2.0 PROJECT DESCRIPTION

2.1 SITE DESCRIPTION

The site is located in the townlands of Derryarkin, Derryiron, Coolcor, Coolville, Ballyburly, Greenhills, Bunsallagh, Derrygreenagh, Knockdrin, Wood, Killowen, Corbetstown, Carrick, Garr and Dunville, approximately 1.6 km north of Rhode, Co. Offaly. Please refer to **Figure 1.1** - Site Location.

The landholding outline of the site is approximately 1,002.234 hectares. The site is relatively flat, ranging in elevation from 75 m to 93 m OD (Malin Head). The site can be located on Discovery Series Map No.s 48 and 49 at approximate centre grid co-ordinate N 525 370. The site is irregular in outline and is bisected by the R400 and the Garr Road.

The site is predominantly improved agricultural grassland underlain with peaty soil. There has been extensive turf cutting in the western section of the site with old and new turf banks evident. Peat has been removed from considerable areas of the site and these areas have subsequently been further drained, improved and seeded with grasses for grazing of cattle and sheep. A network of existing local roads and private access tracks allow vehicular access to the various sections of the site.

The development will comprise thirty two (32) electricity generating wind turbines with a hub height up to 110 metres and a rotor diameter up to 113 metres giving an overall height of up to 166 m, hardstandings, a 110 kV substation, an electrical compound, a temporary construction compound, a permanent meteorological mast, a new access road off the R400 Roundabout at Rhode and upgraded access roads, associated site roads, drainage and site works.

2.2 DURATION OF PERMISSION

Given the scale and element of uncertainty in grid scheduling, a duration of 15 years is being sought for any planning permission issued on foot of this application. An operational lifetime of 30 years is being sought for the proposed wind farm, plus a 3 year construction/commissioning period and a 2 year decommissioning period. The DoEHLG Wind Farm Planning Guidelines state:

"*Planning Authorities may grant permission for a duration of longer that 5 years if it is considered appropriate, for example, to ensure that the permission does not expire before a grid connection is granted*".

2.3 WIND FARMS IN THE AREA

There are no operational wind farms in the surrounding landscape. There are currently no operational wind farms in Co. Offaly or Co. Westmeath. The closest operating wind farm is located at Carrig and Skehanagh, approximately 65km south west of the proposed development. However, Mount Lucas Wind Farm is currently under construction in Co Offaly, approximately 10km south of the proposed wind farm and Cloghan Wind Farm received a conditional grant of planning permission in July 2013 from Offaly County Council. Cloghan Wind Farm is located approximately 42km southwest of the proposed Yellow River Wind Farm site. Leabeg Wind Farm has also been consented but has not, as yet, gone to construction.

The existing wind farm at Carrig/Skehanagh has been operational since 2006 and consists of 8 Vestas V52 850kW turbines with an output capacity of 6.8 MW.

Mount Lucas Wind Farm, consisting of 28 turbines, is currently under construction since December 2012 and is located approximately 10 km south of the proposed site. The maximum output capacity for Mount Lucas is 79.2MW.

Leabeg Wind Farm, with a maximum export capacity of 4.25 MW, has planning permission consented, however, construction of this wind farm has not, as yet, commenced. Leabeg Wind Farm lies approximately 36 km south west of the proposed development.

A conditional grant of planning permission was issued to Cloghan Wind Farm in July 2013. This wind farm is located approximately 42km southwest of the proposed development. Cloghan Wind Farm comprises of 10 wind turbines with a maximum output capacity of 25MW.

Please refer to **Figure 1.2** for details of the Operational/ Consented wind farms**.**

Wind Farm	Status	Output (MW)	Direction from the Site	Distance (km)
Mount Lucas	Construction	79.2MW	South	10
Leabeg	Consented	4.25MW	West	36
Cloghan	Consented	25MW	South West	42
Carrig / Skehanagh	Operational	6.8MW	South West	65

Table 2.1: Operational/ Consented wind farms in the vicinity of the proposed site.

2.4 DESIGNATED AREAS OF CONSERVATION

The site is not located within any area designated for conservation. However there are eighteen designated areas and one proposed designated area within 15km of the site. Please refer to **Figure 2.1 -** Environmental Designation Map.

Site Name	Designation type	Distance from Landholding
Black Castle Bog	NHA	2.4km East
Grand Canal	pNHA	3km South
Raheenmore Bog	SAC, pNHA	4km South West
Cloncrow Bog	NHA	5km West
Rahugh Ridge (Kiltober Esker)	pNHA	7km Southwest
Murphy's Bridge Ridge Esker	pNHA	7km Southwest
Split Hills and Long Hill Esker	SAC	7km West
Milltown Pass Bog	NHA	8km North
Mount Hevey Bog	SAC/ pNHA	9km North West
Lough Ennell	SPA/ SAC/ pNHA	10km North West
Royal Canal	pNHA	10km North
Ardan Wood	PNHA	10km West Southwest
Daingean Bog	NHA	10km Southwest
Molerick Bog	NHA	10km Northeast
The Long Derries	SAC	11km Southeast
Nure Bog	NHA	12km North Northwest
Wooddown Bog	NHA	14km North Northwest
River Boyne & River Blackwater	SAC, SPA	14km Northeast

Table 2.2 - Designated Areas of Conservation within 15 km of the proposed site.

SAC = Special Area of Conservation; SPA = Special Protection Area; NHA = Natural Heritage Area; pNHA = Natural Heritage Area

Lough Ennell SAC (code 000685) and SPA (code 004040)

Lough Ennell is a large, limestone lake. The lake is classified as a mesotrophic system by the EPA though it had been eutrophic in the past. The site is an SAC due to the presence of the Annex I habitat alkaline fen.

Lough Ennell is one of the most important midland lakes for wintering waterfowl, with nationally important populations of Mute Swan, Pochard, Tufted Duck and Coot. At times, the lake is utilised as a roost (with limited feeding) by the internationally important midland lakes population of Greenland White-fronted Goose (ca.400 strong) (this flock is now centred at Lough Iron and seldom uses Lough Ennell or the other large midland lakes, O. Crowe pers comm.). The site also attracts Golden Plover (200) and Lapwing (673) though these feed mainly outside of the SPA site.

Lough Ennell is located approximately 10 km to the north-west of the Derryarkin sector of the site.

River Boyne and River Blackwater SAC (code 002299) and SPA (code 004232)

This large site consists of the freshwater stretches of the River Boyne as far as the Boyne Aqueduct, the Blackwater as far as Lough Ramor and the Boyne tributaries including the Deel, Stoneyford and Tremblestown Rivers.

Overall, this SAC site is of considerable conservation significance for the occurrence of good examples of a range of habitats and of populations of plant and animal species that are listed on Annexes I and II of the EU Habitats Directive respectively.

The site is a SPA as it is of special importance of Kingfisher. A survey in 2010 recorded 19 pairs of Kingfishers in the River Boyne and River Blackwater SPA

At the closest, the designated river is at a distance of approximately 14 km to the northeast of the development site.

Raheenmore Bog SAC (code 000582)

Raheenmore Bog is a classic example of a largely intact raised midland bog. It is located approximately 4 km southwest of the Derryarkin sector of the site.

Mount Hevey Bog SAC (code 002342)

Mount Heavy Bog SAC is located to the northeast of Kinnegad and approximately 9 km northeast of the northeastern sector of the proposed wind farm. The site is a good example of a mostly intact raised bog.

Split Hills and Long Hill Esker SAC (code 001831)

This esker ridge crosses the N5 Dublin to Galway road between Kilbeggan and Tyrellspass. The main habitat is semi-natural woodland, though there are several areas of species rich calcareous grassland. The SAC is located approximately 7 km west of the development site.

The Long Derries SAC (code 00925)

Located just over 3 km southeast of Edenderry, the Long Derries, Edenderry SAC is part of a low esker ridge running from Edenderry to Rathdangan. It primarily consists of glacial gravels interspersed with loam and peat soil. The dominant habitat is dry calcareous grassland, of which this is a particularly good example and includes a number of rare plant species. The SAC is located approximately 11 km southeast of the development site.

Wooddown Bog NHA (code 000694)

This NHA is a good example of a relatively intact raised bog. It is located about 4 km east of Mullingar and approximately 14 km to the north-northwest of the development area.

Nure Bog NHA (code 001725)

This NHA is a good example of a relatively intact raised bog. It is located to the southwest of Lough Ennel about 4 km east of Mullingar and approximately 12 km to the north-northwest of the development area.

Milltownpass Bog NHA (code 002323)

This NHA is located about 1 km north-east of Milltownpass and just over 8 km north-east of the Derryarkin sector of the site. The NHA is a fine example of a relatively intact raised bog.

Cloncrow Bog (New Forest) NHA (code 000677)

This NHA is located approximately 1 km west of Tyrellspass and just over 5 km west of the development site. The NHA is a fine example of a relatively intact raised bog.

Black Castle Bog NHA (code 000570)

This NHA is a good example of a relatively intact raised bog and is notable for its easterly location. It is located about 3 km northwest of Edenderry, and approximately 3 km to the west of the proposed wind farm.

Molerick Bog NHA (code 001582)

This NHA is a fine example of a relatively intact raised bog. It is located about 4 km west of Longwood and approximately 10 km northeast of the northeastern sector of the proposed wind farm.

Daingean Bog NHA (code 002033)

This NHA is a good example of a relatively intact raised bog. It is located about 2 km south west of Daingean village and approximately 10 km southwest of the development site.

Rahugh Ridge (Kiltober Esker) pNHA (code 0918)

The pNHA lieas about 9 km northeast of Tullamore and runs for about 2.5 km in anortheast direction. Is a good example of an esker ridge with woodland and calcareous grassland and supports the rare and protected hemp nettle. It is situated approximately 7 km southwest of the Derryarkin sector of the site.

Ardan Wood pNHA (code 01711)

Ardan Wood is a crescent shaped woodland on a steep slope located about 5 km west of Kilbeggan. It is a good example of a semi-natural woodland. It is situated approximately 10 km west-southwest of the development site.

Murphy's Bridge Ridge Esker pNHA (code 01775)

The pNHA is a good example of an esker ridge with calcareous grassland and supports the rare and protected hemp nettle. It is situated approximately 7 km southwest of the Derryarkin sector of the site.

Royal Canal pNHA (code 02103)

The Royal Canal pNHA passes north of the proposed wind farm site (approximately 10 km from the nearest development area). The canal supports a wide range of ecological interests.

Grand Canal pNHA (code 02104)

The Grand Canal pNHA is situated to the south of Rhode and approximately 3 km south of the nearest part of the development site. The canal supports a wide range of ecological interests.

Natura Impact Assessment

Under Article 6 of the European Union Habitats Directive, a "Natura Impact Assessment" is required where there is a possibility of significant effects of a plan or project on the integrity of a Natura 2000 Site (i.e. SAC or SPA). Stage 1 Screening identifies any likely significant impacts on a site arising from the proposed plan or project. Stage 2 Appropriate Assessment considers whether there will be a negative impact upon the integrity of the site with respect to the structure, function and conservation objectives of the site, either alone or in combination with other plans and projects. Mitigation measures are considered where negative impacts are predicted (EC, 2001).

Stage 1 screening has been carried out for all designated sites for nature conservation within 10km of the site.

No impacts are envisaged on any of these designated sites as a result of the proposed wind farm development. Please refer to Chapter 5, Flora and Fauna for further details.

