LISHEEN EXTENSION
WIND ENERGY DEVELOPMENT

ENVIRONMENTAL IMPACT STATEMENT

VOLUME 1

NON TECHNICAL SUMMARY

Prepared by:

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Shinagh House
Bandon
Co. Cork

February 2009

LISHEEN EXTENSION WIND ENERGY DEVELOPMENT

ENVIRONMENTAL IMPACT STATEMENT

Volume I

Document Control Sheet

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February 2009

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1 INTRODUCTION

This non technical summary has been prepared according to National and European Statutory Requirements. It presents a summary of the main findings of the Environmental Impact Statement. This summary should be read in conjunction with the full Environmental Impact Statement which is contained in Volume 2 Main EIS Report and Volume 3 Appendices.

SWS Energy are seeking planning permission from North Tipperary County Council to develop a renewable energy twelve turbine wind power development at Lisheen situated in the townlands of Barnalisheen, Cooleeny, Derryfada, Derryville and Killoran Co Tipperary. The selected site is an extension to an 18 turbine windfarm (Lisheen Windfarm, Phase 1, Reg. Ref 06/510773 & PL.22.222142) a development which received planning permission in August 2007 and is currently under construction.

The site area covers a total of *circa* 300 hectares. The application is made up of two parcels of land; one to the north and one to the south of the existing windfarm. The application sites are owned by private landowners and Coillte Teoranta. The proposed wind farm extension at Lisheen is included in the grid allocation termed “Gate II” and is already in receipt of a grid connection offer and will therefore be granted connection to the national grid, subject to a grant of planning permission for this extension proposal. It is envisioned that the proposed extension turbines will connect to the electrical grid via the existing substation. This eliminates the need for construction of another substation and associated overhead lines and therefore reduces the visual influence and environmental impacts usually associated with such a development. With its Gate 2 connection offer and the limited infrastructural requirements wherein the extension turbines require no additional substation it is likely that the extension project will be able to be constructed in the very near future and this is an important consideration in terms of meeting our renewable targets.

This Environmental Impact Statement had been prepared in accordance with guidelines provided by the EPA and Planning Guidelines for Wind Energy Development 2006 published by the Department of the Environment, Heritage and Local Government (DoEHLG). The purpose of the Environmental Impact Assessment is to identify and thereby minimise the environmental impacts of certain new or expanding developments. It involves a detailed predicted impact of the development, examines the existing environment and details proposed mitigation measures.

A pre-planning meeting took place on the 29th January 2009 with Mr. Brian Beck, Senior Planner, from North Tipperary County Council. During the meeting potential landscape and visual impacts were flagged as priority issues for North Tipperary County Council in terms of their appraisal of a new planning application. It was agreed that the proposed site is located in an area for which the landuse has been established as being suitable for wind energy development subject to the environmental review process.

The developer, SWS Energy, recognise that there are particular sensitivities that need to be addressed in undertaking an environmental assessment for a wind energy development and these are dealt with at length within the statement.

The proposed site was selected based upon its wind regime and the minimal environmental impacts this development would impose upon the surrounding area. Figure 1.1 shows the location of the proposed development.

No significant difficulties were encountered during the compilation of these reports. Specialist subcontractors were employed for the completion of specific sections of this EIS and are referenced accordingly.

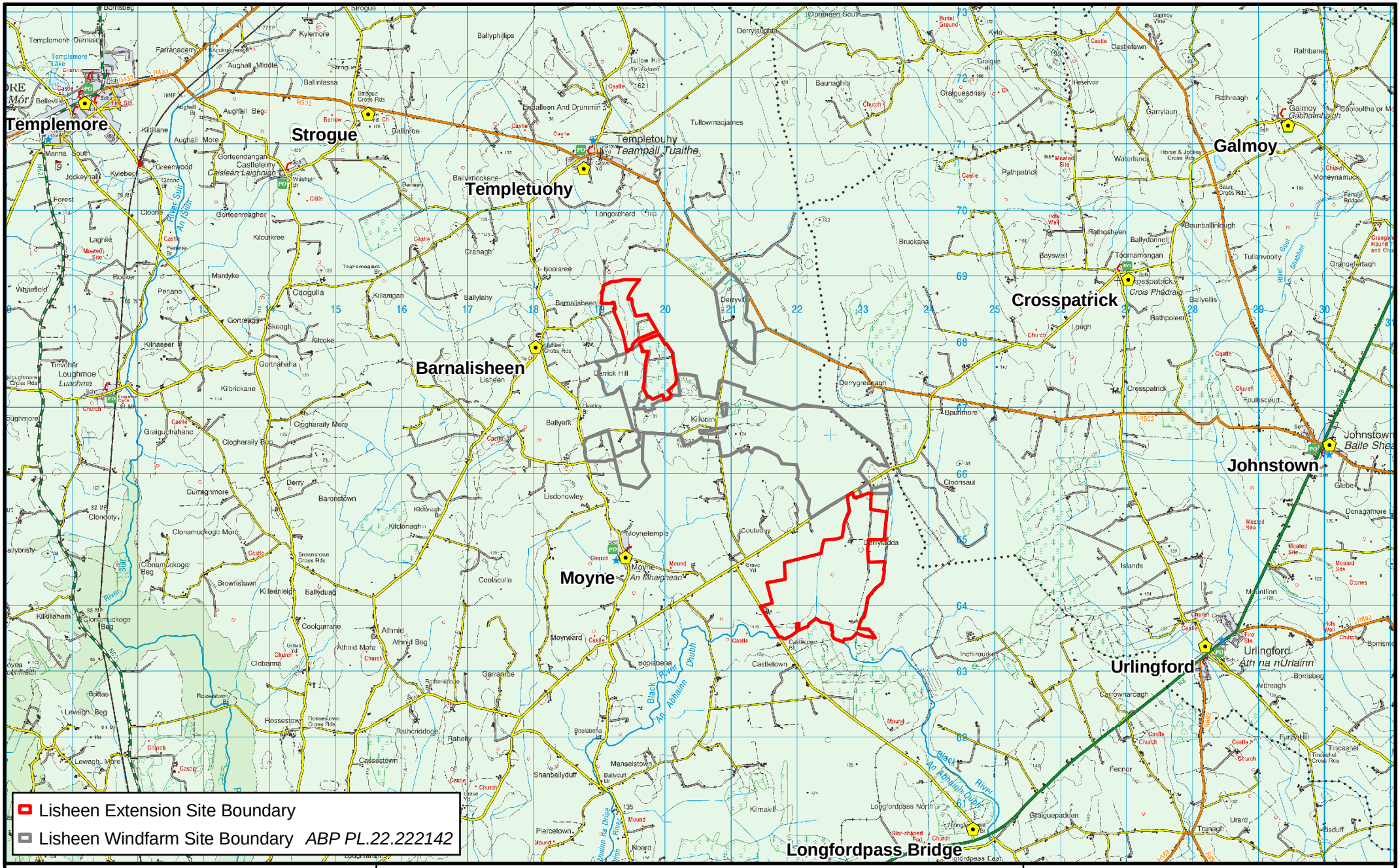


Figure 1.1
Site Location

SWS Environmental Services
MEMBER OF SWS Group

0 0.75 1.5 2.25 3 km.

Scale: 1:75,000

N

Prepared by: CA
Checked by: SH
Drawing date: 24/02/2009
Drawing No: Lisheen\05-Extension EIS & Planning App\Planning\EIS Maps\NTS Maps\Fig 1.1 Site Location

1.1 Format of this EIS

An Environmental Impact Assessment (EIA) is the process whereby the environmental impacts of new or expanding developments are predicted; their significances are assessed and proposed mitigation measures are detailed.

The full EIS consists of the following:

- EIS Volume 1: Non Technical Summary
- EIS Volume 2: Main Report
- EIS Volume 3: Appendices to Main Report

Each area of the EIS contains a discussion of the existing environment, potential impacts associated with the proposed development and any mitigation measures required to minimise these impacts.

1.1.1 Objectives of the Environmental Impact Assessment

This EIS has been prepared in accordance with guidelines provided by the EPA and 2006 Planning Guidelines for Wind Energy Development published by the Department of the Environment, Heritage and Local Government (DoEHLG). The purpose of the EIA is to identify and thereby minimise the environmental impacts of certain new or expanding developments. It involves a detailed review of the proposed development, it examines the existing environment, assesses the predicted impact of the development on the existing environment and details proposed mitigation measures. Specialist subcontractors were employed for the completion of specific sections of this EIS and are referenced accordingly.

1.2 The Developer

The developer of the site is SWS Energy Ltd based at Shinagh House, Bandon, Co. Cork.

1.3 Pre Submission Consultation

During the preparation of this EIS, consultation with interested government and non-government bodies and individuals was carried out. Information describing the proposed development was distributed and comments regarding the development were invited. A copy of the information distributed for the purpose of consultation is included in **Appendix 2** (Volume III) to the main body of this EIS. Responses received to date regarding the consultation material are included in **Appendix 3** (Volume III).

Public information leaflets were distributed to residential houses within a 2km radius of the proposed development. A public information evening is due to be held on 04th March 2009 at Moyne Community Hall from 15.00 to 20.00. This information evening will provide the community with information on the proposed development and potential environmental impacts. A copy of the information material pertaining to this information evening is attached in **Error! Reference source not found.**, EIS Volume III.

