* provides details of the main existing geotechnical, hydrological, ecological and archaeological conditions onsite. These conditions are to be considered by the contractor in the construction, operation and decommissioning of this proposed development.

Section 3: *Overview of Construction Works*, this section provides an overview of the construction works proposed, including drainage and sediment controls to be installed.

Section 4: *Environmental Management Plan (EMP)*, this section outlines the main requirements of the EMP and outlines operational controls for the protection of the environment including soil management, habitat and species, site drainage control, archaeology, construction traffic, site reinstatement and decommissioning and waste management.

Section 5: *Safety & Health Management Plan,* this section defines the work practices, procedures and management responsibilities relating to the management of safety and health during the design, construction and operation of the Maighne Wind Farm.

Section 6: *Outline Emergency Response Plan* contains predetermined guidelines and procedures to ensure the safety, health and welfare of everybody involved in the project and to protect the environment during the construction phase of Maighne Wind Farm.

Appendices: The mitigation measures, as included in the EIS have been extracted and are included as Appendix 1. Stilling Pond Calculations are included as Appendix 2 and 'The Best Practice Management Guidelines' produced by Invasive Species Ireland (Maguire et al, 2008) is included as Appendix 3.

1.2 The Applicant

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 megawatt (MW) of renewable energy generation in operation and approximately 9,000MW 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.

1.3 The Site

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 (MV) 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 up to a maximum voltage of 220kV for export to the Irish national grid via high voltage (HV) underground cables to either one of two existing substations located at Woodlands, Co. Meath or Maynooth, Co. Kildare.

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

The proposed site location is shown on Figure 1.1.

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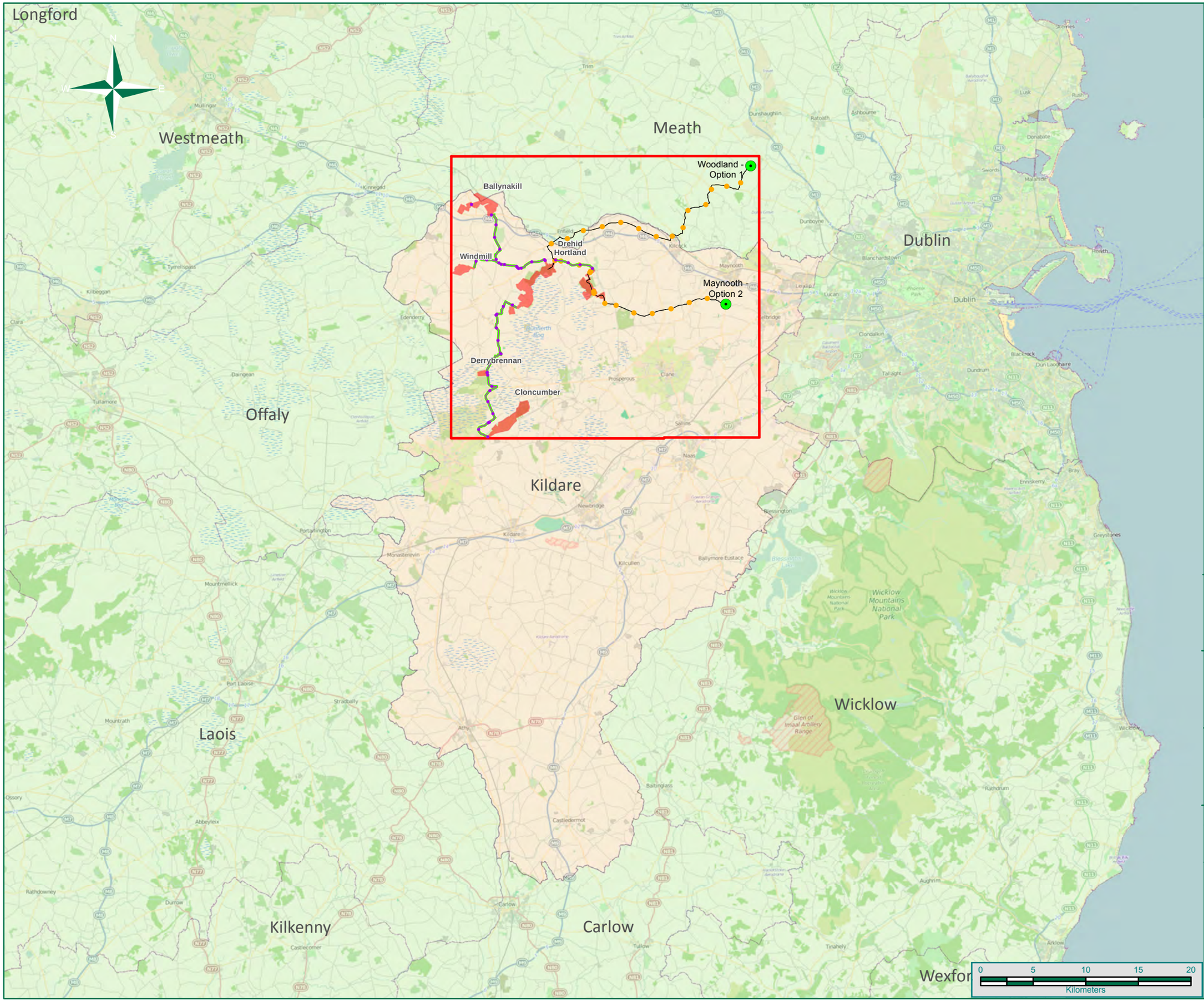

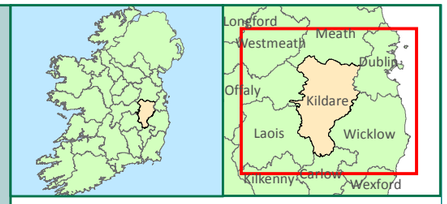

Legend

- 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

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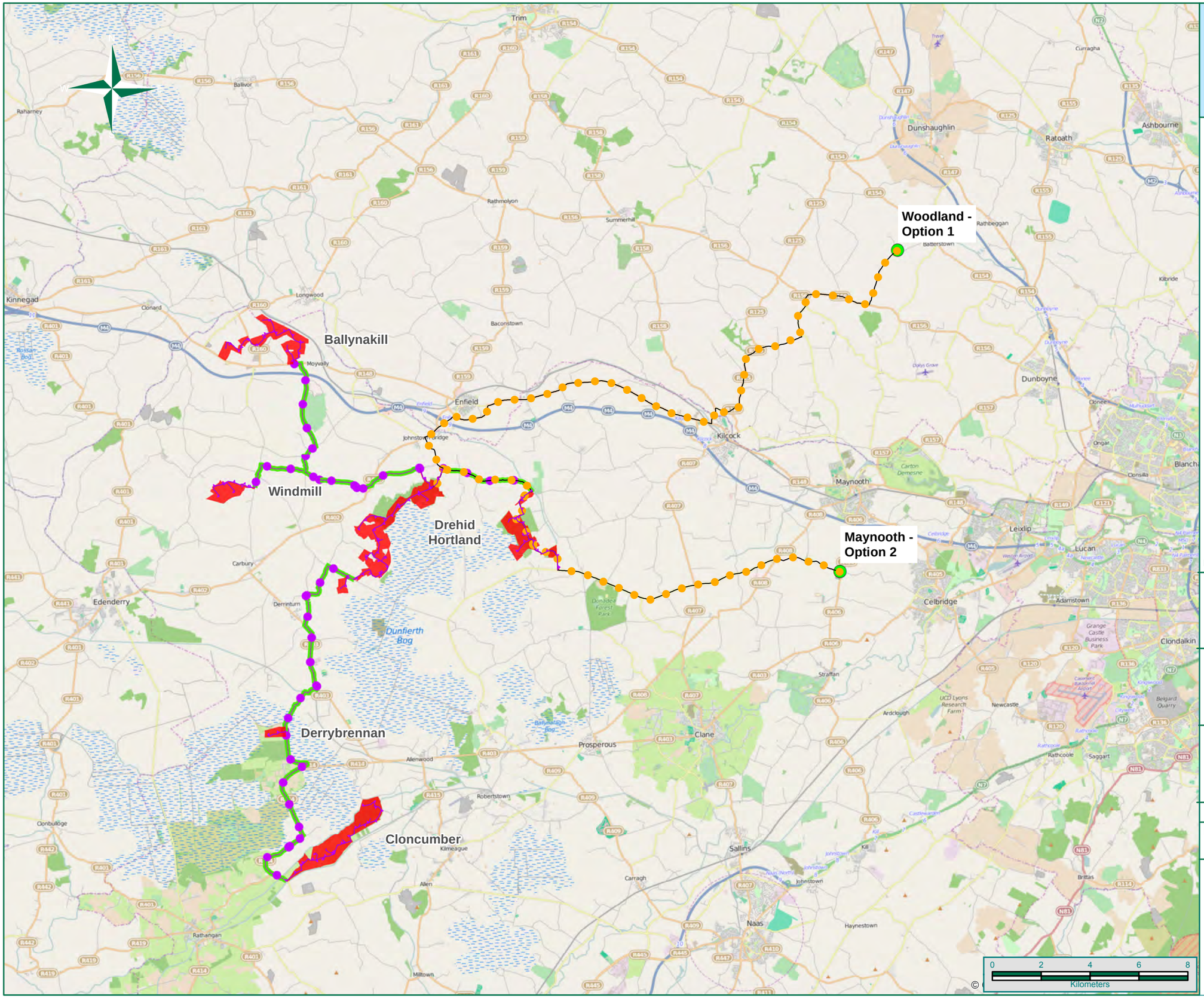

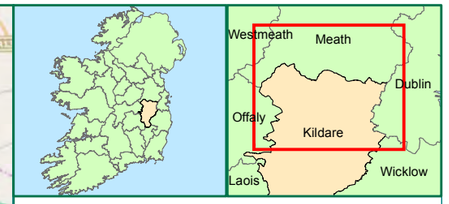

Legend

- 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

Maighne Wind Farm

Title Of Figure

Site Location Map

Scale Used 1:150,000 @ A3

Figure No. 1.2

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2. EXISTING SITE ENVIRONMENTAL CONDITIONS

This section of the Outline CEMP describes the existing site. The information contained in this section is an abridged version of the text contained in the EIS. The EIS should be consulted for a more extensive description of the existing site.

2.1 Existing Site Description

The proposed Maighne Wind Farm site is located in North County Kildare and South County Meath. The proposed site is approximately 4.6km northeast of Rathangan, 6.9km north and 7.7km northwest of Prosperous, 1.8km east and 3km north of Carbury, and 1km northeast and 4.7km northwest of Derrinturn in County Kildare, and is 1.6km to the south of Longwood and 3.5km south of Enfield in County Meath. The proposed overview site layout is shown on Figures 2.1, with sub maps in Figures 2.1.1 – 2.1.9.

The proposed Maighne Wind Farm development is located in lands varying in use from agricultural to forestry and commercial peat extraction with elevations of between 70m and 80m OD. Habitats were present on all clusters which reflects the varying land cover, e.g. agricultural to forestry to commercial peat extraction.

It is proposed that all turbine deliveries will be via the M4 and onto the Regional Road (R402) at Junction 9 for the Drehid-Hortland, Windmill, Derrybrennan and Cloncumber clusters. Local roads from the R402 lead to the numerous site entrances. The Ballynakill cluster will be accessed from the M4 onto the R148.

There are 1,007 dwellings within 1,310m of the turbines.

The area proposed for the Maighne Wind Farm is located across a number of river catchments. The northern part of the site drains to the River Boyne and River Blackwater. The southern part of the site drains to the River Barrow and River Nore as well as the Slate River and the Figile River.

The Royal Canal lies north of the proposed development. It connects the River Liffey in Dublin with the River Shannon in Co. Longford.

The Grand Canal runs through the Southern area of the proposed development, connecting the River Liffey in Dublin with the River Shannon in Co. Offaly. A feeder line from Athy and the Barrow, called the Grand Canal (Barrow Line) is a branch of the canal and flows just east of the Cloncumber cluster.

The Ballynakill cluster is located in lands on the western side of the Royal Canal and north of the M4, the Regional road R148 and the Glash River. The River Boyne is located to the North West of the cluster with the settlement of Moyvalley to the South East.

There is one Groundwater Source Zone (SPZ) within the site boundary. Some of this SPZ, known as Johnstown well field, is located within the Drehid-Hortland cluster.

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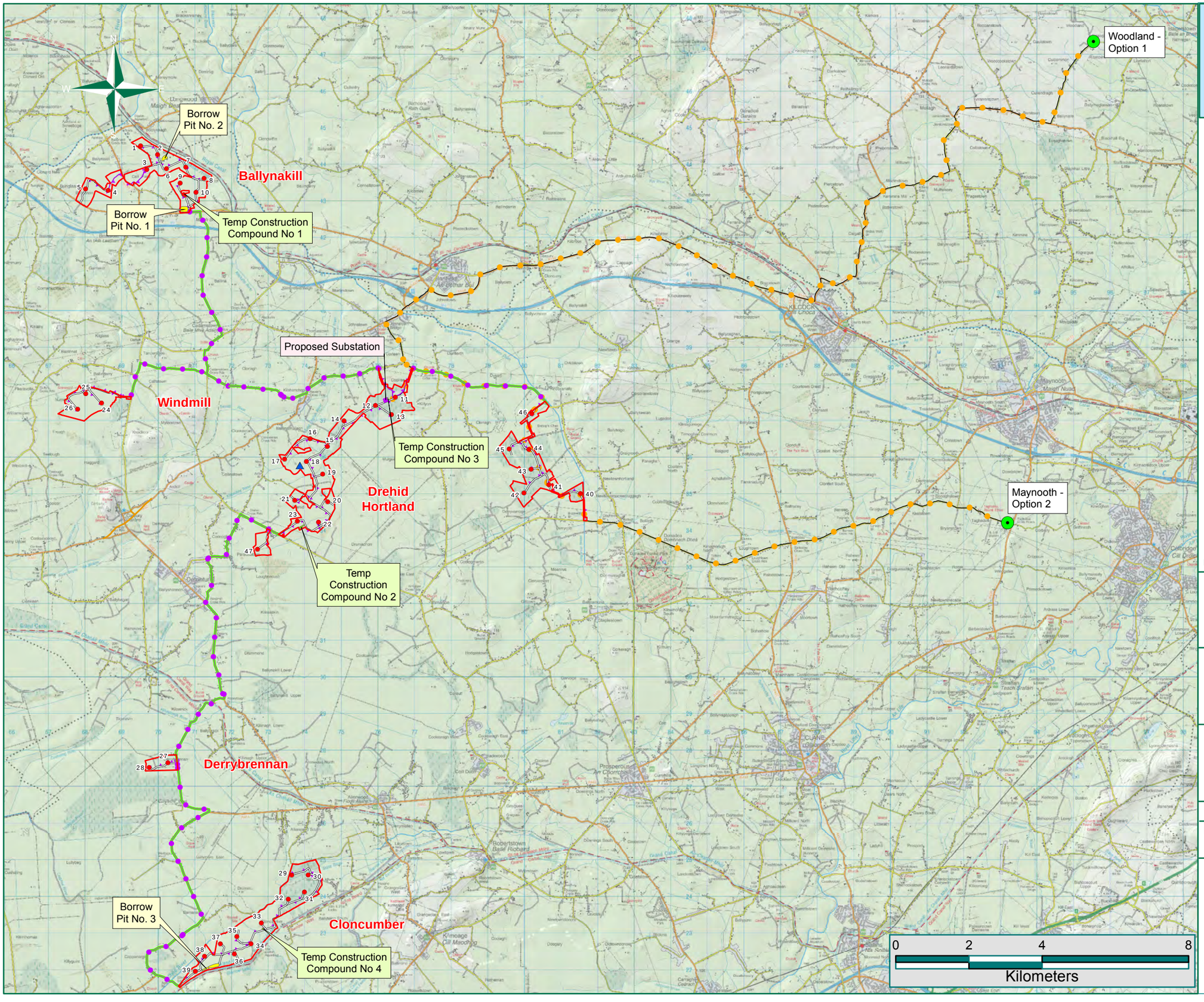

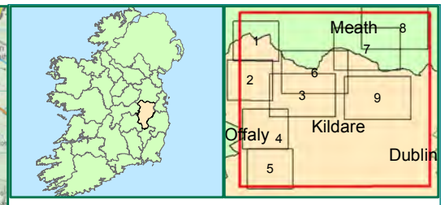

Legend

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

Date 25/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Site Layout Overview (Maighne)

Scale Used 1:100,000 @ A3

Figure No. 2.1.

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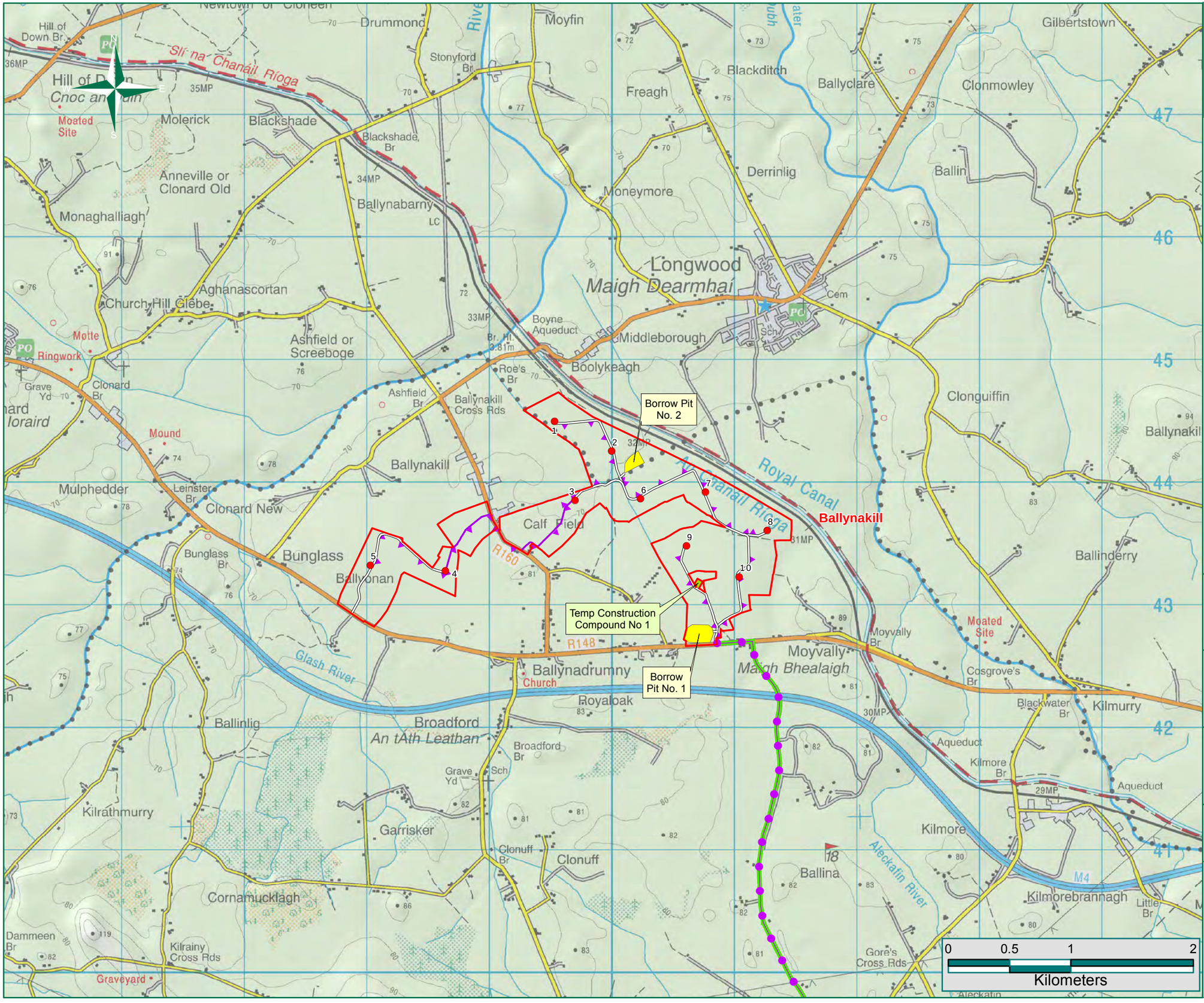

Legend

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

Date 25/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Site Layout
Submap 1 of 9 (Ballynakill)

Scale Used 1:30,000 @ A3

Figure No. 2.1.1

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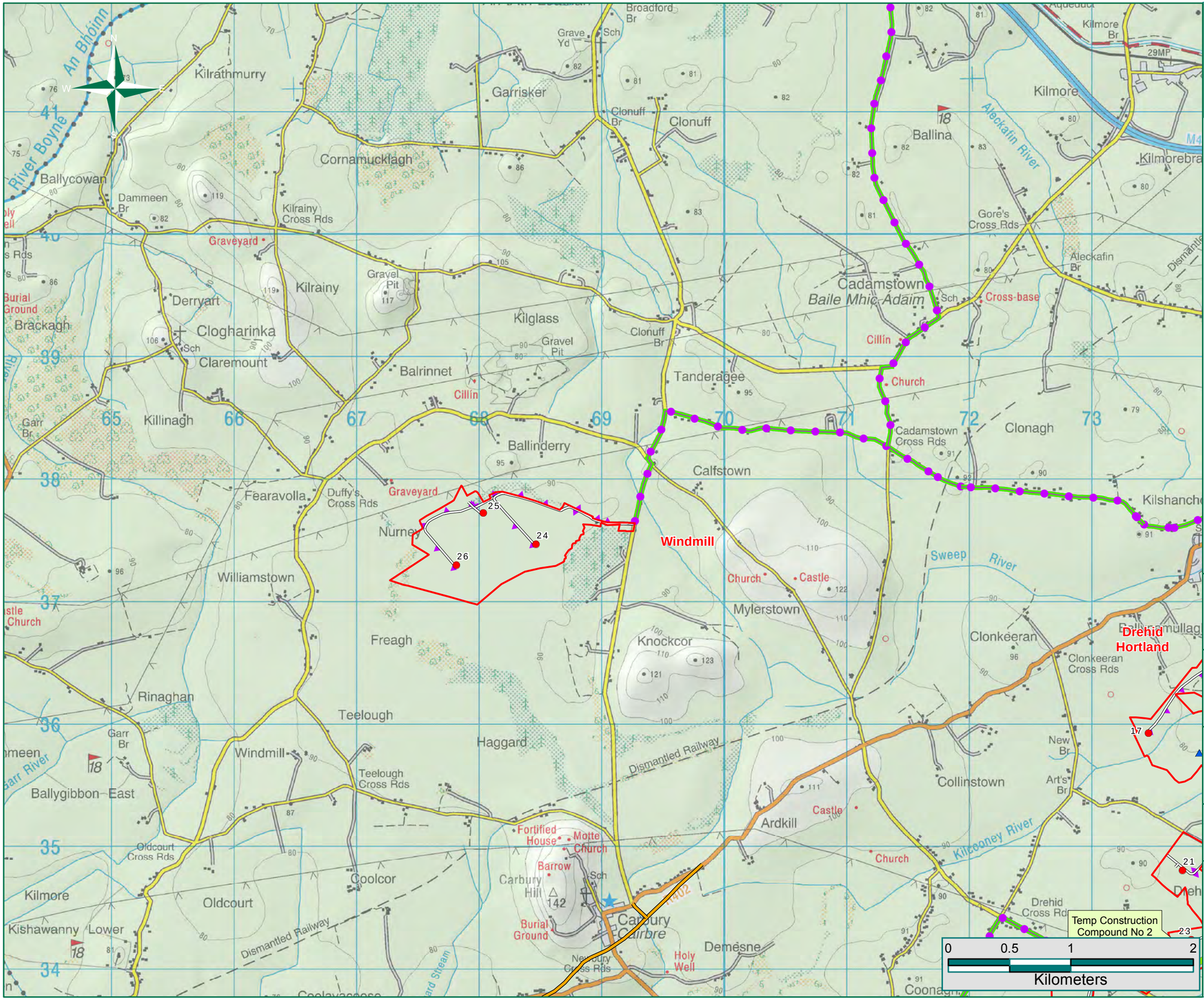

Legend

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

Date 25/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Site Layout
Submap 2 of 9 (Windmill)

Scale Used 1:30,000 @ A3

Figure No. 2.1.2

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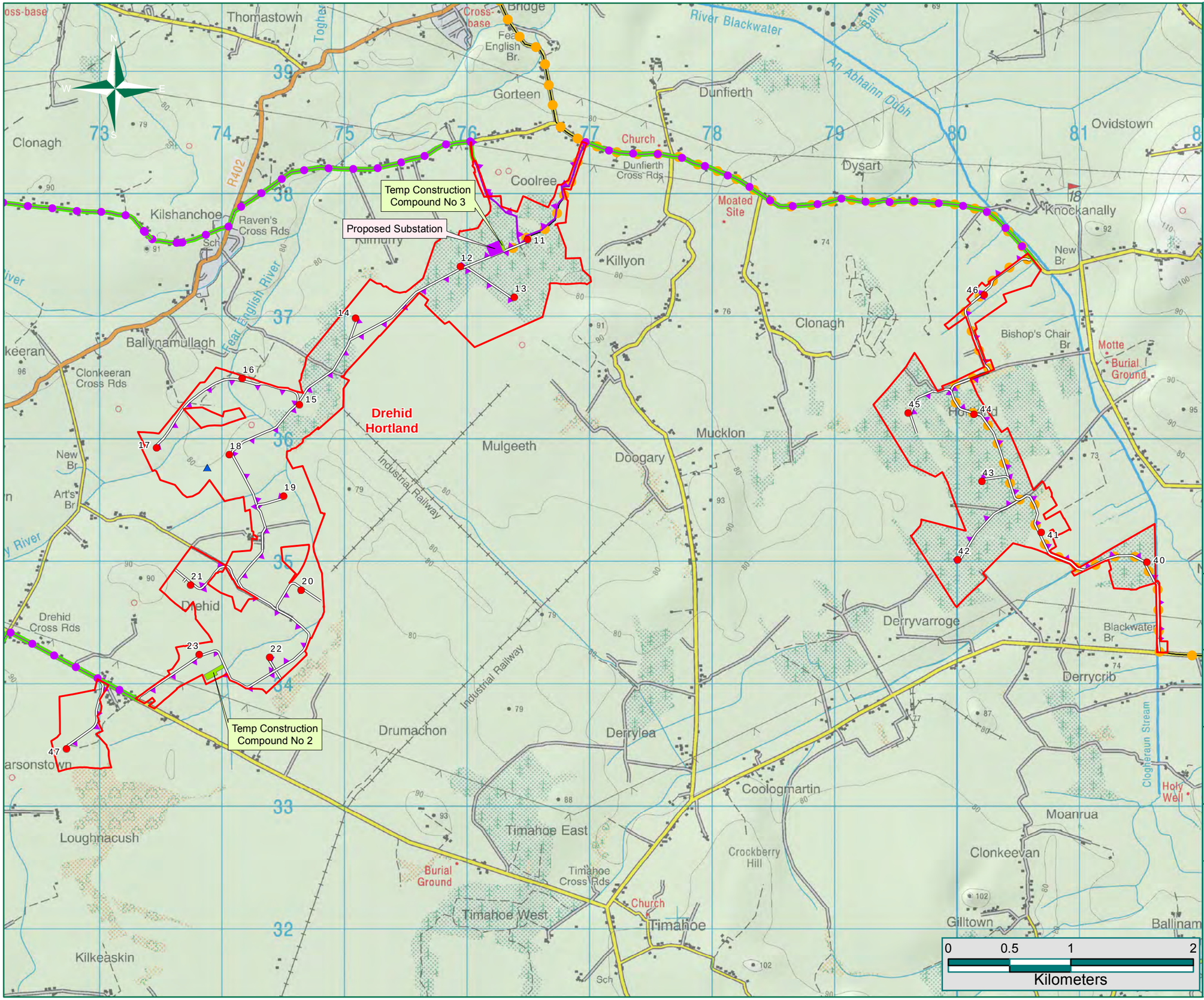

Legend

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

Date 25/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Site Layout
Submap 3 of 9 (Drehid Hortland)

Scale Used 1:30,000 @ A3

Figure No. 2.1.3

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Date 25/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Site Layout
Submap 4 of 9 (Derrybrennan)

Scale Used 1:30,000 @ A3

Figure No. 2.1.4

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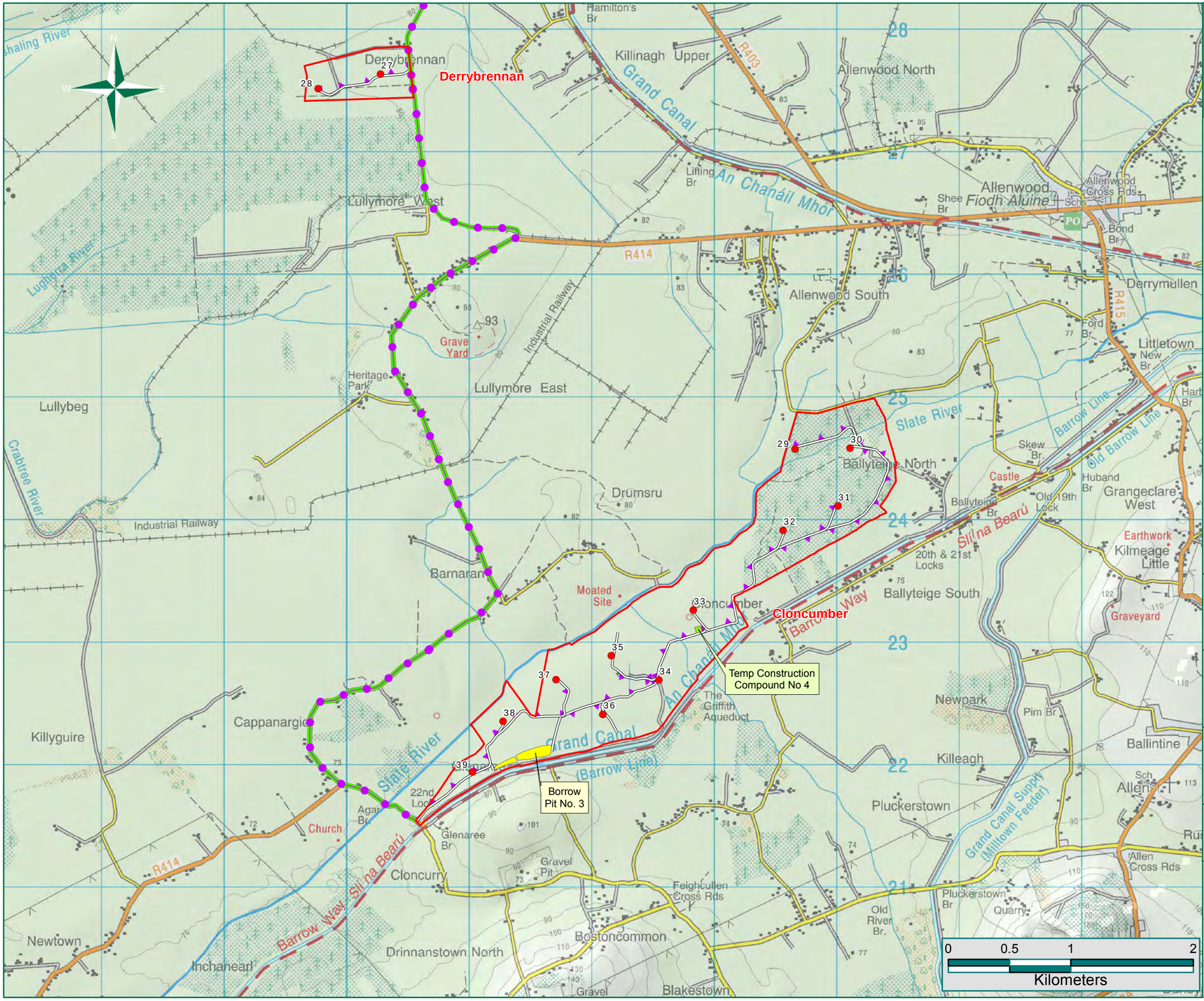

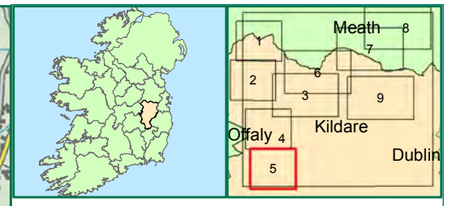

Legend

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

Date	25/03/2015
Name Of Client	Element Power Ireland
Name Of Job	Maighne Wind Farm
Title Of Figure	Site Layout Submap 5 of 9 (Cloncumber)
Scale Used	1:30,000 @ A3
Figure No.	2.1.5
Rev	A

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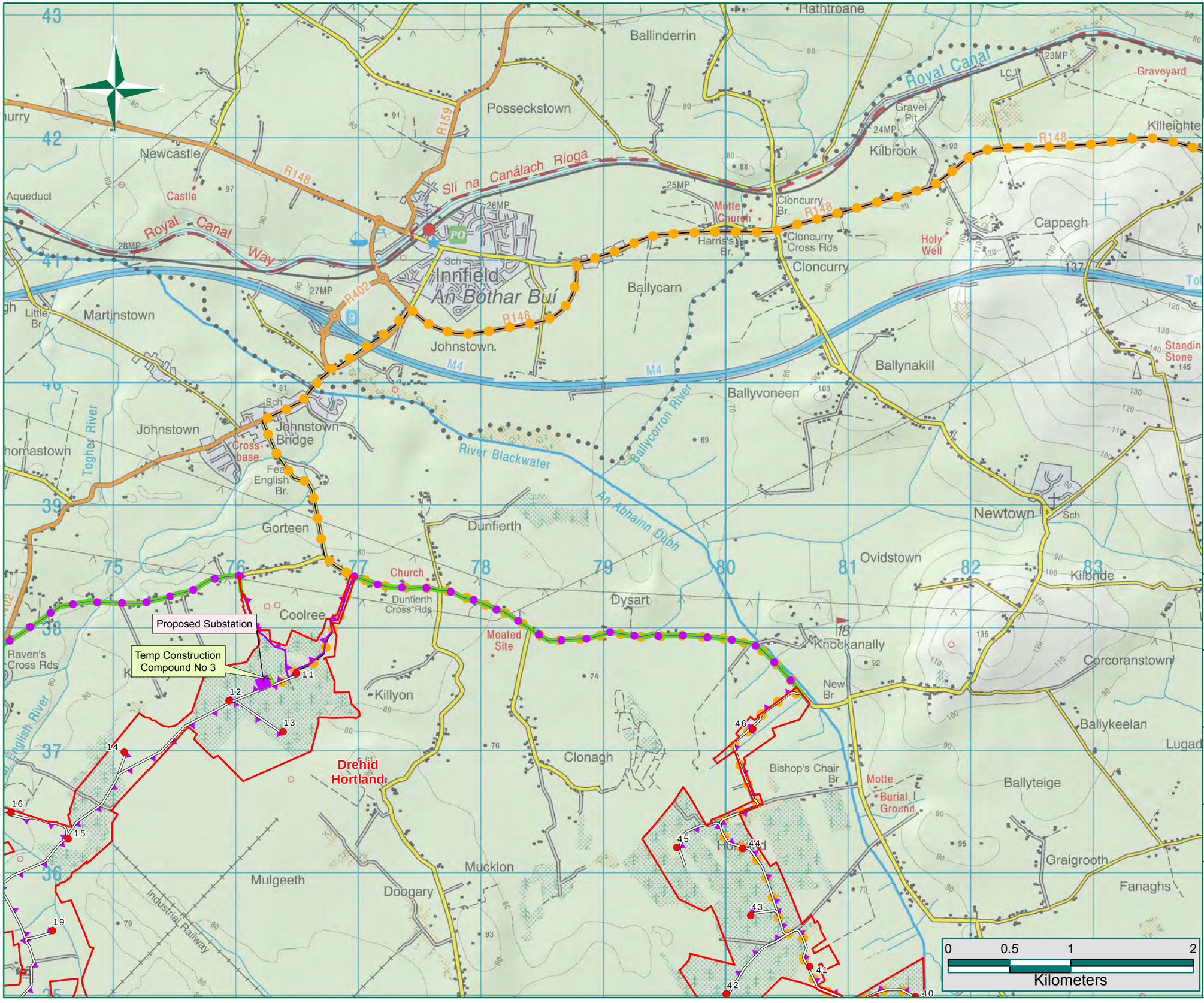

Legend

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

Date 25/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Site Layout
Submap 6 of 9 (Cable to Woodland)

Scale Used 1:30,000 @ A3

Figure No. 2.1.6

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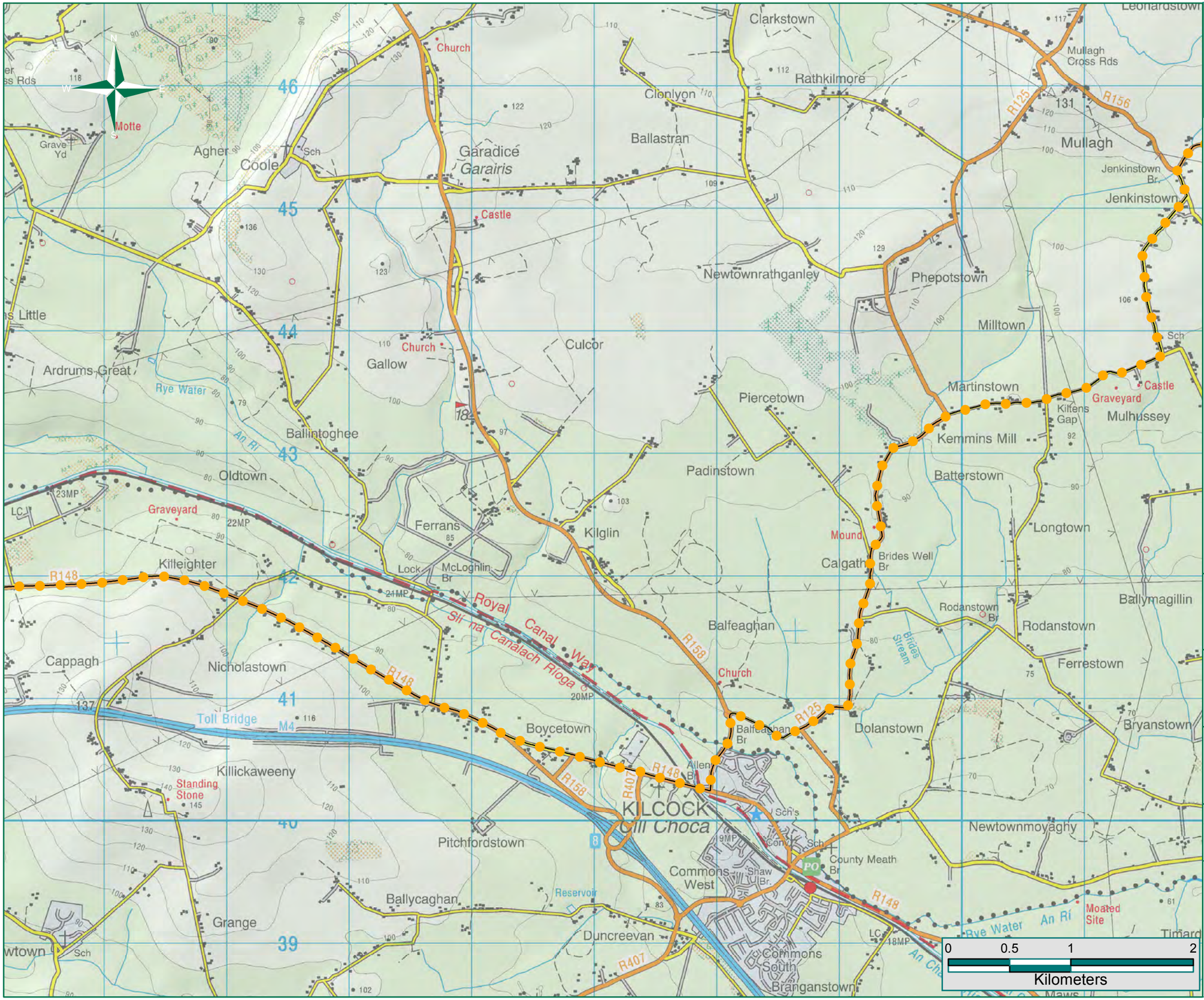

Legend

- 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 7 of 9 (Cable to Woodland)

Scale Used 1:30,000 @ A3

Figure No. 2.1.7

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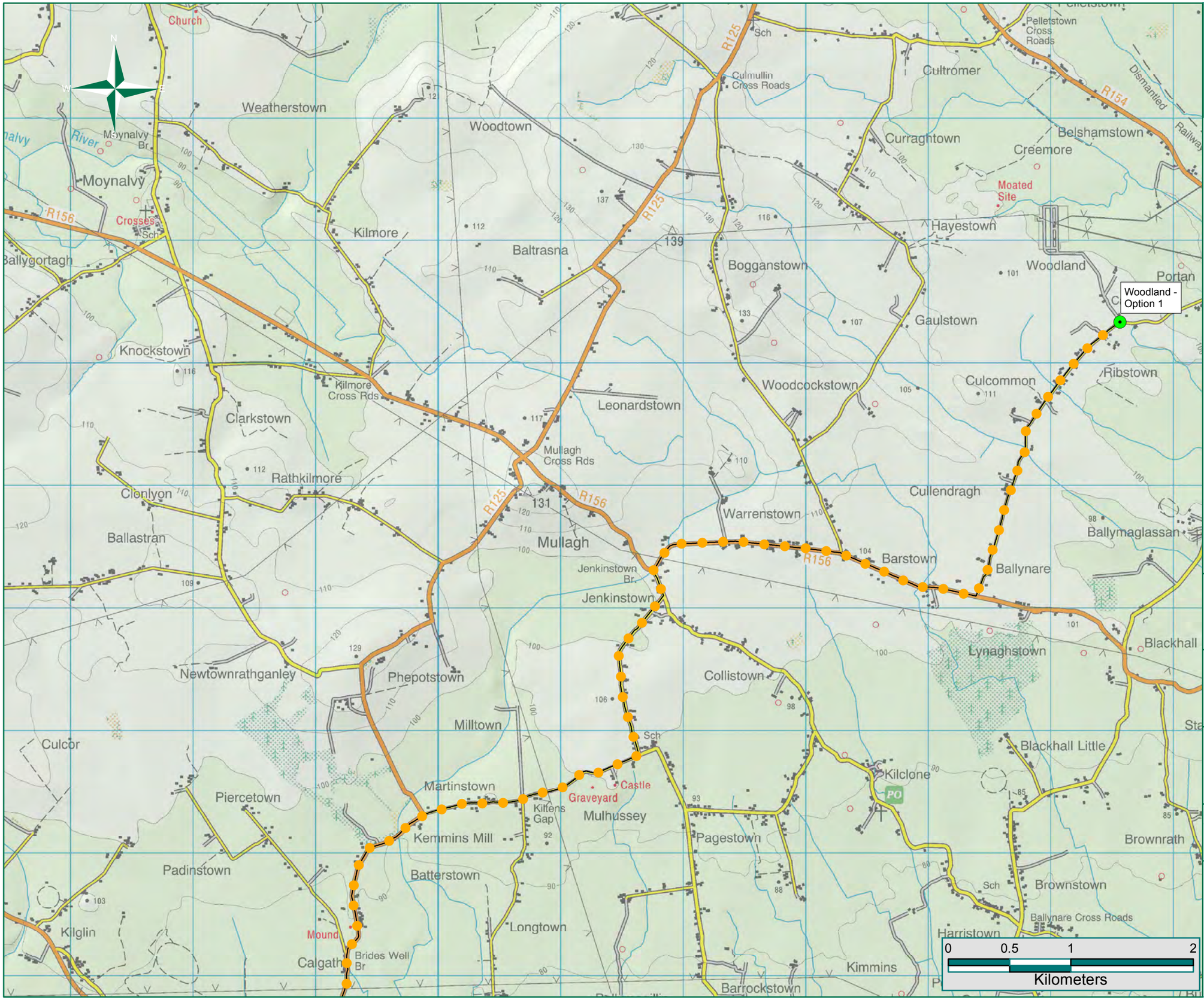

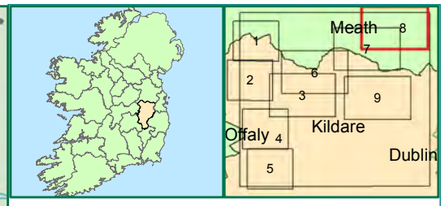

Legend

- 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 8 of 9 (Cable to Woodland)

Scale Used 1:30,000 @ A3

Figure No. 2.1.8

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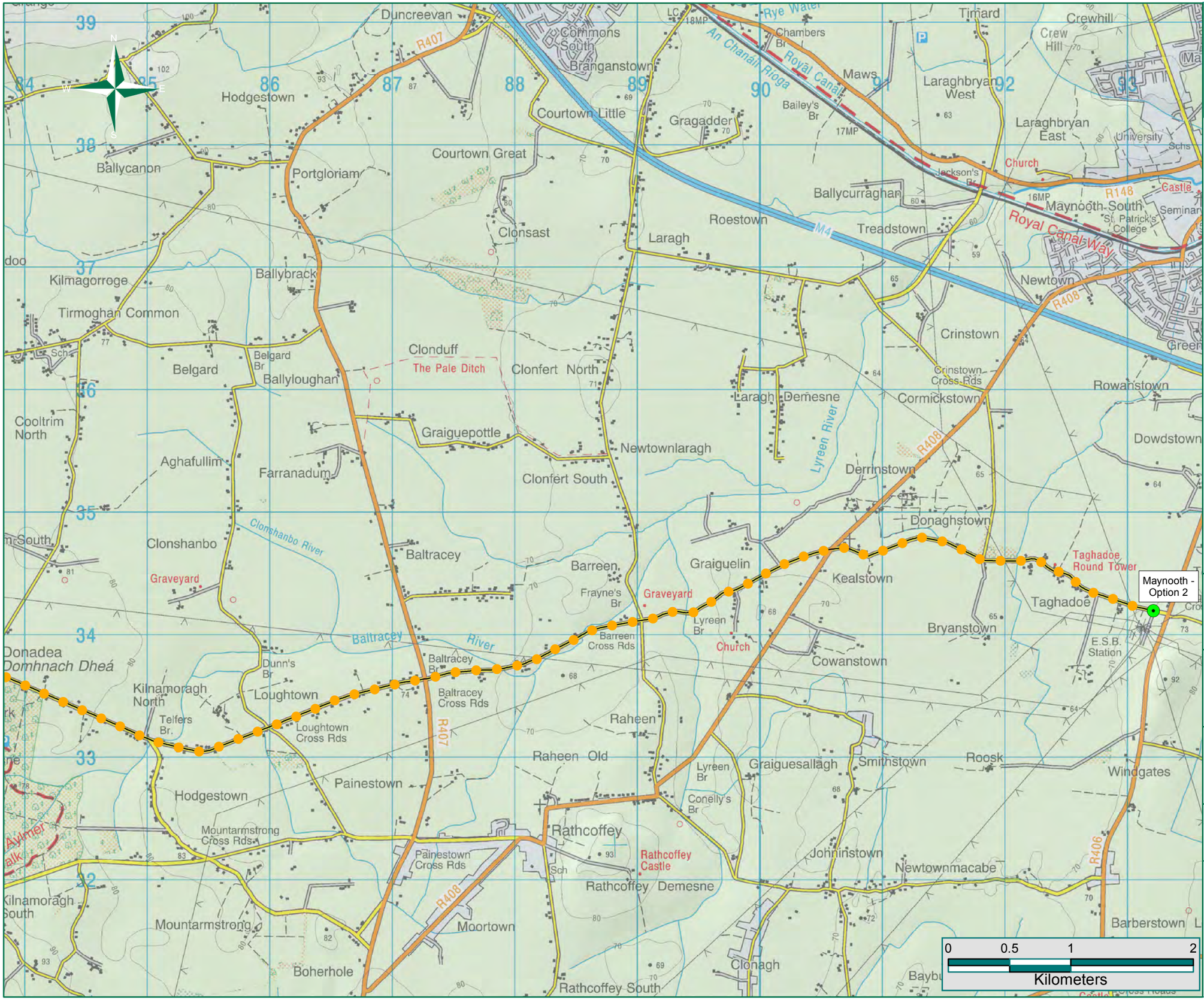

Legend

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

Date 25/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Site Layout
Submap 9 of 9 (Cable to Maynooth)

Scale Used 1:30,000 @ A3

Figure No. 2.1.9

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2.2 Geological Conditions

The soils present at the proposed Maighne Wind Farm site comprise Grey Brown Podzolics derived from limestone and shale glacial till with associated Gleys and Brown Earths. The underlying quaternary soils identified on the site are cutover peat (within Windmill, Derrybrennan, Drehid-Hortland and Cloncumber) and limestone till deposits derived from the underlying limestone/sandstone with some minor alluvium areas present. The bedrock comprises limestones and calcarerous shales.

The GSI were consulted in October 2014. No specific sites of geological heritage of other areas of concern were identified by the GSI. The GSI geological heritage database [13] shows no sites of significant geological heritage within the proposed Maighne Wind Farm site.

The closest geological heritage sites are the Hill of Allen which is part of the Allen Andesite formation a massive andesitic lava flow. This is located 2.7 km southeast of the Cloncumber cluster (ING 275700 220600) and the Kilbrook Spring, a warm spring within a disused gravel pit (ING 281460 242200), located about 3km east of Enfield and approximately 0.5km north of the potential HV Grid Connection route to Woodland.

There are a number of operational quarries and concrete batching plants located in the vicinity of the Maighne Wind Farm site:

- Kilsaran Concrete Ltd. operate a crushed rock quarry together with sand and gravel borrow pits, a readymix concrete batching plant and a concrete laboratory in the townland of Ballykane Hill. The nearest turbine (T25) to Kilsaran Concrete Ltd at Ballykane is approximately 3.6km away and is within the Windmill cluster
- Walsh Concrete have a sand and gravel quarries located approximately 0.9km north of T25 in Windmill
- Flanagan Concrete is an operational quarry with a ready mix and concrete batching plant, sand and gravel pit, and concrete block production facility. It is located approximately 0.8km southeast from the nearest turbine (T39)
- Arkil Ltd located in the townsland of Drinnanstown South is an operational limestone, sand and gravel quarry. It is located approximately 2.3km southeast from the nearest turbine (T39)
- Roadstone Allen have a crushed rock quarry (Andasite) located approximately 3.7km east of the nearest turbine (T34) within the Cloncumber cluster. This quarry is locally known as Allen Quarry and it forms part of the Hill of AllenHanlon Concrete operate a sand and gravel pit to the west of Robertstown. It is located approximately 3.7km from the nearest turbine (T31).

The slopes of the site are characterised by level or gently sloping ground with slopes of between 0° and 3° being typical. No evidence of slope instability was observed on the site. The site walkover identified peat within the Drehid-Hortland, Windmill and Cloncumber clusters.

Peat depths recorded at Turbines T12, T13, T14, T40, T42, T43 and T44 within the Drehid Hortland cluster, exceeded 0.5m thickness, with a maximum peat depth of 3.4m recorded at T12. A peat depth of 3m was recorded at the location of the proposed onsite substation within the Drehid-Hortland cluster.