2.5 PLANNING CONTEXT

2.5.1 Offaly County Development Plan 2009-2015

The Offaly County Development Plan 2009-2015 directs readers to the Offaly County Wind Energy Strategy 2009 – 2015 which sets out areas for wind energy development. The Plan acknowledges the targets set out in The White Paper on Energy of 40% of electricity to be generated from renewable sources by 2020.

It is council policy *to encourage the development of wind energy in suitable locations in an environmentally sustainable manner and in accordance with Government policy, having particular regard for the wind energy strategy in the county.*

It is an objective of the Development Plan:

(a) To facilitate the promotion and construction of energy efficient developments throughout the county.

(b) To assist in the development of a regional energy agency over the period of the plan.

(c) To achieve a reasonable balance between responding to government policy on renewable energy and in enabling the wind energy resources of the county to be harnessed in an environmentally sustainable manner. This will be implemented having regard to the Council's Wind Energy Strategy.

2.5.2 County Offaly Wind Strategy to 2015

The County Offaly Wind Strategy accompanies the Offaly County Development Plan and was adopted on 19th January 2009. A Strategic Environmental Assessment was carried out for the County Development Plan 2009 – 2015 and associated strategies, including the Wind Energy Strategy.

The objective of the strategy is *to evaluate and analyse the potential wind energy resource in the county, to define environmental and planning considerations for wind energy development and to make recommendations on Wind Energy Resource Policy and Practice.* It clarifies the

council's policy towards wind energy in Co. Offaly and forms the basis of assessment methodology for planning applications.

There are currently no operational wind power developments in the County Offaly. The Wind Energy Strategy identified 12 main areas within the county as having wind energy development potential. These areas were further examined and of the 12 areas found to have development potential, 6 were designated as suitable for wind energy development.

The Yellow River site is located in an area designated as suitable for large scale wind farms. These areas are considered suitable for wind farm development because of: Sufficient wind speeds; Access to grid network; established patterns of inquiries. The site is located within the "*North of Rhode*" Suitable Area. The following is an extract from the Wind Energy Strategy:

NO	Considerations	Decision
1	Area **North of Rhode** Having regard to proximity to existing substation access, roads, cutover bog, large landholdings, precedent of existing visually intrusive infrastructure, this area is highly suitable. There is some sensitivity to the overlooking of the western portion of this area from protected views.	**Suitable** for large-scale Windfarms.

Please refer to **Figure 2.2 – County Offaly Wind Energy Strategy – Results of field analysis of potential sites for wind energy development**. Please refer to **Figure 2.3 – County Offaly Wind Energy Strategy - Areas of Wind Energy Development Potential.**

Applications for wind turbines within this area are acceptable in principle, subject to conformance with all other requirements of this plan.

The Yellow River site supports good wind speeds and a proposed substation will be located less than 0.5km north of the existing Derryiron 110kV ESB substation building. The siting, layout and environmental studies conform to all best practice guidance. Please Refer to Chapter 11 Landscape, for a detailed description of how the wind farm avoids visual clutter and will sit harmoniously with the existing landscape.

2.5.3 Wind Farm Planning Guidelines

The Wind Farm Planning Guidelines published by the DoEHLG in 2006, as revised from the 1996 edition, set out guidance for wind farms siting and design in various landscape contexts.

A wind farm on this site would be designed with reference to a list of Aesthetic Recommendations (as set out in Chapter 6 of the Guidelines) such as siting, spatial extent and

scale, cumulative effect, spacing of turbines, layout of turbines and height of turbines. Other issues which must be taken into consideration include:

- Proximity to designated areas
- Potential effects on birds
- Potential effects on water based habitats and freshwater systems
- Effect on peat stability
- Effect on archaeology
- Noise effects
- Shadow Flicker effects
- Proximity to public roads and distraction of motorists
- Electromagnetic and telecommunications interference

2.5.4 Kildare County Development Plan 2011-2017

Chapter 8 of the Kildare County Development Plan 2011-2017 relates to Energy & Communications. The aim of Kildare's Energy & Communication Chapter is;

"To encourage and support energy and communications efficiency and to achieve a reasonable balance between responding to central Government policy on renewable energy and communications and enabling resources to be harnessed in a manner consistent with the proper planning and sustainable development of the area".

Section 8.5.1 states:

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

It is the policy of the Council:

ER 2: To support regional, national and international initiatives for limiting emissions of greenhouse gases through energy efficiency and the development of renewable

energy sources which make use of the natural resources in an environmentally acceptable manner.

WE 2: To encourage the development of wind energy in suitable locations in an environmentally sustainable manner and in accordance with Government policy.

WE 3: To ensure that the assessment of wind energy development proposals will have regard to:

- the sensitivity of the landscape;
- the visual impact on protected views, prospects, scenic routes, as well as local visual impacts;
- the impacts on nature conservation designations, archaeological areas and historic structures, public rights of way and walking routes;
- local environmental impacts, including noise and shadow flicker;
- the visual and environmental impacts of associated development such as access roads, plant and grid connections;

2.5.5 Meath County Development Plan 2013-2019

Chapter 8 of Meath County Development Plan sets out objectives for the provision or facilitation of the provision of infrastructure for energy and communication facilities in accordance with the Planning and Development Acts 2000-2012.

Section 8.1.5 states;

"*The development plan must achieve a reasonable balance between responding to overall Government Policy on renewable energy and enabling the wind energy resources of the Local Authority's area to be harnessed in a manner that is consistent with proper planning and sustainable development*".

It is the policy of Meath County Council:

EC POL1: To facilitate energy infrastructure provision, including the development of renewable energy sources at suitable locations, so as to provide for the further physical and economic development of Meath.

EC POL2: To support international, national and county initiatives for limiting emissions of greenhouse gases through energy efficiency and the development of renewable energy sources which makes use of the natural resources of the county in an environmentally acceptable manner, where it is consistent with proper planning and sustainable development of the area.

EC POL3: To encourage the production of energy from renewable sources, such as from biomass, waste material, solar, wave, hydro, geothermal and wind energy, subject to normal proper planning considerations, including in particular, the potential impact on areas of environmental or landscape sensitivity and Natura 2000 sites.

2.5.6 Draft Westmeath County Development Plan 2014-2020

Chapter 10 of the Draft Westmeath County Development Plan 2014-2020 relates to Energy & Communications. The aim of Westmeath's Energy & Communication Chapter is;

"*To support and provide for the development of indigenous energy resources, with an emphasis on renewable energy supplies. To promote the development of high capacity Information Communications Technology Infrastructure, broadband connectivity and digital broadcasting in the interests of economic progress and the proper planning and sustainable development of the county".*

Section 10.5 of the CDp states:

"*The Council seeks to achieve a reasonable balance between an overall positive attitude to renewable energy and enabling the wind energy resources of County Westmeath to be harnessed in a manner that is consistent with proper planning and sustainable development*".

It is the policy of Westmeath County Council:

P-EN1: To promote renewable forms of energy where it is consistent with the proper planning and sustainable development of an area.

P-EN2: To support local, regional, national and international initiatives for limiting emissions of greenhouse gases through energy efficiency and the development of renewable energy sources which make use of the natural resources in an environmentally acceptable manner, and having particular regard to the requirements of the habitats directive.

P-WIN2: To direct large-scale energy production projects, in the form of wind farms, onto cutover cutaway peatlands in the county, subject to environmental, landscape, habitats and wildlife protection requirements being addressed.

P-WIN3: To ensure the siting and development of wind turbines is carried out in accordance with the requirements of the DoEHLG Wind Energy Development Guidelines 2006.

2.6 EXISTING LAND USE

The parent material at the site is peatland. There has been extensive historic cutting and old turf banks are evident in the western section of the site. Most of the peat has been removed entirely from considerable areas of the site and these have subsequently been further drained and seeded with grasses for grazing of cattle and sheep.

A network of existing local roads and private access tracks allow vehicular access to parts of the site. Both surfaced and un-surfaced finishes have been applied. There are extensive artificial drainage networks in place throughout the site.

2.7 ALTERNATIVES CONSIDERED

The Environmental Protection Agency, in its guidance documents on EIS preparation, stipulates that alternatives, which were assessed prior to beginning the project design, be explained in the EIS. The alternatives can include:

- Alternative Electricity Generation
- Alternative locations
- Alternative designs
- Alternative processes

2.7.1 Alternative Electricity Generation

The current demand for electricity generation capacity in Ireland is predominantly satisfied by fossil fuel plants. However, renewable and alternative sources of power will play an increasingly important role in meeting power needs in the future. Ireland's dependence on a finite supply of imported fossil fuels raises questions over the security of supply in future years as reserves of fossils fuels are depleted. This makes the development of an energy supply from indigenous resources essential.

Wind power has become an important source of energy worldwide. Worldwide growth in the wind power sector is shown in **Table 2.3**.

Year	2004	2005	2006	2007	2008	2009	2010	2011
Installed Capacity (MW)	47,600	59,100	74,100	93,900	120,900	159,200	200,457	238,038
Annual Growth	20.8%	24.2%	25.4%	26.7%	28.7%	31.7%	25.9%	18.7%

Table 2.3: Global Deployment of Wind Power (International Energy Agency – Wind Annual Report 2010)

Worldwide wind generating capacity stood at 13,600 MW in 1999 with the capacity in 2011 representing an almost eighteen-fold increase over the intervening twelve years. Growth has been particularly strong in Europe, where industry targets for 2020 are set at 230 GW installed capacity. In Germany, the country with the most installed wind generating capacity at 31,307 MW, approximately 11 % of its electricity is supplied from wind power, while Spain in second place with over 22,796 MW of capacity has 16% of its electricity from wind. Denmark's wind capacity meets 27% of its electricity needs, the largest share in any country.

In Ireland (including Northern Ireland), approximately 2,252 MW of wind energy capacity is connected to the Grid as of January 1st 2013 (EirGrid, All-Island Renewable Connection report, Q4 2012); this figure was 525 MW in mid-2006. The national target for the renewable energy share of gross electricity consumption is 40 % by 2020. It has been estimated that between 6,000 MW of installed wind generation will be required to meet circa 37% of electricity demand in 2020. Hydro, wave and tidal energy resources in Ireland are still in the development phase, while solar and geothermal technologies are not considered commercially feasible in Ireland.

2.7.2 Site Selection Criteria

Green Wind Energy (Wexford) Ltd., was established in 2003. The aim of the company was to establish a sustainable wind farm in the midlands region. At an early stage in the assessment

Green Wind Energy Ltd. identified the County of Offaly as a key location for potential large wind farm development for the following reasons:

- The publication of the Offaly Wind Energy Strategy in 2009 which includes progressively identified strategic wind development zones and clear policy guidance in respect of these zones.

- The history of conventional power generation in Offaly and the resulting excellent electrical grid infrastructure to which a potential wind farm could connect.

- The low concentration of existing wind energy development in Offaly resulting in the availability of large undeveloped suitable spatial area and uncongested grid infrastructure.

- The strong road infrastructure network throughout the County.

- The infrequency of environmental designations within the County resulting in lower potential for environmental effects.

Green Wind Energy Ltd. in their assessment of potential development sites within the County of Offaly identified nine criteria under which unsuitable sites could be eliminated. These criteria area as follows:

Development Control

Table 1 of the County Offaly Wind Energy Strategy identifies 12 potential sites for wind energy development, 6 of which are deemed to be suitable areas for wind energy development within the county. Table 2.4 lists these areas suitable for wind energy development.