1.4 Wind Energy and the Environmental Benefits

Some economies in the developed world such as Spain, Denmark and Germany have implemented significant changes in their energy policies and look to wind as a sustainable indigenous energy resource. With our exposure to Atlantic south-westerly winds, Ireland has a very strong wind resource that represents an accessible and environmentally sustainable energy potential. Wind energy is one of Ireland's most important renewable resources and was described in the government's published White Paper on "*Delivering a Sustainable Energy Future for Ireland*" as being "the pivotal contribution" for achieving Ireland's targets in relation to electricity from renewable resources. Included in this White Paper is a commitment to achieve 33% of Ireland's electricity from renewable sources by 2020.

The Irish economy is expanding and need for a more environmentally sustainable approach to energy policy is required. Improvements in energy efficiency is extremely important for sustainability as it has the potential to be the cheapest and cleanest method of reducing greenhouse gas emissions and energy costs for consumers, both domestic and business alike. Up to 90% of our energy supply comes from non- indigenous sources. Burning of fossil fuels has been acknowledged as a main contributor to the formation of Greenhouse Gas Emissions such as CO_2. More than 95% of the CO_2 produced in Ireland comes from the burning of fossil fuels and this is a major contributor to climate change. Under the 1997 Kyoto Protocol the EU agreed to reduce emissions of the six greenhouse gases to 8% below 1990 levels by 2008-2012. Within this limit, Ireland agreed to a maximum increase of 13% above the 1990 levels.

A major element in Ireland's strategy to achieve this is through the development of renewable energy resources. This extension of up to 24MW of wind energy at Lisheen Extension should be encouraged to achieve efficient deployment of wind energy. The environmental benefits associated with wind energy developments include a reduction in greenhouse gas emissions and other harmful pollutants resulting directly from substituting and reducing fossil fuels currently used to meet our expanding energy demands.

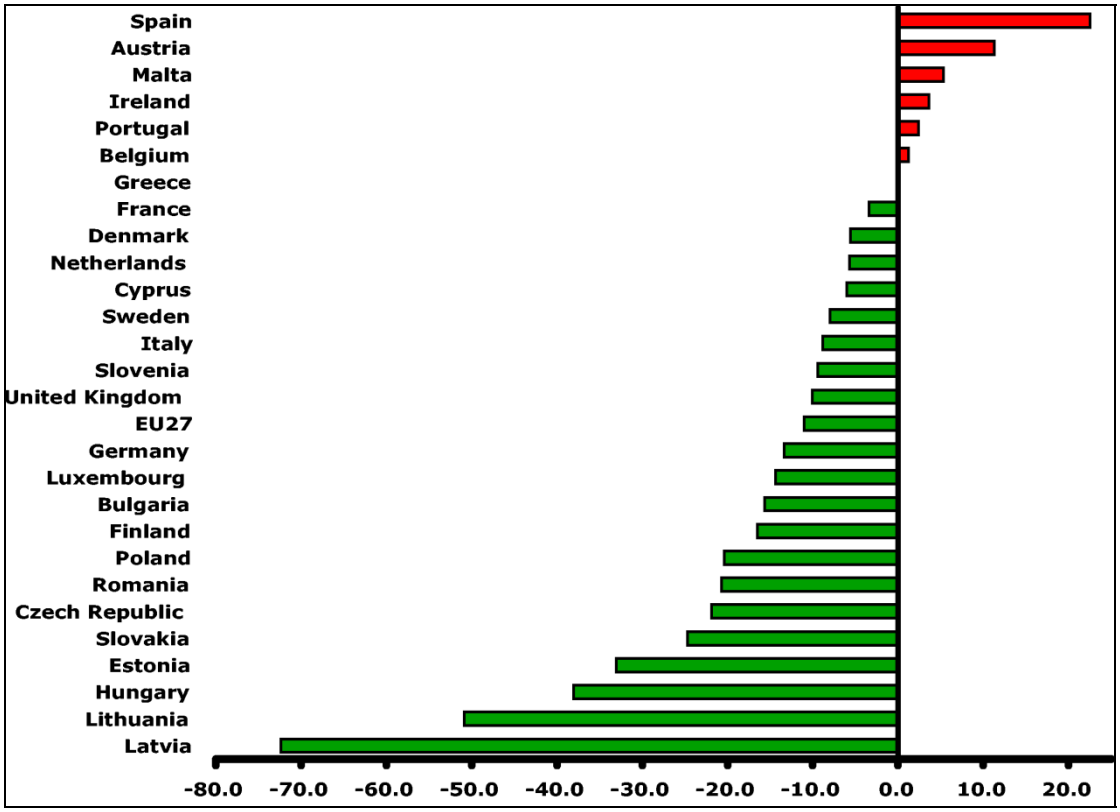
1.5 Need for the Proposed Development:

i) Environmental

Climate change caused by greenhouse gas emissions is not restricted by political boundaries and is therefore a global environmental issue that can only be contended with if individual countries address it on a national level. Under the 1997 Kyoto Protocol the EU agreed to reduce greenhouse gas emissions to 8% below 1990 levels by 2008 – 2012.Under this agreement Ireland has agreed to limit the increase of greenhouse gases to 13% above 1990 levels by the period 2008-2012. According to information gathered by the European Environment Agency, Ireland is currently one of a small percentage of EU Member States who needs to do more in terms of reducing greenhouse gas emissions to be on track to meet these set targets; this is illustrated in Figure 1.2.

Another adverse statistic in terms of Ireland's energy sector is that currently 90% of our energy requirements are imported ('*Delivering a Sustainable Energy Future for Ireland'*, Energy White Paper 2007, Department of Communications, Energy and Natural Resources). The White Paper describes the actions and target for the energy policy framework out to 2020. It sets out a clear path for meeting the Government's goals of ensuring safe and secure energy supplies, promoting a sustainable energy future, and supporting competitiveness. Included in the framework is a commitment to achieve 33% of Ireland's electricity from renewable sources by 2020 with wind energy being described as providing "the pivotal contribution" for achieving this goal.

Figure 1.2 2007 Distance to Target for EU-27 Member States



Red indicates the Member States that need to do more to be on track to meet their ceiling in 2010

Green indicates the Member States that are on track to meet their ceiling in 2010

(Source: European Environment Agency 2008)

ii) Economic

The Stern report on the "economics of climate change", published in 2006, stressed the need to reduce global emissions of greenhouse gases to at least 25% below current levels by the year 2050. The development of a 24MW wind farm at Lisheen, Co. Tipperary would help Ireland in obtaining energy from an indigenous source, reduce our current dependence on imported energy and would make a significant contribution towards our national CO2 abatement strategy through reduction. Such positive impacts would incur consequential economic benefits.

A development of a 24MW Windfarm at the proposed location had the potential to displace over 27,121 tonnes of CO2 per annum[1]. Put another way; the proposed development has the

[1] Calculation of the amount of CO_2 displaced/avoided by the proposed 24 MW Renewable Energy Development at Lisheen Extension Windfarm is based on a wind power generation efficiency (capacity factor) estimate of 30%. The tonnage avoidance figure for CO_2 presented is calculated on the basis that electricity from the proposed turbines will replace a typical generation mix of coal, oil and gas. For calculation method see: http://www.bwea.com/edu/calcs.html

potential to power the equivalent of 13,420 homes[2]. This would represent a significant contribution to Ireland's renewable energy targets and their strategic importance in relation to national, EU and indeed global obligations necessary to contend with climate change. Taking into consideration the permitted 36MW windfarm (Lisheen Windfarm, Phase 1) in the adjoining land the potential CO2 displacement for the entire project and homes equivalent is summarised in Table 1.1.

Table 1-1 Electricity Generation Proposed by Lisheen

Development Project	MW	Potential CO_2 displacement per annum (tonnes)	Homes Equivalent
Lisheen Windfarm (PL. 22. 222142)	36	40,681	20,129
Lisheen Extension Windfarm	24	27,121	13,420
Total	60	67,802	33,550

1.6 Site Selection

There are a number of criteria that must be assessed when investigating and selecting the location of a wind farm development. The most important technical factor is the average wind speed available at that location. Additional criteria used as indicators for determining suitable sites for wind farm development include; distance from the electricity grid, proximity to environmentally sensitive areas, proximity to scenic areas or tourist attractions, access to the site and distance to the nearest dwellings. In addition to those quantifiable physical characteristics, sites are also assessed in terms of the ability of the landscape to accommodate the development.

The site scoping and modelling assessment identified the following site attributes as favourable to a wind energy development of this scale at this location;

- Extension to an existing windfarm utilizes many of the same infrastructure components that the original wind farm would use such as substations, grid connection lines and road. As a result they have much fewer environmental and visual impacts than those usually associated with an individual development.
- The offer of an existing grid connection from ESB Networks
- Not adversely impacting on any environmentally designated sites

[2] Calculation of the number of homes powered is calculated on the basis that is the average Irish household electricity consumption is 4,600 kW hours per annum. For calculation method see also : http://www.bwea.com/edu/calcs.html

- Landuse and Landscape character sensitivity
- Distance from main regional tourism areas
- Distance from airports and proximity to regional routes
- The sites previous suitability for a wind farm development as determined by the grant of planning for such developments by North Tipperary County Council.

2 THE PROPOSED DEVELOPMENT

2.1 The Site

The proposed development, comprising of 12 no. wind turbines (hub height not exceeding 95m and overall height from ground to blade tip not exceeding 140m) and associated infrastructure will be located in the local area of Lisheen, Co. Tipperary. The site is located close to the village of Moyne, approximately 15km from Thurles and adjacent to the Lisheen Mines.