In the Cloncumber cluster, peat depths recorded at Turbines T29, T31 and T32 exceeded 0.5m. A maximum peat depth of 3.7m was recorded at the T31.

Peat depths exceeding 0.5m was also recorded at the Windmill cluster. A depth of 4m was recorded at T24. Whereas a peat depth of 1.8m and 2.3m was recorded at T25 and T26 respectively.

An Outline Soil Management Plan is presented in Section 4.3.2 of this CEMP.

2.3 Hydrological Conditions

The area proposed for the Maighne Wind Farm development is located across a number of river catchments.

The northern sections of the site predominantly drain to the River Boyne and its tributaries. The main tributary of the River Boyne draining the northern sections of the site is the River Blackwater.

To the east and north east of the site, the tributaries flowing through the site, which drain to the River Blackwater are: the Kilcooney River; the Fear English River and the Mulgeeth Stream. The Kilcooney River rises near Carbury at approximately 95mOD and flows in an easterly direction along the northern site boundary. It joins the Fear English River to the south of Ballynamullagh within the site boundary.

The Fear English River rises in Parsonstown at approximately 88mOD and flows north east along the southern boundary of the site and follows along the eastern boundary of the site. After the confluence with the Kilcooney River, the Fear English River continues in a north easterly direction for 3km to Johnstown Bridge, where it meets the River Blackwater.

Mulgeeth Stream rises to the southeast of the site in bogland and flows south for approximately 3km, before turning east at Derrylea and joining the Clogheraun Stream that runs into the main channel of the River Blackwater at Newtownhortland. The River Blackwater continues for 7km in a northwesterly direction towards Johnstown Bridge. From Johnstown Bridge the River Blackwater flows in a northwesterly to northerly direction for approximately 12.5km, crossing the Royal Canal and the Blackwater Bridge at Kilmurry before joining the River Boyne at Rourkestown.

The Glash River drains the western parts of the site and flows northwards to meet the River Boyne. The Glash River rises at Mylerstown at approximately 100m OD, 0.5km upstream of the nearest point of the site boundary (Windmill cluster) and flows past this point at a distance of 0.2km to the east, before joining the main river channel of the River Boyne a further 7.5km downstream, at a location just downstream of Leinster Bridge. The Glash River passes the site boundary (Ballynakill cluster) again here at a distance of 0.5km to the west. The River Boyne runs in a north easterly direction for 3km towards Longwood, draining the northern part of the site just upstream of where it crosses under the Royal Canal at the Boyne Aqueduct. The River Boyne continues in a north easterly direction, meeting the River Deel a further 5.6km downstream at Ballymahon and meeting the River Blackwater a further 2.4km at Rourkestown. The River Boyne then flows on for 12km in a north easterly direction towards Trim in County Meath. At Trim the River Boyne turns northwards and flows for 18km to Navan Town. From Navan Town, the River Boyne veers in an easterly direction, flowing for 30km towards Drogheda. The River Boyne flows out into the Irish Sea at some 6km to the east of Drogheda.

The southern sections of the site predominantly drain to tributaries of the River Barrow. The main tributaries of the River Barrow draining the southern sections of the site are the Figile River and the Slate River.

To the south west of the site, the tributaries flowing through the site, which drain to the Figile River are: the Abbeylough River and the Cushaling River. The Abbeylough River rises at Ballynakill Lower and flows in a south westerly direction towards the Cushaling River. The Abbeylough River flows under the R403 Regional Road at Abbeylough Bridge. The river is culverted under the Grand Canal some 400m to the west of the bridge. It meets the Cushaling River 4km downstream at Ticknevin, as shown in Figure 9.1..

The Cushaling River continues in a southwesterly direction for approximately 6km where it meets the Figile River. The Figile then flows northwest for 3.5km before turning south for 4km where it enters the village of Clonbulloge and meets the Phillipstown River.

The Figile River continues south from Clonbulloge before joining the Slate River to the south of Bracknagh. The Cushina River joins the Slate River from the west and continues as the Black River until it enters the River Barrow just to the north of Monasterevin.

To the south of the site, the tributaries flowing through the site, which drain to the Slate River are: the Killenagh Upper tributary, the Cloncumber Stream and the Ballyteige North Stream. The Killenagh Upper tributary rises to the north of Allenwood and joins the Slate River after 3.5km at Ballyteigh North, just downstream of the confluence of Ballyteige North Stream with the Slate River. Approximately 1km further downstream, the Cloncumber Stream joins the Slate River. The Cloncumber Stream rises 7km to the south of the site, at Pollardstown and flows in a north westerly direction to meet the Slate River at Drumsru.

The Slate River rises in Balynafagh at approximately 95m OD and flows in a southwesterly direction, as shown in Figure 9.1. After passing Agar Bridge, approximately 3.8km downstream of the confluence with the Killenagh Upper tributary, the Slate River flows southwest for approximately 4km where it enters the town of Rathangan. It continues in a south-westerly direction for a further 7km where it meets the Figile River which then enters the Black River.

The Black River flows south for 6km where, on entering Monasterevin it meets the main channel of the River Barrow. The River Barrow continues south as the main arterial river, joining the River Nore in New Ross and the River Suir in Waterford where it flows out into Waterford Harbour.

The TDR extends from Kilcock westwards towards the proposed development, to the north of Broadford and from Johnstown Bridge southwards, extending into the turbine clusters along existing roads. The TDR transgresses through the same waterbody catchments as the abovementioned rivers, however as it approaches Kilcock to the north east, it extends into the Rye Water waterbody catchment (a tributary of the River Liffey) and eastwards into the Boyne 4_Upper tributary of the River Boyne.

The preferred connection point for the HV cable to the Irish National Grid will be determined by Eirgrid in 2015, however for the purposes of this EIS, both potential routes to Woodland, Co. Meath and Maynooth, Co. Kildare are assessed. A HV substation is proposed in the Drehid cluster as shown in Figure 2.6, in order to provide a connection point between the wind farm and EirGrid's network. The HV cable route to Woodland in Co. Meath transgresses some of the same waterbody catchments as the above mentioned rivers, in addition to the Ballycorron tributary of the River Blackwater, tributaries and the main channel of the Ryewater River, a tributary of the River Liffey as well as tributaries and the main channel of the Tolka River.

The cable route connects the turbine clusters, running southwards from Moynally extending into the turbine clusters along existing roads, as far as Cloncurry to the south west of the site (Cloncumber cluster). The MV cable route transgresses some of the same waterbody catchments as the above mentioned rivers, in addition to the Alecafin tributary of the River Blackwater and two further tributary catchments of the River Boyne.

The internal MV cable route (i.e. within the clusters) follows the existing or proposed internal access roads and as such lies in the same waterbody catchments as those already mentioned.

The northern part of the site drains to the environmentally protected designated sites, River Boyne and River Blackwater candidate Special Area of Conservation (cSAC) (site code: 002299) and Special Protection Area (SPA) (site code: 0004232), which lies approximately 0.6km to the north of the site by Hydrological links, at its nearest point (Ballynakill cluster). The southern part of the site drains to the River Barrow and River Nore cSAC (site code: 002162), which lies approximately 14km by hydrological links downstream from the south of the site, at its nearest point (Cloncumber cluster).

The proposed development site, including the TDR and cable route lies within Hydrometric Area HA 14 known as Barrow of the Irish River Network, which is under the responsibility of the South Eastern River Basin District (SERBD) and HA 07 known as Boyne of the Irish River Network, which is under the responsibility of the Eastern River Basin District (ERBD). The TDR also extends into HA 09 Liffey and Dublin Bay as it approaches Kilcock. All of these hydrometric areas are also under the responsibility of Inland Fisheries Ireland (IFI).

The relevant waterbodies and the associated turbines, located within these waterbody catchments, for the turbine clusters within the proposed Maighne Wind Farm site are identified as follows:

Ballynakill

- EA_Boyne159BlackwaterLongwood_Blackwater1_Lower (T8, T10 and 1 No. Borrow Pit)
- EA_Boyne159Main_BoyneTRIB_Glash1_Lower (Access at Ballyonan only)
- EA_Boyne159Main_Boyne2 (T1, T2, T3, T4, T5, T6, T7, T9, a Temporary Compound and 1 No. Borrow Pit)

Windmill

- EA_Boyne159Main_BoyneTrib_Glash3_Upper (T24, T25 and T26)

Drehid-Hortland

- EA_Boyne159BlackwaterLongwood_BlackwaterTRIB_FearEnglish (T12, T14, T16, T17, T18, T19, T20, T21, T22, T23, a Met Mast and a Temporary Compound)
- EA_Boyne159BlackwaterLongwood_Blackwater2_Upper (T11, T13, T40, T41, T42, T43, T44, T45, T46, a Temporary Compound and the Substation)
- EA_Boyne159BlackwaterLongwood_BlackwaterTRIB_Deryvarroge (T15)
- SE_BarrowFigile_Cushaling (Drehid T47)

Derrybrennan

- SE_BarrowFigile_Figile_Upper (T28)
- SE_BarrowSlate_Slate
- SE_BarrowFigile_Cushaling (T27)

Cloncumber.

- SE_BarrowSlate_Slate (T29, T30, T32, T35, T37, T38, T39 and 1 No. Borrow Pit)
- SE_BarrowSlate_Cloncumber (T31, T33, T34, T36 and a Temporary Compound)

The TDR will cross a number of the above waterbody catchments in addition to the following waterbodies:

- EA_Liffey168Rye_RyeWater3_Upper
- EA_Boyne159Main_Boyne4_Upper

The MV cable route will cross a number of the waterbody catchments associated with the turbine layout in addition to the following waterbodies:

- EA_Boyne159BlackwaterLongwood_BlackwaterTRIB_Aleckafin
- EA_Boyne159Main_BoyneTRIB_Glash2_Mid
- EA_Boyne159Main_Boyne4_Upper

There are two potential HV cable routes, to connect Maighne Wind Farm to one of two proposed substation locations in either Woodland, Co. Meath or Maynooth, Co. Kildare.

The two routes are included in this assessment of the impacts on hydrology but only one route will be constructed. The two proposed routes and associated waterbody catchments are shown in Figure 9.1.

The proposed HV cable route from the sub-station at Drehid to the substation at Woodland will cross 12 waterbody catchments as follows:

- EA_Boyne159BlackwaterLongwood_Blackwater2_Upper
- EA_Boyne159BlackwaterLongwood_BlackwaterTRIB_FearEnglish (IE_EA_07_317)
- EA_Boyne159BlackwaterLongwood_Blackwater1_Lower (IE_EA_07_954)
- EA_Boyne159BlackwaterLongwood_BlackwaterTRIB_Ballycorron
- EA_Liffey168Rye_RyeWater3_Upper
- EA_Liffey168Rye_RyeWater2_Mid
- EA_Liffey168Rye_RyeWateTRIB_Brides
- EA_Liffey168Rye_RyeWateTRIB_Porterstown
- EA_Liffey168Rye_RyeWateTRIB_Carton
- EA_Tolka167_TolkaTRIB_DunboyneStream
- EA_Tolka167_Tolka2_Mid
- EA_Tolka167_TolkaTRIB_Batterstown

Of these 12 waterbody catchments, the Ballynakill cluster lies at the downstream end of the EA_Boyne159BlackwaterLongwood_Blackwater1_Lower waterbody and the Drehid-Hortland cluster also lies in the EA_Boyne159BlackwaterLongwood_BlackwaterTRIB_FearEnglish waterbody and the EA_Boyne159BlackwaterLongwood_Blackwater2_Upper waterbody.

The proposed HV cable route from the sub-station at Drehid to the substation at Maynooth will cross five waterbody catchments as follows:

- EA_Boyne159BlackwaterLongwood_Blackwater2_Upper
- EA_Boyne159BlackwaterLongwood_BlackwaterTRIB_FearEnglish
- EA_Boyne159BlackwaterLongwood_BlackwaterTRIB_Deryvarroge
- EA_Liffey168Rye_LyreenTRIB_Clonshanbo
- EA_Liffey168Rye_RyewaterTRIB_Lyreen1_Lower

Of these five waterbody catchments, the Drehid Hortland cluster also lies in the EA_Boyne159BlackwaterLongwood_BlackwaterTRIB_FearEnglish waterbody, the EA_Boyne159BlackwaterLongwood_Blackwater2_Upper waterbody and the EA_Boyne159BlackwaterLongwood_BlackwaterTRIB_Deryvarroge.

The national flood hazard mapping website, www.floodmaps.ie (4), indicates records of historical flooding, as can be seen on Figure 9.2. OPW Flood Maps, which is included in the Figures and Drawings in Volume 2a and Volume 3 Appendices of the EIS. The information in this figure is available to view in more detail in the sub maps, which are included in Volume 2a of the EIS.

There are agricultural drainage ditches, forest drains and stream courses running throughout the clusters. Some of the proposed access routes follow existing farm and forest tracks, which vary between 3.0m and 4.5m wide.

The proposed substation at Drehid is not within a 'Flood Zone A' area as indicated in OPW CFRAM PFRA mapping. Although the ground is quite flat at the location of the substation, it drains via forestry drains in a north easterly direction towards the River Blackwater. Some infrastructural tree-felling will be required to facilitate the location of turbines and associated access tracks on this site.

The existing tracks typically drain 'over the edge' into adjacent fields or into roadside drains. Streams and drains are piped or culverted across the existing farm tracks and entrances with pipes varying in size from 300mm to 1,200mm in diameter. A number of pluvial features were recorded on site, such as depressions in the landscape, which may be subject to seasonal ponding.

There is one Groundwater Source Protection Zone (SPZ), at Johnstown, within the proposed Maighne Wind Farm development as shown in Figure 10.3 Aquifer Classification Map Overview. The information in this figure is available to view in more detail in the sub maps, which are included in Volume 2a of the EIS. The well field at Johnstown Bridge was installed by Kildare County Council in the early 2000's for the abstraction of groundwater as a potable water supply. However, abstraction has never occurred and the well field remains undeveloped. The Source Protection Plan (12) for this well field and the GSI mapping shows 3 no. Inner SPZs and an Outer SPZ. The source protection plan states that the planned abstraction was from 7 no. production wells, with a combined output of 3.75 M l/day. There are 2 no. production wells in each of the eastern and western Inner SPZs and 3 production wells in the central Inner SPZ. While a site walkover of the area resulted in identification of 4 no. wells, the grid coordinates of the identified wells do not match those for the source protection wells. Plate 10.1 shows the 3 wells in the vicinity of T11. These are not labelled, covered or fenced off.

A number of elements of the proposed development are located within the Johnstown SPZ. These include:

- The Drehid electrical substation, 5 no. turbines (T11, T12, T13, T43 and T44) along with sections of access track, MV cables and HV cable are in the Outer SPZ
- A section of the proposed MV and HV cable route between Drehid and Hortland which runs along the local road (L-1004) is in the Inner and Outer SPZ at Dysart
- Section of the HV cable route through the Hortland portion of the Drehid-Hortland cluster, along with Turbine T45, its associated MV cable and access track are in the Inner SPZ.

An Outline Site Drainage Management Plan is presented in Section 4.3.3.

2.4 Ecological Conditions

Maighne Wind Farm lies primarily within North Kildare (2 proposed turbine locations are in South County Meath). The landscape of north Kildare is strongly influenced by the Bog of Allen resulting in a mosaic of various habitats from improved agricultural farmland to raised bog, cutover bog and forestry in various stages of its lifecycle. The subject site consists of 5 clusters of proposed turbines. Of these, two; located at the northern and southern extremity of the overall site are located in improved agricultural land, the remaining clusters are situated within or on the periphery of historical or existing raised bog basins. The majority of these basins 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 area is drained by a number of river catchments, primarily the Rivers Boyne and Blackwater (north) which drain the northern clusters of the proposed Wind Farm site whilst the River Slate and Figile (via the Cushaling and Crabtree Rivers) drain the southern clusters. Two canals, the Royal and the Grand transect the proposed development area. The M4 motorway also transects the greater area south of the northernmost cluster of proposed turbines which abuts the county boundary with Meath.

In total, there are 34 designated sites or proposed designated sites within 15km of the proposed development (see Table 7.10). Ten of these are Natura 2000 or 'European' sites. Of these 10 European sites, nine are candidate Special Areas of Conservation (cSACs) and one is designated as a Special Protected Area (SPA). It should be noted that a number of the cSAC sites are also designated as a Natural Heritage Areas (NHA). There are 20 proposed Natural Heritage Areas (pNHAs) and four additional, designated Natural Heritage Areas.

Two of the clusters within the proposed wind farm, Balinakill and Cloncumber are dominated by improved agricultural grassland and tillage. Proposed turbines at the Windmill cluster are to be located in bare peat under active extraction. The Drehid-Hortland cluster comprises a mosaic of both improved agricultural grassland and varying age classes of forestry. Most of the forestry is located in the historical basin of a raised bog and small remnants of active raised bog was identified outside the proposed cluster boundary. The proposed Derrybrennan cluster is located in improved agricultural grassland and tillage north of Lullymore. Linear habitats such as hedgerows and treelines form the majority of the field boundaries on site and drains are frequent. Aquatic habitats on site stem from smaller watercourses which flow adjacent to or through the Wind Farm site such as the Cloncumber Stream, the upper reaches of the River Blackwater and the Fear English River. No flora protection species (FPO) were recorded on site. The invasive *Rhodendron Ponticum* was recorded as being present within the Drehid-Hortland cluster.

Six terrestrial mammal species were recorded during the ecological surveys carried out at the proposed development. Desktop review of information available from the National Biodiversity Data Centre (NDBC) suggests species such as Badger, Irish Hare, Red Fox, Otter, Irish Stoat, American Mink, West European Hedgehog and Red Squirrel are all present within the 10km squares within which the proposed Maighne wind farm is located. Badger setts were located at a number of clusters during baseline surveys such as Ballinakill, Drehid-Hortland and Cloncumber. Otter evidence was present in suitable habitat throughout the proposed wind farm such as along the Slate River, the Fear English River and the upper reaches of the Blackwater. Evidence of American Mink, an invasive species was noted at a number of bridges along the proposed cable routes. All terrestrial mammal species recorded from the subject site are of 'Least Concern' on Ireland's Red List of terrestrial mammals.

The key locations of importance for bats in the local area include water bodies, watercourses, woodlands, treelines and hedgerows. Additional habitats include scrub and scattered trees. The bat fauna present onsite is typical of the habitats present, with the predominantly pasture grassland landscape providing a limited range of habitats. Faunal diversity is greater in areas dominated by semi-natural vegetation. Common and soprano pipistrelles were the most commonly recorded species onsite and were ubiquitous along hedgerows, treelines and the edges of forests throughout the area. Brown long-eared bat was encountered in several areas but this species may be present without being detected as it is a very quiet species and sometimes hunts without echolocating. 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 one the larger rivers in the area.

Wintering birds recorded at the subject site reflect the nature of the habitats present with general birds of open countryside predominating. Wintering species include Annex I species such as Golden Plover, recorded at a number of clusters and Whooper Swan, recorded in very low numbers at Cloncumber. Wintering Lapwing and Curlew were also noted. Breeding birds include Yellowhammer, a red listed species, which is found throughout the site in suitable habitat. Breeding wader records were dominated by species such as Snipe and Woodcock, reflecting the high proportion of forestry and cutover bog present. Raptors using the site include Buzzard (present in or proximal to every cluster), Kestrel and Peregrine. Evidence of an occupied Merlin territory at the Hortland portion of Drehid-Hortland was also found suggesting that the species may occur in suitable habitat outside the proposed site boundary (albeit in very low densities).

An Outline Habitat and Species Management Plan is presented in Section 4.3.4.

2.5 Archaeological Conditions

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.

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.

There are no recorded archaeological monuments within in the proposed Ballynakill cluster land parcel. Outside of the proposed development land parcel there are several monuments within a 2km radius of the site .There are two castle sites of which there are no upstanding remains within 1km of the turbine sites, in the townlands of Moyvally (KD001-005) and Calf Field (KD001-007, discussed above). In Moyvally the site of a castle (KD001-005) is located on prominently sited hillock in gently undulating pasture; there is no visible surface trace of the monument. Within 1km there is also an enclosure site (KD001-010) in Moyvally, there is no visible surface trace of this monument. There are no protected structures within the cluster land parcel.

There are no recorded monuments within the boundary of the Drehid-Hortland cluster, however the cluster has a significant bogland archaeological potential. There are several RMP sites in the farmland in the surrounding environment (1km and 1-2km radius).

The closest sites in the immediate vicinity of the wind turbines are at Mucklon, a habitation site (KD004-010, no upstanding remains), ringfort sites at Mulgeeth (KD004-011), Ballynamullagh (KD008-010), Coolree (KD004-008 and -009) and a ringfort and souterrain in Drehid (KD008-011001-/002) indicating that there was an early medieval population living at the very edges of the bog (Fig 14.6). These sites are all located within fields of pasture and are not publically accessible, they would have originally overlooked a dense bogland, the landscape that they are in now is very much altered, the bog has been afforested or cutover, there is no present day intervisibility between these ringfort sites.

There are fourteen recorded monuments within 1km of the Drehid-Hortland cluster. The majority of the sites are hidden beneath the bog and relate to the crossing of the bog (toghers, gravel trackways and peat land structures) and sites indicative of the early medieval settlement of the area on higher ground (i.e. five ringforts, a crannog, and two enclosure sites).

There is a crannóg site in Dysert (KD004-014001, NMI 1958: 1) c.800m north of T46 in the Drehid-Hortland cluster) it was discovered during drainage work at the confluence of a small north-easterly flowing stream with the northwest flowing River Blackwater. The site presents as an area of overgrown vegetation at the junction of local roads and is otherwise not legible or accessible.
There are no protected structures, NIAH sites or gardens within or in the immediate vicinity of the proposed Drehid-Hortland cluster.

There are no protected structures or sites of an architectural heritage significance located within 2km of the Derrybrennan cluster, the majority of structures of a recorded architectural significance are clustered and emanate from the main settlement centres in the area. Lullymore ecclesiastical site is located 2.3km to the south of the Derrybrennan cluster the site is subject to a preservation order (PO11/1972) and is as such a national monument Lullymore Monastic enclosure is also an RPS site (B12-01).

There are two recorded monuments within the Cloncumber cluster one of which is a redundant record and is recorded as a find spot of a saddle quern (KD017-040). The reason for its delisting is that while it is possible of being indicative of habitation, it is classified in the record as an artefact and its find spot was subsequently 'delisted' from the RMP in 1995. The other site is a ringfort (KD017-004, described above) just 60m west of T33 which is described as located on a low, gently sloped, east-west pasture ridge in an extensively cleared and now huge field, surrounded by bog to the northwest through to the southeast.

There are five RMP sites that lie outside the wind farm cluster land parcel but within 1km of the turbines a moated site, two ringforts and two enclosure sites.

There are two protected structures, both metal footbridges (RPS B17-05A and B17-05B) over the Slate River on and just within the northern site boundary of the cluster. They are said to belong to a former mass path and locals say that the footbridges provided access from the barracks at Lullymore to the chapel at Allen, there is no indication that this path still survives.

An Outline Archaeological Management Plan is presented in Section 4.3.5 of this CEMP.

3. OVERVIEW OF CONSTRUCTION WORKS

3.1 Description of the Proposed Development

It is proposed to construct a wind farm comprising of up to 47 wind turbines with a maximum tip height of up to 169m to be developed and connected to the Irish grid for domestic purposes. The exact output cannot be specified at this stage as the turbine model has not been chosen. The energy produced from the wind farm will be connected to the Irish National Grid. However, throughout the EIA process, consideration of environmental impacts of the proposed development is based on the largest possible size of development. The choice of turbine model will not affect the assessment of impacts outlined. The exact make and model of the turbine will be dictated by the energy production efficiencies of various turbines on the market at the procurement stage, but will not exceed the maximum size envelope set out within the development description.

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

In summary the development includes:

- 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 8 no. site entrances from public roads
- Construction of approximately 31km of new site tracks and associated drainage
- Upgrade of approximately 10km of existing tracks and, where required, upgrade of associated drainage
- Excavation of 3 no. borrow pits
- 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 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 (29km) or the existing substation at Maynooth, Co. Kildare (23km)
- Joint bays along the cable route
- Underground communication cables
- 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.

The proposed layout is shown in Figure 2.1.

3.2 Site Layout

The site layout for the proposed turbines, substation, borrow pits and access roads is shown on Figure 2.1 and on the planning drawings.

3.3 Construction Period

The construction period for the proposed development has been estimated in the region of 23 months, i.e. inclusive of all works to site roads, access routes, on-site cabling, substation building, grid connection works and installation and commissioning of turbines. The layout of the site lends itself to clearly defined phases (civil construction, MV cables, HV cables, turbines, on-site substation) where the various work elements can overlap without a significant increase in local traffic movements or congestion on site. There is likely to be some overlap with civil works and turbine erection, and also with turbine erection and commissioning. It is estimated the following civil and electrical works will be completed:

- Temporary site compound
- Site entrances
- New river crossings
- New site roads
- Upgrade to local roads
- Cable trenching and ducting
- Cable pulling
- Turbine foundations and hardstands
- Turbine delivery, installation and energisation
- Electrical compound and substation buildings.

The final programme will be developed post planning in consultation with the turbine manufacturer and the main construction contractor, based on projected turbine delivery dates. All recommendations and mitigation measures relevant to the construction phase as identified in this EIS, or by the Department of the Environment, Community and Local Government Wind Farm Planning Guidelines and recommended by the Planning Authorities, will be implemented.

3.4 Overview of the Construction Sequence (Preliminary Only)

The following section outlines the construction methodology for the proposed Maighne Wind Farm development. In the event that the Board decides to grant planning permission for the proposed development, peat excavation (where required), upgrading of existing site tracks and the provision of new site tracks will precede all other activities. Drainage infrastructure will be constructed in parallel with the track construction. Typically this will be followed by tree felling (where required) and the construction of the turbine foundations and the provision of the hardstanding areas. In parallel with these works the on-site electrical works; sub-station and internal cable network and off-site connection works to the EirGrid substation at Maynooth or Woodland will be completed.

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

3.4.1 Overview of the Construction Methodology (Preliminary Only)

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

The proposed construction methodology is summarised under the following headings:

- Site entrances
- Temporary site compounds
- Upgrade of existing roads

- New Access roads
- Borrow pits construction
- Crane hardstands
- Turbine foundations
- Micro-siting
- Substation buildings and compound
- MV trenching
- HV trenching
- Electrical works
- Turbine erection

Prior to any groundwater wells identified in the source protection plan (14) will be located and flagged. Site walkovers determined that fencing is not currently in place at any of the wells as they are not in use. Where wells are located posts will be erected and a 10 m x 10 m area taped off around them.

No materials will be stored adjacent to the wells. Concrete wash out areas will be located outside of the SPZ in the temporary construction compound to the south of the Drehid cluster.

Site Entrances

Prior to the commencement of any other works, the site entrance layouts will be constructed. 5 existing site entrances that shall be upgraded and an additional 4 site entrances shall be constructed. Visibility splays will be provided for the relevant design speed i.e. for 80km/hr, a 160m visibility splay from carriageway edge is required.

Temporary Site Compound

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

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

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

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

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

Concrete Wash-Out Area

It is proposed that all concrete batching will be done off-site at an authorised quarry/pit.

Concrete trucks delivering to the site must use the dedicated wash-out areas to be located within the temporary construction compounds prior to leaving the site. The concrete wash-out area will be constructed as follows:

- The topsoil and subsoil, if necessary, will be stripped out and placed adjacent to the temporary compound area

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

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

There are two temporary construction compounds located within the Drehid-Hortland cluster. The most northern construction compound is located between T11 and T12 within the Outer Source Protection Zone (SPZ) of the Johnstown well field. As a result, no concrete wash-out area shall be permitted at this temporary construction compound. Concrete trucks delivering concrete to the Drehid-Hortland cluster must use the dedicated wash-out area located within the temporary construction compound at the southern end of this cluster, which is located to the southeast of T23.

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

Upgrade of Existing Internal Access Tracks

Where suitable it is proposed to utilise the existing network as much as possible. The access tracks to be upgraded and widened from approximately 3m to approximately 4.5m where required. The typical road widening details of the site roads are detailed on Figure LE1473104_FIG_004 Construction Details for New & Upgraded Access Tracks which is included in Appendix 4.

New Site Access Tracks

Drainage runs and associated stilling ponds will be installed. All site access tracks will be designed taking account of the loadings required by the turbine manufacturer, and will consist of a compacted stone structure. Material for the sub-base and base course of the tracks may be sourced from borrow pits within the site if suitable. Capping material may also be available however this will be subject to testing during construction. Some material for road construction may be imported or transported from one section of the site to another. All delivery truck movements between sites and from external sources will follow predefined haul routes as agreed with local authorities.

All roads on the site will be constructed using the traditional road construction method from suitable load bearing strata. This system will consist of either one or two layers of stone depending on the load bearing capacity of base layer. Where the underlying layer is mineral subsoil, two layers of stone are used; a stone capping layer and running layer. In areas where the load bearing layer is rock, the capping layer is omitted, and the running layer is installed directly onto the rock surface.

The typical road widening details of the site roads are detailed on Figure LE1473104_FIG_004 Construction Details for New & Upgraded Access Tracks which is in Appendix 4. Road construction details are likely to be as follows:

- Establish alignment of the new site roads from the construction drawings and mark out the centrelines with ranging rods or timber posts
- The access roads will be of single-track design with an overall width of approximately 4.5m. There will be some local widening on the bends, junctions and around Turbine foundations for the safe passage of large vehicles. All bends have been designed to suit the requirements of the delivery vehicles
- All machinery shall work within the construction corridors that will be indicated on the contract drawings. Vehicle movement will be restricted to site access roads and agreed haul routes. Topsoil/subsoil will be stripped back to required levels. All material will be bunded, stored separately and covered
- The soil will be excavated down to a suitable formation layer of either firm subsoil or rock

- Well-graded granular fill will be spread and compacted in layers to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be decided by the Site Manager based on the characteristics of the material and the compaction plant to be used
- Batters will have a slope of between 1:1 and 1:2 (depending on depth and type of material) and will be left as cut to re-vegetate naturally with local species.

Details of typical new forestry track are detailed on Figure LE1473104_FIG_005 Typical New Forestry Track which is included in Appendix 4.

Cable Trenches

Initially the contractor will excavate cable trenches and then lay high density polyethylene (HDPE) ducting in the trench in a surround of CBM (cement bound material). A rope will be inserted into the ducts to facilitate cable-pulling later. The as-constructed detail of the cable duct locations will be carefully recorded. Cable marker strips will be placed 75mm above the ducts and the two communication ducts will also be laid. An additional layer of cable marker strips will be laid above the communication ducts and the trench back-filled. Back-filling and reinstatement in public roads will be to a specification to be agreed with the relevant road authority.

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

Borrow Pit Construction

The onsite borrow pits are an essential aspect of the development as they will be used, where possible, to source suitable (and local) rock fill which will be used for the construction of the various roads, turbine bases and hardstanding areas. The locations of the three proposed borrow pits are shown on the planning drawings.

The borrow pits will be developed in line with the following outline methodology, which may be subject to change following the appointment of the contractor for the main construction works:

1. The access roads will be prepared to the borrow pit locations in line with the methodology described in Section 3.5.3 and 3.5.5 above
2. The extent of the works areas shall be accurately delineated using stakes and rope to prevent works being carried out outside the agreed areas. Stock proof fencing shall be installed around the borrow pits in advance of any works taking place
3. A bespoke method statement shall be drawn up by the contractor for the main construction works shortly before the works take place
4. Once the borrow pits have been outlined and fenced off, the drainage infrastructure shall be installed as per the Site Drainage Management Plan in Section 4.3.3 of this CEMP
5. After drainage infrastructure has been put in place, the main excavation works will commence. The excavation works will commence by stripping the topsoil material. Due to the possibility of soil-borne diseases, all topsoil recovered from each farm property will remain on the same property. Where a property includes a borrow pit, some of the topsoil will be used to help in the reinstatement and re-vegetation of the borrow pit. Any surplus topsoil will be used for local landscaping
6. Excavation works will be carried out by the following means at the borrow pits:
    a. Conventional excavators (using buckets) to excavate and load dumper trucks
    b. Rippers mounted on conventional excavators to ‘rip’ the rock where appropriate
    c. Rock breakers
7. Excavation activities will be conducted in a phased manner to minimise dust emissions
8. Excavated rock will be loaded onto dumper trucks and transported to the required area for tipping and placement e.g. when building the access roads
9. When the borrow pits have been exploited they shall be closed and reinstated using surplus soil or rock excavated from elsewhere on the site as described in the EIS and in the Outline Site Reinstatement Plan. Generally the borrow pits, once reinstated, shall be covered with topsoil and allowed to re-vegetate naturally. However, appropriate measures will be taken if it is found that natural re-vegetation is too slow or if the area is being taken over by inappropriate species
10. Noise, dust and site drainage mitigation measures shall be implemented as described in the EIS and in Section 4.3.3 of this CEMP.

Crane Hardstands

All crane pads and associated splays will be designed taking account of the loadings provided by the turbine manufacturer, and will consist of a compacted stone structure.

All crane pads will be formed from a suitably stiff layer and the finished crane pad surface will provide a minimum bearing capacity of up to 260kN/m^2. Piled/floated construction using geo textiles will be used where the ground bearing pressures cannot be reached.

Crane pad and associated splay formation will consist of either 1 or 2 layers of suitable fill material depending on the properties of the underlying load bearing layer. Where the underlying layer is soft soil, 2 layers of suitable fill formation are used and the stone capping layer. In areas where the load bearing layer is rock, the capping layer is omitted, and the running layer is installed directly onto the rock surface. The crane pads are approximately 30m x 50m and have a maximum cross and longitudinal fall tolerance of 3%.

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

- Typical excavation method
- Piled/Floated hardstand method.

The typical excavation method can be summarised as follows:

Typical Excavation Method:

- Establish alignment of the hardstands from the construction drawings and mark out the corners with ranging rods or timber posts
- The excavated material will be stored close to the hardstand or taken back to the borrow pits. Topsoil and subsoil stockpiles will be formed and the side compacted to prevent silt run off during heavy rain or air bourn dust during dry periods
- Drainage runs and associated settlement ponds will be installed
- The soil will be excavated down to a suitable formation layer of either firm clay or rock
- Suitable granular fill will be spread and compacted in layers to provide a homogeneous running surface
- Batters to have a slope of between 1:1 and 1:2 (depending on depth and type of material) and will be left as cut to re-vegetate naturally with local species.

Piled/Floated Hardstand Method:

Floating/piled construction will be adopted where the site investigation has revealed the depth of unsuitable sub-formation is such that it is not suitable to be excavated. Piling will mitigate against the excavation soft material thereby avoiding excessive volumes of unusable material. This system involves:

- Installing a layer of geo-grid directly onto of the existing ground
- Placement of a layer of well graded course stone to level the platform
- Application of further layers of geo grid (if required)
- Laying the final layer of a finer well graded stone for the running surface.

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

Turbine Foundations

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

- Submerged foundation design.
- Non Submerged Foundation design.

Turbine foundations will be designed to Eurocode Standards. Foundation loads will be provided by the wind turbine supplier, and factors of safety will be applied to these in accordance with European design regulations. The turbine will be anchored to the foundation as per the turbine manufacturer's guidelines which will be incorporated in the civil foundation design. The shape and size of the foundation can vary in size and shape up to approximately 25m x 25m.
The turbine foundations will be constructed as follows:

Standard Excavated Reinforced Concrete Base:

a) The extent of the excavation will be marked out and will include an allowance for trimming the sides of the excavation to provide a safe working area and slope batter
b) The excavated material will be stored at agreed locations close to the base. Topsoil and subsoil stockpiles will be formed and the side compacted to prevent silt run off during heavy rain or air bourn dust during dry periods. The subsoil material will be used as backfill and the topsoil will be used for landscaping around the finished turbine post construction
c) Storage areas will be stripped of vegetation prior to stockpiling in line with best working practises
d) Around the perimeter of the foundation formation a shallow drain will be formed to catch ground water entering the excavation. The drain will direct the water to a sump where it will be pumped out to a settlement pond away from the excavation
e) A layer of concrete blinding will be laid approximately 75mm thick directly on top of the newly exposed formation, tamped and finished with a screed board to leave a flat level surface
f) High tensile steel reinforcement will be fixed in accordance with the designer's drawings & schedules. The foundation anchorage system will be installed, levelled and secured to the blinding using steel box section stools
g) Ductwork will be installed as required, and formwork erected around the steel cage and propped from the backside as required
h) The foundation anchorage system will be checked both for level and line prior to the concrete being installed in the base
i) Concrete will be placed using a concrete pump and compacted using vibrating pokers to the levels and profile indicated on the construction drawings
j) Upon completion of the concreting works the foundation base will be covered from the elements that could cause hydration cracking and or delay setting in any way
k) Steel shutters will be used to pour the upper plinth section
l) The foundation will be backfilled with a cohesive material, where possible using the material arising during the excavation and landscaped using the top-soil set-aside during the excavation. A gravel footpath will be formed from the access road to the turbine door and around the turbine for maintenance.

Reinforced Concrete piled foundations:

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

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

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

Design and Construction of the Foundation and Hardstanding for Turbine T44 & T45

A permanent sheet pile 'cut-off' wall will be installed around the turbine foundations of T45 and T44 (owing to its close proximity to the inner protection zone). It will prevent alkali leakage into the SPZ during gravity reinforced concrete foundation construction. The sheet pile 'cut-off' wall will be toed sufficiently deep into the overburden and will form an enclosed 'cofferdam' to prevent fluid circulation or loss from under the turbine foundation, when subjected to wind pressures from the turbine, to the surrounding aquifer.

If a piled foundation is required at this location, cementitious fluid loss during pile construction will be mitigated by the use of precast piles or with the provision of temporary steel lining or casing over the full length of each pile through granular soils. A perimeter 'cut-off' wall around the turbine foundation site will also be provided, as described above.

Excavation flooding will be prevented by controlled pumping to transportable containers/holding tanks. The water collected in this tank with be tested and following agreement with Kildare County Council, will be discharged under licence or alternatively transported off-site for treatment/disposal.

Groundwater monitoring and testing will be carried out throughout the foundation phase of the works.

Micro-Siting

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

Substation and Compound

The compound surrounding the substation will measure approximately 112.5m x 85m. The compound will include substation buildings which will be divided into the wind farm control building and the switchgear housing. The buildings main functions are to provide housing for switchgear, control equipment and monitoring equipment necessary for the proper functioning of the substation and wind farm. The substation will be constructed on an impermeable hardstanding. The buildings will be constructed by the following methodology:

- The area of the control buildings and compound will be marked out using ranging rods or wooden posts and the vegetable soil stripped and removed to the nearby storage area for later use in landscaping. Storage areas will be stripped of vegetation prior to stockpiling in line with best working practices
- Drainage runs and associated settlement ponds will be installed. Further details of the drainage design are included in Section 4.3.3 of this report.
- The dimensions of the Building and Compound area will be set to meet the requirements of EirGrid/ ESB and the necessary equipment to safely and efficiently operate the wind farm
- The foundations will be excavated down to the level indicated by the designer and concreted
- The blockwork will then be raised to wall plate level and the gables & internal partition walls formed. Scaffold will be erected around the outside of the building for this operation
- The concrete roof slabs will be lifted into position using an adequately sized mobile crane
- The wooden roof trusses will then be lifted into position using a telescopic load all or mobile crane depending on site conditions. The roof trusses will then be felted, battened, tiled and sealed against the weather.

The remainder of the substation compound will be brought up to the agreed formation and approved stone imported and graded to the correct level as per the detail design. Following the construction of the hardstanding an earth mat will be installed throughout the compound.

The substation will accommodate the following main equipment:

1. Independent Power Producer (IPP), i.e. the wind farm, control building including 33kV indoor switchroom: This will consist of a single storey masonry building with a pitched roof. The building will contain a meeting room, a small workshop/spares room, a relay room to house control cabinets, a WC and a 33kV indoor switch room
2. HV/33kV Transformer: The main transformer will increase the voltage from 33kV to the specified HV. It will be an oil immersed type transformer with cooling fans and an oil storage tank. The transformer and the oil storage tank will be bunded
3. EirGrid control building: The EirGrid control building will consist of a meeting room, a relay room, a small office and a WC
4. Harmonic filtering equipment: Harmonic filtering equipment may be required to supress non system voltages generated by the HV cable connection to either Woodlands or Maynooth substation. This will be subject to further system studies as the project develops
5. HV Air Insulated Switchgear (AIS) transformer switchgear bay: The switchgear bay consists of disconnector switches, circuit breakers and measuring equipment and allows the transformer to be isolated from the rest of the substation
6. HV AIS cable switchgear bay: The switchgear bay consists of disconnector switches, circuit breakers, measuring equipment and cable terminations and allows the cable to be isolated from the rest of the substation
7. HV Harmonic Filter switchgear bay: The switchgear bay consists of disconnector switches, circuit breakers and measuring equipment and allows the harmonic filter to be isolated from the rest of the substation
8. HV Double busbar: The busbar consists of three elevated aluminium tubes and is supported along its length by vertical insulators mounted on steel supports
9. Lightning protection masts: High level lightning protection masts will be required around the substation in order to prevent lightning strikes from damaging the HV equipment. Lightning protection rods may also be installed high on the gable ends of the control buildings to protect the equipment within these buildings
10. Diesel Generator: A diesel generator will be required to provide back-up electricity supply to the control rooms and site lighting. It will be bunded
11. Ancillary equipment (house transformers, lighting, telecoms aerials/receiver dishes, cooling fans and similar items, metering equipment, power quality equipment) as may be required by ESB/EirGrid for the operation of the wind farm and substation
12. Permanent parking
13. All necessary fuels and oils will be stored in a dedicated bunded area.

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

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

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

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

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

A sealed drainage system will be provided, extending past the area of significance i.e. concrete dished channels with a kerbed perimeter at the substation hardstanding. The concrete dished channels will drain to a stilling pond, located 200m from the Inner SPZ, which will in turn drain via forestry drains to the receiving watercourse, which is at a distance of 1km from the location of the substation.

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

Internal Cable Trenching

Depending on the final design cables between the turbines and the nearest public road and/or the Maighne substation at Drehid could be either be ducted or be direct buried except where they cross trafficked areas, in which case the cable will be ducted. The line of the cable trench will run beside the site access roads until it exits to the public road. The ground will be trenched typically using a mechanical digging machine. The top layer of soil will be removed and placed to one side. It will be used for landscaping the top of the backfilled cable trench following the laying of the cables. The remaining subsoil, excavated to the required depth, will be placed separately and used as backfill. The cables will be laid directly onto a bed of suitable material, free from sharp stones and debris. A suitable material will be spread over the top of the cables to protect them during backfilling. The cables will be backfilled to EirGrid/ESB standard specification for LV/MV installations. On completion, the ground will be reinstated and marker posts will be positioned at agreed centres to the side of the trench highlighting the presence of electric cables below.

Trenches will vary in width depending on the number of cables in the circuit. Where there is more than one set of cables they will be separated as per cable manufacturers and ESB/EirGrid requirements. Small jointing pits will be located along the route of the trench which will be left open until jointing takes place. A protective handrail/ barrier will be placed around each pit for Health and Safety reasons.

The cables will be terminated on the transformers at each turbine location and at the substation switchgear. Ducts will be cast into each foundation to provide access for the cables into the turbine. Likewise at the substation, ducts will be cast through the building foundation to provide access for the cables.

Cable Trenching within Public Roads

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

Records of services such as watermains, sewers, gas mains and other power cables will be obtained from the relevant service providers. Cable detection tools, ground penetrating radar and slit trenches will be used, as appropriate, to find the exact locations of existing services. The final locations of the cable trenches will be selected to minimise conflicts with other services. It is desirable that a minimum separation distance of 300mm will be maintained with existing services where the cables are to be laid near or crossing existing services. Usually the new cables will be laid below existing services.

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

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

Once the cables are joined and sealed the jointing container will be removed and the cables at the joint-bay locations will be back-filled in the same manner as the rest of the cable trench.

Cement Bound Material within Cable Trenches

Initially the contractor will excavate cable trenches and then lay high density polyethylene (HDPE) ducting in the trench in a surround of CBM (cement bound material) in roads which have good road foundations, more flexible surrounding materials such as granular fill will be selected for cables to be laid in bog roads. A rope will be inserted into the ducts to facilitate cable-pulling later. The as-constructed detail of the cable duct locations will be carefully recorded. Cable marker strips will be placed 75mm above the ducts and the two communication ducts will also be laid in the trench.

An additional layer of cable marker strips will be laid above the communication ducts and the trench back-filled. Back-filling and reinstatement in public roads will follow consultation with Kildare and Meath County Councils, as appropriate.

Electrical Works

Substation and switchgear: - The substation will have a domestic electrical system including lights, sockets, fire alarm and intruder alarm. The high voltage switchgear is usually installed using a truck mounted hydraulic crane. The indoor equipment is then connected, wired tested and commissioned. The equipment will be decommissioned in the reverse of the above, removed from site, dismantled and disposed of in an approved manner.

Transformers: - The turbine transformers will be placed directly onto the turbine foundation upon delivery to site, prior to the installation of the turbine towers. The transformers will be of the sealed type and will be inspected for any damage prior to offloading. It is likely that the units will be installed using a small mobile all-terrain crane and will be tested, commissioned and energised by suitably trained and authorised persons. The accessible MV and LV sections of the transformer will be protected within an enclosure which shall be locked at all times displaying appropriate warning signs. The units will be decommissioned in the same manner, removed from site and disposed of by a company certified to handle such materials. This specialist company will also dispose of any oil or residual waste products.

Turbine Erection

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

- Foundation anchors x 1
- Towers x 4/5
- Blades x 3
- Hub x 1
- Nacelle x 1
- Switchgear Components x 1

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

3.5 Construction Working Hours

The hours of construction activity will be limited to avoid unsociable hours as per Section 8.5 (d) of the code of practice for BS 5228: Part 1: 1997. Construction operations shall generally be restricted to between 08:00 hours and 19:00 hours Monday to Saturday. It should be noted that it may be necessary to commence turbine base concrete pours earlier due to time constraints incurred by the concrete curing process. Work on Sundays or public holidays will only be conducted in exceptional circumstances or in an emergency. Additional emergency works may also be required outside of normal working hours as quoted above. This work, if required, will be agreed through notification and consultation with the affected parties as deemed necessary.

4. ENVIRONMENTAL MANAGEMENT PLAN

4.1 Introduction

This environmental management plan (EMP) defines the work practices, environmental management procedures and management responsibilities relating to the construction of the proposed Maighne Wind Farm.

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

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

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

4.2 Project Obligations

In the construction of the proposed Maighne Wind Farm development there are a number of environmental management obligations on the developer and the contractor. As well as statutory obligations, there are a number of specific obligations set out in the EIS. These obligations are set out below. When planning is granted, there are also likely to be planning conditions, with which the developer must comply. This outline CEMP will be updated following the completion of the planning phase to incorporate these obligations. The contractor and all of its sub-contractors are to be fully aware of and in compliance with these environmental obligations.

4.2.1 EIA Obligations

The EIS identified mitigation measures that will be put in place to mitigate the potential environmental impacts arising from construction of the project. These mitigation measures are set out in full in Appendix 1.

4.2.2 Planning Permission Obligations

Should the proposed development be granted planning permission, the conditions of the planning grant issued will be adhered to.

4.2.3 Felling Licence

As outlined in the EIS, portions of the proposed Maighne Wind Farm development will require infrastructural tree felling and a tree felling licence will need to be in place before any such felling can take place. The developer will apply to the Forestry Service for a Felling Licence, taking cognisance of the Forest Service Policy on the Granting of Felling Licences for Wind Farm Development, 2011.

No tree felling will take place until the Felling Licence is in place and all felling will take place in accordance with the conditions of the Felling Licence. Further details are provided in Chapter 10 of Volume 2 of the EIS.

4.2.4 Other Obligations

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

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

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

4.3 Environmental Management Programme

4.3.1 Noise, Vibration, Dust and Air Control

Noise and Vibration Control

Noise will be generated from inter alia heavy earthmoving plant, excavation and rock breaking operations. The main control measure will be the suppression of noise at source by the use of plant and equipment in good working order, new or for all other plant with a full maintenance schedule. All plant operatives will contact their foremen in the event that their machine becomes defective with resulting high noise emissions. The foreman as part of his weekly physical inspection will check the mechanical state of all plant with the fitter. Any defective plant will be kept out of service until the necessary repairs are done.

To mitigate against the impact of noise and vibration on the local community during construction, the following measures are proposed:

- Consultation with the local community is important in minimising the likelihood of complaints and therefore construction will be undertaken in consultation with the local authority as well as the residents being informed of construction activities through a community liaison group. Working hours at the site during the construction phase will generally be limited to 08:00 hours to 19:00 hours Monday to Saturday inclusive. Work on Sundays or public holidays will only be conducted in exceptional circumstances or in an emergency. However, to ensure that optimal use is made of fair weather windows, or at critical periods within the programme, it could occasionally be necessary to work outside these hours. Any such out of hours working would be agreed in advance with Kildare County Council and/or Meath County Council
- Construction contractors will be required to comply with the requirements of the European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations, 1988 as amended in 1990 and 1996 (S.I. No. 320 of 1988, S.I. No. 297 of 1990 and S.I. No. 359 of 1996), and the Safety, Health and Welfare at Work (Control of Noise at Work) Regulations, 2006 (S.I. No. 371 of 2006)
- The noise impact for construction works traffic would be mitigated by generally restricting movements along access routes to the standard working hours and exclude Sundays, unless specifically agreed otherwise. For example, during turbine erection, an extension to the working day may be required, i.e. 0500 to 2100, but this would be necessary only on a relatively small number of occasions. If turbine deliveries are required at night it would be ensured that vehicles on local roads do not wait outside residential properties with their engines idling, and that the local residents will be informed of any activities likely to occur outside of normal working hours.

The main control measures will be the control of noise at source using the following methods in line with Clause 8 'Control of Noise' of BS 5228:2009:

- Operators of all mobile equipment will be instructed to avoid unnecessary revving of machinery (Clause 8.2.1 General)
- Use of appropriate plant and equipment where possible with low noise level generation where possible (Clause 8.2.2 Specification and Substitution)
- All construction traffic to be used on site should have effective well-maintained silencers (Clause 8.2.3 Modification of Existing Plant and equipment)
- Temporary barriers or screens will be erected if necessary around noisy equipment such as generators and compressors (Clause 8.2.4 Enclosures)
- Noise generating equipment will be located as far as possible away from local noise sensitive areas (Clause 8.2.5 Use and Siting of equipment)
- Regular and effective maintenance of site machinery including a full maintenance schedule ensuring all pieces of equipment are in good working order (Clause 8.2.6 Maintenance).

In addition, the following best practice measures are proposed:

- Training of site staff in the proper use and maintenance of tools and equipment
- The positioning of machinery on site to reduce the emission of noise to offsite receivers and to site personnel
- Avoidance of unnecessary noise when carrying out manual operations and when operating plant and equipment
- Sources of significant noise will be enclosed where practicable
- Machines such as cranes that could be in intermittent use will be shut down between work periods or will be throttled down to a minimum
- Plant start-up will be sequential rather than all together
- Internal haul roads to be well maintained
- Plant known to emit noise strongly in one direction will, when possible, be orientated so that the noise is directed away from noise-sensitive locations
- Drop heights for material such as gravels will be minimised whenever practicable
- Plant and/or methods of work causing significant levels of vibration at sensitive premises will be replaced by other less intrusive plant and/or methods of working where practicable.