Area No. (As per OCC Wind Energy Strategy 2009)	Description	Classification
1	Area North of Rhode	Suitable for large scale wind farms
2	Area from Cloneygowan to Clonbulloge	Suitable for large scale wind farms
4	Area around Corracullin Bog	Suitable for large scale wind farms
5	Area around Castletown Bog	Suitable for large scale wind energy development
6	Area East of Shannonbridge	Suitable for large scale wind energy development
7	Area South of Cloghan	Suitable for large scale wind energy development

Table 2.4 - Offaly County Wind Strategy - Suitable Areas for Wind Development (Extract from Table 1 of the Offaly Wind Energy Strategy)

NOTE: Areas numbered 3, 8, 9, 10, 11 and 12 in Table 1 of the Offaly Wind Energy Strategy are NOT suitable for wind energy development.

These areas are considered suitable for wind farm development because of: sufficient wind speeds; access to grid network; established patterns of inquiries.

Please refer to **Figure 2.2** for details of Areas of Wind Energy Development Potential (Extracted Figure 8 from Offaly Wind Energy Strategy).

These six areas were subsequently examined under the following eight headings to assess their suitability.

Grid Connection

Close proximity to a suitable connection point with the electricity grid is desirable in order to minimise the impact of any overhead lines. The electricity network must be capable of absorbing the power without adverse effects on existing electrical installations or customers.

Availability of Wind

To operate a wind farm efficiently an average annual mean wind speed of ≈ 8 m/s (metres per second) is generally considered to be required.

Environment

It is preferable that a wind farm is not located in an area designated as a Special Protection Area (SPA), Special Area of Conservation (SAC) or proposed Natural Heritage Area (NHA) or where the visual aspect of the wind farm would be overly obtrusive. Preferably the site under consideration should hold no historical, archaeological or ecological interest.

Dwellings

Locations with low housing density are preferable so as to minimise any disturbance which may be caused to people as a consequence of construction activities, visual impact, shadow flicker and noise.

Accessibility

The site needs to have reasonable access to facilitate construction and the subsequent operation, maintenance and monitoring of the site. Alternative access may be provided but this should not involve excessive construction.

Terrain

The geological features and the topography of the region should be suitable to facilitate construction on site. The site should not be overly difficult to develop, and should not exhibit excessive peat depths and should not show signs of peat instability.

Electromagnetic Interference

Preferably the development should be sited in an area where there is less potential for electromagnetic interference with telecommunications, television and radio signals etc.

Aviation Interference

Wind farm development represents a potential navigational hazard to air transport. It is the policy of the IAA to request an obstruction / radar survey for all developments within 20km of a national or international airport. Wind energy developments can have an impact at distances up to 40km depending on their altitude and orientation relative to the wind farm.

2.7.3 Selected Site

The Yellow River site was deemed the most suitable for advancement to development at this juncture.

Area 1 **– Yellow River Wind Farm, Rhode, Co. Offaly**

Availability of Wind

The site is at an elevation of between 75 mOD and 93 mOD (Malin Head).

According to the Irish Wind Atlas published by Sustainable Energy Ireland, 2003, the site sustains winds in excess of 8.00m/s at an elevation of 100m above ground level. This would be considered good in terms of wind energy development. Please refer to **Figure 2.4 Wind Speed Map**.

Environment

The site itself is not designated at any level.

The closest designated site is Black Castle Bog NHA, 2.4km East of the Yellow River site.

Black Castle Bog NHA is a site of considerable conservation significance, comprising as it does, a raised bog, a rare habitat in the E.U. and one that is becoming increasingly scarce and under threat in Ireland. It is especially important because of its eastern location. There are a number of habitat types found on the cutover areas of the bog. Irish Hare, a Red Data Book species, has also been recorded at the site

It is unlikely that the development would have any negative effect on the habitat of the bog vegetation at this designated site, as there is no hydrological connection between the proposed wind farm site and Black Castle Bog.

Development Control

According to the County Offaly Wind Strategy, the site is located in an area deemed as Suitable for Large-Scale Wind Farms. Applications for wind turbines within this area are acceptable in principle, subject to conformance with all other requirements of this plan.

There are two large areas of the county designated as "Wind Energy Development Area", one to the west of the county, around Ferbane, and one to the east of the county, north and west of Rhode. There are currently no wind farms within this designation.

Distance from dwellings

The nearest population centre is Rhode, located approximately 1.6 km south of the site. There is one regional road and one local road traversing the site splitting the site into three different sections. The local road, known as 'the Garr Road', has several houses dotted along sections of the road. When 500 metre buffers are applied to these houses, the majority of the site remains available for turbine development.

Grid Connection

The Derryiron 110kV station is located less than 0.5km south of the site area. A 110kV high voltage grid network runs through the southern part of the site.

Accessibility

The site has good access from the M6 motorway and reasonable internal road network to all sections of the site.

Terrain

The terrain is sloping with gradients between 1:40 and 1:100. This would make construction feasible at all areas of the site.

Electromagnetic Interference

There are no telecommunications masts within the site, however, there are several masts within 5km of the site. Telecoms operators were consulted and it was found that there were few links passing through the site.

Aviation Interference

The site is located over 60km from Dublin International Airport, Baldonnel Airfield is approximately 50km from the proposed development and Clonbulloge Airfield (The Irish Parachute Club) is approximately 13 km from the proposed wind farm site.

Yellow River Wind Farm has been designed in accordance with County Offaly Wind Energy Strategy, Wind Farm Planning Guidelines (2006) and IWEA best practice documents.

2.7.4 Turbine Selection

Turbines considered for the site were required to have:

- A wind class rating (IEC) of class IIa / IIIa due to estimated wind speeds and topography.
- Low noise output.
- Three blades, which have a greater aesthetic quality than two bladed or single bladed machines.
- Cylindrical type towers, which have a greater aesthetic quality than pylon or lattice type towers.

- Good financial security by manufacturer (such that operation and maintenance support and spares, are available through the full operational life of the turbine).
- Proven track record by manufacturer.

A range of turbine models which have demonstrated their effectiveness at other locations throughout Europe and are proven to be of the highest international standard were examined. Turbines from well-established manufacturers meeting the above criteria were considered. The following are examples of the options that were considered:

Turbine Type	**Rotor Diameter (m)**	**Hub Height (m)**	**Individual Output (MW)**	**Expected Capacity Factor based on Wind Resource**	**Number of WTGs required to achieve approximately 95MW .**
Siemens SWT 113	101, 108, 113	75, 108, 145	3	35	32
Vestas V112	112	84, 94, 119, 140	3 / 3.3	35	32
Enercon E82	82	98, 108	2 / 3	30	48
Alstom ECO 100/122	100, 110, 122	110, 119	2.7 / 3	35	35

Table 2.5 – Turbine comparison Matrix

For purposes of the EIS, a turbine type with rotor diameter no greater than 113 metres, hub height no greater than 110 metres and overall height no greater than 166m is used. These dimensions are essential to maintain good operational turbine efficiencies at the Class IIa / IIIa site and for the overall site's financial viability. For the purposes of Noise & Shadow Flicker, the technical characteristics of the Siemens SWT 113, rotor diameter 113m and maximum hub height of 122.5m, is used. For the purposes of demonstrating the impact on the landscape, a turbine with maximum hub height of 110m and maximum rotor diameter of 112m giving the overall maximum height of 166m is used.

Please refer to **Figure 2.5** for an illustration of a sample turbine model.

2.7.5 Internal Site Layout

Turbine Layout

The Wind Farm Planning Guidelines published by the Department of the Environment, Heritage and Local Government (DoEHLG) in 2006, set out design goals for wind farms in various landscape contexts.

Chapter 6 of the Guidelines lists a series of recommendations for the Siting and Design of Wind Energy Development. The Guidelines also discuss "Landscape Character Types", listing six different character types. Yellow River Wind Farm site fits into the "Flat Peatland" Landscape Character Type. The Guidelines state that, *"The preferred option here is one of large-scale response. The vast visual openness with few, if any, dominant geometric elements provides a certain freedom in the siting and design of wind farms."*

The following describes how these Guidelines were integrated into the Yellow River Wind Farm design and siting process:

1. **Siting and location of wind farms** – The site is located in a lowland area of flat peatland. The landscape has a small number of dwellings along the site's surrounding road network. Careful planning was taken to site the turbines at the prescribed 500 m distance from the surrounding dwellings.

2. **Spatial Extent** – The Yellow River Wind Farm should appear as a single large wind energy development. The Guidelines state that *"The vast scale of this landscape type allows for a correspondingly large spatial extent for wind farms"*. The design of Yellow River Wind Farm complies with the Guidelines.

3. **Spacing of Turbines** – The Guidelines state that "*Regular spacing is generally preferred*". The turbines have been spaced at regular uniform spacing as suitable for this site.

4. **Layout of Turbines** – The Guidelines state that a grid layout is more appropriate than a simple linear layout. The turbine locations are also based on analysis of wind measurement data from a temporary 80m wind mast located on the site. This analysis concluded with a layout which fully complies with the Guidelines.

5. **Turbine Height** – The guidelines state in relation to turbine heights in flat peatland landscapes *"Aesthetically, tall turbines would be most appropriate. In any case in terms of viability, they would certainly likely be necessary given the relatively low wind speeds available."* The proposed hub height of up to 110m and the proposed tip height of up to 166m complies with this requirement.

6. **Cumulative Effect** – The guidelines state that *"The openness of vista across these landscapes will result in a clear visibility of other wind energy developments in the area. Given that the wind energy developments are likely to be extensive and high, it is important that they are not perceived to crowd and dominate the flat landscape. More than one wind energy development might be acceptable in the distant background provided it was only faintly visible under normal atmospheric conditions."* There are no other wind farms currently operational in the area, however, Mount Lucas wind farm is currently under construction and should be operational before 2014. Mount Lucas will contain 28 turbines. No cumulative impact is envisaged from this wind farm.

Preliminary Site Layout

Figure 2.6 shows the preliminary site layout, which was developed prior to the results of the various scientific surveys and the consultation process. The preliminary turbine layout was largely based on the results of wind modelling, carried out in order to determine the optimum electrical output for the site. The constraints adopted were as follows:

- Turbines located within area 'Suitable for Wind Energy Development' (Offaly County Council Wind Energy Strategy).
- Prescribed turbulence spacing between turbines.
- Compliance with Wind Farm Planning Guidelines, DoEHLG, 2006.

The initial layout was developed purely on the basis of maximum potential of the site in terms of electricity generation and consisted of 32 turbines. Some basic turbine siting requisites and a fundamental landscape appraisal were also taken into account.

Constraints Report

The landholding area was subsequently assessed by the EIA team for wind farm development constratints. This process involved:

- Sending a scoping pack to all relevant stakeholders and consultees.
- Walkover surveys by Jennings O'Donovan & Partners.
- Walkover survey and interim report preparation by Jennings O'Donovan & Partners and the specialist consultants.

The following development constraints were identified within the available landholding:

- Area of degraded raised bog south of current T9 location. This is annexed listed habitat. It is noted that T8, 9 and 10 are not located within degraded raised bog. This area is subject to intensive peat cutting and the peat face is rapidly receeding southwards. Please refer to Chapter 5 for further discussion.
- Demesne boundaries adjacent to T13 and T14 presented potential bat feeding areas therefore a 50m turbine siting exclusion zone buffer was applied. Please refer to Chapter 5 for further discussion.
- One geotechnical exclusion zone was identified corresponding to the area of degraded raised bog south of the current T9 locations. Please refer to Chapter 6 for further discussion.
- Irish Archaeological Consultancy Ltd. identified archaeologically and architecturally sensitive sites; the avoidance of these sites was incorporated into the design of the wind farm.

Please refer to **Figure 2.7 Environmental Constraints Map**.