The extension site encompasses lands to the north and south of an existing windfarm (Lisheen Windfarm, Planning Ref, 06/510773 & PL. 22. 222142). The site is an extensive site with a total area of approximately 300 hectares and is located on areas of improved agricultural land and planted forestry. The lands within the application area are owned by private landowners and Coillte Teoranta. (Site Centre Grid Reference: E219586, N168116).

As mentioned the proposed development is an extension to an existing windfarm. The northern extension site is located to the northwest of the permitted windfarm, approximately 1km from the turbines at Derryville. The closest turbine from the proposed development and granted windfarm is turbine 5 to permitted turbines 9 & 10. It is proposed that turbine 5 is to be sited between permitted Turbine 9 & Turbine 10 (Planning Ref, 06/510773 & PL. 22. 222142). It is approximately 440m and 424m from Turbine 9 and 10 respectively.
The southern extension site is to the southeast of Lisheen Windfarm (Planning Ref, 06/510773 & PL. 22. 222142). A public road, the L267, divides the site boundaries between Lisheen Windfarm and the proposed extension development. Turbine 7 of the proposed extension project is the closest turbine to Lisheen Windfarm (Ref, 06/510773 & PL. 22. 222142) - Turbine 7 is 1,403m from permitted Turbine 19.

2.2 Description of the Proposed Development

The proposed development will involve the installation of twelve wind turbines, with a power output of up to 2MW, three borrow pits, internal site access roads, craneage pads and associated infrastructure. Each wind turbine will comprise a tubular tower and three blades. The site layout is presented in Figure 2.1.

The wind turbines will have a tower or ‘hub’ height not exceeding 95m and a blade diameter not exceeding 95m. The overall height from ground to blade tip will, therefore, not exceed 140m. The blade radius (length of the blade) will measure up to 45m; all of the blades on the turbines will rotate in the same direction and at the same speed rate of 14 to 31.4 revolutions per minute depending on the wind speed.

2.3 Construction

It is estimated that the total construction phase will be 8-10 months in duration. It is anticipated that an average of 15-25 people will be employed during this construction period. Any wastes (excavated material, building rubble) produced during the construction phase will be either utilised on site or removed from site by licensed waste operators as appropriate.

The proposed wind farm extension is included in the grid allocation termed “Gate II” and is already in receipt of a grid connection offer and will therefore be granted connection to the national grid, subject to a grant of planning permission. It is envisioned that the proposed extension turbines would connect to the electrical grid via the existing substation. This eliminates the need for construction of another substation and associated overhead lines and therefore reduces the visual influence and environmental impacts usually associated with such a development.

2.4 Operation

The turbines will have an anticipated life span of 20-25 years and while they will operate automatically, they will require periodic servicing. When the turbines are decommissioned, all materials associated with the development will be removed and the site allowed to revegetate.

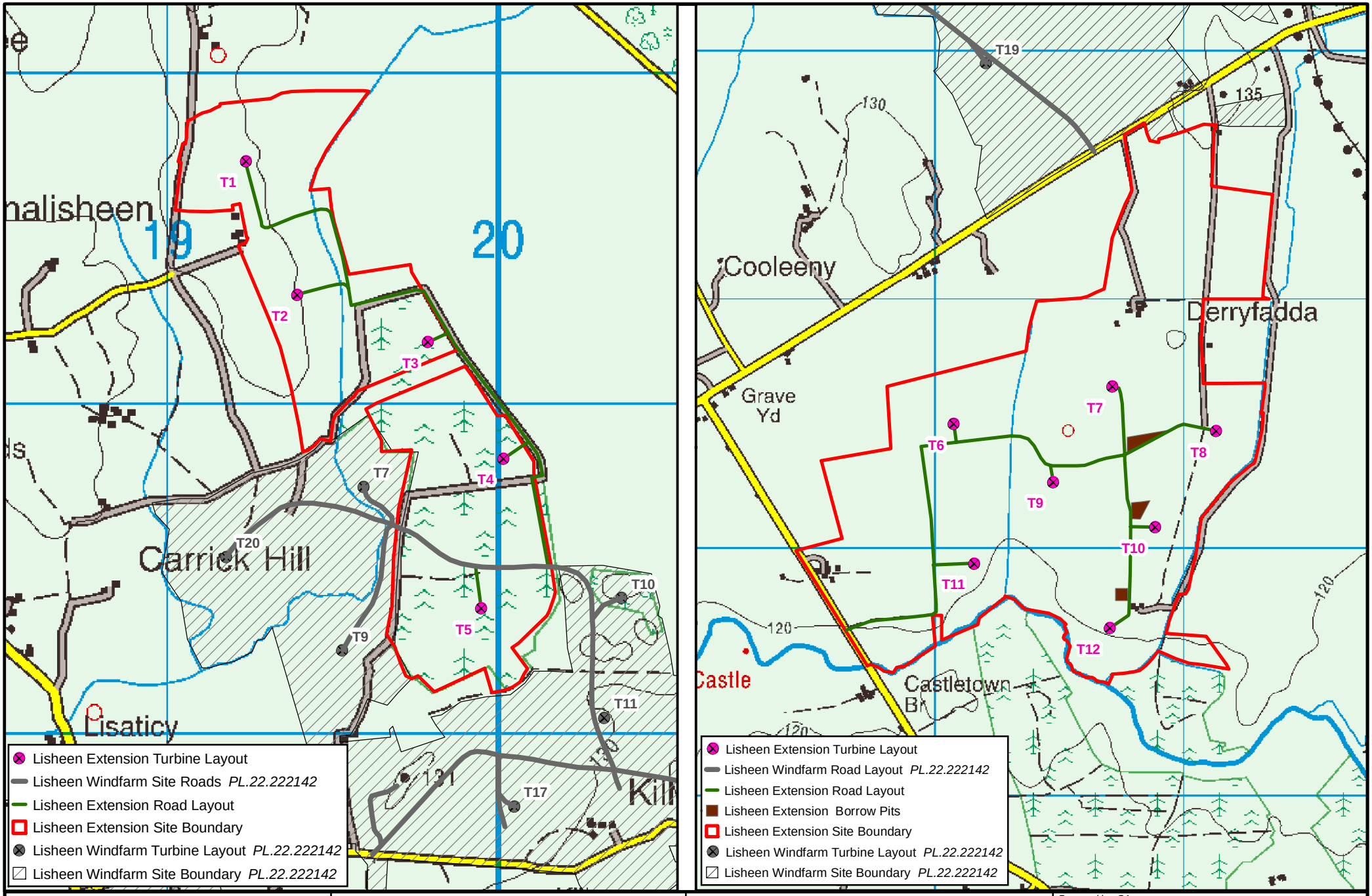


Figure 2.1
Site Layout

SWS Environmental Services
SWS Group

Prepared by: CA
Checked by: SH
Drawing date: 24/02/2009
Drawing No: Lisheen\05-Extension EIS & Planning App\Planning\EIS Maps\NTS Maps\Fig 2.1 Site Layout

3 IMPACTS OF THE PROPOSED DEVELOPMENT

The findings of the Environmental Impact Assessment (EIA) carried out for the proposed extension to the Lisheen Windfarm are presented in full in Volume II and Volume III of the Environmental Impact Statement.

During the scoping study the main environmental impacts were identified and considered in detail as part of the EIS. The EIA examined the key issues associated with the proposed development:

- Human Environment
- Landscape and Visual Impacts
- Ecological Impacts
- Geology, Hydrogeology and Geotechnical
- Hydrology and Water Quality
- Archaeological and Cultural Heritage Resources
- Noise Impacts
- Electromagnetic Interference
- Shadow Flicker
- Other Potential Impacts (Health & Safety, turbine decommissioning)
- Interaction of Impacts.

Potential impacts associated with the development was assessed in relation to:

- assessment of the existing environment
- predicted Impacts
- mitigation measures
- assessment and conclusions

3.1 Human Environment

3.1.1 Introduction

This section of the report describes the existing human environment in terms of land use, population and employment and assesses the likely impacts on the human environment arising from the proposed wind farm development. The main areas to assess with respect to the potential effects of this development on the human environment are noise and visual impacts. These are discussed in detail in various sections of this EIS. Other potential impacts include health and safety impacts to employees and locals, potential impacts on tourism, shadow flicker, impacts on telecommunications signals and socio-economic impacts.

In compliance with planning for granted Lisheen Windfarm (Pl. 22.222142) SWS Energy are currently contributing to a Trust administered via the Council on behalf of the local community with a view to allowing them to administer the funds as deemed appropriate for the community. In regards to the proposed extension development SWS Energy is offering to donate a similar amount to a Trust.

3.1.2 Site Context

Lisheen Extension Windfarm is made up of two parcels of land; one to the north and one to the south of the permitted site on the townlands of Barnalisheen, Derryville, Killoran, Cooleeny and Derryfadda. The proposed wind farm is located close to the village of Moyne and approximately 15km from Thurles. The subject site is in the Electoral Divisions of Longford Pass and Moyne.

SWS Environmental Services conducted a detailed house survey on the days of the 13th, 20th and 21st of January 2009. A total of 148 features were identified within 1.5km of the site boundary. Of these 148 features, 119 were classified as inhabited houses, 27 were identified as derelict of uninhabitable, 2 were identified as a site with outline planning permission granted and 1 was classified as a workplace building. All residential properties are sited over 500m from of the nearest proposed turbine location. The closest dwelling, House Y18 is located approximately 594m from the closest proposed turbine.