Operational noise monitoring will be carried out in compliance with the anticipated noise planning condition. Noise modelling undertaken for the EIS suggests that the noise levels will be compliant with current guidelines. Should non-compliance occur, the turbines will be adjusted as necessary to achieve compliance.

Complaints regarding noise will be entered into the site complaints log and the relevant site environmental officer will arrange to meet with those affected. The situation will be acted upon immediately and reviewed by the Project Manager. If nuisance is occurring then the project manager will decide what action is necessary to reduce to acceptable levels or eliminate the disturbance.

Dust and Air Quality Control

The principal source of air emissions during the construction of the proposed wind farm will be dust arising from earthworks, 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.

The amount of dust generated and emitted from a working site and the potential impact on surrounding areas varies according to:

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

The earthworks foreman will inspect the haul road as part of his daily supervision of the site. If dust nuisance arises, a water bowser will be engaged. Complaints in relation to dust will be entered into the site complaints log and the relevant site environmental officer will arrange to meet with those affected. The situation will be acted upon immediately and reviewed by the Project Manager.

In the unlikely event that dust situation be such as to pose a hazard to site traffic or others then the Project Manager will decide whether to cease operations in the area impacted or whether a second bowser is required.

The control measures that will be implemented, where necessary, during the construction phase of the wind farm to address the potential impact of dust and particulate pollution are as follows:

- The internal access roads and internal haul roads will be constructed prior to the commencement of other major construction activities. These roads will be finished with graded aggregate
- A water bowser will be available to spray work areas and haul roads, especially during periods of excavations works coinciding with dry periods of weather, in order to suppress dust migration from the site
- In relation to the borrow pits, the following will be implemented:
    - Topsoil removed from each pit will be temporarily stored in designated areas adjacent to the pits. These stockpiles will be damped and covered
    - Access to each borrow pit will be controlled through one dedicated access/egress location which limit the movement of vehicles within each borrow pit. Speed limits will also be enforced along this access tracks
    - Excavation of each pit will be conducted in a phased manner with the actual working area from which material is being extracted minimised
    - Excavation activities will stop during periods of strong winds
    - Material will be loaded onto covered vehicles (sheeted) or damped for transport
    - Backfill/restoration of the pits will commence as soon as practicable and will be re-seeded immediately upon completion
- All loads which could cause a dust nuisance will be covered to minimise the potential for fugitive emissions during transport
- All other stockpiles will be kept damp and covered to prevent windblown dust emissions
- The access and egress of construction vehicles will be controlled to designated locations, along defined routes, with all vehicles required to comply with onsite speed limits
- Construction vehicles and machinery will be serviced and in good working order
- Wheel washing facilities will be provided at the entrance/exit point of each cluster
- The developer in association with the contractor will be required to develop and implement a dust control plan. This plan will address aspects such as excavations, haul roads and borrow pits, temporary stockpiling and restoration works. The plan will be prepared prior to any construction activities and will be established and maintained through the construction period. It will be submitted to Kildare and Meath County Councils for approval.

Decommissioning Phase

If the removal of access tracks from the wind farms as part of decommissioning is required, dust mitigation measures, similar to those outlined under 'construction mitigation measures' will be put in place to reduce dust nuisance.

4.3.2 Outline Soil Management Plan (incl. ground stability)

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

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

Material Balance and Storage

Ballynakill

The total quantity of soil to be excavated at the Ballynakill cluster from tracks, hardstandings, turbine bases, compounds, substations, drainage ponds and swales is estimated to be approximately 46,175m^3. Of this, approximately 13,795m^3 will be topsoil which will be used mainly for landscaping of trackside berms, borrow pits, around turbine bases, hardstanding and compounds, and approximately 32,380m^3 is subsoil which will be used for reinstatement of the Ballynakill borrow pits (along with some of the topsoil if recovered from the same farm property as the borrow pit and about 40,889m^3 of subsoil from the other clusters).

Preliminary calculations show that the amount of aggregate required for the construction of the Ballynakill cluster will be of the order 45,965m^3 (29,721m^3 from borrow pits and 16,244m^3 imported aggregate including sand but excluding concrete containing aggregate) as shown in Table 8.14 of Chapter 8 – Soils and Geology of the Volume 2 of the EIS. It is proposed that the site won material will be sourced from the on-site borrow pits at Ballynakill. The total surface area of these two proposed borrow pits is of the order 45,109m^2. The maximum depth of excavation proposed at the borrow pits is 4m, with an estimated useable depth of about 3.0m. The borrow pits will therefore supply up to 135,327m^3, giving an aggregate surplus of about 102,606m^3, some of which will be used to supply aggregate to other wind farm clusters.

Windmill

The total quantity of soil to be excavated is estimated to be approximately 19,856m^3, most of which will be peat. It is intended that this material will be spread over the existing worked bog within a level area to the east of T24 which has been extensively worked in the past.

It is intended to temporarily place the excavated peat to a depth of approximately 1m over an area of approximately 20,000m^2 at the location shown in Figure 8.5.2 of Volume 2a of the EIS. This material will then be removed and processed along with the adjacent areas of peat which will continue to be worked after construction of the wind farm.

Preliminary calculations show that the amount of aggregate required during construction will be in the order of 35,367m^3 as shown in Table 8.15 of Chapter 8 – Soils and Geology of the Volume 2 of the EIS. It is proposed that most of this material will be sourced from the Ballynakill or Cloncumber cluster borrow pits (approximately 30,166m^3), however some surfacing and structural aggregate may also need to be sourced from local quarry sources (approximately 5,201m^3). These volumes do not includes volumes of concrete for turbine bases (approximately 2,400m^3 in total) which will also contain imported aggregate as shown in Table 8.15 of Chapter 8 – Soils and Geology of the Volume 2 of the EIS.

Drehid-Hortland

Due to the possibility of soil-borne diseases, all topsoil/peat recovered from each farm property will remain on the same property. Topsoil will be used for landscaping berms alongside existing and new access tracks where suitable and will also be used for reinstatement purposes around turbines bases and hardstandings. Subsoil and surplus/unsuitable rock material from the excavations will be used for reinstatement of the borrow pits at Ballynakill and Cloncumber. Some temporary stockpiles of material will be necessary adjacent to the excavations prior to transport, however no permanent stockpiles of material will remain after construction.

The total quantity of soil to be excavated from tracks, hardstandings, turbine bases, compounds, substations, drainage ponds and swales at Drehid-Hortland is of the order 135,052m^3. Of this, approximately 88,459m^3 will be peat and topsoil which will be used mainly for landscaping purposes at the cluster and approximately 46,593m^3 is subsoil which will be partially used for sub-base for tracks and hardstanding (if acceptable) and partially used for reinstatement of the borrow pits in Ballynakill and/or Cloncumber.

Preliminary calculations show that the amount of aggregate required during construction at Drehid-Hortland will be in the order of 131,379m^3 (85,790m^3 from borrow pits and 45,589m^3 imported from local quarries but excluding 16,800m^3 of concrete) as shown in Table 8.16 of Chapter 8 – Soils and Geology of the Volume 2 of the EIS.

It is proposed that site won material will be sourced from the Ballynakill and/or Cloncumber borrow pits, however the structural fill for turbine bases, track surfacing stone and cable trench sand may be imported from nearby quarries.

Derrybrennan

Subsoil and surplus/unsuitable rock material from the excavations will be used for reinstatement of the borrow pits at the Cloncumber cluster. Some temporary stockpiles of material may be necessary adjacent to the excavations prior to transport to the borrow pit for beneficial re-use, however no permanent stockpiles of material will remain after construction.

The total quantity of soil to be excavated from tracks, hardstandings, turbine bases, compounds, drainage ponds and swales is estimated to be approximately 15,288m^3. Of this, approximately 4,961m^3 will be peat and topsoil which will be used mainly for berms and landscaping purposes adjacent to tracks, turbines and hardstandings and approximately 10,327m^3 is subsoil which will be used in the reinstatement of the borrow pits in Cloncumber.

Preliminary calculations show that the amount of aggregate required during construction will be of the order 7,098m^3 (10,833m^3 from borrow pits and 6,316m^3 imported from nearby quarries) as shown in Table 8.17 of Chapter 8 – Soils and Geology of the Volume 2 of the EIS. It is proposed that most of this material will be sourced from the Cloncumber borrow pits although some additional material will be required for structural fill, track surfacing and cable trench sand which will be sourced from a local quarry.

Cloncumber

Due to the possibility of soil-borne diseases, all topsoil/peat recovered from each farm property will remain on the same property. Topsoil will be used for landscaping berms alongside existing and new access tracks where suitable and will also be used for reinstatement purposes around turbine bases and hardstandings. Where a property also includes a borrow pit, some of the topsoil will also be used to help in the reinstatement and revegetation of the borrow pit. Subsoil and surplus/unsuitable rock material from the excavations will be used in the reinstatement of the borrow pits. Some temporary stockpiles of material may be necessary adjacent to the borrow pits within this cluster prior to reinstatement, however no permanent stockpiles of material will remain after construction and no surplus/waste soil or rock will be removed from the wind farm.

The total quantity of soil to be excavated from tracks, hardstandings, turbine bases, compounds, drainage ponds and swales at Cloncumber is estimated to be approximately 57,486m^3. Of this, approximately 33,182m^3 will be peat and topsoil which will be used mainly for landscaping purposes and approximately 24,304m^3 is subsoil which will be used in the reinstatement of the borrow pits.

Preliminary calculations show that the amount of aggregate required during construction will be of the order 62,462m^3 (42,243m^3 from borrow pits and 20,219m^3 imported from local quarries) but excluding 8,800m^3 of concrete as shown in Table 8.18 of Chapter 8 – Soils and Geology of the Volume 2 of the EIS. It is proposed that the site won material will be sourced from on-site borrow pits located within the Cloncumber cluster. Structural fill and track surfacing stone will be imported from local quarries.

The total surface area of the proposed borrow pits is in the order of 27,676m^2, hence an effective depth of about 3.0m will provide approximately 83,028m^3 of aggregate, giving a surplus of about 40,785m^3 which will be partly used to supply other clusters. The typical depth of excavation proposed at the borrow pits however will be about 4m in order to allow for variations in material quality and stone requirements and to ensure that excavation below the water table is not required, particularly close to the canal.

Preparation before Implementing Soil Management Plan

Site Risk Assessment

The preliminary site specific hazards have been identified for this site in Table 4.1 below. The hazards should be re-assessed prior to the commencement of construction on the site and these hazards should be communicated to all personnel entering the site. No site personnel should enter lands outside the scope of the project. The construction areas must be secured from public access at all times.

Table 4.1: Site Specific Hazards

Site Specific Hazards	
Maighne Wind Farm	• Borrow pits (risk of falling) at locations as shown on the Planning Drawings. • Excavations (risk of falling) • Ground stability • Materials storage

Preparation in advance of and during the Implementation of the Soil Management Plan

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

The construction area is restricted to roads, turbines, borrow pits, the met mast, the sub-station and temporary compounds within the planning boundary in addition to turbine delivery and haul routes and cable construction routes.

Regular meetings will be held between the Geotechnical Engineer appointed by the contractor and the contractor's Project Manager. The following soil management elements are to be implemented in advance of construction:

Materials excavated during the construction phase shall, in the first instance, be stored temporarily on site in a level area adjacent to the proposed borrow pits. The soils will be stored in an environmentally safe manner that will not result in the pollution of waters or the smothering of ecologically sensitive habitats. The following measures will be implemented to ensure this occurs:

- All materials will be stockpiled at low angles (< 10°) to ensure their stability
- If necessary, soils will be covered while stored to minimise run-off
- Sediment management systems, such as silt fencing, will be provided around the storage areas where necessary
- Drainage systems will also be utilised in mineral storage areas where necessary.

Excavated material will be mostly used to reinstate the borrow pits with the balance of excavated material will be used to reinstate around turbine foundations and for general landscaping. These will be reinstated during and upon completion of the construction works. It is proposed to begin to reinstate the borrow pits during construction as excavation proceeds. The reinstated borrow pits will be appropriately graded and landscaped. Natural re-vegetation is the preferred method of restoration, however, if this is not possible, the re-vegetation process can be encouraged with the use of native grass seed or other suitable planting measures during the growing season. No spoil stockpiles will be left on site after construction is completed. Areas disturbed during construction will be landscaped using locally recovered topsoil to merge with the contours of the existing topography.

Excavations will be carried out from access tracks, where possible, in order to reduce the compaction of topsoil. All excavations will be constructed and backfilled as quickly as possible. Excavations will not be left open overnight where possible and excavation will stop during or immediately after heavy rainfall.

Due to the possibility of soil-borne diseases, all topsoil received from each farm property will remain on the same property. Topsoil will be used for landscaping berms alongside existing and new access tracks where suitable and will also be used for reinstatement purposes around turbine bases and hardstandings. Where a property also includes a borrow pit, some of the topsoil will also be used to help in the reinstatement and re-vegetation of the borrow pit.

The contractor's project manager will be responsible for ensuring that the earthworks are done in accordance with the requirements of this plan. The temporary storage areas and the restoration of vegetative material will be inspected regularly from an ecological and water quality perspective.

Daily Preparation during the Implementation of the Soil Management Plan

The Geotechnical Engineer appointed by the contractor should conduct regular meetings with the Project Manager to discuss the phasing of soil management as the work progresses. The focus of these meetings will be on establishing an operational drainage system in advance of the progression of the works. Particular regard will be taken of daily weather conditions and long range forecasts. The Drainage Engineer should have the authority to suspend the works if weather conditions are deemed too extreme for the effective protection of receiving watercourses. Mitigation measures to protect receiving watercourses will be put in place as directed by the Drainage Engineer in advance of extreme forecasts.

Personnel Qualifications and Key Contacts

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

4.3.3 Outline Site Drainage Management Plan

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

Preparation before Implementing Site Drainage Management Plan

Site Risk Assessment

The preliminary site specific hazards have been identified for this site in Table 4.2 below. The hazards should be re-assessed prior to the commencement of construction on the site and these hazards should be communicated to all personnel entering the site. No site personnel should enter lands outside the scope of the project. The construction areas must be secured from public access at all times.

Table 4.2: Site Specific Hazards

Site Specific Hazards	
Maighne Wind Farm	• Stilling ponds (risk of drowning) at locations as shown on the Planning Drawings • Peaty ground at proposed substation location (risk of injury, overtopping of machinery in wet conditions) • Five existing stream crossings and seven proposed principle stream crossings (risk of drowning)

General Preparation in Advance of Implementing Site Drainage Management Plan

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

The construction area is restricted to roads, turbines, borrow pits, the meteorological mast, the sub-station, temporary compounds, cables and minor alterations to the turbine delivery route within the planning boundary.

Regular meetings should be held between the Drainage Engineer appointed by the contractor and the contractor's Project Manager. The following construction drainage management elements are to be implemented in advance of construction:

- Due to the dispersed nature of the site, there will be a designated refuelling station at each of the temporary site compounds, a minimum of 100m from any watercourse, for refuelling of plant on site during construction. Each station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. Drip trays and spill kits will be kept available on site, to ensure that any spills from the vehicle are contained and removed off site. Only emergency breakdown maintenance will be carried out on site and appropriate containment facilities will be provided to ensure that any spills from breakdown maintenance vehicles are contained and removed off site
- A procedure will be drawn up for accidental spillage containment and the location of spill kits on site
- Silt fencing is to be stocked and readily available on site for use as required. Silt fencing is to be stored in a designated area on site and a number of key holders designated for access to the store
- Drainage is to be installed in advance as construction progresses across the site under the supervision of the Drainage Engineer appointed by the contractor. Roadside swales and stilling ponds for the treatment of sediment in surface water run-off will to be put in place at the locations shown in the Planning Drawings in advance of construction trafficking on site
- Where required, interceptor drains will be put in place in advance of the vegetation strip of the footprint of the works
- The four temporary site compounds and associated facilities are to be in place with an operational surface water drainage system in advance of the commencement of construction
- Wheel washing facilities are to be in place prior to commencement of construction and will be provided at each of the entrances to the site draining to silt traps. Additional silt fencing will be kept on site in case of an emergency break out of silt laden run-off. The wheel wash will prevent silt laden discharges onto the public roads
- Drainage at the entrances to the site will be managed to avoid the consequences of flooding out onto the public road from the site and vice versa to protect the site
- Designated areas for concrete wash-down will be located within the compounds.

Existing overland flow channels will be maintained and cross-drains will be provided in the access roads to allow continuity of flow. Where required, interceptor drains will be constructed upslope where there are no existing channels, with cross-drains provided at regular intervals, to collect overland flows on the upslope side of the access tracks and hard standing areas. The roadside drains will therefore only carry the site access road run-off and so avoid carrying large volumes of water and concentrating flows. Where cross-drains are to be provided to convey the drainage across the track, the recommended sizes for these cross-drains are 225mm diameter pipes. Interceptor cut-off drains will be provided around the borrow pits to divert overland flow to the nearest watercourse, and prevent it from entering the borrow pit.

Daily Preparation during the Implementation of the Site Drainage Management Plan

The Drainage Engineer appointed by the contractor should conduct regular meetings with the Project Manager and his/her team to discuss the phasing of construction and drainage as the work progresses. The focus of these meetings will be on establishing an operational drainage system in advance of the progression of the works. Particular regard will be taken of daily weather conditions and long range forecasts.

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

Personnel Qualifications and Key Contacts

All those carrying out work on site must have a FÁS Safe Pass Card. All works must be supervised by a competent supervisor. Workers must be adequately trained in the tasks they are required to carry out. The key contact names and contact details should be supplied to all personnel entering the site. All site staff should be informed of the emergency procedures for the site. The Drainage Engineer should be contacted if there is an accidental spillage or break out of silt on the site.

Drainage of Wind Farm during the Construction and Operation Phases

Sustainable Drainage Systems (SuDS)

Where possible, sustainable drainage systems, in the form of grassed swales will be used to drain the proposed development. The grassed swales will serve to slow down the velocities of flows draining the hardcore surfaces of the hardstanding areas and the access roads. The grassed swales will also treat the surface water run-off, removing some of the sediment borne contaminants. These grassed swales will serve to detain flows and reduce the velocities of surface water flows. The swales will be typically 0.15m in depth with a bottom width of 0.9m and side slopes of 1 in 3 (see typical swale detail in Figure 4-1). The swales will be constructed in accordance with CIRIA C698 Site Handbook for the Construction of SUDS.

As discussed, stilling ponds will be put in place in advance as construction progresses across the site (see typical stilling pond in Figure 4-2). Stilling ponds will be typically sized with a surface area of 40 m^2 and a depth of 1 m, see sizing criteria and details included in Appendix 2. The stilling pond will have a diffuse stone filled outflow which will encourage the diffuse spread of flows overland and back into natural drains down slope of the stilling ponds. Drainage stone will be placed at the inlet to the ponds to filter the flows before they enter the ponds. After passing through the stilling ponds, the concentration of suspended solids in the surface water run-off due to the excavations will be reduced to within acceptable levels in accordance with Directive 2006/44/EC – European Communities (Quality of Fresh Waters Needing Protection or Improvement to Support Fish Life)[i]. In the event of an emergency, the stilling ponds will provide a temporary holding area for any accidental spills on site as it will be possible to block off the outflow from these ponds for a limited period. The stilling ponds will be fenced off for safety. A diffuse outflow will mitigate any increase in run-off. Erosion control and retention facilities, including stilling ponds will be regularly maintained during the construction phase.

Figure 4.1: Typical Grassed Swale along access road

Figure 4.2: Typical Swale draining to Stilling pond

The stilling ponds may be backfilled, when satisfactory vegetation has been deemed to have been established by the Drainage Engineer. The outflow detail will remain in place and the swale will be continued across the backfilled stilling pond to meet the diffuse outfall, maintaining an operating drainage system for the access roads and hardstanding areas during the operation phase. For the decommissioning phase the stilling ponds can be reopened to treat any surface water from exposed areas as a result of decommissioning at the site. During decommissioning the turbine base, hardstanding areas and access tracks should remain in place and be covered with local soil/topsoil to minimise disturbance to soils. Removal of this infrastructure would result in considerable disruption to the local environment in terms of increased sedimentation, erosion, dust, noise, traffic and an increased possibility of contamination of the local water table'.[1] However if removal is deemed to be required all infrastructure will be removed with mitigation measures similar to those during construction being employed.

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

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

Drainage of Temporary Site Compound

The compounds will be set back a minimum of 50m from streams. Drains around the hard-standing areas of the site compound will be in the form of shallow grassed swales to minimise the disturbance to sub-soils.

[1] http://www.iwea.com/index.cfm/page/planning_regulationsandadminis?#q78

Filter drains may be used where trafficking by site staff is required to access temporary site compounds. The filter drains/swales will drain to a stilling pond as indicated on the Planning Drawings. The stilling pond will be backfilled following the construction period and the vacation of the temporary site compound.

Refuelling of plant during construction will be carried out at a number of dedicated refuelling station locations on site, typically at each compound or at least 100m from a watercourse. Each station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. Drip trays and spill kits will be kept available on site, to ensure that any spills from the vehicle are contained and removed off site. Only emergency breakdown maintenance will be carried out on site and appropriate containment facilities will be provided to ensure that any spills from breakdown maintenance vehicles are contained and removed off site.

The designated area for concrete wash-down will be located within each compound. A settlement pond will be provided to receive all run-off from the concrete wash down area.

A full retention petrol interceptor and spillage tank will be provided at the areas where fuels and oils will be stored. Any diesel or fuel oils stored at the substation will be bunded. The bund capacity will be sufficient to contain 110% of the tank's maximum capacity. Where there is more than one tank within the bund, the capacity will be sufficient to accommodate 110% of the largest tank's maximum capacity or 25% of the total maximum capacities of all tanks, whichever is the greater. Design and installation of fuel tanks will be in accordance with best practice guidelines BPGCS005 (Oil Storage Guidelines). A suitable permanent petrol and oil interceptor will be installed to deal with all substation surface water drainage.

Portaloos and/or containerised toilets and welfare units with storage tanks will be used to provide toilet facilities for site personnel during construction. The sanitary waste will be removed from site by a permitted contractor. All portaloo units located on site during the construction phase will be operated and maintained in accordance with the manufacturer's instructions, and will be serviced under contract with the supplier. All such units will be removed off-site following completion of the construction phase.

This dirty water drain flows to a stilling pond before final discharge over land. A trained and dedicated environmental and fuel spill emergency response team will be set up on site before commencement of construction on-site.

Drainage of Overland Flows

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

Surface Water Management during Tree Felling

A Limited Felling Licence will be in place prior to works commencing on site.

To ensure a tree clearance method that reduces the potential for sediment and nutrient runoff, the construction methodology will follow the specifications set out in the Forest Service Forestry and Water Quality Guidelines (2000) and Forest Harvesting and Environmental Guidelines (2000). Trees will be felled away from aquatic zones where possible. Branches, logs or debris will not be allowed to accumulate in aquatic zones and will be removed as soon as possible. Additional silt fencing will be erected along the banks of any streams at the location of the proposed tree felling to provide additional protection to the watercourses in this area. Infrastructural felling only, around the required infrastructure, is proposed for the site. The rate of absorption of a felled site, and therefore rate of run-off, is expected to be slightly higher than that of a forested site. However the area of proposed felling is small relative to the overall planted area and is expected to develop a vegetation ground cover relatively quickly.

Drainage of Existing Tracks

The drainage system for the existing tracks will largely be retained. Much of the existing track will be widened by approximately 1.5m. This will involve the slight re-location of existing roadside swales to allow for widening. Silt traps will be placed in the new roadside swales, upstream of the outfalls, leaving an allowance for a buffer.

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

Drainage of New Site Tracks

As discussed above, the proposed new site access tracks will be drained via roadside grassed swales with stilling ponds at the end of the swale run. The criteria applied for the stilling pond calculation is included in Appendix 2. The proposed layout of the drainage system for Maighne Wind Farm can be seen on the planning drawings. A cross-section through the proposed site access road construction is shown in the EIS.

At slopes greater than 2%, check dams will be required in the swales and interceptor drains to slow down the velocities of flows and prevent erosion occurring, as shown in Figure 4.3.

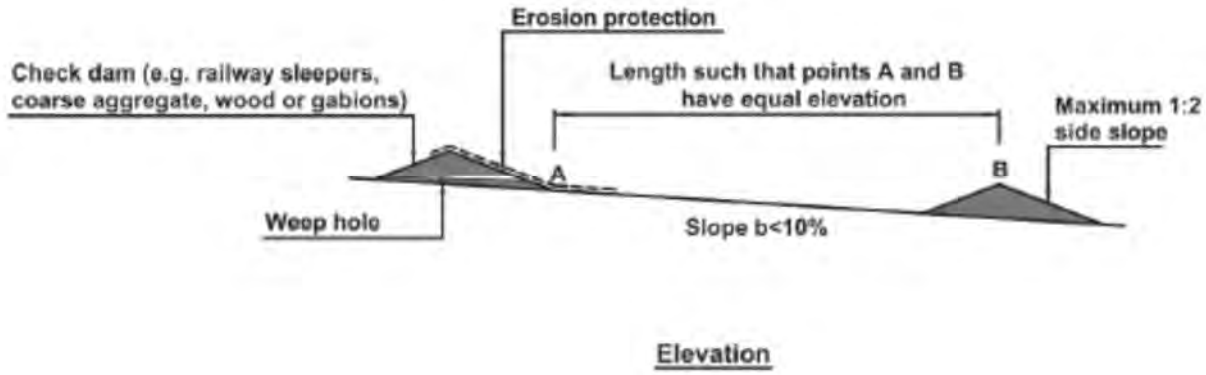

Figure 4.3: Typical Check Dam Details

The roadside swales will drain to stilling ponds before discharging diffusely overland. The stilling ponds will remain in place for the duration of the construction period and until satisfactory vegetation has been established in the swales.

If cross-drains are required to convey the drainage across the track, the recommended sizes for these cross-drains are 225mm diameter pipes.

Silt traps will be provided in swales which will consist of geotextile staked across the swale at regular intervals with clean filter stone weighted across the upstream side of the geotextile to provide further filtration and stability to the silt trap, as shown in Figure 4-4 to Figure 4-6.

Silt fencing will be kept on site and erected at the locations shown on the planning drawings and as required during construction to provide further protection to prevent the ingress of silt into the watercourses. The silt fencing will be kept in place until the natural vegetation has been re-established. Details of the proposed silt fencing are included in the EIS.

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

This would be in addition to the measures required in the guidance document '*Maintenance and Protection of the Inland Fisheries Resource during Road Construction and Improvement Works - Requirements of the Southern Regional Fisheries Board*' (Current guidance document adopted by Inland Fisheries Ireland (IFI) for all fisheries areas).

Figure 4.4: Typical Silt Trap across Grassed Swale

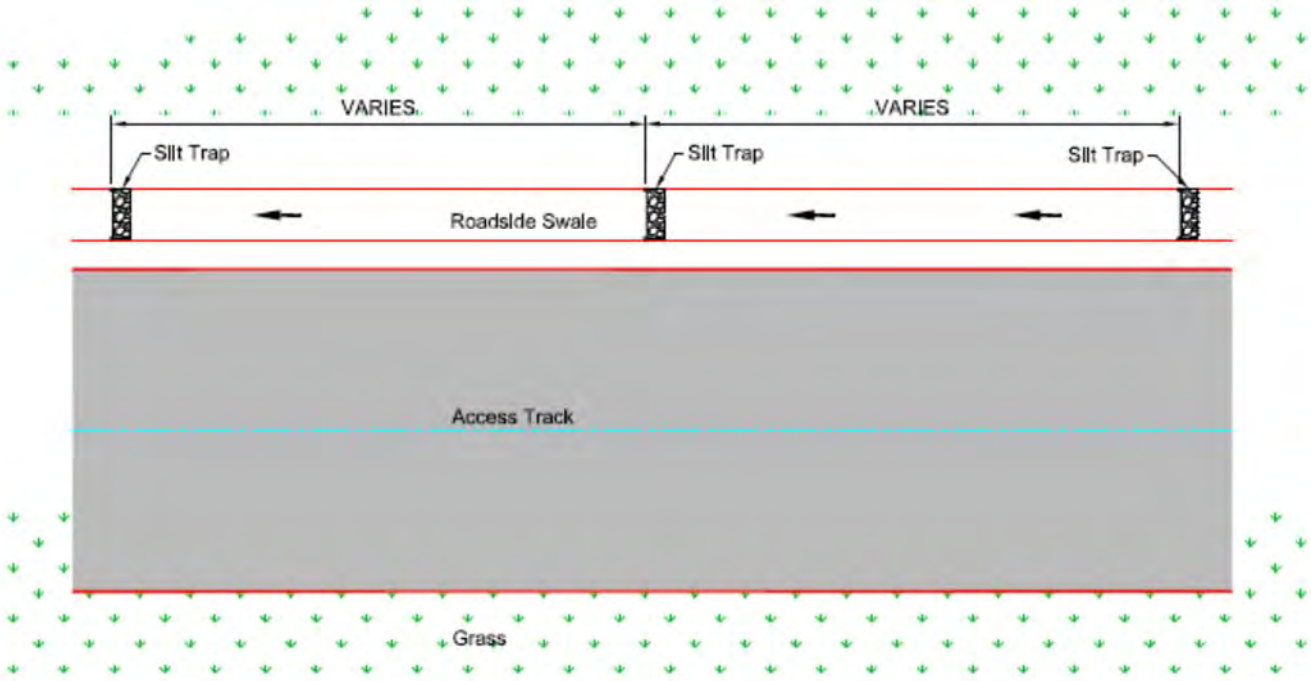

Figure 4.5: Plan of Silt Trap in Swale

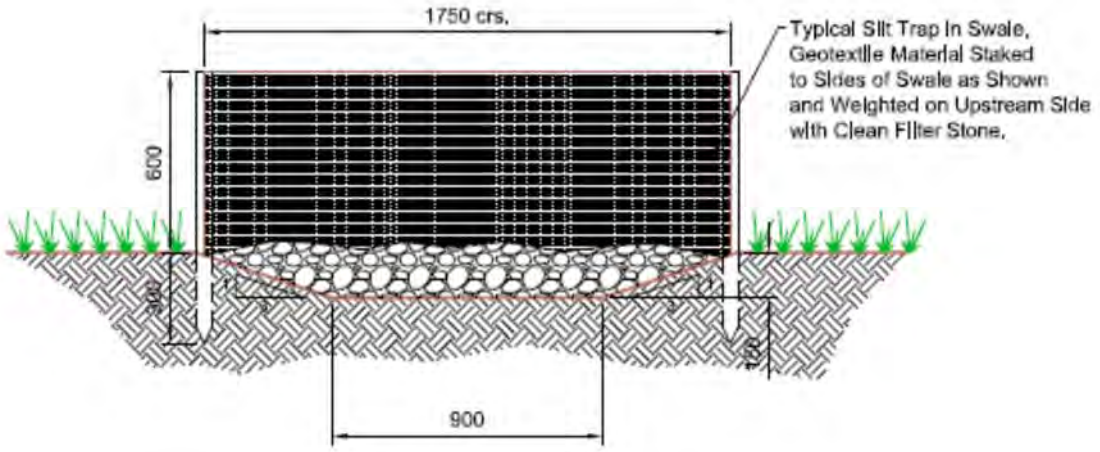

Figure 4.6: Typical Silt Trap Details

Drainage of Turbine Bases and Hardstanding

The excavations for turbines will be pumped into the site drainage system (including stilling ponds), which will be constructed at site clearance stage, in advance of excavations for the turbine bases. As there was no appreciable evidence of inflow observed in the trial pits, it is anticipated that pumped flows from turbine foundation excavations will be very low.

As discussed above, the proposed new turbine hard-standing areas will be drained via shallow swales with stilling ponds at the end of the swale run, as shown in the planning drawings. The criteria applied for the stilling pond calculation is included in Appendix 2. The stilling ponds will remain in place for the duration of the construction period and until satisfactory vegetation has been established in the swales.

If cross-drains are required to convey the drainage across the hardstanding area, the recommended sizes for these cross-drains are 450mm diameter pipes.

Silt traps will be provided in swales which will consist of geotextile staked across the swale at regular intervals with clean filter stone weighted across the upstream side of the geotextile to provide further filtration and stability to the silt trap, as shown in Figure 4.4 to Figure 4.6.

If the transformer is housed externally, each turbine transformer enclosure will be self-contained or bunded to preclude the release of contaminants.

Silt fencing will be kept on site and erected at the locations shown on the planning drawings and as required during construction to provide further protection to prevent the ingress of silt into the watercourses. The silt fencing will be kept in place until the natural vegetation has been re-established. Details of the proposed silt fencing are included in the EIS.

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

This would be in addition to the measures required in the Inland Fisheries Ireland (IFI) guidance document.

Drainage of Cable Trenches

Cables will be installed in trenches adjacent to site access roads, where possible. Trenches for the underground cabling will be excavated using a mechanical excavator and the excavated materials placed in small bunds adjacent to the trenches for back filling, as shown in Figure 4.7. The seed bank is to be retained for placing back as the top layer of backfill to the trench, to aid successful restoration of vegetation in disturbed areas.

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

Figure 4.7: Typical Backfill Over Cable Trench

Procedure for Dewatering of Excavations

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

Drainage of Sub-station

During the design process, cognisance was taken of the location of the substation in the Outer SPZ and changes were made to avoid potential impacts to water quality during the construction and operation of the substation. These included:

- The location of the substation on impermeable hardstand to prevent any risks associated with infiltration to groundwater
- The bunding of the transformer, oil storage tanks, diesel generator and any diesel or fuel oils stored at the substation. The bund capacity will be sufficient to contain 110% of the tank's maximum capacity. Where there is more than one tank within the bund, the capacity will be sufficient to accommodate 110% of the largest tank's maximum capacity or 25% of the total maximum capacities of all tanks, whichever is the greater. Design and installation of fuel tanks will be in accordance with best practice guidelines BPGCS005 (Oil Storage Guidelines)
- A sealed drainage system will be provided, extending past the area of significance i.e. concrete dished channels with a kerbed perimeter at the substation hardstanding. The concrete dished channels will drain to a stilling pond, located 200m from the Inner SPZ, which will in turn drain via forestry drains to the receiving watercourse, which is at a distance of 1km from the location of the substation.
- A petrol and oil interceptor will be installed to deal with all substation surface water drainage.

To increase the time of concentration of the surface water run-off contribution from the substation, tanked permeable paving is a viable alternative to the sealed drainage system and this may be considered at detailed design stage. At the upslope side of the substation overland flows will be intercepted in channels and discharged diffusely over vegetated areas. Further details on the drainage design of the substation is provided in Chapter 9 – Hydrology of Volume 2 of the EIS.

Permanent sanitary facilities will be provided at the substation. It is acknowledged that Kildare County Council requested that wastewater treatment be used in place of a holding tank at the location of the substation, in comments provided by them, in their scoping response. However, given its proximity to a SPZ and the requirement to maintain water quality within this area, a holding tank was deemed to be the most environmentally appropriate solution. This ensures that there are no direct discharges to groundwater. Effluent from the holding tank will be transported off-site for treatment/disposal by a permitted contractor.

Drainage of Stockpiled Material

The proposed borrow pits are located in the Ballynakill and Cloncumber clusters. The borrow pits will be set back a minimum of 50m from watercourses. It is proposed to drain the borrow pits to stilling ponds. At the upslope side of the borrow pits overland flows will be intercepted in channels which will discharge diffusely over vegetated areas. The opening of borrow pits at Cloncumber will be from the east and from the west where the borrow pits are located to the north of the Barrow Line of the Grand Canal. There will be no opening of these borrow pits from the south (canal side).

During the construction period, the excavated material will be used to reinstate the turbine bases. Any surplus peat that is excavated, in particular in the Windmill Cluster, will be re-used in the active milling operations on-site. It is proposed to reinstate the borrow pits with surplus subsoil material from the excavations. This will be carefully managed, with sections of the borrow pits being reinstated in stages. Swales will be used to drain the reinstated sections to the stilling ponds at the borrow pit locations. Silt fencing will be erected to further protect streams, where required. The stilling ponds will remain in place until the reinstated areas have attained satisfactory re-vegetation.

All excavations shall be constructed and backfilled as quickly as possible. Excavation will not be undertaken during heavy rainfall.

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

Surplus soil or rock excavated during the course of the works will be temporarily stored in a level area adjacent to the proposed borrow pits and will be either used for reinstatement of the borrow pits (following construction) or will be re-used on site in the form of landscaping and berms (during construction).

Temporary storage may also be required after excavation and prior to transportation. No spoil stockpiles will be left on site after construction is completed.

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

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

All temporary cuts/excavations will be carried out such that they are stable or adequately supported. Gravel fill will be used to provide additional support to drains where appropriate. Where appropriate and necessary, temporary cuts and excavations will be protected against the ingress of water or erosion by covering during adverse weather. Temporary works will be such that they do not adversely interfere with existing drainage channels/regimes by the provision of silt traps and silt fencing as required.

Watercourse Crossings

The new and existing stream crossings are distributed across the following turbine clusters within the proposed Maighne Wind Farm development as follows:

- Ballynakill - 1 No. existing stream crossing
- Windmill – 1 No. existing stream crossing
- Drehid-Hortland – 2 No. existing stream crossings and 6 No. new stream crossings
- Derrybrennan - None
- Cloncumber – 2 No. new stream crossings

The preliminary sizes of the principal stream crossings required throughout the site to cross tributaries of the River Boyne and the Slate River were estimated as part of the flood risk assessment. A summary of the preliminary culvert sizing is provided in Chapter 9 – Hydrology of Volume 2 of the EIS. The culverts were sized to convey a 1 in 100 year flood with a 20% allowance for Climate Change, while maintaining a minimum freeboard of 300 mm.

Embedded culverts must maintain the natural channel gradient, width and substrate configuration. They will be buried to a minimum of 500 mm. below the stream bed at the natural gradient. Box and pipe culverts will be sized to maintain the natural stream channel width. The gradient will not exceed 3%. In the case of box culverts on angling waters, the box will be 3 meters in height.

To minimise adverse impacts on the fisheries resource works in rivers, streams and watercourses, such works are generally only permitted to be carried out during the period July-September. However the specific period for the works at each of the river crossing locations will be reviewed on a site specific basis with the IFI at detailed design stage.

The IFI have provided detailed specifications on the design of temporary and permanent stream crossings in fisheries sensitive streams. These specifications, which are included in Appendix B of Volume 3 of the EIS, will be followed in the detailed design of at the stream crossings.

Additional flow connectivity culverts were not deemed to be required, as the track layout mostly allows for the crossing of streams and rivers at the narrowest part of the floodplain or does not obstruct flows.

Clear span structures will be required for the crossing of fisheries sensitive streams. Bridge foundations will be designed and positioned at least 2.5 metres from the river bank so as not to impact on the riparian habitat.

A Section 50 application will be required to obtain the consent of the OPW for the design of the seven new stream crossings. The IFI will also be consulted at the detailed design stage.
Minor drains such as manmade agricultural, forestry and bog drains will be crossed using 450mm diameter pipes.

All other existing stream and drain crossings will be left in place and extended where required to match the existing structure where it is proposed to widen the road. Existing stream crossings will be protected using silt fencing.

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

Silt fencing will be erected at the location of stream crossings along the MV and HV cable routes and the TDR. For off-line cabling methods, a temporary diversion of the watercourse may be required. Silt curtains and floating booms will also be used where deemed to be appropriate and this will be confirmed in consultation with IFI at each individual location.

Climate Change

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

Wash Down from Concrete Trucks and Cement Mixers

Every concrete truck delivering concrete to the site must use concrete wash-down areas prior to leaving the site. A settlement pond will be provided to receive all run-off from the concrete wash down area. Regular inspections of the wash down area and associated settlement pond shall be carried out and adequate records kept.

The settlement pond shall be lined using a 1mm LLDPE impermeable liner. A sump will be provided at this location which will collect the wash water from the concrete trucks. The sump will be excavated (6.75 m long x 3.2 m wide x 1.5 m deep) to provide an effective volume of 21.6m^3 at a depth of 1m. The excavated material will be kept on site for reinstatement following the construction period.

The sump will be lined with a 1 mm LLDPE impermeable liner.

Figure 4.8: Typical Lined Settlement Pond for Concrete Wash out Facility

On wind farm projects, it is the concrete pours for each turbine bases that generally leads to the most HGV numbers on a given day. On the Maighne Wind Farm development, each base pour will require approximately[2] 550m^3 of concrete which is equivalent to approximately 69 ready mix truck loads (or 138 HGV trips) on the day that a pour occurs.

Each truck uses approximately 70 litres of water for rinse-out and this equates to a total maximum daily volume of approximately 9.7m^3 rinse water for 138 trucks, which is less than half the capacity of the proposed sump. During construction, wash water and any solids in the sump will be removed periodically by a permitted waste contractor. The sump can be emptied daily if required. Following construction, any solids, the liner, and any remaining wash water in the sump will all be removed to an appropriate licensed facility for disposal. The sump will then be reinstated.

Mitigation Measures for Flooding

A flood risk assessment has been undertaken for this development. The flood risk assessment concludes that the proposed Maighne Wind Farm has 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.

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

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

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

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

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

Stilling ponds will be put in place in advance as construction progresses across the site. The stilling ponds with a diffuse outflow detail will mitigate any increase in run-off and treat suspended solids in the surface water run-off. Erosion control and retention facilities, including stilling ponds will be regularly maintained during the construction phase. The three-stage treatment train (swale – stilling pond – diffuse outflow) proposed to retain and treat the discharges from hard surface areas as a result of the development will reduce any risk of flooding downstream. In the unlikely event of accidental break out of silt, this will be dealt with in the Emergency Response Procedures, included herein.

- All stockpile material will be bunded adequately and protected from heavy rainfall to reduce silt run-off, where necessary.
- Adequate security will be provided to prevent spillage as a result of vandalism.
- Drains around hard-standing areas will be shallow to minimize the disturbance to sub-soils.
- Cross-drains of 450mm diameter will be provided to prevent a risk of clogging for drainage crossings and conveying flows from agricultural drains and forestry drains across the access roads.
- Roads will be capped as soon as practicably possible to cover exposed subsoils and as such reduce the concentration of suspended solids in the run-off.
- All open water bodies adjacent to proposed construction areas will be protected by fencing, including the proposed stilling ponds.

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

[2] Concrete volume subject to detailed design

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

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

Refuelling of plant on site during construction will only be carried out at designated refuelling station locations at each of the temporary site compounds, or by mobile tanker where this is not possible. Each station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. Only emergency breakdown maintenance will be carried out on site. Drip trays and spill kits will be kept available on site, to ensure that any spills from the vehicle are contained and removed off site. In the unlikely event of accidental spillage from leaking or damaged fuel lines, this will be dealt with in the Emergency Response Procedures, included herein.

Any diesel, fuel or hydraulic oils stored at the temporary site compounds will be bunded. The bund capacity will be sufficient to contain 110% of the tank's maximum capacity. Design and installation of fuel tanks will be in accordance with best practice guidelines BPGCS005 (Oil Storage Guidelines).

Vehicles entering the site should be in good working order, free from leakage of fuel or hydraulic fluid. No concrete wash out is permitted on the site.

A wheel wash will be provided at each of the site entrances draining to silt traps to avoid any silt laden run-off flowing on to the public road and entering roadside drains. An additional water tank will be provided at each wheel wash. These units will be self-contained, with waste removed from site by a permitted contractor. Additional silt fencing will be kept on site in case of an emergency break out of silt laden run-off.

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

Silt fencing will be erected at the location of stream crossings along the cable route. For off-line cabling methods, a temporary diversion of the watercourse may be required. Silt curtains and floating booms will also be used where deemed to be appropriate, in consultation with IFI and this will be assessed separately at each individual location.

In the event that trenchless techniques is the cable crossing method used, a biodegradable fluid such as CLEARBORE shall be used rather than Bentonite. CLEARBORE is a biodegradable drilling fluid that degrades into carbon dioxide and water when exposed to sunlight and the environment. An Outline Trenchless Techniques Contingency and Resource Protection Plan is included below:

- Drilling operations are to be limited to daytime hours and conditions when low levels of rainfall are forecast
- Drilling fluid materials and their respective data sheets shall be included in the method statement for waterways or stream crossings.
- Any site specific investigation results shall be disclosed including, review of all available data from utility owners, site investigations, trial holes, ground penetrating radar as might be appropriate for the location
- Materials such as suitable biodegradable absorbent material, silt fencing and gravel bags (plastic, gravel filled bags) shall be kept at boring sites in quantities sufficient
- At stream crossings with flowing water, water monitors will be placed upstream and downstream of the crossing point, access permitting
- Onsite training shall be provided for all monitors, and names and phone numbers provided to site supervisors
- Upon completion of each drill rod, the monitoring person/team will be provided with information in relation to position of entry and exit of drilling head, amount of fluid utilised or pumped, equipment breakdowns or repairs, any abnormal drilling pressures recorded and any change of drilling fluid contents
- A field response plan to minimise loss of returns of drilling fluid and actions to restore returns shall be provided
- Equipment required to clean up any accidental release of drilling fluid will be available at the work site or at an offsite location at the temporary construction compounds

- In the event of a release of drilling fluid; the directional boring will stop immediately, the bore stem shall be pulled back to relieve pressure and the site supervisor notified to ensure adequate actions are taken and notifications made. In addition terrestrial releases shall be cleaned up using on site equipment and a terrestrial berm will be constructed around any terrestrial release
- Silt fences will be constructed around proposed work areas prior to commencement of works
- Refueling of equipment will take place at the temporary construction compounds
- Pre-construction Ecological surveys shall take place at drilling sites to determine whether any sensitive species or species requiring derogations (such as Otter) are present
- Works will be monitored by the project ecologist
- Any dewatering of the pits will be pumped to land as far from the watercourse as possible to allow it to infiltrate through the field or to a stilling pond or alternative to a holding tank, tested and appropriately discharged under licence.

Alternatively any in-stream works will:

- Be undertaken in consultation with the Planning Authority and Inland Fisheries Ireland (IFI). To minimise adverse impacts on the fisheries resource, works in watercourses will be carried out during the period July-September unless prior agreement has been reached with IFI. The works will be isolated from the water in the stream
- All construction machinery operating in-stream will be mechanically sound to avoid leaks of oils, hydraulic fluid, etc. Machinery will be steam cleaned and checked prior to commencement of in-stream works
- All works areas will be reinstated fully.

In the event that a culvert is required, it will be sized in accordance with CIRIA C689 Culvert Design and Operation Guide, the Office of Public Works (OPW) guidance. A Section 50 Application will be prepared for all new stream crossings to obtain the consent of the OPW at detailed design stage.

Water Quality Monitoring Plan for Mitigation Measures during Construction and Operation Phases of the Wind Farm

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

- Daily visual inspections of drains and outfalls from interceptor drains will be performed during the construction period to ensure suspended solids are not entering the streams and rivers of the site, to identify any obstructions to channels, and to allow for appropriate maintenance of the drainage regime. If excessive suspended solids are noted, construction work will be stopped and remediation measures will be put in place immediately.
- Fortnightly visual inspections will be continued during the operation period until satisfactory vegetation is established on site.
- Turbidity meters will be installed up and downstream of the construction area to determine any impacts. They will be in place for the duration of the works for each particular phase before being moved to the next phase. Should the turbidity levels measured during construction be greater downstream than upstream, the source of the turbidity will be identified and additional mitigation measures will be implemented
- Grab samples, will be undertaken during the construction phase of the development at representative locations so as to ensure the effective implementation of the proposed mitigation measures. Appropriate locations will be chosen to monitor the water quality of the receiving environment for each construction area. Field measurements will be recorded at each site and will include measurement of the following parameters, electrical conductivity, pH, temperature and dissolved oxygen. The field measurements will be taken on a weekly basis during the site clearance and earthworks stage of the construction period.
- Following site clearance and earthworks, the field measurements will be taken on a monthly basis until full re-vegetation has occurred, unless otherwise directed by the planning authority, Inland Fisheries Ireland (IFI) or Waterways Ireland. Grab samples were taken for this EIS from seven locations during a dry weather and storm event to provide a baseline against which samples taken during the construction stage can be measured. Trigger values will be defined for indicator parameters based on the pre-construction monitoring results and results will also be compared to the maximum guideline values specified in the table below.

Table 4.3: Water Quality Monitoring Parameters

Parameter	Maximum Guideline Value
Conductivity (µs/cm)	1000
Turbidity (NTU)	20
pH	6.0 < pH < 9.0
Dissolved Oxygen (% saturation)	80 – 120 (%ile)
Total Suspended Solids (mg/l)	25
Total Ammonia (mg/l N)	0.14 (95%ile)
Nitrite (NO_2) (mg/l)	0.05
Molybdate Reactive Phosphorus (mg/l P)	0.075 (95%ile)
Total Phosphorus (mg/l P)	0.5
Chloride (mg/l)	250

Groundwater

Groundwater wells will be installed up and downgradient of the construction site in the vicinity of the proposed substation at Drehid and for turbines T44 and T45 which are located in or in close proximity to the inner SPZ at Johnstown. Baseline conditions will be established for each well prior to earthworks or construction. Appropriate trigger levels will be set for monitoring parameters. Monitoring will be carried out at regular intervals during construction. The wells will be purged daily and sampled for pH, electrical conductivity and a visual and odour inspection will be carried out. In the event of significant differences in the results from baseline results or in the downgradient well, works will be immediately stopped, the reason identified and additional mitigation measures will be put in place. In addition, monthly groundwater samples will be sent to a laboratory for analysis of the parameters listed below during the construction period.