Final Turbine Layout

An assessment of the turbulence wake effects of the combined development was undertaken by Wind Prospect Ireland Limited. This assessment identified areas of high turbulence which

would ultimately affect the energy production and operational life of the wind turbines. Turbines were relocated to minimise wake effects while accounting for the environmental constraints and recommendations from the Wind Energy Development Guidelines.

Access roads and crane platform located adopt the following constraints:

- Minimise impact on local inhabitants by avoiding transit along local public roads, where possible.
- Utilisation of existing infrastructure including internal access roads, where possible.
- Minimisation of lengths of road and land take areas to mitigate impacts to local farmers and agricultural practices.

Please refer to Figure 2.8 – Final Site Layout.

2.8 FINALISED PROJECT

2.8.1 General

The finalised proposed Yellow River Wind Farm development will comprise thirty-two (32) electricity generating wind turbines with a hub height of up to 110 metres and a rotor diameter of up to 113 metres and an overall height of up to 166 m, hardstandings, a 110 kV substation containing two (2) control buildings, an electrical compound and a wastewater holding tank, nine (9) watercourse crossings, temporary construction compound, a permanent meteorological mast, a new access road off the R400 Roundabout at Rhode and upgraded access roads, associated site roads, drainage and site works.

2.8.2 Site Layout

The proposed site layout is shown on **Figure 2.8 –** Final Site Layout. The development comprises the following elements:

- 32 no. wind turbines with concrete bases measuring approximately 18m in diameter.
- 32 no. crane hardstand areas (1,250m^2) with associated splays (745m^2) and laydown areas (3,600m^2), placed near each turbine location to facilitate erection by mobile cranes.

- Approximately 25,675 metres of underground cabling to connect the turbines within the site to the proposed substation. Cabling will also be required along short sections the Regional road (R400) and short sections of three local roads.

- An electrical compound which is to measure approximately 50 x 37 metres. This compound will contain two control buildings and ancillary electrical equipment. A wastewater holding tank will also be installed at this location.

- Temporary compound

A schedule of the proposed wind turbines together with the met mast and substation and their corresponding grid co-ordinates is set out in **Table 2.5.**

Item Description	Dimensions of Unit	No of Units	Unit Area (m^2)	Total Area (m^2)	*Total Area (ha)*	Typical Depth of Stone for Fill Layer (m)	Stone Required for Base Layer(m^3)	Typical Depth of Stone for Surface Layer (m)	Stone Required for Surface Layer (m^3)	Total Stone Required (m^3)
Turbine bases	18m diameter	**12**	255.00	3,060.00	0.31	0.00	0.00	-	-	-
Hardstands		**12**	1,250.00	15,000.00	1.50	0.00	0.00	0.60	9,000.00	9,000.00
Electrical Compound, Substation + Car Parking	50m x 37m	**1**	1,850.00	1,850.00	0.19	0.45	832.50	0.15	277.50	1,110.00
Upgrade of existing trackway	3.5m to 5.5m Wide	**2,894**	2.00	5,788.00	0.58	0.45	2,604.60	0.15	868.20	3,472.80
Construction of new roads	5.5m Wide	**2,964**	5.50	16,302.00	1.63	0.00	0.00	0.60	9,781.20	9,781.20
Construction of site entrance splays and additional access track areas	Various	**1**	12,635.00	12,635.00	1.26	0.00	0.00	0.60	7,581.00	7,581.00
Meteorological Mast Foundation	5m x 5m	**1**	25.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00
Stilling Ponds	8m x 3.5m for 12hr retention at each turbine	**24**	28.00	672.00	0.07	0.00	0.00	0.15	100.80	100.80
Plus additional vegetated swales and outfall areas	$0.3m^2$ per m	**5,858**	0.30	1,757.40	0.18	0.00	0.00	0.00	0.00	0.00
Temporary Compound	50m x 30m	**1**	-	1,500.00	0.15	0.00	0.00	0.60	900.00	900.00
TOTAL AREA / VOLUME			N/a	**58,589**	**5.86**		**3,437**		**28,509**	**31,946**

Table 2.4a – Schedule of land take areas (Turbines 1-12)

Item Description	Dimensions of Unit	No of Units	Unit Area (m^2)	Total Area (m^2)	*Total Area (ha)*	Typical Depth of Stone for Base Layer (m)	Stone Required for Base Layer(m^3)	Typical Depth of Stone for Surface Layer (m)	Stone Required for Surface Layer (m^3)	Total Stone Required (m^3)
Turbine bases	18m diameter	**20**	255.00	5,100.00	0.51	0.00	0.00	0.00	0.00	0.00
Hardstands		**20**	1,250.00	25,000.00	2.50	0.00	0.00	0.60	15,000.00	15,000.00
Upgrade of existing trackway	3.5m to 5.5m Wide	**3,022**	2.00	6,044.00	0.60	0.45	2,719.80	0.15	906.60	3,626.40
Construction of new roads	5.5m Wide	**15,311**	5.50	84,210.50	8.42	0.45	37,894.73	0.15	12,631.58	50,526.30
Construction of site entrance splays and additional access track areas	Various	**1**	20,282.00	20,282.00	2.03	0.45	9,126.90	0.15	3,042.30	12,169.20
Stilling Ponds	8m x 3.5m for 12hr retention at each turbine	**40**	28.00	1,120.00	0.11	0.00	0.00	0.15	168.00	168.00
Plus additional vegetated swales and outfall areas	$0.3m^2$ per m	**18,333**	0.30	5,499.90	0.55	0.00	0.00	0.00	0.00	0.00
TOTAL AREA / VOLUME			N/a	**147,256**	**14.73**		**49,741**		**31,748**	**81,490**

Table 2.4b – Schedule of land take areas (Turbines 13-32)

Item Description	Dimensions of Unit	No. of Units	Total Area (m^2)	*Total Area (ha)*	Stone Required for Base Layer(m^3)	Stone Required for Surface Layer (m^3)	Total Stone Required (m^3)
Turbine bases	18m diameter	32	8,160.00	0.82	-	-	-
Hardstands		32	40,000.00	4.00	0.00	24,000.00	24,000.00
Electrical Compound, Substation + Car Parking	54m x 40m	1	1,850.00	0.19	832.50	277.50	1,110.00
Upgrade of existing trackway	3.5m to 5.5m Wide	5,916	11,832.00	1.18	5,324.40	1,774.80	7,099.20
Construction of new roads	5.5m Wide	18,275	100,512.50	10.05	37,894.73	22,412.78	60,307.50
Construction of site entrance splays and additional access track areas	Various	2	32,917.00	3.29	9,126.90	10,623.30	19,750.20
Meteorological Mast Foundation	5m x 5m	1	25.00	0.00	-	-	-
Stilling Ponds	8m x 3.5m for 12hr retention at each turbine	64	1,792.00	0.18	0.00	268.80	268.80
Plus additional vegetated swales and outfall areas	$0.3m^2$ per m	24,191	7,257.30	0.73	-	-	-
Temporary Compound	Various	Various	1,500.00	0.15	900.00	0.00	900.00
TOTAL AREA / VOLUME			**204,346**	**20.58**	**54,079**	**59,357**	**113,436**

Table 2.4c – Schedule of total land take area

ID	Easting	Northing	Altitude
1	246732	236362	84
2	247210	236362	83
3	247123	236782	85
4	247635	236766	82
5	247635	237187	82
6	248485	237036	82
7	249366	236606	83
8	250195	236156	79
9	250565	236006	81
10	251119	235699	82
11	250724	236496	80
12	251130	236092	80
13	253795	235233	80
14	254181	235482	81
15	254359	235887	78
16	254727	237571	74
17	255114	237770	72
18	255557	237802	74
19	256771	238244	71
20	255743	238954	77
21	255885	238619	73
22	254872	238217	73
23	254874	238588	74
24	253865	239134	75
25	253350	239085	78
26	253238	239527	79
27	252501	239834	80
28	253509	239904	81
29	252924	239732	87
30	253414	240469	80
31	254509	241132	76
32	254167	241446	75
Met Mast	251841	235481	79
Substation	252422	234669	83

Table 2.5 – Schedule of proposed wind turbine co-ordinates.

2.8.3 Micrositing

The DoEHLG Wind Energy Development Guidelines suggest that there should be some flexibility built into the planning permission for wind turbines to accommodate minor adjestments to the turbine location which may be required for geotechnical or other reasons. The extent of flexibility will be site specific but should not generally extend beyond 20 metres.

Further detailed investigation at the time of construction may lead to minor repositioning of a small number of individual turbines. Any suggested micrositing will be agreed with the Planning Authority before commencement of construction.

2.8.4 Wind Turbine

For purposes of the EIS, a turbine type with rotor diameter no greater than 113 metres, and hub height no greater than 110 metres will be used, and an overall maximum height of 166m. A three bladed, horizontal axis machine will be used.

The wind turbines proposed are classified as upwind, horizontal axis turbines. The visible components include a cylindrical tower, nacelle and blades. The towers will be up to 110 m high. The nacelle comprises the hub where the blades meet, and housing for the stepped transmission, generator and various ancillary items of equipment. The blades will rotate in a clockwise direction when facing into the wind, and the resultant disc described in space will have a diameter of up to 113 m. The blades will begin to rotate at a wind speed of 3 m/s and will cut out at a wind speed of 25 m/s. Full power output will be reached at a wind speed of approximately 13 m/s. The maximum speed of the blades will be 13.8 revolutions per minute. Power take off is controlled by regulating the pitch on the blades and the speed of rotation.

Electricity is generated at 710 V within the turbine. However, at this voltage, electrical losses would be too high for economical and efficient transmission. Accordingly, the voltage is stepped up to 33,000 V by a transformer (which is located within the turbine tower or outside the turbine tower) for transmission by underground cable to the on site substation.

The blades will be manufactured from carbon and fibre glass and consist of two airfoil shells bonded to a supporting beam. The lightning protection system (LPS) helps protect the wind turbine against the physical damage caused by lightening strikes. The LPS will follow the general cable run between the nacelle and the base of the tower and will be earthed to the ground adjacent to the turbine base.

The towers will be constructed of welded steel, or steel & concrete, and will be protected against corrosion by a high specification, factory applied, paint finish. Paintwork will be touched up on-site after erection. While any colour is available, the colour generally provided is off white/grey typically RAL 7035 (light grey) so as to minimise visual impact, particularly colour change as a result of shadowing.

Each tower is to be fitted internally with a service lift as standard. A ladder with a fall arrest system (rigid rail) is also mounted through the tower.

The tower base will be fixed to a concrete foundation, approximately 18 m in diameter and with a depth of approximately 2 m. Exact dimensions will depend on the existing ground conditions and the depth to soil with a suitable bearing capacity. The central part of the base will be ≈ 5.5 m in diameter, will be raised from the main base but below ground level, and will encompass a cast-in insert and holding down bolts to connect to the bottom of the turbine tower. The anticipated volume of concrete required for each tower base is approximately 420 m^3. The area around the base will be backfilled with compacted granular material, and the only portion exposed in the long term will be the ≈ 5.5 m diameter central base section.

Please refer to **Figure 2.5** – Typical Turbine Foundation Detail.

2.8.5 Electrical Substation

The design principle of the development is to develop a simple, discrete and efficient substation to best practice standards. The design is largely dictated by the EirGrid standard layout for this type of development. The land take of the development and height of the ancillary elements have been kept to the minimum acceptable tolerance to mitigate any visual impacts.

The design complies with appropriate technical and operational requirements including electrical clearance, mechanical hardstand and operational requirements as set out in appropriate National and International standards.