3.1.3 Potential Impacts

Potential impacts associated with the proposed development in relation to any significant impacts to humans can be assessed based on landscape and visual impact associated with the turbines, noise during construction and operation, traffic impacts, potential impacts on tourism, shadow flicker impacts, and potential health and safety impacts and water quality impacts associated with construction and wind farm operation. Additional concerns include

potential impacts on material assets in the local community. These impacts are discussed in following sections of this Non Technical Summary.

3.2 Landscape and Visual Impact

Note - Please note all Figures and Photomontages prepared for the Landscape and Visual Assessment have been appended to the EIS (Volume III) as a DVD and should be viewed in conjunction with reading this Chapter. A paper copy of these figures and photomontages can be requested from the planning desk of North Tipperary County Council.

3.2.1 Introduction

SWS Energy Ltd is proposing an extension to a wind farm granted planning permission (and currently under construction) at Lisheen Mines, County Tipperary. The extension project consists of 12 turbines in addition to the 18 'granted' turbines, split into a northern group consisting of 5 turbines, and a southern group of 7 turbines. The proposed turbines will be the same height as those granted turbines, i.e. 95 meters hub height and a rotor diameter of 90 meters. This report presents the findings of an extensive landscape and visual impact assessment of the proposed extension.

MosArt are intimately familiar with the landscape in question, having been the landscape consultants since 2006 for the now granted wind farm.

3.2.2 Potential Impacts

In total, the proposed extension was assessed from 37 viewpoints spread throughout the surrounding landscape. Many of these viewpoints were used in the original landscape assessment in 2006, thereby enabling a direct comparison between the 18 granted turbine project and the current extension. In some cases, the precise position of the viewpoint was shifted slightly in order to provide the most exposed view of the extension turbines. In other cases, completely new viewpoints were chosen which present an assessment from a location not previously considered or available (such as the new M8 motorway).

A detailed map illustrating all those locations which would 'theoretically' be provided with a view of the proposed extension turbines was first prepared (titled a zone of theoretical visibility map, or ZTV). This map highlights that there are very few areas within a 30km radius which provide only a view of the proposed extension turbines. In other words, practically all locations mapped in the ZTV study within the study area would be able to see not only the proposed extension turbines, but also the granted turbines.

The assessment of landscape and visual impact is centred on the use of the four criteria listed below:

- Landscape sensitivity - concerned with the acceptability of landscape change;

- Visual presence – concerns how visually dominant the wind farm extension is on the landscape;
- Aesthetic impact – examines the relationship of the extension to its context and whether it results in a negative or positive change; and
- Significance – summary statement regarding overall significance of landscape and visual impact.

3.2.3 Summary & Conclusion

In terms of results of the assessment, the following overview is provided:

- The locations assessed are typically of low sensitivity (24 of the viewpoints) with just four of the locations assessed in the study deemed to be of high or very high sensitivity.
- The proposed extension will considerably increase the level of visual presence of wind turbines compared to the current granted project.
- There would be a relatively small number of locations which would experience an increase in the level of adverse aesthetic impact.
- While the proposed wind farm extension at Lisheen Mines will increase the overall level of significance of landscape and visual impact at about one third of the locations assessed, none of these will experience either a Significant or Profound impact.

MosArt concludes that the proposed extension would not result in a critically unacceptable level of landscape or visual impact.

3.3 Flora and Fauna Assessment

3.3.1 Introduction

Inis Environmental Services was commissioned to undertake a detailed ecological survey to assess the flora and fauna at the proposed windfarm development site at Lisheen.

3.3.1.1 General description

The predominant habitat type of the c.300 hectare proposed windfarm site is made up of coniferous forestry plantation, improved agricultural grasslands and tilled land with Bord na Mona commercial cutover bogs, Lisheen Windfarm (PL 22222142) and Lisheen Mines Operations located in adjacent lands. The principal land uses in the locality are turf cutting, wet pasture, tillage and commercial forestry. Soil type on the site is peaty with compact sandstone-derived clay beneath. No parts of the Subject Site lie within or overlap areas designated as a Special Protection Area for birds (SPA), Special Areas of Conservation (SAC), and or Natural Heritage Areas (NHA).The closest designated site is approximately 9 kilometers to the north east at Galmoy Fen cSAC (Site Code:001857) and the Loughans pNHA (Site Code: 00407) approximately 10 kilometers to the south east, these designated areas will not be affected by the proposed wind farm extension. No wildfowl sanctuaries, Ramsar Sites or nature reserves are located within the site boundaries. The receiving environment therefore can be concluded to be of little conservation value. The drainage regime of the proposed development site forms part of a catchment that eventually feed into the Rossesstown River and the River Black/Drish.

3.3.2 Site Flora

The site for the proposed windfarm is located on conifer forestry plantation, improved agricultural grassland and tilled land. Species recorded during the survey were consistent with these habitat types with no rare or protected species of ecological significance identified.

3.3.2.1 Potential Impacts – Flora

The greatest impact on flora in this area would occur during the construction phase of the development when construction works might cause direct damage to habitat. Recolonisation of disturbed ground by plant species post-construction however would limit this problem to the short term. The greatest long term impact on the flora of the site would be brought about by land take for turbine foundations and site roads. The actual area required for these however is relatively small and the associated permanent habitat loss would be minimal. The physical area of habitat loss should not be significant as it is coniferous forestry plantation, improved agricultural grasslands and tilled land, these habitats are of little conservation value and are widespread in the area.

3.3.3 Site Fauna

No animal species of ecological importance were recorded on the site. The following species were identified during the ecological assessment; fox, brown rat, house mice, rabbits, Irish hares, mink, no signs of badger or otter were observed. In addition the following are also known to occur in the general area- otters, stoat, hedgehog, bats, red squirrel and badger.

The main impact for fauna would arise from the immediate loss of habitat and also from the generation of noise and human activity during the construction phase of the development.

3.3.3.1 Potential Impacts - Birds

The construction phase may impact avian populations in terms of noise and intrusion but this would be short-term impact not considered to be significant as any displaced avian fauna would temporarily relocate to nearby habitats. Disturbance caused post-construction by human activity and site visits would be infrequent and of no great significance.

Habitat loss will occur through the physical placement of wind turbines at the site, together with the building of access roads and other structures associated with the wind farm. However, the overall physical area of habitat lost to birds during the construction phase will not be significant as it is coniferous forestry plantation, improved agricultural grasslands and tilled land and these habitats are of little conservation value and are widespread in the area.

Recent studies indicate that wind turbine developments have minimal impacts on flying birds as they can adjust their flight paths to avoid such large obstacles. It is considered that based on the species recorded within the site; there will be no significant collision risk to birds within the site arising from the development. Collision risk has been minimized through site selection and turbine siting and layout, all turbines are located in habitats that are subject to ongoing human influences and include agricultural grasslands, tilled land and coniferous forestry plantation. The area in general also is of little conservation value- it is not within or proximal to any conservation designation areas.

As there are no identified flight paths by waterbirds or migratory routes over or near the Proposed Lisheen Extension Site, it is concluded that the proposed development does not pose a significant threat to wintering waterfowl.

3.3.3.2 Potential Impacts –Amphibians

There is no rare or threatened amphibian biodiversity at the extension areas. The proposed wind farm development constitutes an insignificant impact for amphibians. Any pools or aquatic areas (drainage ditches) should be fenced off and protected from disturbance during the construction phase.

3.3.3.3 Potential Impacts – Mammals

The site is considered to be of low ecological interest in terms of its mammal population with mammalian fauna being represented during the faunal survey only by fox, brown rat, house mice, rabbits, Irish hares, mink, no signs of badger or otter were observed.

The construction phase of the development will impact upon mammalian populations in terms of noise and earth moving activity. The proposed development would not be expected to have any significant adverse impacts on the various mammal species which inhabit the site and surrounding areas. All the species recorded, or considered likely to occur, would be expected to continue to be found in the area after the turbines are constructed. As the site will not be enclosed no long-term impact on wildlife corridors will occur. If the removal of mature trees is unavoidable during any of the works, felling during the breeding season for birds (April-July) will be avoided. An ecologist with experience in bat surveys will check mature trees that are to be felled for signs of bat roosts. The timing and manner of the felling of any mature trees removed will be under the advice of the ecologist.

3.3.3.4 Potential Impacts – Aquatic

Potential aquatic impacts occurring during the construction phase would be due mainly to the alteration of drainage regimes within the site. The network of streams that drain the site eventually flow the Rossesstown River and the River Black. Proposed turbine locations however have been selected to avoid streams and allow for appropriate buffer distances so that the state of aquatic ecosystems would not be negatively affected. Surface water protection measures will be implemented prior to commencement of construction, including the installation of silt traps and regular cut-off drains to re-distribute the water to the surrounding soil/grasslands and the use of span type structures in water crossings. The developer will submit details of the proposed water protection measures to the Planning Authority and/or local Fisheries Authority for approval prior to the commencement of the development.

3.3.4 Proposed Mitigation Measures

The proposed road layout of the wind farm has been devised in such a manner so as to minimise the extent of road upgrade required and to make use of the existing networks of tracks and roads. Designated areas will be used to dispose of all excavated material which will be utilised and graded as part of the site restoration post construction. Best site management practices will be implemented at all times to prevent as far as possible any negative impacts on aquatic ecosystems.

An ecologist will supervise all site works in order to minimise the disturbance of habitats. Of particular concern will be the preservation of animal dwellings and the prevention of disturbance to breeding birds during the breeding season (April - July).