Table 4.4: Groundwater Quality Monitoring Parameters

Parameters	
Total Coliforms	Total Phosphorus
Faecal Coliforms	Total Organic Carbon
pH_Laboratory	Chloride
Conductivity_Laboratory	Fluoride
Alkalinity	Sulphate
Total Suspended Solids	Sodium
Colour	Potassium
Turbidity	Calcium
Ammonium	Metals
Nitrite as NO_2	Total Pesticides
Nitrate as NO_3	(Total) PAHs

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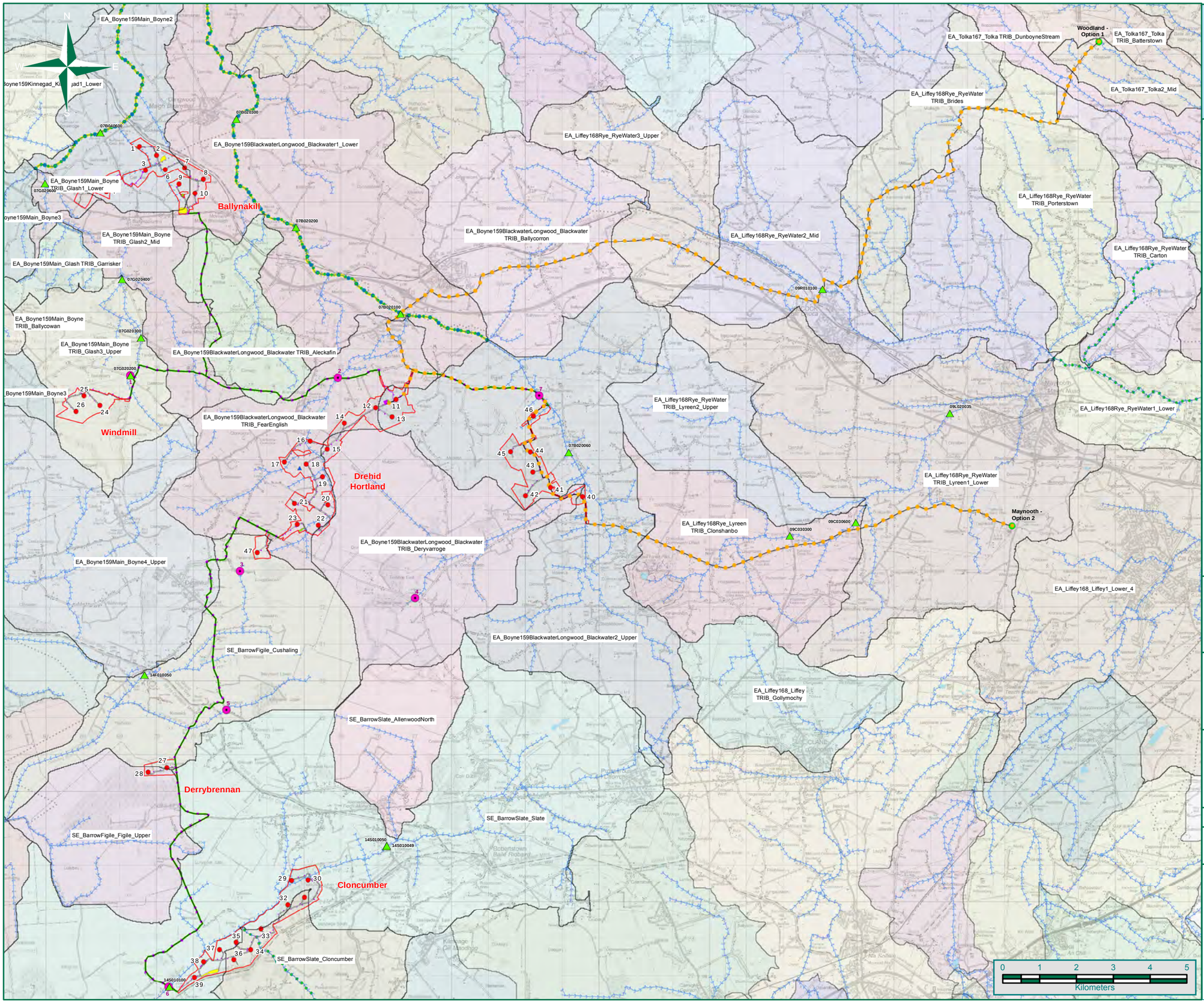

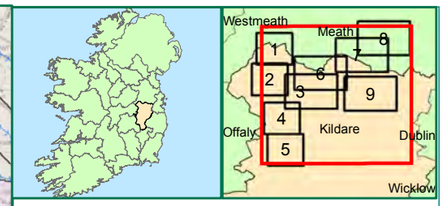

Legend

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

WFD Register of Protected Areas (RPA)

- Drinking Water Rivers
- Salmonid Rivers
- SAC
- SPA
- WFD River Sub-basin
- Water Sampling Locations
- EPA Monitoring Stations

Date 27/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Water Quality Monitoring Locations Map
Maighne Overview

Scale Used 1:100,000 @ A3

Figure No. 4.9.

Rev B

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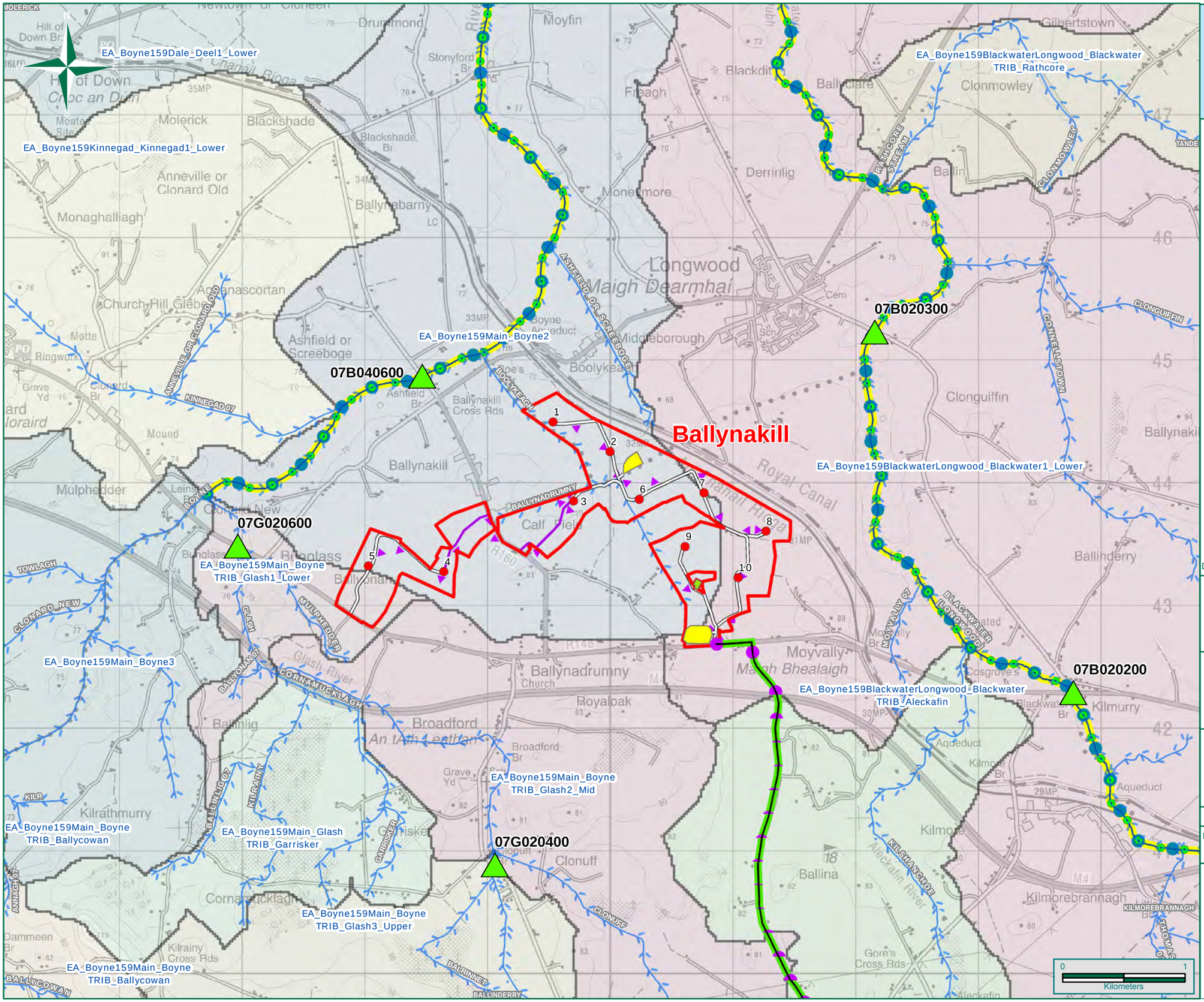

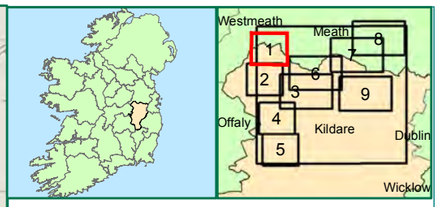

Legend

- Turbine Locations
- Wind Farm Cluster Boundary
- Proposed Borrow Pit Location
- Proposed Compound Location
- Indicative Access Tracks
- MV Cable Routes
- Cable Routes (Internal to Windfarm Cluster)

WFD Register of Protected Areas (RPA)

- Drinking Water Rivers
- Salmonid Rivers
- SAC
- SPA
- WFD River Sub-basin
- EPA Monitoring Stations

Date 27/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Water Quality Monitoring Locations Map
Ballynakill Submap 1 of 9

Scale Used 1:30,000 @ A3

Figure No. 4.9.1

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EA_Boyne159Main_Boyne TRIB_Glash1_Lower

EA_Boyne159Main_Boyne3

EA_Boyne159Main_Glash TRIB_Garrisker

EA_Boyne159Main_Boyne TRIB_Ballycowan

EA_Boyne159Main_Boyne3

EA_Boyne159Main_Boyne TRIB_Glash3_Upper

EA_Boyne159Main_Boyne4_Upper

EA_Boyne159Main_Boyne TRIB_Glash2_Mid

EA_Boyne159BlackwaterLongwood_Blackwater1_Lower

EA_Boyne159BlackwaterLongwood_Blackwater TRIB_Aleckafin

EA_Boyne159BlackwaterLongwood_Blackwater TRIB_FearEnglish

SE_BarrowFigile_Cushaling

07G020400

07G020300

07G020200

Windmill

Drehid

Hortland

1

25

24

26

17

21

23

AGHNAGILLAGH

KILR

BALLINIGUR

KILRAINY

CORNAMUCKLAGH

GARRISKER

CLONUFF

BALRINNET

BALLINDERRY

CALFSTOWN

KILSHANCHOE

CADAMSTOWN

BALLYCOWAN

DERRYART 07

BRACKAGH

ANNAGHMORE

CLAREMOUNT 07

RUSSELLSWOOD

GLASH

KILLINAGH

KISHAWANNY_LOWER

KISHAWANNY_UPPER

CARBURY

COOLAVACOOSE

RINAGHAN

BALLYGIBBON_EAST

BALLYGIBBON_WE

BOYNE

KNOCKCOR

CLONKEERAN

COLLINSTOWN 07

COOLREE 07

Kilrathmurry

Ballycowan

Dammeen

Kilrainy Cross Rds

Kilrainy

Derryart

Cloghanmika

Claremount

Kilglass

Balrinnet

Tanderagee

Cillin

Killinagh

Fearavolla

Duffy's Cross Rd

Nurney

Williamstown

Freagh

Mylerstown

Knockcor

Rinaghan

Teelough

Haggard

Windmill

Ballygibbon East

Oldcourt Cross Rds

Oldcourt

Kishawanny Lower

Coolcor

Carbury Hill 142

Carbury Cairure

Burial Ground

Newbury Cross Rds

Holy Well

Demesne

Calfstown

Cadamstown Baile Mhic Adaim

Gore's Cross Rds

Kilmore

Ballina

Kilmorebra

Aleckafin

Clonagh

Drehid Cross Rds

Collinstown

Castle Kirdkill

Clonkeeran

Clonkeeran Cross Rds

Kilshanchoe

Broadford

Grave Yd

Clonuff

Gravel Pit

Graveyard

Church

Dismantled Railway

Sweep River

Boyne River

Aleckafin River

R402

29MP

Legend

- Turbine Locations
- Wind Farm Cluster Boundary
- Proposed Compound Location
- Proposed Met Mast Location
- Indicative Access Tracks
- MV Cable Routes
- Cable Routes (Internal to Windfarm Cluster)

WFD Register of Protected Areas (RPA)

- Drinking Water Rivers
- Salmonid Rivers
- SAC
- SPA
- WFD River Sub-basin
- Water Sampling Locations
- EPA Monitoring Stations

Westmeath, Meath, Offaly, Kildare, Dublin, Wicklow

0 1 Kilometers

Date 27/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Water Quality Monitoring Locations Map
Windmill Submap 2 of 9

Scale Used 1:30,000 @ A3

Figure No. 4.9.2

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Drehid Hortland

EA_Boyne159BlackwaterLongwood_Blackwater1_Lower

EA_Boyne159BlackwaterLongwood_Blackwater TRIB_Ballycorron

EA_Boyne159BlackwaterLongwood_Blackwater2_Upper

EA_Boyne159BlackwaterLongwood_Blackwater TRIB_Aleckafin

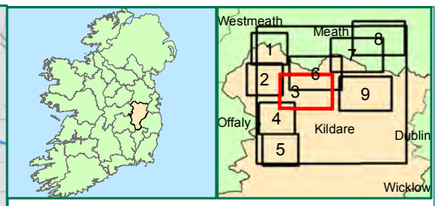
EA_Boyne159Main_Boyne TRIB_Glash2_Mid

EA_Boyne159BlackwaterLongwood_Blackwater TRIB_FearEnglish

EA_Boyne159BlackwaterLongwood_Blackwater TRIB_Deryvarroge

SE_BarrowFigile_Cushaling

07B020060



Legend

- Turbine Locations
- Wind Farm Cluster Boundary
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- Proposed Met Mast Location
- Indicative Access Tracks
- MV Cable Routes
- Cable Routes (Internal to Windfarm Cluster)
- HV Cable Route

WFD Register of Protected Areas (RPA)

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- EPA Monitoring Stations

Date 27/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Water Quality Monitoring Locations Map
Drehid Hortland Submap 3 of 9

Scale Used 1:30,000 @ A3

Figure No. 4.9.3

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0 1 Kilometers

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Drehid
Hortland

Derrybrennan

14F010050

EA_Boyne159BlackwaterLongwood_Blackwater
TRIB_FearEnglish

EA_Boyne159BlackwaterLongwood_Blackwater
TRIB_Deryvarroge

SE_BarrowFigile_Cushaling

EA_Boyne159Main_Boyne4_Upper

EA_Boyne159Main_Boyne
TRIB_Derrycoris

SE_BarrowFigile_Figile_Mid

SE_BarrowFigile_Figile_Upper

SE_BarrowSlate_Slate

SE_BarrowSlate_AllenwoodNorth

COOLNAGOOSE
BOYNE
BALLYHAGAN
CLONKEEN 07
TICKNEVIN
FIGILE
KILKEASKIN
PARSONSTOWN
BALLYNAMULLACH
DREHID
ABBEYLOUGH
UPPER BALLYNAKILL
ALLENWOOD NORTH
KILLINAGH UPPER

Westmeath
Meath
Offaly
Kildare
Dublin
Wicklow

Legend

- Turbine Locations
- Wind Farm Cluster Boundary
- Proposed Compound Location
- Indicative Access Tracks
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WFD Register of Protected Areas (RPA)

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- WFD River Sub-basin
- Water Sampling Locations
- EPA Monitoring Stations

0 1 Kilometers

Date 27/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Water Quality Monitoring Locations Map
Derrybrennan Submap 4 of 9

Scale Used 1:30,000 @ A3

Figure No. 4.9.4

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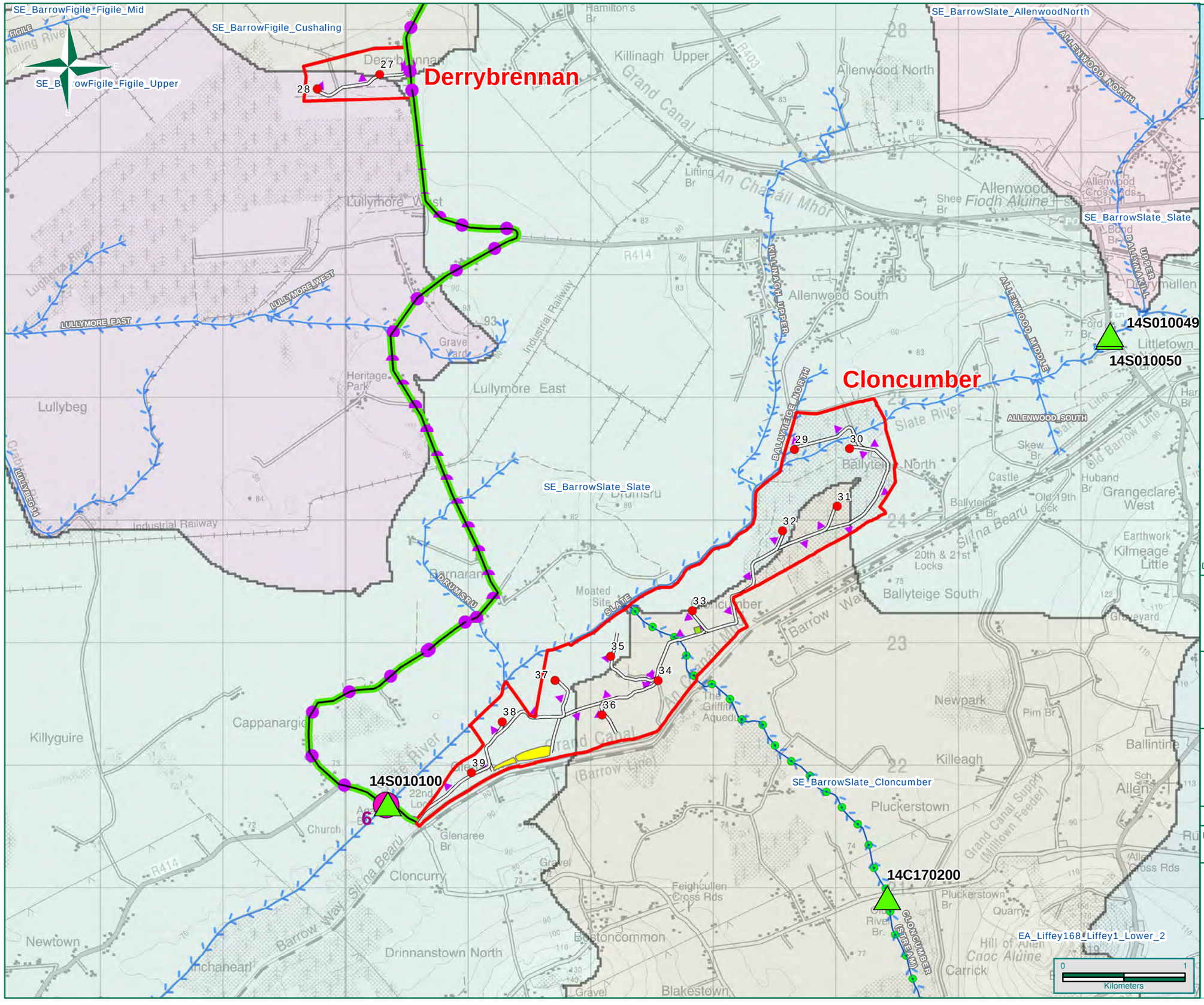

Legend

- Turbine Locations
- Wind Farm Cluster Boundary
- Proposed Borrow Pit Location
- Proposed Compound Location
- Indicative Access Tracks
- MV Cable Routes
- Cable Routes (Internal to Windfarm Cluster)

WFD Register of Protected Areas (RPA)

- Drinking Water Rivers
- Salmonid Rivers
- SAC
- SPA
- WFD River Sub-basin
- Water Sampling Locations
- EPA Monitoring Stations

Date 27/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Water Quality Monitoring Locations Map
Cloncumber Submap 5 of 9

Scale Used 1:30,000 @ A3

Figure No. 4.9.5

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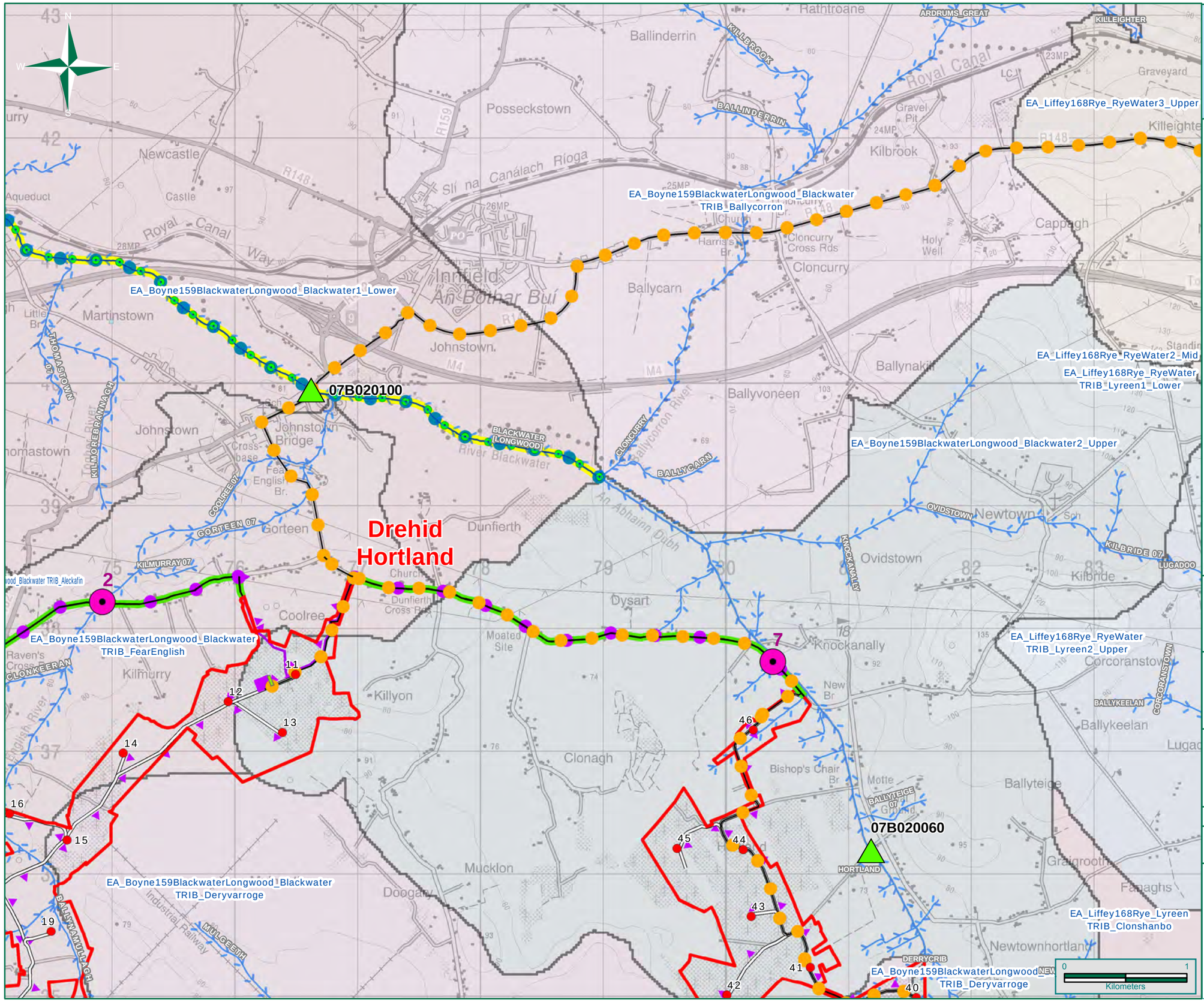

Legend

- Turbine Locations
- Wind Farm Cluster Boundary
- Proposed Compound Location
- Proposed Substation Location
- Indicative Access Tracks
- MV Cable Routes
- Cable Routes (Internal to Windfarm Cluster)
- HV Cable Route

WFD Register of Protected Areas (RPA)

- Drinking Water Rivers
- Salmonid Rivers
- SAC
- SPA
- WFD River Sub-basin
- Water Sampling Locations
- EPA Monitoring Stations

Date 27/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Water Quality Monitoring Locations Map
Cable to Woodland Submap 6 of 9

Scale Used 1:30,000 @ A3

Figure No. 4.9.6

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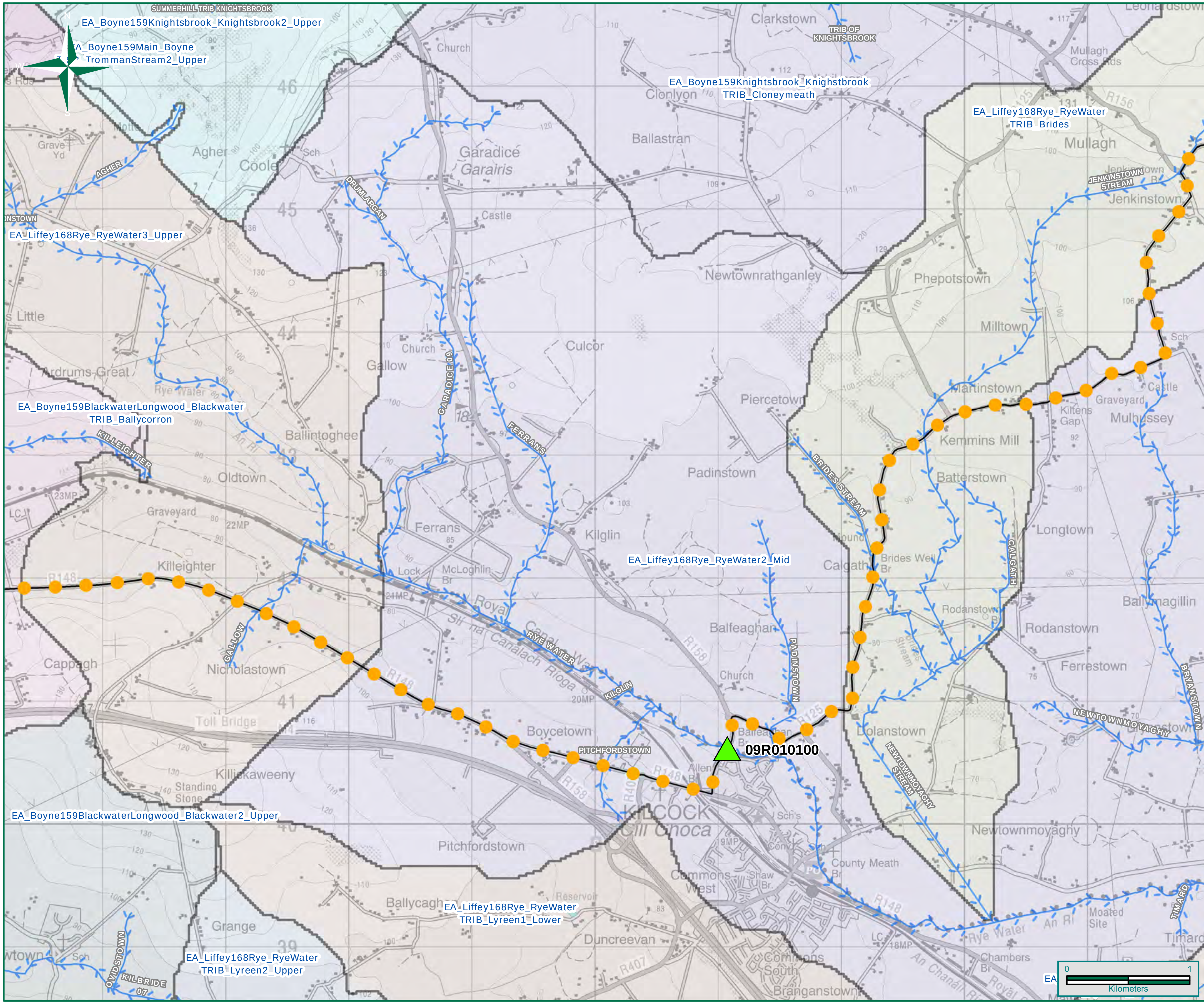

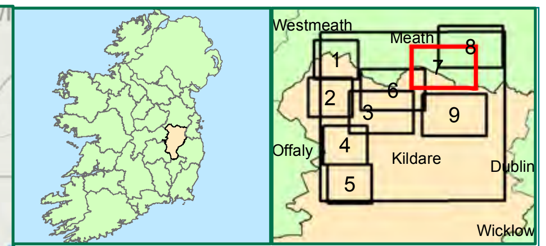

Legend

- HV Cable Route
- ***WFD Register of Protected Areas (RPA)***
- Drinking Water Rivers
- Salmonid Rivers
- SAC
- SPA
- WFD River Sub-basin
- EPA Monitoring Stations

Date 27/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Water Quality Monitoring Locations Map
Cable to Woodland Submap 7 of 9

Scale Used 1:30,000 @ A3

Figure No. 4.9.7

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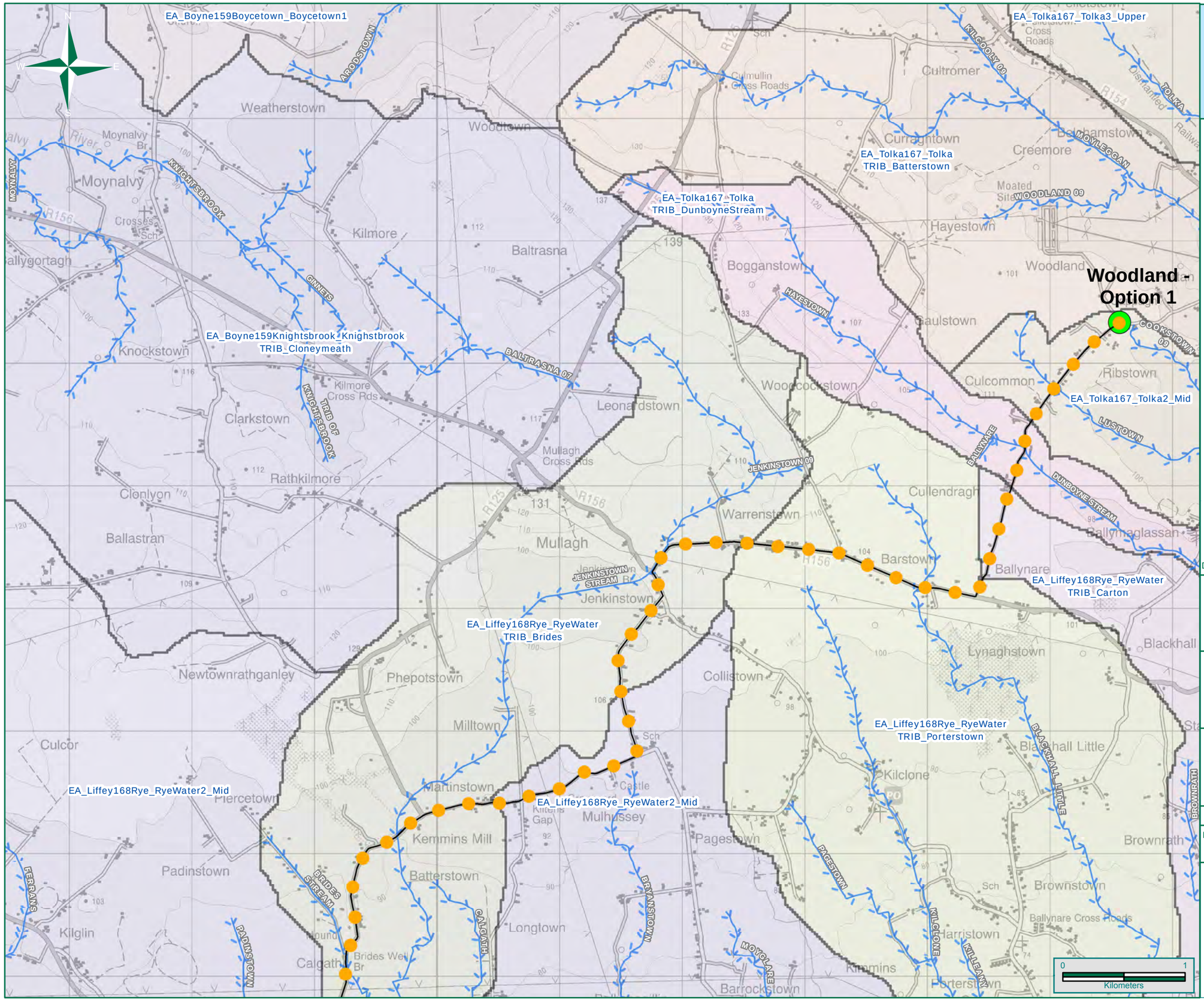

Date 27/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Water Quality Monitoring Locations Map
Cable to Woodland Submap 8 of 9

Scale Used 1:30,000 @ A3

Figure No. 4.9.8

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EA_Liffey168Rye_RyeWater2_Mid

EA_Liffey168Rye_RyeWater2_Mid

EA_Liffey168Rye_RyeWater
TRIB_Lyreen2_Upper

09L020035

EA_Liffey168Rye_RyeWater
TRIB_Lyreen1_Lower

EA_Liffey168Rye_Lyreen
TRIB_Clonshanbo

09C030600

09C030300

EA_Liffey168_Liffey1_Lower_4

EA_Liffey168_Liffey1_Lower_3

EA_Liffey168_Liffey
TRIB_Gollymochy

EA_Liffey168_Liffey
TRIB_Gollymochy

EA_Boyne159BlackwaterLongwood_Blac

Maynooth - Option 2

Legend

- HV Cable Route
- Irish Grid Connection Points

WFD Register of Protected Areas (RPA)

- Drinking Water Rivers
- Salmonid Rivers
- SAC
- SPA
- WFD River Sub-basin
- EPA Monitoring Stations

Westmeath, Meath, Offaly, Kildare, Dublin, Wicklow

Kilometers

Date 27/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Water Quality Monitoring Locations Map
Cable to Maynooth Submap 9 of 9

Scale Used 1:30,000 @ A3

Figure No. 4.9.9

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Emergency Silt Control and Spillage Response Procedures

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

Accidental spillage from leaking or damaged fuel lines

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

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

In the event of pollution or potential risk of pollution the relevant local authority will be informed immediately. In the case of water pollution, Inland Fisheries Ireland and Waterways Ireland (if applicable) should also be informed immediately.

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

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

Accidental break out of silt

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

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

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

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

Maintenance of Site Drainage Systems

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

- inspection and maintenance of swales
- inspecting cross-drains for any blockages
- inspecting stilling ponds and outfalls
- inspecting the stream crossing and piped crossings for obstructions
- inspecting the progress of the re-establishment of vegetation
- implementing appropriate remedial measures as required after the above inspections
- Maintenance will be in accordance with CIRIA C697 (SuDS and Maintenance Manual).

It is not envisaged that the operation of the wind farm will result in significant impacts on the hydrological regime or water quality of the area, as there will be no further disturbance of soils post-construction, and only a minimum of traffic movement.

The stilling ponds will be a permanent feature, and will continue to be effective in filtering the run-off from the site should any accidental release of silt combine with the surface water run-off during operational activities.

4.3.4 Outline Habitat and Species Management Plan

This Outline Habitat and Species Management Plan (HSMP) outlines the measures that will be put in place to protect species and natural and semi-natural habitats at the proposed Maighne Wind Farm development and describes how these areas will be managed during the lifetime of the proposed development. The Habitat and Species Management Plan shall be finalised in accordance with this outline plan following the appointment of the contractor for the main construction works. This plan should be read in conjunction with the EIS.

Objectives

The primary objectives of the HSMP over the construction, operation and reinstatement phases of the Maighne wind farm project are as follows:

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

Current Site Status and Management

Existing ecological conditions are outlined in Section 2.4 of the CEMP.

Habitat and Species Mitigation and Management Requirements

The mitigation measures for ecology at the site are listed in Chapter 7 - Ecology of Volume 2 of the EIS and also in Appendix C of this document. These include mitigation measures to prevent impacts on watercourses, to prevent disturbance to breeding birds, to limit habitat disturbance and limit impacts on terrestrial mammals and bats. In addition monitoring methods proposed to monitor bird and bat usage of the wind farm post construction are described, as well as fatality monitoring.

Mitigation and Management Measures during Construction

Designated Nature conservation sites

Mitigation measures outlined in Chapter 8 'Geology and Slope Stability', Chapter 9 'Hydrology' and Chapter 10 'Water Quality' of this EIS, in addition to the accompanying NIS and measures outlined hereunder, will be implemented to prevent any impacts on the River Boyne and River Blackwater cSAC and River Boyne and River Blackwater SPA.

Habitat Loss

Any re-instated habitats such as Hedgerows will utilise native species suitable for the area.

Indirect impacts on raised bogs at Windmill and Drehid-Hortland

In order to protect the existing raised bog and nearby groundwater wells from the effects of dewatering, if high permeability strata are encountered along with strong groundwater inflow within excavations, groundwater cut-off techniques (such as sheet piling) will be used in preference to lowering of the water table (dewatering). The precise technique to be used will be determined at detailed design stage following a full ground investigation.

This will avoid the possibility of significant drainage of the adjacent raised bogs. It should also be noted that the majority of excavations close to peat bogs will not extend much deeper than the existing drainage network. Any dewatering will be temporary, during construction only and will not have time to cause drainage of the peat, which due to the low permeability of the peat would result in very slow drainage.

Aquatic Ecology

The Construction Method Statement will be distributed and discussed with all parties involved in the construction of the wind farm site (including any sub-contractors) in order to protect aquatic conservation interests within the study area. The CEMP will set out measures to avoid siltation, erosion, surface water run-off and accidental pollution events which all have the potential to adversely affect water quality within the site during the construction phase.

The CEMP will detail preparatory works on the site, including installation of silt fences and bunds. The preparatory work including assessment of existing bridge crossings will be undertaken in advance of any excavations on the site. A sealed silt fence will be placed at both sides of the crossing points and to a minimum of 10m upstream and downstream of each crossing at both sides of the road. All measures provided for the protection of aquatic ecology and fisheries within the proposed development site, in addition to the mitigation measures for water quality protection to be detailed in the CEMP, will effectively protect aquatic ecological interests downstream of the proposed development.

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

A buffer of 50 m from watercourses has been adopted. Where site tracks are existing rather than a new site track, this buffer will not apply.

All infrastructure will set back 50 m away from all streams within the site except for the main crossings and the entrance to the Hortland portion of Drehid-Hortland (near T40) which is <50m (although an existing track is partially utilised). An access road at Cloncumber is also <50m from a water feature. The contractor should also ensure that trafficking on site is kept to a minimum and the routes of haul roads are kept away from watercourses as far as possible.

Where haul roads pass close to watercourses, silt fencing will be used to protect the streams. Again, maintenance and monitoring of such silt fences will be subject to an on-site quality management system as set out in the CEMP.

Cross-drains will be provided for drainage crossings and conveying flows from existing and proposed drains across the access tracks. Any new or upgraded culverts will be sized appropriately.

A method statement for streams crossings (roads and cables) will be finalised following consultation with NPWS and IFI and will follow the guidelines set out in (Murphy, 2004 [152]) and the NRA (2008) [153] '*Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*' and also the latest IFI guidelines. In relation to cable crossing, trenchless techniques will be used when other alternatives (i.e. placing cables on bridges, open cut techniques) are not practical. There are two options available:

i. Horizontal Directional Drilling (HDD)

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

ii. Alternative Trenchless Option

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

The optimal construction technique will be selected on the basis of detailed site investigation at the crossing locations and following consultation with Kildare and/or Meath County Council and statutory authorities including Inland Fisheries Ireland.

In the event that trenchless techniques utilise drilling; a biodegradable fluid such as CLEARBORE will be used rather than Bentonite. In addition a contingency and resource protection plan to include the following will be prepared:

- Drilling operations to be limited to daytime hours and conditions when low levels of rainfall are forecast.
- Drilling fluid materials and their respective data sheets shall be included in the method statement for waterways or stream crossings.
- Any site specific investigation results shall be disclosed. Investigations will include review of all available data from utility owners, site investigations, trial holes, ground penetrating radar as might be appropriate for the location.
- Materials such as suitable biodegradable absorbent material, silt fencing and gravel bags (plastic, gravel filled bags) shall be kept at boring sites in sufficient quantities to contain any release of drilling fluid.
- A visual inspection shall be undertaken of the planned bore path prior to the boring operation to ensure any or all utilities and substructures have been identified and test holes have been properly prepared.
- At stream crossings with flowing water, water monitors will be placed upstream and downstream of the crossing point, access permitting.
- Onsite training shall be provided for all monitors, and names and phone numbers provided to site supervisors.
- Upon completion of each drill rod, the monitoring person/team will be provided with information in relation to position of entry and exit of drilling head, amount of fluid utilized or pumped, equipment breakdowns or repairs, any abnormal drilling pressures recorded and any change of drilling fluid contents.
- A field response plan to minimise loss of returns of drilling fluid and actions to restore returns shall be provided.
- Equipment required to clean up and contain any released drilling fluid in the event of hydrofracture will be available at the work site or at an offsite location at the temporary construction compounds.
- In the event of a release of drilling fluid; the directional boring will stop immediately, the bore stem shall be pulled back to relieve pressure and the site supervisor notified to ensure adequate actions are taken and notifications made. In addition terrestrial releases shall be cleaned up using on site equipment and a terrestrial berm will be constructed around any terrestrial release.
- Silt fences will be constructed around proposed work areas prior to commencement of works.
- Refueling of equipment will take place at the temporary construction compounds
- Pre-construction Ecological surveys shall take place at drilling sites to determine whether any sensitive species or species requiring derogations (such as Otter) are present.
- Works will be monitored by the project ecologist.
- Any dewatering of the pits will be pumped to land as far from the watercourse as possible to allow it to infiltrate through the field or to a stilling pond or alternative to a holding tank, tested and appropriately discharged under licence.

The contractor shall ensure that erosion control and attenuation facilities, namely silt fences and silt curtains are regularly maintained during the construction phase. Spoil heaps from the excavations for the turbine bases and trenches will be covered with geotextile and surrounded by silt fences to filter sediment from the surface water run-off from excavated material. Cable trenches within the wind farm clusters will be located underneath and directly adjacent to access tracks as far as possible. Trenches will be excavated during dry periods where possible in short sections and left open for minimal periods to avoid acting as a conduit for surface water flows. Clay bunds will be constructed within any cable trenches at intervals.

Emergency Silt Control and Spillage Response Procedure have been outlined in Section 4.3.3 of this CEMP which detail the required measures for the Contractor to implement in the event of a ‘worst case’ scenario on the site. Timing of the proposed works will also take account of the fisheries constraints within the study area, where no works will be undertaken in the instream environment during the salmonid close season.

A risk assessment will be prepared prior to any wet concrete operations being carried out. All concreting works will be fully detailed in the Contractor's Construction Method Statement and will be minimised, particularly adjacent to the aquatic environment.

Standing water in the excavations at the turbine bases will contain an increased concentration of suspended solids. The excavations will be pumped into temporary settlement basins as necessary which will be lined and which will drain into existing or proposed drainage channels on site. The settlement basins will be constructed in advance of any excavations for the turbine bases.

Wheel washing facilities will be provided at the site entrance draining to silt traps. Additional silt fencing will be kept on site for the ongoing maintenance of the structures provided. Portaloos will be used to provide toilet facilities for site personnel. Sanitary waste will be removed from site via a licensed waste disposal contractor and will not be discharged on site.

Any diesel or fuel oils stored on site will be bunded to 110 % of the capacity of the storage tank. Such facilities will not be located near any drain or watercourse. Design and installation of fuel tanks will be in accordance with best practice guidelines. Refuelling of plant during construction will be carried out on a designated concrete pad, away from watercourses, draining to an oil interceptor. Drip trays and spill kits will be kept available on site. Only emergency breakdown maintenance will be carried out on site. Appropriate containment facilities will be provided to ensure that any spills from the vehicle are contained and removed off site.

The contractor will carry out visual examinations of watercourses receiving flows from the proposed development during the construction phase and regular water samples will be taken.

The works programme for the site will incorporate erosion and sediment control including the installation of drainage and runoff controls before starting site clearance and earthworks; minimisation of the area of exposed ground; preventing runoff entering the site from adjacent ground; provision of appropriate control and containment measures on site; monitoring and maintenance of erosion and sediment controls throughout the project; and establishing vegetation as soon as practical on all areas where soil has been exposed. The design of all silt and erosion control measures on the site including silt traps and siltation ponds, culverts and cross-drains will be based on the peak flood flows determined using the procedure set out in CIRIA (2006) (9).

Due to fact that the proposed site is located within the catchment areas of important salmonid rivers, effective water runoff protection methods will be integrated into the detailed Construction Environmental Management Plan (CEMP) and contractor's method statement. The Water Quality chapter of the EIS also provides run-off prevention measures. The implementation of the water quality protection measures will be incorporated into an Environmental Commitments audit checklist for the site.

There will no excavations in close proximity to watercourses / riparian habitats, no instream works will be undertaken during the salmonid close season (October–March annually) in order to protect spawning salmonids, incubating ova and emerging fry. Any upgraded bridges or culverts will be designed to be passable by fish.

Flora

The following methods will be implemented to ensure that invasive alien species are not accidentally introduced or spread during construction:

- Measures to be utilised to deal with invasive species will be included in the CEMP .These measures will follow as relevant the manual '*The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads'* by NRA (2010) [154]; and cognisance will be made of '*The Best Practice Management Guidelines*' produced by Invasive Species Ireland as included in Appendix 3 of this CEMP
- Rhododendron was primarily located at the edge of the cluster boundary (forestry entrance at Hortland). Any new patches of Rhododendron that are located during construction and operation of the wind farm will be treated to prevent further spread of this plant. Where Rhododendron has established, such areas will be eradicated by a suitably qualified person prior to construction to prevent further spread of this highly invasive plant. For this location cutting and stump treatment with an appropriate herbicide is likely to be the most effective measure. Additional applications of herbicide of any regrowth will be required to achieve complete eradication.

Wheel washes draining to silt traps will be implemented at site entrances to prevent the possible spread of any invasive species.

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. This in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds [61].

In relation to breeding Lapwing, although no turbines are proposed at located nests sites; all Turbine locations in suitable breeding locations (Derrybrennan and Cloncumber) will be surveyed for breeding Lapwing should proposed works occur within the Lapwing Breeding Season (April to June). Should any be present at exact turbine locations, then no works shall be undertaken during the period April-June to allow breeding to progress. Any works required to be carried out during the breeding season close to these locations shall be supervised by the project ecologist with stop works authority (so as to minimise disturbance).

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 as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds [61]. Limited operations such as concrete pours and turbine erection may require nighttime operating hours; these will be detailed in the CEMP and supervised by the project ecologist.

Toolbox talks with construction staff on disturbance to key species during construction. This will help minimise disturbance. This in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (10).

Sections of hedgerow scheduled for removal and/or trimming, and containing mature trees suitable for nesting Barn Owls will be surveyed prior to construction for occupancy by Owls. Should Owls be present then minimum protection zones as outlined in published guidance will be adhered to for the period of construction or until breeding has ceased (11).

Due to published impacts during construction on breeding Snipe and the assessment of significance, 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 possibility of disturbing birds during critical periods of breeding season, as per published literature (12). The implementation of this measure will be monitored by the project ecologist.

Re-instated hedgerows will be planted with native species, locally sourced, this will result in habitat enhancement for local species of conservation importance such as Yellowhammer. This in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (10).

Kingfisher: Implement mitigation measures outlined in Chapter 8 ‘Geology and Slope Stability’, Chapter 9 ‘Hydrology’ and Chapter 10 ‘Water Quality’ of this EIS, and Chapter 7 - Ecology, previous, to minimise and prevent the identified indirect impacts water quality.

Merlin:Prior to scheduled commencement of construction; nest baskets suitable for Merlin will be placed in suitable locations (such as isolated trees on high bog or trees within forestry compartments which are in clearings) as these are often preferred nest locations. Locations chosen shall be >500m from proposed turbines; this is to encourage any birds scoping territories to take up nest sites suitably removed from turbines. This may also benefit birds not currently breeding (as breeding was not proved). This will occur at the Drehid-Hortland Cluster, within the 1km square identified (west of T32) and also at within the area identified as active raised bog (south of T13) (as an enhancement measure).

A pre-construction survey (March) will be conducted of the proposed turbine locations and adjacent high bog of the Hortland portion of Drehid-Hortland to assess any evidence of Merlin activity or taking up territories. Should Merlin be present then works at these locations will be restricted to outside the breeding season (April-July).

Mammals (excluding Bats)

Construction operations will take place during the hours of daylight to minimise disturbances to faunal species at night. Limited operations such as concrete pours and turbine erection may require nighttime operating hours; these will be detailed in the CEMP and supervised by the project ecologist.

Due to the time delays between initial surveys for terrestrial mammals and the likely construction date, a qualified ecologist will re-survey the hedgerow/woodland areas earmarked for development for Badger setts, Pine Marten dens or Red Squirrel dreys no more than 10–12 months prior to construction, with a further check immediately prior to vegetation clearance. In the event that a Badger sett is found, the National Roads Authority (2006) guidelines (contained in Appendix F of Volume 3 Appendices of the EIS) for the treatment of Badgers will be followed. In addition the NPWS will be updated and consulted on the status of any Badger setts found. All works shall be overseen by the project ecologist.

All locations where river crossings are to occur and where construction of bridges or enhancement of existing bridges is required will be surveyed for Otter no more than 12-14 months prior to construction as per published guidance from the NRA. This will involve re-survey, by a qualified ecologist, of the locations in question for breeding or resting places of Otter. Survey methods will follow established best practice [157]. The location of the recorded Otter holt at Drehid-Hortland shall also be resurveyed no more than 12-14 months prior to construction as per published guidance from the NRA.

Should Otter breeding or resting sites be present then best practice guidance (NRA) in the treatment of Otters will be followed, under the terms of the obtained derogation. The NPWS will be updated on the status of any evidence found. All works shall be overseen by the project ecologist. In the event that the Otter holt recorded at Drehid-Hortland is active prior to construction commencing, mitigation measures such as the erection of screening, reduced timing of works, shall be implemented as per best practice guidance from the NRA, following consultation with NPWS.

At the Cloncumber cluster, in addition to the above, screening shall be placed along the banks of the Cloncumber stream to prevent disturbance to Otters commuting between the Canal and the Slate River during the construction period.

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

Bats

Standard mitigation measures, as would apply to any large-scale development, shall be adopted in the site clearance and construction of the turbines. These shall include limiting season of disturbance to trees and other vegetation so as to reduce impacts on breeding bird species and to implement measures to avoid and/or control pollution and sedimentation into watercourses. The following specific measures will be required to protect bats onsite.

The following mitigation measures are in line with the NRA guidelines on provisions for the conservation of bats during the planning and construction of roads (2006) (see Appendix F8 of Volume 3 Appendices of the EIS). Reference is made to the NRA Guidelines (*Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes* and the *Guidelines for the Treatment of Bats during the Construction of National Road Schemes*).

Each of the proposed locations of the 47 turbines and sub-station was surveyed and the bat activity findings recorded have identified specific areas of conflict that are listed in Table 4.5 along with recommended mitigation measures to prevent or reduce the potential negative impacts in these areas.