The electrical compound of the substation will measure approximately 50 m x 37 m. A permanent diesel generator will be located within the compound as per EirGrid requirements. The generator will be bunded to accommodate at least 110% of the diesel capacity such that no accidental spillages can occur. The compound will be surrounded by 2.6 m high palisade fence. Access to the fenced off compound shall be through similar styled palisade double gates.

The compound will comprise of a single 110kV AIS (Air Insulated Switchgear) bay which will include circuit breaker, surge arrestors, line/earth disconnects, current transducer, voltage transformer, transformer/earth disconnect and associated civil works.

The compound will drain to an installed hydrocarbon interceptor, and then discharge to the main drainage network via an attenuation tank, which is to be constructed from clean crushed stone with a minimum void ratio of 40% and with a minimum of 200mm of topsoil cover.

Please refer to **Figure 2.9** – 110kV Electrical Compound and Substation Detail.

2.8.6 Substation Control Buildings

The compound will also include two control buildings, an Independent Power Producer (IPP) substation building and separate TSO (Transmission Systems Operator) substation building, as follows:-

- ESB Control Building measuring approximately 14.5 x 8.85 metres in plan. The building will consist of a control room, battery room, storage room, toilet facilities and corridor.

- IPP Control Building measuring approximately 9 x 8.85 metres in plan. The building will consist of a switchgear room, control room, storage room and toilet facilities.

The buildings main functions are to provide housing for switchgear, control equipment and monitoring equipment necessary for the proper functioning of the substation. It will utilise Air Insulated Switchgear (AIS). Each of the buildings shall allow for the safe and efficient harvesting of energy from the wind turbine generators. Additional room will be provided to allow for the installation of power factor correction equipment if required.

The equipment to be installed within the TSO control building will include electrical switchgear, metering and monitoring equipment and a Supervisory Control and Data Acquisition (SCADA) System. The SCADA system will allow for off-site monitoring, via telephone connection, at the TSO headquarters. The installation of a SCADA System minimises the need for TSO staffing of the substation except during routine planned maintenance visits or during breakdown.

The equipment to be installed within the IPP control buildings will also include electrical switchgear for the protection of the wind turbines, metering and monitoring equipment and a Supervisory Control and Data Acquisition (SCADA) System. The SCADA system will allow for off-site monitoring, via telephone connection, both at the Developer's premises and at the headquarters of the turbine manufacturer. The installation of a SCADA System avoids the

need for staffing by the development of the wind farm except during routine planned maintenance visits or during breakdown.

A GSM network can provide communication between the SCADA System and the TSO.

Electricity transported between the turbines and the site control building will be at 33kV. In order to transport the electricity to the national grid it will be necessary to step up the voltage to 110 kV. This will be carried out in the wind farm substation by the air insulated external grid transformer.

Sewage will be collected and stored in a sealed tank on site and transported away at regular intervals for treatment at a Wastewater Treatment Works. The sealed tank will be similar in specification to Klargester Sealed Cesspool to BS 6297:1983 and surrounded by 225mm thickness of concrete or Silotank equivalent. The general arrangement of such a tank is shown on **Figure 2.9** while the detail is shown in **Figure 2.10**. This is in preference to developing a sewage treatment works on the site.

The tank will be fitted with an ultrasonic level measurement system with signal connected to the SCADA system of the wind farm operator. Once the liquid level attains a pre-determined level, the tank will be scheduled for emptying and the contents will be taken to an approved sewage works. This work will be done under a contract with one of the Contractors who have a permit to transport Septic Tank Waste to a Wastewater Treatment Plant (e.g. Rhode) as issued by Offaly County Council.

During the construction phase, assuming each worker produces 40 litres of wastewater per day. (See Value for Open Industrial Site, excluding Canteen, in Table 3: Recommended Wastewater Loading Rates from Commercial Premises, Wastewater Treatment Manuals: Treatment Systems for Small Communities, Business, Leisure Centres and Hotels as published by the Environmental Protection Agency, 1999), then the maximum daily production of wastewater based on 45 workers is estimated to be $1.8m^3/d$. Assuming that the tank will be emptied once per week and assuming 5.5 working days per week then the storage volume required is $9.9m^3$. A tank of minimum volume of 10 m^3 would suffice.

In the course of normal operation post construction, the tank would be emptied every 3 months.

The final specification of this tank will be discussed and agreed with Offaly County Council prior to the commencement of construction.

2.8.7 Electrical Cabling

Underground cabling will be provided around the site for:

- Electricity transmission at 33kV between the turbines, the Control Buildings and the Electrical Control Building Compound.

- Electricity transmission at 110kV between the Substation and the Eirgrid/ESB Substation

- Signal transmission between the turbines, the Control Buildings and the Electrical Control Building Compound.

The cable routes will be laid along the site roads and bedded in surplus excavated peat / clay material. Danger tape, incorporating a metallic strip, will be laid during backfilling. Where the cables are to cross public roads, suitable electrical ducting will be provided. Permanent posts will mark the trenches at regular intervals and at all changes in direction. A built layout plan showing the location of underground cables will be on permanent display within the control building.

Please refer to the following figures for Underground Cable Trench & Chamber Details (33kV and 110kV).

- 2.11a - 33kV Cables in Regional Road R400 and the local road L-10092-1, past the Sewerage Treatment Plant, preferred option, if possible, from Western Section.

- 2.11b - 33kV Cables across R400 at Garr Road Roundabout from the Eastern Section

- 2.11c - General 33kV Cable layout on Business Park Access Road, L-10093-1, and 110kV cable layout

Underground cabling will connect all sections of the wind farm to the proposed substation of the development. In the western section of the site cabling will run along existing trackway, improved agricultural grassland, forested areas (approximately 500 m) and cutaway bog. To connect the western section to the substation cables will run along the public road (R400) for

approximately 1.2 km, where it will turn west onto the preferred option the L-10092-1 road for approximately 650 m, before turning in a southeasterly direction to connect in to the substation. If full access cannot be gained along this preferred option the cables will travel along the R400 for just under 2km before turning west onto the L-10093-1 access road into the Business Park to connect in to the substation.

In the south eastern section of Yellow River Wind Farm site cabling will run along existing trackway and improved agricultural grasslands, although the cabling will travel along the Greenhills road (L-50112-1) for just under 800 m. Crossing from the south eastern section to the north eastern section cabling will run along the Garr road (L-1008-1) for approximately 30 m. In the north eastern section cabling will run along improved agricultural grasslands, existing trackway, forested areas (approximately 2km) and the public road, Carrick Lane (L-10081-1). The eastern section will connect to the substation by running 33kV cables across the R400 and along the L-10093-1 in to the substation.

The 110kV Cable connection from the Wind farm Substation will run for under 200m along an existing trackway lying immediately east of the proposed substation before entering Derryiron ESB/Eirgrid Substation

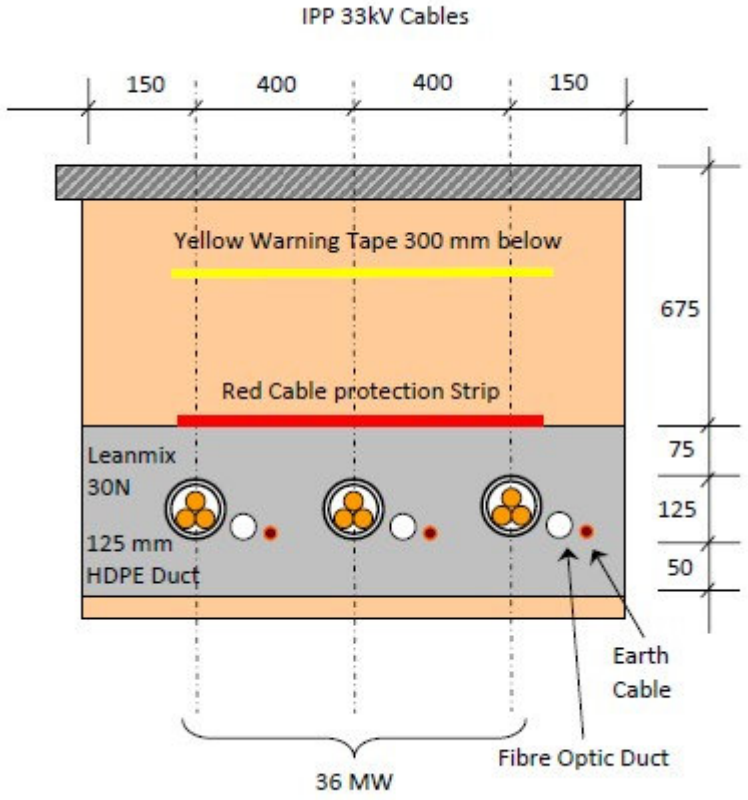

Figure 2.11a - Underground Cable Trench & Chamber Details for R400 and Garr Road

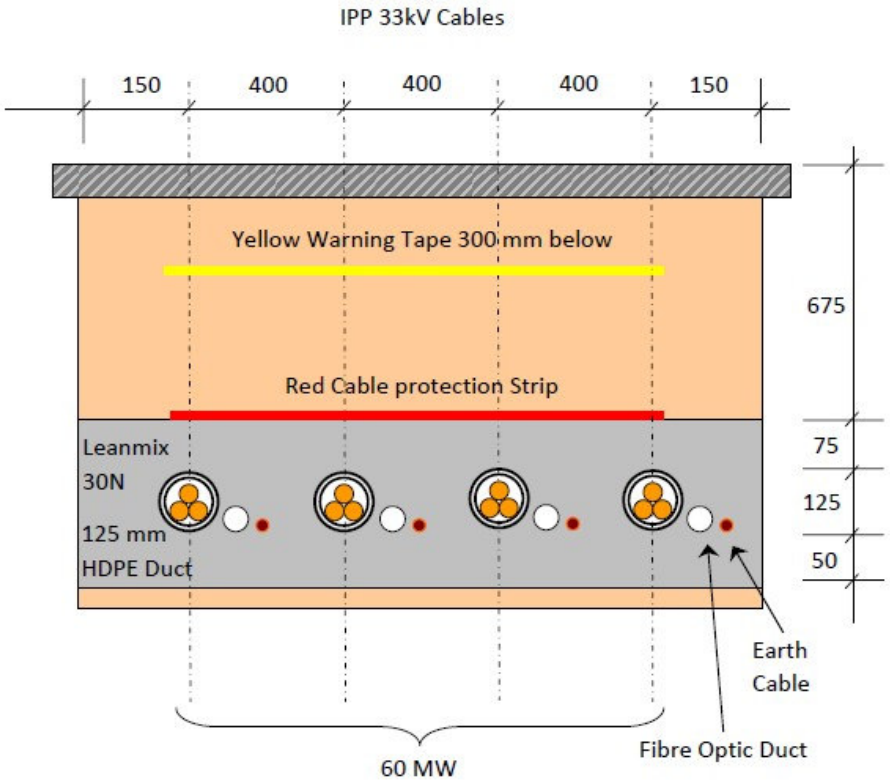

Figure 2.11b - Underground Cable Trench & Chamber Details across R400 at Garr Road Roundabout.

NOTE: Surface to be finished to Offaly County Council specification/requirement
Similar drawing will apply for roads where the electrical load is less.