3.3.5 Conclusion

The proposed Lisheen Extension Wind farm and the associated works do not pose a significant threat to the local populations of flora and fauna. The proposed extension area for the most part is of low conservation value being composed of post thicket/mature coniferous forestry plantation, agricultural grasslands, arable and tilled land. All of these habitats types are and have been subject to a considerable amount of human influence over time. The habitat being used for the siting of the turbines and associated works at the proposed Lisheen extension have been carefully considered and is of very low ecological importance. The development would not have significant ecological impacts. The site construction phase will be closely monitored by a site environmental engineer/ecologist to ensure Best Management Practices are implemented.

3.4 Soils, Geology & Geotechnical Impact Assessment

3.4.1 Introduction

The proposed extension development consists of 12 turbines associated access roads and 3 borrow pits. The proposed development is geographically divided into two sites, the northern extension site and the southern extension site. This chapter of the EIS assesses the potential impacts of the Proposed Development on the existing soil, geology, and geotechnical aspects of the site.

The soils and geology sections of this chapter were prepared by O'Neill Ground Water Engineering Ltd. (OGE). RPS Group Ltd. were commissioned to conduct a 'Geotechnical Appraisal' of the proposed site, with the purpose of providing geotechnical input, guidance and recommendations for the project. The geotechnical sections of this chapter summarise the key findings and recommendations of the RPS report.

The objectives of this assessment are to determine the feasibility of the development in terms of its potential impacts on the soils and geology as well as in a geotechnical context and to provide mitigation solutions to minimise any impacts identified during the assessment.

3.4.2 Existing Environment

The proposed development site was studied in terms of the existing environment. An assessment of the existing geology indicated that the main regional geological units in the study area are Waulsortian Limestone, Crosspatrick Formation and Ballysteen Formation. Geological stratification and structural geology were also examined.

Karst is the term used to describe features that have developed in rock types that are readily dissolved by water generally carbonate rock. Palaeokarst is buried, inert or fossilised karst. The study also indicates that the proposed development area is part of a palaeokarst system. While currently inactive and potential impact is considered to be low, further detailed geotechnical investigation work will be required to identify any potential karst features. Mitigation measures to deal with karst areas have been identified.

As part of the statutory consultation process for this development, Geological Survey of Ireland (GSI) were advised of the proposal to extend the permitted Lisheen Windfarm development. GSI responded with information regarding proposed NHA (Natural Heritage Area) designations; this email is attached in Appendix 3.0. GSI, as part of the Irish Geological Heritage (IGH) Programme, has identified two listed sites within the permitted Lisheen Windfarm site and none within the proposed extension development sites. The two listed sites

include a deep Doline and the Lisheen Mines complex. It was confirmed that the proposed development would not impact upon these lists sites (pers. comm. S.Preteseille, GSI, Feb 2009). GSI advised the developer that a geotechnical assessment of the bedrock and slope stability should be carried out for the proposed development. GSI also advised (pers. comm S.Preteseille, GSI, Feb 2009) that, should the development go ahead, further detailed geotechnical investigation work should be carried out. This advice has been adopted in the migitaion measures proposed. The raised bogs identified as NHAs in County Tipperary by National Parks and Wildlife Services (NPWS) are not located in the vicinity of the site. The proposed windfarm is in the locale of the operating Lisheen Zinc-Lead Mine. The construction of the windfarm extension is planned to commence during the operating life of the mine and shall have no effect on mine production.

In terms of soils and subsoils, regionally three main subsoil types have been identified in the vicinity of the proposed development – Limestone till, cutover peat, isolated areas of sand and gravel and occasional shallow bedrock or bedrock outcrops. The geotechnical investigation work conducted by RPS identified the predominant subsoil at the trial pits conducted for the base of turbines T1, T2 and T6 – T12 as 'Till'. A 'Peat/Till' arrangement was encountered at trial pits for turbine bases T3 – T5. The peat area on the northern site of the proposed Lisheen Extension Development is within a relatively flat raised bog area with very low gradient. RPS conducted a risk assessment of mass movement for the peat area in the northern site; it was concluded that the likelihood of a peat slip occurring at the proposed sites during construction is considered to be 'unlikely', with a low probability rating. The Geological Survey of Ireland has indicated that there is no designated geological Natural Heritage Area (NHA), a potential NHA or County Geological Site in the vicinity of Lisheen.

3.4.3 Potential Impacts & Mitigation Measures

Potential Impacts from the development were assessed in relation to the following areas:

- **Impact on existing bedrock, soils and subsoils**

  Bedrock, soils and subsoils will be exposed during the construction phase of the development; however exposure is expected to be short-term. Mitigation measures pertaining to impact on existing bedrock, soils and subsoils include bunding of temporary fuel storage areas, parking areas and other potential risk areas.

- **Ground Stability – in both peat and non-peat areas**

  Potential impacts on ground stability were identified as part of the RPS 'Geotechnical Appraisal' (Appendix 7.0, Volume 3). It was deemed 'unlikely' that a peat slip would occur as a result of the proposed development. Nevertheless, mitigation measures against mass movement of peat have been proposed. Examples of such measures include the use of conservative excavation slope angles, the use of specialised low-

ground pressure tracked machinery. Specialised road construction types have also been identified to suit the particular ground conditions on site. Provided all recommendations and considerations are incorporated into best practice site construction, the risk of significant impacts to site stability arsing from the construction of the proposed extension is low.

- **Karst and Palaeokarst**

  Karst is the term given to rock types that are readily dissolved by water generally carbonate rock. Palaeokarst is the term given to buried, inert or fossilised karst. The proposed development site is part of a palokarst system. While currently deemed to be inactive, further geotechnical investigations will be conducted, subject to receipt of planning permission, to ensure that any potential underground karst features are identified prior to detail design stage. Should any karst features been identified, best practice mitigation measures will be applied.

- **Bearing Conditions**

  Based on preliminary site investigation work, suitable road types and foundation types have been matched according to investigation results. Where applicable roads will be founded directly on competent material, in areas of peat a road type termed 'excavate and replace' will be used and in areas of deeper peat 'floating roads' will be utilised. Foundations are expected to be of two types, piled or raft. While unlikely, bearing failure could potentially occur. The types of road and foundation construction described above are designed to mitigate against bearing failure, excessive movement and settlements.

- **Side Casting and Stockpiling**

  Long-term stress due to side casting and stockpiling could potentially occur in peat areas. Where possible, all excavated peat should be removed to suitable stockpile or side casting areas which have been assessed in terms of environmental impact and ground stability. Excavated peat should not be cast onto surface of deep or saturated peat, and stockpile heights should be limited. Side casts should be spread in thin layers, bog mats could also be used to distribute the loading if required.

- **Borrow Pits**

  Three borrow pits have been proposed as part of this development, these are located on the southern extension site. Borrow material will be used on site for the construction of roads and turbine foundations. This has a positive effect in that it will significantly reduce the volume of traffic on the surrounding road networks and the need for importing fill from quarries will be reduced if not eliminated entirely. In order to mitigate against environmental related impacts associated with borrow pits standard buffer zones from aquatic zones will be implemented. Potential stability

issues can be addressed by strengthening the excavation using liners or a layer of blinding.

- **Drainage**

  Incorrectly designed or managed drainage systems may increase instability risk; this is true for all ground conditions but it is especially true on sloping ground - It is evident that the proposed site has a very low gradient. Drainage from exposed excavations can increase suspended solids in natural watercourses leading to siltation of stream beds. Overdrainage of bogs can also have a detrimental affect on hydrology. Mitigation of these impacts will include the use of best practice methodology during construction; aquatic buffer zones will be implemented, sediment control measures such as silt traps and settlement ponds will be constructed where necessary. Drainage should be designed to avoid overdrying or soaking of the peat areas; a site drainage management plan has been prepared and is attached as Appendix 4.0, Volume 3.

- **Aggressive Ground**

  The principle cause of deterioration of concrete in foundations is attack from chemicals, acids and frost in the soil and groundwater, potentially affecting the buried turbine foundation. Subject to receipt of planning permission, further investigations will be conducted prior to detail design stage. In the event that potentially aggressive ground is identified and if it has been deemed to be a potential issue specialised resistant cement can be used in the turbine foundations.

3.4.4 Conclusion

An assessment of potential impacts on soils, geology and geotechnics was carried out for the proposed development. O'Neill Ground Water Engineering Ltd. (OGE) prepared the soil and geological sections of the assessment and RPS Group Ltd provided geotechnical information for the proposed site. RPS prepared a 'Geotechnical Appraisal' report.

The proposed development site was studied in terms of the existing environment. An assessment of the existing geology indicated that the main regional geological units in the study area are Waulsortian Limestone, Crosspatrick Formation and Ballysteen Formation. Geological stratification and structural geology were also examined. The study also indicates that the proposed development area is part of a palaeokarst system. While currently inactive and potential impact is considered to be low, further detailed geotechnical investigation work will be required to identify any potential karst features.

In terms of soils and subsoils, regionally three main subsoil types have been identified in the vicinity of the proposed development – Limestone till, cutover peat, isolated areas of sand and

gravel and occasional shallow bedrock or bedrock outcrops RPS conducted a risk assessment of mass movement for the peat area in the northern site; it was concluded that the likelihood of a peat slip occurring at the proposed sites during construction is considered to be 'unlikely'. The risk assessment also indicated that the natural peat slopes at the proposed turbines and access road locations have an acceptable Factor of Safety (FoS) when compared with relevant standards. The Geological Survey of Ireland (GSI) has indicated that there is no designated geological Natural Heritage Area (NHA), a potential NHA or County Geological Site on the proposed extension development sites. However there are two listed sites within the vicinity of Lisheen (as per current working draft). As confirmed with GSI, the proposed development is not expected to impact upon these sites.