Table 4.5: Assessment of potential turbine / sub-station / bat conflict zones

Turbine number	Nearest vegetation	Bat activity	Recommended mitigation measures and general comments
1	Hedgerow	Low	Survey veteran ash tree with bat roost potential
2	Hedgerow	Low	No mitigation required
3	Hedgerow	Low	No mitigation required
4	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft Survey mature beech and horse chestnut trees with bat roost potential
5	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
6	Hedgerow	Low	Survey mature beech trees with bat roost potential
7	Hedgerow	Low	No mitigation required
8	Hedgerow	Low	No mitigation required
9	Hedgerow	Low	No mitigation required
10	Hedgerow	Low	Survey mature beech trees with bat roost potential
11	In forestry	High	Remove all tree plantings within a 60m radius of the turbine shaft
12	In forestry	High	Remove all tree plantings within a 60m radius of the turbine shaft
13	Scrub	Low	Remove vegetation within 60m of the turbine shaft
14	Scrub	Low	Remove vegetation within 60m of the turbine shaft
15	Scrub	Low	Remove vegetation within 60m of the turbine shaft
16	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
17	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
18	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
19	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
20	Hedgerow	Low	No mitigation required
21	Hedgerow	Low	No mitigation required
22	Hedgerow	Low	No mitigation required
23	Hedgerow	Low	No mitigation required
24	N/A	Low	No mitigation required
25	N/A	Low	No mitigation required
26	N/A	Low	No mitigation required
27	N/A	Low	No mitigation required
28	In forestry	Low	No mitigation required
29	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
30	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
31	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
32	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft

Turbine number	Nearest vegetation	Bat activity	Recommended mitigation measures and general comments
33	N/A	Low	No mitigation required
34	Hedgerow	High	Remove hedgerow vegetation within 60m of the turbine shaft
35	Hedgerow	Low	No mitigation required
36	N/A	Low	No mitigation required
37	N/A	Low	No mitigation required
38	N/A	Low	No mitigation required
39	N/A	Low	No mitigation required
40	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
41	N/A	Low	No mitigation required
42	In forestry	High	Remove all tree plantings within a 60m radius of the turbine shaft
43	In forestry	High	Remove all tree plantings within a 60m radius of the turbine shaft
44	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
45	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
46	N/A	Low	No mitigation required
47	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft

As shown in the previous table, apart from four sites needing pre-construction tree surveys, mitigation measures to protect bats are required at 22 of the 47 proposed turbine locations. In all cases it is recommended that existing vegetation is cleared to provide a vegetation-free buffer zone around the turbine. This includes turbines T31 and T32 at Cloncumber which are within a *Coillte*-owned, set-aside biodiversity area. This area mainly consists of non-native coniferous woodland and removing such within a 60m radius of both turbines will not impact on the biodiversity value of the site as tree clearance should encourage the growth of ground-cover native bog flora.

In all cases it is recommended that existing vegetation is cleared to provide a vegetation-free buffer zone around the turbine. This includes turbines T31 and T32 at Cloncumber which are within a *Coillte*-owned, set-aside biodiversity area. This area mainly consists of non-native coniferous woodland and removing such within a 60m radius of both turbines will not impact on the biodiversity value of the site as tree clearance should encourage the growth of ground-cover native bog flora.

Buffer zones

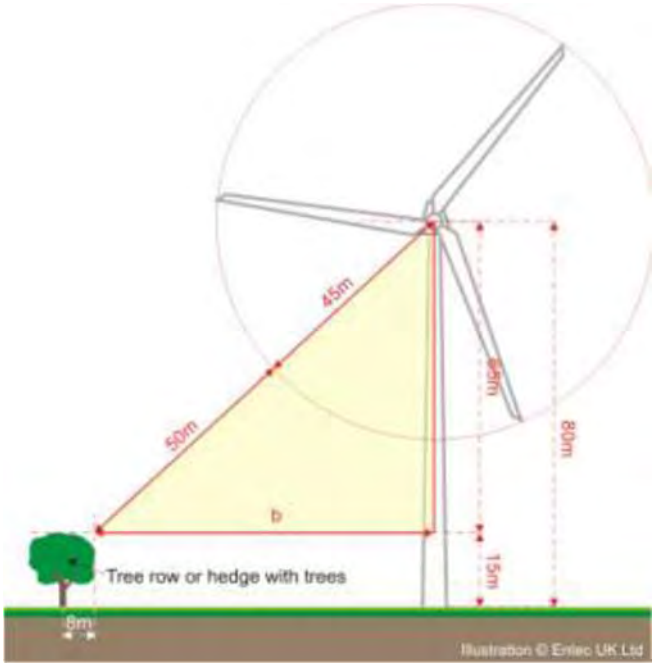
Bats commuting and foraging along onsite forest edge, treelines and hedgerows should be safeguarded by providing a 50m minimum distance buffer zone between the rotors of the planned turbines and the nearest vegetation to reduce the risk of collision and/or barotrauma. This is in line with present best practice guidelines (Carlin and Mitchell-Jones 2012) and should prevent impacts to bats that mainly fly low along such linear features e.g. the pipistrelles. Such a buffer zone can be provided by either siting the turbines so that rotors are a minimum of 50m away from existing vegetation or by felling any trees within 50m of rotors. Such cleared vegetation should be managed and maintained during the operational life of the development

From Carlin and Mitchell-Jones 2012: *It is incorrect to measure 50m from the turbine base to habitat feature at ground level as this would bring the blade tips very close to the canopy of a tall hedgerow tree and potentially put bat populations at risk. Instead, it is necessary to calculate the distance between the edge of the feature and the centre of the tower (b) using the formula:*

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

where, (in metres):

bl = blade length
hh = hub height
fh = feature height



For the example above, b = 69.3m

Removal of deciduous trees

Any mature broadleaved trees that are to be removed, should first be surveyed for bat presence by a suitably experienced specialist. If bats are found, an application for a derogation licence should be made to the *National Parks and Wildlife Service* to allow its legal removal. Such trees should ideally be felled in the period late August to late October, or early November, in order to avoid disturbance of any roosting bats as per *National Roads Authority* guidelines (NRA 2006a and 2006b (14)- see Appendix F8 of Volume 3 Appendices of the EIS) and also to avoid the bird breeding seasons. Tree felling should be completed by Mid-November at the latest as bats roosting in trees are very vulnerable to disturbance during their hibernation period (November – April). Trees with ivy *Hedera helix* cover, once felled, should be left intact onsite for 24 hours prior to disposal to allow any bats beneath foliage to escape overnight.

Landowners should be advised that the timber from felled trees will remain for their use. This should prevent trees being felled prematurely.

Retention of trees

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

HV and MV cable routes – other structures

Should any further structures be impacted by changes to the current proposed HV and MV 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.

Compensation for loss of commuting routes

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

Severed linear features such as hedgerows and treelines should, 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. The exact locations of such planting will be designed at detailed landscaping stage. Native species should be used as they support more insect life than non-native varieties.

All planting shall preferably, be completed during the pre-construction phase to provide hedgerow/tree growth prior to completion of the development. This would ensure that bats commuting in the area have prior knowledge of newly planted landscape features as well as ensuring the newly planted hedgerows/treelines are well established prior to completion of the wind farm.

Habitat retention, replacement and landscaping

Habitat replacement and landscaping could compensate for or add to the wildlife value of the area and also provide areas of aesthetic as well as wildlife interest. Further pro-active habitat restoration measures are considered below.

In general, best practice design should aim to retain the quality of the landscape where possible and ensure its protection within the landscaping programme. Existing hedgerows and treelines, semi-natural scrub or semi-natural grasslands should be retained where possible and incorporated into the landscaping programme.

The overall design of the project should also include habitat replacement or enhancement of existing onsite woodland, hedgerow, treeline and scrub habitats and it is recommended that the planting of native broadleaved trees is also considered. Native species should be chosen in all landscaping schemes. Planting schemes should attempt to link in with existing wildlife corridors (hedgerows and treelines) to provide continuity of wildlife corridors.

Bridges and culverts on cable/turbine delivery routes

If any of the structures previously listed that showed potential for use by bats or any other local bridge is to be strengthened prior to use for haulage of construction materials for this development, it should first be surveyed/re-surveyed for bat presence prior to any upgrading or maintenance works. Bats, especially Daubenton's, regularly use bridges for roosting and are vulnerable within such structures due to infilling of crevices during which they may be entombed. If bats are found then some crevices beneath the bridge should be retained for their continued use according to best practice bat mitigation measures for bridge works (see *Billington and Norman 1997* (15), *Highways Agency 2001* (16), *Joint Nature Conservation Committee 2004* [160], *National Roads Authority 2006a/2006b* (18) and *Shiel 1999* (19)). Any re-pointing or pressure grouting of bridges should only proceed after an inspection of the structure for bats and, should bats be found, an application for a derogation licence to legally allow works on or near a bat roost, which is a notifiable action under current legislation (see Appendix F6: Bat Survey Report of Volume 3 Appendices of the EIS), should be made to the National Parks and Wildlife Service.

Lighting restrictions

In general, artificial light creates a barrier to bats so lighting should be avoided where possible. Where lighting is required, directional lighting (i.e. lighting which only shines on work areas and not nearby countryside) will be used to prevent overspill. This can be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvers and shields to direct the light to the intended area only.

Marsh Fritillary:

Linear habitat features along proposed internal access roads to Derrybrennan, Cloncumber, and Drehid-Hortland where road widening or instatement of new roads is required, will be examined by a suitably qualified ecologist for the presence of Marsh Fritillary butterfly larvae prior to the commencement of works and a translocation programme will be undertaken should Marsh Fritillary be recorded. This will not apply to roads in improved agricultural grassland.

The construction works adjacent to the sensitive butterfly habitats identified within the Proposed Development will require adequate fencing to avoid trampling and further impacts outside of the required land take.

Monitoring for the presence of Marsh Fritillary and control of the contractor's works on site within these sites will be managed by an appointed site ecologist in direct consultation with the NPWS.

Landscaping works post construction will include the provision of suitable habitats for butterflies in general, including Marsh Fritillary. The following measures will be incorporated into Habitat and Species Management plan as a general enhancement measure, in areas where potentially high quality habitat for butterflies could be created (such as clearfelled forestry on bog/ wet grassland etc.):

Avoidance of smoothing out the soil around any facility; creation of undulations in the ground and do not sew any seed unless taken from plants in the vicinity of the project.

Creation for slopes with a south or west facing aspect.

Any material alongside access tracks/roads will be placed alongside the route and given a broad "A" shape and where possible face south or west.

Clearance of scrub in the area around the facility to allow a semi-natural grassland to develop.

Clearing of encroaching scrub every five years and scraping of parts of the surface to interrupt natural succession and manage the habitat for lepidoptera. Done during winter.

Create a pond/wetland by removal of peat where only a thin layer remains to expose marl. Shallow ponds (maximum depth of about 60 cm) with shallow edges/margins will attract amphibians while wetland plants like Cuckoo-flower, Purple Loosestrife and Devil's-bit Scabious will attract butterflies and moths. Scrape parts of the ground around the pond and drag the parts of the bottom of the pond every five years to maintain the habitat. Do this in September/October.

4.3.5 Archaeological Management Plan

During the construction phase all mitigation measures will be undertaken in compliance with national policy guidelines and statutory provisions for the protection of the archaeological, architectural and cultural heritage.

Attention is drawn to national monuments legislation (1930-2004), which states that in the event of the discovery of archaeological finds or remains, the Heritage and Planning Division of the Department of the Environment, Heritage and Local Government (now Department of Arts Heritage and the Gaeltacht) and the National Museum of Ireland shall be notified immediately. If features are revealed, the archaeological finds or remains will need to be investigated, and no further development will take place in that area until the site is fully identified, recorded and excavated or alternatively avoided to the satisfaction of the statutory authorities.

A report on the findings should be furnished to the Planning Authority and the DAHG. If archaeological finds, features or deposits are uncovered during the course of monitoring all works at this location should be stopped pending a discussion with the relevant authorities as to how best to mitigate against impacting on the archaeology, if present.

Mitigation measures must be carried out in advance of construction. All archaeological works will take place under licence to the National Monuments Service of the Department of Arts Heritage and the Gaeltacht (DAHG).

In order to avoid direct impact or to lessen the impact on the features identified in the geophysical survey the turbines were moved to their present proposed locations and mitigation measures are recommended.

Archaeological Monitoring

An experienced archaeologist under licence to the Department of Arts Heritage and the Gaeltacht (DAHG) will monitor all sub-surface ground works on site. The purpose of monitoring is to determine if any archaeological material or features are uncovered during ground disturbance works and also to inspect the topsoil for stray artefacts. Should any archaeological remains be uncovered during monitoring a limited amount of cleaning back will be undertaken by the archaeologist to establish the nature and extent of any potential archaeology. All works will be halted in that location and the site will be cordoned off from construction activity whilst a suitable mitigation strategy is agreed with the DAHG. The agreed mitigation strategy will be set out in a method statement and submitted to the DAHG. All work will be carried out in accordance to best practice.

Following completion of the monitoring and under the terms of agreement of the licence the results of monitoring must be detailed in a written report and submitted to the DAHG. The report summarises and contextualises information that has been recorded, and presents this information in its geographical, historical and archaeological setting using maps, illustrations and photographs as well as written text.

Archaeological Testing/assessment

The purpose of archaeological testing/assessment is to determine if any archaeological material is present at a particular location and to determine the impact of the proposed development on such material. Investigative archaeological testing will provide information on the definition, quantity and extent of sub-surface archaeological material at each of sites and areas of archaeological potential as specified in the Chapter 14 _Archaeology, Architectural and Cultural Heritage of Volume 2 of the EIS (in the vicinity of Turbines T6 (in Ballynakill), T47 (in Drehid-Hortland), T33 and T35 (in Cloncumber) and their access tracks and cables) well in advance of construction.

The assessment will involve the examination by an archaeologist of a number of investigative trenches opened by mechanical digger (using a toothless grading bucket) across the footprint of the proposed development. The results of the site investigations and research will be compiled in a report with an impact statement. This report will be submitted to the DAHG for their review and recommendations.

This will seek to establish the exact nature, date and extent of the archaeological features and the impact that the proposed turbine and access track/cable will have on them. The results of the testing will inform a suitable mitigation strategy to be discussed and agreed with the DAHG. If development is permitted full excavation/ preservation by record of the features impacted by the development will be required in advance of development.

The areas of the site that will not be subject to impact will be preserved ‘in-situ’ and must be fenced off during construction to ensure that there is no accidental damage to the subsurface archaeological remains that lie outside the construction area. A cordoned off construction corridor, that has been archaeologically resolved prior to construction, should be maintained so that machinery, equipment, spoil or fill material etc. will not be placed in the areas that contain subsurface archaeological remains.

Given the archaeological potential of the bogs it is likely that the three turbines and access roads in Windmill will require archaeological testing in advance of the construction works.

Turbine Foundations and Access Tracks

All earthmoving works for the proposed development for:

- turbine foundations
- access tracks
- hardstands
- cables
- substations
- borrow pits
- temporary construction compounds.

which will include the greenfield areas, river crossings, townland boundaries and bogland areas (subject to health and safety) will require archaeological monitoring under licence to the DAHG in accordance to National Monuments Act 1930, as amended.

The purpose of monitoring is to determine if any archaeological material or features are uncovered during ground disturbance works. In the event of the discovery of archaeological finds or remains, the DAHG and the NMI should be notified immediately. Provision will be made to allow for, and fund any, archaeological work that may be needed if any remains are noted. If features are revealed, the immediate area will need to be investigated, allowing no further development to take place until the site is fully identified, recorded and excavated or alternatively avoided to the satisfaction of the statutory authorities.

Any investigation the bogs that are to be impacted should also include paleo-environmental sampling that would complement the examination of the past environment.

Node Upgrades for Turbine Delivery Routes

The construction team should be made aware of the locations of those RPS/NIAH sites that are situated in the immediate vicinity of the proposed delivery and cable routes. All precautions should be taken to ensure that there is no accidental impact on any of the boundary treatments associated with these site /structures during the construction phase. These are outlined in Chapter 14 – Archaeology, Architectural and Cultural Heritage.

It is proposed to upgrade the Kilpatrick bridge where a modern 20th century bridge crosses the Grand Canal. Any proposed works in this location will avoid impacting the 18th century canal or canal banks (KDIAHS-012-002) and that the existing bridge should not be removed or otherwise physically impacted. If removal of the structure is required a full photographic record of the structure should be carried out.

Where the haul route runs offline at Lullymore West, archaeological investigation at the site of a gravel trackway in Lullymore West (RMP KD012-016) will be carried out well in advance of construction and will assist in devising a suitable mitigation strategy in consultation with the DAHG. It is anticipated that all archaeological issues associated with this area will be resolved before the MV cable or the haul road is constructed to the satisfaction of the DAHG.

MV Cable

Archaeological testing of the route of the MV cable as it runs offline at Lullymore West, before joining the R414 will be required, this is also the line of a proposed haul route. The testing will establish the exact location, nature and extent of the road / gravel trackway in Lullymore West (RMP KD012-016) and a suitable mitigation strategy can then be designed in consultation with the DAHG; such a strategy might include redesign by avoidance, preservation in situ by bridging the feature or full excavation.

Licenced archaeological monitoring in the areas along the MV cable routes that pass in the vicinity of recorded archaeological monuments will be required. That is in the vicinity of the Children's Burial Ground (RMP KD003-015) and a church and graveyard (RMP KD003-014002) in Cadamstown, a medieval church, graveyard and castle site in Dunfierth (RMP KD004-005 and KD004-006) and a crannog and trackway in the townland of Dysart/Knockanally (RMP KD004-014).

HV Cable Routes

- *HV Cable Route to Woodland*

Archaeological monitoring in the vicinity of the settlement of Cloncurry (RMP KD004-021002) and of Mulhussey Church, graveyard and castle site (RMP ME049-011, ME049-012) will assist in identifying any remains during the trench excavation required for the cables in the external road network.

- *HV Cable Route to Maynooth*

Archaeological testing under ministerial consent will be required along the line of the HV cable route option to Maynooth on the L5037 road in the vicinity of Taghadoe National Monument. The testing will establish whether features associated with the site extend beneath the road surface. If features are identified their nature and extent will be recorded and a suitable mitigation strategy can then be considered in consultation with the DAHG; such a strategy might include redesign by avoidance or full excavation.

Archaeological monitoring of the sections of this HV route option that passes adjacent to the church and graveyard and castle site in Dunfierth (RMP KD004-005 and KD004-005) and a crannog and trackway in the townland of Dysart/Knockanally (RMP KD004-014) will assist in identifying any remains during the trench excavation required for the cables in the external road network.

4.3.6 Outline Waste Management Plan

This Outline Construction Waste Management Plan has been prepared for the proposed Maighne Wind Farm in line with the ”Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects” (2006) as published by the Department of the Environment, Community and Local Government and supported by the Eastern-Midlands Region Waste Management Plan 2015-2021 (which is prepared to draft status at the time of writing).

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

It is an objective of this plan to prevent, reduce, reuse and recover as much of the waste generated on site as practicable and to ensure the appropriate transport and disposal of residual waste off site. This is in line with the relevant National Waste Management Guidelines and the European Waste Management Hierarchy.

Assignment of Responsible Personnel

It will be the responsibility of the contractor for the main construction works (when appointed) to nominate a suitable site representative such as a Project Manager, Site Manager or Site Engineer as Waste Manager who will have overall responsibility for this waste management plan. The waste manager will have overall responsibility to instruct all site personnel including sub-contractors to comply with the specifications of this plan.

They will ensure that at an operational level that crew foreman/gangers are assigned direct responsibility for its implementation.

Waste Generated

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

- Municipal solid waste (MSW) from the Office & Canteen
- Construction and demolition waste
- Waste oil/hydrocarbons
- Paper/cardboard
- Timber
- Steel
- Soil

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

Waste Reduction

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

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

Waste Reuse

When possible, materials shall be re used onsite for other suitable purposes, for example:

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

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

Waste Recovery

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

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

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

- Timber
- Ferrous Metals
- Aluminium
- Dry Mixed Recyclables
- Packaging Waste
- Food waste

Waste Disposal

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

Contaminated Material

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

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

Training

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

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

4.3.7 Outline Construction Traffic Management Plan

This document is the Outline Construction Traffic Management Plan (CTMP) for the proposed Maighne Wind Farm, in North County Kildare and South County Meath. The Construction Traffic Management Plan shall be finalised in accordance with this outline plan following the appointment of the contractor for the main construction works and the turbine supply contract[3].

Please note that some items in this plan can only be finalised with appropriate input from the contractor who will actually carry out and schedule the works. Furthermore, it is appropriate that the Project Supervisor Construction Stage (PSCS), when appointed, should have an active role in the preparation/review of the Traffic Management Plan. This plan should be read in conjunction with Chapter 13 - Traffic and Transportation of Volume 2 of the EIS.

The contractor is required to prepare the necessary Site Specific Traffic Management Plans prior to the construction works commencing as part of the road opening licencing applications. The contractor will be responsible for the implementation of all agreements between the developer and Kildare and Meath County Councils with the objective that the transportation needs for the proposed development and associated cable trenching will have a minimal impact on the road network and local communities.

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

Public perception of the construction phase will be influenced primarily from the impact of traffic movements. The degree of traffic disturbance caused by the construction phase of a wind farm depends on the number of turbines, the associated civil engineering requirements and the length of the construction period.

This Outline Construction Traffic Management Plan (CTMP) deals with the traffic generated during the construction of the proposed Maighne Wind Farm development. It concentrates on the traffic arising from each element of the works which includes the civil and electrical construction phase and the turbine delivery and erection period of the works.

[3] The size, shape and weight of turbine elements, and the resulting loads transported, can vary depending on the choice of turbine supplier, which is not yet determined.

Construction traffic will require regular access to the site at varying times throughout the construction phase. The aim of this CTMP is to put in place procedures to manage traffic effectively on site and in the immediate vicinity of Maighne Wind Farm, to ensure the continued movement of traffic on the public roads and to minimise disturbance during transportation of materials particularly oversize loads. The correct implementation of this CTMP will ensure that appropriate procedures are in place to minimise any effects on the safety and movement of the general public.

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

Construction Staging

The period of construction for completion of the total scheme is estimated at approximately 23 months, which includes civil construction, MV and HV cable construction, turbine delivery and erection, and the construction and commissioning of the substation and control building within the Drehid cluster. However, the bulk civil works will take approximately 14 months. Once the bulk civil works are completed, an element of testing and commissioning of the wind farm and substations will be carried out over the final three months of the construction period.

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

- Construction of site entrances
- Initial installation of on-site access tracks and associated drainage works
- Development of the construction compound and other temporary works
- Preparation of crane hard standings
- Construction of foundations
- Installation of Wind Turbine Generators (WTGs)
- Installation of cabling substation and control building
- Land reinstatement.

The hours of construction activity will be limited to avoid unsociable hours as per Section 8.5 (d) of the code of practice for BS 5228: Part 1: 1997. Construction operations shall generally be restricted to between 08:00 hours and 19:00 hours Monday to Saturday. It should be noted that it may be necessary to commence turbine base concrete pours earlier due to time constraints incurred by the concrete curing process. Work on Sundays or public holidays will only be conducted in exceptional circumstances or in an emergency. Additional emergency works may also be required outside of normal working hours as quoted above.

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

Road Improvements and Modifications

Access to the proposed turbines will be via the existing and proposed internal site track network. Widening and strengthening of some existing access tracks will be required to facilitate the delivery of large oversized trucks carrying turbine elements, to improve the strength of the existing road to carry the construction vehicles, to improve the safety of the roads and to benefit the local residents in the short, medium and longer term.

The precise nature of the temporary works to the public roads (for the purposes of the TDR) will be agreed between the developer, the local authority and the local landowners.

Restricted Public Road Use by Construction Traffic

The indicative haul route, as presented on Figure 4.10 overleaf, shows the likely route that will be taken by most construction traffic to and from each of the cluster. The haul route has been chosen using the following objectives:

1. Where possible, the route follows regional roads including R418 (old N4), R402, R403 and R414. There are no national roads in the immediate area.

2. Where possible, bog rampard type roads which are common place in the area, have been avoided.
3. Where possible, bridges over canals have been avoided due to weight restrictions.

The route of both the MV and HV cable routes was chosen to avoid, where possible, the need to trench along bog rampart type roads which present difficult geotechnical conditions in terms of construction and reinstatement.

Subject to agreement with the planning authority, a letter drop will be carried out to notify members of the public living near the proposed site/route/roadworks, to advise them of any particularly significant upcoming traffic related matters e.g. temporary lane/road closure (if required), delivery of turbine components at night.

Reasonable access to local dwellings, farms, businesses is to be maintained at all times during any road closures associated with the cable works. The details of this will be agreed with the roads authority in advance of the works in consultation with the local residents in so far as is practicable. The network of local roads in the area will be used for traffic diversions for local traffic in order to expedite the works and limit the duration of the impact owing to the cabling works.

Access to/from the National Road Network

Site Access

A system of clear signage relating to the project, both temporary and permanent will be agreed with the planning authority. These signs will also identify those roads to be used (and not to be used) for accessing the site in line with the objectives of the TMP.

Road Cleaning

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

Temporary wheel washing facilities will be located at each site entrance, subject to agreement with the planning authority, to prevent soil/dirt from being transported onto the public road network.

Road Closures, Diversions and Safety Measures for Open Cut Road trenching and Trenchless Road Crossings

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

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

Safety measures for road users adjacent to deep excavations, such as temporary concrete barriers should be detailed for trenchless road crossings in advance of construction and agreed with the respective local authority.

Canal Crossings

An overall Traffic Management Plan (TMP) will be prepared in advance of the works and this will be agreed with the roads authority and An Garda Síochána. The TMP will have regard to Waterways Ireland restrictions on the use of certain bridges over the canal networks and the haul route identified in Figure 4.10.

Carriageway/ Road Reinstatement

A pre-condition survey shall be carried out on all public roads that will be used in connection with the works to record the condition of the road before the works commence. The specification and timing of the pre-construction survey will be agreed with the roads authority. A joint survey shall be undertaken if the roads authority so agrees. For the avoidance of doubt the cost of these resurfacing works will be borne by the developer, subject to agreement with the planning authority.

All roads, shall upon completion of the construction works, be reinstated to their pre-works condition or better and to the satisfaction of the relevant roads authority.

Trenches on public roads, once backfilled, shall be reinstated without delay to the satisfaction of the roads authority.

Construction Compound

There are four proposed temporary construction site compounds and associated parking.

R:\Map Production\2014\LE14\731\04\Workspace\CEMP\LE14 731 04_Figure 4.10 Haulage Route and Traffic Counters.mxd

Ballynakill

Windmill

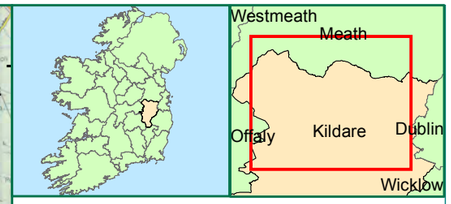
Drehid Hortland

Derrybrennan

Cloncumber

Woodland - Option 1

Maynooth - Option 2



Legend

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

0 1 2 3 4 5 Kilometers

Date 27/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Indicative Haul Route and Traffic Count Locations

Scale 1:100,000@ A3

Figure No. 4.10.

Rev A

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Construction Plant and Vehicles

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

- Hydraulic excavators
- Dump trucks
- General construction delivery vehicles (e.g. steel reinforcement bar, electrical components etc.)
- Concrete trucks and pumps
- Cranes of various lifting capacities (up to 1,000 tonnes)
- Oversized articulated delivery vehicles (for turbine component transport)
- Site Jeeps (off-road 4x4 all purpose vehicles)
- Private vehicles of those employed on site for the construction phase.

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

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

Wind Turbine Generator Deliveries

As a turbine supplier has not yet been appointed for this project, it is unclear at this stage into which port the turbines will be delivered. It is likely that the port used will be Dublin. However, the final turbine delivery route from the selected port will be confirmed following appointment of the turbine supplier.

The components of the wind turbine generators (WTG's) will then be transported by road to the proposed development for on-site assembly, using the access route outlined in Figure 4.11.

The turbines will be delivered to the site in separate parts. This typically comprises ten traffic movements for each turbine, therefore, it is estimated that 470 HGVs will be required to transport the turbines. As the loads are oversized, these will require co-ordination with the local authority and An Garda Síochána.

Mitigation measures proposed as part of the turbine delivery access management plan include:

- Temporary works at existing roundabouts to enable movement straight through the junctions
- Temporary works at tight bends and pinch-points to enable movement around these corners
- Temporary works at entrances and junctions to enable movement at the junctions.

It should be noted that the delivery of the turbine components will be carried out at night time and will be subject to a separate temporary traffic management plan, and it is not anticipated that this will have a significant impact on the prevailing traffic network.

Prior to the commencement of delivery of components to the site, a separate temporary traffic management plan will be developed further by the turbine supplier. The traffic management plan will also be approved by the Employer, the Project Supervisor Design Process (PSDP), the local authority and An Garda Síochána.

Transport deliveries will be scheduled to avoid disruption to the local roads and general public in so far as possible. The delivery of the turbine components will be carried out at night time.

R:\Map Production\2014\LE14\731\04\Workspace\CEMP\LE14 731 04 _ Figure 4.11 Turbine Delivery Route.mxd

Woodland - Option 1

Ballynakill

Windmill

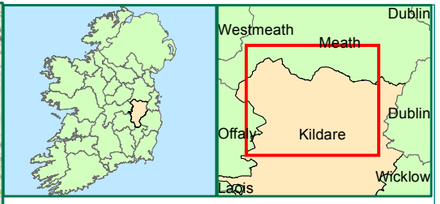
Drehid Hortland

Derrybrennan

Cloncumber

Maynooth - Option 2

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



Legend

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

0 2 4 Kilometers

Date 27/03/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm

Title Of Figure

Turbine Delivery Route

Scale Used 1:100,000 @ A3

Figure No. 4.11

Rev A

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Consultation and Notification

An Garda Síochána

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

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

Local Authorities

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

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

Waterways Ireland

The contractor will liaise directly with Waterways Ireland in relation to using bridges over the canal networks.

Local Residents

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

(a) Information signs will be erected in advance of the construction/transportation works
(b) A letter drop will be carried out to notify members of the public living near the proposed site/route/roadworks, to advise them of any particularly significant upcoming traffic related matters e.g. temporary lane/road closure (if required), delivery of turbine components at night
(c) Contact details for a Liaison Officer will be provided so that any concerns can be easily channelled to the Developer.

Key Personnel and Responsibility

Once prepared and agreed with the relevant local authority and An Garda Síochána the contractor will implement the project specific Traffic Management Plan (TMP).

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

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

Transport Officer

The Transport Officer will be responsible for maintaining regular contact with An Garda Síochána, Kildare County Council, Meath County Council, the statutory bodies and the client concerning traffic control, interference with services and co-ordination of crossings at roads, rivers and railways.

The Transport Officer will contact the relevant bodies in relation to method statements prior to the work taking place. The Transport Officer will be responsible for instructing the Construction Manager, Foreman and all other personnel on the information in the agreed method statement prior to the work commencing and ensuring that the method statement is adhered to. The Transport Officer will be responsible for ensuring that the Traffic Management Plan will be implemented in full.

Safety Officer The Safety Officer will be responsible for implementing all safety requirements detailed in the Project Safety Plan. Ensure that all operatives receive site safety induction prior to commencing work on site. He will ensure that all plant, particularly lifting equipment, on site has the relevant certification and are checked regularly by a competent person. The Safety Officer will carry out safety audits and checks on a regular basis and amend procedures where necessary.

Construction Manager The Construction Manager will be responsible for overall supervision of the operations to ensure they are constructed in a safe and efficient manner. He will ensure that sufficient resources are available to meet the programme and that the necessary information is provided to the appropriate staff.

Foreman The Foreman is responsible for ensuring that the crew carry out the work in accordance with the method statement and contract specifications and drawings using good working practices in a safe manner. He will supervise construction personnel ensuring their competence. He will check all plant and equipment on a regular basis ensuring it is maintained and in good working order.

4.3.8 Outline Site Reinstatement and Decommissioning Plan

This Outline Site Reinstatement and Decommissioning Plan has been prepared for the proposed Maighne Wind Farm development. This plan should be read in conjunction with the EIS. The Site Reinstatement and Decommissioning Plan shall be finalised in accordance with this outline plan following the appointment of the contractor for the main construction works.

The stages of the reinstatement process comprise the successful reinstatement of the site, including general site remediation and re-vegetation following construction completion in addition to the successful decommissioning of plant and equipment.

Removal of Contractors Plant and Machinery

On completion of the construction works, the contractor will remove all temporary structures, any temporary services and all machinery and plant used during the construction of the works, leaving the site in a safe and tidy condition.

General Site Remediation – Post Construction

The proposed development will result in some loss of existing vegetation, and as such, the primary objective of measures outlined in this site reinstatement plan is to facilitate regeneration of existing vegetation on site and thus maintain the natural integrity of the site as much as possible.

The developer is committed to the reinstatement, where possible, of any disturbed areas of the site during and following the construction works.

In so far as is practicable, the areas around the turbine bases and other disturbed areas will be allowed to re-vegetate naturally. Replacement of harvested vegetated sod to bare areas post construction will encourage re-vegetation and avoid erosion in the vicinity of proposed turbines, hardstands, access roads, drainage structures and all other associated infrastructure. This is considered in keeping with the existing vegetation of the site and favours the proliferation of native species in the area to maintain the natural integrity of the site.

Due to the possibility of soil-borne diseases, all topsoil recovered from each farm property will remain on the same property. Topsoil will be used for landscaping alongside existing and new access tracks where suitable and will also be used for reinstatement purposes around turbine bases and hardstandings. Where a cluster also includes a borrow pit, some of the topsoil will also be used to help in the reinstatement and re-vegetation of the borrow pit.

4.3.9 Decommissioning of Plant and Equipment

Before the end of the working life of the turbines, approximately 30 years, a technical, commercial and landscape/environmental appraisal of the project site will be carried out. This assessment will determine whether or not the turbines will be replaced by new turbines or if the site should be terminated in relation to electrical generation.

If the site is to be decommissioned, cranes will disassemble each turbine tower and all equipment. The associated components will be removed from the site for re-use, recycling or waste disposal. Any structural elements that are suitable for recycling will be disposed of in an appropriate manner. All lubrication fluids will be drained down and put aside for appropriate collection, storage, transport and disposal.

This outline decommissioning plan will be further developed with the relevant local authorities.

4.3.10 Site Reinstatement Programme

Reinstatement of Turbine Bases, Access Tracks and Hardstandings

Following decommissioning of the wind farm, turbine bases and hardstanding areas will be rehabilitated. The wind turbine towers will be dismantled and removed from site. It is proposed that turbine foundations and hardstanding areas will be left in place. The Irish Wind Energy Association (IWEA) states[4] that when decommissioning a wind farm "*the concrete bases could be removed, but it may be better to leave them under the ground, as this causes less disturbance*".

It is proposed to leave the access tracks in-situ at the decommissioning stage. IWEA also state that "*it may be best*" to leave site tracks in-situ depending on the size and geography of the development.

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

Reinstatement of Soil and Vegetation

The development will result in some loss of existing vegetation, and consequently the primary objective of measures, which will be outlined in a decommissioning report, is to facilitate regeneration of existing vegetation on site and thus maintain the natural integrity of the site as much as possible. After decommissioning, the areas around the turbine bases and other disturbed areas will be encouraged to re-vegetate naturally. The replacement of harvested vegetated sod to bare areas post removal will encourage re-vegetation and avoid erosion in the vicinity of any infrastructure that has been removed. This is considered to be in keeping with the existing vegetation of the site and favours the proliferation of native species in the area to maintain the natural integrity of the site.

Following reinstatement, the site will be monitored on a regular basis to determine the progress of re-vegetation and if necessary to look at introducing supplementary planting with native species. A reassessment of the site will be carried out at the end of year 1 to assess the sites progression over the previous year and to take photographic evidence of the site vegetation status, drainage management and general site appearance at the end of year 1.

Reinstatement will incorporate landscaping of trackside berms and construction compounds. Excavated soil and rock recovered during the excavation of the infrastructure will be re-used on-site for the restoration works (where the materials originated on the site) or removed from the site and recycled (where imported). Recycling of materials may involve re-use or recycling at a local recovery facility. Only material which is not re-useable or recyclable will be permitted to be disposed of.

All reinstatement and re-profiling will consider and mitigate against all identified significant risks to environmental receptors. Water management will be taken into consideration in order to maintain or reinstate the pre-existing hydrogeological balance of the site.

[4] IWEA website, http://www.iwea.com/index.cfm/page/planning_regulationsandadminis?#q78

Any hedgerows damaged or removed during decommissioning works at the wind farm will be fully replaced. The hedgerows will be replaced using species of similar type and maturity as those pre-existing so as to match the surrounding vegetation and to give the species the best chance of survival.

4.3.11 Transportation and Timing

The removal of site infrastructure and reinstatement works will take place within three months of the start of decommissioning. If the wind farm is decommissioned, the site will be reinstated within six months according to this programme.

4.3.12 Recycling of Plant and Reuse of Waste Materials

All plant removed during decommissioning of the site will be re-used at other wind farm sites whenever possible. All remaining materials which cannot be re-used will be recovered/recycled. This is likely to include scrap metal, plastic and other waste materials. Any materials which cannot be re-used, recycled or recovered will be disposed of by an appropriately licenced contractor in the most environmentally manner available at the time of the decommissioning by an appropriately licenced contractor.

4.4 Environmental Management Team - Structure and Responsibility

A preliminary organisation chart is included in Figure 4.11. Revisions to the project organisation chart shall be controlled independently of this plan following the appointment of the Contractor for the main construction works.

The Contractor's Project Manager will be responsible for the delivery of all elements of the Environmental Management Plan.

The Contractor's Project Manager will retain all responsibility for issuing, changing and monitoring the Environmental Management Plan throughout.

4.5 Training, Awareness and Competence

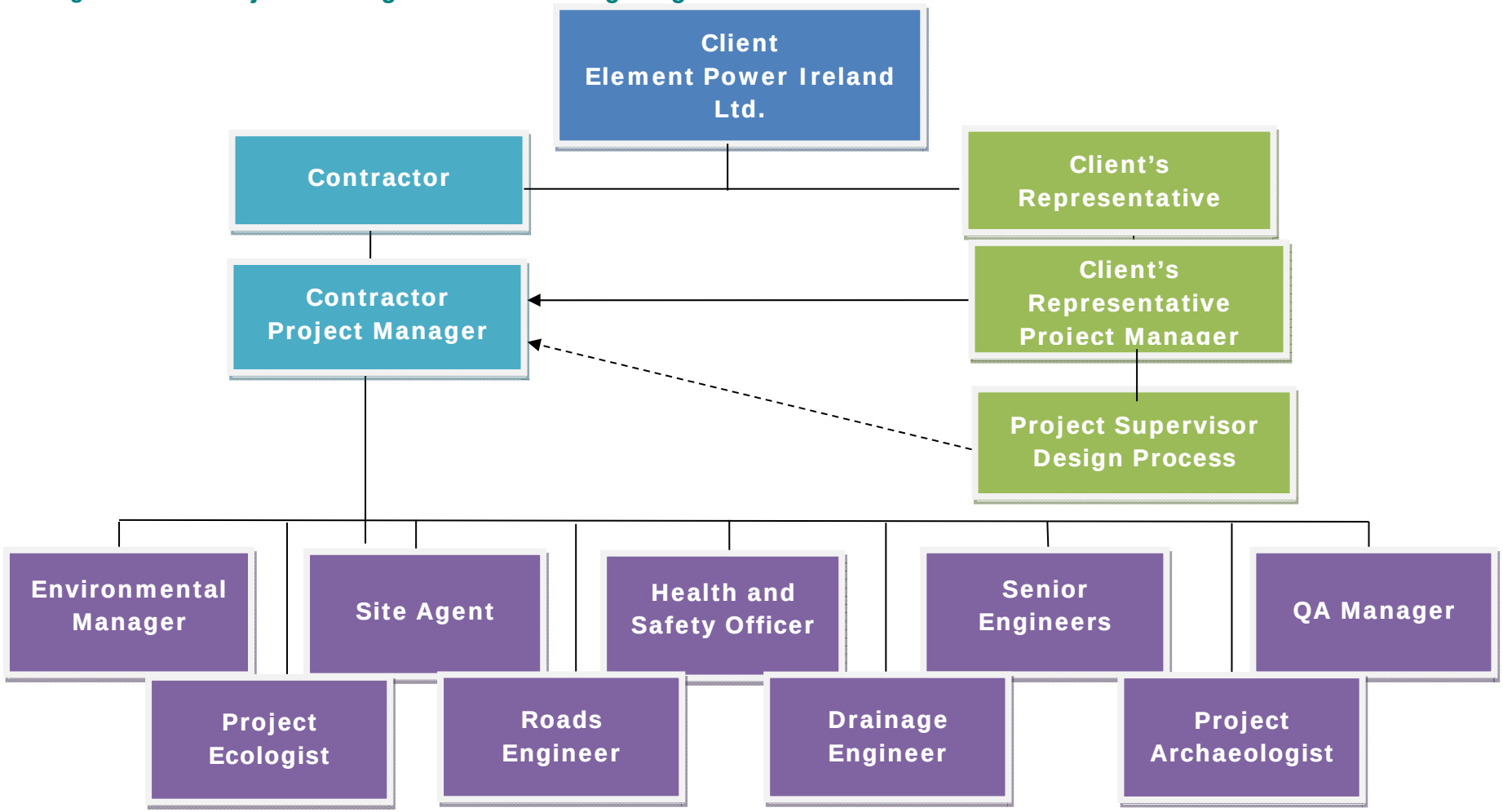
All site personnel will receive environmental awareness information as part of their initial site briefing. The detail of the information will be tailored to the scope of their work on site. The contractor for the main construction works may decide to conduct the environmental awareness training at the same time as Health and Safety Training (often referred to as Site Inductions).

This will ensure that personnel are familiar with the environmental aspects and impacts associated with their activities, the procedures in place to control these impacts and the consequences of departure from these procedures.

The CEMP will be posted on the main site notice board during the project. The environmental performance at the site is on the agenda of the monthly project management meetings for the project.

Elements of the CEMP will be discussed at these meetings including objectives and targets, the effectiveness of environmental procedures etc. Two-way communication will be encouraged by inviting all personnel to offer their comments on environmental performance at the site.

Figure 4.12: Project Management Team Organogram



4.6 Environmental Policy

The contractor is responsible for preparing and maintaining an Environmental Policy for the site. The policy should be appropriate to the project, commit to continuous improvement and compliance with legal requirements and provide a framework for objectives and targets. This will be communicated to all site personnel and will be available on site notice boards.

4.7 Register of Environmental Aspects

The contractor is responsible for preparing and maintaining a *Register of Environmental Aspects* pertaining to the site. This register will identify the environmental aspects associated with activities onsite and determine which aspects have or can have a significant impact on the environment.

4.8 Register of Legislation

The contractor is responsible for preparing and maintaining a register of key environmental legislation pertaining to the site. This register will reference all current environmental legislation and will be inspected, reviewed and updated regularly to ensure compliance.

4.9 Objectives and Targets

Objectives and targets are required to be set to ensure that the project can be constructed and operated in full accordance with the EIS, planning conditions and legislative requirements, with minimal impact on the environment.

Environmental objectives are the broad goals that the contractor must set in order to improve environmental performance. Environmental targets are set performance measurements (key performance indicators or KPI's) that must be met in order to realise a given objective.

The contractor will set objectives based on each significant environmental impact. Key objectives are likely to include the following:

- To ensure that the rivers and streams are not negatively impacted by construction works
- To ensure that humans are not negatively impacted by dust generated by construction works
- To ensure that humans are not negatively impacted by noise or vibration generated by construction works
- To ensure that impacts to habitats and wildlife are minimised during works
- To ensure that a waste management plan for this site will be fully implemented
- To ensure that the visual impact during the construction work is minimised
- To ensure Maighne Wind Farm is constructed in compliance with the EIS.

Performance in relation to each of these objectives will be reviewed on a regular basis by means of inspections, audits, monitoring programmes, etc.

4.10 Non-Conformance, Corrective and Preventative Action

Non-Conformance Notices will be issued where there is a situation where limits/trigger levels associated with activities on the project are exceeded, or there is an internal/external complaint associated with environmental performance.

Non-conformance is the situation where essential components of the EMS are absent or dysfunctional, or where there is insufficient control of the activities and processes to the extent that the functionality of the EMS in terms of the policy, objectives and management programmes, is compromised. A non-conformance register is to be controlled by the contractor.

The EMS and all its components must conform to the EMP, objectives and targets and the requirements of the ISO 14001 management standard.

In the event of non-conformance with any of the above, the following must be undertaken:

- Cause of the non-compliance
- Develop a plan for correction of the non-compliance
- Determine preventive measures and ensure they are effective
- Verify the effectiveness of the correction of the non-compliance
- Ensure that any procedures affected by the corrective action taken are revised accordingly.

Responsibility must be designated for the investigation, correction, mitigation and prevention of non-conformance.

4.11 EMS Documentation

The Contractor is required to keep the following documentation in relation to the environmental management of the project (as a minimum):

- Construction Environmental Management Plan for Maighne Wind Farm
- Register of Environmental Impacts
- Register of Planning Conditions
- Monitoring Records
- Minutes of Meetings
- Training Records
- Audit and Review Records.

All of these documents and records are to be available for inspection in the site office. The documentation shall be to date and shall be reviewed on a regular basis with revisions controlled in accordance with the site quality plan.

4.12 Control of Documents

The Contractor will establish, implement and maintain a procedure to control CEMP documents and records so they are clearly identifiable, organised, current, easily located and revised when necessary.

5. SAFETY & HEALTH MANAGEMENT PLAN

5.1 Introduction

This Safety and Health Management Plan (SHMP) defines the work practices, procedures and management responsibilities relating to the management of health and safety during the design, construction and operation of the Maighne Wind Farm and shall be read in conjunction with the Preliminary Safety & Health Plan prepared for the project by the Project Supervisor for the Design Process. The Safety and Health Management Plan shall be finalised in accordance with this outline plan following the appointment of the contractor for the main construction works.

This SHMP describes how the contractor for the main construction works will implement a site safety management system (SMS) on this project to meet the specified contractual, regulatory and statutory requirements, environmental impact statement mitigation measures and planning conditions. It is the contractor's responsibility to implement an effective safety management system to ensure that the developer's safety requirements for the construction of this project are met.

All site personnel will be required to be familiar with the requirements of the safety management plan as related to their role on site. The plan describes the project organisation and sets out the health and safety procedures that will be adopted on site:

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

5.2 Project Obligations

The construction of the Maighne Wind Farm will impose numerous safety management obligations on the developer, designer and contractor. As well as statutory obligations, there are a number of specific obligations set out in the EIS in addition to those that will be set out in the planning conditions for the proposed wind farm, should it be granted consent. These obligations are set out below. The contractor for the main construction works and all of its sub-contractors are to ensure that they are fully aware of and in compliance with these safety obligations.

5.2.1 EIA Obligations

The EIS for the proposed development identifies mitigation measures that will be put in place to mitigate the potential impacts arising from construction of the project.

5.2.2 Planning Permission Obligations

Should the proposed development be granted consent, the specified conditions will be complied with and should be read in conjunction with this CEMP and other related reports prepared by and on behalf of the developer.

5.2.3 Statutory Obligations

The Safety, Health and Welfare at Work Act 2005 and the Safety, Health and Welfare at Work (Construction) Regulations 2013 place a responsibility on the Developer as the "Client", the Designer, the Project Supervisors and the Contractor. The Client must:

- Appoint a competent and adequately resourced PSDP
- Appoint a competent and adequately resourced PSCS
- Be satisfied that each designer and contractor appointed has adequate training, knowledge,experience and resources for the work to be performed
- Co-operate with the project supervisor and supply necessary information
- Keep and make available the safety file for the completed structure
- Provide a copy of the safety and health plan prepared by the PSDP to every person tendering for the project
- Notify the Authority of the appointment of the PSDP.

Designers must:

- Identify any hazards that their design may present during construction and subsequent maintenance
- Eliminate the hazards or reduce the risk
- Communicate necessary control measures, design assumptions or remaining risks to the PSDP so they can be dealt with in the safety and health plan
- Co-operate with other designers and the PSDP or PSCP
- Take account of any existing safety and health plan or safety file
- Comply with directions issued by the PSDP or PSCS.

The PSDP must:

- Identify hazards arising from the design or from the technical, organisational, planning or time related aspects of the project
- Where possible, eliminate the hazards or reduce the risks
- Communicate necessary control measure, design assumptions or remaining risks to the PSCS so they can be dealt with in the safety and health plan
- Ensure that the work of designers is coordinated to ensure safety
- Organise co-operation between designers
- Prepare a written safety and health plan for any project and deliver it to the client prior to tender
- Prepare a safety file for the completed structure and give it to the client.

The PSCS must:

- Co-ordinate the identification of hazards, the elimination of the hazards or the reduction of risks during construction
- Develop the Safety and Health Plan initially prepared by the PSDP before construction commences
- Co-ordinate the implementation of the construction regulations by contractors
- Organise cooperation between contractors and the provision of information
- Co-ordinate the reporting of accidents to the Authority
- Notify the Authority before construction commences
- Provide information to the site safety representative
- Co-ordinate the checking of sage working procedures
- Co-ordinate measures to restrict entry on to the site
- Co-ordinate the provision and maintenance of welfare facilities
- Co-ordinate arrangements to ensure that craft, general construction workers and security workers have a Safety Awareness card, e.g. Safe Pass and a Construction Skills card where required
- Co-ordinate the appointment of a site safety representative where there are more than 20 persons on site
- Appoint a safety adviser where there are more than 100 on site
- Provide all necessary safety file information to the PSDP
- Monitor the compliance of contractors and others and take corrective action where necessary;
- Notify the Authority and the client of non-compliance with any written directions issued.

The Contractor must:

- Co-operate with the PSCS
- Promptly provide the PSCS with information required for the safety file
- Comply with directions of the project supervisors
- Report accidents to the Authority and to the PSCS where an employee cannot perform their normal work for more than 3 days
- Comply with site rules and the safety and health plan and ensure that your employees comply
- Identify hazards, eliminate the hazards or reduce risks during construction
- Facilitate the site safety representative
- Ensure that relevant workers have a safety awareness card and a construction skills card where required
- Provide workers with site specific induction
- Appoint a safety officer where there are more than 20 on site or 30 employed
- Consult workers with site specific induction
- Monitor compliance and take corrective action.

Consequently at all stages of the project there are statutory requirements for the management of safety, health and welfare of all involved in or affected by the development. As previously outlined this CEMP and specifically the Safety and Health Management Plan addresses key construction management issues associated with the proposed wind farm. This plan will be developed further at the construction stage, on the appointment of the Contractor for the main construction works.

5.2.4 The Management of Health and Safety during the Design Process

FTC has been appointed PSDP (for the preparation of the EIS and planning application for the proposed Maighne Wind Farm development) and is competent to fulfil this role in accordance with the Safety, Health and Welfare at Work (Construction) Regulations, 2013. Health and safety is a major priority for FTC and FTC adopts health and safety practices that are an inherent part of a safe and sustainable business. FTC's objective is to provide a safe and healthy work environment for all and to meet our duties to clients, contractors and members of the public.

It is FTC's policy to comply fully with all health and safety legislation, in particular the Safety, Health and Welfare at Work Act, 2005, Safety, Health and Welfare at Work (General Application) Regulations 2007, and the Safety, Health and Welfare at Work (Construction) Regulations 2013.

FTC has developed in-house procedures to ensure, so far as is reasonably practicable, that all projects:

- Are designed to be capable of being constructed to be safe/ without risk to health
- Can be operated and maintained safely and without risk to health during use
- Comply in all respects, as appropriate, with the relevant statutory enactments and instruments.

These procedures include effective risk management procedures involving the identification and evaluation of risks and the development of mitigation measures to eliminate (where possible) or reduce those risks during the life-cycle of the project. The FTC team is committed to health and safety and shares responsibility for managing risk at all stages of a project.

All work by FTC is undertaken in a competent and efficient manner taking account of the general principles of prevention to safeguard the safety, health and welfare of construction and maintenance workers and other third parties.

The FTC procedures for the management of safety during the design process are outlined in the in-house procedure PP09 "Health and Safety Requirements in Design Projects" and is adhered to on all design projects.

The purpose of this procedure is to define the requirements for the management of health & safety during design projects, to ensure compliance with the Safety, Health and Welfare at Work (Construction) Regulations 2013.