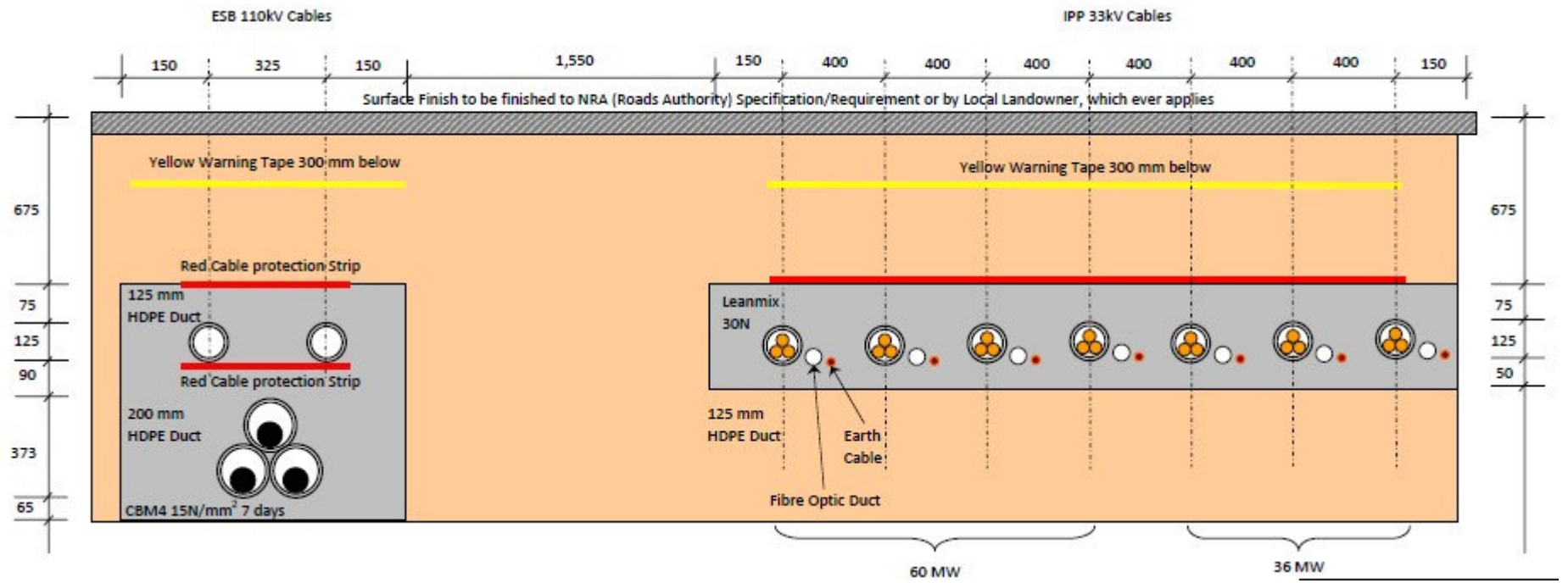

Figure 2.11c - Underground Cable Trench & Chamber Details for Substation Access Road

2.8.8 Felling and Thinning of Forestry

There are approximately 275 hectares of forestry in the vicinity of the Yellow River Wind Farm site. Four of the proposed turbines are located within forested areas: T1; T25; T26 and T27, and one turbine, T2, is partially located within forestry.

Felling and thinning will be necessary to accommodate the construction and erection of these four turbines and associated works.

Provision of the construction area at each turbine location will require approximately 1.5 hectares for turbines T1; T25; T26 and T27, and approximately 0.77 hectares for T2, which totals 6.77 hectares. These areas include all hardstanding and assembly areas. The estimated loss of forestry due to access roads is approximately 3.63 hectares based on the requirement for approximately 2,425 metres of new access road. This gives a total area for tree felling as a result of the development of approximately 10.4 hectares.

Of the total forested area of approximately 275 hectares, the total area of tree felling required for the proposed development represents approximately 3.8% of the total forested area.

It is not anticipated that there is any requirement for felling to reduce the wake effect from the trees affecting the turbine performance. Mature trees will not be allowed to exceed a height of 30 metres in the immediate vicinity of the turbine. The forested areas on site could be classified as good yield with good tree heights.

All felling works will be subject to the grant of a felling license from the Forest Service. Please refer to Chapters 12 - Material Assets for further details on forestry.

Forestry Reinstatement Areas

Areas totalling 100% of the areas clearfelled will be acquired (10.4 ha) for forestry reinstatement, in accordance with the Forest Service Policy on the Granting of Felling Licenses for Wind Farm Development.

2.8.9 Site Roads

The site roads are necessary to allow access for cranes and delivery trucks during construction of the wind farm and also during servicing/repairs to the wind turbines. Please refer to **Appendix G** for the Haul Route Assessment Report.

The minimum road width required is approximately 5m although this may increase at bends and junctions. The typical outer radius required for turning the delivery trailers is up to 38 m depending on the configuration of the curve. Gradients should, generally, be limited to 1 in 7 and a stone layer should be provided, so as to give a good grip during wet weather. Gradients of proposed access tracks will not exceed this value.

It is proposed to use the existing internal road network as much as possible. These roads will need widening from approximately 3.5 m to approximately 5 m (calculations were carried out for worst case scenario, 5.5m). A large proportion of these roads have a sealed surface however resurfacing will be required along the majority of the roads. Approximately 5,916 m of existing site roads will require upgrading to provide suitable access to the wind turbines and site control buildings.

It is to be noted that there is a section of approximately 2,500 m of existing track which will be utilised for internal haulage which is deemed not to require any upgrading works. The majority of this section is along the existing access to the Kilmurray quarry.

It is proposed that approximately 18,275m of new site road will be constructed to provide suitable access to the wind turbines and site control buildings.

The roads will be constructed to provide a minimum road surface width of 5.5 metres and the construction details will be as follows: 200mm of 50mm Down Quarried Rock; Gravel pavement on c.400mm down quarry floor material. The site roads will be designed to carry a 20 tonne Construction Loading.

The site road layout is shown in **Figure 2.8**.

These roads will have to be maintained during the construction phase. When weathered, the stone should not contain any constituents, which may be harmful to the environment, surface and groundwater in particular. The stone, which will be imported from nearby quarries of which there are three major quarries, all north of Rhode. Therefore the imported stone

material will be of a similar geochemistry, wherever possible. Please refer to Chapter 12 Material Assets for a further discussion of the quarry resources in the area.

At the end of the construction period, the edges of the road will be covered with peat/top soil so that the running width is reduced to 5.5m (except at bends).

The road construction detail is shown in **Figure 2.12** and details are as follows:

2.8.10 Hardstand areas

Various crane hardstand areas in addition to turning areas are required in the vicinity of each turbine location. Hardstand areas must allow two cranes to work in the vicinity of a turbine. The required hardstand pad area for both the large 1,000/750 tonne crane, the small crane (80/100 tonne) and for a delivery lorry is approximately 1,250m^2 plus splay area of 745m^2. There should also be a 5.5m wide access road to the turbine tower base to allow for the repair or replacement of any of the components inside the tower.

Hardstand areas will be covered with excavated soil and re-seeded with grass after construction.

There are two possible methods of hardstanding construction:

Excavated hardstandings

This is where hardstandings are excavated to a suitable formation width i.e., all organic matter (peat) is removed. The level of the hardstanding is then raised, enabling it to be kept above the water table, facilitating the run-off of surface water. It is anticipated that this method will be undertaken where peat depths are less than 4 metres. Therefore hardstandings will be excavated at all of the turbine locations. The walls of the excavation can be stabilised in two ways:

1. Walls are excavated with side slopes of 1:2. i.e., every 1m of excavation requires 2 metres of additional land take around the perimeter of the hardstanding.

2. Walls are stabilised through the use of gabion baskets. Therefore no additional land take is required.

Piled / Floated Hardstandings

This is where hardstandings are floated on the peat surface i.e., organic matter (peat) is retained. Four small areas at the edges of the hardstanding are then piled and a concrete cap is placed on top. These pads are required to provide adequate support to the crane. It is anticipated that this method will not be undertaken on this project.

The exact method of hardstanding construction will not be determined until detailed pre-construction site investigation works are conducted on the site and a detailed design is prepared. For the purposes of the EIS a worst-case scenario will be assumed, i.e. excavated hardstands. Please refer to Section 3.2.7.

2.8.11 Meteorological Mast

It is proposed to erect a permanent meteorological mast approximately 600 metres northwest of the existing temporary meteorological mast. This structure is essential to achieve compliance with ESB grid code as the wind conditions must be independently monitored.

The mast will be up to one hundred metres tall steel lattice tower structure. It will measure approximately 4 metres at its base. Please refer to **Figure 2.13** for details.

2.9 YELLOW RIVER DRAINAGE DESIGN

2.9.1 Introduction

Scope

The approach to drainage design is to use Sustainable Urban Drainage Systems (SuDS). Through the utilization and implementation of this approach, JOD&P have determined that the proposed design for the development and associated infrastructure will minimise risk to the hydrology regime of the site and to the receiving environs of the Yellow and Mongagh Rivers.

Development Description

The development comprises the following elements:

- 32 no. wind turbines with concrete bases measuring approximately 18m in diameter.

- 32 no. crane hardstand areas (1,250m^2) with associated splays (745m^2) and laydown areas (3,600m^2), placed near each turbine location to facilitate erection by mobile cranes.

- Approximately 25,675 metres of underground cabling to connect the turbines within the site to the proposed substation. Cabling will also be required along short sections the Regional road (R400) and short sections of three local roads.

- An electrical compound which is to measure approximately 50 x 37 metres. This compound will contain two control buildings and ancillary electrical equipment. A wastewater holding tank will also be installed at this location.

- Temporary compound

Scoping Responses

A consultation letter and scoping document/feasibility report were sent to all relevant statutory and non-statutory consultees during the scoping process. A full list of the bodies consulted, the consultation letters sent and the corresponding responses can be found in **Appendix F**. Of the 31 bodies consulted, 2 responses were received relating to water and drainage aspects of the development.

OPW

OPW drainage channels require a 10m maintenance strip along the edge of the channel. This strip should not be planted or paved in any way, which would prevent access for maintenance. This requirement should be applied for all drainage channels where possible to assist in the prevention of flooding.

New culvert/bridges on any watercourses or changes to existing structures will require Section 50 consent from The Office of Public Works.

Inland Fisheries Ireland

All the sites are located in the sub-catchment of the Yellow River and its tributary the Mongagh/Castlejordan River. The Yellow River itself is a tributary of the River Boyne (a cSAC). Both rivers contain stocks of salmon and trout. IFI are anxious that stocks would be

protected from the negative effects of in-stream works associated with this project (turbines, buildings, cabling, roads, ect) and that an adequate buffer zone would be set around watercourses. Please note that no in-stream works should be carried out in the closed season i.e. October to April.

Inland Fisheries Ireland referenced guidelines entitled, "Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites". This document has been adhered to in the proposed drainage design for the site.

2.9.2 Purpose of a SUDS Drainage Design

There is increased potential for water pollution, in particular sedimentation to local watercourses due to large volumes of spoil and emplacement of stone materials during the construction stage of the project.

The purpose of incorporating a SuDS design is to provide sufficient detail to ensure that water pollution will not occur as a result of construction activities at the site and to minimise the risk of any such occurrence.

The drainage design adopts temporary SuDS for the drainage of the temporary works during the construction phase. The following elements in series are proposed:

- Swales;
- Check dams and;
- Settlement ponds.

These measures provide a surface water management train that will mitigate any adverse impact on the hydrology of the site and surrounds during the construction phase of the project. Other pollution preventative measures include silt fences where necessary. Please refer to Figure 2.12 Road Construction Detail & Swales, Figure 2.16 Check Dam Detail, Figure 2.17 Settlement Pond Detail.

A 50m buffer zone has been adopted from turbine bases and hardstandings to watercourses, however, works are proposed in the vicinity of watercourses including access roads and crossings, Where such works are proposed appropriate mitigation measures are identified to prevent the pollution of the these watercourses.