Mitigation measures and recommendations have been proposed in order to prevent or alleviate soil erosion, mass soil movement, bearing failure, soil and bedrock contamination, failure due to karst features and water quality deterioration. Potential impacts relating to borrow pits, stockpiling and aggressive ground have also been addressed. These mitigation measures will be implemented where appropriate. Furthermore, a Construction Method Statement (CMS) for the proposed site will be prepared in consultation with the appointed civil contractors. Such appointments are expected to be made subject to receipt of planning permission; therefore a CMS cannot be prepared at this stage of the project. Once prepared, a copy of this document will be made available to the Planning Authority. The CMS will incorporate applicable mitigation measures from this chapter. The CMS will be incorporated into the civil contractor tender documents in order to be fully implemented and controlled on site. Provided that appropriate engineering supervision, good site practices and the incorporation of recommendations are carried out where appropriate, no significant adverse effects are likely to occur arising from this development on ground conditions and the surrounding area. In addition no long term geotechnical risk is expected to exist because of this development.

3.5 Water quality Assessment

3.5.1 Introduction

O'Neill Ground Water Engineering Ltd. (OGE) were commissioned to conduct a 'Water Quality Appraisal' of the proposed site, with the objectives of determining the feasibility of the development in terms of potential impacts of the development on the water environment, to characterise the current hydrological and hydrogeological systems in the vicinity, to assess the impact of the proposed development on surface and ground water patterns and identify appropriate mitigation measures.

3.5.2 Existing Environment

The proposed wind farm development sites are drained by the Rossestown River (the northern extension site) and the River Drish/Black to the southern site. The Rossestown River, a tributary of the River Suir, rises in the Derryville bog immediately north-west of the proposed northern extension site. The Suir River flows from north to south between Templemore and Thurles, to the west of the site, and the River Black/Drish flows from the north east, south of the site. The confluence of these two major rivers is 1.5km south of Thurles.

3.5.3 Potential Impacts during the Construction Phase

Hydrology

- The excavation of material for road and foundation construction may have the potential to contaminate surface water features situated adjacent to the proposed wind turbines.

  Impact: Slight Impact

- The construction of the windfarm involves the use of a range of materials and fluids. Fuels and lubricants used for construction machinery, which if spilled, have the potential to give rise to contamination of surface water.

  Impact: Slight Impact

- If wash water from concrete mixers and waste concrete were accidentally discharged into water courses this may lead to an increase in pH and suspended solids.

  Impact: Moderate Impact

- The construction of proposed access routes through peat areas may alter the drainage network within this area.

  Impact*:* Moderate Impact

Hydrogeology

- The removal of the overburden would increase the vulnerability of the aquifer beneath to potential contamination during the construction of each turbine base.

  Impact: Slight Impact

- There will be no impact of the development on the water quality and yield of third party wells during the construction phase of the development.

  Impact: No impact

3.5.4 Potential impacts during the Operational Phase

Hydrology

- The proposed wind turbines are situated at discrete locations within the site such that any potential impacts on surface water hydrology will be localised. There will be no risk runoff of suspended solids entering water courses in the vicinity of the proposed wind turbines.

  Impact: Imperceptible Impact

- Alteration of existing drainage in the southern extension area due to the construction of internal access roads

  Impact: Imperceptible Impact

- There will be no impact on the regional surface water network as a consequence of the proposed development.

  Impact: Neutral Imperceptible Impact

Hydrogeology

- Given the non-intrusive nature of the development, there will be no impact on the existing ground water flow regime in terms of quality and quantity, during the operational phase of the development.

  Impact: No Impact

- There will be no impact of the development of the water quality and yield of third party wells during the operational phase of the development.

  Impact: No Impact

3.5.5 Mitigation Measures

- There are no sources of wastewater or effluent discharge arising from the construction or operation of the development. The mitigation measure proposed will ensure the protection of surface water and ground water in the vicinity of the site and, consequently, the ground water beneath the site.

- A spill kit will be maintained during construction. This kit will be equipped with suitable absorbent materials, refuse bags etc. to allow for the appropriate cleanup and storage of contaminated materials in the event of a spill or leak occurring.

- Small quantities of lubrication oils, required for maintenance and repair works to equipment, will be securely stored in a bunded area within the construction compound.

- There will be no discharges of effluent to surface or ground water during the construction phase.

- Fuelling of plant equipment will be carried out on the main site, thereby eliminating the requirement for bulk storage of diesel fuel.

- The maintenance contract for the turbines will include the requirement that all waste materials, including oils, generated during maintenance activities, are collected and transported off site for correct disposal or reprocessing prior by approved waste contractors. (See **Appendix 4**, Waste Management Plan)

- In order to ensure the protection of surface waters during construction, silt traps will be provided at surface water drainage points from the site. These will remove

increased suspended solids loadings from rainwater runoff from the wind turbine sites. These will be regularly inspected and maintained throughout the construction period.

- Extensive site works will not take place during periods of extended heavy rain in order to minimise the quantities of mud and soil runoff to silt traps.

- The access routes to wind turbines situated in peat areas will be constructed such that they will not cause any significant reduction of water levels in the peat or drainage off the peat. As outlined in Chapter 7.0, floating roads methods will be used in areas of deep peat. The existing peat structure will therefore remain intact beneath the roadway and not result in any significant drainage off the peat.

- Although the road network within the extension areas will not be impermeable, the road network will be drain along its entire length with french drains, which will enable excess runoff water to soak away into the ground. The construction of the drains will comply with relevant standards set out by the National Roads Authority and North Tipperary County Council requirements.

- Based on the proposed access route to the turbines in the northern extension area the access road will cross the Rossestown River at two separate locations. As recommended by the Southern Regional Fisheries Board stream crossings are to be bridged. Any crossings man-made drains will be culverted. Subject to planning, and prior to the commencement of construction works a detailed site specific Construction Method Statement will be implemented and shall be submitted to the Southern Regional Fisheries Board and Environmental Dept of North Tipperary County Council for approval. (See **Appendix 4** for Site Drainage Plan)

- Where water is required to be pumped from the excavated turbine base, this will be diverted to a designated pre-constructed silt control pond.

- No concrete washing will occur within the proposed extension areas.

3.5.6 Conclusion

All of the mitigation measures identified above have been incorporated into a Site Drainage Plan (See attached **Appendix 4**). Subject to planning the Site Drainage Plan will form part of a site specific Construction Method Statement. This Construction Method Statement will be submitted to the North Tipperary County Council and the Southern Regional Fisheries Board for approval and sign off prior to the commencement of works.

3.6 Archaeological, Architectural and Cultural Heritage Assessment

3.6.1 Introduction

In order to establish the existing archaeological environment of the site and to determine if the proposed wind farm development would have any potential impact on archaeological and heritage resources an archaeological site survey was commissioned. This incorporated both a field survey and a desk based assessment of the proposed site. Gregory Consultants Archaeology Ltd were commissioned to carry out an Archaeological, Architectural and Cultural Heritage Assessment Report.

3.6.2 Existing Environment

Extensive archaeological monitoring and excavation works have been carried out in the past in the Lisheen area. Following site investigations and study of the Record of Monuments and Places it was determined that a total of 238 archaeological sites are located within a 1.5km radius of the northern and southern extension sites. Two newly recorded archaeological monuments were detected during field survey as part of this assessment. An enclosure and moated site were discovered in the southern extension site. Both features are located approximately 230m from the nearest turbine.

A burnt pit was detected during routine archaeological monitoring at permitted Lisheen Windfarm. Following recommendations from the on-site archaeologist the feature was preserved in situ and appropriate mechanisms were implemented to ensure no impacts from construction activity.

3.6.3 Potential Impacts

Relatively little ground disturbance is associated with wind turbines. Therefore it is not anticipated that any negative impacts on cultural or archaeological heritage will result from this development. An extensive visual impact assessment was carried out with accompanying photomontages to determine the potential visual influence of the granted and proposed turbines. It is considered that the visual impacts immediate to the site and in relation to the other archaeological sites referred to in this report are not of sufficient influence to preclude development. Any visual considerations described are none to minor, with the exception of one, Site 22, in which the moderate impacts are lessened to some extent by the wind turbines' setting within the landscape and below the horizon when viewed from the perspective of the site.

The inter-visible relationship between sites in the immediate area of the development is not impacted upon by the proposed locations of the turbines.

3.6.4 Proposed Mitigation Measures

In order to ensure that archaeological finds, features or artefacts are not accidentally disturbed or destroyed during construction, all ground disturbance associated with the construction of the proposed wind farm including all ground investigations, road construction and excavation of turbine bases should be monitored by a suitably qualified archaeologist under licence from the Department of the Environment, Heritage and Local Government.

3.6.5 Conclusion

Following the implementation of the above mitigation measures, the proposed development should not have any known impact on possible archaeological features within the site. An archaeologist will monitor site topsoil removal and construction activities for discovery of unknown significant archaeological findings, which will be reported to Heritage Service. No other mitigation measures are considered necessary at this point.

3.7 Noise

3.7.1 Introduction

A baseline environmental noise survey was carried out by Noise and Vibrations Consultants Ltd to determine existing environmental noise levels at and around the proposed development site. The results of the noise monitoring programme were used to characterise and evaluate the existing environmental sound levels in the area and assess the impact of noise emissions from the proposed development. Noise level prediction modelling (using specialist software) was carried out by SWS Environmental Services to determine the potential impact of the proposed development on noise sensitive residences in the area.