The procedure includes standard forms which are used to communicate health and safety considerations within the design team and also guidelines which develop the company's health and safety procedure and outline the company's responsibilities for health and safety during the design process.

The procedure addresses health and safety issues at all stages of a project, from the preliminary design through to commissioning and operation. By establishing a chain of responsibility each party is clear on their role and obligations from a health and safety perspective. Risk assessments are carried out, at preliminary and detailed design stages by every discipline involved in the design. Each risk assessment is prepared by the designers and reviewed by the Health and Safety Facilitator for the project.

Risk assessments are used to identify hazards and assess risk at all stages during the life of the project including the construction and maintenance stages.

A Health and Safety Facilitator for the Design Process (HSF) is appointed on all projects where FTC are the Project Supervisor for the Design Process (PSDP). Health & Safety Facilitators are selected from the senior ranks of FTC design staff to ensure they have the required knowledge, experience and training to carry out the role.

Meetings will be held between the HSF and relevant design personnel to collate all the risk assessments and other pertinent information and to discuss any issues relating to health and safety and ensure the constructability of the designs. The minutes of these meetings are circulated to the entire design team complete with actions allocated to the designers as appropriate. At such a meeting a 'Construction Risk Analysis' form is completed which forms the basis for the Preliminary Safety & Health Plan. This document outlines the particular, significant and residual risks and in addition specific construction methods or sequences assumed during the design. Special requirements for maintenance envisaged at design stage are also included.

A Designers Safety File shall be kept and maintained during the design. All design criteria adopted and safety & health information required for the Safety File shall be kept in this file which is maintained by the HSF and is the pre-cursor to the Safety File. The information required from the Contractor/PSCS for inclusion in the Safety File is specified at tender stage in the Preliminary Safety and Health Plan.

This information from the PSCS & Contractor(s) and the Designers Safety File is used to compile the Safety File in the latter stages of a contract and formally issued to the Client on completion of the contract.
FTC promotes a collaborative approach to health and safety on site where the Client, PSDP, Designers, Contractors and PSCS co-operate with each other and share information. Joint site safety audits and/or walk-downs are carried out as part of this collaboration and safety is monitored and addressed on site on an ongoing basis. The regular safety meetings are held to document this ongoing co-operation, get an over-view of works currently in hand onsite and about to commence and share information.

5.2.5 The Preliminary Safety and Health Plan

In accordance with the requirements of the Safety, Health & Welfare at Work (Construction) Regulations 2013 a Preliminary Safety & Health Plan will be required as part of the design process. This plan will be further developed by the PSCS on appointment and maintained as a live document during construction and commissioning of the proposed development.

The safety and health plan is required to include the following information:

- A general description of the project
- Details of other work activities taking place on site
- Works involving particular risks
- The timescale for the project and the basis on which the time frame was established
- Conclusions drawn by designers and the PSDP having taken into account the General Principles of Prevention and any relevant Safety and Health Plan or Safety File
- The location of electricity water and sewage connections so as to facilitate early establishment of welfare facilities.

In accordance with the PSDP's procedures the Preliminary Safety & Health Plan for the proposed Maighne Wind Farm development is to include the following sections and subsections to ensure the PSCS is aware of the health and safety issues at tender stage and enable them to price accordingly:

Preamble

1 General Project Information:
- 1.1 Title
- 1.2 Description of Project
- 1.3 Employer
- 1.4 Designers / Other Consultants
- 1.5 Project Supervisor Design Process
- 1.6 Drawings, Specifications and Other Documents
- 1.7 Intended Contract Commencement Date
- 1.8 Intended Contract Completion Date
- 1.9 Basis for Contract Duration
- 1.10 Restrictions on Working Hours
- 1.11 Notification of Project
- 1.12 Termination of the PSCS Appointment

2 The Existing Environment:
- 2.1 Site Location
- 2.2 Relevant Adjoining Land Uses
- 2.3 Site Restrictions
- 2.4 Restrictions on Access
- 2.5 Hazardous Area Classification
- 2.6 Existing Services
- 2.7 Ground Conditions
- 2.8 Existing Hazards
- 2.9 Liaison with Statutory Bodies

3 Other Work Activities:
- 3.1 Other Contracts Which May Affect Work
- 3.2 Occupation of Site
- 3.3 Building Activities
- 3.4 Other Work Activities
- 3.5 Emergency Procedures in Place on Site

4 Particular and Residual Risks:
- 4.1 Works Which Puts Persons at Work At risk
- 4.2 Work Which Puts Persons at Risk from Chemical or Biological Substances
- 4.3 Work with Ionising Radiation
- 4.4 Work near High Voltage Power Lines
- 4.5 Work Exposing Persons at Work to the Risk of Drowning
- 4.6 Work on Wells, Underground Earthworks and Tunnels
- 4.7 Work Carried Out By Divers at Work Having a System of Air Supply
- 4.8 Work Carried Out in a Caisson with a Compressed Air Atmosphere
- 4.9 Work Involving the Use of Explosives
- 4.10 Work Involving the Assembly or Dismantling of Heavy Prefabricated Components
- 4.11 Work Involving Hazardous Material
- 4.12 Residual Risks

5 Additional Information:
- 5.1 Existing Documents
- 5.2 Site Possession
- 5.3 Site Rules
- 5.4 Site Specific Safety Objectives
- 5.5 Phasing of Works
- 5.6 Permits / Authorisation Required
- 5.7 Maintenance
- 5.8 Continuing Liaison
- 5.9 Specific Recommendations

6 Information Required For Safety File:
- 6.1 Information Required For Safety File from PSCS

5.2.6 The Management of Health and Safety during the Construction Phase

The selection criteria for the Contractor for the works will be based on the ability to construct the works in a manner that will not endanger the safety, health and welfare of any parties and competence to fulfil the role of PSCS.

The contract will be awarded on the basis of assessment of the candidates against relevant health and safety criteria including experience of similar projects, knowledge of the construction processes involved and training of their management and staff who will be involved in carrying out the works.

5.2.7 The Construction Stage Safety and Health Plan

In accordance with the requirements of the Safety, Health & Welfare at Work (Construction) Regulations 2013 the preliminary Safety & Health Plan prepared by the PSDP will be further developed by the PSCS before the commencement of the construction work and updated on a regular basis during the construction phase of the project.

The document will include the following sections and subsections to ensure the management of health and safety during the construction phase of the project:

1. Description of Project:
    - project description and programme details
    - details of client, PSDP and PSCS, designers
    - main contractor and other consultants
    - extent and location of existing records and plans
    - arrangements for communicating with Contractors, PSDP and others as appropriate.

2. Communication and Management of the Work:

    - management structure and responsibilities
    - safety and health goals for the project and arrangements for monitoring and review of safety and health performance
    - arrangements for:
        - regular liaison between parties on site
        - consultation with the workforce
        - the exchange of design information between the Client, Designers, Project Supervisor for the Design Process, Project Supervisor Construction Stage and Contractors on site
        - handling design changes during the project
        - the selection and control of contractors
        - the exchange of safety and health information between contractors
        - security, site induction, and on-site training
        - welfare facilities and first aid
        - the production and approval of risk assessments and method statements
        - the reporting and investigation of accidents and other incidents (including near misses)
    - site rules
    - fire and emergency procedures.

3. Arrangements for Controlling Significant Site Risks:

    - safety risks
        - services, including temporary electrical installations
        - preventing falls
        - work with or near fragile materials
        - control of lifting operations
        - dealing with services (water, electricity and gas)
        - the maintenance of plant and equipment

poor ground conditions

        - traffic routes and segregation of vehicles and pedestrians
        - storage of hazardous materials
        - dealing with existing unstable structures

  - accommodating adjacent land use
  - other significant safety risks.

- health risks:
  - removal of asbestos
  - dealing with contaminated land
  - manual handling
  - use of hazardous substances
  - reducing noise and vibration
  - other significant health risks.

The construction stage safety and health plan will be maintained on site by the PSCS and will be communicated to all relevant parties on an ongoing basis through inductions, site safety meetings and tool box talks etc. as required.

6. OUTLINE EMERGENCY RESPONSE PLAN

6.1 Introduction

This chapter of the Outline CEMP presents an Outline Emergency Response Plan for the Maighne Wind Farm development. The Emergency Response Plan shall be finalised in accordance with this outline plan following the appointment of the contractor for the main construction works and following detailed design development.

This outline Emergency Response Plan contains predetermined guidelines and procedures to ensure the safety, health and welfare of everybody involved in the project and to protect the environment during the construction phase of Maighne Wind Farm. This outlines the immediate response to an emergency or disaster situation and will be developed by the main construction works contractor and PSCS as part of their construction stage Safety and Health Plan.

An emergency is any disruptive or harmful event that endangers people, environment, property or assets. Emergencies can be small, as in a fire contained by employees using firefighting equipment or large, as in a disaster resulting from a storm.

In the context of the Maighne Wind Farm, examples of Emergency Response Plan emergency events are:

- Medical emergency
- Explosion
- Overheated equipment
- Chemical and fuel spill
- Fire
- Loss of power
- Vehicle incidents.

Example sources of emergency or disaster events are:

- Unstable/inappropriate stockpiles on site
- Faulty or incorrect use of equipment
- Falls from height
- Smoking
- Storm/adverse weather
- Power failure
- Fuel spill
- Road failure
- Serious vehicle collisions or overturning.

6.2 Emergency Response Plan

An emergency response plan deals with the immediate physical effects of a disaster and outlines the initial response.

6.2.1 Emergency Response Liaison

The contractor/PSCS will designate an individual to serve as the Emergency Response Liaison for this project. The emergency response liaison will coordinate the emergency response for the duration of any emergency at or nearby the project site.

Kildare County Council and Meath County Council, An Garda Síochána and the HSE Ambulance Co-ordinator will be provided with the construction programme and the onsite contact information from the Emergency Response Liaison prior to construction.

The Emergency Response Liaison will be immediately reachable at all times during project construction. The Liaison will coordinate with the above agencies to establish emergency procedures for access to and within the site in the event of an emergency.

6.2.2 Reporting Emergencies

In the event of fire, storm, flood, serious injury or other emergency, contact:

ALL ON SITE EMERGENCIES DIAL 999

6.2.3 Designated Responder

A map depicting tower locations with the emergency meeting points will be furnished to Kildare and Meath County Council's Fire Department and HSE ambulance co-ordinators.

Upon arrival on the scene, the senior EMS Officer will set up the incident command structure. The Emergency Response Liaison and all contractor's personnel will cooperate with directions of the incident commander and assist as directed.

The nearest emergency services, ambulance and Accident & Emergency (A&E) facilities are:

Service:	Contact Details:	
Accident & Emergency (A&E)	Naas General Hospital	045 849500, 045 897221
Ambulance Service	Dial 112 or 999	
Fire Services	Dial 112 or 999	
Garda Station	Longwood Garda Station Kilcock Garda Station Carbury Garda Station Rathangan Garda Station	046 9554570 01 6757390 045 884311 045 527737
District HQ:	Trim Garda Station Leixlip Garda Station Kildare Garda Station	046 9481547 01 6667800 045 527737
Divisional HQ:	Navan Garda Station Naas Garda Station	046 903 6300 045 884311

Each member of the contractor's site team who are First-Aid and Cardiopulmonary Resuscitation (CPR) trained personnel will be identifiable with a hard hat sticker indicating their training.

6.2.4 Emergency Alarm

The emergency alarm will be raised on site as soon as an emergency situation is detected, the alarm will be identified (contractor to check those that apply):

	Air Horn		Radio		Voice		Hand Signals		Siren

6.2.5 Emergency Reporting

In the event of an emergency the nearest supervisor with radio equipment/mobile phone will be notified. The degree of emergency will be reported to the Emergency Response Liaison who will contact the Emergency Services and request the appropriate emergency service.

6.2.6 Medical Protocol

In the event of a major medical emergency, the emergency centre (999) will be notified and an ambulance and emergency medical team will respond to the scene. All major medical cases require professional (ambulance) transportation. In the event of a minor medical case, the affected employee can be transported via company vehicle in the escort of a foreman or site engineer (with first aid training).

6.2.7 Emergency Response

Upon notification, the Emergency Response Liaison will respond to the emergency scene and manage emergency operations:

1. Assess hazards and make the area safe – If you cannot enter the area without risking your safety, don't do it, call the Emergency Services immediately and wait for them. If you think you can safety enter the area, look around the emergency scene for anything that can be dangerous or hazardous to you, the casualty, or anyone else at the scene. Bystanders can help with making the area safe. First aid kits will be available on site. Operators that have been first aid/CPR/AED trained will be listed on site and easily identifiable by a hard hat sticker.

2. Take charge of the situation – if you are the first-aid provider on the scene act fast. If someone is already in charge, briefly introduce yourself and see if that person needs any help. If there is any chance the casualty could have a head or spinal injury, tell them not to move.

3. Get Consent – always identify yourself as a first-aid provider and offer to help. Always ask for consent before touching a conscious adult casualty and always ask for consent from a parent or guardian before touching an unconscious or conscious child or infant. With an unconscious adult casualty consent is implied as it is generally accepted that most people want to live. Remember to protect yourself first by wearing gloves and eye protection.

4. Assess Responsiveness – is the casualty conscious or unconscious? Note their response while you are asking them for their consent. If they respond, continue with the primary survey, and if they don't respond, be aware that an unconscious casualty is or has the potential of being a breathing emergency.

5. Call out for help – this will attract bystanders. Help is always useful in an emergency situation. Someone can be called over to phone for medical help. Others can bring blankets if needed, get water, etc. a bystander can help with any of the following:

- Make the area safe
- Find all the casualties
- Find the first aid kit, or any useful medical supplies
- Control the crowd
- Call for medical help
- Help give first aid, under you direction
- Gather and protect the casualty's belongings
- Take notes, gather information, be a witness
- Reassure the casualty's relatives
- Lead the ambulance attendants to the scene of the emergency
- Notify Emergency Services as soon as you can. Either send a bystander or call yourself.

In the event of a major medical emergency the Emergency Response Liaison, as the person-in-charge of the emergency scene, will dispatch someone to the site access point nearest the emergency scene to direct and lead arriving outside responders to the emergency scene. The designated meeting point will be agreed prior to the commencement of construction. Emergency personnel will be met at this meeting point communicated by management during the 999 call. The emergency personnel escort will use the hazard lights on their vehicle so they are easily identified.

6.2.8 Escape and Evacuation Procedure

Dependent upon the degree of the emergency and if safe to do so, employees will evacuate to the designated assembly area where the designated wardens shall account for all employees and determine if anyone still remains within the emergency scene.

Where the designated assembly area is compromised other locations will be designated as secondary assembly areas.

6.2.9 Tower Rescue Procedure

In the event personnel are trapped or injured in an elevated tower position the following protocol will be initiated:

1. The Emergency protocol will be initiated
2. Emergency Response Liaison will be notified
3. Tower Rescue Team will be activated and respond to the scene
4. Outside medical and Rescue Teams will be notified and respond to the scene.

Tower Rescue Procedure:

1. Upon learning of an emergency, the on-scene foreman shall assess the emergency and ascertain its degree, location and the extent of any injuries
2. Upon confirming that an emergency exists the on-scene foreman notifies the Emergency Response Liaison and the project office
3. Upon notification of the emergency the Emergency Response Liaison shall notify senior project supervision and the local emergency centre (999) of the emergency
4. The Emergency Response Liaison shall inform the dispatcher of the location, tower number, the degree of the emergency and the extent of injuries.

6.2.10 Prevention of Illness/Injury Due To Weather/Elements

1. All employees will have access to shelter and heat in the event of inclement weather
2. Employees will have access to at least a litre of water at all times
3. High wind warnings and weather forecast will be discussed every morning with the crews. Weather conditions and forecast will be monitored regularly by management

4. No Employee will work alone. A buddy system will be used so employees can contact a supervisor in case of an emergency.

6.2.11 Environmental Emergency Procedure

An emergency preparedness and response procedure is required to prevent environmental pollution incidents. Emergency Silt Control and Spillage Response Procedures are included in Section 4.3.3 of this Outline CEMP.

Suitable spill kits and absorbent material for dealing with oil spills will be maintained on site. In the event of pollution or potential risk of pollution the Local Authority will be informed immediately. In the case of water pollution, Inland Fisheries Ireland should also be informed immediately.

6.2.12 Emergency Response Plan – Haul Routes

Emergency Response Procedures relating to transportation of plant, equipment and materials to site to be developed by the main contractor during the construction phase of the wind farm.

Appendix 1

EIS Requirements

A Air and Climate

A.1 Mitigation Measures for Air Quality and Climate

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

- The internal access roads and internal haul roads will be constructed prior to the commencement of other major construction activities. These roads will be finished with graded aggregate
- A water bowser will be available to spray work areas and haul roads, especially during periods of excavations works coinciding with dry periods of weather, in order to suppress dust migration from the site
- In relation to the borrow pits, the following will be implemented:
    - Topsoil removed from each pit will be temporarily stored in designated areas adjacent to the pits. These stockpiles will be damped and covered
    - Access to each borrow pit will be controlled through one dedicated access/egress location which limit the movement of vehicles within each borrow pit. Speed limits will also be enforced along this access tracks
    - Excavation of each pit will be conducted in a phased manner with the actual working area from which material is being extracted minimised
    - Excavation activities will stop during periods of strong winds
    - Material will be loaded onto covered vehicles (sheeted) or damped for transport
    - Backfill/restoration of the pits will commence as soon as practicable and will be re-seeded immediately upon completion
- All loads which could cause a dust nuisance will be covered to minimise the potential for fugitive emissions during transport
- All other stockpiles will be kept damp and covered to prevent windblown dust emissions
- The access and egress of construction vehicles will be controlled to designated locations, along defined routes, with all vehicles required to comply with onsite speed limits
- Construction vehicles and machinery will be serviced and in good working order
- Wheel washing facilities will be provided at the entrance/exit point of each cluster
- The developer in association with the contractor will be required to develop and implement a dust control plan. This plan will address aspects such as excavations, haul roads and borrow pits, temporary stockpiling and restoration works. The plan will be prepared prior to any construction activities and will be established and maintained through the construction period. It will be submitted to Kildare and Meath County Councils for approval.

Operational Phase

As the proposed operation of the wind farm will have only have positive impacts on air quality, mitigation is unnecessary.

Decommissioning Phase

If KCC and/or MCC requires the removal of access tracks from Maighne Wind Farm as part of decommissioning, dust mitigation measures, similar to those outlined under ‘construction mitigation measures’ will be put in place to reduce dust nuisance.

B Noise

B.1 Mitigation Measures for Noise

Construction

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

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

The construction works on site would be carried out in accordance with the guidance set out in BS5228: 2009, and the noise control measures set out in this CEMP.

The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 08:00 hours and 19:00 hours Monday to Saturday. However, to ensure that optimal use is made of fair weather windows, or at critical periods within the programme, it could occasionally be necessary to work out with these hours. Any such out of hours working would be agreed in advance with the local planning authority.

Operation

The results of the noise predictions presented at Appendix E11 of Volume 3 of the EIS show that operational noise levels are above the proposed daytime and night-time noise limits at a number of dwellings surrounding the clusters. As a result, the required mitigation to ensure that predicted noise levels meet the relevant noise limits has been calculated based on the information pertaining to noise reduced modes of turbine operation, as contained at Table 1 and 2.

The proposed daytime and night-time noise limits may be met by operating the potential turbines in the noise modes specified at Table 1.

As discussed previously, the operational noise predictions have been carried out for a candidate turbine and, therefore, the proposed mitigation measures only apply to the assumed turbine considered here. It may be the case that mitigation would not be required for the turbine that is selected for the site, assuming that the site is granted planning consent. It should be noted that the proposed curtailment strategies are not exhaustive; there may be several other configurations/alternatives that would allow noise limits to be met and that an appropriate mitigation strategy may be specified for the procured turbine model prior to construction of the wind farm. The finalised mitigation measures to be implemented at the site will be chosen to ensure that the relevant noise limits set out within this chapter are met.

Table 1: Required Turbine Curtailment / Mitigation to Meet Proposed Noise Limits

Wind Turbine ID	Easting	Northing	Required Nosie Modes to meet 40 dB L_{A90}*	Required Nosie Modes to meet 43 dB L_{A90}	Required Noise Modes to meet 45 dB L_{A90}
T1	669469	744518	-	-	-
T2	669934	744277	-	-	-
T3	669636	743875	-	NRO104	-
T4	668580	743303	-	NRO103	-
T5	667965	743346	-	-	-
T6	670172	743889	-	NRO105	-
T7	670700	743942	-	-	-
T8	671205	743629	-	-	-

Wind Turbine ID	Easting	Northing	Required Nosie Modes to meet 40 dB L_{A90}*	Required Nosie Modes to meet 43 dB L_{A90}	Required Noise Modes to meet 45 dB L_{A90}
T9	670546	743503	-	NRO105	-
T10	670977	743250	-	-	-
T11	676429	737651	-	-	-
T12	675881	737430	-	NRO104	-
T13	676322	737179	-	-	-
T14	675025	737010	-	NRO105	-
T15	674567	736303	-	-	-
T16	674100	736517	-	-	-
T17	673401	735952	-	NRO105	-
T18	673994	735895	-	NRO102	NRO104
T19	674439	735556	-	NRO100	NRO103
T20	674583	734792	-	NRO101	NRO104
T21	673678	734832	-	NRO101	NRO104
T22	674325	734242	-	-	-
T23	673750	734266	-	-	-
T24	668401	737494	-	-	-
T25	667970	737750	-	-	-
T26	667750	737323	-	-	-
T27	670213	727662	-	-	-
T28	669705	727544	-	-	-
T29	673597	724603	NRO104	-	-
T30	674046	724610	NRO102	-	-
T31	673946	724139	NRO102	NRO104	-
T32	673499	723939	NRO101	NRO105	-
T33	672765	723287	NRO103	-	-
T34	672485	722719	NRO104	-	-
T35	672097	722917	NRO104	-	-
T36	672028	722439	NRO100	NRO103	-
T37	671644	722720	NRO100	NRO104	-
T38	671213	722382	NRO100	NRO102	NRO105
T39	670963	721968	NRO100	NRO105	-
T40	681485	735017	-	-	-
T41	680622	735262	-	NRO104	-
T42	679941	735038	-	-	-
T43	680139	735678	-	NRO104	-
T44	680074	736225	-	NRO105	-
T45	679536	736234	-	-	-
T46	680157	737199	-	-	-
T47	672665	733496	-	-	-

* Applies to the proposed Cloncumber turbines (T29 to T39) for measured 10 m height wind speeds up to 4.5 m/s, see Table 6.3

As discussed in section **Error! Reference source not found.**, the Department of the Environment, Community and Local Government is currently undertaking a review of the Wind Energy Development Guidelines. Any new noise limits that are proposed following this review could be complied with at this site, if required, by implementing the necessary mitigation through the control systems of the wind farm and wind turbines.

Mitigation Measures during Decommissioning

The noise impact for construction works traffic would be mitigated by generally restricting movements along access routes to the standard working hours and should exclude working on Sundays, unless specifically agreed otherwise with the local authority. The decommissioning works, which will be at a lower impact than construction works, will be carried out in accordance with the policies and guidance required at the time of the works, and restricted to normal working hours, typically 07:00-19:00 hours Monday to Friday, and 07:00-13:00 hours on Saturdays.

C ECOLOGY

C.1 Mitigation Measures for Ecology

Designated Nature conservation sites

Implement mitigation measures outlined in Chapter 8 'Geology and Slope Stability', Chapter 9 'Hydrology' and Chapter 10 'Water Quality' of this EIS, in addition to the accompanying NIS and the sections below, to minimise and prevent the identified indirect impacts on the River Boyne and River Blackwater cSAC, the River Boyne and River Blackwater SPA, the River Barrow and River Nore cSAC, the Rye Water/Carton cSAC and Ballynafagh Lake cSAC.

Habitats

A Habitat and Species Management Plan which will detail habitat restoration measures will be appropriately planned and designed to avoid/minimise any potential conflicts between the proposed development and the positive impacts of increasing habitat diversity in close vicinity to operational turbines. An appropriately qualified and experienced ecologist will review and, where required, amend the proposed Habitat and Species Management Plan and consult with NPWS to seek their views on the implementation of the proposed measures. Enhancement measures will include butterflies such as Marsh Fritillary.

Any re-instated habitats such as Hedgerows will utilise native species suitable for the area.

Indirect impacts on Raised Bogs at Windmill and Drehid-Hortland

In order to protect the existing raised bog and nearby groundwater wells from the effects of dewatering, if high permeability strata are encountered along with strong groundwater inflow within excavations, groundwater cut-off techniques (such as sheet piling) will be used in preference to lowering of the water table (dewatering). The precise technique to be used will be determined at detailed design stage following a full ground investigation. This will avoid the possibility of significant drainage of the adjacent raised bogs. It should also be noted that the majority of excavations close to peat bogs will not extend much deeper than the existing drainage network. Any dewatering will be temporary, during construction only and will not have time to cause drainage of the peat, which due to the low permeability of the peat would result in very slow drainage.

Aquatic Ecology

In advance of any works taking place, a method statement for protecting watercourses and waterbodies on the site, along with a detailed Site Drainage Management Plan will be prepared following further consultation with the IFI and NPWS and detailed in the final Construction Environmental Management Plan (CEMP).

The Construction Method Statement will be distributed and discussed with all parties involved in the construction of the wind farm site (including any sub-contractors) in order to protect aquatic conservation interests within the study area. The CEMP will set out measures to avoid siltation, erosion, surface water run-off and accidental pollution events which all have the potential to adversely affect water quality within the site during the construction phase.

The CEMP will detail preparatory works on the site, including installation of silt fences and bunds. The preparatory work including assessment of existing bridge crossings will be undertaken in advance of any excavations on the site. A sealed silt fence will be placed at both sides of the crossing points and to a minimum of 10m upstream and downstream of each crossing at both sides of the road. All measures provided for the protection of aquatic ecology and fisheries within the proposed development site, in addition to the mitigation measures for water quality protection to be detailed in the CEMP, will effectively protect aquatic ecological interests downstream of the proposed development.

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

A buffer of 50 m from watercourses has been adopted. Where site tracks are existing rather than a new site track, this buffer will not apply.

All infrastructure will set back 50 m away from all streams within the site except for the main crossings and the entrance to the Hortland portion of Drehid-Hortland (near T40) which is <50m (although an existing track is partially utilised). An access road at Cloncumber is also <50m from a water feature. The contractor will also ensure that trafficking on site is kept to a minimum and the routes of haul roads are kept away from watercourses as far as possible.

Where haul roads pass close to watercourses, silt fencing will be used to protect the streams. Again, maintenance and monitoring of such silt fences will be subject to an on-site quality management system as set out in the CEMP.

Cross-drains will be provided for drainage crossings and conveying flows from existing and proposed drains across the access tracks. Any new or upgraded culverts will be sized appropriately.

A method statement for streams crossings (roads and cables) will be finalised following consultation with NPWS and IFI and will follow the guidelines set out in (Murphy, 2004 [150]) and the NRA (2008) [151] '*Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*' and also the latest IFI guidelines. In relation to cable crossing, trenchless techniques will be used when other alternatives (i.e. placing cables on bridges, open cut techniques) are not practical. There are two options available:

i. Trenchless Technique #1

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

ii. Trenchless Technique #2

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

The optimal construction technique will be selected on the basis of detailed site investigation at the crossing locations and following consultation with Kildare and Meath County Councils and statutory authorities including Inland Fisheries Ireland.

In the event that trenchless techniques utilise drilling; a biodegradable fluid such as CLEARBORE will be used rather than Bentonite.

In addition a contingency and resource protection plan to include the following will be prepared:

1. Drilling operations to be limited to daytime hours and conditions when low levels of rainfall are forecast.
2. Drilling fluid materials and their respective data sheets shall be included in the method statement for waterways or stream crossings.
3. Any site specific investigation results shall be disclosed. Investigations will include review of all available data from utility owners, site investigations, trial holes, ground penetrating radar as might be appropriate for the location.
4. Materials such as suitable biodegradable absorbent material, silt fencing and gravel bags (plastic, gravel filled bags) shall be kept at boring sites in sufficient quantities to contain any release of drilling fluid.
5. A visual inspection shall be undertaken of the planned bore path prior to the boring operation to ensure any or all utilities and substructures have been identified and test holes have been properly prepared.
6. At stream crossings with flowing water, water monitors will be placed upstream and downstream of the crossing point, access permitting.
7. Onsite training shall be provided for all monitors, and names and phone numbers provided to site supervisors.
8. Upon completion of each drill rod, the monitoring person/team will be provided with information in relation to position of entry and exit of drilling head, amount of fluid utilized

or pumped, equipment breakdowns or repairs, any abnormal drilling pressures recorded and any change of drilling fluid contents.

9. A field response plan to minimize loss of returns of drilling fluid and actions to restore returns shall be provided.
10. Equipment required to clean up and contain any released drilling fluid will be available at the work site or at an offsite location at the temporary construction compounds.
11. In the event of a release of drilling fluid; works will stop immediately, the bore stem shall be pulled back to relieve pressure and the site supervisor notified to ensure adequate actions are taken and notifications made. In addition terrestrial releases shall be cleaned up using on site equipment and a terrestrial berm will be constructed around any terrestrial release.
12. Silt fences will be constructed around proposed work areas prior to commencement of works.
13. Refueling of equipment will take place at the temporary construction compounds or with a mobile bowser a minimum of 100 m from watercourse.
14. Pre-construction Ecological surveys shall take place at drilling sites to determine whether any sensitive species or species requiring derogations (such as Otter) are present.
15. Works will be monitored by the project ecologist.
16. Any dewatering of the pits will be pumped to land as far from the watercourse as possible to allow it to infiltrate through the field or to a stilling pond or alternative to a holding tank, tested and appropriately discharged under licence.

The contractor shall ensure that erosion control and attenuation facilities, namely silt fences and silt curtains are regularly maintained during the construction phase. Spoil heaps from the excavations for the turbine bases and trenches will be covered with geotextile and surrounded by silt fences to filter sediment from the surface water run-off from excavated material. Cable trenches within the wind farm clusters will be located underneath and directly adjacent to access tracks as far as possible. Trenches will be excavated during dry periods where possible in short sections and left open for minimal periods to avoid acting as a conduit for surface water flows. Clay bunds will be constructed within any cable trenches at intervals.

An Emergency Silt Control and Spillage Response Procedure will be included as a contingency in the CEMP which will detail the required measures for the Contractor to implement in the event of a ‘worst case’ scenario on the site. Timing of the proposed works will also take account of the fisheries constraints within the study area, where no works will be undertaken in the instream environment during the salmonid close season.

A risk assessment will be prepared prior to any wet concrete operations being carried out. All concreting works will be fully detailed in the Contractor’s Construction Method Statement and will be minimised, particularly adjacent to the aquatic environment.

Standing water in the excavations at the turbine bases will contain an increased concentration of suspended solids. The excavations will be pumped into temporary settlement basins as necessary which will be lined and which will drain into existing or proposed drainage channels on site. The settlement basins will be constructed in advance of any excavations for the turbine bases.

Wheel washing facilities will be provided at the site entrance draining to silt traps. These units will be self-contained and will filter the waste for ease of disposal. Waste will be removed from each unit and from site by a permitted contractor. Additional silt fencing will be kept on site for the ongoing maintenance of the structures provided. Portaloos will be used to provide toilet facilities for site personnel. Sanitary waste will be removed from site via a permitted waste contractor(s) and will not be discharged on site.

Any diesel or fuel oils stored on site will be bunded to 110 % of the capacity of the storage tank. Such facilities will not be located near any drain or watercourse. Design and installation of fuel tanks will be in accordance with best practice guidelines. Refuelling of plant during construction will be carried out at a number of dedicated refuelling station locations on site, typically at each compound or at least 100m from a watercourse using mobile bowsers. Drip trays and spill kits will be kept available on site. Only emergency breakdown maintenance will be carried out on site. Appropriate containment facilities will be provided to ensure that any spills from the vehicle are contained and removed off site.

Appropriate preventative measures will be detailed within the CEMP, and are set out in the outline CEMP, so as to ensure that non-native aquatic/riparian species are not introduced into the site. These measures will follow as relevant the manual '*The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads'* by NRA (2010) [152].

The contractor will carry out visual examinations of watercourses receiving flows from the proposed development during the construction phase and regular water samples will be taken.

The provisions within the CEMP for the site will effectively result in the control of erosion and siltation on the site. This is considered to be the key mitigation measure for the protection of aquatic species located in downstream receiving waters.

The works programme for the site will incorporate erosion and sediment control to be detailed in the CEMP including the installation of drainage and runoff controls before starting site clearance and earthworks; minimisation of the area of exposed ground; preventing runoff entering the site from adjacent ground; provision of appropriate control and containment measures on site; monitoring and maintenance of erosion and sediment controls throughout the project; and establishing vegetation as soon as practical on all areas where soil has been exposed. The design of all silt and erosion control measures on the site including silt traps and siltation ponds, culverts and cross-drains will be based on the peak flood flows determined using the procedure set out in CIRIA (2006) [153].

Due to the fact that the proposed site is located within the catchment areas of important salmonid rivers, effective water runoff protection methods will be integrated into the detailed CEMP and contractor's method statement. Chapter 10 - Water Quality of this EIS also provides run-off prevention. The implementation of the water quality protection measures will be incorporated into an Environmental Commitments audit checklist for the site.

There will no excavations in close proximity to riparian habitats or instream works during the salmonid close season (October–March annually) in order to protect spawning salmonids, incubating ova and emerging fry. Any upgraded bridges or culverts will be designed to be passable by fish.

Flora

The following methods will be implemented to ensure that invasive alien species are not accidentally introduced or spread during construction:

- Measures to be utilised to deal with invasive species will be included in the CEMP .These measures will follow as relevant the manual '
  The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads' by NRA (2010) [152]; and cognisance will be made of '*The Best Practice Management Guidelines*' produced by Invasive Species Ireland (Maguire et al, 2008 [154]).
- Rhododendron was primarily located at the edge of the cluster boundary (forestry entrance at Hortland). Any new patches of Rhododendron that are located during construction and operation of the wind farm will be treated to prevent further spread of this plant. Where Rhododendron has established, such areas will be eradicated by a suitably qualified person prior to construction to prevent further spread of this highly invasive plant. For this location cutting and stump treatment with an appropriate herbicide is likely to be the most effective measure. Additional applications of herbicide of any regrowth will be required to achieve complete eradication.

Wheel washes draining to silt traps will be implemented at site entrances to prevent the possible spread of any invasive species.

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. This in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds [64].

In relation to breeding Lapwing, although no turbines are proposed at located nests sites; all turbine locations in suitable breeding locations (Derrybrennan and Cloncumber) will be surveyed for breeding Lapwing should proposed works occur within the Lapwing Breeding Season (April to June). Should any be present at exact turbine locations, then no works shall be undertaken during the period April-June to allow breeding to progress.

Any works required to be carried out during the breeding season close to these locations shall be supervised by the project ecologist with stop works authority (so as to minimise disturbance).

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 as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds [64]. Limited operations such as concrete pours and turbine erection may require night-time operating hours; these will be detailed in the CEMP and supervised by the project ecologist.

Toolbox talks with construction staff on disturbance to key species during construction. This will help minimise disturbance. This in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds [64].

Sections of hedgerow scheduled for removal and/or trimming, and containing mature trees suitable for nesting Barn Owls will be surveyed prior to construction for occupancy by Owls. Should Owls be present then minimum protection zones as outlined in published guidance will be adhered to for the period of construction or until breeding has ceased [135].

Due to published impacts during construction on breeding Snipe and the assessment of significance, 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 possibility of disturbing birds during critical periods of breeding season, as per published literature [63]. The implementation of this measure will be monitored by the project ecologist.

Re-instated hedgerows will be planted with native species, locally sourced, this will result in habitat enhancement for local species of conservation importance such as Yellowhammer. This in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds [64].

Kingfisher: Implement mitigation measures outlined in Chapter 8 ‘Geology and Slope Stability’, Chapter 9 ‘Hydrology’ and Chapter 10 ‘Water Quality’ of this EIS, and section belows, previous, to minimise and prevent the identified indirect impacts water quality.

Merlin:
Prior to scheduled commencement of construction; nest baskets suitable for Merlin will be placed in suitable locations (such as isolated trees on high bog or trees within forestry compartments which are in clearings) as these are often preferred nest locations. Locations chosen shall be >500m from proposed turbines; this is to encourage any birds scoping territories to take up nest sites suitably removed from turbines. This may also benefit birds not currently breeding (as breeding was not proved). This will occur at the Drehid-Hortland Cluster, within the 1km square identified (west of T32) and also at within the area identified as active raised bog (south of T13) (as an enhancement measure).

A pre-construction survey (March) will be conducted of the proposed turbine locations and adjacent high bog of the Hortland portion of Drehid-Hortland to assess any evidence of Merlin activity or taking up territories. Should Merlin be present then works at these locations will be restricted to outside the breeding season (April-July).

Curlew (Lodge Bog): Breeding Curlew at Lodge Bog will be surveyed prior to the commencement of construction to establish the location of occupied territories/breeding attempts. No construction works shall be undertaken within 1km of a Curlew breeding location during the period April to July.

All works will be monitored by the project ecologist.

Mammals (excluding Bats)

Construction operations will take place during the hours of daylight to minimise disturbances to faunal species at night. Limited operations such as concrete pours and turbine erection may require night-time operating hours; these will be detailed in the CEMP and supervised by the project ecologist.

Due to the time delays between initial surveys for terrestrial mammals and the likely construction date, a qualified ecologist will re-survey the hedgerow/woodland areas earmarked for development for Badger setts, Pine Marten dens or Red Squirrel dreys no more than 10–12 months prior to construction, with a further check immediately prior to vegetation clearance. In the event that a Badger sett is found, the NRA (2006) guidelines (contained in Appendix F8 for the treatment of Badgers will be followed. In addition the NPWS will be updated and consulted on the status of any Badger setts found. All works shall be overseen by the project ecologist.

All locations where river crossings are to occur and where construction of bridges or enhancement of existing bridges is required will be surveyed for Otter no more than 12-14 months prior to construction as per published guidance from the NRA. This will involve re-survey, by a qualified ecologist, of the locations in question for breeding or resting places of Otter. Survey methods will follow established best practice [155]. The location of the recorded Otter holt at Drehid-Hortland shall also be resurveyed no more than 12-14 months prior to construction as per published guidance from the NRA.

Should Otter breeding or resting sites be present then best practice guidance (NRA) in the treatment of Otters will be followed, under the terms of the obtained derogation. The NPWS will be updated on the status of any evidence found. All works shall be overseen by the project ecologist. In the event that the Otter holt recorded at Drehid-Hortland is active prior to construction commencing, mitigation measures such as the erection of screening, reduced timing of works, shall be implemented as per best practice guidance from the NRA, following consultation with NPWS. It should be noted that this holt is outside the red line boundary and unlikely to be affected.

At the Cloncumber cluster, in addition to the above screening shall be placed along the banks of the Cloncumber stream to prevent disturbance to Otters commuting between the Canal and the Slate River during the construction period.

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

Bats

Overview of impacts

Risks to bats from wind turbines have to be acknowledged and it is possible that some bat mortality may occur due to the operation of the planned development therefore mitigation measures are recommended to reduce the likelihood of such fatalities.

Assessment of conflict zones

Standard mitigation measures, as would apply to any large-scale development, shall be adopted in the site clearance and construction of the turbines. These shall include limiting season of disturbance to trees and other vegetation so as to reduce impacts on breeding bird species and to implement measures to avoid and/or control pollution and sedimentation into watercourses. The following specific measures will be required to protect bats onsite.

The following mitigation measures are in line with the NRA guidelines on provisions for the conservation of bats during the planning and construction of roads (2006) (see Appendix F8). Reference is made to the NRA Guidelines (*Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes* and the *Guidelines for the Treatment of Bats during the Construction of National Road Schemes*).

Each of the proposed locations of the 47 turbines and sub-station was surveyed and the bat activity findings recorded have identified specific areas of conflict that are listed in Table 1 below along with recommended mitigation measures to prevent or reduce the potential negative impacts in these areas.

Table 1: Assessment of potential turbine / sub-station / bat conflict zones

Turbine number	Nearest vegetation	Bat activity	Recommended mitigation measures and general comments
1	Hedgerow	Low	Survey veteran ash tree with bat roost potential
2	Hedgerow	Low	No mitigation required
3	Hedgerow	Low	No mitigation required
4	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft Survey mature beech and horse chestnut trees with bat roost potential
5	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
6	Hedgerow	Low	Survey mature beech trees with bat roost potential
7	Hedgerow	Low	No mitigation required
8	Hedgerow	Low	No mitigation required
9	Hedgerow	Low	No mitigation required
10	Hedgerow	Low	Survey mature beech trees with bat roost potential
11	In forestry	High	Remove all tree plantings within a 60m radius of the turbine shaft
12	In forestry	High	Remove all tree plantings within a 60m radius of the turbine shaft
13	Scrub	Low	Remove vegetation within 60m of the turbine shaft
14	Scrub	Low	Remove vegetation within 60m of the turbine shaft
15	Scrub	Low	Remove vegetation within 60m of the turbine shaft
16	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
17	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
18	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
19	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
20	Hedgerow	Low	No mitigation required
21	Hedgerow	Low	No mitigation required
22	Hedgerow	Low	No mitigation required
23	Hedgerow	Low	No mitigation required
24	N/A	Low	No mitigation required
25	N/A	Low	No mitigation required
26	N/A	Low	No mitigation required
27	N/A	Low	No mitigation required
28	In forestry	Low	No mitigation required
29	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
30	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
31	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft

Turbine number	Nearest vegetation	Bat activity	Recommended mitigation measures and general comments
32	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
33	N/A	Low	No mitigation required
34	Hedgerow	High	Remove hedgerow vegetation within 60m of the turbine shaft
35	Hedgerow	Low	No mitigation required
36	N/A	Low	No mitigation required
37	N/A	Low	No mitigation required
38	N/A	Low	No mitigation required
39	N/A	Low	No mitigation required
40	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
41	N/A	Low	No mitigation required
42	In forestry	High	Remove all tree plantings within a 60m radius of the turbine shaft
43	In forestry	High	Remove all tree plantings within a 60m radius of the turbine shaft
44	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
45	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
46	N/A	Low	No mitigation required
47	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft

As shown in the previous table, apart from four sites needing pre-construction tree surveys, mitigation measures to protect bats are required at 22 of the 47 proposed turbine locations. In all cases it is recommended that existing vegetation is cleared to provide a vegetation-free buffer zone around the turbine. This includes turbines T31 and T32 at Cloncumber which are within a *Coillte*-owned, set-aside biodiversity area. This area mainly consists of non-native coniferous woodland and removing such within a 60m radius of both turbines will not impact on the biodiversity value of the site as tree clearance should encourage the growth of ground-cover native bog flora.

In all cases it is recommended that existing vegetation is cleared to provide a vegetation-free buffer zone around the turbine. This includes turbines T31 and T32 at Cloncumber which are within a *Coillte*-owned, set-aside biodiversity area. This area mainly consists of non-native coniferous woodland and removing such within a 60m radius of both turbines will not impact on the biodiversity value of the site as tree clearance should encourage the growth of ground-cover native bog flora.

Buffer zones

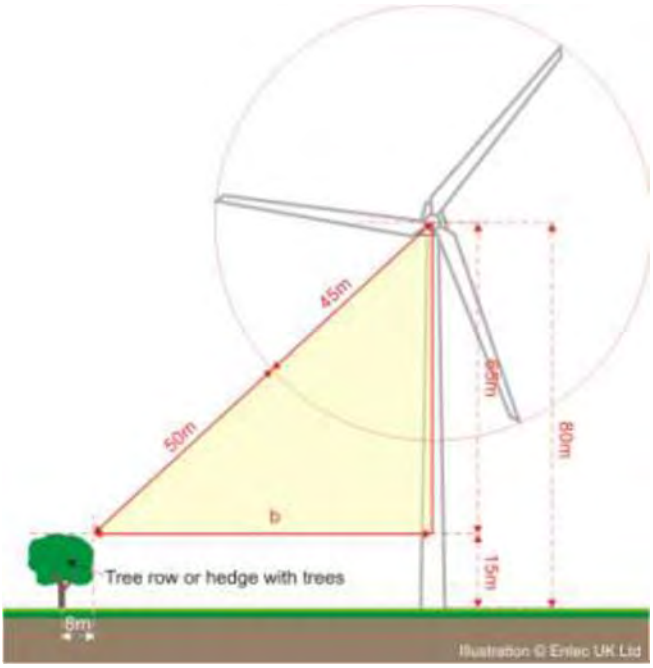
Bats commuting and foraging along onsite forest edge, treelines and hedgerows will be safeguarded by providing a 50m minimum distance buffer zone between the rotors of the planned turbines and the nearest vegetation to reduce the risk of collision and/or barotrauma. This is in line with present best practice guidelines (Carlin and Mitchell-Jones 2012) and should prevent impacts to bats that mainly fly low along such linear features e.g. the pipistrelles. Such a buffer zone can be provided by either siting the turbines so that rotors are a minimum of 50m away from existing vegetation or by felling any trees within 50m of rotors. Such cleared vegetation should be managed and maintained during the operational life of the development.

From Carlin and Mitchell-Jones 2012: "*It is incorrect to measure 50m from the turbine base to habitat feature at ground level as this would bring the blade tips very close to the canopy of a tall hedgerow tree and potentially put bat populations at risk. Instead, it is necessary to calculate the distance between the edge of the feature and the centre of the tower (b) using the formula:*

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

where, (in metres):

bl = blade length
hh = hub height
fh = feature height



For the example above, b = 69.3m

Removal of deciduous trees

Any mature broadleaved trees that are to be removed, will first be surveyed for bat presence by a suitably experienced specialist. If bats are found, an application for a derogation licence will be made to the National Parks and Wildlife Service to allow its legal removal. Such trees will ideally be felled in the period late August to late October, or early November, in order to avoid disturbance of any roosting bats as per *National Roads Authority* guidelines (NRA 2006a and 2006b [22]- see Appendix F8) and also to avoid the bird breeding seasons. Tree felling will be completed by Mid-November at the latest as bats roosting in trees are very vulnerable to disturbance during their hibernation period (November – April). Trees with ivy *Hedera helix* cover, once felled, will be left intact onsite for 24 hours prior to disposal to allow any bats beneath foliage to escape overnight.

Landowners will be advised that the timber from felled trees will remain for their use. This will prevent trees being felled prematurely.

Retention of trees

Several species of bats roost in trees. Where possible, treelines and mature trees that are located immediately adjacent to the line of TDR routes or are not directly impacted will be avoided and retained intact. Overall impacts on these sites will be reduced through modified design and sensitivity during construction. Any trees and treelines along approach roads and planned site access tracks will be retained where possible.

Retained trees will be protected from root damage by machinery by an exclusion zone of at least 7m or equivalent to canopy height. Such protected trees will be fenced off by adequate temporary fencing prior to other works commencing.

HV and MV cable routes – other structures

Should any further structures be impacted by changes to the current proposed HV and MV 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 should be taken to ensure no animals are harmed.

Compensation for loss of commuting routes

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

Severed linear features such as hedgerows and treelines should, 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. The exact locations of such planting will be designed at detailed landscaping stage. Native species should be used as they support more insect life than non-native varieties.

All planting shall preferably, be completed during the pre-construction phase to provide hedgerow/tree growth prior to completion of the development. This would ensure that bats commuting in the area have prior knowledge of newly planted landscape features as well as ensuring the newly planted hedgerows/treelines are well established prior to completion of the wind farm.

Habitat retention, replacement and landscaping

Habitat replacement and landscaping could compensate for or add to the wildlife value of the area and also provide areas of aesthetic as well as wildlife interest. Further pro-active habitat restoration measures are considered below.

In general, best practice design will aim to retain the quality of the landscape where possible and ensure its protection within the landscaping programme. Existing hedgerows and treelines, semi-natural scrub or semi-natural grasslands should be retained where possible and incorporated into the landscaping programme.

The overall design of the project will also include habitat replacement or enhancement of existing onsite woodland, hedgerow, treeline and scrub habitats and it is recommended that the planting of native broadleaved trees is also considered. Native species will be chosen in all landscaping schemes. Planting schemes will attempt to link in with existing wildlife corridors (hedgerows and treelines) to provide continuity of wildlife corridors.

Bridges and culverts on cable/turbine delivery routes

If any of the structures previously listed that showed potential for use by bats or any other local bridge that is to be strengthened prior to use for haulage of construction materials for this development, it should first be surveyed/re-surveyed for bat presence prior to any upgrading or maintenance works. Bats, especially Daubenton's, regularly use bridges for roosting and are vulnerable within such structures due to infilling of crevices during which they may be entombed. If bats are found then some crevices beneath the bridge will be retained for their continued use according to best practice bat mitigation measures for bridge works (see *Billington and Norman 1997* [156]*, Highways Agency 2001* [157]*, Joint Nature Conservation Committee 2004* [158]*, National Roads Authority 2006a/2006b* [23] and *Shiel 1999* [159]). Any re-pointing or pressure grouting of bridges will only proceed after an inspection of the structure for bats and, should bats be found, an application for a derogation licence to legally allow works on or near a bat roost, which is a notifiable action under current legislation (see Appendix F6: Bat Survey Report), will be made to the National Parks and Wildlife Service.

Lighting restrictions

In general, artificial light creates a barrier to bats so lighting should be avoided where possible. Where lighting is required, directional lighting (i.e. lighting which only shines on work areas and not nearby countryside) should be used to prevent overspill. This will be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvers and shields to direct the light to the intended area only.

Other Taxa present on site

Marsh Fritillary:

Linear habitat features along proposed internal access roads to Derrybrennan, Cloncumber, and Drehid-Hortland where road widening or instatement of new roads is required, will be examined by a suitably qualified ecologist for the presence of Marsh Fritillary butterfly larvae prior to the commencement of works and a translocation programme will be undertaken should Marsh Fritillary be recorded. This will not apply to roads in improved agricultural grassland.

The construction works adjacent to the sensitive butterfly habitats identified within the proposed development will require adequate fencing to avoid trampling and further impacts outside of the required land take.

Monitoring for the presence of Marsh Fritillary and control of the contractor's works on site within these sites will be managed by an appointed site ecologist in direct consultation with the NPWS.

Landscaping works post construction will include the provision of suitable habitats for butterflies in general, including Marsh Fritillary. The following measures will be incorporated into Habitat and Species Management plan as a general enhancement measure, in areas where potentially high quality habitat for butterflies could be created (such as clearfelled forestry on bog/ wet grassland etc.):

Avoidance of smoothing out the soil around any facility; creation of undulations in the ground and do not sew any seed unless taken from plants in the vicinity of the project.

Creation for slopes with a south or west facing aspect.

Any material alongside access tracks/roads will be placed alongside the route and given a broad "A" shape and where possible face south or west.

Clearance of scrub in the area around the facility to allow a semi-natural grassland to develop.

Clearing of encroaching scrub every five years and scraping of parts of the surface to interrupt natural succession and manage the habitat for lepidoptera. Done during winter.

Create a pond/wetland by removal of peat where only a thin layer remains to expose marl. Shallow ponds (maximum depth of about 60 cm) with shallow edges/margins will attract amphibians while wetland plants like Cuckoo-flower, Purple Loosestrife and Devil's-bit Scabious will attract butterflies and moths. Scrape parts of the ground around the pond and drag the parts of the bottom of the pond every five years to maintain the habitat. Do this in September/October.