2.9.3 Reference Information

Relevant EIS Studies

Hydro-Environmental Services undertook an assessment of the potential impacts of the proposed wind farm at Yellow River, Co. Offaly on water aspects (hydrology and hydrogeology) of the receiving environment.

The primary objectives of the assessment include:

- Produce a baseline study of the existing water environment (surface and groundwater) in the area of the proposed wind farm development;
- Identify likely positive and negative impacts of the proposed development on surface and groundwater during construction and operational phases of the development; and,
- Identify mitigation measures to avoid, remediate or reduce significant negative impacts.

This report is included as Chapter 7 of the Environmental Impact Statement.

Conservation Services - Ecological & Environmental Consultants to carry out a freshwater ecological assessment for the proposed wind farm at Rhode, County Offaly. The aims of the assessment are:

- To assess the present fishery value, invertebrate fauna, aquatic flora, water quality, habitat value and general ecological condition of streams and rivers in the vicinity of the proposed development and provide baseline data against which any future changes can be assessed
- To assess the general status of the streams from an ecological and fisheries perspective in the context of their wider catchment based on survey data, published sources, EPA data, and on consultation with Inland Fisheries Ireland, NPWS and Marine Institute
- To assess the potential impact of the proposed development on water quality and aquatic flora and fauna
- To recommend mitigation measures where potential negative impacts are predicted

This report is included as Chapter 5 of the Environmental Impact Statement.

Legislative Background

The EIS is carried out in accordance with the follow legislation:

- S.I. No. 349 of 1989: European Communities (Environmental Impact Assessment) Regulations, and subsequent Amendments (S.I. No. 84 of 1995, S.I. No. 352 of 1998, S.I. No. 93 of 1999, S.I. No. 450 of 2000 and S.I. No. 538 of 2001), S.I. No. 30 of 2000, the Planning and Development Act, and S.I. 600 of 2001 Planning and Development Regulations and subsequent Amendments. These instruments implement EU Directive 85/373/EEC and subsequent amendments, on the assessment of the effects of certain public and private projects on the environment;

- S.I. No. 600 of 2001 Planning and Development Regulations, 2001;

- S.I. No. 94 of 1997 European Communities (Natural Habitats) Regulations, resulting from EU Directives 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) and 79/409/EEC on the conservation of wild birds (the Birds Directive);

- S.I. No. 293 of 1988 Quality of Salmon Water Regulations, resulting from EU Directive 78/659/EEC on the Quality of Fresh Waters Needing Protection or Improvement in order to Support Fish Life;

- S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations 2009 and S.I. No. 722 of 2003 European Communities (Water Policy) Regulations which implement EU Water Framework Directive (2000/60/EC) and provide for implementation of 'daughter' Groundwater Directive (2006/118/EC). Since 2000 water management in the EU has been directed by the Water Framework Directive (WDF). The key objectives of the WFD are that all water bodies in member states achieve (or retain) at least 'good' status by 2015. Water bodies comprise both surface and groundwater bodies, and the achievement of 'Good' status for these depends also on the achievement of 'good' status by dependent ecosystems. Phases of characterisation, risk assessment, monitoring and the design of programmes of measures to achieve the objectives of the WFD have either been completed or are

ongoing. In 2015 it will fully replace a number of existing water related directives, which are successively being repealed, while implementation of other Directives (such as the Habitats Directive 92/43/EEC) will form part of the achievement of implementation of the objectives of the WFD;

- S.I. No. 41 of 1999 Protection of Groundwater Regulations, resulting from EU Directive 80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances (the Groundwater Directive);

- S.I. No. 249 of 1989 Quality of Surface Water Intended for Abstraction (Drinking Water), resulting from EU Directive 75/440/EEC concerning the quality required of surface water intended for the abstraction of drinking water in the Member States (repealed by 2000/60/EC in 2007);

- S.I. No. 439 of 2000 Quality of Water intended for Human Consumption Regulations and S.I. No. 278 of 2007 European Communities (Drinking Water No. 2) Regulations, arising from EU Directive 98/83/EC on the quality of water intended for human consumption (the Drinking Water Directive) and WFD 2000/60/EC (the Water Framework Directive);

- S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations;

- S.I. No. 9 of 2010 European Communities Environmental Objectives (Groundwater) Regulations 2010: and,

- European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.

Construction Industry Research and Information Association (CIRIA) – Guidance Manuals

- CIRIA (Construction Industry Research & Information Association) Report C502 Environmental Good Practice on Site

- CIRIA 521 - Sustainable Urban Drainage Systems; Design Manual for Scotland and Northern Ireland

- CIRIA Report C532 Control of Water Pollution from Construction Sites
- CIRIA Report C648 Control of Pollution from Linear Construction Project. Technical Guidance
- CIRIA Handbook C650 Environmental good practice on site
- CIRIA Handbook C651 Environmental good practice on site checklist
- CIRIA Report C609 - SuDS – hydraulic, structural & water quality advice
- CIRIA Report C697 – The SuDS Manual

2.9.4 SuDS Drainage Design Criteria

The design criteria for the SuDS are:

- To minimize alterations to the ambient site hydrology and hydrogeology. To provide attenuation and treatment controls as close to the site footprint as possible and to replicate where possible the existing hydrological environment of the site.
- To minimize sediment loads resulting from the development run-off during the construction phase.
- To preserve Greenfield runoff rates and volumes.
- To provide appropriate retention times.
- To provide settlement ponds to encourage sedimentation and storm water runoff attenuation
- To reduce stormwater runoff velocities throughout the site to prevent scouring and encourage settlement of sediment locally.
- To manage the problems of erosion and allow for the effective revegetation of bare surfaces.

- To control water within the site and allow for the discharge of runoff from the site within the limits prescribed in the Salmonid Regulations.

These design criteria can then be translated into an outline design philosophy.

2.9.5 SuDs Design Philosophy

The approach to treatment and attenuation of storm water is as follows:

- Additional drainage measures will only be added as necessary. The dimensions of these features will avoid intercepting large volumes of water.

- Storm water runoff from hardstandings and roads will be managed via swales. Roads and hardstandings will crossfall downslope to mimic the natural drainage patterns of the site.

- Swale vegetation used will be appropriate to the local area.

- Temporary erosion protection together with silt fences may be required until the vegetation becomes established (coire matting or similar).

- Roads and hardstandings are constructed from aggregate and will not be surfaced with bitumen materials, thus helping to reduce runoff volumes. Therefore a reduced runoff coefficient of 70% is applicable.

- A large portion of the hardstanding construction will be of single sized stone therefore the pore spacing in the hardstanding and road will also act to store and attenuate water.

- Swales will be primarily used to attenuate water and to encourage discharge into the ground locally.

- Outflow points will be taken from the swales into the existing onsite drainage channels. Silt fences will be maintained at the interface between the proposed and existing drainage channels for the duration of the construction phase.

- No direct discharge from swales to natural watercourses. This avoids concentrating large volumes of water into point discharges.

- Stormwater runoff within the swale will be treated through the provision of small Silt fences at approximately 40m centres along the swales. The stone used for the construction of the check dams will be washed graded stone with a size range between approximately 5mm and 50mm.

- It is noted that swales will not be used along floated sections of road.

- Swales will provide a flow route in extreme events to carry water to the existing surface water channels across site. It will be necessary to increase the cross sectional area of the swales further downstream of the footprint as larger volumes of stormwater are conveyed.

- Discharging directly back to the surrounding area will assist in maintaining the hydrological characteristics of the site.

- Vegetation will be reinstated on slopes as early as possible.

- Under track drainage will be provided with associated sumps and silt fences. The under track drainage will provide a means for flows to pass from a swale on the uphill side of the slope to the downhill side of the slope.

- Under track drainage will be provided under the floated roads at all locations where existing land drainage passes under the proposed roads. Conventional cross drains will be 150mm diameter, and increased to 300mm diameter (minimum) at points for land drainage or natural drainage paths crossing under the section of floated road. The spacing of the cross drains will be dependant upon whether the roads run parallel or tangential with the general contours of the site.

- Sumps will be required for each turbine location to collect dewaterings, water will subsequently be pumped into settlement ponds and allowed to settle prior to discharging into the swales. The general location of the small concrete sumps will ensure that they pose minimal health and safety risk to site personnel, particularly whilst constructing the wind turbine rotor blades during the installation process (as this process takes place adjacent to the crane hard standing).

- All swales and ponds will be kept as shallow so that they pose no health and safety risk to plant or personnel. Maximum depth of standing water will be limited to 0.5m within the ponds and 0.3m within the swales.

- The settlement ponds will be designed to cater for infilling and rehabilitation post construction phase of the project.

- The use of large balancing ponds is to be avoided and there will be no merit in using other methods such as filter drains or hard permeable surfacing due to the lack of infiltration capacity and high groundwater levels across the site.

- The level of silt in runoff during construction will be monitored and if it is excessive in any area this can be managed by the provision of additional silt attenuation features such as silt fences or silt traps. The low gradient nature of the site allows for slow water velocities therefore settlement of particles should occur readily throughout the site. If the suspended solids levels remain high, water can be pumped from settlement ponds into tankers and transferred off site to a suitable water treatment facility subject to agreement with the Local Authority.

- Field drains/streams will be piped directly under the track through appropriately sized drainage pipes.

- Where ditch or stream crossings cannot be avoided, the design of the crossing, either culvert or bridge, shall be prepared in line with IFI Fisheries guidelines.

- Appropriate site management measures will be taken to ensure that runoff from the construction site is not contaminated by fuel or lubricant spillages. Please refer by Section 3.5 of the EIS for further details.

- There will be no discharge of trade effluent, sewage effluent or contaminated drainage into any watercourse system or ditch.

2.9.6 Detailed Design Considerations

The following issues have been identified in the preliminary SUDS design of the development.

- The development of suitable mitigating measures will be given further consideration during detailed design stage of the project.

- Watercourse crossing identification and sizing

- Detailed design of track drainage

- Detailed design of turbine and hardstanding drainage

- Peat storage and handling measures

- Requirement for attenuation storage

- Definition of buffer-zones

Watercourses and Watercourse Crossings

There are nine new stream crossings on site, three of which cross the Yellow River, five of which are tributaries of the Yellow River and one is a tributary of the Mongagh River. An existing bridge, (C3, Derryiron Stream East) will require upgrading. Please refer to **Figure 2.14 for River / Stream Crossing Location Map** and to Chapters 5 & 7 for further discussion on these watercourses.

The nine proposed crossing points and bridge upgrade are as follows:

Crossing No.	Stream/River	Grid Ref.	Salmonid Spawning Habitat	Salmonid Nursery Habitat	Salmonid Adult Habitat
C1	Yellow River	250444, 236339	Poor - Fair	Poor - Fair	Fair - Good
C2	Derryiron Stream West	250839, 236275	None	None	None
C3	Derryiron Stream East	251775, 235747	Poor - Fair	Poor -Fair	Fair
C4	Corbetstown Bridge Stream	253800, 239124	None	None- Poor	None
C5*	*Corbetstown Bridge Stream	254354, 238857	Poor	Fair	Poor
C6	Wood Stream West	255006, 237548	None	Poor	Poor
C7	Yellow River	255054, 237857	Fair - Good	Poor - Fair	Poor - Fair
C8	Wood Stream East	255456, 237778	None	None	None
C9	Yellow River	255982, 238270	Fair - Good	Poor - Fair	Poor - Fair
C10	Killowen Stream	256552, 238276	Fair	Fair - Good	Fair

***Existing road crossing to be upgraded**

Table 2.7 River / stream crossings and existing bridge upgrades.