Lisheen Extension Windfarm is made up of two parcels of land; one to the north and one to the south of the permitted site on the townlands of Barnalisheen, Derryville, Killoran, Cooleeny and Derryfadda. The proposed wind farm is located close to the village of Moyne and approximately 15km from Thurles.

Historically, noise has been considered to be an important consideration in the location of wind farm developments due to mechanical and aerodynamic noise associated with turbine operation. Modern turbine developments however are designed to minimise noise impacts and careful planning and site location will ensure that a wind farm development does not significantly impact on the environment.

3.7.2 Existing Environment

A house survey was conducted by SWS personnel on the days of the 13th, 20th and 21st of January 2009. A total of 148 features were identified within 1.5 km of the proposed development site boundary.

Of the 148 features surveyed:

- 119 were classified as inhabitable houses
- 27 were identified as derelict or uninhabitable houses
- 2 were classified as a site with outline planning permission granted.
- 1 was classified as a workplace building.

The closest inhabitable dwelling to the proposed development (House Y18) is located approximately 594m from the closest turbine.

Noise monitoring was carried out by Noise and Vibration Consultants Ltd to determine the background noise levels in the surrounding area of the proposed development. Noise monitoring was carried out at 5 locations over a 15-day period using environmental noise analysers with the facility to log recorded data. The baseline noise monitoring locations were chosen to be representative of the closest dwellings to the proposed development. The impact of noise generated from the windfarm development on background noise levels was also determined.

There are no houses located at a distance of less than 500m from the nearest turbine. As stated in the DOEHLG Wind Energy Planning Guidelines 2006, “noise is unlikely to be a significant problem where the distance from the nearest turbine to any noise sensitive property is more than 500m”.

3.7.3 Potential Noise Impacts during Construction

Noise during the construction period will arise from the construction of the turbine bases, the erection of the turbines, the excavation of trenches for cables, and the construction of associated hard standings, new access tracks and the construction compound. Noise from vehicles on local roads and access tracks will also arise resulting from the delivery of the turbine components and construction materials. Noise impacts associated with the construction period will be temporary in nature.

3.7.4 Proposed Mitigation Measures during Construction

During construction, noise activities will generally be confined to daytime and will be of short duration.
A number of noise abatement measures will be implemented:

- Limiting noisy construction activity to daylight hours where possible,
- Limiting the duration of the construction period,
- Plant commissioning activity will be confined to daytime,
- Construction activities will be required to comply with British Standard BS 5228: Part 1: 1997 (Noise Control on Construction and Open Sites - Part 1. Code of Practice for Basic Information and Procedures for Noise Control) which offers detailed guidance on the control of noise from demolition and construction activities.

3.7.5 Potential Noise Impacts during Operation

Noise level prediction modelling (using specialist software) for each dwelling identified within 1.5 km of the proposed turbines was carried out by SWS Environmental Services to

determine the potential impact of the proposed development on noise sensitive residences (closest residences to the proposed development). The impact of the proposed development on the residential community was calculated by monitoring the existing (baseline) noise levels at five locations (representative of the closest dwellings to the proposed turbines) and comparing the baseline to the predicted noise emissions from the development.

The assessment of baseline Noise survey results together with the assessment of the prediction model results taking account of the permitted Lisheen Windfarm and the proposed Lisheen Extension indicate that the predicted Noise levels at all potentially noise sensitive dwellings within 1.5km of the proposed Lisheen Extension are compliant with the identified day time and night time noise limit criteria as stipulated in the DoEHLG Wind Energy Planning Guidelines 2006.

3.7.6 Proposed Mitigation Measures during Operation

The development should meet all standards with regard to operating noise for wind power developments. Overall, the development should not impact significantly on the acoustic soundscape of the area.

3.7.7 Conclusion

Noise monitoring was carried out by Noise and Vibration Consultants Ltd to determine the background noise levels in the surrounding area of the proposed development. A house survey was carried out a total of 148 buildings were identified within 1.5 km of the proposed development. Of these, 119 were found to be inhabitable dwellings, 27 were designated as uninhabitable/derelict buildings, 2 sites with outline planning permission granted and 1 workplace were also identified.

Noise modeling was carried out and it was shown that that proposed addition of Lisheen 12 Turbine Extension to the permitted Lisheen 18 turbine windfarm presents a marginal increase in predicted noise levels at the closest noise sensitive residences surrounding both developments.

The proposed Lisheen Extension complies with all the criteria and limits stated in the Planning Guidelines for Wind Energy 2006.

The developer intends to ensure that source noise from the proposed windfarm will comply with the noise criteria outlined by the Planning Guidelines for Wind Energy, published by the Department of Environment, Heritage and Local Government in 2006.

3.8 Electromagnetic – Aeronautical and Telecommunications Impacts

3.8.1 Introduction

Radio waves and microwaves are used for a wide variety of communication purposes. The rotating blades of wind turbines can scatter electromagnetic signals causing interference in a range of communication systems.

An electromagnetic impact assessment was carried out in order to:

- Survey the existing electromagnetic conditions
- Determine possible sources of electromagnetic emissions from the proposed development
- Assess any potential impact of electromagnetic emissions on the existing environment
- Determine if any mitigation measures would be required

During the site layout design phase, the following telecommunications companies, airports and authorities were consulted regarding proposed turbine locations and potential impacts on existing transmission signal paths and aeronautical infrastructure. (Grid Co-ordinates, dimensions and elevations of the proposed turbines were forwarded to each company for assessment).

- The Irish Aviation Authority (IAA)
- Vodafone
- Eircom
- Meteor
- O2
- RTE
- Shannon Airport
- The Broadcasting Commission of Ireland
- 3G
- Eirgrid
- Irish Coastguard

Copies of the Consultation information sent are included in **Appendix 2** to the main body of the EIS. Written responses received from consultees prior to the submission of this EIS are included in **Appendix 3** to the Main Body of the EIS.

Pager Power Ltd were commissioned to undertake a Telecommunications Assessment to assess potential impacts associated with the proposed development. A full copy of this report

is included as **Appendix 11** to the Main Body of the EIS. The purpose of the assessment was to ascertain whether the installation of a proposed 12 no. wind turbine extension at Lisheen would potentially interfere with services provided by telecommunications companies (microwave link operators) in the area. A number of telecommunications links (or signals) which pass through the proposed site were identified.

3.8.2 Existing Environment

The proposed developed is located approximately 65km to the northwest of Mount Leinster Telecommunications Mast. Mt Leinster transmitter mast is located on Mount Leinster which is the highest mountain in both Co. Carlow & Co. Wexford. It is one of the main television transmitters for Ireland and covers the south-east of Ireland. In some areas signals were received from the Maghera Transmitter which is located to the north-west of the site.

The proposed development is located approximately 80km from Shannon Airport.

3.8.3 Potential Sources of Electromagnetic Impacts during Construction

The primary sources of Electromagnetic Interference that may be produced during construction include electrical power tools and electrical generators brought on site before mains electricity is provided.

3.8.3.1 Proposed Mitigation Measures during Construction

Electromagnetic emissions from these devices are not anticipated to cause any EMI. All electrical components apparatus and systems utilised during construction will be required to comply with the EMC Directive 89/336/EEC thereby ensuring that these devises will not cause interference. If abnormal operation of equipment due to faulty equipment occurs then appropriate remedial action will be fully implemented.

3.8.4 Potential Electromagnetic Impacts during Operation

Potential electromagnetic impacts during operation include

- interference with television signals,
- interference with radio and mobile phone transmissions and
- interference with aviation equipment.

3.8.4.1 Proposed Mitigation Measures during Operation

All equipment will be required to comply with the EMC Directive 89/336/EEC thus ensuring that electromagnetic emissions from these devices will be well below those specified in the ICNIRP 1998 Guidelines and in the EU Council Recommendation 1999/519/EC.

As per standard practice, a Protocol Agreement has been signed on behalf of the developer with RTE NL to address in a clear and structured manner any impacts arising as a direct result of the proposed development and implement mitigation or remedial measures as deemed necessary.

Shannon Airport responded by stating that the proposed development is unlikely to give rise to an objection from the Airport Authority and advised the developer to correspond with the Irish Aviation Authority. The findings of this consultation are dealt with below.

The Irish Aviation Authority responded to consultation information on the 27th January 2009 (Refer to **Appendix 3.0** to this EIS Report) The IAA stated that "*it is unlikely that the proposed development would have adverse consequences for the safety of air navigation provided that it complies with any aeronautical and positional lighting data requirements specified by the IAA at the planning stage."* Subject to the receipt of planning permission, as is standard practice the developer, will consult with the IAA to ensure compliance with the above requirements.

Subject to the receipt of planning permission, as is standard practice the developer, will consult with the IAA to ensure compliance with the above requirements.

3.8.5 Conclusion

The Telecommunications (Microwave Link) survey and assessment conducted by Pager Power Ltd identified three signals which cross through the site and would potentially be impacted upon by the proposed development. Calculated results show that the nearest turbine to the Vodafone links was Turbine 12 however following the construction of an Exclusion Chart it was demonstrated that the turbine has a clearance of over 300m from the links. As such, it is considered that the likelihood of disruption of telecommunications signal as a result of the development is extremely low. All link operators will be informed of any changes to the layout should these occur to ensure that compliance with telecommunication constraints is maintained.