Mitigation Measures during Operation

Designated Nature conservation sites

Implement mitigation measures outlined in Chapter 8 'Geology and Slope Stability', Chapter 9 'Hydrology' and Chapter 10 'Water Quality' of this EIS, in addition to the NIS and sections below, to minimise and prevent the identified indirect impacts on water quality as outlined previously.

Habitats and Flora

Implement mitigation measures outlined in Chapter 8 'Geology and Slope Stability', Chapter 9 'Hydrology' and Chapter 10 'Water Quality' of this EIS, and sections below, to ensure that there will be no contamination of water bodies due to siltation or contaminated run-off during the operational phase.

Wheel washes, draining to silt traps will be implemented at the site entrance to prevent the possible spread of any invasive species.

Aquatic Ecology

During the operation phase, oils will be required for cooling the transformers giving rise to the potential for oil spills within the site. The transformers will be bunded to over 110% of the volume of oil within them.

It is not envisaged that maintenance will involve any significant impacts on the hydrological regime of the area. Weekly inspections of the erosion and sediment control measures on site will be required during the construction period, followed by fortnightly inspections until the risk of erosion or siltation has declined following the successful establishment of vegetation during the operational phase.

Access to the site will be limited using gates to prevent illegal dumping on the site, use of off road vehicles etc.

Birds

Bird diverters shall also be placed on the proposed meteorological mast guy wires following SNH guidance. In a study in the Netherlands, decreases in collision rates of up to 80% were recorded with flight diverters installed at 5m intervals [160]. Additional research shows that the attachment of line markers can reduce bird collisions on overhead lines by at least 50-60% (Jenkins *et al.*, 2010 [161]; Barrientos *et al.,* 2011 [162]; Martin, 2011 [124]; APLIC, 2012 [163]).

A post construction monitoring programme is to be implemented at the subject site in order to confirm the efficacy of this method; the results of this are to be submitted annually to the competent authority and NPWS. published guidance on assessing the impacts of wind farms on birds from English Nature and the Royal Society for the protection of birds recommends the implementation of an agreed post development monitoring programme as a best practice mitigation measure [64].

In addition published recommendations on swans and wind farms [116] suggests that systematic post construction monitoring ; adapted to quantify collision, barrier and displacement, be conducted over a period of sufficient duration to allow for annual variation or in combination effects. The following individual components are proposed.

1) Fatality Monitoring: A comprehensive fatality monitoring programme is to be undertaken following published best practice; the primary components are as follows:

    a. Initial carcass removal trials to establish levels of predator removal of possible fatalities. This is to be done following best recommended practice and with due cognisance to published effects such as predator swamping, whereby excessive placement of carcasses increases predator presence and consequently skews results [164]. No turbines which are used for carcass removal trials are to be used for subsequent fatality monitoring.
    b. Turbine searches for fatalities are to be undertaken following best practice [115] [128] in terms of search area (minimum radius hub height) and at intervals selected to effectively sample fatality rates based on carcass removal rates (e.g. 2 per month). To be conducted for an initial period of 7 years to allow for annual variation and cumulative effects. Dependant on results further monitoring to be agreed with NPWS.
    c. The large scale of the proposed wind farm and clustered nature provides an opportunity for a standardised approach with a possible control group of one cluster and/or variation in search techniques such as straight line transects/ randomly selected spiral transects/ dog searches as a means of robustly estimating the post construction impact in terms of fatality.
    d. Recorded fatalities to be calibrated against known predator removal rates to provide an estimate of overall fatality rates.

An annual report will be submitted to the competent authority and NPWS. Following the first 7 years, a report shall be disseminated publicly via publication in a recognised journal.

2) Flight Activity Survey: A flight activity survey is to be undertaken during the winter months to:

    a. Record any barrier effect i.e. the degree of avoidance exhibited by species such as Whooper Swan approaching or within the wind farm [116]. Target species to be Whooper Swan, Golden Plover, Gulls and Raptors.
    b. Record changes in flight heights of key receptors post construction.

An annual report will be submitted to the competent authority and NPWS. To be conducted for an initial period of 7 years to allow for annual variation and cumulative effects. Dependant on results further monitoring to be agreed with NPWS. Following the first 7 years a report shall be disseminated publicly via publication in a recognised journal.

3) Monthly Wildfowl Census: A monthly wildfowl census, following the methods utilised for the baseline survey, is to be repeated on a monthly basis during the winter period. This aims to:
    a. Assess displacement levels (if any) of wildfowl such as swans post construction
    b. Assess overall habitat usage changes within the vicinity of the wind farm post construction.

To be conducted for an initial period of 7 years to allow for annual variation and cumulative effects. Dependant on results further monitoring to be agreed with NPWS. Following the first 7 years a report shall be disseminated publicly via publication in a recognised journal.

4) Breeding Wader survey: A breeding wader survey, following methods used in the baseline survey to be repeated yearly April-May-June. This aims to:

    a. Assess any displacement effects such as those recorded in the literature [62] [63] [145] on breeding waders. Overall density of breeding waders to be annually recorded.

To be conducted for an initial period of 7 years to allow for annual variation and cumulative effects. Dependant on results further monitoring to be agreed with NPWS. Following the first 7 years a report shall be disseminated publicly via publication in a recognised journal.

Bats

Buffer zones

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

Changes to cut-in speeds

Due to mitigation by design, as each turbine is to be sited a suitable separation distance to hedgerows and/or trees or such vegetation is to be removed to ensure a vegetation-free buffer zone, no operational curtailment of any turbine as a mitigation measure is required however, should any turbine be relocated so that its blade tip is less than 50m from any hedgerow or treeline, the recommended mitigation measure is to increase the turbine's cut-in speed during the active bat period from April to September, inclusive. Increasing the cut-in speed to 5.5m/s from 30 minutes prior to dusk to 30 minutes after dawn has been shown to protect bats (Arnett *et al.* 2010 [165]). This measure should be actioned during optimal bat hunting conditions when wind speeds are less than 5.5m/s and air temperature is greater than 7ºC as measured onsite.

Bat Fatality Monitoring

As no research currently exists on bats and wind farms in Ireland, the planned development could provide an opportunity to gain baseline data on bat/turbine interaction and it is recommended that the scheme be monitored for bat fatalities for the first three years of operation. A comprehensive onsite avian fatality monitoring programme is to be undertaken following published best practice. This fatality monitoring programme should be extended and duplicated for bat fauna. The primary components of the bird mortality

programme are outlined below and an assessment of bat mortality would essentially follow the same methodology.

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

Monitoring of Mitigation Measures

The success of the implemented mitigation measures for bats on the project should be monitored for a period of three years after construction and appropriate measures taken to enhance these if and where required. A recommended schedule for such monitoring is given in Table 7.2below.

Table 2: Monitoring schedule recommended for bat mitigation measures

Mitigation measure	Monitoring required	Description	Duration
Newly planted hedgerows and treelines	Ensure viable growth of planting	Planted material shall be checked periodically over the growing season to remove dead material. Any dead material shall be replaced within the same season with viable stock according to age/height restrictions already specified in mitigation.	From time of planting to 1 year post construction
Bat boxes and tubes	Monitor bat use	Bat boxes and tubes shall be examined by a licensed bat specialist. Records should be submitted to *Bat Conservation Ireland* for inclusion in their bat distribution database. Re-site if necessary. Annual cleaning required if well used by bats or if used by birds. Replacement if damaged/lost.	From mounting to 3 years post construction.
Mortality Study	Fatality Monitoring	Corpse searches beneath turbines to assess the impact of operation on bats.	From initial operation to three years post commissioning.

Other Taxa present on site

No mitigation required.

Mitigation Measures during Decommissioning

Nature conservation sites

Implement mitigation measures outlined in Chapter 8 'Geology and Slope Stability', Chapter 9 'Hydrology' and Chapter 10 'Water Quality' of this EIS, in addition to the NIS and sections below, to minimise and prevent the identified indirect impacts on water quality as outlined previously.

Habitats

Habitat restoration measures will be appropriately planned and designed to avoid/minimise any potential conflicts between the proposed development and the positive impacts of increasing habitat diversity in close vicinity to operational turbines. An appropriately qualified and experienced ecologist will review and, where required, amend the proposed Habitat and Species Management Plan and consult with NPWS to seek their views on the implementation of the proposed measures.

Any re-instated habitats such as Hedgerows will utilise native species suitable for the area.

Aquatic Ecology

Decommissioning activities will take place in a similar fashion to the construction phase. There will be disturbance to underlying soils and therefore a risk again of silt laden run-off entering the receiving watercourse. The mitigation measures outlined above will be implemented for the protection of aquatic ecological interests during the decommissioning phase.

Flora

Rhododendron was primarily located within the area of high bog outside the red line boundary and hence any construction works. Any new patches of Rhododendron that are located during decommissioning the wind farm will be treated to prevent further spread of this plant.

Where Rhododendron has established, such areas will be eradicated by a suitably qualified person prior to construction to prevent further spread of this highly invasive plant. Cognisance will be made of 'The Best Practice Management Guidelines' produced by Invasive Species Ireland (Maguire et al, 2008 [154]) .For this location cutting and stump treatment with an appropriate herbicide is likely to be the most effective measure. Additional applications of herbicide of any regrowth will be required to achieve complete eradication.

Giant Hogweed was located close to one of the proposed bridges along the cable/turbine delivery route. Should any off road works be required at this location during decommissioning cognisance will again be made of 'The Best Practice Management Guidelines' produced by Invasive Species Ireland (Maguire et al, 2008 [154]).

Birds

Decommissioning 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 as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds [64]. Limited operations such as turbine removal may require night-time operating hours; these will be detailed in the CEMP and supervised by the project ecologist.

Toolbox talks shall be held with construction staff on disturbance to key species during decommissioning. This will help minimise disturbance. This is in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds [64].

Any re-instated habitats will include native species where possible to enhance diversity of birds. This is in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds [64].

The post construction monitoring programme previously outlines is to be implemented at the subject site with the following components, the results of this are to be submitted annually to the competent authority and NPWS. This will be continued into the decommissioning phase of the project.

Mammals (excluding Bats)

Badger

Construction operations will take place during the hours of daylight to minimise disturbances to faunal species at night. Limited operations may require night-time operating hours; these will be detailed in the CEMP and supervised by the project ecologist. Due to the time delays between initial surveys for terrestrial mammals and the likely construction date, a qualified ecologist will re-survey the hedgerow/woodland areas earmarked for development for Badger setts, no more than 10–12 months prior to construction, with a further check immediately prior to vegetation clearance. In the event that a Badger sett is found, the NRA (2006) guidelines (see Appendix F8) for the treatment of Badgers will be followed. In addition the NPWS will be updated and consulted on the status of any Badger setts found.

Otter

Construction operations will take place during the hours of daylight to minimise disturbances to Otter at night. Limited operations may require night-time operating hours; these will be detailed in the CEMP and supervised by the project ecologist. All locations where river crossings are to occur and where construction of bridges or enhancement of existing bridges is required will be surveyed no more than 12-14 months prior to construction as per published guidance from the NRA (see Appendix F8).

This will involve re-survey, by a qualified ecologist, of the locations in question for breeding or resting places of Otter. Survey methods will follow established best practice. Should Otter breeding or resting sites be present then best practice guidance (NRA) in the treatment of Otters will be followed, under the terms of the obtained derogation. The NPWS will be updated on the status of any evidence found.

Pine Marten

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

Red Squirrel

Where possible tree felling of trees in forestry areas will be limited to time periods outside which Red Squirrels may have young in Dreys. If this is unavoidable than areas to be clear felled will be surveyed in advance by a suitable qualified ecologist to determine whether any occupied Pine Marten dens are present. A necessary license under the wildlife act will be applied for.

Bats

Mitigation measures implemented during decommissioning should be the same as those recommended during construction.

Other Taxa present on site

Mitigation measures implemented during decommissioning should be the same as during construction.

D SOILS & GEOLOGY

D.1 Mitigation Measures for Soils and Geology

The following sections outline appropriate mitigation measures to avoid or reduce the potential impact of the proposed development.

Mitigation Measures for Slope Stability

With regard to slope stability issues, although the sites all rank as low to negligible risk, detailed design best practice will be implemented as follows:

- The works will be designed and checked by a suitably qualified and experienced geotechnical engineer or engineering geologist, and hydrologist or drainage engineer
- Identified risks will be minimised by the application of the principles of avoidance, prevention and protection. This will be reviewed and updated prior to commencement of construction
- A detailed method statement for each element of the works will be prepared prior to any element of the work being carried out. An outline of the methods are given in thos Outline CEMP. This will be reviewed and updated prior to commencement of construction
- Details of the relevant assumptions, relating to methods and sequencing of work are provided in the this Outline CEMP. This will be reviewed and updated prior to commencement of construction
- No amendments to the designed works will be made without the prior approval of a suitably qualified and experienced engineering geologist or geotechnical engineer familiar with wind farm construction works
- Prior to construction, a site-specific environmental management plan for construction will be prepared, which will incorporate all measures set out in this Outline CEMP, in consultation with the relevant statutory bodies, including the planning authority, Waterways Ireland and the NPWS
- The environmental management plan for construction will provide for the checking by suitably qualified and experienced staff of equipment, materials storage and materials transfer areas, as well as drainage structures and their attenuation ability, on a regular basis
- Excavation works will be monitored by suitably qualified and experienced geotechnical personnel
- The programming of the works will be such that earthworks are not scheduled to be carried out during severe weather conditions.

Mitigation Measures for Construction

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.

The proposed turbine locations have been carefully selected in areas of the site which is relatively close to the existing access tracks to minimise the length of new access tracks required. Drainage will be towards the existing drainage network.

To mitigate against erosion of the exposed soil or rock, all excavations will be constructed and backfilled as quickly as possible. Excavations will stop during or immediately after heavy rainfall.

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

Surplus soil or rock excavated during the course of the works will be temporarily stored in a level area adjacent to the proposed borrow pits and will be either used for reinstatement of the borrow pits (following construction) or will be re-used on site in the form of landscaping and berms (during construction). Temporary storage may also be required after excavation and prior to transportation.

No spoil stockpiles will be left on site after construction.

Any contaminated soils will be handled, removed and disposed of in accordance with the requirements of the local authority and/or EPA and waste management legislation. In particular, the following measures will be implemented:

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

All temporary cuts/excavations will be carried out such that they are stable or adequately supported. Gravel fill will be used to provide additional support to drains where appropriate. Where appropriate and necessary, temporary cuts and excavations will be protected against the ingress of water or erosion by covering during adverse weather. Where necessary sheet piling or other measures will be used to provide integrity for unstable excavations, particularly within peat, alluvial, gravel or for excavations below the water table. Support may also be required to support elevated floating roads which are being excavated for the installation of cable trenches. The stability of all excavations will be assessed in advance by an experienced geotechnical engineer. Temporary works will be such that they do not adversely interfere with existing drainage channels/regimes by the provision of silt traps and silt fencing as required (refer to Chapter 9 - Hydrology chapter).

Unregulated drainage will be not permitted within the wind farm. Any pumping of excavations will be directed into existing drainage networks via settlement ponds and will not be allowed to discharge directly to the ground except under licence. Generally, the overburden is of sufficient thickness and low permeability so that karst features will not be common.

All fuel and liquids will be stored on site in fully bunded areas as described in detail in Chapter 10 - Water Quality of the EIS. In addition, an effluent holding tank along with other protection measures will be used at the substation in order to protect the Source Protection Zone at Drehid and prevent any discharges to ground. These include:

- The location of the substation on impermeable hardstand to prevent any risks associated with infiltration to groundwater
- The bunding of the transformer, oil storage tanks, diesel generator and any diesel or fuel oils stored at the substation. The bund capacity will be sufficient to contain 110% of the tank's maximum capacity. Where there is more than one tank within the bund, the capacity will be sufficient to accommodate 110% of the largest tank's maximum capacity or 25% of the total maximum capacities of all tanks, whichever is the greater. Design and installation of fuel tanks will be in accordance with best practice guidelines BPGCS005 (Oil Storage Guidelines)
- A sealed drainage system will be provided, extending past the area of significance i.e. concrete dished channels with a kerbed perimeter at the substation hardstanding. The concrete dished channels will drain to a stilling pond, located 200m from the Inner SPZ, which will in turn drain via forestry drains to the receiving watercourse, which is at a distance of 1km from the location of the substation.
- A petrol and oil interceptor will be installed to deal with all substation surface water drainage.

To increase the time of concentration of the surface water run-off contribution from the substation, tanked permeable paving is a viable alternative to the sealed drainage system and this may be considered at detailed design stage. At the upslope side of the substation overland flows will be intercepted in channels and discharged diffusely over vegetated areas. Further details on the drainage design of the substation is provided in Chapter 9 - Hydrology.

Other mitigation measures relating to soils and geology include the following:

- Haul roads will be capped as soon as practicably possible to cover exposed subsoils and as such reduce the concentration of suspended solids in the run-off
- A suitably qualified person will be appointed by the developer to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process
- A ground investigation will be carried out at each turbine (and other infrastructure) for detailed design. This would include trial pits, drilling and geophysical survey, as appropriate. This will inform depth of excavations, foundation type and size, and the construction method.

- Due to the dispersed nature of the site, refuelling of plant during construction will be carried out at a number of dedicated refuelling station locations on site, typically at each compound or at least 100m from a watercourse using mobile bowsers.
- Each station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. Drip trays and spill kits will be kept available on site, to ensure that any spills from the vehicle are contained and removed off site. Only emergency breakdown maintenance will be carried out on site and appropriate containment facilities will be provided to ensure that any spills from breakdown maintenance vehicles are contained and removed off site.
- Portaloos and/ or containerised toilets and welfare units will be used to provide toilet facilities for site personnel during construction. Sanitary waste will be removed from site via a permitted waste contractor.

Mitigation Measures for on-site Borrow Pits

When infilling each borrow pit, a shallow profile will be created using the overburden material initially removed from the borrow pits and from other sources within Maighne wind farm. As the borrow pits are located on farmland, they will be capped with local topsoil (in consultation with the landowner or farm manager). The growth of vegetation on the restored borrow pits will be monitored to ensure that it returns to its original state. Appropriate measures will be taken if it is found that natural re-vegetation is too slow or if the area is being taken over by inappropriate species. The final profile of the borrow pit will be similar to the original profile.

There is the potential for impacts on local watercourses (including the canals) and groundwater, during construction of the borrow pits. This has been taken into account in the design of the borrow pit infrastructure and suitable mitigation measures have been included (see Water Quality and Hydrology chapters).

To ensure stability of the excavations, a maximum side slope of 1 vertical: 2 horizontal will be adopted for the borrow pits (subject to detailed investigation and design). The stability of all slopes will be checked and assessed by a suitably qualified and experienced engineer to ensure the stability and safety of the excavations. By avoiding excavations below the water table, stability of the sides should not be an issue. Where groundwater is encountered locally, sheet piling or other measures will be used to provide integrity to the excavation, to prevent collapse of the sides and to reduce the groundwater inflow into excavations.

Mitigation Measures during Operation

Due to the reduced magnitude of the impacts, no additional mitigation measures are required for the maintenance and operation of the wind farm, over and above those incorporated into the design of the substation transformer, which will be bunded to protect soils against accidental leakages of oil.

Mitigation Measures during Decommissioning

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

Some of the impacts associated with reinstatement of the site (excavation of turbine bases, access tracks etc.) will be avoided by leaving these in place where possible. The bases will be rehabilitated by covering with locally sourced topsoil (in consultation with the landowner or farm manager) in order to regenerate vegetation which will reduce run-off and sedimentation effects. Access tracks which are not required for farm use will also be covered with topsoil and rehabilitated in a similar manner. Further details are provided in the CEMP included in Appendix D of Volume 3 of the EIS.

The Irish Wind Energy Association (IWEA) [(11)] states that when decommissioning a wind farm "*the concrete bases could be removed, but it may be better to leave them under the ground, as this causes less disturbanc*e".

It is proposed to leave the access tracks in-situ at the decommissioning stage. IWEA also state that "*it may be best*" to leave site tracks in-situ depending on the size and geography of the development.

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

Mitigation measures to avoid contamination by accidental fuel leakage and compaction of soil by on-site plant will be implanted as per the construction phase mitigation measures.

E HYDROLOGY

E.1 Mitigation Measures for Hydrology

Mitigation Measures

Proposed Mitigation Measures for the Construction Stage of the Wind Farm

Proposed drainage measures to reduce and protect the receiving waters from the potential impacts during the construction of the proposed development are as outlined in Section 9.6 of Chapter 9 - Hydrology. These include measures to prevent runoff erosion from vulnerable areas and consequent sediment release into the nearby watercourses to which the proposed development site discharges. The mitigation measures proposed to reduce potential direct, indirect and turbine delivery route and cable route impacts are outlined below.

- A suitably qualified person will be appointed by the developer to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process. The operations management of the wind farm will include regular monitoring of the drainage system and maintenance as required. The increase in the rate of run-off along the route of the site access roads and hard-standing areas will be mitigated by the proposed drainage system which includes the provision of stilling ponds to reduce the concentration of suspended solids in the run-off from these areas, and the addition of silt fencing where deemed necessary.
- As discussed, stilling ponds will be put in place in advance as construction progresses across the site. The stilling ponds with a diffuse outflow detail will mitigate any increase in run-off. Erosion control and retention facilities, including stilling ponds will be regularly maintained during the construction phase. The three-stage treatment train (swale – stilling pond – diffuse outflow) proposed to retain and treat the discharges from hard surface areas as a result of the development will reduce any risk of flooding downstream.
- Standing water, which could arise in excavations, has the potential to contain an increased concentration of suspended solids as a result of the disturbance to soils. The excavations for turbines will be pumped into the site drainage system (including stilling ponds), which will be constructed at site clearance stage, in advance of excavations for the turbine bases. As the majority of turbine excavations will be within low permeability peat or glacial till, groundwater inflow is expected to be small. In areas of higher permeability soils (expected at Cloncumber), flows may be higher and exclusion techniques such as sheet piles may be required to control groundwater flow and stabilize excavations, particularly close to the river where a higher water table is expected.
- The excavated subsoil material will be removed, either to the designated material storage areas at the borrow pit locations or stockpiled close to the excavation and used as backfill material if suitable. Temporary material storage areas will be covered with impermeable sheeting and surrounded with silt fencing, which will be monitored to manage any potential loss of suspended solids to surface waters. Temporary material storage areas will be a minimum of 50 m from the true bank edge of any watercourse.
- Interceptor cut-off drains around the borrow pits will be provided to divert overland flow to the nearest watercourse, and prevent it from entering the borrow pit, to mitigate the volume of flows to be treated.
- Individual stilling ponds will be provided at borrow pit locations.
- Drains around hard-standing areas will be shallow to minimise the disturbance to sub-soils.
- Cross-drains of 450mm diameter will be provided to prevent a risk of clogging for crossings conveying flows from bog drains, agricultural drains and forestry drains across the access roads.
- All tracks will be surfaced with clean well graded stone with the minimum of fines which will be imported, to mitigate the conveyance of silt-laden run-off in the track drainage.
- Silt fencing will be used as an additional protection to watercourses where deemed necessary, where floating roads are to be constructed
- Interceptor cut-off drains will be provided on the upslope side of the site access roads to prevent the mixing of overland flows with the drainage for the proposed development. These interceptor drains will discharge diffusely over land.
- Cables will be installed in trenches adjacent to the site access roads, or laid within the access road line, where required. Trenches will be excavated during dry periods where possible in short sections and left open for minimal periods, to avoid acting as a conduit for surface water flows. Clay bunds will be constructed within the cable trench at regular intervals.

- The routes for the proposed access tracks are laid out to follow the existing tracks where practicable. Site access roads have been laid out to reduce the longitudinal slope of roadside drains and to follow natural flow paths where possible. Where roadside drains are laid at slopes greater than 2%, check dams will be provided.
  This is unlikely to occur as the slopes on the site are so flat, however the check dams, if required, will reduce the effective slope and run-off velocities and any consequent potential for erosion.
- Cognisance has been taken of the findings in Chapter 7 Ecology and Chapter 8 Soils and Geology in the location of stilling ponds to ensure that these facilities are located in suitable areas.
- Culverts will be sized in accordance with CIRIA C689 Culvert Design and Operation Guide, the Office of Public Works (OPW) guidance and the guidance provided by IFI in the design of the proposed stream crossings. A Section 50 Application will be prepared for all new stream crossings to obtain the consent of the OPW at detailed design stage.
- Where agricultural tracks, bog tracks and forestry tracks will be used to access the development, the roadside drains alongside these roads will be cleared of obstructions, should it be found that debris and vegetation are impeding flows. Silt traps will be provided at regular intervals to reduce the concentration of suspended solids in the surface water run-off being conveyed in the existing drains, which may result from vehicles trafficking these roads from the construction areas.
- All open water bodies adjacent to proposed construction areas will be protected by fencing, including the proposed stilling ponds.
- The conceptual site drainage has been designed to complement existing overland flow and existing bog, agricultural and forestry drainage. The drainage design will be developed in full at the detailed design stage.
- Additional protection will be provided in the form of silt fencing downslope where required and at existing stream crossings during construction, to further ensure that there is no impact from the development to streams and rivers crossing the site.
- All personnel working on site will be trained in pollution incident control response. Emergency Silt Control and Spillage Response Procedures contained in the CEMP will ensure that appropriate information will be available on site outlining the spillage response procedure and a contingency plan to contain silt. Adequate security will be provided to prevent spillage as a result of vandalism. A regular review of weather forecasts of heavy rainfall is required and a contingency plan will be prepared for before and after such events. A record will be kept of daily visual examinations of watercourses which receive flows from the proposed development, during and for an agreed period after the construction phase. Water samples will be taken and water quality will be monitored in accordance with a water monitoring programme which will be agreed with Kildare County Council, Meath County Council and IFI, as outlined in Chapter 10 of Volume 2 of the EIS.
- The developer will ensure that erosion control, namely silt-traps, silt fencing and swales are regularly maintained during the construction phase.
- Existing overland flow channels will be maintained and cross-drains provided in the access roads to allow continuity of flow. Interceptor drains where required, will be constructed upslope where there are no existing channels, with cross-drains provided at regular intervals. The roadside drains will therefore only carry the site access road run-off and so avoid carrying large volumes of water and concentrating flows.
- During the construction period an emergency facility will be provided to control the discharge from the stilling ponds. This will mitigate the risk of any accidental spillage on site affecting watercourses.
- Roads will be capped as soon as practicably possible to cover exposed subsoils and as such reduce the concentration of suspended solids being conveyed in the run-off into the drainage system.
- Where access tracks pass close to watercourses, silt fencing will be used to protect the streams by reducing the concentration of suspended solids being conveyed in the surface water run-off into watercourses. Silt traps will also be provided at outfalls from roadside swales to existing drains. Silt traps will be kept upstream of outfalls to allow a buffer zone to the outfall.
- Wheel wash facilities will be located at each site entrance to reduce construction traffic fouling public roads. Each wheel wash will come with an additional water tank which will be filled regularly. These units will be self-contained and will filter the waste for ease of disposal. Waste will be removed from each unit and from site by a permitted contractor. Additional silt fencing will be kept on site in case of an emergency break out of silt laden run-off.
- Silt traps and silt fencing for the proposed wind farm development are proposed as described above in Section 9.5 and will be put in place in advance as construction progresses across the site.
- Tree felling will be undertaken in accordance with the specifications set out in the Forest Service Forestry and Water Quality Guidelines (2000) [34] and Forest Harvesting and Environmental Guidelines (2000) [38], to ensure a tree clearance method that reduces the potential for sediment and nutrient runoff.

Trees will be felled away from aquatic zones where possible. Branches, logs or debris will not be allowed to accumulate in aquatic zones and will be removed as soon as possible. Additional silt fencing will be erected along the banks of any streams at the location of the proposed tree felling to provide additional protection to the watercourses in this area. Felling around the required infrastructure, made up of a corridor of approximately 33m along all tracks, an area of approximately 1.3ha at each of the turbine locations located in forestry, plus an area around the substation (approximately 1.9ha) is proposed for the site.

The rate of absorption of a felled site, and therefore rate of run-off, is expected to be slightly higher than that of a forested site. However the area of proposed felling is small relative to the overall planted area and is expected to develop a vegetation ground cover relatively quickly. Thus, no significant increase in the rate of run-off is anticipated as a result of felling or risk of downstream flooding.

- Where new cross-drains are proposed on this site to convey surface water from roadside swales to outfalls, these will be sized at a minimum of 225mm diameter to avoid blockages.
- Roadside swales will serve to attenuate any increase in surface water run-off due to new hardcore tracks or existing track widening.
- Refuelling of plant during construction will only be carried out at dedicated refuelling station locations on site, typically at each compound or at least 100m from a watercourse using mobile bowsers. This will reduce any risk of pollutants being conveyed in the surface water run-off, into the drainage system and subsequently into watercourses. Each station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. Only emergency breakdown maintenance will be carried out on site. Drip trays and spill kits will be kept available on site, to ensure that any spills from the vehicle are contained and removed off site.
- To avoid any risk of groundwater contamination resulting from the foul drainage for the site, portaloos and/ or containerised toilets and welfare units will be used to provide toilet facilities for site personnel. Sanitary waste will be removed from site via a licenced waste disposal contractor.
- Where works will be required to modify existing bridges to facilitate the delivery of turbines, pre-cast concrete will be used whenever possible, to eliminate the risk to all forms of aquatic life. Should cast-in-place concrete be required, all work will be done in the dry and effectively isolated from any water that may enter the drainage network for a period sufficient to cure the concrete. Debris containment netting will be used to arrest and contain falling objects. Silt curtains will be used where there is a risk of fine sediment getting into the stream or canal. Partial isolation may be undertaken using caissons or cofferdams. No instream works shall be carried out without the written approval of Waterways Ireland and IFI.
- Turbine delivery is not expected to take place during extreme weather conditions. The road widening at the ‘S’ bend on L5025, is a temporary measure to facilitate turbine delivery and this bend will be reinstated to its original layout, including the re-establishment of vegetation, following the delivery of turbines to the site. Therefore there should be no long term risk of an increase in the risk of pluvial flooding at this location.
- Where existing drains will be covered with hardcore as part of modifications for road widening to facilitate the TDR, the surface water will be diverted into new drains which will connect to the existing drainage system.
- Modifications are required to upgrade a section of the disused railway in Bord Na Mona lands. The TDR will go off-road for 0.99km and will wind back to tie-in with the existing R414 Regional Road at Lullymore. The new road will be drained to a toe drain which will in turn drain to the existing drainage system in Bord Na Mona lands. Silt traps will be provided along the toe drain at regular intervals, to avoid any increase in suspended solids from the disturbed soils entering the existing drainage system.
- Modifications are required at the entrance to the Cloncumber cluster. The modifications proposed are to a bridge over a drain, which is a disused Mill Race that leads to the Slate River, some 0.6km downstream. A temporary extension is required to the bridge. Debris containment netting will be used to arrest and contain falling objects during demolition. Silt curtains will be used where there is a risk of fine sediment getting into the stream or canal. Partial isolation may be undertaken using caissons or cofferdams. No instream works shall be carried out without the written approval of IFI.
- Silt fencing will be erected at the location of stream crossings along the cable route, to avoid any risk of an increase in the concentration of suspended solids being conveyed in the surface water run-off into watercourses. Silt curtains and floating booms will also be used where deemed to be appropriate, in consultation with IFI and Waterways Ireland and this will be assessed separately at each individual location.

Proposed Mitigation Measures for the Operation Stage of the Wind Farm

It is not envisaged that the operation of the wind farm will result in significant impacts on the hydrological regime or water quality of the area, as there will be no further disturbance of soils post-construction, and only a minimum of traffic movement.

The conceptual drainage has been designed to operate effectively during the operation period. The stilling ponds will be a permanent feature, and will continue to be effective in filtering the run-off from the site should any accidental release of silt combine with the surface water run-off during operational activities.

During the operation period the swales will have vegetated and will serve to attenuate flows and remove suspended solids from the run-off.

Proposed Mitigation Measures for Maintenance of the Wind Farm

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

The maintenance regime will include inspecting the following:

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

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

Maintenance will be in accordance with CIRIA C697 (SuDS and Maintenance Manual). Daily visual inspections will be undertaken during the construction period, followed by fortnightly visual inspections until the vegetation has been re-established satisfactorily. Monthly monitoring will continue following the completion of construction until full re-vegetation has occurred, as outlined in Chapter 10 of Volume 2 of the EIS.

Proposed Mitigation Measures for Decommissioning of the Wind Farm

As in the construction phase silt protection controls would again be put in place. The drainage system will remain operational during the decommissioning phase and will serve to treat any sediment laden surface water run-off due to a renewed disturbance of soils. Re-vegetation will be monitored. If it is deemed necessary, erosion control matting will be used to assist in the re-establishment of vegetation.

Proposed Mitigation Measures for Flooding

The FRA for Maighne Wind Farm concludes that the proposed development has 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.

Proposed Particular Mitigation Measures for Specific Clusters

Windmill

The proposed drainage of the cluster will avoid excavations in the bog as far as possible, with the exception of some interception of existing drains. The avoidance of high bog will ensure that no direct impacts (such as habitat loss or surface damage) will occur. This is discussed further in Chapter 7 Ecology and the proposed drainage of the development is discussed further in Section 9.6 of Volume 2 of the EIS.

The entrance road is an existing entrance which crosses an area identified in the OPW PFRA mapping as an indicative floodplain. However, no construction personnel, operation or maintenance personnel will be permitted in this cluster during extreme flood events. Commercial operators will take the usual precautionary measures as far as practicable during flood events. Emergency operations during a flood event are not envisaged on the wind farm.

It was noted at a consultation meeting with the IFI that the River Glash is a salmonid nursery and it is under pressure, due to elevated ammonia levels due to peat soils. There will be no direct discharges to this river, from disturbed areas of peat soils. The only area draining to the Glash River will be the existing entrance road. There are no modifcations proposed to the entrance road at this location.

Drehid-Hortland

The proposed substation is located close to a Source Protection Zone (SPZ). A sealed drainage system will be provided, extending past the area of significance i.e. concrete dished channels with a kerbed perimeter at the substation hardstanding. The concrete dished channels will drain to a stilling pond, located 200m from the Inner SPZ, which will in turn drain via forestry drains to the receiving watercourse, which is at a distance of 1km from the location of the substation.

The entrance access road into the location of turbine T40 to the east of the cluster runs within 50m of a tributary and the main channel of the Clogheraun Stream (tributary of the River Blackwater). The track here is partially an existing track. There is the potential risk of the ingress of silt, into the stream, as a result of overland silt laden surface water flows, during the construction of the turbine cluster which will be accessed from this entrance. Silt fencing will be provided along the full length of the access track where it coincides with the bank of the tributary and the main channel of the Clogheraun Stream

Cloncumber

Where a new bridge will be required next to an existing bridge over the Slate River to facilitate the delivery of turbines, pre-cast concrete will be used whenever possible, to eliminate the risk to all forms of aquatic life. Should cast-in-place concrete be required, all work will be done in the dry and effectively isolated from any water that may enter the drainage network for a period sufficient to cure the concrete. No instream works shall be carried out without the written approval of IFI.

F WATER QUALITY

F.1 Mitigation Measures for Water Quality

Mitigation Measures during Tree Felling

As outlined, dispersed around the various clusters comprising the site, approximately 63ha of tree felling will be required for this proposed development across four of the five clusters. The tree felling area proposed for Maighne Wind Farm is shown in Figure 2.8 of Volume 2A of the EIS. This tree felling will be the subject of a Felling Licence from the Forest Service and will be in accordance with the conditions of such a licence. A Limited Felling Licence will be in place prior to any felling works commencing on site.

The licence will include the provision of relevant replant lands to be planted in lieu of the proposed tree felling on the site. The replant lands will be properly certified as suitable for forestry by a certified forester. The replant lands will be certified to be of an appropriate yield class and soil type and recommendations as to types and amount of fertilisation required will also be provided by a certified forester at the time of applying for the felling licence.

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

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

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

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

- avoid streams or other watercourses
- be as short as possible
- avoid any areas of poor crop or bare areas
- generally extract to site roads with the extraction racks laid out at right angles to the road to prevent water flowing down wheel ruts.

Dense, fresh brash mats are the most important part of a felling site as they serve to avoid soil damage, erosion and sedimentation. These will be designed and installed to protect the underlying soil from damage and will be maintained throughout the felling operation. Their purpose is to prevent breaking of the ground surface thus preventing silt or nutrient run-off.

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

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

Once felling operations are complete, the bulk of the brash will be bundled and recovered from the site in a process known as forest residue recovery. Double- wheeled machinery and corduroy rafts (close poling) will be used as necessary to maximise the recovery of brash and where the bearing capacity of the ground is poor.

If any damage or rutting begins to occur, extraction will be suspended immediately, and will not recommence until either repairs are made or an alternative extraction route is provided. Extraction and cutting will be suspended during and following heavy rainfall periods.

Felling will be conducted to accommodate infrastructure and will be limited to the criteria set out in Chapter 2 – Description of the Development.

The permanent areas not replanted will include a corridor of approximately 33m along all tracks and internal cable routes, an area of approximately 1.3ha at each turbine locations located in forestry, plus an area around substation (approximately 1.9ha). Planting along the well-drained margins of roads will ensure a relatively high level of soil fertility and better drainage which is most conducive to tree growth.

The area of proposed felling is small relative to the overall planted area. Thus, no significant increase in the rate of run-off is anticipated as a result of felling nor is the risk of downstream flooding or sedimentation due to erosion increased.

The amount of felling required to facilitate the wind farm will in some cases be undertaken earlier than programmed, which may intensify forestry operations in some compartments during the construction period. There will in turn be an equivalent reduction in forestry operations in the same compartments in subsequent years, giving a net, neutral result in terms of area felled.

Mitigation Measures During Construction

Mitigation measures for the protection of surface water and groundwater include:

- The proposed three-stage treatment train (swale – stilling pond – diffuse outflow) will retain and treat the discharges from hard surface areas as a result of the development
- Silt Protection Controls (SPCs) are proposed at the location of watercourse crossings and where haul roads pass close to watercourses, silt fencing with an associated buffer strip will be used to protect the streams Silt traps will also be provided at outfalls from roadside swales to existing drains. Silt traps will be kept upstream of outfalls to allow a buffer zone to the outfall. Additional silt fencing will be kept on site in case of an emergency break out of silt laden run-off
- The stilling ponds, silt traps and silt fencing will be put in place in advance as construction progresses across the site and will be regularly maintained during the construction phase
- During the construction period an emergency facility, e.g. sand bags will be provided to control the discharge from the stilling ponds. This will mitigate the risk of any accidental spillage on site affecting watercourses
- Roads will be capped as soon as practicably possible to cover exposed subsoils and as such reduce the concentration of suspended solids in the run-off
- All stockpile material will be bunded adequately and protected from heavy rainfall to reduce silt run-off, where necessary
- Borrow pit No.3 in the Cloncumber cluster is adjacent to the Barrow Line of the Grand Canal. There will be no opening of or access to these borrow pits from the south (canal side). This borrow pit will be set back a minimum of 50m from watercourses with excavation areas 70m from the canal and they will be drained away from the canal to stilling ponds. At the upslope side of the borrow pit overland flows will be intercepted in channels which will discharge diffusely over vegetated areas. Swales will be used to drain the reinstated sections to the stilling ponds at the borrow pit locations. Silt fencing will be erected to further protect streams, where required. The stilling ponds will remain in place until the reinstated areas have attained satisfactory re-vegetation
- Wheel washing facilities will be provided at the entrances to the temporary site compounds draining to silt traps
- Cross-drains of 450 mm diameter will be provided to prevent a risk of clogging for drainage crossings and conveying flows from bog drains, agricultural drains and forestry drains across the access roads
- Where new cross-drains are proposed on this site to convey surface water from roadside swales to outfalls, these will be sized at a minimum of 225mm diameter to avoid blockages
- Any standing water from the turbine excavations will be pumped into the site drainage system (including stilling ponds), which will be constructed at site clearance stage, in advance of excavations for the turbine bases. Bio-degradable silt bags (or equivalent approved) will be used during dewatering of excavations

- It is not expected that overland flows will be obstructed to any great extent as a result of the layout of the wind farm, however where required, interceptor channels will collect overland flows on the upslope side of the access tracks, hard standing areas, material storage areas and borrow pits. The interceptor channels will cross the access tracks in cross-drains which will be provided at regular intervals. The overland flow will then discharge diffusely on the downslope side over vegetated areas within the site boundary
- Emergency Silt Control and Spillage Response Procedures contained within the Site Drainage Management Plan of the CEMP will ensure that appropriate information will be available on site outlining the spillage response procedure and a contingency plan to contain silt
- A suitably qualified person will be appointed by the developer to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.
- Tree felling will be undertaken in accordance with the specifications set out in the Forest Service Forestry and Water Quality Guidelines (19) (2000) and Forest Harvesting and Environmental Guidelines (20) (2000), to ensure a tree clearance method that reduces the potential for sediment and nutrient runoff. Trees will be felled away from aquatic zones where possible. Branches, logs or debris will not be allowed to accumulate in aquatic zones and will be removed as soon as possible. Additional silt fencing will be erected along the banks of any streams at the location of the proposed tree felling to provide additional protection to the watercourses in this area. Felling will be conducted to accommodate infrastructure and will be limited to the criteria set out in Chapter 2 – Description of the Development. If further felling is required at any stage, a separate felling licence will be applied for from the Forest Service and appropriate mitigation measures put in place
- Due to the dispersed nature of the site, there will be a number of designated refuelling stations on site, typically at each temporary site compound or refuelling will take place at least 100 m from a watercourse using mobile bowsers. Each station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. Drip trays and spill kits will be kept available on site, to ensure that any spills from the vehicle are contained and removed off site. Only emergency breakdown maintenance will be carried out on site and appropriate containment facilities will be provided to ensure that any spills from breakdown maintenance vehicles are contained and removed off site
- Any diesel or fuel oils stored at the temporary site compounds will be bunded. The bund capacity will be sufficient to contain 110% of the tank's maximum capacity
- Portaloos and/ or containerised toilets and welfare units will be used to provide toilet facilities for site personnel during construction. Sanitary waste will be removed from site via a licensed waste disposal contractor. Non-potable water at the site compound will be brought in by tanker and drinking water will also be imported
- Concrete wash out areas will only be allowed in designated areas within the temporary construction compounds and drainage from these areas will be controlled as detailed in Chapter 9 - Hydrology
- Adequate security will be provided to prevent spillage as a result of vandalism
- Where works will be required to modify existing bridges to facilitate the delivery of turbines, pre-cast concrete will be used whenever possible, to eliminate the risk to all forms of aquatic life. Should cast-in-place concrete be required, all work will be done in the dry and effectively isolated from any water that may enter the drainage network for a period sufficient to cure the concrete. Debris containment netting will be used to arrest and contain falling objects. Silt curtains will be used where there is a risk of fine sediment getting into the stream or canal. Partial isolation may be undertaken using caissons or cofferdams. No instream works shall be carried out without the written approval of Waterways Ireland and IFI
- The potential impact of exposed soils during the excavation of the turbine bases and cable trenches will be temporary. Any standing water, which could arise in excavations, has the potential to contain an increased concentration of suspended solids or as a result of the disturbance to soils. The excavations for turbines will be pumped into the site drainage system (including stilling ponds), which will be constructed at site clearance stage, in advance of excavations for the turbine bases
- As the majority of turbine excavations will be within low permeability peat or glacial till, groundwater inflow is expected to be small. In areas of higher permeability soils (expected within alluvium at Cloncumber and within the gravel aquifers at Johnstown), flows may be higher and exclusion techniques such as sheet piles may be required to control groundwater flow and stabilise excavations, particularly close to the river where a higher water table is expected
- Cable trenches will be backfilled with a cement bound material in the SPZ which will prevent preferential pathways from forming
- Existing groundwater wells will be avoided during construction. If any unused existing wells are encountered during construction (e.g. within the Johnstown wellfield), they will be decommissioned properly with grout seals.

- In order to protect the existing peat bog and nearby groundwater wells from the effects of dewatering, if high permeability strata are encountered along with strong groundwater inflow within excavations, groundwater cut-off techniques (such as sheet piling) will be used in preference to lowering of the water table (dewatering). The precise technique to be used will be determined at detailed design stage following a full ground investigation. This will avoid the possibility of significant drainage of the adjacent peat bog. It should also be noted that the majority of excavations close to peat bogs will not extend much deeper than the existing drainage network. Any dewatering will be temporary, during construction only and will not have time to cause dewatering of the peat, which due to the low permeability of the peat would result in very slow drainage.

A full ground investigation will be carried out at the detailed design stage. This will include trial pit excavation, drilling and geophysical survey, as appropriate, at each turbine location, along the roads, cable routes and substation. These investigations will determine the bearing stratum for each turbine, its depth, the presence of groundwater and inform the turbine foundation type and size.

No materials will be stored adjacent to the wells. Concrete wash out areas will be located outside of the SPZ in the temporary construction compound to the south of the Drehid cluster.

Surface Water Monitoring Programme

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

- Daily visual inspections of drains and outfalls from interceptor drains will be performed during the construction period to ensure suspended solids are not entering the streams and rivers of the site, to identify any obstructions to channels, and to allow for appropriate maintenance of the drainage regime. If excessive suspended solids are noted, construction work will be stopped and remediation measures will be put in place immediately
- Fortnightly visual inspections will be continued during the operation period until satisfactory vegetation is established on site
- Turbidity meters will be installed up and downstream of the construction area to determine any impacts. They will be in place for the duration of the works for each particular phase before being moved to the next phase. Should the turbidity levels measured during construction be greater downstream than upstream, the source of the turbidity will be identified and additional mitigation measures will be implemented
- Grab samples, will be undertaken during the construction phase of the development at representative locations so as to ensure the effective implementation of the proposed mitigation measures. Appropriate locations will be chosen to monitor the water quality of the receiving environment for each construction area. Field measurements will be recorded at each site and will include measurement of the following parameters, electrical conductivity, pH, temperature and dissolved oxygen. The field measurements will be taken on a weekly basis during the site clearance and earthworks stage of the construction period
- Following site clearance and earthworks, the field measurements will be taken on a monthly basis until full re-vegetation has occurred, unless otherwise directed by the planning authority, Inland Fisheries Ireland (IFI) or Waterways Ireland. Grab samples were taken for this EIS from seven locations during a dry weather and storm event to provide a baseline against which samples taken during the construction stage can be measured. Trigger values will be defined for indicator parameters based on the pre-construction monitoring results and results will also be compared to the maximum guideline values specified in the table below.

Table 1: Surface Water Quality Monitoring Parameters

Parameter	Maximum Guideline Value
Conductivity (µs/cm)	1,000
Turbidity (NTU)	20
pH	6.0 < pH < 9.0

Parameter	Maximum Guideline Value
Dissolved Oxygen (% saturation)	80 – 120 (%ile)
Total Suspended Solids (mg/l)	25
Total Ammonia (mg/l N)	0.14 (95%ile)
Nitrite (NO_2) (mg/l)	0.05
Molybdate Reactive Phosphorus (mg/l P)	0.075 (95%ile)
Total Phosphorus (mg/l P)	0.5
Chloride (mg/l)	250

Groundwater

Groundwater wells will be installed up and downgradient of the construction site in the vicinity of the proposed substation at Drehid and for turbines T44 and T45 which are located in or in close proximity to the inner SPZ at Johnstown. Baseline conditions will be established for each well prior to earthworks or construction. Appropriate trigger levels will be set for monitoring parameters. Monitoring will be carried out at regular intervals during construction.

The wells will be purged daily and sampled for pH, electrical conductivity and a visual and odour inspection will be carried out. In the event of significant differences in the results from baseline results or in the downgradient well, works will be immediately stopped, the reason identified and additional mitigation measures will be put in place. In addition, monthly groundwater samples will be sent to a laboratory for analysis of the parameters listed below during the construction period.

Table 2: Groundwater Quality Monitoring Parameters

Parameters	
Total Coliforms	Total Phosphorus
Faecal Coliforms	Total Organic Carbon
pH_Laboratory	Chloride
Conductivity_Laboratory	Fluoride
Alkalinity	Sulphate
Total Suspended Solids	Sodium
Colour	Potassium
Turbidity	Calcium
Ammonium	Metals
Nitrite as NO_2	Total Pesticides
Nitrate as NO_3	(Total) PAHs

Mitigation Measures for the cable route and temporary alterations to the Turbine Delivery Route

Cables will be installed in trenches adjacent to the site access roads, or laid within the access road line, where required. Trenches will be excavated during dry periods where possible in short sections and left open for minimal periods, to avoid acting as a conduit for surface water flows. Clay bunds will be constructed within the cable trench at regular intervals.

Short lengths of MV and HV cable will be laid in the SPZ of Johnstown Well Field at the Drehid-Hortland cluster. Dewatering of the trench will be to the site drainage system (including stiling ponds) or to transportable containers. Road drainage will be installed to convey run-off from the access track.

Silt fencing will be erected at the location of stream crossings along the cable route. For off-line cabling methods, a temporary diversion of the watercourse may be required. Silt curtains and floating booms will be used where deemed to be appropriate, in consultation with IFI and this will be assessed separately at each individual location.

Cognisance will be taken of the NRA "*Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*" and the "*Requirements for the Protection of Fisheries Habitat During Construction and Development Works at River Sites*" (Eastern Regional Fisheries Board) in the planning and implementation of the watercourse crossings.

A method statement will be prepared in advance of all proposed watercourse crossings which will include the following mitigation measures:

Mitigation Measures during Operation and Maintenance

It is not envisaged that the operation of the wind farm will result in significant impacts on the water quality of the area, as there will be no further disturbance of soils post-construction, and only minimal traffic movement.

The preliminary drainage specification has been designed to continue to run efficiently during the operation period. Surface water run-off will discharge to the drainage swales during rain events. During the operation period the swales will have vegetated and will serve to further attenuate flows and reduce the amount of sediment discharging from the site.

The stilling ponds will be a permanent feature, and will continue to be effective in filtering the run-off from the site should any accidental release of silt combine with the surface water run-off during operational activities.

During the operation period the swales will have vegetated and will serve to attenuate flows and remove suspended solids from the run-off.

There is potential for small oil spills during the operation phase and as a result, all equipment with the potential for oil spillage will be bunded.

The water quality monitoring programme is detailed previously. During the operation and maintenance phase fortnightly visual inspections of the drains and outfalls from the interceptor drains will be continued until satisfactory vegetation is established on site. Following this stage, the field measurements will be taken on a monthly basis from appropriate monitoring locations until full re-vegetation has occurred, unless otherwise directed by the planning authority, IFI or Waterways Ireland.

Mitigation Measures during Decommissioning

As in the construction phase silt protection controls would again be put in place. The drainage system will remain operational during the decommissioning phase and will serve to treat any sediment laden surface water run-off due to a renewed disturbance of soils.

F Human Environment

F.1 Mitigation Measures for Human Environment

Socio-Economics

Rates paid by the developer will contribute significant funds to Kildare and Meath County Councils which are used to improve the services available to the people of the county.