In the context of the SuDS drainage proposals, a "natural watercourse" will encompass the following:

- Natural rivers and streams as normally perceived and charted by OS 1:50,000 series mapping;
- Watercourses recorded on the EPA rivers dataset.

It should be noted that a significant number of the smaller uncharted drains / watercourses are normally dry and are effectively drainage paths in periods of wet weather only.

Works to watercourse crossings will be subject to authorisation by OPW through a Section 50 application.

2.9.7 Design of Watercourse Crossings

As part of the drainage design, detailed mapping of drainage paths across the site has been undertaken; utilising topographical surveys, contour mapping and aerial photography. Detailed mapping aided the accurate definition of catchment extents for each of the water crossing locations.

The following guidance was used in the sizing of watercrossings;

- Hydrological assessments made using EPA Hydronet Tool.
- CIRIA Culvert design and operation guide (C689)
- Requirements for the Protection of Fisheries Habitats during Construction and Development Works at River Sites, Eastern Regional Fisheries Board (Inland Fisheries Ireland)

It is proposed to construct free span reinforced concrete bridges to avoid any instream works which could cause siltation or reduce the hydraulic efficiency of these watercourses.

Please refer to **Figure 2.15** – Bridge Crossing Design. The method of construction is discussed further in Chapter 3.

2.9.8 Water Buffer Zones

Buffer (exclusion) zones have been preliminarily defined by HydroEnvironmental Services in Table 7.11. The following buffer zone rules will apply in the development of the site;

Areas not acceptable for construction work or stockpiling of excavated material:

- 10m buffer zone around manmade drainage channels
- 50m buffer zone around minor watercourses
- 50m buffer zone around major watercourses and other sensitive surface water features

Areas which will be acceptable for construction activities with mitigation:

- Areas within the respective surface water buffer which have previously been passed through by existing tracks which will be updated as part of the Wind farm development.

- Additional water crossing points to facilitate the crossing of watercourses (manmade drainage, minor and major watercourses).

The remainder of the site outside these areas would be suitable to accept proposed site infrastructure.

2.9.9 Linear Track Drainage (Swales)

Where linear track drainage swales are utilised, it is proposed that rock filled check dams will be installed at a regular frequency, in order to reduce flow velocities and improve conditions for the settlement of solids in transit. Check dams will be constructed from 5-40mm crushed rock locally won, and will constitute the majority of the check dams. It is intended that these dams will be relatively simple to construct but will provide treatment of construction runoff at source. There will be outflow points (spillways) from the swales to the existing onsite drains to preserve the hydraulic efficiency of the site and to prevent ponding of water. No outflows will be permitted into natural watercourses. Please refer to Figure 2.12 for details of swales.

2.9.10 Wastewater Discharges

It is to be noted that no sewage will be discharged or treated on site as part of the development. Wastewater discharges from the substation toilet facilities will be collected and stored in a sealed tank on site and transported away at regular intervals for treatment at a Waste Water Treatment Works. The sealed tank will be similar in specification to Klargester Sealed Cesspool to BS 6297:1983 and surrounded by 225mm thickness of concrete or Silotank equivalent. This work will be done under a contract with one of the Contractors who have a permit to transport Septic Tank Waste to a Waste Water Treatment Plant (e.g. Rhode) as issued by Offaly County Council.

2.9.11 Runoff Attenuation

Runoff from large hardstanding areas such as the site compound, turbine hardstandings, and substation will be attenuated to mimic natural runoff patterns. Attenuation will utilise shallow

primary and secondary settlement ponds to aid removal of suspended solids. Calculations for the determination of storage requirements have been undertaken and are as follows:

- A 1 in 100 year rainfall return design.
- The largest hardstanding area of 0.0025 hectares.
- The rational method6 is subsequently applied to calculate the flow volumes into the settlement pond over these respective periods.
- An initial outlet weir overflow rate is applied of 5l/s which approximate to Greenfield run-off rates.

Please refer to **Table 2.8** for a breakdown of this calculation.

1 in 100 year return							Weir Overflow Rate 5L/s	
Duration	**Rainfall (mm)**		**C**	**A (km^2)**	**(m^3/s)**	**Volume (m^3)**	**Discharge (m^3)**	**Residual Volume (m^3)**
5min	13.2	0.278	0.95	0.0025	0.1046	31.3751	1.500	29.9
10min	18.4	0.278	0.95	0.0025	0.0729	43.7350	3.000	40.7
15min	21.6	0.278	0.95	0.0025	0.0570	51.3410	4.500	46.8
30min	26.2	0.278	0.95	0.0025	0.0346	62.2748	9.000	53.3
60min	31.6	0.278	0.95	0.0025	0.0209	75.1100	18.000	57.1
2hr	38.3	0.278	0.95	0.0025	0.0126	91.0353	36.000	55.0
4hr	46.4	0.278	0.95	0.0025	0.0077	110.2882	72.000	38.3
6hr	51.8	0.278	0.95	0.0025	0.0057	123.1234	108.000	15.1
12hr	62.8	0.278	0.95	0.0025	0.0035	149.2693	216.000	-66.7
24hr	76	0.278	0.95	0.0025	0.0021	180.6444	432.000	-251.4
48hr	85.3	0.278	0.95	0.0025	0.0012	202.7496	864.000	-661.3

Table 2.8 – Settlement Pond Volumes Calculations

The largest residual volume requirement is 57.1 m^3. It is to be noted that ponds will be removed on completion of the construction phase of the project.

A set of dimensions of approximately 9m in length, 3m in width and 1m in depth for the primary and secondary settlement ponds are derived which account for the storage and

[6] Rational Method is expressed by the formula $V = 2.78 \cdot C \cdot A \cdot I \cdot t$, where V is the volume of water generated in the stilling pond, C is the run-off co-efficient which is assumed to be 0.95 across all hardstanding areas, A is the area of the hardstanding / catchment, I is the rainfall depth and T is the duration of rainfall occurance.

attenuation of the residual volume. The Length: Breath ratio of the ponds must be a minimum of 3:1 as recommended by COFORD[7]. Please refer to Figure 2.17 - Settlement Pond Detail.

2.9.12 Peat Storage/Spoil Management

It is understood that excavated peat is to be side cast adjacent to proposed access track alignments. Areas of stored peat:

- Will not be permitted within previously denoted watercourse buffer zones;
- Will not be permitted to obstruct the flow of overland surface water.
- Where areas of peat storage other than side casting is proposed, formal drainage will be designed on a bespoke basis to allow controlled dewatering and prevent washout of suspended solids to the receiving water environment.

Mitigation proposals for spoil management are detailed in **Section 3.8** of the EIS.

2.9.13 Construction Phase - Detailed Considerations

A process of mitigation by avoidance has been adopted by the design team. A number of best practice SUDS mitigation measures are also proposed to minimise impacts to water quality.

It is critical that an environmentally responsible contractor/sub-contractor is appointed to carry out construction works. The following measures should be enforced by the clients engineer on site:

- All site personnel should be made aware of their environmental responsibilities at the site.
- Method Statements will be prepared at an early stage in the project, outlining Environmental
- Requirements for contractors, which will include contingency plans to deal with spillages, should they occur.

[7] Mulqueen and Others. 1999. Forest Drainage Manual. COFORD, National Council for Forest Research and Development.

- Site visits by the SuDS Engineer will be agreed in advance and will be undertaken at various stages of the construction process to ensure that the proposed SuDS scheme is being constructed in line with the design.

- Land disturbance will be kept to minimum and disturbed areas will be stabilised as soon as possible.

- In principle, soil excavation should be undertaken during dry periods whenever possible.

- A Spoil management plan will be further developed for the site by the contractor which will detail the placement of excess spoil across the site and will be based upon the recommendations from Whiteford Geoservices.

All drainage recommendations from the soils, geology and water reports have been considered and incorporated into the SuDS design.

Working in the vicinity of Water or Buffer Zones

The following mitigation measures apply when working within the watercourses or in the vicinity of watercourses.

- Ensure roads are built to the layout design and therefore remain outside the relevant buffer zones to rivers and watercourses.

- Avoid construction near streams in wet weather whenever possible.

- Stone will be of a local geochemistry i.e. be sourced from one of the nearby quarries.

- Plan so that roadside drains do not discharge directly into watercourses, but rather are profiled back towards existing field drains e.g. T16, 17 and 18.

- No concrete will be used in watercourses. .

- Runoff from excavations will not be pumped directly to watercourses. Where dewatering of excavations is required, water shall be pumped to the head of a

treatment train (swale or concrete sump in the case of turbine bases) in order to receive full treatment prior to re-entry to the natural drainage system.

- In a precautionary approach buffer zones will be set out at a minimum of 10m to all land drainage channels, with a 50m buffer zone defined on minor and major watercourses.

Watercourse Crossings

Nine new water crossings (i.e. a watercourse identified on a 1:50,000 scale map) have been identified at preliminary design stage, one upgraded water crossing on the Garr Road. All of these crossings will be carried out by free span concrete bridges. Therefore:

- Flow will not be restricted
- Fish passage will not be restricted
- Instream works will be avoided
- Risk of sedimentation or pollution control will be reduced.

Crossings of a number of cut drains and minor drainage path crossings will be required, whose exact locations will be determined at detailed design stage. The final detailed design of each of the crossing points will be discussed and agreed with Inland Fisheries Ireland. The designs will also be subject to Section 50 authorisation from the OPW.

Settlement Ponds

The following design criteria shall apply to the construction of settlement ponds at the site:

- Install interceptor drains upslope of the works areas, where gradient requires to separate uncontaminated surface runoff and divert it around and away from the works; Post completion of the scheme the interceptor drains can be in filled.
- All flow depths to be kept to a normal depth of 0.3m with a maximum depth of 1.0m maximum.

- Settlement ponds will be lined with geotextile material.

- Side slopes to be shallow, nominally at a 1 in 3 side slope (maximum).

- Material excavated from the settlement pond will be compacted around the edge of the pond, which will prevent site personnel from falling into the pond.

- Settlement ponds will be removed on completion of the construction phase of the project. Settlement ponds should be subject to regular inspection and maintenance by both the contractor and SUDS engineer.

Please refer to Figure 2.17 - Settlement Pond Detail.

Turbine Bases

Drainage and dewatering from turbine base excavations will pumped to a separate concrete sump. Water will be allowed to settle prior to discharging into the settlement ponds. The general location of the small concrete sumps will ensure that they pose minimal health and safety risk to site personnel, particularly whilst constructing the wind turbine rotor blades during the installation process (as this process takes place adjacent to the crane hard standing). Please refer to Figure 2.17 Hardstand Concrete Sump.

Delivery trucks, tools and equipment will be cleaned at designated concrete washout area located within the temporary compound. In addition the following drainage measures will apply;

Installation of cut-off drains around the working areas to intercept uncontaminated surface runoff and divert it around and away from the works.

The base of the excavation will be constructed level, and water will be gathered in a sump, and pumped at a low flow rate into a concrete sump.

The foundation working areas will be re-vegetated as soon as possible after construction.

Substation and Temporary Compound Area

The following shall apply to the construction of the substation and temporary compound at the site:

- During construction of the substation and temporary compounds, similar measures to those implemented during turbine/crane pad construction will be used to limit water ingress, sediment erosion and concrete pollution.

- French drains or similar will be constructed around the substation to ensure ground water levels around the building can be managed and that internal sumps within the building do not become waterlogged.

2.9.14 Operational phase - Detailed Considerations

Collection of surface water for the 20.58 ha footprint of the proposed development will be through open vegetated swales. No direct discharge to streams is proposed as part of the development. Discharge will be via existing drainage channels.