As is standard practice, the developers have consulted with RTE NL and have entered into a protocol agreement with RTE NL regarding the proposed development at Lisheen Extension. This protocol includes both granted Lisheen Windfarm (Ref 06/510773 & PL.22.222142) and

proposed Lisheen Extension in one document. Should interference with Television signals occur that is associated with the windfarm development, the developers will remedy the problem in conjunction with Radio Telefís Éireann Transmission Network Ltd.

The mitigation measures outlined will ensure that, in the unlikely event of interference with electromagnetic signals in the area occurring as a direct result of the proposed development at Lisheen Windfarm and proposed extension site, such interference would be dealt with quickly and efficiently in conjunction with the service provider.

3.9 Shadow Flicker

3.9.1 Introduction

Like any other tall structure, wind turbines can cast long shadows on the neighbouring area when the sun is low in the sky. During sunny conditions under certain combinations of geographical position and time of day, the sun may pass behind the moving rotor blades and cause a shadow to flicker on and off on neighbouring properties. This effect is known as shadow flicker. Only occupants of nearby buildings are likely to be affected by shadow flicker (i.e. when a turbine blade shadow passes an open door or window within a flicker zone), as the sunlight comes from one source. Shadow flicker will not be obvious out in the open as sunlight outside comes from all directions.

The shadow flicker effect lasts only for a short period and happens only in certain specific combined circumstances such as when:

- The sun is shining and is at a low angle in the sky (after dawn and before sunset); and
- The turbine is directly between the sun and the affected property; and
- The wind speed is high enough to move the turbine blades.

3.9.2 Potential Shadow Flicker Impacts

The potential shadow flicker impact associated with the proposed extension development was assessed using two methodologies; firstly a very conservative theoretical 'worse case' method and secondly a more realistic (corrected) method. The theoretical or 'worse case' scenario was modelled using the Garrad Hassan WindFarmer 3.6.2 software package; this methodology is believed to significantly overestimate the actual annual hours of shadow flicker experienced at a location. The 'realistic' duration of shadow flicker was calculated by applying correction factors derived from the probability of sunshine and sufficient wind resource to the 'worse case' model results. An assessment area of 1000m was used in both cases.

A shadow flicker impact assessment of the proposed 12 turbine extension was conducted. It was found that one third party habitable dwelling (Property Z.2) could theoretically exceed the Department of Environment, Heritage and Local Government's recommended maximum of 30 hours/year. However, by applying correction, it was found that expected shadow duration at all habitable dwellings and workplaces is well below the recommended maximum.

A second shadow prediction model was run to assess the cumulative shadow flicker affect of the permitted Lisheen Windfarm Development and the proposed 12 turbine extension development. The assessment indicated that 5 habitable dwellings and workplaces could, in theory, exceed the recommended maximum duration. The correction factors were again

applied to the model results. These corrected results, provide a more realistic indication of the predicted shadow flicker duration. It was found that all properties assessed came within the recommended maximum.

3.9.3 Proposed mitigation measures

The realistic (or 'corrected') shadow flicker impact associated with the proposed development is considered to be minor. However, should it be the case whereby shadow flicker becomes a significant impact during the operation of the wind farm, the developer will address the issue.

Following property owner consent, further studies will be undertaken by the developer to accurately assess the affected property, in particular the dimensions and exact locations of windows. If it is established that the nearby property is affected by shadow flicker, mitigation methods will be applied.

The principle method of mitigation available for shadow flicker effects is to shut down the particular wind turbine(s) responsible for causing the effects at a particular property, at times when the turbine(s) has been predicted or demonstrated to cause shadow nuisance. Landscape features, such as trees and hedging, could also be used to prevent or limit the potential for shadow flicker.

Given the limited duration of expected real shadow duration, it is unlikely that mitigation should be required.

3.9.4 Conclusion

The potential shadow flicker impact associated with the proposed 12 turbine extension to Lisheen Windfarm was assessed in detail. It was found that a number of nearby properties will experience some degree of shadow flicker. The assessment indicated that theoretical exceedances do exist, however a study of the probable or likely shadow flicker duration concludes that all properties assessed come within the recommended guidelines.

While highly unlikely that shadow flicker will ever become a significant impact of this proposed development, mitigation measures have been proposed and if deemed necessary and appropriate these will be implemented.

3.10 Other Impacts

3.10.1 Health and Safety

Any development may give rise to both occupational and public accidents and wind energy schemes are no exception. Developer health and safety obligations apply to the design, construction and operation of the wind farm. The construction phase was deemed the most hazardous stage of the proposed development; this has been addressed by the developer who will identify a site manager with responsibility for coordinating good environmental, health and safety practices during the on-site construction. A site-specific health and safety statement will be prepared that will address all standard health and safety issues arising on such a construction site.

Accidents to the public are extremely unlikely. Wind farms have demonstrated themselves to being inherently safe, even under extreme weather conditions. There is no record of serious injury or fatality being caused to a member of the public.

3.10.1.1 Potential Impacts during the Construction Phase

In view of the number of separate contractors involved in the construction works for a wind energy project, the developer will identify an individual with responsibility for site management to the local planning authority. This individual will have responsibility for all aspects of the work. The developer will also ensure that all contractors are aware of and abide by the requirements of any planning conditions or agreed environmental measures. An environmental engineer shall be on site to liaise with the onsite project manager to ensure compliance with all relevant planning consent conditions.

3.10.1.2 Potential Impacts during the Operational Phase

The turbines will require routine maintenance during their anticipated 20-25 year life span. It is expected that this will require no more than one-two vehicles per day and will not impact significantly on the existing traffic levels or road condition. Monitoring of wind farm performance is done electronically, and has no environmental effects.

3.10.2 Turbine Decommissioning

At the end of the useful life cycle of the turbines, a commercial and environmental appraisal of the project site will be carried out. The commercial appraisal will assess whether or not the turbines will be replaced or if the site should be terminated in relation to electrical generation. The developer will consult with North Tipperary County Council regarding these and other issues at this stage.

3.11 Interaction of Impacts

As a requirement of S.I No. 349 of 1989 and S.I. No. 93 of 1999, not only are the impacts on the individual elements of the environment to be considered, but so too are the interactions between those elements. The most common interactions are between human beings and noise, visual perceptions, construction impacts, biological resources, water resources and landscape.

In examining the interaction of the potential impacts for this development with regard to visual and landscape impacts and taking into account the evidence from the numerous photomontages, the existing cultural and historical landscape, current landuse patterns landcover for the site area and also reviewing the zone of theoretical visibility (ZTV) for the proposed development, it is considered that the proposed extension would not result in a critically unacceptable level of landscape or visual impact.

Potential Noise Impacts on the surrounding environment have also been given due consideration and overall, the impact of the proposed development on the soundscape of the greater area is regarded as not significant.

In terms of site construction and clearfelling, it is unlikely that the proposed development will adversely impact peat stability, site drainage or water quality in the area provided the recommendations put forward in the Geotechnical and Water Quality Assessment Reports (prepared by O'Neill Ground Water Engineering Ltd. (OGE) & RPS Group Ltd refer to Appendix 7 & 8 to the Main body of the EIS) are incorporated into a Construction Management Plan (approved by North Tipperary County Council and the South Regional Fisheries Board, subject to planning permission) are followed during the construction phase of the development.

In terms of ecological interactions similar to the above exposing soil and peat during the construction phase may lead to the sedimentation of nearby watercourses. However, mitigation measures will be put in place to control siltation occurring during the construction phase and ensure protection of the aquatic environment. Also excavation and removal of soils for the construction of permanent features such as hardstands, access roads etc may potentially lead to habitat loss. However as outlined in Chapter 6, the physical area of habitat loss should not be significant as it is coniferous forestry plantation, improved agricultural grasslands and tilled land, these habitats are of little conservation value and are widespread in the area.

The positive interactive elements of the development would be considered to be both of a temporary and long-term nature. The short term include employment generation, the longer

term, suitable utilisation of wind resource in a technically and logistically desirable location, the diversification of land use in poor agricultural land, the replacement of fossil fuel life cycle emissions with a pollution free alternative. Additional positive impacts are benefits to the National grid and assistance in meeting peak power demands for County Tipperary.

4 Difficulties encountered in compiling Information for EIS

No significant difficulties were encountered during the compilation of this EIS.

5 SUMMARY AND CONCLUSIONS

Each of the sections of this EIS identifies and describes the potential and likely impacts associated with this development both on and off site. The interaction of impacts and the capacity of the landscape to absorb the development are also dealt with in detail.

On review of the information gathered during the assessment carried out as part of the EIA, it is evident that the proposed project will not cause substantial adverse effects on human beings, housing or recreation.

Effects on landscape character, noise, biological and ecological resources, cultural & historical resources, land use, tourism and material assets, have all been determined not to be significant. Careful measures will be taken both during the construction as well as the operation to minimise any potential adverse impacts identified.

Positive attributes for the site with regard to supporting this wind energy development include:

- An extension to an existing windfarm
- It offer of an existing Grid Connection from ESB Networks
- Ease of site access
- Not adversely impacting on any environmentally designated sites
- Landuse and Landscape character sensitivity
- Distance from cultural and heritage sites
- Distance from main regional tourism areas

The findings of the Environmental Impact Assessment indicate that the potential impacts associated with a wind energy development of this size and layout can be absorbed and accommodated at this location without significant impairment of the existing environment.

Provided the recommended mitigation measures and management plans are implemented, the environmental impacts associated with this development in the immediate area would be considered minor. The regional and national impacts associated with this development would be regarded as significantly positive in terms of promotion of renewable energy development and indigenous energy production.