The proposed community benefit scheme will provide funding for local community schemes and accordingly, may enhance the local community interaction. The Near Neighbour Scheme will also provide those living closest to the wind farm with additional benefits.

All works in public roads will require a road opening licence. The timing and sequence of the works in order to minimise impacts on road users and local communities will be specified by the respective local authority and will inform the preparation of a Traffic Management Plan.

Land Use

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.

Recreation, Amenity and Tourism

Regular updates will be provided to the local community in relation to the construction programme. This will be co-ordinated by an appointed liaison officer. During the operation of the wind farm, a dedicated telephone number and email will be set up and will be posted on an information noticeboard at the entrance to the each cluster.

The Bloodstock Industry

Mitigation Measures during Construction Phase

During the construction phase the developer will engage in comprehensive communication with the local community detailing construction activities so that people working with horses are aware of all such activities, in particular:

- the Traffic Management Plan
- road closures and alternative routes
- construction period and construction methods

Other mitigation measures will be provided by the developer such as:

- providing detailed day to day updates for construction activities, when occurring near to those facilities located closest to the turbines (equine facilities within 1km) to the operators of these facilities.
- no blasting shall be used during the construction works
- any other activities that could lead to startling of horses in close vicinity to the construction works will be communicated with the owners of the equine facilities

- The developer will engage the services of an equine expert who can advise on other recommended measures during the construction period.

These measures should ensure that horses will not be affected by the construction activities and will become accustomed to the wind turbines over a period of time.

Case Studies of Wind Turbines and Horses

The scientific research supports the conclusion that horses exhibit adaptation, acclimatisation, and habituation after repeated exposure to noise and visual stimuli. Marshall Day (2014)[vi] supports the view that noise has minimal effects on animals;

> "*Once animals become habituated to noise, especially when it is steady and associated with clearly non-threatening activity, they suffer very little adverse response*."

In terms of providing evidence of how horses exhibit an adaptation and habituation to operational wind farms there are already examples of existing wind farms being located on or near stud farms, equestrian centres and horse-riding trails in the UK and Ireland.

The currently operational Mace Upper wind energy scheme in Co. Mayo (planning reference 00/1954 and 06/2476) is on an estate that operates an equestrian centre. An appeal to An Bord Pleanála (PL16.221313) was made in which the issue of the interaction of horses and wind turbines was raised. Section 10.8 of the An Bord Pleanála Inspectors Report dismissed this point as it did not represent a significant issue. Upon speaking with the owner of the Mace Upper Equestrian Centre - Mr. Noel Walsh, his experience of the three wind turbines on his land has been very positive.

The three turbines are within approximately 200m, 280m and 450m of the equestrian centre buildings and areas where outdoor equestrian events are held. A video of the turbines and the equestrian centre as well as an interview with the owner has been produced by Element Power and is available for viewing[vii].

The first onshore wind farm in Britain which became operational in 1991 was developed on the site of a stud farm. This wind farm, which has since been expanded, is in Delabole in Cornwall. Young horses are regularly broken in within 50 metres of wind turbines there and are ridden through the wind farm site. Along with having no impact on the horses, there are no reports of any animal or activities disturbances at the adjacent Camel Valley Riding Club from the turbines. Furthermore, in 2007 a nine turbine wind farm was developed at Stags Holt in the Fenlands in Cambridgeshire on a site adjoining a stud farm. This wind farm was subsequently extended to almost double its original size in 2010 and there have been no issues with the owners of the stud.

In conclusion, considering the existing scientific evidence, the proposed wind farm layout, the case studies and the mitigation measures outlined above, the Maighne wind farm as proposed does not have a significant impact on the bloodstock industry in the area.

Health and Safety

Construction Health and Safety Mitigation Measures

A site specific Safety and Health Management Plan has been prepared on a preliminary basis for the project in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2013 and is included in this Outline CEMP.

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

All hazards will be identified and risks assessed. Where elimination of the risk is not feasible, appropriate mitigation and/or control measures will be established. The contractor will be obliged under the construction contract and current health and safety legislation to adequately provide for all hazards and risks associated with the construction phase of the project.

FÁS Safe Pass registration cards are required for all construction, delivery and security staff. Construction operatives will hold a valid Construction Skills Certificate Scheme card where required.

The developer is required to ensure a competent contractor is appointed to carry out the construction works. The contractor will be responsible for the implementation of procedures outlined in the Safety & Health Plan. Public safety will be addressed by restricting site access during construction. Appropriate warning signs will be posted, directing all visitors to the site manager.

Operational Health and Safety Mitigation Measures

For security purposes, access to the towers and the substation compound will not be obtained without the corresponding keys. The substation will be enclosed by palisade fencing and equipped with intruder and fire alarms in line with ESB and EirGrid standards.

A harness will be provided to allow access to the nacelle and will be connected to a central line running behind the ladder. This will prevent personnel from freefalling more than a few centimetres, hence reducing the potential for injury.

Adequate clearance of structures from overhead lines will be provided. In this case, all on-site electrical connections are carried by underground cable.

There will be lightning conductors on each turbine as all structures standing tall in the sky require protection and turbines in particular to allow surge protection to electrical components.

As no impacts from ELF-EMF have been identified, mitigation measures are not included.

Material Assets

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.

Non-renewable resources will be sourced locally as far as possible to minimise transportation distances and indirect impacts on climate change.

G Archaeology, Architectural & Cultural Heritage

G.1 Mitigation Measures for Cultural Heritage

Construction

The following mitigation measures will be carried out in advance of construction. All archaeological works will take place under licence to the National Monuments Service of the Department of Arts Heritage and the Gaeltacht (DAHG).

Archaeological Assessment

Archaeological investigation in the vicinity of Turbines T6 (in Ballynakill), T47 (in Drehid-Hortland), T33 and T35 (in Cloncumber) and their access tracks and cables will be carried out well in advance of construction upon grant of permission as they lie in close proximity to potential sites and recorded monuments. A combined programme of geophysical survey and test excavation will take place at these locations. This will establish the exact nature, date and extent of the archaeological features and the impact that the proposed turbine and access track/cable will have on them.

The results of the testing will inform a suitable mitigation strategy to be discussed and agreed with the DAHG. If development is permitted, full excavation/ preservation by record of previously unknown features directly impacted by the development will be carried out in advance of development.

The areas of the site that will not be subject to impact will be preserved 'in-situ' and will be fenced off during construction to ensure that there is no accidental damage to the subsurface archaeological remains that lie outside the construction area. A cordoned off construction corridor, that has been archaeologically resolved prior to construction, will be maintained so that machinery, equipment, spoil or fill material etc. will not be placed in the areas that contain subsurface archaeological remains.

Given the inherent archaeological potential of bogs the three turbines T24, T25, T26 in Windmill cluster and their access tracks and cables will require archaeological testing in advance of construction works under license to the DAHG. Should archaeological features be identified a suitable mitigation strategy, either full excavation, preservation in situ or avoidance by redesign will be agreed with the DAHG.

Archaeological Monitoring during earthmoving works:

Given the general archaeological potential of this landscape all earthmoving/excavation works associated with the development of:

- Turbine foundations
- Access tracks
- Hardstands
- Internal cables
- Substations
- Borrow pits
- Met mast
- Temporary construction compounds

(which includes the areas of archaeological potential i.e. the greenfield areas, river crossings, townland boundaries and bogland etc.) will require archaeological monitoring under licence to the DAHG in accordance to National Monuments Act 1930, as amended.

The purpose of monitoring is to determine if any archaeological material or features are uncovered during ground disturbance works. In the event of the discovery of archaeological finds or remains, the DAHG and the NMI will be notified immediately. Provision will be made to allow for, and fund any, archaeological work that may be needed if any remains are noted. If features are revealed, the immediate area will be investigated, allowing no further development to take place until the site is fully identified, recorded and excavated or alternatively avoided to the satisfaction of the statutory authorities.

Any archaeological investigation the bogs will also require paleo-environmental sampling that would complement the examination of the past environment.

Cultural Heritage

The derelict vernacular cottage (CH3) in the Ballynakill cluster should be robustly cordoned off with robust fencing during construction to prevent accidental machine damage to the structure.

The removal of sections of the townland boundaries disturbed as a result of the construction of the access tracks will also be recorded in advance of the site preparation stages of the development and their removal monitored.

MV Cable
Archaeological testing of the route of the MV cable as it runs offline at Lullymore West, before joining the R414 will be required, this is also the line of a proposed haul route. The testing will establish the exact location, nature and extent of the road / gravel trackway in Lullymore West (RMP KD012-016) and a suitable mitigation strategy can then be designed in consultation with the DAHG; such a strategy might include redesign by avoidance, preservation in situ by bridging the feature or full excavation.

Licenced archaeological monitoring in the areas along the MV cable routes that pass in the vicinity of recorded archaeological monuments will be required. That is in the vicinity of the Children's Burial Ground (RMP KD003-015) and a church and graveyard (RMP KD003-014002) in Cadamstown, a medieval church, graveyard and castle site in Dunfierth (RMP KD004-005 and KD004-006) and a crannog and trackway in the townland of Dysart/Knockanally (RMP KD004-014). .

HV Cable Routes

- *HV Cable Route to Woodland*

Archaeological monitoring in the vicinity of the settlement of Cloncurry (RMP KD004-021002) and of Mulhussey Church, graveyard and castle site (RMP ME049-011, ME049-012) will assist in identifying any remains during the trench excavation required for the cables in the external road network.

- *HV Cable Route to Maynooth*

Archaeological testing under ministerial consent will be required along the line of the HV cable route option to Maynooth on the L5037 road in the vicinity of Taghadoe National Monument. The testing will establish whether features associated with the site extend beneath the road surface. If features are identified their nature and extent will be recorded and a suitable mitigation strategy can then be considered in consultation with the DAHG; such a strategy might include redesign by avoidance or full excavation.

Archaeological monitoring of the sections of this HV route option that passes adjacent to the church and graveyard and castle site in Dunfierth (RMP KD004-005 and KD004-005) and a crannog and trackway in the townland of Dysart/Knockanally (RMP KD004-014) will assist in identifying any remains during the trench excavation required for the cables in the external road network.

Node Upgrades for Turbine Delivery Routes

The construction team should be made aware of the locations of those RPS/NIAH sites that are situated in the immediate vicinity of the proposed delivery and cable routes. All precautions should be taken to ensure that there is no accidental impact on any of the boundary treatments associated with these sites / structures during the construction phase.

It is proposed to upgrade the existing bridge at Kilpatrick where a modern 20th century bridge crosses the Grand Canal. It is recommended that any proposed works in this location will avoid impacting the 18th century canal or canal banks (KDIAHS-012-002). A full photographic record of the structure will be carried out.

A baseline condition survey will be carried out at Johnstown Bridge (RPS B04-25), Fear English Bridge (RPS B04-24) and Agar Bridge (RPS B17-15) and the numerous structures and the crossings of features identified along the haul/delivery routes in the respective county industrial heritage surveys. This will be undertaken to record baseline data which will be monitored during construction phase.

Where the haul route runs offline at Lullymore West, archaeological investigation at the site of a gravel trackway in Lullymore West (RMP KD012-016) will be carried out well in advance of construction and will assist in devising a suitable mitigation strategy in consultation with the DAHG.

It is anticipated that all archaeological issues associated with this area will be resolved before the MV cable or the haul road is constructed to the satisfaction of the DAHG.

Indirect impact on setting mitigation

There is no mitigation possible for this potential impact; instead mitigation by design was carried out during the EIA process. Using a GIS spatial data the archaeological, architectural and cultural heritage features identified during the baseline study and field survey work were used as a tool by all consultants. Arriving at the final proposed layout was through a series of iterative phases and interaction with all of the technical consultants.

Turbines were excluded in Drehid and Timahoe where they were found to dominate the view of Newberry Hall from Carbury Hill and castle. Additional turbines were dropped around Lullymore Monastic site where the turbine was found to be dominant over the national monument. Where possible access tracks followed existing tracks or when new tracks were required took the shortest possible routes, where possible, to minimise the amount of ground disturbance required. Approximately 10km of out of a total 41km of access tracks to be constructed will use existing tracks.

General
Attention is drawn to national monuments legislation (1930-2004), which states that in the event of the discovery of archaeological finds or remains, the Heritage and Planning Division of the Department of the Environment, Heritage and Local Government and the National Museum of Ireland should be notified immediately. In such a scenario, the archaeological finds or remains will need to be investigated, and no further development will take place in that area until the finds or remains are resolved in agreement with the relevant authorities.

During the construction phase all mitigation measures will be undertaken in compliance with national policy guidelines and statutory provisions for the protection of the archaeological, architectural and cultural heritage.

- Operation

All physical archaeological, architectural and cultural heritage impact issues will be resolved at the pre-construction stage of the development and therefore there will be no potential impacts at the operation stage of the development. There are no appropriate mitigation measures to remedy the indirect impacts on the setting of features within the wider landscape.

- Decommissioning

No mitigation measures will be required during the decommissioning phase. The same level of baseline recording and monitoring of the bridge structures along the access routes will be required.

J Traffic and Transportation

J.1 Mitigation Measures for Traffic and Transportation

The following mitigation measures will be implemented prior to and during the project as appropriate:

1. **Traffic Management Plan (including restricted use of public roads)**- An overall Traffic Management Plan (TMP) will be prepared in advance of the works and this will be agreed with the roads authority and An Garda Síochána. The traffic management plan will clearly identify those roads that will be used to access the site/clusters and those roads that are not to be used. In some cases, the Garda Síochana and the roads authority may direct/agree that certain roads cannot be used for laden HGV's but can be used for LGV's or unladen HGV's.

   In such cases, these particulars will be recorded on the TMP. The TMP will also have regard to Waterways Ireland restrictions on the use of certain bridges over the canal networks.
2. **Traffic Management Coordinator** - A dedicated competent Traffic Management Coordinator will be appointed for the duration of the project and this person will be the main point of contact for all matters relating to traffic management on the project.
3. **Road Pre-Condition Survey** - A pre-condition survey shall be carried out on all public roads that will be used in connection with the works to record the condition of the road before the works commence. The specification and timing of the pre-construction survey will be agreed with the roads authority. A joint survey shall be undertaken if the roads authority so agrees.
4. **Road Reinstatement** - All roads, shall upon completion of the construction works, be reinstated to their pre-works condition or better and to the satisfaction of the relevant roads authority.
5. **Site Inductions** - All workers will received a comprehensive site induction which shall include, as appropriate, a section of traffic management and clear guidance on the routes to be used/not used.
6. **24 Hour Emergency Phone Number** - A 24 hour emergency phone number will be maintained for the duration of the construction works and the number will be noted on temporary signage at each works area (for cable works) and at each site entrance at a minimum.
7. **Orderly Traffic Management** - All necessary temporary traffic management will be planned and executed in accordance with best practice, including Chapter 8 of the Traffic Signs Manual as published by the NRA/Department of Transport.
8. **Letter Drops** - Subject to agreement with the planning authority, a letter drop will be carried out to notify members of the public living near the proposed site/route/roadworks, to advise them of any particularly significant upcoming traffic related matters e.g. temporary lane/road closure (if required), delivery of turbine components at night.
9. **Clear signage** - A system of clear signage relating to the project, both temporary and permanent will be agreed with the planning authority. These signs will also identify those roads to be used (and not to be used) for accessing the site in line with the objectives of the TMP.
10. **Wheel washing facilities** - temporary wheel washing facilities will be located at each site entrance, subject to agreement with the planning authority, to prevent soil/dirt from being transported onto the public road network.
11. **Road sweepers** will be utilised to maintain the public roads in a clear condition, and this will apply especially during the earthworks stages of the project.

Mitigation Measures –Cable Works

12. **Road Opening Licence** - The road works associated with the cabling will be undertaken in line with the requirements the road opening licence, the terms of which will be set out by the roads authority.
13. **Route Proofing** – in advance of the main cabling works 'route proving' will be carried out to define the precise alignment of the cables to be laid. This route proving process will include slit trenching with the aim of avoiding, where possible, existing services in the road. This step will allow for the cabling works to be carried out as expeditiously as possible thereby minimising the impact on road users.
14. **No cable works to overlap with concrete pours -** Unless otherwise agreed with the planning authority, cabling works shall not take place on the same section of local road on the same day that a turbine base pour is taking place.
15. **Maintain local access during diversions and road closures –** reasonable access to local dwellings, farms, businesses is to be maintained at all times during any road closures associated with the cable works. The details of this will be agreed with the roads authority in advance of the works in consultation with the local residents in so far as is practicable. The network of local roads in the area will be used for traffic diversions for local traffic in order to expedite the works and limit the duration of the impact owing to the cabling works.

16. **Road Cleanliness** - Appropriate steps will be taken to prevent soil/dirt generated during the trenching works from being transported on the public road.
17. **Reinstatement** - Trenches on public roads, once backfilled, shall be reinstated without delay to the satisfaction of the roads authority.
18. **Road Resurfacing/improvements** - So as to improve the condition of the local road network following the completion of the works, the local roads along which the cable routes travel, will be resurfaced in line with details/specification and timing to be discussed with the roads authority. For the avoidance of doubt the cost of these resurfacing works will be borne by the developer, subject to agreement with the planning authority.

Appendix 2

Stilling Pond Calculations

CONSULTANTS IN ENGINEERING & ENVIRONMENTAL SCIENCES
Cork : Tel 021-4964133 Fax 021-4964464

DESIGNED: MC **CHECKED:**
DATE: 26/03/2015 **REVISION:** -
JOB NUMBER: **LE14-731-04**
CALC NUMBER: **C-1**
FILE: Q:\2014\LE14\731\04\06 EIS\09 Hydrology\Reports\Draft Appendices\Appendix H6\LE1473104_Typical Stilling Pond_26.03.15.xls
SHEET: Calc cover

PROJECT: **Maighne Wind Farm**

DESCRIPTION: **Typical Stilling Pond Design and Layout**

Rev	Date	Purpose and Description	Prepared	Checked	
-	26/03/2015	Design of Stilling Pond	MC		

Fehily Timoney Co.
Core House
Pouladuff Rd.
Cork

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 272867, Northing: 229669,

	Interval		Years											
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.5,	3.4,	3.9,	4.7,	5.2,	5.6,	6.9,	8.4,	9.3,	10.7,	11.9,	12.8,	14.2,	15.3,	16.2,	N/A ,
10 mins	3.4,	4.8,	5.5,	6.5,	7.3,	7.8,	9.6,	11.7,	13.0,	14.9,	16.5,	17.8,	19.8,	21.3,	22.6,	N/A ,
15 mins	4.0,	5.6,	6.4,	7.7,	8.5,	9.2,	11.3,	13.7,	15.3,	17.5,	19.5,	21.0,	23.3,	25.1,	26.6,	N/A ,
30 mins	5.3,	7.3,	8.4,	9.9,	11.0,	11.8,	14.4,	17.3,	19.2,	21.8,	24.1,	25.9,	28.7,	30.8,	32.6,	N/A ,
1 hours	7.0,	9.5,	10.8,	12.8,	14.1,	15.0,	18.2,	21.7,	24.0,	27.2,	29.9,	32.1,	35.3,	37.8,	39.9,	N/A ,
2 hours	9.3,	12.4,	14.1,	16.4,	18.0,	19.2,	23.1,	27.3,	30.1,	33.8,	37.1,	39.6,	43.5,	46.4,	48.8,	N/A ,
3 hours	11.0,	14.5,	16.4,	19.1,	20.8,	22.2,	26.5,	31.2,	34.3,	38.5,	42.1,	44.9,	49.1,	52.3,	55.0,	N/A ,
4 hours	12.3,	16.2,	18.2,	21.2,	23.1,	24.6,	29.3,	34.4,	37.6,	42.1,	46.0,	49.0,	53.5,	57.0,	59.8,	N/A ,
6 hours	14.5,	18.9,	21.2,	24.5,	26.7,	28.4,	33.6,	39.3,	42.9,	47.9,	52.2,	55.5,	60.4,	64.2,	67.3,	N/A ,
9 hours	17.0,	22.1,	24.7,	28.5,	30.9,	32.8,	38.6,	44.9,	49.0,	54.5,	59.2,	62.8,	68.3,	72.4,	75.8,	N/A ,
12 hours	19.1,	24.7,	27.5,	31.6,	34.3,	36.3,	42.6,	49.4,	53.8,	59.7,	64.8,	68.6,	74.4,	78.8,	82.4,	N/A ,
18 hours	22.5,	28.9,	32.1,	36.6,	39.6,	41.9,	48.9,	56.5,	61.3,	67.8,	73.4,	77.7,	84.0,	88.9,	92.8,	N/A ,
24 hours	25.3,	32.2,	35.7,	40.7,	43.9,	46.4,	54.0,	62.2,	67.3,	74.3,	80.3,	84.8,	91.6,	96.7,	100.9,	115.0,
2 days	30.3,	38.0,	41.7,	47.1,	50.6,	53.2,	61.3,	69.8,	75.2,	82.4,	88.6,	93.2,	100.1,	105.3,	109.5,	123.7,
3 days	34.7,	43.1,	47.2,	53.0,	56.7,	59.5,	68.1,	77.1,	82.8,	90.3,	96.8,	101.6,	108.8,	114.2,	118.5,	133.1,
4 days	38.8,	47.8,	52.2,	58.3,	62.3,	65.2,	74.4,	83.9,	89.8,	97.7,	104.5,	109.5,	117.0,	122.5,	127.1,	142.1,
6 days	46.2,	56.4,	61.3,	68.2,	72.5,	75.8,	85.9,	96.3,	102.8,	111.4,	118.6,	124.1,	132.1,	138.1,	142.9,	159.0,
8 days	53.1,	64.3,	69.7,	77.2,	81.9,	85.5,	96.4,	107.7,	114.6,	123.9,	131.7,	137.5,	146.0,	152.4,	157.6,	174.6,
10 days	59.6,	71.7,	77.5,	85.7,	90.8,	94.6,	106.3,	118.4,	125.8,	135.6,	143.9,	150.0,	159.1,	165.8,	171.3,	189.2,
12 days	65.8,	78.8,	85.1,	93.8,	99.2,	103.3,	115.7,	128.5,	136.4,	146.8,	155.5,	161.9,	171.5,	178.6,	184.3,	203.1,
16 days	77.7,	92.4,	99.4,	109.1,	115.3,	119.8,	133.6,	147.7,	156.4,	167.8,	177.4,	184.5,	194.9,	202.6,	208.8,	229.3,
20 days	89.1,	105.3,	113.1,	123.8,	130.5,	135.4,	150.5,	165.9,	175.3,	187.7,	198.0,	205.7,	216.9,	225.2,	231.9,	253.9,
25 days	102.8,	120.9,	129.5,	141.3,	148.7,	154.2,	170.8,	187.6,	197.8,	211.3,	222.6,	230.9,	243.1,	252.1,	259.3,	283.0,

NOTES:
N/A Data not available
These values are derived from a Depth Duration Frequency (DDF) Model
For details refer to:
'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

Maighne Wind Farm

Stilling Pond downslope of Turbine Locations

Location	Turbine Hardstanding & Foundations	Imp. Factor X 0.75	Existing access roads	Proposed site access roads	Area road x 4.5 m wide	Imp. Factor X 0.75	Area	Area	Greenfield Area
	m^2		m	m	m^2		m^2	ha	ha
At turbines	2125	1593.75	0	260	1170	877.5	2471.25	0.25	0.33
				Greenfield					**0.33**
				Developed Site				**0.25**	

Assumptions;

New access roads are 4.5m wide

2650 m^2 allowed for hardstanding for turbines, with an impermeability factor of 0.75

The new site access roads will have a maximum cross-fall of 2% and drain over the edge into a swale.

The new roads have an impermeability factor of 0.75

Existing roads have an impermeability factor of 0.75

Overland flow from the hill side of the tracks will be accommodated in interceptor drains. These interceptor drains will discharge diffusely over existing vegetated areas.

The roads are drained 'over the edge' into swales.

The hardstanding areas associated with the turbine locations will be drained into swales. Where swales have a slope of less than 1/50 they require check dams at intervals in the swale.

The outflow weir from stilling ponds will accommodate a 1 in 100 year, 30 minute duration flow. Where stilling ponds are to be backfilled following construction and after satisfactory re-establishment of vegetation, the weir will become the diffuse outfall for a drainage swale, which will be left in place to drain the surface water from the new development.

Suspended solids removal is estimated in accordance with the plain sedimentation method in CIRIA B14.

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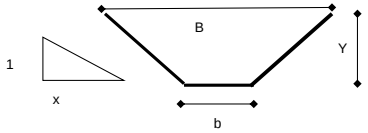
Open channel design

Microsoft Office Excel 2003

References: Open Channel Design - Douglas/Gasiorek/Swaffield, Fluid Mechanics and Swale Design - The Suds Manual, CIRIA C697



b =	varies	Allow width for mowing in swales	
Y =	varies	Depth (May depend on upstream pipe diameter or culvert entering channel)	
x =	varies	Side slope (Varies)	
n =	Check Table	Manning's 'n' (Rough stream bed, poor condition n = 0.06, concrete lined n = 0.017)	
i =	0.001	(min.bed slope, longitudinal gradient - varies but must be less than 0.02 for swales)	

Area	A	(b+(x*Y))*Y	Q =	(1/n)*(A^(5/3)/P^(2/3))*i^0.5 m3/s	Manning Formula
Wetted Perimeter	P	b+((2*Y)*((1+x^2)^0.5))	V =	Q/A m/s	(Maximum V not to exceed 2 m/s or 0.3 m/s in swales)
Top Width	B	b+2*x*Y			
Hydraulic Mean Depth	m	A/P	QReq=	Q 5, I = 25.96 mm/hr (30 min. duration incl. CC)	
			Qmax=	Q 100, I = 56.98 mm/hr (30 min. duration incl. CC)	

Job Nr.:	LE14-731-04
Designed by:	Mary Creedon
Date:	18/12/2014

Swale from T27, contributing impervious area = 0.25 ha

Location/Chainage	Description	b m	Y m	x	n	i	A m2	P m	$A^{5/3}$	$P^{2/3}$	$I^{1/2}$	Qcap m3/s	Q Req m3/s	Qmax m3/s	V (for Qreq) m/s	Critical depth V^2/g m	Depth $Y>V^2/g$	Status
Swale	Trap. Channel	0.9	0.150	3	0.06	0.005	0.203	1.849	0.070	1.506	0.071	0.05	0.02	0.04	0.09	0.0008	depth greater than critical	Capacity Adequate

Notes:
1) When designing open channels the depth of flow must be greater than the critical depth to avoid the formation of a hydraulic jump.
2 Erosion protection such as check dams to be considered for very steep gradients.

Maighne Wind Farm

Location: Downslope of turbine T27

Sizing of the Stilling Pond

Volume =		**30**	m3	Volume required for settlement only
Length of the pond, L =		8.5	m	input
Width of the Pond, W=		5.5	m	input
Side slope = 1V:ZH	Z =	1		input
Free board =		0.15	m	input
Live depth =		0	m	input from invert of orifice outfall
Permanent depth =		1	m	input
Total depth =		1.15	m	
Live and dead storage (total water) depth =		1	m	3m is Max. allowable
Surface Area of the pond =		46.75	m2	
Top water level length =		8.2	m	
Top water level width =		5.2	m	
Area at top water level, A =		43	m2	<--- Use to assess SS Removal
Permanent water level length =		8.2	m	
Permanent water level width =		5.2	m	
Area at permanent water level, a =		42.64	m2	
Bottom width, b =		3.2	m	
Bottom Length, l =		6.2	m	
Bottom area =		19.84	m2	
Calculated live volume = H/3*(A+a+sqrt(Aa)) =		**0**	m3	
Permanent volume* =		31	m3	
Freeboard volume =		7	m3	
Total volume excavation =		37	m3	

Check for efficient nutrient removal & Suspended Solids Removal:

*CIRIA B14 Design of flood storage reservoirs 6.6.2 states that the permanent pool should be at least the size of 12mm times the contributing catchment area.

Permanent Volume	2500	m^2	X	0.012	m	30.00	m^3 ok

Maighne Wind Farm

Location: Downslope of turbine T27

Assessment of Adequacy of Size of Stilling Pond for Reduction in Concentration of Suspended Solids:

Guidelines:
Ref.:Freshwater Fish Directive

Measured at the discharge point from the surface water settling ponds to the boundary stream.
Level (Suspended Solids mg/l) = 25 mg/l

Ref.: Ernest W. Steel - Water Supply & Sewerage, Plain Sedimentation

Top Surface Area of Live Storage of Swale sized as per CIRIA guidelines:

Area = 43 m^2

Trial 1
Maximum Outflow :
0.03960 m3/s

Flow velocity in Pond : Q/A = 0.0396 ÷ 43

= 0.00092093 m/s (v)

Ref. Table 6.6 CIRIA B14

Material	% content	settling velocity, m/s		content	
1. Gravel	5	0.8		129.1	mg/l
2. Sand	5	0.022		129.1	mg/l
3. Silt	20	0.00018		516.4	mg/l
4. Clay	70	0.000011		1807.4	mg/l
Total	**100**			**2582**	
Avg. particle settling velocity =		0.0411437	m/s	(v_s)	

Ratio of Removal = r = Vs / V = 0.0411437 ÷ 0.00092093

= 45

Percentage Removal = 100 %

Typical Incoming Concentration = 2582 mg/l
(Ref.:CIRIA B14, Section 6.1.3. Table 6.1Event mean concentrations of Suspended Solids)

Required Maximum Outgoing Concentration = 25 mg/l

SS Concentration from Stormwater Pond = 25 mg/l

Sizing of overflow spillway

Checking the depth of water over top water level (i.e. head for the weir)

Job No. **LE14-731-04**

Pond: **Location: Downslope of turbine T27**

Overflow Weir Design

The overflow weir Invert should be at the Top Water Level			
The 100-year discharge	0.04	m3/s	
100 year water depth over TWL =	0.100	m	target value
Discharge through broad crested weir, Q* = 1.705*B*H^1.5			
Take the overflow weir width B =	**0.800**	m	
Discharge capacity of the weir, Qcap =	0.0431	m3/s	

Weir Width = 0.8 m

**Ref: Fluid Mechanics by Douglas, Gasiorek and Swaffield, 1979, pp 456*

Appendix 3

‘The Best Practice Management Guidelines’ produced by Invasive Species Ireland (Maguire et al, 2008)

invasivespecies Ireland

Best Practice Management Guidelines

Rhododendron (*Rhododendron ponticum*)

and

Cherry Laurel (*Prunus laurocerasus*)

1. Aim of this advice

This document provides best practice management guidelines on the control of *Rhododendron ponticum* and Cherry Laurel (*Prunus laurocerus*) on the island of Ireland.

2. Introduction

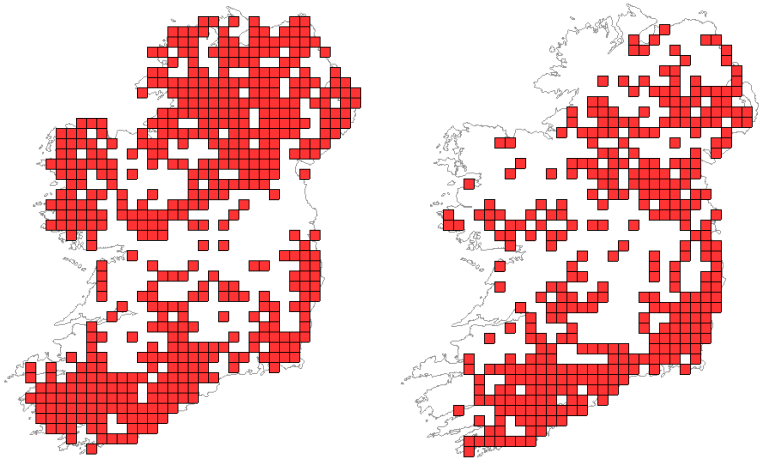
2.1. *Rhododendron*

Rhododendron is a large evergreen shrub (growing up to 8m tall) that was introduced to Ireland as an ornamental plant in the 18th Century from Asia and north-west China. There are more than 900 species of *Rhododendron*, but only one type, *Rhododendron ponticum* is invasive in Ireland. It has dark green waxy, oblong leaves and conspicuous pinkish purple or lilac flowers on 2-4cm stalks although hybrids and cultivated varieties can vary in colour. Flowering occurs in spring and summer with plants capable of producing large quantities of viable seed, which can persist to create a seed-bank in the soil. *Rhododendron* can also propagate itself by vegetative means, both by suckering from roots and by layering wherever branches touch the ground.

Rhododendron thrives on peaty, sandy and acidic soils and is extremely hardy. It is a very popular garden ornamental plant and has been extensively planted as game cover along the edges of fields and within woodlands. Its popularit , adaptability to Irish climate and soils along with its highly successful and multiple methods of reproduction and dispersal means that it has become naturalised and widespread. As *Rhododendron* is very shade tolerant, it has become widely established in several habitats, notably heathlands and woodlands from adjacent gardens.

2.2. Cherry Laurel

Cherry Laurel is a dense thicket forming invasive ever-green shrub of gardens, parks and woodlands from South West Asia. The leaves are thick and laurel-like, poisonous with cyanide, the white flowers are produced on upright spikes and are succeeded in autumn by blackish cherry-like fruits which should not be eaten.



Distribution of *Rhododendron ponticum* in Ireland (right) and Cherry Laurel (left). Source of data: National Biodiversity Network; accessed 07 April 2008.

2. Impacts

Rhododendron and Cherry Laurel are extremely invasive plant species, particularly in the more humid western parts of Ireland forming dense impenetrable thickets. Both species are unpalatable and likely toxic to mammals and probably invertebrates due to the presence of 'free' phenols and diterpenes in *Rhododendron* and cyanide in Cherry Laurel. They are both avoided by grazing animals, thus giving them significant advantages over native species. The deep shadow cast by the plants and toxic leaf litter accumulating underneath *Rhododendron* produces a dark sterile environment, which suppresses regeneration of native species and supports little wildlife. Changes in soil chemistry induced by *Rhododendron* have also been reported. Animal populations can also be negatively influenced by *Rhododendron* e.g. bird numbers are lower in mature oak woodlands dominated by *Rhododendron*.

In Ireland, *Rhododendron* has invaded three habitats of international importance under the EC Habitats Directive: upland oak woods, bogs and heath. For example, it is now a widespread invasive species in Killarney, where >650 acres of the Killarney National Park are completely infested.

Rhododendron in Ireland hosts a serious plant health pathogen *Phytophthora ramorum.* This is a fungus that has the potential to attack a wide variety of native woody plants and is the causative agent of 'Sudden Oak Death'. On *Rhododendron*, the first indication of the disease is wilting of shoots. These develop a brown/black colour that spreads along the twig and can move onto the leaves, where the leaf bases and tips blacken. The fungus has been recorded in Northern Ireland and DARD has identified this species as likely to cause significant damage t trees and landscapes if it establishes widely. Consequently, *Rhododendron* is one of the biggest conservation issues facing Irish woodlands today.

There are reported cases of human poisoning by 'toxic' honey from *Rhododendron*. The severity of the reaction probably relates to the amount of affected honey digested and the health and susceptibility of the individual concerned.

3. Legal status

There are no specific legal provisions associated with growing of *Rhododendron* or Cherry Laurel on the island of Ireland. However, all management methods described here should be carried out with due care and attention, with particular consideration to health and safety requirements and, where necessary, by trained and competent personnel. All waste not dealt with on site should be taken to a licensed landfill site

Under the EU Plant Health Directive, emergency legislation was introduced in 2002 to prevent the introduction and spread of *Phytophthora ramorum* within the EU. If suspicious symptoms are observed on *Rhododendron* or any other tree species, the Forest Service (ROI) / DARD (NI) should be informed.

4. Managing *Rhododendron* and Cherry Laurel

The management and eradication of *Rhododendron* and Cherry Laurel is challenging. Understanding the ecology of the species and carefully planning clearance work will ensure success. Clearance can be expensive and time consuming, and should be well planned before any action is taken.

5. Control and eradication

Three main issues must be considered when planning management/control. These are:

• *Rhododendron* in Ireland is a prolific seed producer. However, a naturally seeded plant does not flower and produce seed until at least 10-12 years old. This provides a window of opportunity to prevent serious infestation, through the immediate removal of young plants.

• *Rhododendron* regrows vigorously when cut. As a result, some method of stump killing or removal is always necessary. Any untreated cut stump will regrow and in most cases flower within 3-4 years

• The scale and nature of the site infestation. Adjacent garden/land owners should be encouraged to control *Rhododendron* at the same time as clearance on your site.

6. Rhododendron and Cherry Laurel on adjacent sites

It is important to consider populations in the wider environment around the site. If *Rhododendron* is growing profusely on adjacent land, or upstream, then recolonisation of recently cleared sites is possible. Discussion with neighbouring land owners on the issues involved and your intended actions, may help encourage them to remove or not plant *Rhododendron* and Cherry Laurel as ornamental or hedging species.

For all sites, the following six steps may be usefull to ensure success:

1. Find out how much *Rhododendron* and/or Cherry Laurel there is on the property and map it if possible.

2. Note the age, condition and previous treatments at your site. Use this information to guide your control programme.

3. Areas should be prioritised. It may be easier to clear less heavily infested areas to begin with or sites where seed production has not yet occurred. Also, ideally work with prevailing wind direction, rather than against it, to help minimise seed dispersal into recently cleared areas.

4. Create suitable conditions for the recovery of native ground flora. This will reduce open areas for recolonisation.

5. Write a Management Plan to guide your work. Including timeframes for planned clearance and repeated treatments.

6. Follow-up work will be necessary to ensure that any small plants and seedlings have not been missed.

7. Treatment options

Treatment programmes can be divided into 3 main stages: initial removal, control of stems and roots, and follow up. The following treatment options have been widely tested and measured for effectiveness across Ireland. In almost all cases, failures can be accredited to poor application of a particular technique and/or logistical difficulties, rather than the control method itself. Care should be taken when embarking on a control programme and resources should be identified and allocated for repeated treatments.

8. Successfully managing *Rhododendron*

Cut and remove stems by hand or chainsaw, cutting as close to the ground as possible to remove above ground growth. Chip or remove the cut material from the area to allow for effective follow-up work and prevent regrowth. Chipped material can provide good weed barrier around ornamental garden areas. Flailing has also been effectively used in Ireland to treat young or immature growth. Although not suitable on all sites and locations, especially steeply sloping or wet sites, it is very effective as it breaks up woody stems upon contact.

The removal of above ground growth will not prevent regrowth as *Rhododendron* will regrow from cut stems and stumps. There are four recommended methods to achieve successful management after the initial cut and removal:

1. Digging the stumps out. The effectiveness of this technique is increased by removing all viable roots. This can be done manually or with a tractor and plough. To avoid regrowth, stumps should be turned upside down and soil should be brushed off roots.

2. Direct stump treatment by painting or spot spraying freshly cut low stumps with a herbicide immediately after been cut. Glyphosate (20% solution), tryclopyr (8% solution) or ammonium sulphate (40% solution) are known to be effective during suitable weather conditions i.e. dry weather. The herbicide concentrations used and timings of applications vary according to which chemical is used. Use of a vegetable dye is recommended to mark treated stumps and all stumps should be targeted. A handheld applicator will help avoid spray drift onto surrounding non-target species. Always read the label and follow the manufacturers guidelines when using herbicides. Remember that using

3. A variation on the stump treatment method is stem injection, using a ‘drill and drop’ methodology, whereby, if the main stem is cut and is large enough for a hole to be drilled into it, the hole can be used to facilitate the targeted application of glyphosate (25% solution). The main drawback is that the dead *Rhododendron* may persist in situ for 10-15 years.

4. Stump regrowth and seedlings can be effectively killed by spraying regrowth with a suitable herbicide, usually glyphosate. Best practice spraying protocols should be carefully followed. General broadcast spraying is not as effective as stump spot treatment and has the potential to impact on surrounding non-target species. Rhododendron leaves are thick and waxy. For herbicide treatment to be effective **each individual leaf needs be thoroughly wetted with herbicide to kill the plant**.

Remember: If the initial infestation was of flowering age or a seed source is nearb , then follow-up seedling removal work will be necessary. The intensity of this work will vary according to the severity and duration of infestation.

See also: Higgins, G.T. (2006) *Rhododendron ponticum*: A guide to management on nature conservation sites. Irish Wildlife Manuals, No. XX. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

9. Rhododendron/Cherry Laurel Management Plan Template

Use this template to help formulate your own management plan outlining how you are going to proceed and what you will need.

Site Name: _____
Site Manager/Owner: _____

Site details

Address:	
Telephone:	
Email:	
Agencies/persons involved:	
Date:	

Date of introduction:	
Total site area:	
Total area colonised:	
Previous site management:	

Designation	**On site**	**Near site**	**None present**
Details: Establish if there is a requirement to apply for a license/notify before proceeding with plan.			

Actions and resources

Management options	**Responsibility**	**Date to undertake**

Resources needed	**Responsibility**	**Date to undertake**

Monitoring and evaluation

Name of person/s	**Date to undertake**	**Report to**	**Additional treatments date (if required)**

10. Summary of actions needed for effective management

1. Confirm *Rhododendron*/Cherry laurel identification

2. Carry out a survey and produce a distribution map indicating the location across the site.

3. Consider surrounding properties and potential for reintroduction. Talk to adjacent land owners. Identify potential contamination routes to your site and mitigate against these.

4. Decide should the programme aim for continuous control on a yearly basis or eradication from the site. Base your decision on an understanding of the biology, size of infestation, potential for reintroduction and other relevant sensitivities in the area. Once management has begun, do not allow any plant to flower and set seed within areas that have undergone initial clearance

5. Consider if you can successfully and safely carry out the work or if professional practitioners, with relevant training and certificates should undertake the work

6. Identify if sufficient resources are/will be available to complete the work within the planned timescale. If work will take more than 1 year to complete, ensure you have sufficient funds to complete the work.

7. Ensure disposal options for plant material are in place prior to work commencing.

8. Develop and produce a site specific control/management plan. Use the template provided in this document to guide you.

9. Monitor for regrowth and/or reintroduction during site visits. If applicable, ensure new members of staff are aware of your *Rhododendron*/Cherry Laurel plan and report sightings.

12. *Rhododendron* and Cherry Laurel treatment times

Cutting	J	F	M	A	M	J	J	A	S	O	N	D
Glyphosate	J	F	M	A	M	J	J	A	S	O	N	D
Tryclopyr*	J*	F*	M*	A*	M*	J*	J*	A*	S*	O*	N*	D*
Ammonium sulphate	J	F	M	A	M	J	J	A	S	O	N	D

Optimum treatment time. Remember to consider breeding birds before embarking on a programme.

Suboptimum treatment time but can be effective. In the case of glyphosate based herbicides consider higher concentrations 25--100% during this time period.

* Suitable for treatment any time after cutting and appearance of new growth.

Please consider sharing your experience undertaking a management plan with others. The Invasive Species Ireland website will feature case studies to help guide others under taking similar work.

The Invasive Species Ireland Project is undertaken, in partnership, by EnviroCentre and Quercus.

www.envirocentre.co.uk

www.quercus.ac.uk

and is funded by the National Parks and Wildlife Service and the Northern Ireland Environment Agency.

www.ni-environment.gov.uk

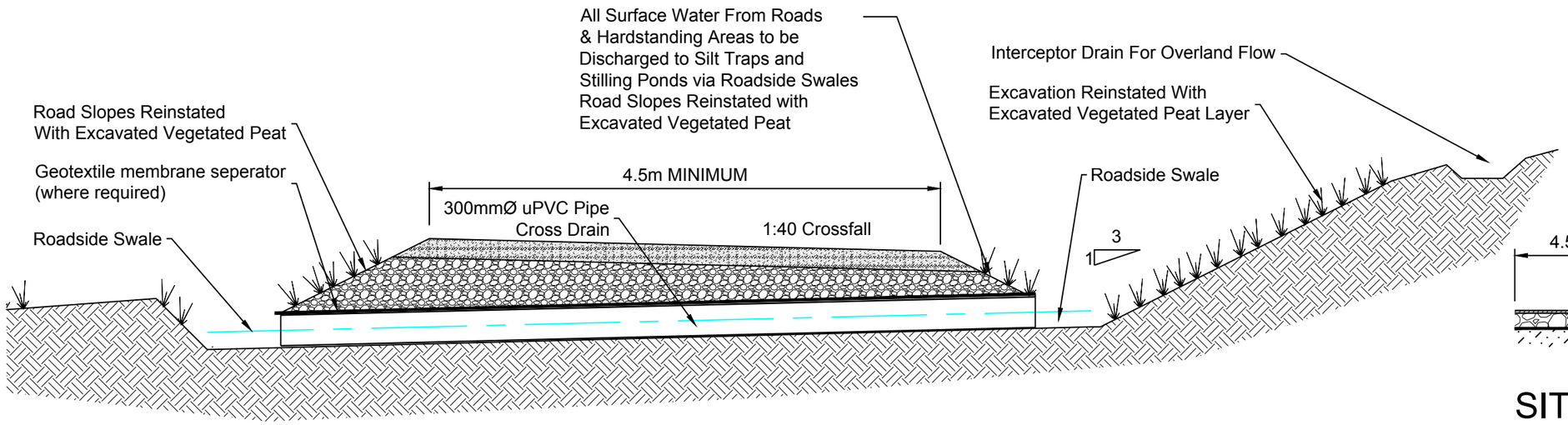
www.npws.ie

For more information on the Invasive Species Ireland Project please see the website at www.invasivespeciesireland.com

Recommended citation: Maguire, C.M., Kelly, J. and Cosgrove, P.J. (2008). Best Practice Management Guidelines Rhododendron *Rhododendron ponticum* and Cherry Laurel *Prunus laurocerasus.* Prepared for NIEA and NPWS as part of Invasive Species Ireland.

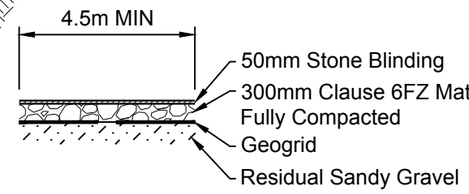
Appendix 4

Typical Access Track Standard Details



CROSS SECTION A-A THROUGH ROAD

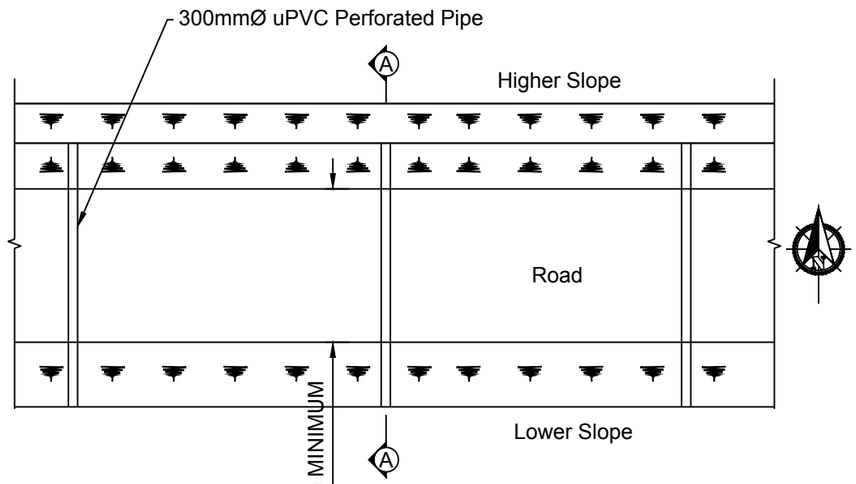
Scale 1:50



SITE TRACK DETAIL

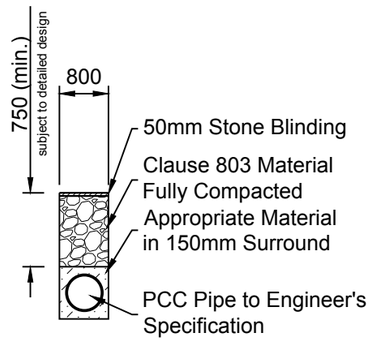
(Peat Depth <1.5m)

Scale 1:100



PLAN OF ACCESS TRACK

Scale 1:200



ROAD CROSSING

(PIPE TRENCH)

Scale 1:100

SITE TRACK DETAIL

(Peat Depth >1.5m)

Scale 1:100

TYPICAL CHECK DAM DETAIL

Scale 1:50

FEHILY TIMONEY & COMPANY
CONSULTANTS IN ENGINEERING AND ENVIRONMENTAL SCIENCES

Title of Drawing

MAIGHNE WIND FARM

TYPICAL CONSTRUCTION DETAILS FOR NEW & UPGRADED ACCESS TRACK

Date 12-Mar-15	Sheet 1 of 1	Scale 1:50
Dwg. No. LE1473104_FIG_004		Rev. A

ORIGINAL DRAWING SIZE A3 - (420 x 297)

NATURAL SCALE
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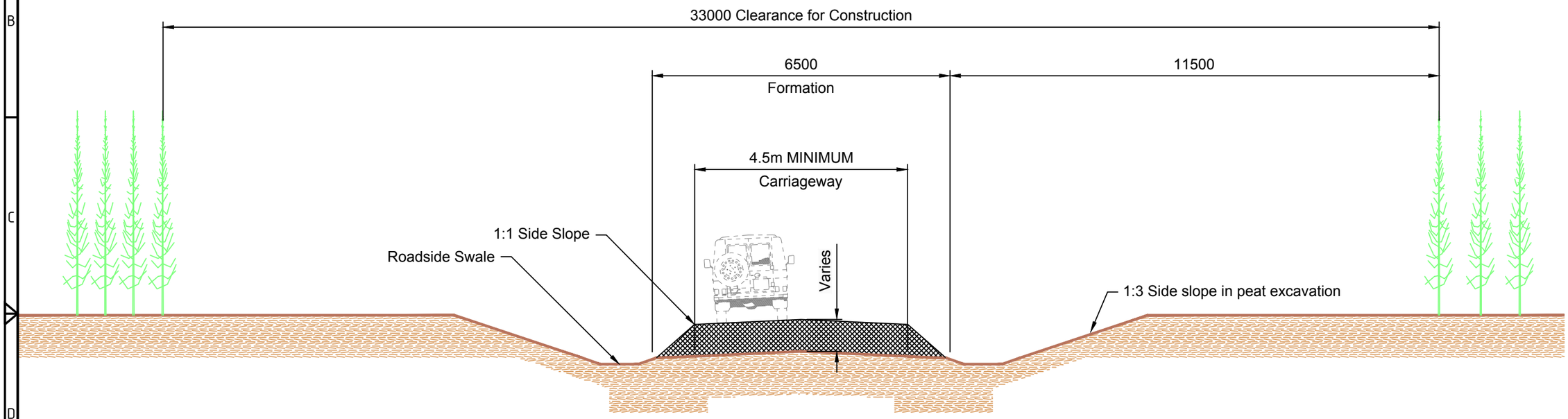

SECTION THROUGH FORESTRY TRACK

Scale 1:100

NATURAL SCALE
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FEHILY TIMONEY & COMPANY CONSULTANTS IN ENGINEERING AND ENVIRONMENTAL SCIENCES	
Title of Drawing MAIGHNE WIND FARM TYPICAL NEW FORESTRY TRACK	
Date 12-Mar-15	Sheet 1 of 1 / Scale 1:100
Dwg. No. LE1473104_FIG_005	Rev. A

ORIGINAL DRAWING SIZE A3 - (420 x 297)

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